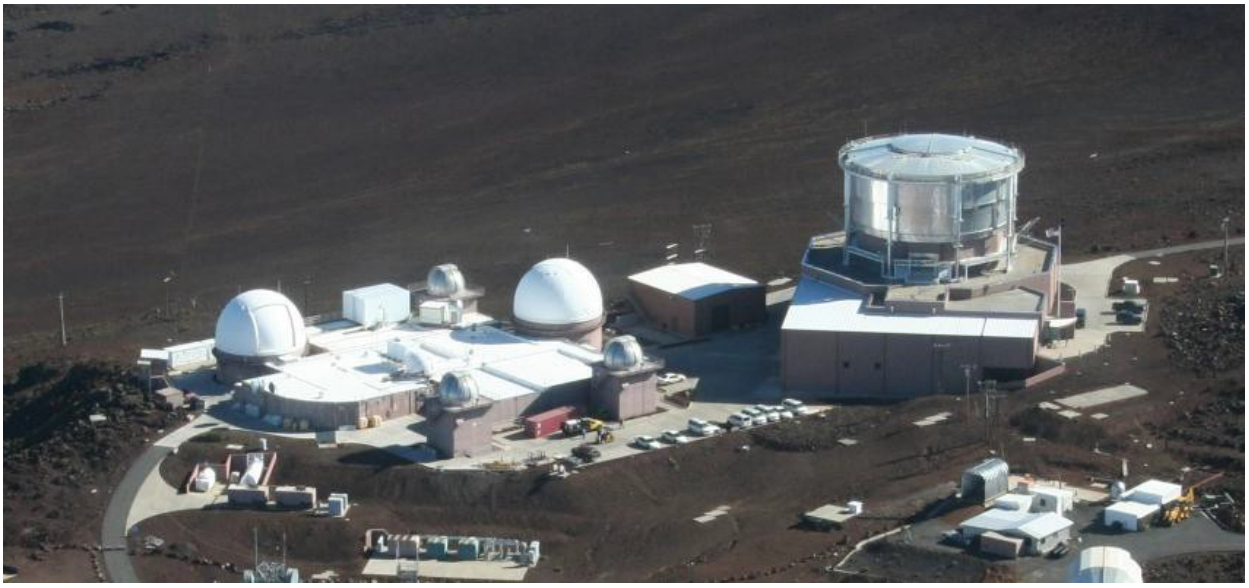
ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED MODERNIZATION OF MAUI SPACE SURVEILLANCE COMPLEX EQUIPMENT HALEAKALĀ, MAUI, HAWAI'I



FINAL

April 2016

United States Air Force Research Laboratory
Directed Energy Directorate
AFRL/DET 15 Maui
550 Lipoa Parkway
Kihei, Hawai'i 96753

FINAL

ENVIRONMANTAL ASSESSMENT FOR THE PROPOSED MODERNIZATION OF MAUI SPACE SURVEILLANCE COMPLEX EQUIPMENT AT HALEAKALĀ, MAUI, HAWAI'I

APRIL 2016

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MODERNIZATION OF MAUI SPACE SURVEILLANCE COMPLEX (MSSC) EQUIPMENT HALEAKALĀ, MAUI, HAWAI'I FINDING OF NO SIGNIFICANT IMPACT

APRIL 2016

Pursuant to Section 102(2) (c) of the National Environmental Policy Act (NEPA) of 1969 and the implementing regulations of the Council on Environmental Quality (CEQ) (40 Code of Federal Regulations, Parts 1500-1508), the Air Force Research Laboratory (AFRL) gives notice that a Final Environmental Assessment (EA) has been prepared to address the potential environmental consequences of the Modernization of Maui Space Surveillance Complex Research Equipment at Haleakalā, Maui, Hawai'i. Specifically, the Air Force Research Laboratory Directed Energy Directorate, Detachment 15 proposes the modernization of research equipment at the Maui Space Surveillance Complex (MSSC) located on Haleakalā, Maui, HI over the next five to ten years. The modernization of research equipment consists of: (1) the replacement of sensors and instrumentation, (2) operation of a sodium laser known as Frequency Addition Source of Optical Radiation (FASOR) propagated from the existing AEOS 3.6m telescope, and (3) installation and operation of an improved adaptive optics system which would be used throughout the year for the observation of stars and satellites. The improved instrumentation would be operated and supported by the existing staff and no additional Anti-Terrorism/Force Protection standoff would be required. The upgrade of this equipment will be installed within existing buildings and would not exceed current exterior structure dimensions. No federal or state permits or approvals will be required for this action. This action does not trigger compliance with Hawai'i Revised Statutes ("HRS") Chapter 343, the Hawai'i Environmental Policy Act, because the action does not require an approval, defined under Hawai'i law as a discretionary consent required from a state or county agency prior to actual implementation of the action, HRS § 343-2, 343-5(e).

This Finding of No Significant Impact (FONSI) summarizes the Proposed Action and alternatives and the results of the environmental analysis.

Site Location: The modernization of research equipment will occur at the Maui Space Surveillance Complex located at the Haleakalā Observatory at the summit of Mount Haleakalā in Maui Hawai'i.

Purpose of and Need for the Proposed Action:
The purpose of this action is for AFRL/DET 15 to modernize research equipment in order to continue meeting its DoD operational requirements and research objectives. The MSSC mission is required for the space monitoring network of the U.S. Air Force serving a dual role:

1. Providing electro-optical facilities for the collection of data from suborbital, near earth, and deep–space objects; and
2. Serving as a test site for sensor/laser research.

Modernization and upgrade of equipment at MSSC is needed to accomplish state-of-the-art

space observation, illumination, and ranging capabilities.

Description of the Proposed Action and Alternatives:

Proposed Action

The Air Force is proposing to continue space object viewing, data collection, and site operations at MSSC on Haleakalā with the following improvements: (1) replacement of sensors and instrumentation, (2) operation of a sodium laser known as FASOR propagated from the existing AEOS 3.6m telescope, and (3) installation and operation of an improved adaptive optics system which would be used throughout the year for the observation of stars and satellites. All of the equipment would be installed by qualified scientists, engineers, technicians and electricians within the existing buildings previously constructed at the MSSC, on Haleakalā in Maui, Hawai'i. When activities require the integration with facility electrical power, licensed electricians would follow National Electric Code requirements. The instrumentation sensors, cameras, and other research equipment are relatively small and can be installed by one to two individuals and will not alter the existing structure dimensions.

Site Alternatives

Alternative sites were considered for the research activities that require the modernization at Maui. The Starfire Optical Range at Kirtland AFB, New Mexico was considered as a potential location to perform the AFRL/DET 15 MSSC research activities. Operations at SOR consist of optical research and advanced imaging R&D experiments utilizing similar equipment in the form of 3.5 m and 1.5 m telescopes and various lasers to obtain optical images. The facility is operated primarily from dusk to dawn including infrequent daylight operational experiments that do not require totally dark conditions.

The SOR was eliminated as an alternative to the proposed action due to its current and projected future operations tempo, which is heavily programmed and scheduled for its current the R&D mission. SOR operates 5 days a week for 42 weeks out of the year. A typical night of testing encompasses approximately 10-12 hours per night with 6-8 hours being scheduled test hours. The SOR facility is shut down for approximately 8 weeks for engineering/maintenance and there is a 2 week shutdown during the holidays. Additionally, SOR does not have the same climate and seeing conditions that MSSC has, nor can SOR provide the AF Space Command operational data and information for the on-going DoD operational mission due to its current and future workload.

No-Action Alternative

Under the No-Action Alternative, modernization of the equipment would not occur, and operations with new equipment/sensors to include the FASOR sodium guide star laser would not be propagated outdoors at the MSSC. The objective to modernize current equipment at MSSC necessary to accomplish state-of-the-art space observation, illumination, and ranging capabilities will not be met. Critical operational mission data collection, and research and development pertaining to improved image resolution would not occur. The MSSC capabilities would fall behind in its ability to provide relevant, high quality data to support Air Force mission needs and eventually become obsolete.

SUMMARY OF ANTICIPATED ENVIRONMENTAL EFFECTS:

The following resources or issues of concern were evaluated: Land Use, Safety and Occupational Health, Biological Resources, Cultural Resources, Visual Resources and Cumulative Impacts. A summary of potential impacts from the Proposed Action and alternatives follows. The Area of Potential Effect (APE) for determining the affected environment for the proposed action includes the 4.4 acres of land leased by the United States Air Force and owned by the University of Hawai'i where MSSC is located within the HO on Haleakalā. Additionally, based upon experimental testing at Kirtland AFB, Albuquerque NM the APE would include visual perception of the FASOR at a maximum distance of 1200 m. The following resources were not evaluated in the EA since it was determined that the nature of the proposed action will have no impact or negligible impact on the environment. These resources are; Air Quality, Water Quality, Hazardous Materials/Waste, Geology and Soils and Socioeconomics.

Proposed Action

Land Use. The Proposed Action is to modernize AF research equipment at existing MSSC facilities, including the installation of a FASOR laser on the AEOS telescope, the installation of improved sensors and instrumentation, and an improved adaptive optics system would be located internal to the facility. Improvements would not change the current structure dimensions, nor would research mission activities change from those currently performed.

The Proposed Action complies with UH IfA Haleakalā High Altitude Observatory Site Management Plan (HOMP), USFWS and Haleakalā National Park Service plans; and is consistent with Conservation District General Subzone designation for Astronomy as research activities are similar to those allowed/performed at Haleakalā Observatories. The proposed action would have no significant impact on land use. It would not restrict access to any areas that are currently open to the general public. MSSC buildings are considered secured military facilities and will continue to have restricted access. The 4.4 acres managed by the AF is not fenced and does not have any archeological sites. Access for native Hawai'ians to cultural areas would not change from current practices as the ahu are outside the AF property.

Safety. To ensure the light emissions do not cause hazards for personnel, AFRL strictly adheres to OSHA, Air Force, and ANSI laser safety Standards and imposes strict safety protocols for all of its laser operations. For example, AFRL imposes a 30-degree above the horizon minimum pointing angle for all laser operations—resulting in the elimination of laser hazards to the Public on the ground. The MSSC incorporates this multi-tiered safety system to address inadvertent lasing of personnel on aircraft and space optical assets, by incorporating human outdoor safety spotters, monitoring Federal Aviation Administration (FAA) radar feed, and implementing a space asset Predictive Avoidance (PA) system during all outdoor laser operations. Implementation of these safe guards has allowed MSSC to operate without incident for over twenty years. No adverse or significant safety impacts are anticipated from the implementation of the proposed action to modernize the MSSC research equipment. Established site safety policies and procedures will be continued for outdoor laser operations.

Biological Resources. The proposed modernization of the MSSC equipment would have no significant impact on biological resources. The potential threat to fauna from the installation and operation of the FASOR laser is from the visible light (589nm orange color) that would be propagated from the AFRL, MSSC 3.6 m AEOS telescope. Past and existing visible lasers have been used at the MSSC and HO; however these lasers have been in the blue and green visible spectrum. Since the FASOR is in the orange spectrum, and could possibly be a source of distraction to avifauna, additional analysis was performed. To determine the impact on fauna, specifically the ʻuʻau, nēnē and hoary bat, an analysis of proposed operations and behavioral information for these species was analyzed with consideration for: 1) Direct laser illumination where the animal would be exposed by flying through the laser beam; and/or 2) distraction or disorientation by back scattered laser light.

Analysis shows the sodium guidestar laser operation at MSSC is highly unlikely to adversely affect the well-being of or flying behavior of any threatened or endangered species. The proposed equipment/sensor installation and operation of the sodium guidestar laser, "FASOR", poses no surface or skin hazard due to the beam size, power, and notional exposure duration. While possible, it is extremely unlikely that a bird inflight near the laser projection (beam diameter 20 cm (7.874 in.)) would intersect resulting in retinal injury or surface injury, due to: tracking and slewing of the laser beam, short exposure time to the beam; relative low bird activity over the MSSC; 30 degree laser elevation pointing limitation; and typical flight altitude (15m) of the petrel – below normal beam height above the ground. The AFRL's MSSC has been performing outdoor laser and optical system testing since 2000 with negligible impact on environmental resources and no recorded impacts on any ʻuʻau or other wildlife.

Consultation under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq*.) was completed with the U.S. Fish and Wildlife Service on 3 Jan 2015. Based on AFRL's avoidance and minimizing measures, USFWS has concurred with AF determination that the proposed project **may affect, but is not likely to adversely affect** the Hawai'ian petrel, Haleakalā silversword, Hawai'ian goose, and Hawai'ian hoary bat. For these reasons, and the established practices designed to prevent impacts to flora and fauna, no significant impacts on biological resources are anticipated from the Proposed Action.

Cultural Resources. The archaeological resources at Haleakalā Observatories are described in several studies conducted at the summit. No archaeological features have been identified within the boundaries of the MSSC; however, archaeological features at Haleakalā Observatories include four sites identified near the MSSC. An archaeological reconnaissance survey was carried out by Pacific Northwest Laboratory on behalf of the U.S. Air Force Maui Space Surveillance Site or MSSS in 1991 and has been reconfirmed by additional surveys performed by UH, the most recent being performed in 2006. During the course of the surveys, four archaeological sites were identified outside MSSC, primarily along the western side of Kolekole Hill. These sites were described as wind shelters, typically constructed against the existing rock outcrop of the hill. As all activities performed for the proposed action will occur within existing facilities and no soil will be disturbed, there will be no significant impact on cultural resources/archaeological sites.

The primary impact on visual resources and view planes that would result from the operation of the FASOR laser is the visible light (589 nm orange color) propagated from the AFRL MSSC AEOS telescope. The FASOR laser would be visible from a few locations on the summit; mainly the Visitor's Center and the Summit Overlook starting at dusk. Experimental testing at Kirtland AFB, Albuquerque NM was conducted to determine the Area of Potential Effect for proposed FASOR operations at Haleakalā. Results of this testing indicate visual perception of the FASOR would be a maximum distance of 1200 m from the AEOS telescope. The beam becomes faintly visible at dusk and more apparent as the night sky darkens. Operations cease as dawn approaches and the visibility of the beam becomes invisible as the sky lightens. As mentioned in this EA, past and existing visible lasers have been used at the MSSC and HO, currently other HO organizations conduct operations using a visible green (532nm) laser almost continuously 10- hours a day. These existing laser operations are conducted during day and nighttime hours. Adding the FASOR laser operation would not significantly increase visible laser operations.

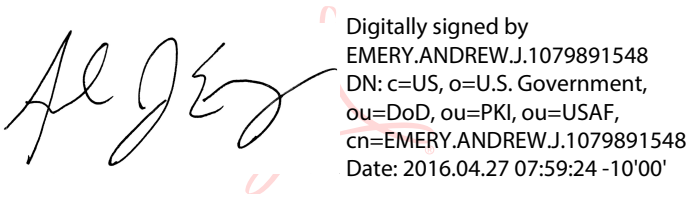
Based upon detailed analysis in section 4.3 of the Final EA, the proposed action would not affect visual resources and view planes from distances greater than 1200 m. The Proposed Action would have no significant impact on cultural or visual resources. Per section 106 of the National Historic Preservation Act of 1966, as amended, SHPD has reviewed the AF proposed undertaking and the State Historic Preservation Officer concurs with the determination of the AF that the project will have **no adverse effect** on the National Register Eligible Maui Space Surveillance Site or adjacent archaeological sites within the APE.

Cumulative Impacts. Past, Present, and Reasonably Foreseeable Future Actions Associated with HO and Adjacent Neighbors and this Proposed Action was evaluated. This analysis identifies likely impact on the environment, including short- and long-term impacts, and direct, indirect, and cumulative impacts. The analysis focused only on those environmental issues that have potential impact and are associated with the MSSC Modernization of Research Equipment activity. Installation of instrumentation, cameras and other research equipment within existing facilities would have no cumulative impact on the environment. Cumulative impacts associated with this Proposed Action were evaluated for the operation of the FASOR laser as it would be visible to a maximum distance of 1200 m from the AEOS telescope on Haleakalā. There is a potential for visitors to the summit during nighttime hours to see the visible beam. The FASOR sodium guide star laser would only be used intermittently and the duration of the laser beam projection would be short (5-10 minutes in duration) but would occur multiple times per hour over a 6-8 hour period. Laser usage has been in place at HO for decades. Currently lasers are being used for outdoor propagation by numerous entities on HO. The proposed visible FASOR laser is an addition to existing and previously used lasers in the HO. Visible lasers in the green spectrum are currently used by the AF and the University of Hawai'i. The only difference is that the FASOR laser will be a different color (orange) than is currently being used. Overall, AFRL/Det 15 has significantly reduced the number of lasers used at the MSSC. Adding the FASOR does not increase the operations tempo, but does create an intermittent new visual image that visitors to the summit during dark sky conditions could potentially see. The proposed action would result in negligible impacts on Visual resources and View Planes, Visitor Use and Experience, and Biological Resources and these impacts are considered to be negligible, adverse, and short term; as the impacts would only exist when the laser is actively

being projected into the sky. This action would not significantly increase the cumulative impact on the HO and surrounding areas.

CONCLUSION

Based on analysis of the EA conducted in accordance with the requirements of the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) regulations, and Air Force Instruction 32-7061, which is hereby incorporated by reference, and after careful review of the potential impacts, I conclude that the impacts of the Proposed Action (modernization of research equipment and the installation of the FASOR laser) would not have a significant impact either by itself or cumulatively (with other nearby projects) on the quality of the natural or human environment. Therefore, issuance of a FONSI is warranted, and preparation of an Environmental Impact Statement is not required. This analysis fulfills the requirements of NEPA and the implementing regulations promulgated by the CEQ.



April 27, 2016

Approved by: ANDREW J. EMERY, Lt Col, USAF
Commander, AFRL Detachment 15

Date:

COVER SHEET

Lead Agency for the EA:	United States Air Force Research Laboratory, Directed Energy Directorate (AFRL/RD/Detachment 15, Maui)
Title of Proposed Action:	Environmental Assessment (EA) for the Modernization of USAF Research Equipment at the MSSC, Haleakalā, Maui, Hawai‘i,
Affected Jurisdiction:	U.S. Department of Defense and Air Force Research Laboratory Maui Space Surveillance Site, Haleakalā, Maui, Hawai‘i
Designation:	Final Environmental Assessment

For Additional Information:

Air Force Research Laboratory Detachment 15
(AFRL/DET 15 Maui)
550 Lipoa Parkway,
Kihei, Hawai‘i 96753

ABSTRACT:
This Final Environmental Assessment (EA) is prepared under the National Environmental Policy Act (NEPA) and has been revised from the original Draft EA published February 23, 2015 to clarify the scope of proposed activities. Specifically, the Air Force Research Laboratory Directed Energy Directorate, Detachment 15 proposes the modernization of research equipment at the Maui Space Surveillance Complex (MSSC) located on Haleakalā, Maui, HI over the next five to ten years. The modernization of research equipment consists of: (1) the replacement of sensors and instrumentation, (2) operation of a sodium laser known as Frequency Addition Source of Optical Radiation (FASOR) propagated from the existing AEOS 3.6m telescope, and (3) installation and operation of an improved adaptive optics system which would be used throughout the year for the observation of stars and satellites. The improved instrumentation would be operated and supported by the existing staff and no additional Anti-Terrorism/Force Protection standoff would be required. The upgrade of this equipment will be installed within existing buildings and would not exceed current exterior structure dimensions. No federal or state permits or approvals will be required for this action. This action does not trigger compliance with Hawai‘i Revised Statutes (“HRS”) Chapter 343, the Hawai‘i Environmental Policy Act, because the action does not require an approval, defined under Hawai‘i law as a discretionary consent required from a state or county agency prior to actual implementation of the action, HRS § 343-2, 343-5(e).

The purpose and need of the proposed action is to allow the Air Force to modernize equipment for state-of-the-art space observation, illumination, and ranging capabilities at MSSC. Additionally, the AF would operate the proven FASOR sodium guide star laser technology from the Advanced Electro-Optical System (AEOS) 3.6 m telescope to enhance current data collection. The AEOS was constructed under Conservation District Use Permit number MA-2705 issued 8/26/1994 and is the primary telescope used by the AF at MSSC. The equipment modernization would enhance current capabilities and will not significantly change the operational tempo of the facility.

The MSSC mission is to enhance the space monitoring network of the U.S. Air Force, by serving a dual role:

1. Providing electro-optical facilities for the collection of data from suborbital, near earth, and deep–space objects; and
2. Serving as a test site for sensor/laser research.

Comments to the previously published draft EA have been considered and revisions have been made in this Final EA. Responses to comments on the draft EA publications will be provided directly to individual commenters.

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LIST OF ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

^{o}c	degree Celsius
^{o}f	degree Fahrenheit
ac	acre
AEOS	Advanced Electro-Optical System
AFRL	Air Force Research Laboratory (U.S.)
AFMC	Air Force Material Command
AMOS	Air Force Maui Optical and Supercomputing Site
ATST	Advanced Technology Solar Telescope
CDUP	Conservation District Use Permit
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CZM	Coastal Zone Management
dB	decibels
DKIST	Daniel K. Inouye Solar Telescope
dBA	decibels A-weighted scale for sound level
DLNR	Department of Land and Natural Resources
DBEDT	Department of Business, Economic Development and Tourism
DoD	Department of Defense
DOE	Department of Energy (U.S)
DOH	Department of Health
DRMO	Defense reutilization and Marketing Office
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency (U.S.)
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
GEODSS	Ground-Based Electro-Optical Deep Space Surveillance System
HAR	Hawai‘i Administrative Rules
HAZMAT	Hazardous Material Emergency Planning and Response Plan
HECO	Hawai’ian Electric and Light Company
HOMP	Haleakalā High Altitude Observatory Site Management Plan
HRS	Hawai‘i Revised Statutes
IfA	Institute for Astronomy
INRMP	Integrated Natural Resources Management Plan
kV	kilovolt
kW	kilowatt
LASER	Light Amplification by Stimulated Emission of Radiation
LURE	Lunar and Satellite Ranging Observatory
MAGNUM	Multi-color Active Galactic Nuclei Monitor
MCS	Mirror Coati ng Shop
MECO	Maui Electrical Company, Inc.
MSO	Kenneth Mees Solar Observatory
MSSC	Maui Space Surveillance Complex
MSSS	Maui Space Surveillance System
NASA	National Aeronautics and Space Administration

NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
RCRA	Resource Conservation and Recovery Act (Federal)
SHPD	State Historic Preservation Division
SHPO	State Historic Preservation Office
SIHP	State Inventory of Historic Places
SOR	Starfire Optical Range (AFRL/Kirtland AFB)
TU	Tohoku University
UH	University of Hawai‘i
U.S.	United States
USA CE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

GLOSSARY OF HAWAI'IAN WORDS

‘ahinahina	Haleakalā Silversword plant
Ali‘i	royalty, Chief
Haleakalā	House of the Sun
Iwi	bones
K ah u	clergyman, Spiritual Advisor
Kahuna	priest
Kanaka maoli	true aboriginal person, Native to Hawai‘i
ko‘i	adze, a bladed tool, Tool used to carve out (Ko‘i)
Kumu Hula	hula teacher, Source of Hula Learning
Kupuna	elder
Makahiki	ancient annual festivals; according to moon phase to give honor
Mana	spirit, supernatural or divine power
Mele	Chants, songs or poems
Mo‘olelo	Story, tale, legend or narrative
Nēnē	Hawai'ian Goose
‘ope‘ape‘a	Hawai'ian hoary bat
Oli	Hawai'ian chant
Pa Ka‘oao	White Hill Pa‘ele
Ku Ai I Ka Moku	East-facing ahu
Paliku	an order of priesthood, Steep Cliff
Piko	navel
Pu‘u	hill
Pu‘u Ula‘ula	Red Hill
‘ua‘u	Hawai'ian Dark-rumped Petrel
wahi pana	legendary place

CHAPTER 1.0 PURPOSE OF AND NEED FOR ACTION

1.0 Proposed Action

The U.S. Air Force Research Laboratory, Detachment 15 (AFRL/DET 15) proposes to modernize the research equipment at the Maui Space Surveillance Complex (MSSC) located at Haleakalā, Maui, Hawai‘i, Figure 1. In this action, AFRL proposes to update research equipment over the next five - ten years. The primary piece of equipment AFRL/DET 15 proposes to install and operate is a sodium laser known as Frequency Addition Source of Optical Radiation (FASOR) for enhanced research and development activities associated with space observation, illumination, and ranging capability by the spring of 2016. Other equipment needed to support research is described below in Chapter 2 “Description of Proposed Action and Alternatives”. All of this supporting equipment would be installed within existing buildings located at MSSC.

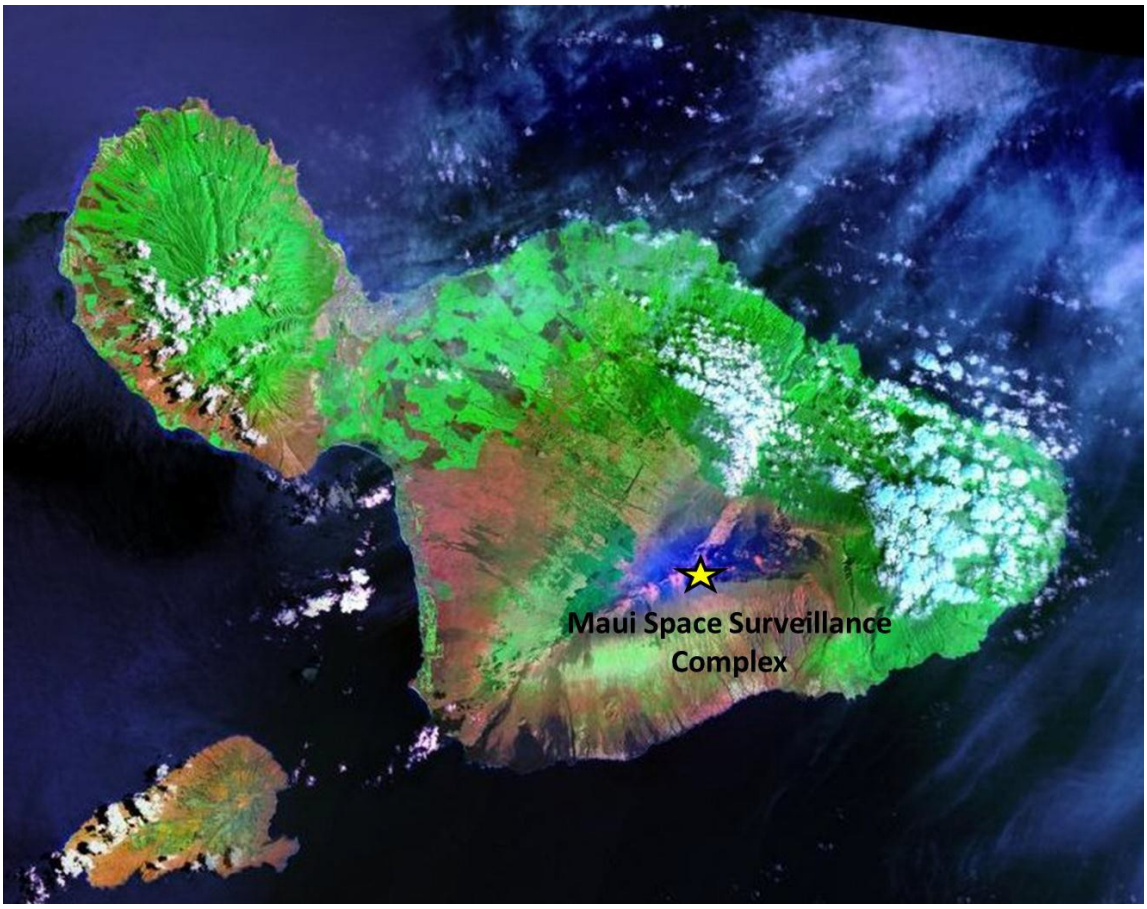

Figure 1: The Maui Space Surveillance Complex (MSSC) is located on the top of Haleakalā on Maui, Hawai‘i.

1.1 Background

The AFRL/DET 15 currently operates three main facilities within the Maui Space Surveillance Complex and a variety of visible and invisible lasers and sensors for the purpose of conducting research and development (R&D) for tracking, ranging, illuminating, communicating with, and observing space objects. These existing and past research efforts have included the use of sensors, cameras, and lasers focused on satellites, stars, space debris, missiles, spacecraft and static ground targets. These activities and all MSSC operations have been previously evaluated for their impact on the environment (see section 1.11 below), to determine if they created adverse impacts on cultural and natural resources, and for compliance with the National Environmental Policy Act (NEPA) (42 United States Code (USC) §4321 *et seq.*) and the implementing regulations of the Council on Environmental Quality (CEQ) (40 Code of Federal Regulations (CFR), 2014).

The proposed action includes FASOR, which is called a sodium laser because it has the ability to propagate light into the sodium layer of the atmosphere and create an artificial star. The FASOR light enters the sodium layer of the atmosphere located approximately 90 km from the earth's surface. Sodium atoms are present in this layer that is about 10 km wide in an area known as the Mesosphere-lower thermosphere (MLT). The sodium layer is created by the ablation of approximately 30 tons of interplanetary dust which enters the atmosphere every day. Interplanetary dust is created by meteoroids undergoing rapid frictional heating by collision with air molecules, leading to vaporization of their constituents and minerals. This process provides the major source of metals, sodium, in the MLT.

1.2 History of Activities at the MSSC

The MSSC was established by the Advanced Research Projects Agency (ARPA) under the Department of Defense (DoD), Public Law 85-325 in February of 1958. Some of ARPA's programs formed the foundation of sensor, surveillance and directed energy research and development; particularly in the study of radars, infrared sensing, and x-ray/gamma ray detection. The first telescope facility at MSSC was constructed in 1963. Around 1966, routine Midcourse Optical Station missions were performed using laser sensors for tracking and collecting data from missiles and other targets. Lasers are used to illuminate objects and reflected photons are collected using a telescope and instrumentation to improve the image resolution. Additional telescopes were installed and the use of directed energy laser or light emission sources to sense, track and collect data has continued to the present time. This research has led to significant discoveries in the fields of telecommunications, signal processing, and space object identification and imaging.

The most prominent structure at the MSSC is the Advanced Electro-Optical System (AEOS) telescope, designed and built by the USAF in 1995. Conservation District Use Permit number MA-2705 was issued for AEOS on 8/26/1994. AEOS is the primary telescope used by the AF at MSSC. AEOS houses a 3.67-meter (~12 foot) diameter telescope mirror, considered the largest and most sensitive telescope in the DoD. It provides superb spatial and temporal resolution and atmospheric measurement capabilities. Its sensors produce

simultaneous images in the visible and infrared spectrum, and it has the capability to track both satellites and missiles. This world-class national asset was used by NASA when they suspected a problem with the Passive Thermal Control System on the Space Shuttle Mission, STS-134 in 2011. The AFRL/DET 15 team was able to discover a leak that helped NASA formulate a response that contributed to the safety of six astronauts and the health of NASA's STS 134, a $150B asset.

The MSSC is an integral part of the space monitoring network of the U.S. Air Force and serves a dual role: (1) an electro-optical facility for the collection of imagery and space situational awareness data from suborbital, near earth, and deep–space objects, supporting real-world operations; and (2) a test site for sensor/laser technology research. The term laser is used to describe a device that has characteristics to generate light that can coherently propagate to greater distances than normal light sources. Normal everyday light disperses in three dimensions, the light intensity reduces, and the light is absorbed in the environment. Therefore, the AF has been performing research to design and fabricate lasers to overcome these barriers. Lasers have numerous applications; they are used in CD/DVD drives, in electronics for appliances and medical devices. The AF uses lasers as to enhance capabilities to capture high resolution images of space objects.

The MSSC is located in the University of Hawai'i's Haleakalā High Altitude Observatory (HO) site, located just outside Haleakalā National Park on Pu‘u Kolekole at an altitude of 3050 m (10,010 feet) on the Island of Maui. The HO site is an 18.166-acre parcel of land set aside for the University of Hawai‘i in 1961 through State of Hawai‘i Executive Order 1987. HO is located within the General Subzone of the Conservation District and the IfA is responsible for managing the site. MSSC comprises approximately 4.4 acres of land leased by the United States Army Corps of Engineers and owned by the University of Hawai‘i. The current lease between USA CE and UH commenced on 14 May 2006 and has a term of 25 years. Initial construction at the MSSC site occurred in 1963, and it is currently operated by the AFRL/DET 15.

Another major part of the MSSC is the Ground-Based Electro-Optical Deep Space Surveillance (GEODSS) System, which is operated for the Air Force Space Command, Detachment 3. The GEODSS at HO is one of three operational sites in the world performing ground-based optical tracking of space objects. The GEODSS site performs its mission using three powerful telescopes; low light level, electro-optical cameras; and high-speed computers. Detachment 3 uses three, 1- meter telescopes with a 1.68-degree field of view. GEODSS telescopes primarily operate between civil sunset and civil sunrise, just before all ambient light is out of the atmosphere. The telescopes are able to see objects 10,000 times dimmer than the human eye can detect.

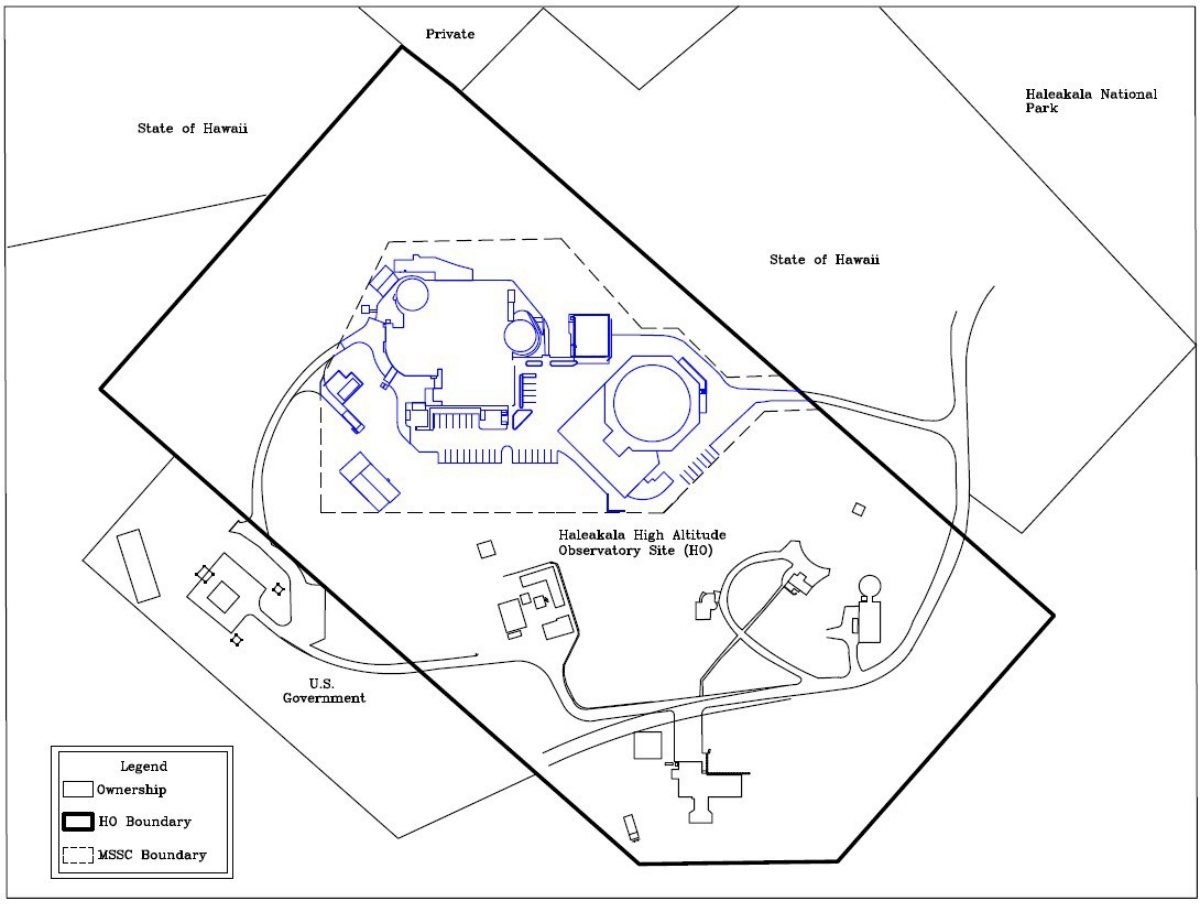

Figure 2: The US Air Force operates the MSSC which is located within the Haleakalā High Altitude Observatory Site (HO).

1.3 Purpose and Need for the Proposed Action

The purpose of this action is for AFRL/DET 15 to modernize research equipment in order to continue meeting its DoD operational requirements and emerging research objectives. The MSSC mission is required for the space monitoring network of the U.S. Air Force serving a dual role: 1) Providing electro-optical facilities for the collection of data from suborbital, near earth, and deep– space objects; and 2) Serving as a test site for sensor/laser research.

1.4 Relevant Resources and Issues

This EA focuses on the following environmental resources and issues of concern:

- Land Use
- Safety

- Biological Resources
- Cultural Resources
- Cumulative Impacts

Impacts on Water Quality, Socioeconomics, Hazardous Materials/Waste, Traffic and Roads, Noise, Geology and Soils Resources are deemed to be negligible; as the modernization of research equipment will take place within existing structures, no digging or soil would be removed; no new facilities would be constructed; no changes to site drainage would be made; there would be no changes in the size of the workforce at MSSC; and all activities would meet the requirements defined in the University of Hawai'i *Haleakalā High Altitude Observatory Site Management Plan* (HOMP). The primary environmental impact of this action will be increased visible laser beam activities from the AEOS telescope due to installation of the FASOR Sodium Guide Star instrument. Impacts of modernization of MSSC research equipment on all other environmental resources would be minimal as all upgrades would be contained within the existing buildings and would not exceed current structure dimensions.

1.5 Objectives of the Proposed Action

The objective of this modernization and upgrade of equipment and sensors at MSSC is to accomplish state-of-the-art space observation, illumination, and ranging capabilities. This proposed action is the installation of improved cameras and lasers to support operational requirements. One of the primary lasers to be installed would be the FASOR Sodium Guide Star laser.

The goal of this modernization is to improve the site's ability to maintain awareness of deep space objects; to characterize objects and search for closely spaced objects in proximity to objects of interest; to discover dim objects; to improve fast-search capabilities; to perform tactical indications and warnings; and continue to provide space object identification (SOI) data products on Low Earth Orbit (LEO) and Geosynchronous Earth Orbit (GEO) objects. Mount Haleakalā, located at 3,050 meters (10,010 feet) in altitude, is above one third of the Earth's atmosphere and provides excellent conditions for astronomical observation. This combined with its remoteness from light pollution sources and high number of non-cloudy days makes it one of the best locations in the world for ground-based telescope observations. Haleakalā is an optimal location for obtaining the highest quality space object imagery required by the Air Force mission.

1.6 Purpose of this Document

This revised Final Environmental Assessment (EA) was prepared in accordance with NEPA, as amended (42 USC §§4321 *et seq.*); CEQ regulations, as amended (40 CFR Chapter V Parts 1500 *et seq.*; and Department of the Air Force Environmental Impact Analysis Process (32 CFR Part 989). This EA identifies the purpose and need for the proposed action,

reasonable alternatives, existing environmental conditions, environmental consequences, and measures to avoid or minimize potential impacts.

1.7 Decision to be Made

The decision to be made by AFRL is whether or not to pursue the modernization of equipment within existing facilities with a Finding of No Significant impact (FONSI), determine if an Environmental Impact Statement (EIS) needs to be prepared, or to do nothing and continue current operations with existing technologies and equipment.

1.8 Required Permits/Approvals

All activities proposed under this action include upgrades to research equipment only and do not involve construction or facility modification. The repair, maintenance and replacement of existing research equipment would stay within the footprint and facility dimensions of current structures; no federal or state permits or approvals will be required for this action. This action does not trigger compliance with Hawai‘i Revised Statutes (“HRS”) Chapter 343, the Hawai‘i Environmental Policy Act, because the action does not require an approval, defined under Hawai‘i law as a discretionary consent required from a state or county agency prior to actual implementation of the action, HRS§-343-2, 343-5(e).

1.9 Regulatory Overview

National Environmental Policy Act (NEPA):

NEPA establishes national environmental policy and goals for the protection, maintenance, and enhancement of the environment and requires all Federal government agencies to assess the environmental impacts of proposed federal agency actions prior to their execution. To determine if a proposed Federal action would have significant environmental impacts, NEPA requires that a document be prepared to assess the potential impacts and examine alternative actions. As indicated in the introduction of this chapter, this EA document is intended to comply with NEPA.

Air Force Instruction 32-7061:

This is the AF implementing instruction and AF Policy Directive, on Environmental Quality. It directs the user to the regulatory source that describes the specific tasks and procedures for successfully conducting the AF Environmental Impact Analysis Process. This instruction adopts the current Title 32, Code of Federal Regulations, Part 989 (32 CFR Part 989), Environmental Impact Analysis Process, as the controlling document on the AF EIAP.

National Historic Preservation Act:

The National Historic Preservation Act (NHPA) of 1966, as amended (16 USC §470),

recognizes the nation's historic heritage and establishes a national policy for the preservation of historic properties as well as the National Register of Historic Places (NRHP). Section 106 of the NHPA requires Federal agencies to take into account the effects of Federal undertakings on historic properties, and affords the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on such undertakings. The NHPA Section 106 process, as defined in 36 CFR Part 800, provides for the identification and evaluation of historic properties for determining the effects of undertakings on such properties and for developing ways to resolve adverse effects in consultation with consulting parties.

Native American Graves Protection and Repatriation Act:

The Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 (25 USC§3011, 1990) provides for the protection and repatriation of Native American and Native Hawai'ian human remains and cultural items discovered on Federal lands. NAGPRA provides a process for Federal agencies to return certain cultural items (i.e., human remains, funerary objects, sacred objects, or objects of cultural patrimony) to lineal descendants and culturally affiliated Native Hawai'ian organizations. NAGPRA includes provisions for unclaimed and culturally unidentifiable cultural items, intentional and inadvertent discovery of cultural items on Federal lands, and penalties for noncompliance and illegal trafficking.

Endangered Species Act:

The Federal Endangered Species Act (ESA) of 1973 (16 USC §1531 et seq., 1973) establishes a process for identifying and listing threatened and endangered species. It requires Federal agencies to carry out programs for the conservation of federally listed endangered and threatened plants, wildlife, and designated critical habitats for such species, and prohibits actions by Federal agencies that would likely jeopardize the continued existence of those species or result in the destruction or adverse modification of designated critical habitat. Section 7 of the ESA requires consultations with Federal wildlife management agencies on actions that may affect species or designated critical habitat. Section 9 of the ESA prohibits the "taking" (through harm or harassment) of endangered species without an agency-issued permit.

Migratory Bird Treaty Act (MBTA):

The Migratory Bird Treaty Act of 1918 (16 U.S.C. §§ 703-712, 1918) implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Unless permitted by regulations, the MBTA prohibits the pursuit, hunting, taking, capture or killing; attempted taking, capture or killing; possession, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not. Subject to limitations in the MBTA, the Secretary of the Interior (Secretary) may adopt regulations determining the extent to which, if at all, hunting, taking, capturing, killing, possessing, selling, purchasing, shipping, transporting or exporting of any migratory bird, part, nest or egg will be allowed, having regard for temperature zones, distribution, abundance, economic value, breeding habits and migratory flight patterns. Regulations are effective upon

Presidential approval. Currently there are over 800 bird species covered by the MBTA. The USFWS is currently responsible for overseeing and enforcing the MBTA.

Clean Air Act:

The Clean Air Act (CAA) and amendments (42 USC §7401 et seq.) are comprehensive Federal laws that regulate air emissions from area, stationary, and mobile sources. This law authorizes the U.S. Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) to protect public health and the environment. Pursuant to the CAA and amendments, State operated permit programs serve to control emissions. In Hawai'i, the State operating permit program is implemented by the State of Hawai'i Department of Health (DOH) and emissions of regulated air pollutants within the state may be subject to permitting as required under Hawai'i Administrative Rules (HAR) Chapter 11-60.1.

Other environmental regulatory requirements relevant to the Proposed Action include, but are not limited to:

Occupational Safety and Health Act (OSHA):

Congress enacted the Occupational Safety and Health Act of 1970, which created the Occupational Safety and Health Administration (OSHA). Its mission is to help employers and employees reduce on the job injuries, illnesses and deaths. OSHA directs national compliance initiatives in occupational safety and health.

Chemical Hazard Communication Program:

The Chemical Hazard Communication Program requires that chemical hazard identification, information and training be available to employees using hazardous materials and institutes safety data sheets (SDS) which provide this information.

Air Force Instruction 91-203, Air Force Consolidated Occupational Safety Instruction, 15 June 2012:

AFI 91-203 identifies occupational safety, fire prevention, and health regulations governing Air Force activities in the workplace. In conjunction with the USAF Mishap Prevention Program, these standards ensure all USAF workplaces meet Federal safety and health requirements.

AFI 91-202, USAF Mishap Prevention Program:

AFI 91-202 implements AFPD 91-2, Safety Programs. It establishes mishap prevention program requirements and assigns responsibilities for program elements, and contains program management information.

Resource Conservation and Recovery Act (RCRA) of 1976:

An amendment to the Solid Waste Disposal Act, RCRA authorizes USEPA to provide for "cradle- to-grave" management of hazardous waste and sets a framework for the management of nonhazardous municipal solid waste. Under RCRA, hazardous waste is controlled from generation to disposal through tracking and permitting systems, and restrictions and controls on the placement of waste on or into the land. Under RCRA, a waste is defined as hazardous if it is ignitable, corrosive, reactive, toxic, or listed by USEPA as being hazardous. With the Hazardous and Solid Waste Amendments (HSWA) of 1984, Congress targeted stricter standards for waste disposal and encouraged pollution prevention by prohibiting the land disposal of particular wastes. The HSWA strengthens control of both hazardous and nonhazardous waste and emphasizes the prevention of pollution of groundwater.

Coastal Zone Management:

15 CFR 930.39 requires federal agencies to assess their proposed activity and make a consistency determination. The assessment reviews the activity and its effects on any coastal use or resource, associated facilities, and the effects of the associated facilities (e.g., erosion, wetlands, beach access impacts) must all be consistent to the maximum extent practicable with the enforceable policies of the management program. The State of Hawai‘i CZM program states "Because there is no point of land more than 30 miles from the ocean, a definite land-sea connection exists throughout the state. So, designating the entire state as the CZM area was logical. What occurs on land, even on the mountains, will impact and influence the quality of the coastal waters and marine resources. The CZM area also extends seaward to the limit of the State's police power and management authority, to include the territorial sea. This legal seaward boundary definition is consistent with Hawai'i's historic claims over the Hawai'ian archipelagic waters based on ancient transportation routes and submerged lands." The proposed action does not require a coastal zone consistency determination because all activities occur inside existing infrastructure.

Air Force Instruction 32-7086, Hazardous Materials Management, 11 April 2014:

AFI 32-7086 establishes procedures and standards that govern management of hazardous materials (HAZMAT) throughout the Air Force. It applies to all Air Force personnel (at classified and unclassified operations) who authorize, procure, issue, use, or dispose of HAZMAT in the course of their official duties; and to those who manage, monitor, or track any of the preceding processes, whether the processes are performed by government or contractor personnel.

Air Force Instruction 32-7042, Waste Management, 31 March 2010:

AFI 32-7042 identifies compliance requirements for all solid waste (SW), including hazardous waste (HW), but excludes radioactive waste (except mixed waste) and medical waste. It applies to individuals at all levels who handle and/or manage waste.

Air Force Pamphlet (AFPAM) 32-7043 Hazardous Waste Management Guide, and AFI 32- 7086 Hazardous Materials Management:

These documents describe the actions and procedures necessary to ensure compliance with all applicable federal, state, and local laws and regulations; executive orders; and DoD and Air Force policies related to hazardous materials.

1.10 Related Documents

Previous EAs prepared for activities at AF facilities in Maui that may have relevance to this proposed action are:

Programmatic Environmental Assessment for Maui Space Surveillance Site (MSSS), Haleakalā, Maui, FONSI dated 5 July 1991. This EA discuss the AF desire to expand the MSSS within HO to increase the boundary and to add a pre-engineered metal maintenance shop warehouse. Additionally, this EA proposed activities to upgrade fuel storage, improve site access, enhance heat exchanger capability, expand utility infrastructure, and demonstrate lasers.

Environmental Assessment for Advanced Electro-optical System (AEOS) Telescope and Related Improvements at the Maui Space Surveillance Site (MSSS), Haleakalā, Maui, Hawai‘i, FONSI dated 24 July 1994. In this EA, the Air Force proposed the construction and operation of the Advanced Electro-Optical System (AEOS) telescope to provide greater light gathering ability than any existing telescope at MSSS and enhance MSSS's infrared capabilities. This telescope was needed to increase research capabilities to improve resolution and allow more extensive work on object characterization.

Environmental Assessment for Proposed Advanced Electro Optical System Completion at the Maui Space Surveillance Complex (MSSC) Haleakalā, Maui, Hawai‘i. In this EA, the AF proposed the completion of the Advanced Electro-Optical System (AEOS) telescope building by adding a mirror coating shop (MCS) at the Maui Space Surveillance Complex (MSSC) to accommodate the 3.67 meter mirror within the existing AF MSSC footprint atop Haleakalā, Maui, Hawai‘i. The Proposed Action was previously identified in the 1994 Environmental Assessment for AEOS construction; however, the mirror coating shop was not completed due to a funding shortfall. The FONSI for this action was signed on September 13, 2005.

Final Environmental Assessment for the Haleakalā High Altitude Observatory Site, Maui, Hawai‘i Management Plan University of Hawai‘i Institute for Astronomy, 25 October 2010. This EA evaluates the implementation of a Management Plan for appropriate and reasonable activities that would be undertaken by the University of Hawai‘i Institute for Astronomy (IfA) at the Haleakalā High Altitude Observatory Site (HO) in support of ongoing and future astronomical research activities.

CHAPTER 2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 Introduction

This chapter describes the Proposed Action and reasonable alternative actions that would meet the following objectives:

Modernization and upgrade of equipment at MSSC to accomplish state-of-the-art space observation, illumination, and ranging capabilities. The proposed action is the installation of improved cameras, sensors, and adaptive optics, to support operational requirements. One of the primary items to be installed would be the FASOR Sodium Guide Star laser. All upgrades would be contained within the existing buildings and would not exceed current structure dimensions.

In accordance with CEQ regulations implementing NEPA (40CFR 1500-1508), the No-Action Alternative represents two common meanings: (1) Continue present management activities, but do not do the proposed project, and (2) don't do anything. The No-Action alternative for this Final EA requires the DET 15to continue performing research at MSSC Haleakalā with existing equipment and improvements with improved sensors would not occur. The No-Action will be analyzed to provide the baseline against which the environmental impacts of implementing the range of alternatives addressed can be compared. While the no-Action alternative would not satisfy the purpose of or need for the proposed action, it is analyzed in detail in the remainder of this document.

The alternatives considered to this proposed action are to perform the required AF mission requirements at another suitable location. The only other AF facility with a telescope similar in size and with high altitude viewing is the Star Fire Optical Range (SOR) at Kirtland AFB. SOR has been considered but eliminated due to the AF mission requirements/operations tempo currently accomplished at SOR and due to the foreseeable future activities required at this site as SOR would not be able to accommodate or incorporate the Det 15, MSSC mission.

2.2 Description of Proposed Action

The Air Force is proposing to continue space object viewing, data collection, and site operations at MSSC on Haleakalā with the following improvements: (1) replacement of sensors and instrumentation, (2) operation of a sodium laser known as FASOR propagated from the existing AEOS 3.6m telescope, and (3) installation and operation of an improved adaptive optics system which would be used throughout the year for the observation of stars and satellites. All of the equipment would be installed by qualified scientists, engineers, technicians and electricians within the existing buildings previously constructed at the MSSC, on Haleakalā in Maui, Hawai'i. When activities require the integration with facility electrical power, licensed electricians would follow National Electric Code requirements. The instrumentation sensors, cameras, and other research equipment are relatively small and

can be installed by one to two individuals and will not alter the existing structure dimensions.

An improved Adaptive Optics (AO) system in the AEOS facility would be installed to improve sensor and camera focus. This AO system would be used to sense atmospheric induced irregularities along the path from an object to the primary aperture so that the deformable mirror can compensate for those aberrations. This can be achieved by sensing the light from an object, if the object is bright enough and sky background is dim enough. However, when the object is dim, either due to its intrinsic reflectance or in earth shadow, or when the sky is quite bright in the daytime, the use of an artificial sodium guide star is an alternative source of reference light for sensing. This is accomplished by using a laser to excite the naturally occurring sodium layer in the atmosphere, located 80-105 km above the earth's surface making it emit light or "glow". This provides a moveable guide star reference point anywhere in the sky to allow adaptive optical compensation of images. Optical compensation greatly enhances image quality. This laser guide star technology is currently in use at observatories around the world, including the Keck Observatory on Mauna Kea, HI; the Lick and Palomar Observatories in California; the European Southern Observatory in Northern Chile; and the Air Force Starfire Optical Range, Albuquerque, NM.

The FASOR, a Class IV, 589-nm wavelength (orange color), 50 watt continuous wave laser propagated from the azimuthal base of the AEOS 3.67m telescope would be used to excite the sodium layer in the mesosphere to create a guide star. This laser, mounted on the existing AEOS telescope, would not change the dome or structure that houses the telescope. The laser equipment would occupy less than 13 square feet of space on the existing telescope mount and would not require heavy equipment for installation, operation or removal. Once installed, the FASOR guide star system would be integrated into MSSC operations and become a standard instrument for collecting space object imagery in support of its mission. The FASOR would be added to the list of existing devices at the MSSC, and operated in accordance with American National Standards for the Safe Use of Lasers, ANSI Z136.1, U.S. Air Force, AFOSH Standard 48-139 and Federal Aviation Administration 7400.2 Outdoor Laser Operation requirements.

Light emissions from FASOR would occur primarily at night, approximately 80 nights per year. The duration of testing is dependent on weather conditions, cloud cover and targets approved for imaging (4-6 hours estimated per night). A typical operation would consist of 5 to 10 minutes of propagation; laser OFF during computer selection of next object; confirmation of next object; and then ON 5 to10 minutes for tracking and laser light emission. This would be done for nominally 2-5 objects per nightly operation. Laser beam pointing elevation is limited to 30-90 degrees above the horizon; and 0-360 degrees in azimuth. This ensures the beam does not interfere with personnel on the ground or other structures adjacent to AFRL facilities.

The improved instrumentation would be operated and supported by the existing staff, so no increase in MSSC personnel would occur and no additional Anti-Terrorism/Force Protection standoff would be required. The installation of instrumentation will be installed within

existing buildings and is not expected to have any environmental effects.

2.3 No-Action Alternative

Under the No-Action Alternative, modernization of the equipment would not occur, and operations with improved equipment/sensors to include the FASOR sodium guide star laser would not be propagated outdoors at the MSSC. The objective to modernize current equipment at MSSC necessary to accomplish state-of-the-art space observation, illumination, and ranging capabilities will not be met. Critical operational mission data collection, and research and development pertaining to improved image resolution would not occur. The MSSC capabilities would fall behind in its ability to provide relevant, high quality data to support Air Force mission needs and eventually become obsolete.

2.4 Alternatives Considered But Eliminated From Further Analysis

Alternative sites were considered for research activities that require the proposed modernization of equipment for state-of-the-art research at MSSC. Modernization includes installation and operation of a sodium laser known as FASOR and the installation of improved sensors and instrumentation.

The Starfire Optical Range (SOR) at Kirtland AFB, New Mexico could be a potential location to perform the AFRL/DET 15 MSSC research activities. Operations at SOR consist of optical research and advanced imaging R&D experiments. These research efforts and associated experiments utilize similar equipment in the form of 3.5 m and 1.5 m telescopes and various lasers to obtain optical images. The facility is operated primarily from dusk to dawn including infrequent daylight operational experiments that do not require totally dark conditions.

SOR operates 5 days a week for 42 weeks out of the year. A typical night of testing encompasses approximately 10-12 hours per night with 6-8 hours being scheduled test hours. The SOR facility is shut down for approximately 8 weeks for engineering/maintenance and there is a 2 week shutdown during the holidays. Additionally, the SOR desert climate and seeing conditions are greatly impacted by Mie scattering caused by constituents and particles in the atmosphere, see details in section 4.3.2.

The SOR was eliminated as an alternative to the proposed action due to its current and projected future operations tempo, which is heavily programmed and scheduled for its current R&D mission. Additionally, SOR does not have the same climate and atmospheric conditions available at the MSSC. As MSSC is located at 3,050 meters (10,010 feet) in altitude, above one third of the Earth's atmosphere, it provides excellent conditions for astronomical and space surveillance observations. This combined with its remoteness from light pollution sources and high number of non-cloudy days makes it one of the best locations in the world for ground-based telescope observations. Haleakalā is an optimal location for obtaining the highest quality space object imagery required by the Air Force mission. Additionally, SOR cannot provide the AF Space Command with operational data

and information for the on-going DoD operational mission that is available from the MSSC.

No other telescopes, the size of the AEOS 3.67 m telescope, are available to the AF to conduct this ongoing mission.

CHAPTER 3.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT

The Area of Potential Effect (APE) for determining the affected environment for the proposed action includes the 4.4 acres of land leased by the United States Air Force and owned by the University of Hawai‘i where MSSC is located within the HO on Haleakalā. Additionally, based upon experimental testing at Kirtland AFB, Albuquerque, NM the APE would include visual perception of the FASOR at a maximum distance of 1200m.

The following resources were not evaluated in the EA since it was determined that the nature of the proposed action will no impact or negligible impact on the environment. These resources are:

- Air Quality
- Water Quality
- Hazardous Materials/Waste
- Geology and Soils
- Socioeconomics

Resources that may be impacted are as follows:

3.1 Land Use

State Land Use District designations, established by the State Land Use Commission, categorize all land in one of four districts: Urban, Agriculture, Conservation, or Rural. Conservation District subzone designations, regulated by the State Department of Land and Natural Resources (DLNR), are Protective, Limited, Resource, General, and Special.

Astronomical research activities occur within the Haleakalā Observatories (HO) complex at the summit of Haleakalā. A repeater station that is part of the Federal Aviation Administration’s (FAA) air traffic control system and a U. S. Department of Energy (DOE) research facility are situated immediately to the west of HO. Also bordering the HO parcel is an area owned by the State of Hawai‘i, which is controlled by the State Department of Land and Natural Resources.

The HO complex is situated in the General subzone of the State Conservation District (Figure 3) in accordance with Hawai‘i Administrative Rules (HAR) Chapter 13-5, which regulates land use in the Conservation District for conserving, protecting, and preserving the important natural resources of the state through appropriate management and use to promote their long-term sustainability and the public health, safety and welfare. Astronomy is a permitted use in the

General subzone. Other nearby conservation areas include the National Park Service's Haleakalā National Park and four state forest reserves (Kula, Makawao, Ko'olau and Kahikinui) that function as watersheds and biological preserves. The forest reserves are also used for tourism and recreational purposes such as hiking, hunting and camping. Ranch lands used for cattle grazing border these conservation lands. Physical development (e.g., roads, buildings and water catchment projects) is minimal throughout these conservation and agricultural areas.

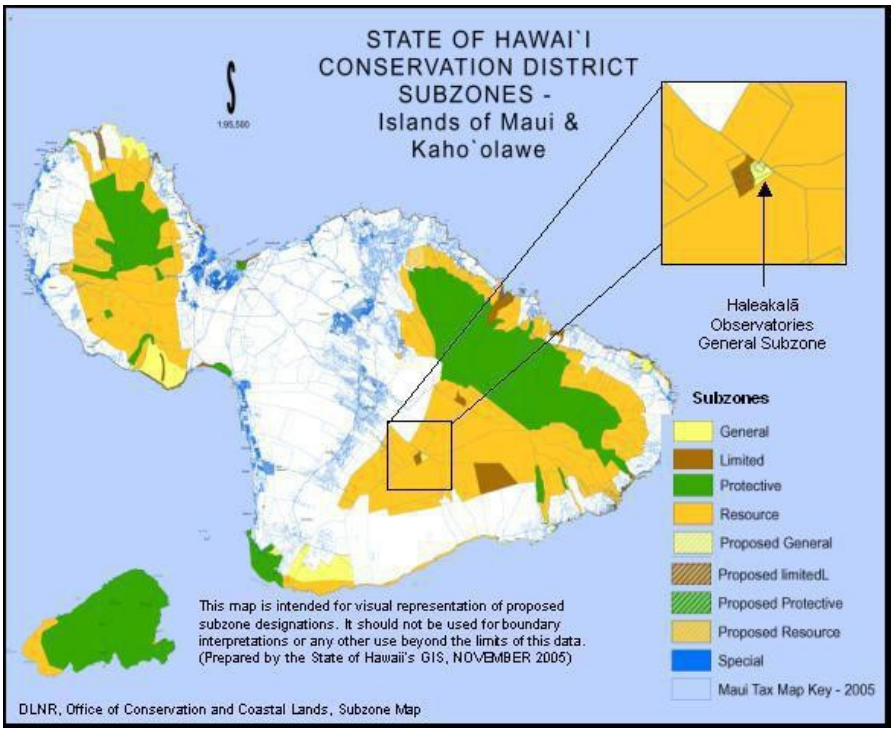

Figure 3: State of Hawai'i Conservation District Subzones.

The Air Force Research Laboratory (AFRL) has the responsibility of host command for the MSSC. One part of the MSSC is the Maui Space Surveillance System (MSSS), an electro-optical facility combining operational satellite tracking facilities with a research and development facility. The MSSC houses the largest telescope in the Department of Defense (DoD) inventory, the 3.67m (12 ft.), the Advanced Electro-Optical System (AEOS). Conservation District Use Permit number MA- 2705 was issued for AOES on 8/26/1994. AEOS is the primary telescope used by the AF at MSSC. Additional telescopes ranging from 0.4 to 1.6 m (1.3 to 5.2 ft.) with in the MSSS facility also support the AF mission. The MSSC also supports the Ground-Based Electro-Optical Deep Space Surveillance System (GEODSS), which is operated for the AF Space Command. The GEODSS is one of four operational sites in the world performing ground-based optical tracking of space objects. The main telescope (3.3ft.) aperture and 2 degree field of view is used to search the deep sky for faint slow-moving objects. The GEODSS telescopes are able to see objects 10,000 times dimmer than the human eye can detect.

Over the past 45 years, HO has experienced managed growth of astronomy and space surveillance facilities within its boundaries. The first major UH facility at HO was the C.E.K. Mees Solar Observatory (MSO) that has operated since 1964. The scientific programs at the MSO facility emphasize studies of the solar corona and chromosphere. The LURE Observatory was operated by IfA under contract to the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center from 1972 until 1993, to conduct highly accurate measurements of the distance between LURE and the Moon, as well as measurements of the distance between LURE and satellites in orbit about the Earth. From 1993 to 2004 LURE was operated for the NASA Space Geodesy and Altimetry Projects, providing NASA with highly accurate range measurements between LURE and satellites. The facility was also involved in the NASA Crustal Dynamics Project. Other space programs have been pursued by UH using telescopes to discover and characterize space objects and to monitor for approaching asteroids and comets that might pose a danger to our planet. Additional UH telescope facilities include:

The Daniel K. Inouye Solar Telescope (DKIST,) formerly the Advanced Technology Solar Telescope (ATST,) represents a collaboration of 22 institutions, reflecting a broad segment of the solar physics community. The DKIST represents the next generation ground-based solar telescope and is currently under construction, and is expected to become operational in 2017.

The Faulkes Telescope North (FTN) was originally built by the Dill Faulkes Educational Trust and became operational in 2004; the Zodiacal Light Observatory; and the IfA has dedicated a small building for the Haleakalā Amateur Astronomers to organize and host programs for professors and students at Maui Community College (MCC), K-12, Boy Scout groups, Akamai students, community members and others to conduct astronomy observations at HO.

Vehicular traffic to and from Haleakalā Observatories is via Haleakalā Crater Road, a two-lane roadway through Haleakalā National Park. This road is owned and maintained by the National Park Service from its intersection with Haleakalā Highway to the park boundary nearest to the Haleakalā Observatories.

Visitors to the Park generate most of the vehicle traffic on the Park road, with the highest traffic volumes occurring during peak recreation hours. The high elevations combined with relatively steep grades and numerous switchback curves on the road limit vehicle speeds, particularly speeds of trucks and tour buses.

3.2 Safety and Occupational Health

All USAF-related operations are required to comply with the AF Occupational Safety and Health Program. Program requirements are specified in AFI 91-301, AFI 91-202, AFI 91-204 as Supplemented by AF Material Command and AFRL, *Air Force Occupational and Environmental Safety, Fire Prevention, and Health (AFOSH) Program*. The AFRL Safety

Office has oversight of all ground and test safety activities performed at AFRL/Det 15 on Maui. Det 15 obtains support for government personnel to ensure occupational health requirements are met from the AF located at Hickam AFB, Aerospace Medical Squadron. The primary directive governing the AFOSH Program is USAF Policy Directive 48-1, *Aerospace Medical Program*. Outdoor laser operations are conducted in accordance with American National Standards for the Safe Use of Lasers, ANSI Z136.6 and U.S. Air Force, AFOSH Standard 48-139.

The proposed action at the MSSC would comply with the above program requirements under the supervision of the AFRL/safety office. Mitigation to reduce risks associated with the installation and operation of the improved equipment would be implemented to ensure hazards to human and biological resources are at the lowest level. The safety requirements for the proposed action are consistent with those currently required for mission activities at MSSC. Contractor personnel involved in AFRL mission activities are required to comply with the AFOSH Program in addition to the requirements for contractors under the OSHA.

3.3 Biological Resources

MSSC is on University of Hawai’i land within the Conservation district on Pu‘u Kolekole, and is approximately 0.3 mile from the highest point, Pu‘u ‘Ula‘ula. Mountain summits are typically Aeolian (windy) deserts populated by a few mosses, lichens, and grasses. The predominant vegetation type at HO is alpine drawf-shrubland at the summit; 10,053 ft. Alpine ecosystems exist at elevations from 9,842 to 11,155 feet above mean sea level and can be extremely dry. The wet trade winds frequently do not rise above 6,233 ft. in elevation, being suppressed by the tropical inversion layer, leaving upper slopes too dry to support wet vegetation. Great daily variations in temperature occur, with frost most common at night. Cinder and ash soils underlie this area. At HO, shrubs consist of interspersed ‘*ahinahina* (Silversword) *and na‘ena ‘e* (Dubautia). Vegetation cover is relatively sparse, 10% of the surface area or less due to the harsh climate and soil conditions.

Approximately 44 plant species have been observed in the HO area of which 14 are native species and 30 are non-native species. The MSSC currently has over 100 threatened ‘ahinahina (Silverswords), thriving in planter bays and around the non-paved areas surrounding the MSSC facilities.

The MSSC and HO sites have been surveyed for biological resources (*Movements of Hawai’ian Petrels near USAF Facilities, Fall 2004 and Spring 2005 ABR, Inc.; ATST Botanical Survey, December 2005 and July 2009 Starr and Starr; Biological Opinion USFWS for ATST June 15, 2011*). These surveys have included several botanical and arthropod surveys, a radar and visual survey of the movements of Hawai’ian dark-rumped petrels *(Pterodroma phaeopygia sandwichensis*), and annual monitoring of Haleakalā Silverswords (*Argyroxiphium sandwicense* var. *macrocephalum*) within the MSSC site since 1998. All federally listed species at or near the site have been identified.

The diversity of insect fauna (arthropods) at the HO site is less than what has been reported

for adjacent, undisturbed habitat. This is due in part to the harsh climate, but it is also a result of ground disturbance that has occurred at the overall site, (HOMP, October 2010). Arthropod surveys have occurred on numerous occasions within the vicinity of the MSSC site (Medeiros and Loope 1994, Pacific Analytics, L.L.C., 2003, 2005, 2007, 2010, 2011 and 2012).

The habitat for three Threatened and Endangered (Federal and State) species and one threatened (Federal) species lies within the vicinity of the summit area of Haleakalā. The three endangered species include: the Hawai'ian dark-rumped petrel, which nests in burrows located just outside the 18-acre HO parcel; the Hawai'ian goose (*Branta sandwicensis*), which nests at lower altitudes but over-flies the summit; and the Hawai'ian hoary bat (*Lasiurus cinereus semotus*), which has been sighted near the summit. The threatened Haleakalā silversword (*Argyroxiphium sandwicense* var. *macrocephalum)* is the only federally listed plant species found within the MSSC site.

3.3.1 Haleakalā Silversword (Argyroxiphium sandwicense var. macrocephalum)

The Silversword is the only federally listed plant species found within the MSSC site that is (Threatened - Federal). The Haleakalā Silversword is adapted to the intense, ultraviolet-light and cold, dry atmosphere indicative of the summit environment. The Haleakalā Silversword generally flowers from June to September, with annual numbers of flowering plants varying dramatically from year to year. In 2011, which was an average flowering year, there were approximately 565 blooms out of the tens of thousands of plants found on Haleakalā. The largest flowering year was 1991, with over 6,000 blooms, and the lowest year was 1970 with no blooms (Starr and Starr 2011). The Haleakalā Silversword has a highly restricted distribution. It is only found growing at elevations above 6,900 feet on Haleakalā within the crater and outer slopes around the rim. It is a distinctive, globe-shaped rosette plant, with a dense covering of silver hairs that completely hide the leaf surface. Usually single-stemmed, with its sword-like, rigid, and succulent leaves are 5.9-15.8 inches long, 0.2-0.6 inches wide at the middle, and usually three-angled in cross section. The flowering stalk grows 1.6-9.8 feet tall and contains numerous flowering heads. Plants mature from seed to its final growth stage in approximately 15-50 years. The plant remains a compact rosette until it sends up an erect, central flowering stalk, sets seed, and dies. The Silversword comes from the Asteraceae (*Asters*) family. In the late 80s two plants existed on the MSSC property. Recent surveys conducted by the AF, Oct 2013 and Jun 2014were completed with 128 plants in 2013 and 127 plants in 2014.

3.3.2 ‘ua‘u (Hawai'ian Dark-rumped petrel)

The Hawai'ian petrel (*Pterodroma sandwichensis*) or ‘u‘au was listed as endangered on March 11, 1967 (32 FR 4001). The endangered ‘ua‘u, is known to nest and fly around the Haleakalā summit. The Haleakalā population was estimated to number 450-650 breeding pairs and 1,800 individuals in the 1980-1990s (*Simons T. , 1985*) and (*Simons & Hodges, 1998*), and the West Maui populations may number around 100 (*International, 2009*), although radar

observations suggest that this island-wide estimate may be low (*Cooper, 2003*), and it may be increasing due to increased reproductive success in response to predator-control in the colony areas (*Hodges & Nagata, 2001* and *International, 2009*). The largest known nesting colony of Hawai'ian petrels is located in and around the Haleakalā National Park (Simons and Hodges, 1998). In 2003, approximately 30 known burrows were located along the southeastern perimeter of HO, several burrows were northwest of HO, and additional burrows have been found northeast of the DKIST Project site (NPS, 2003).

The Hawai'ian petrel or ‘ua‘u nests on Haleakalā in high elevation burrows located beneath rock outcrops, under boulders and cliff faces, along talus slopes or along edges of lava flows where there is suitable soil underlying rock substrate for excavation of tunnels. Most of the nests on Haleakalā are in rock crevices in sparsely vegetated, xeric habitat (*Simons & Hodges, 1998*). ‘Ua‘u can be found in deep burrows inside and outside Haleakalā Crater from late February to early November. They spend the remainder of the year at sea. Although historically the species may have nested at lower elevations, the current nesting habitat of Hawai'ian Petrels on Maui is at elevations above 7,200 ft. (2,195 m). The majority of known Hawai'ian petrel burrows are located along the western rim of the Haleakalā Crater, approximately 3,200 feet northeast of HO, where this habitat is most abundant and also where predator control is afforded. In 2004 and 2005, Hawai'ian Petrel passage rates, collected using ornithological radar, were 4 to 7 times greater during summer and fall at the Visitor's Center (Western rim), when compared to the Haleakalā Observatory complex, suggesting bird numbers are lower in areas encompassing the HO. Importantly, the population trend at Haleakalā is increasing, which suggests that additional recruitment into this site is possible (*Holmes, 2010*).

Beginning in mid-February to early March, after a winter absence from Hawai‘i, breeding and non- breeding birds visit their nests regularly at night, for a period of social activity and burrow maintenance work. Pairs are site tenacious, returning to the same burrow year after year. From mid-March to mid-April, birds visit their burrows briefly at night on several occasions. Then breeding birds return to sea until late April or early May, when they return to lay and incubate their eggs. The eggs are incubated until July when hatching occurs. Adults that did not breed or whose eggs failed to hatch usually depart during August. Male and female parents share in feeding their young until the chicks double in size. ‘Ua‘u chicks are fed at approximately two- to three-day intervals for their first three months (July to September). The parents abandon the young around September of each year and leave the nesting colony until the next season. Fledgling occurs between mid-October and mid-November. ‘Ua‘u fly to and from their nests just after dark. Scientists believe the birds approach the crater from the west and leave through the Ko‘olau Gap to the north, where rim elevations are less than 9,500 feet.

‘Ua‘u is prone to colliding with protruding foreign obstacles. Overhead power lines are of concern. Primary predators of the ‘ua‘u are thought to be rats, dogs and mongoose. Other principal threats to the birds are collapsing of burrows by feral goats, collision with artificial light sources, and disease (*U.S Fish and Wildlife Service, 1983*). To help protect the petrels from feral goats, rats and dogs, UH installed a fence around the summit as part of the DKIST

project.

3.3.3 nēnē (Hawai'ian Goose)

Another federally listed endangered species, the nēnē, Hawai'ian goose, or nēnē *Branta sandwicensis*, is Hawai'i's state bird and is a medium-sized goose. The nēnē was re-introduced on the islands of Maui, Kaua‘i and Hawai‘i and recently on Moloka‘i. The nēnē is found in a variety of habitats and elevations. According to the Haleakalā NPS nēnē may fly to the summit and use the area. On the island of Maui (at Haleakalā) the nēnē population is located between 5500-8000 feet and on the West Maui Mountains between 3000 and 4000 feet. There are approximately 250-300 nēnēs on Haleakalā within the National Park. Most nēnē feed on leaves and seeds of grasses and sedges, leaves and flowers of composites, and various fruits. The breeding season is from October through March. Nests are built on the ground and the females lay 2-5 eggs per nest. The female incubates (approximately 30 days) the eggs while the male guards the nest. Fledging occurs at 10-12 weeks after hatch. Adults molt following breeding season at such time they do not fly for about 5 weeks. Predators to the nēnē are dogs, cats, mongooses, rats and pigs.

3.3.4 Hawai'ian Hoary Bat

The Hawai'ian hoary bat (*Lasiurus cinereus semotus*), is a federal-listed endangered species that resides on the lower slopes of Haleakalā. The Hawai'ian hoary bat is found on Hawai‘i, Maui, O‘ahu, Kaua‘i and Moloka‘i. On the island of Hawai‘i, most observations have been from between sea level and 7,500 feet ASL, although individuals have been recorded at elevations as high as 13,000 feet. On Maui, the bat resides in the lowlands of the Haleakalā slopes. According to the "Roadside Faunal Survey, Haleakalā National Park Fall 2014," bats are present in low numbers at Haleakalā National Park, (*Starr Environmental, Roadside Faunal Survey National Park, 2014*).

The highest numbers of bat pulses have been recorded at the 8500 ft. Eucalyptus grove. This grove may also be a roost site for the bats, as bats were detected just after sunset on multiple nights. This is in contrast to most other places in the Park, where bats show up many hours after sunset, suggesting they have roosts relatively far away. The second most active bat area is along the entrance road to Hosmer's Grove, in a protected area near the FAA Road. The numbers aren't large, but the bats are present and appear to possibly be foraging for short periods of time. The only place bats were not detected while having a detector out over multiple nights was near HO. A detector was left out for a week in the cinder parking lot by HO, facing HO and the front gate to the Air Force property, where an Air Force security guard had reported viewing a bat at dusk. No bats were detected, (*Starr Environmental, Roadside Faunal Survey National Park, 2014*).

3.3.5 Invertebrate Fauna

On Haleakalā, there is an Aeolian ecosystem extending up the summit from about the 7,550

feet elevation. It is characterized by relatively low precipitation, porous lava substrates that retain relatively little moisture, little plant cover, and high solar radiation. The dark, heat-absorbing cinder provides only slight protection from the extreme temperatures, and thermal regulation and moisture conservation are critical adaptations of arthropods occurring in this unusual habitat.

Due to the harsh environment, fewer insects are present at upper elevations on Haleakalā than are found in the warm, moist lowlands. A survey and inventory of arthropod fauna was conducted for the 18 acres of HO in 2003 for the UH Long Range Development Plan and HOMP. In this study, several species were added to the previous inventory site records. An additional survey including arthropod collection and analysis was conducted in 2005 at the MEES and Reber Circle sites for the proposed DKIST Project (*Pacific Analytical, 2005*). The arthropod species that were collected in this study were typical of what had been found during previous studies. Although the study was conducted during the fall months, no species were found that are locally unique to the site, nor were there any species found whose habitat is threatened by normal observatory operations.

An arthropod survey was conducted in June 2009 (*Pacific Analytics, 2009*). 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*).

3.4 Cultural Resources

The cultural resources of Maui encompass pre-contact to present time, span legends and religious beliefs, and include activities ranging from spiritual use and hunting to tourism and high technology science. The cultural significance of Haleakalā has connections to the legends of Pele, who died at Haleakalā during a battle with her rival sister, and the demi-god Maui, who lassoed the sun to slow it down, (*CKM Cultural Resources, Traditional Practices Assessment for the Summit of Haleakalā, 2002*). Historical uses of Haleakalā included meditation and prayers by kahuna (priest, clergyman) and their students, who sometimes lived at Haleakalā. An order of priesthood, called Paliku, conducted ceremonies during the Makahiki (ancient annual festivals beginning around the middle of October and lasting about four months). Haleakalā has been and continues to be a source of spiritual guidance; it is considered a temple, a graveyard, and a focal point for mana (supernatural or divine power). The entire summit area, which includes Kolekole, is considered wahi-pana (a legendary place), (*CKM Cultural Resources, Cultural Resources Evaluation for the Summit of Haleakalā, 2003*). The summit area has been used to train kahuna in the arts of healing and navigating with the stars and constellations. Given its religious significance, access to the summit area was limited to Ali'i (royalty) and kahuna, while commoners were only allowed here to gather stone in the quarry or to bury their dead Ali'i. The remains of Ali'i were buried in caves throughout the summit, crater, and adjoining areas. Those who brought the deceased to their final resting place were sacrificed and buried along with the royalty in a

secret location.

Remnants of the physical and spiritual culture have survived. Several cultural resources of importance, such as wind shelters, petroglyph images, and burial and ceremonial sites are still found on Kolekole. Connections to the spiritual sensitivity remain as the summit is still the highest point overlooking Maui and there is still a connection to ancient gods and goddesses and the past traditions. Modern uses of the Kolekole area include the gathering of flora and fauna for medicinal purposes and for adornments by Kumu Hula (hula teachers).

In 2007, Cultural Surveys Hawai'i, Inc. (CSH) was commissioned to conduct a Supplemental Cultural Impact Assessment (SCIA). The SCIA was performed in accordance with the guidelines for assessing cultural impacts, as set forth by the Office of Environmental Quality Control (OEQC) (OEQC 1997) and was intended to supplement the initial Cultural Resource Evaluation (*CKM 2006*) for the proposed DKIST Project. The primary purposes of the SCIA were to widen community outreach and to gather additional information on the Traditional Cultural Property of Haleakalā as an additional means to assess the potential effects of that particular proposed undertaking on Native Hawai'ian traditional cultural practices and beliefs. Although the SCIA was conducted for a specific project, the preparers of the SCIA made an additional effort to gather supplementary information, community input, and knowledge of the summit area, and therefore the information is relevant to this proposed action. The SCIA contains considerable additional historical perspective on Haleakalā. It discusses in great detail the symbology of the mountain, its role in the history of Maui as a living entity, as well as the archeological record.

3.4.1 Haleakalā Summit as a Traditional Cultural Property

The summit of Haleakalā is considered a significant cultural resource in and of itself. It is eligible for listing on the NRHP as a Traditional Cultural Property (TCP) through consultation with the State Historic Preservation Office (SHPO) under Criterion "A" for its association with the cultural landscape of Maui and this is reflected in the number of known uses, oral history, mele and legends surrounding Haleakalā. The term "Traditional Cultural Property" is used in the NRHP to identify a property "that is eligible for inclusion in the NRHP because of its association with cultural practices or beliefs of a living community that, (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community" (DOI 1994). The summit is also eligible under NRHP Criterion "C" because it is an example of a resource type, a natural summit, and a source for both traditional materials and sacred uses. The value ascribed to Haleakalā as a TCP can be expressed in five distinct attributes, solidifying the role of the summit as a place of value.

1. Haleakalā summit is considered by Kanaka Maoli, as well as more recent arrivals to Hawai'i, as a place exhibiting spiritual power.
2. The summit of Haleakalā is significant as a traditional cultural place because of traditional cultural practices conducted there. For both Hawai'ians and non-

Hawai'ians that live and visit here, the summit is a place of reflection and rejuvenation.

3. The mo'olelo and oli surrounding the summit present a collection of stories suggesting the significance of Haleakalā as a TCP.
4. Some believe that the summit possesses therapeutic qualities.
5. The summit provides an "experience of place" that is remarkable.

As mentioned previously, in recognition of the traditional cultural importance of Haleakalā, Native Hawai'ian stonemasons erected the West and East *ahu* (altar or shrine) for ceremonial use by Kanaka Maoli at HO in 2005 and 2006, respectively. Native Hawai'ians practicing cultural traditions are welcome to use these sites, with the understanding that such use will not interfere with other uses and activities within HO.

The archaeological resources at Haleakalā Observatories are described in several studies conducted at the summit. No archaeological features have been identified within the boundaries of the MSSC; however, archaeological features at Haleakalā Observatories include four sites identified near the MSSC. The State Inventory of Historic Places (SIHP) lists several sites that consist of individual wind shelters and partial enclosures for temporary habitation, complexes of wind shelters, and one site that includes two petroglyph images and a possible burial location. Other sites, identified at Haleakalā Observatories, included wind shelters, a historic radio telescope foundation, and a probable trail segment.

There have been three archaeological surveys that had been conducted in the 18.166-acre HO parcel. The first of these archaeological studies was carried out in 1990 and consisted of a reconnaissance survey, (*Chatters, 1991*). Cultural Surveys Hawai'i, Inc. conducted the second study, an archaeological inventory survey, in 1998 (April 2000). In the third study Xamanek Researchers carried out an archaeological inventory survey in the fall of 2002.

The first study, which consisted of an archaeological reconnaissance survey, was carried out by Pacific Northwest Laboratory on behalf of the U.S. Air Force for the expansion of the Maui Space Surveillance Site or MSSS, (*Chatters, 1991*). During the course of this walkover, four archaeological sites were identified, primarily along the western side of Kolekole Hill. These features included 23 temporary shelters and a short, low wall. These wind shelters were typically constructed against the existing rock outcrop of the hill. The sites were designated No. 50-50-11- 2805 through 2808. One sling stone was found on the floor of Feature J at Site 2807. In addition, one *opihi* (*Cellana spp.*) shell was noted on the surface of the Feature B floor of Site 2808. There was no subsurface investigation carried out, and only Site 2805 was mapped (Ibid.)

The second study was carried out by Cultural Surveys Hawai'i, Inc., in conjunction with the planned construction of the Faulkes Telescope North. This study located two previously unidentified sites— 4835 and 4836. Both of these sites were constructed against an exposed rock outcrop. Site 4835 consists of 2 features—both historic rock enclosures filled with burned remnants of modern refuse—obviously historic trash burning pits. These may have been used initially by the U.S. Army during the war, and later by University of Hawai'i

workers. Site 4836 consists of 3 terraces, a rock enclosure, 2 leveled areas and a rock wall—all constructed against an exposed rock outcrop. Five of the features are interpreted as temporary shelters, while the 2 leveled areas were of indeterminate usage.

Xamanek Researchers carried out an inventory survey of the entire 18.166 acre parcel in 2002-2003, (*Fredericksen and Fredericksen, April 2003*). A total of six previously unrecorded sites (50-50-11- 5438 through 5443) were located during the course of this inventory survey. These sites consist of wind shelters, two petroglyph images, a possible burial feature, and an historic foundation—Reber Circle. In addition, a trail segment was recorded at Site 4836 and designated as Feature F. Several isolated pieces of coral were noted in the southeastern portion of the study area, but not assigned a formal site number, because the coral pieces were not weathered.

No archaeological features were identified within the boundaries of the MSSC from these surveys.

3.4.2 Visual Resources

The terrain around HO is rugged, sparsely vegetated, and covered with an abundance of lava rock. The summit area's appearance is a sharp contrast to the lower slopes of Haleakalā and the more tropical environment at sea level. Near the HO, the cinder cones of Haleakalā's summit dominate the panorama. The summit of Haleakalā is an important visual resource for Native Hawai'ians, Maui residents, and tourists.

The Haleakalā Observatories are visible from the Pa Ka‘oao (White Hill) Visitor Center and the Pu‘u Ula‘ula (Red Hill) Overlook (Figure 3). Additionally, when there is no cloud cover, the reflection of sunlight off the AEOS dome can be seen from Central Maui during the early morning and late afternoon hours. The visibility of the HO facilities varies depending upon one's vantage point. Several HO facilities are visible from Pu‘u Ula‘ula. Some HO facilities are partially visible from the Park entrance station to about the first mile of the Park road, the Park Headquarters Visitor Center, portions of the Park road corridor (particularly the last one-third of the Park road closest to the summit), and near the summit from the Haleakalā Visitor Center, (Pa Ka‘oao or White Hill).

Figure 3: View of HO from Pulu Ula ula.

Approximately 785,000 visitors annually (*HALE 2010*) are attracted to Haleakalā‘s various lookouts and vantage points for its spectacular vistas. Looking down the slopes to the northwest, a majestic view of Maui’s isthmus and West Maui Mountains is afforded, while to the east are the richly colored scenes of the crater and, on minimal cloud-cover days, the slopes of Mauna Kea, Mauna Loa and Hualālai.

Overall, visibility of the HO facilities is highly variable depending on a combination of factors. These include locations from where one views them on the island, atmospheric conditions (e.g., dust content, humidity), time of day, cloud cover, and human activity (e.g., cane burning). For example, on a clear, low-humidity day, some of the facilities would be distinguishable as very small man-made objects from as far away as Ma‘alaea Bay, which is a distance of approximately 17 linear miles. However, in humid and/or dusty conditions, they may not be visible at all from Ma‘alaea Bay or even from locations in Upcountry Maui at half that distance.

Visibility of the summit area would be more likely in the early morning before the daytime cloud inversion layer builds up, and in the late afternoon after the inversion layer dissipates. When mid- and upper-level cloud cover is absent, a few of the existing structures at HO are visible. Depending on one’s vantage point they are visible from miles away. Some of the facilities can also be seen from public viewpoints and highways that climb the slopes of the mountain, (*UH IfA, 2010*).

CHAPTER 4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Land Use

The Proposed Action is to modernize AF research equipment at existing MSSC facilities, including the installation of a FASOR laser on the AEOS telescope, the installation improved sensors and instrumentation, an improved adaptive optics system, and other related supporting equipment located internal to the facility. This action would not significantly change the operational tempo or manning of the MSSC. The AEOS is situated in the HO complex within the General subzone of the State Conservation District (Figure 3) in accordance with Hawai‘i Administrative Rules (HAR) Title13-5, Astronomy is a permitted use within the General subzone. The AF AEOS facility and operation was approved under CDUP MA2705 issued by DLNR 8/26/1994 following the Environmental Assessment for *Advanced Electro-optical System (AEOS) Telescope and Related Improvements at the Maui Space Surveillance Site (MSSS)*, Haleakalā, Maui, Hawai‘i, FONSI dated 24 July 1994. The installation and operation of the FASOR laser at AEOS and the installation of improved sensors and instrumentation throughout MSSC facilities, an improved adaptive optics system, and other related supporting equipment will not result in a change in land use, nor there a significant impact on land use. Adding the FASOR laser to the AEOS telescope and adding improved research equipment at MSSC existing facilities would improve the quality of the data collected at the site. The proposed project is consistent with the goals and objectives of the following state, county, community, and University of Hawai‘i, Institute for Astronomy (UH IfA), Haleakalā Observatories plans:

- Similar research activities are performed at HO by the AF, UH IfA, NSF, TU, and NASA.
- AFRL’s practices of handling MSSC’s cultural and biological resources, is consistent with UH IfA Haleakalā High Altitude Observatory Site Management Plan (HOMP), USFWS and Haleakalā National Park Service plans
- Astronomy is a permitted use in the Conservation District General Subzone.

Implementation of the Proposed Action would not restrict access to any areas that are currently open to the general public. In accordance with the lease agreement, AFRL contributes financially to maintenance of the road through HO only and does not apply to the federal highway through Haleakalā National Park. All activities performed for the proposed action do not require any special use equipment, nor will traffic along this highway increase. MSSC buildings are considered secured military facilities and will continue to have restricted access. The 4.4 acres managed by the AF is not fenced and does not have any archeological sites. Access for native Hawai’ians to cultural areas would not change from current practices as the ahu are outside the AF property.

No-Action Alternative

There would be no impacts to Land Use under the No-Action Alternative as the proposed MSSC modernization efforts would not be implemented. Current research activities would continue.

4.2 Safety and Occupational Health

AFRL Det 15 manages all laser projections by analyzing the hazards for each proposed test, determines the safest way to accomplish mission objectives, and implements mitigation to reduce the risk to the lowest level. Standard best practices are implemented such as: coordination with FAA and adjacent users; establishing a laser exclusion zone; limiting pointing angles; implementing operator situational awareness; designing safety interlock devices for equipment associated with the laser projection; and developing emergency stop procedures. The outdoor laser propagation at MSSC is controlled using a tiered safety approach providing space asset protection via Predictive Avoidance (PA) for satellites; aircraft asset protection via a Federal Aviation Administration (FAA) radar feed to monitor aircraft in and around the MSSC; and the use of outdoor spotter(s).

All of the lasers at MSSC incorporate shutters that block the laser (light emission) beam from propagating inside and outside the facility. First, the FAA radar feed is linked with the mount/laser beam software to provide aircraft position information in relation to the telescope mount orientation and beam projection angle; second, the outdoor spotter visually monitors air traffic in relation to the telescope mount orientation and beam projection angle; and third, specific coordinates and times of satellite passes are entered into the mount software to prohibit laser projections to protect against inadvertent satellite illumination. All of these processes and procedures are used to ensure personnel at the summit, air and space assets are protected from laser operations.

The FAA Radar feed is a direct link into the control room at MSSC and provides real-time data on the location of all private and commercial aircraft in the area. If an aircraft enters the exclusion zone of the proposed laser projection, an automatic shutter is engaged. Additionally, the person monitoring this feed has the ability to shutter the laser photon emission if an aircraft approaches too close to the beam affected airspace.

The Safety Spotter stationed outside the facility is continually evaluating outdoor conditions to ensure propagation of laser light will not cause any hazards to aircraft, biological resources and personnel on or off the site. This will include but is not limited to an observation of the cloud cover and weather in the area, observation of personnel or equipment at outlying facilities, and evaluating the beam proximity to aircraft. Any time the spotter recognizes an unsafe condition, the propagation is terminated. By the ANSI Z136.6 'Safe Use of Lasers Outdoors Standard' safety spotters "shall have the responsibility, capability, and authority to terminate laser beams immediately when an aircraft approaches, and before a potential hazard occurs". The Safety Spotters have a headset for communicating with the test laser safety officer, and a dead-man switch that allows the Plane Watch control over the Laser shutter.

To ensure the light emissions do not cause hazards for personnel, AFRL strictly adheres to

OSHA, Air Force, and ANSI laser safety Standards and imposes strict safety protocols for all of its laser operations. For example, AFRL imposes a 30-degree above the horizon minimum pointing angle for all laser operations—resulting in the elimination of laser hazards to the Public on the ground. The MSSC incorporates this multi-tiered safety system to address inadvertent lasing of personnel on aircraft and space optical assets, by incorporating human outdoor safety spotters, monitoring Federal Aviation Administration (FAA) radar feed, and a space asset Predictive Avoidance (PA) system during all outdoor laser operations. Implementation of these safe guards has allowed MSSC to operate without incident for over twenty years.

No adverse or significant safety impacts are anticipated from the implementation of the proposed action to modernize MSSC equipment within existing facilities.

The FASOR Laser emits light at a wavelength of 589.2 nm. This causes sodium atoms, which are naturally occurring in the mesosphere at an altitude of 80-105 km, to absorb laser light and fluoresce (“glow”) at the same wavelength. This glowing is not a chemical reaction, green-house gas or an air emission; it is caused by the sodium ions in the mesosphere absorbing the light from the FASOR, becoming excited, and reemitting the light omnidirectional like a lamp. Once the FASOR laser stops illuminating, the sodium ions will no longer be excited and will stop glowing. This process does not change the chemical make-up of the sodium ions and does not cause any off-gassing. No significant impacts on safety or human health would occur from the proposed project, including the operation of the FASOR laser.

No-Action Alternative

Current research activities at the site would continue and existing procedures would not change. Implemented safety precautions for research equipment and approved lasers would continue to be exercised. There would be no impacts to public safety under the No-Action Alternative as the proposed MSSC modernization efforts would not be implemented.

4.3 Biological Resources

The proposed modernization of the MSSC equipment within existing facilities would have no significant impact on biological resources. The potential threat to fauna from the installation and operation of the FASOR laser is from the visible light (589nm orange color) that would be propagated from the AFRL, MSSC 3.6 m AEOS telescope. As mentioned above, past and existing visible lasers have been used at the MSSC and HO, however these lasers have been in the blue and green visible spectrum. Since the FASOR is in the orange wavelength, within the spectrum visible to avifauna and possibly a source of distraction to these species, additional analysis was performed. To determine the impact on fauna, specifically the ‘ua‘u, nēnē and hoary bat, an analysis of proposed operations and behavioral information for these species was analyzed with consideration for: 1) Direct laser illumination where the animal would be exposed by flying through the laser beam; and/or 2) distraction or disorientation by back scattered laser light.

4.3.1 Direct Laser Illumination

The theoretical worst case hazard to birds or bats directly exposed to the FASOR laser beam is retinal damage due to the species looking directly into the beam while simultaneously being illuminated. There is no surface or skin hazard due to the beam size, power, and notional exposure duration. Inadvertent Avifauna retinal exposure during a laser tracking an object in space is expected to be very low because the relatively short times during which such beams would be On (5-10 min); the relatively small diameters of the beam; the species flight speed; and low flight activity over the MSSC. A bird or bat flying at 48 km/h (30 mph) would pass through a 20cm (7.874 in.) diameter beam in less than 0.015 s. While an avian retinal damage event is possible, the combination of: the laser beam tracking an object in space; propagation path above 30 degrees; limited lasing times; relatively sparse bird activity over the MSSC; narrow laser beam parameters; and bird flight speed makes it a highly unlikely event. Additionally, the bird or bat would need to focus on the beam, directly in-line with the beam projection in the very short time during which it flew through the beam further reducing the probability of a direct illumination blinding event.

The bird species of particular concern at the MSSC are the ‘ua‘u, or Hawai’ian Petrel, which flies to and from nest sites at night; and the Nēnē, which has been re-introduced on Haleakalā. Although experiments using lasers could occur during the ‘ua‘u breeding season, impacts are expected to be unlikely because of the predominant flight path which takes the birds over the Haleakalā NPS Visitor Center and not over the MSSC. Laser projections at MSSC are primarily directly overhead where the beam is blocked from propagating below 30 degrees. The probability is very low that a species would be impacted due to safety protocols implemented and positive laser controls. Typically, these sensors/communications lasers are invisible to both humans and birds thereby reducing the potential species will be disoriented. The Visitor’s Center is approximately 965 m (3168 feet) from the AEOS telescope/FASOR laser would be located. At this laser projection limitation (30 degrees above horizon) the beam would be 557 m (1,827 feet) above the Visitor’s Center. This would indicate that it is highly unlikely petrels would intercept the beam at this location, since the majority of petrels fly below 15m (49 feet) AGL.

It is highly unlikely that the nēnē population would be affected as very few have been observed at the summit, and none have been observed at AFRL 4.4 acres; there is sparse vegetation and food supplies are very limited; consequently nēnē are not known to reside near MSSC facilities. Although the hoary bat could potentially be in the MSSC area, it is unlikely due to the cooler temperatures at night and therefore would not be adversely impacted.

4.3.2 Scattered Laser Light

It is well documented that petrel fledglings are attracted to and disoriented by sources of anthropogenic light on their post-natal nocturnal flights to the ocean (*Troy, Holmes, & Green, 2011*). One explanation for this behavior is that petrels use moonlight to navigate to their burrows. It is believed that the petrel focuses on other bright light sources that emanate omni-directionally causing disorientation. This disorientation can cause them to fall to the ground following exhaustion and/or crashing into manmade structures and vegetation in a

phenomena termed "fallout." Once grounded, the birds become vulnerable to dehydration, starvation, and predation (*Troy, Holmes, & Green, 2011*). While it is unknown what threshold of light intensity is required to attract or disorient birds, experiments have been performed that demonstrated a 40% decreased attraction of fledgling Procellariiform birds, which is an order of seabirds that include Newell's Shearwater, Dark-rumped petrel, and Band-rumped Storm-petrels, by shielding upward radiation of lights at the largest resorts on Kauai (*Reed, Sincock, & Hailman, 1985*). This shows that limiting light viewing angles and direct intensity significantly reduces the attraction potential of artificial lights. These results can be extrapolated to the FASOR case, where all but a very small angle of light is shielded from view (i.e. the main beam) and the backscattered light consisting of a low intensity cone of light would have minimal attraction to birds.

Due to a laser's directionality and coherence properties, the on-axis (in-beam direct view) is very bright (i.e. when the beam is pointed directly at the viewer); while the off-axis visibility is very dim. In a vacuum, when the viewer is off-axis to the beam, the laser beam itself is invisible because the photons are all going in the same direction, and none are impacting the receptors in the viewer's eye. When propagating through an atmosphere, the laser photons are scattered when they hit air molecules (primarily nitrogen and oxygen)--Rayleigh scattering; and larger particles (dust and water vapor)--Mie scattering. When there are enough photons received in the eye, it resolves it as a beam in the sky. The angular distribution of scattered light is complex; however, it can be simplified by imagining the photons as balls all travelling in a single direction and bouncing off of molecules that they encounter. The distribution of the bounced photons would vary, with more bouncing back towards the source and fewer bouncing to the angle normal to the original direction of the source. The result is a cone of intensity, so the apparent brightness will change depending upon the viewer's angle relative to the beam—the backscattered light is brightest when standing near the laser source and gets dimmer as the viewer moves laterally away. Also, the density of molecules in the air will change the number of photon collisions and therefore the off-axis apparent brightness (*Prilutsky & Fomenkova, 1990*). For Rayleigh scattering the atmospheric nitrogen and oxygen concentrations can be considered pretty constant; however the Mie scattering can vary wildly due to ambient conditions such as clouds and dust storms. For this reason, MSSC operations are suspended during cloudy or extreme weather conditions.

The easiest way to explain the off-axis visibility of the laser beam is to compare its apparent brightness to stars observed in the night sky. Astronomers routinely use an "apparent magnitude scale" to measure the brightness of objects in the night sky. The brighter an object appears, the lower the value of its magnitude. A star that is one magnitude number lower than another star is about two-and-a-half times brighter. Table 1 is a list of some common apparent magnitudes.

Direct View Object	Apparent Magnitude	Number of stars brighter than apparent magnitude
Sun	**-26.74**	**0**
Full-Moon	**-12.92**	**0**
International Space Station (when fully	**-5.9**	**0**
10 watt incandescent bulb (5%	**-2**	**0**
Sirius (brightest star in	**-1.46**	**0**
Vega	**0**	**4**
Calculated FASOR brightness directly below the	**2.5**	**between 48 and 171**
Faintest star visible to Human	**6.5**	**9096**
Calculated FASOR brightness at	**6.5**	**9096**
Source: Wikipedia		

Table 1: The calculated brightness of the FASOR backscatter is less than many stars and diminishes as the viewer travels away from the laser source.

To evaluate the FASOR laser brightness in the night sky AFRL/RDMT and AFRL/RDS conducted a test involving a Sodium Laser at Kirtland AFB, NM; using a 10 watt light bulb to provide a reference light source, Figure 4. The apparent brightness of this laser was much less than a 10 watt light bulb and no brighter than the average star in the sky.

The photo was taken on a clear night, so the majority of the laser light seen Figure 4 is caused by Rayleigh scattering. A 10W incandescent light bulb viewed from 500 m (1,640 ft.) has an apparent magnitude of around -2.00, assuming that the bulb is 5% efficient; and the Sodium Laser has a magnitude of around 2.5 when viewed from directly under the beam pointed at zenith (*Hackett, 2014*).

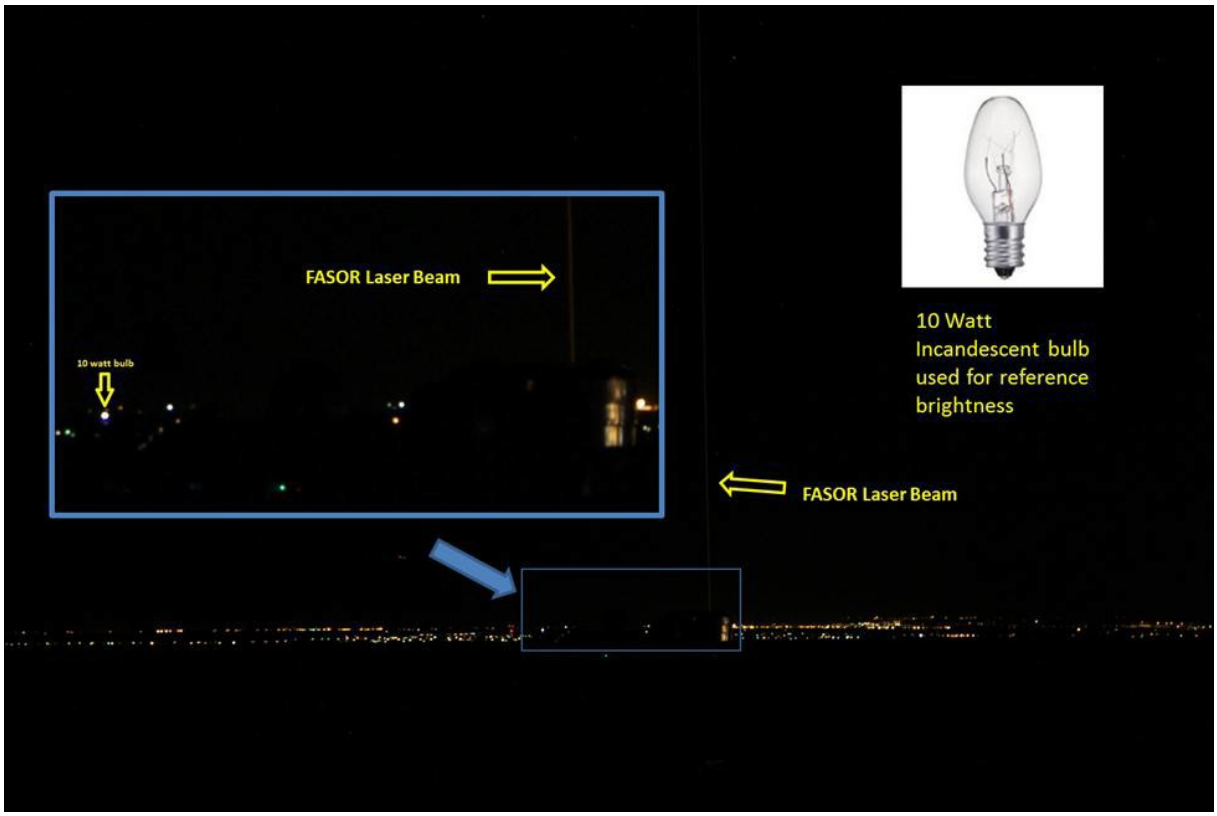

Figure 4: A 10 watt light bulb provides a relative brightness to the laser beam in this photo of the Sodium Guidestar laser at the Starfire Optical Range located on Kirtland Air Force Base, NM taken at a distance of 0.6 miles away.

Based upon this experiment and subsequent analysis, the operation of the FASOR laser at MSSC is highly unlikely to adversely affect the wellbeing or flying behavior of any threatened or endangered species. Leading factors for this conclusion are:

- The FASOR laser poses no surface or skin hazard due to the beam size, power, and notional exposure duration.
- The AFRL's MSSC has been performing outdoor laser and optical system testing since 2000 with negligible impact on environmental resources and no recorded impacts on any ‘u‘au or other wildlife form.
- While possible, it is extremely unlikely that a bird inflight near the laser projection (beam diameter 20 cm (7.874 in.)) would intersect resulting in retinal injury or surface injury, due to tracking and slewing of the laser beam, short exposure time to the beam, relative low bird activity over the MSSC, 30 degree laser elevation pointing limitation, and typical flight altitude (15m) of the petrel – below normal beam height above the ground.
- The backscattered sodium laser light will be 6.25 times dimmer than the brightest star in the sky, thus not constituting a bright light source. It is unlikely that a relatively dim, directional light would have the equivalent disorientation effects on petrels, as

observed with bright omni-directional light sources.

- The FASOR laser would only be used intermittently and the duration of the laser beam projection is typically short (5-10 minutes in duration). If a bird were to become distracted or disoriented by the laser light, the light would be extinguished before the bird becomes exhausted, allowing it to recover and reorient its flight path.

Consultation under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq*.) was completed with the U.S. Fish and Wildlife Service on 3 Jan 2015. Based on AFRL's avoidance and minimizing measures, USFWS has concurred with the AF determination that the proposed project may affect, but is not likely to adversely affect the Hawai'ian petrel, Haleakalā silversword, Hawai'ian goose, and Hawai'ian hoary bat. For these reasons, and the established practices designed to prevent impacts to flora and fauna, no significant impacts on biological resources are anticipated from the Proposed Action.

No-Action Alternative

Current sensor and laser research operations would continue with existing equipment. The upgrade of equipment and addition of the FASOR laser would not be implemented and no impacts to biological resources under the No-Action Alternative as the proposed would occur. MSSC modernization efforts would not be implemented.

4.4 Cultural and Visual Resources

Views of the summit are considered in this section as Haleakalā is considered by many to be a sacred place. The existing MSSC facilities can be seen faintly from Maui's central valley when clouds are absent and the air is clear. As the sun is going down the sunlight reflect off of the AEOS aluminum siding and is potentially seen at different Island locations. As the sunlight continues to diminish the potential glint or "sparkle" off of the AEOS dome disappears. Daylight visibility of the MSSC facilities would not change with the proposed projects described in this EA. With the proposed project, the existing relationships between the natural and man-made environments would be maintained. The Area of Potential Effect (APE) for determining the affected environment for the proposed action includes the 4.4 acres of land leased by the United States Air Force and owned by the University of Hawai'i where MSSC is located within the HO on Haleakalā. Additionally, based upon experimental testing at Kirtland AFB, Albuquerque, NM the APE would include visual perception of the FASOR at a maximum distance of 1200m. The analysis in 4.3 of this EA indicates the proposed action would not affect visual resources and view planes from distances greater than 1200 m.

The primary impact on visual resources and view planes that would result from the operation of the FASOR laser is the visible light (589 nm orange color) propagated from the AFRL MSSC AEOS telescope. The FASOR laser would be visible from a few locations on the summit; mainly the Visitor's Center and the Summit Overlook starting at dusk. The summit area is open to the public 24 hours a day, with the vast majority of people visiting during daylight hours. The beam becomes faintly visible at dusk and more apparent as the night sky darkens. The

visibility of the beam becomes faint as the sky lightens and dawn approaches. As mentioned above, past and existing visible lasers have been used at the MSSC and HO, currently UH (TLRS4/NASA GSFC) conducts operation using a visible green (532 nm) laser almost continuously 10-hours a day. They will continue to operate their laser during day and nighttime hours.

Visitors to the summit areas will be able to see the FASOR laser, providing they are at the appropriate viewing angle, as it is propagated during nighttime hours. Although a photo is difficult to communicate the actual visibility of the FASOR laser beam, the image below was taken at SOR Kirtland AFB, NM with a long exposure to relate the potential visibility depending on seeing conditions and background light. The photo is a reasonable facsimile of the FASOR appearance from the visitor center. The FASOR laser would only be used intermittently and the duration of the laser beam projection is typically would be short (5-10 minutes in duration). During daylight activities, the FASOR would not be visible to the naked eye.

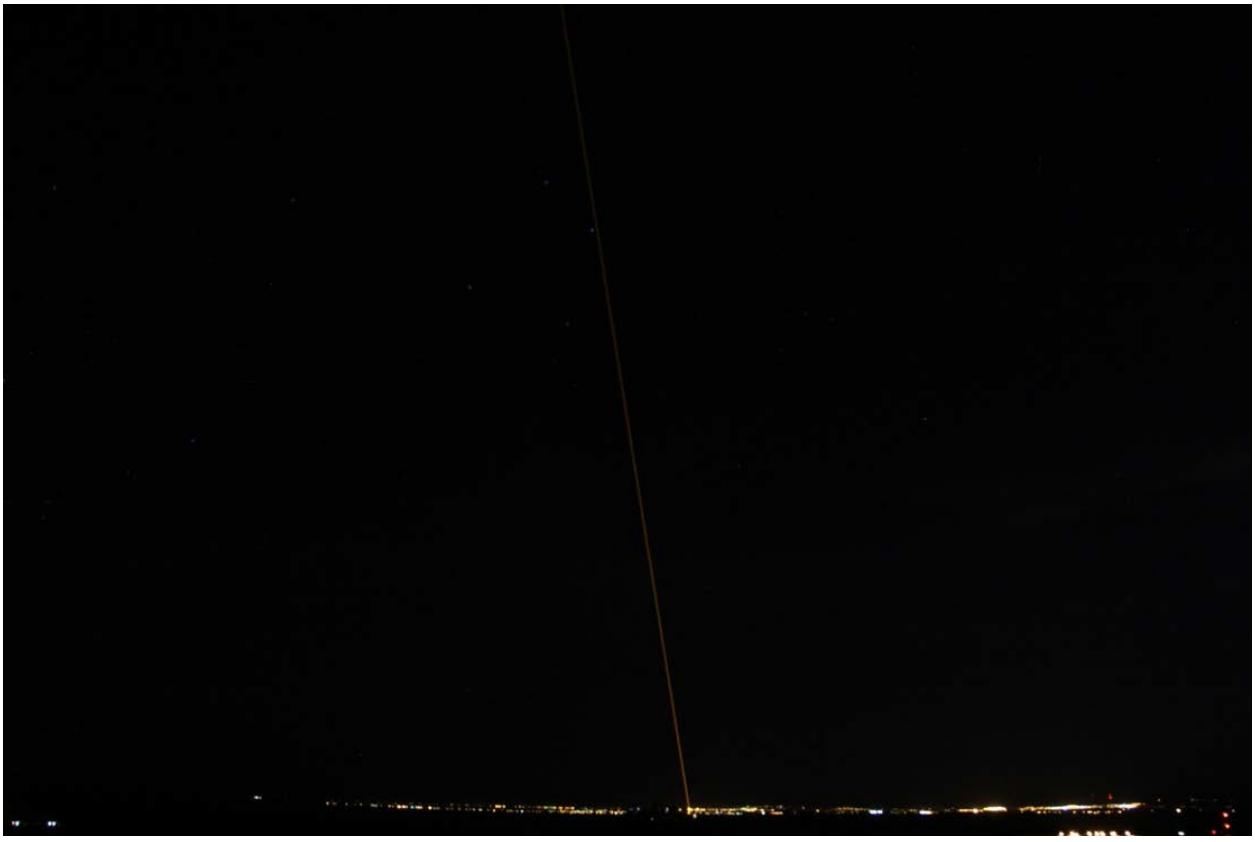

Figure 5: The SOR Sodium Guidestar Laser, located South-East of the Albuquerque, NM metropolitan area, using a long exposure camera.

Initial consultation with the State of Hawai‘i, State Historic Preservation Office in accordance with Title 36, Code of Federal Regulations, Part 800.3(c) and National Historic Preservation Act, Section 106 was performed February of 2015. The AF also briefed the Maui Lana’i Burial

Council, April 2015 explaining the AF proposed action. The AF has incorporated SHPO and community requests regarding cultural resources and the removal of construction activities in this Final EA. The AF submitted a revised Final EA to the SHPO on 31 Dec 2015 for consultation. The AF has determined the proposed action will have No Adverse Effect on Cultural or Visual Resources within the defined APE in accordance with Title 36, Code of Federal Regulations, Part 800.3(c) and National Historic Preservation Act, Section 106. Based upon detailed analysis in section 4.3 of the Final EA, the proposed action would not affect visual resources and view planes from distances greater than 1200 m. The Proposed Action would have no significant impact on cultural or visual resources. Per section 106 of the National Historic Preservation Act of 1966, as amended, SHPD has reviewed the AF proposed undertaking and the State Historic Preservation Officer concurs with the determination of the AF that the project will have **no adverse effect** on the National Register Eligible Maui Space Surveillance Site or adjacent archaeological sites within the APE.

No-Action Alternative

On-going research conducted by the AF with existing equipment would continue. The current requirements to protect cultural resources at the MSSC would not change and personnel would continue to respect the native Hawaiians traditional practices. There would be no impacts to cultural or visual resources under the No-Action Alternative. Visibility of MSSC facilities would remain the same. However visible laser activities conducted by other HO organizations would continue to occur.

CHAPTER 5.0 CUMULATIVE IMPACTS

A cumulative impact is the effect on the environment that could result from the incremental impact of a Proposed Action when added to other past, present, or reasonably foreseeable future actions. Cumulative impacts may result from individually minor but collectively significant actions that can take place over time. The projects listed below occur within the same geographical region of influence and have the potential to be implemented within a 20-year period. Table 2 lists Past, Present, and Reasonably Foreseeable Future Actions Associated with HO and Adjacent Neighbors. This analysis identifies likely impact on the environment, including short- and long-term impacts, and direct, indirect, and cumulative impacts. The analysis focuses only on those environmental issues that have potential impact and are associated with the MSSC Modernization of Equipment activity. Table 3 is a brief description of the impact intensity rating and definitions used for the analysis.

Facility	Status	Reasonably Foreseeable Future Actions
Mees Solar Observatory	1966, currently used	Remain as-is, or be replaced by the proposed ATST Project
Atmospheric Airglow	1961, currently used	Remain as-is, or be replaced by Pan-STARRS or the proposed ATST Project
Zodiacal Light	1961, currently used	Remain as-is
Cosmic Ray Neutron Monitor Station	1961, currently inactive	To Be Determined
Baker-Nunn Site	1957, currently used	Remain as-is
Faulkes Telescope Facility	2003, currently used	Remain as-is
Pan-STARRS, PS-1 South	June 2007, currently used	Remain as-is (was formerly Lunar Ranging Experiment facility)
PS-2 North, 2nd Facility	2009, currently used	Remain as-is
Maui Space Surveillance Complex	Construction occurred over several years since 1963, currently used	Remain as-is
SLR 2000	Proposed	Reuse of site behind Mees facility for Laser Ranging
Haleakalā Visitor Center Comfort Station	Renovations in 2002	Upgrades to water and wastewater treatment system
HALE road cattle guards	Built 2006	HALE project. Edge of HALE road. Installed cattle guard to prevent feral goats from entering Park summit area from State land
FAA site adjacent to HO, Homeland Security tower	Constructed in 2006	Remain as-is
Maui Electric Co., Inc.	Proposed upgrades	Replace transformers, voltage regulators, upgrade and relocate substation for proposed ATST Project. Combined with the proposed ATST Project for **impacts.**
Hawai’ian Telcom	2007	Repair to damaged/exposed conduits
(Roadway)	Early 2009	Repair to 0.3 miles of Saddle access road
HALE road cattle guard	Early 2009	Installed cattle guard to prevent feral goats from entering Park summit area from State land.
HALE road chip sealing	January 2009	HALE road surfacing on upper **two miles, canceled due to potential adverse impact on ‘ua‘u burrows.**
Advanced Technology Solar Telescope	Feb-12	Construction continuing through 2015, initial operations 2017
HALEroad slurry sealing	2011	**Hale road surfacing on upper two miles.**
Hale road rehabilitation	**Within the next 5 years**	**Rehabilitation of road segment in FHWA study reaching end-of-life cycle.**

Table 2: Past, Present, and Reasonably Foreseeable Future Actions Associated with HO and Adjacent Neighbors. (Source: Final Environmental Impact Statement-Advanced Technology Solar Telescope.)

Impact Intensit	Intensity Description
Negligible	Effect is at the lowest levels of detection with neither adverse nor beneficial consequences and would not alter resource conditions.
Minor	Adverse impact — impact(s) result(s) in little, if any, loss of integrity and would be slight but noticeable, but would not appreciably alter resource conditions.
Moderate	Adverse impact — disturbance of a site(s) results in loss of integrity and impact(s) would be apparent and would alter resource conditions or significantly interfere with the resource.
Major	Adverse impact — disturbance of a site(s) results in loss of integrity and impact(s) would alter resource conditions and would severely jeopardize the resource.

Table 3: Definitions of Impact Intensity.

5.1 Cultural and Visible Resources

Installation of instrumentation, cameras and other research equipment within existing facilities would have no cumulative impact on the environment. Cumulative impacts associated with this Proposed Action were evaluated for the operation of the FASOR laser as it would be visible to a maximum distance of 1200m from the AEOS telescope on Haleakalā. There is a potential for visitors to the summit during nighttime hours to see the visible beam. The FASOR sodium guide star laser would only be used intermittently and the duration of the laser beam projection would be short (5-10 minutes in duration) but would occur multiple times per hour over a 6-8 hour period.

Laser usage has been in place at HO for decades. Currently lasers are being used for outdoor propagation by numerous entities on HO. The proposed visible FASOR laser is an addition to existing and previously used lasers in the HO. Visible lasers in the green spectrum are currently used by the AF and the University of Hawai‘i. The only difference is that the FASOR laser will be a different color (orange) than is currently being used. Overall, AFRL/Det 15 has significantly reduced the number of lasers used at the MSSC. Adding the FASOR does not increase the operations tempo, but does create an intermittent new visual image that visitors to the summit during nighttime hours would potentially see.

5.2 Biological

Based upon our experiment at SOR and subsequent analysis, the operation of the FASOR laser at MSSC is highly unlikely to adversely affect the wellbeing or flying behavior of any threatened or endangered species. Consultation under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq*.) was completed with the U.S. Fish and Wildlife Service on 3 Jan 2015.

Based on AFRL’s avoidance and minimizing measures, USFWS has concurred with our determination that the proposed project may affect, but is not likely to adversely affect the Hawai’ian petrel, Haleakalā silversword, Hawai’ian goose, and Hawai’ian hoary bat.

Cumulative impacts on cultural resources as a result of the FASOR laser operation (visible beam propagation) would only occur during night operations when the sky is very dark and individuals are at the summit performing cultural practices as the laser is not visible during the day.

Impact Category	Baseline of Impacts for Past, Present, & Reasonably Foreseeable Future Actions Other Than the Proposed MSSC Equipment Modernization Project *(Source: Final EIS--Advanced Technology Solar Telescope, 2009)*	Proposed MSSC Equipment Modernization Project
Land Use and Exist Activities	Mi-A-L	N
Cultural, Historic, Arch Resources	Mo-A-L	N
Biologic Resources	Ma-A-L	N-A-L*
Topography, Geology, Soils	Mi-A-L	N
Visual Resources and View Planes	Mi-A-L	N-A-L*
Visitor Use and Experience	Mi-A-L	N-A-L*
Water Resources	Mi-A-L	N
HazMat and Solid Waste	Mi-A-L	N
Infrastructure and Utilities	Mi-A-L	N
Noise	Mi-A-L	N
Air Quality	N-A-L	N
Socioecon. and Env. Justice	Mi-B-L	N
Public Services and Utilities	Mi-A-L	N
Natural Hazards	N-A-L	N

Notes: For simplicity, where there are multiple impacts for any of the 14 aspects of affected environment, for past actions, only the highest intensity is displayed in each box, whether it is adverse or beneficial. It should not be assumed that only one adverse or beneficial impact has occurred or would occur for the 14 aspects of affected environment.

*** The negative effect would only occur when the laser is being projected at night. Expected duration is 5-10 minutes, up to 5 times per night**

LEGEND: A-Adverse B-Beneficial L-Long term S-Short term
N-Negligible Mi-Minor Mo-Moderate Ma-Major

Table 4: Relative and Cumulative impacts of the MSSC Equipment Modernization Project

Table 4 lists a summary of the highest intensity impacts for each of 14 categories of past, current, and foreseeable actions and the expected impacts associated with this action. The proposed action would result in negligible, adverse, long term impacts on Visual resources and View Planes, Visitor Use and Experience, and Biological resources. The impacts would only exist when the laser is actively being projected into the sky, 5-10 minutes duration and up to 5 times per night.

This action would not significantly increase the cumulative impact on the HO and surrounding areas.

Upgrading and improving the MSSC equipment to include the installation and operation of the FASOR laser and its corresponding impact on the environment would be insignificant as this research activity is offset by similar activities already performed within the HO. Cumulative impacts from the proposed modernization of research equipment at MSSC are insignificant.

CHAPTER 6.0 LIST OF ORGANIZATIONS AND INDIVIDUALS CONTACTED, REVIEWERS, AND PREPARERS

Person and Agency	Subject/Role
Michelle Hedrick, AFRL/RD, Lead Test and Environmental Engineer	Preparer
Joseph Volza, AFRL/RD, Test and Environmental Office	Preparer
Stephen Yan, AFRL/RD, Test and Environmental Office	Preparer
Sarah Loney, AFRL/RDS/Det 15, Safety and Environmental Contractor	MSSC Site Operations Safety and History
Capt. Shawn Hackett, AFRL/RDSS, FASOR Laser Operations Specialist	FASOR Laser visibility calculations
Dr. Skip Williams, AFRL/RDSM/Det 15, Chief Engineer	MSSC & FASOR Operations

CHAPTER 7.0 REFERENCES

- 32 CFR Part 989. (n.d.). *Environmental Impact Analysis Process*.
- 16 U.S.C. §§ 703-712. (1918). The Migratory Bird Treaty Act of 1918 (16 U.S.C. §§ 703-712, July 3, 1918.
- 16 USC §1531 et seq. (1973). The Federal Endangered Species Act (ESA) of 1973 (16 USC §1531 et seq.)
- 16 USC §470. (n.d.). The National Historic Preservation Act (NHPA) of 1966, as amended (16 USC §470).
- 25 USC§3011. (1990). *Native Americans Grave Protection and Repatriation Act*.
- *40 Code of Federal Regulations.* (2014). Retrieved from http://www.ecfr.gov.
- 42 USC §7401 et seq. (n.d.). *The Clean Air Act (CAA) and amendments (42 USC §7401 et seq.)*
- Ainley, D. G., Podolsky, R., DeForest, L., & Spencer, G. (1997). New Insights into the Status of the Hawai'ian Petrel on Kauai. *Colonial Waterbirds*, pp. 20(1): 24-30.
- Bailey, C., & Chen, H. (2014, Aug). Haleakalā National Park, unpublished data.
- Chen, H., Ganter, C., Panglao, J., & Ryon, A. (2014). *Daniel K. Inouye Solar Telescope (DKIST) Habitat Conservation Plan and Biological Annual Report 2014.*
- CKM Cultural Resources. (2002). Traditional Practices Assessment for the Summit of Haleakalā . CKM Cultural Resources. (2003). *Cultural Resources Evaluation For the Summit of Haleakalā.*
- Cooper, B. a. (2003). Movement of the Hawai'ian Petrel to Inland Breeding Sites on Maui Island, Hawai'i. *Waterbirds*, pp. Waterbirds 26(1): 62-71.
- Day, R. H., Gall, A. E., Burgess, R. M., Parrett, J. P., & Cooper, B. A. (2005). *Movements of Hawai'ian* Petrels *Near USAF Facilities Near the Summit of Haleakalā, Maui Island, Fall 2004 and Spring 2005.*
- Gregory Brenner Pacific Analytics, L. (2009). *ARTHROPOD INVENTORY AND ASSESSMENT AT THE HALEAKALĀ NATIONAL PARK ENTRANCE STATION AND AT THE HALEAKALĀ HIGH ALTITUDE OBSERVATORIES.*
- Hackett, S. (2014). *FASOR Rayleight Scattering Intensity Calculations.*
- Hawai'i Environmental Policy Act (HEPA), Chapter 343, HRS. (n.d.). *ENVIRONMENTAL IMPACT STATEMENTS.*
- Hodges, C., & Nagata, R. (2001). *Effects of predator control on the survival and breeding success of the endangered Hawai'ian Dard-rumped Petrel.* Studies Avian Biol.
- International, B. (2009). *Species Fact Sheets. Http://www.birdlife.org/datazone/species/index.html.* U.K.: Barcelona & Cambridge.
- IUCN Red List. (2012, May). *The IUCN Red List of Threatened Species--Pterodroma Sandwichensis*. Retrieved Aug 2014, from www.iucnredlist.org: http://www.iucnredlist.org/details/22698017/0

- K.C. Environmental, I. (2005). *Proposal to Use Video Surveillance to Monitor 'Ua'u (Hawai'ian Dark-rumped Petrel).*
- Kaplan, M., Gans, Yamamato, & Kahn. (1974). *Open Space and Outdoor Recreation Plan.*
- Loney, S., & Flam, J. (2014). USAF, Unpublished correspondence.
- Pacific Analytical, L. (2005). *UPDATED ARTHROPOD INVENTORY AND ASSESSMENT AT THE HALEAKALĀ HIGH ALTITUDE OBSERVATORIES MAUI, HAWAI`I.*
- Prilutsky, O. F., & Fomenkova, M. N. (1990). Laser Beam Scattering in the Atmosphere. *Science & Global Security*, Vol. 2, pp. 79-86.
- Reed, J. R. (1986). Seabird Vision: Spectral Sensitivity and Light-attraction Behavior. University of Wisconsin--Madison.
- Reed, J. R., Sincock, J. L., & Hailman, J. P. (1985). Light Attraction in Endangered Procellariiform Birds: Reduction by Shielding Upward Radiation. *The Auk*, 102: 377-383.
- Rodriguez, A., & Rodriguez, B. (2009). Attraction of Petrels to Artificial Lights in the Canary Islands: Effect of the Moon Phase and Age Class. *Ibis*, 151, 299-310.
- Simons, T. (1985). Biology and behavior of the endangered Hawai'ian Dark-rumped Petrel. Condor.
- Simons, T. R. (1985). Biology and Behavior of the Endangered Hawai'ian Dark-Rumped Petrel. *The Condor*, pp. 87: 229-245.
- Simons, T., & Hodges, C. (1998). *Dark-rumped Petrel. The Birds of North America.*
- Starr Environmental. (2014). *Roadside Faunal Survey Haleakalā National Park.* Star Environmental. Starr Environmental. (2014). Roadside Faunal Survey Haleakalā National Park. KC Environmental.
- Title 11, Chapter 200. (n.d.). *Hawai'i Administrative Rules (HAR) Environmental Impact Rules (Title 11, Chapter 200)*.
- Title 11, Chapter 200. (n.d.). *Hawai'i Administrative Rules (HAR) Environmental Impact Rules (Title 11, Chapter 200)*.
- Tomich, P. Q. (1986). *Mammals in Hawai'i (2nd edition). .* Honolulu: Bishop Museum Press.
- Troy, J. R., Holmes, N. D., & Green, M. C. (2011). Modeling artificial light viewed by fledgling seabirds.
- Troy, J. R., Holmes, N. D., & Green, M. C. (2011, Oct). Modeling Artificial Light Viewed by Fledgling Seabirds.
    - *Ecosphere*, pp. Vol 2(10), Article 109, 1-13.
- U.S. Fish and Wildlife Service. (1983). *Hawai'ian Dark Rumped Petrel and Newell's Manx Shearwater Recovery Plan.* Portland: U.S Fish and Wildlife Service.
- U.S. Air Force. (1988). *U.S. Air Force Relay Mirror Experiment Supplement to Biological Assessment.* Los Angeles: U.S Airforce Systems Command, Headquarters Space Division.
- UH IfA. (2010, June 8). University of Hawai'i Institute for Astronomy. *Haleakalā High Altitude Observatory Site, Haleakalā, Maui, Hawai'i, Management Plan*.

- URS Consultants. (1988). Biological Assessment for the Bolt Experiment on Maui. *Biological Assessment for the Bolt Experiment on Maui*.
- U.S. Air Force. (1993). *Biological Assessment for Maui Space Surveillance Site Expansion.* US Air Force, Air Force Maui Optical Station, Maui, Hawai‘i.
- Xamanek Researches, l. (2006). *An Archaeological Field Inspection of the Primary and Alternate Locations for the planned Advanced Technology Solar Telescope (ATST) Facility located within the 18.1-acre parcel Science City complex, Haleakalā Crater, Papa`anui Ahupua‘a, Makawao District.*

ATTACHMENT 1 – Agencies/Persons Contacted

Agency/Person Contacted	Comments Received
County of Maui, Department of Environmental Management	YES
Maui County Office of Economic Development	YES
County of Maui, Department of Fire and Public Safety	NO
County of Maui, Department of Water Supply	YES
County of Maui, DLNR, Island Burial Council	NO
County of Maui Planning Department	YES
U.S. Fish and Wildlife Services, Field Supervisor	YES
Haleakala National Park	YES
Natural Resource Conservation Service, U.S. Department of Agriculture	YES
State of Hawaii, Department of Land and Natural Resources State Historic Preservation Division	YES
District Environmental Health Program Chief, State of Hawaii, Department of Health	YES
State of Hawaii, Division of Fish and Wildlife, Maui Branch	YES
State of Hawaii, Department of Land and Natural Resources, Land Division, Maui District Office	YES
State of Hawaii, Department of Land and Natural Resources Land Division	YES
Office of Hawaiian Affairs	NO
Native Hawaiian Legal Corporation	YES
State of Hawaii, Department of Health, Environmental Planning Office	YES
State of Hawaii, Division of Forestry and Wildlife	YES
State of Hawaii, Office of Environmental Quality Control	YES
Maui Electric Company, Ltd.	NO
University of Hawaii, Institute for Astronomy	YES
Wailuku Public Library	NO
Makawao Public Library	NO
Lahaina Public Library	NO
Kahului Public Library	NO
Kihei Public Library	NO
Hana Public and School Library	NO
Department of Hawaiian Homelands	NO
County of Maui Cultural Resource Commission	NO
Department of Hawaiian Homelands Grants Review, Advisory Committee	NO
Hui Kako'o 'Aina Ho'opulapula and Na Po'e Kokua	NO

Central Maui Hawaiian Civic Club	NO
Hui Kakoʻo ʻAina Hoʻopulapula	NO
Maluʻohai Residents Association	NO
Na Kuʻauhauʻo Kahiwakaneikopolei	NO
The I Mua Group	NO
Aha Aliʼi O Kapuʼaiwa O Kamehameha V	NO
Aliʻi Sir and Grand Master Clifford Hashimoto	NO
Alu Like, Inc.	NO
Aʻo Aʻo O Na Loko Iʻa O Maui	NO
Fishpond Ohana	NO
Friends of Polipoli	NO
Historic Hawai'i Foundation	NO
Kahoʻolawe Island Reserve Commission	NO
Paukukalo Hawaiian Homestead Community Association	NO
Hawaiian Community Assets, Inc.	NO
Ku'auhau, Mamo Knight John Kahawaii	NO
Ku'auhau Nui, Ali'i Sir Russell Paio, KGCK	NO
Lokahi Pacific	NO
Maui Community College	NO
Ka Imi Na'auao 'O Hawai'i Nei Institute	NO
Roselle Bailey	NO
Kamehameha Schools	NO
Maui Native Hawaiian Chamber of Commerce	NO
Royal Order of Kamehameha I	NO
Na Kupuna O Maui	NO
Na Leo Pulama	NO
Lei Ishikawa	NO
Native Hawaiian Educational Council	NO
Sierra Club	NO
The Kipahulu Ohana	NO
Shelia Agnitsch	NO
Henry Sr. & Annie Kahula-Rahl	NO
Ed Lincoln	NO
Tweetie Lind	NO
Lyons Naone	NO
Valerie Park	NO
Terry Poaipuni	NO
Angela Tavares	NO
Gordean Bailey	NO

Robert Garcia	NO
Sam Ka‘ai	NO
George Kaho‘ohanohano	NO
Geraldine Kaiwi	NO
Les Kuloloio	NO
Francis Poouahi	NO
William Roback	NO
Keeaumoku Kape	NO
Wilmont Kahailii	NO
Kalai Costa	NO
Clare Apana	NO
Rose Marie Duey	NO
Ms. Shirley S. Swinney	NO

ATTACHMENT 2. Comment Received

ALAN M. ARAKAWA
Mayor

KYLE K. GINOZA, P.E.
Director

MICHAEL M. MIYAMOTO
Deputy Director

MICHAEL RATTE
Solid Waste Division

ERIC NAKAGAWA, P.E.
Wastewater Reclamation Division

COUNTY OF MAUI
DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT
2200 MAIN STREET, SUITE 100
WAILUKU, MAUI, HAWAII 96793

March 6, 2015

AFRL/RDMT
3550 Aberdeen AE
Kirtland AFB, NM 87114

SUBJECT: THE MODERNIZATION OF MAUI SPACE SURVEILLANCE SITE (MSSC) FACILITIES AND EQUIPMENT DRAFT ENVIRONMENTAL ASSESSMENT HALEAKALA, MAUI, HAWAII

We reviewed the subject application and have the following comments:

1. Solid Waste Division comments:

   a. None.

2. Wastewater Reclamation Division (WWRD) comments:

   a. None.

If you have any questions regarding this memorandum, please contact Michael Miyamoto at 270-8230.

Sincerely,

KYLE K. GINOZA, P.E.
Director of Environmental Management

ALAN M. ARAKAWA
Mayor

DAVID TAYLOR, P.E.
Director

PAUL J. MEYER
Deputy Director

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793-2155
www.mauiwater.org

March 3, 2015

Mr. Joseph M. Volza, Senior Environmental Research Analyst
Air Force Research Laboratory, Directed Energy Directorate
3550 Aberdeen Ave. SE
Kirkland AFB, NM 87117

Dear Mr. Volza:

RE: Draft EA for the Modernization of Maui Space Surveillance Site (MSSC) Facilities and Equipment, Haleakala, Maui, Hawaii and the Draft FONSI

Thank you for the opportunity to offer the following comment on the referenced project.

The project will not negatively impact the Department of Water Supply's (DWS) water systems.

Should you have any questions, please contact Arnold Y. Imaye, Staff Planner at Arnold.Imaye@co.maui.hi.us or at (808) 463-3110.

Sincerely,

Dave Taylor, P.E., Director
ayi
c: DWS Engineering Division
DWS Water Resources & Planning Division

"By Water All Things Find Life"

ALAN M. ARAKAWA
Mayor

TEENA M. RASMUSSEN
Economic Development Director

OFFICE OF ECONOMIC DEVELOPMENT
COUNTY OF MAUI
2200 MAIN STREET, SUITE 305, WAILUKU, MAUI, HAWAII 96793, USA
Telephone: (808) 270-7710 • Facsimile: (808) 270-7995 • Email: economic.development@mauicounty.gov

April 2, 2015

Air Force Research Laboratory
Joseph M. Volza
3550 Aberdeen Ave. SE
Kirtland AFB, NM 87117

Re: The Modernization of Maui Space Surveillance Site (MSSC) Facilities and Equipment, Haleakala, Maui, HI

Dear Mr. Volza,

We are in receipt of the draft environmental assessment for the Modernization of Maui Space Surveillance Site (MSSC facilities and equipment at Haleakala, Maui Hawaii.

We are pleased to report that after thoroughly reviewing the draft EA, our office has no objection to this project moving forward.

We believe the draft EA adequately studied the pertinent areas of Cultural Resources, Air Quality, Infrastructure, Traffic, and Road, Biological resources, Land Use/Noise, and Hazardous Material which have shown no significant impacts.

As Maui's County's Economic Development office, we are in complete support of this project, and welcome the benefit it will bring to Maui's economy.

Sincerely,

Teena M. Rasmussen
Director

CC: Herman Andaya, Chief of Staff

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

March 31, 2016

Air Force Research Laboratory
Directed Energy Directorate
Attention: Ms. Michelle L. Hedrick
3550 Aberdeen Avenue, S.E.
Kirtland AFB, NM 87114

via email: AFRL.RDO.Test.Safety@Kirtland.af.mil

Dear Ms. Hedrick:

SUBJECT: The Modernization of Maui Space Surveillance Site (MSSC) Facilities and Equipment

Thank you for the opportunity to review and comment on the subject matter. In addition to the comments previously sent you on March 11, 2016, enclosed are comments from the Engineering Division on the subject matter. Should you have any questions, please feel free to call Lydia Morikawa at 587-0410. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
LAND DIVISION
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DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

'16 MAR 03 AM 10:56 ENGINEERING

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

February 26, 2016

MEMORANDUM

TO: FROM:

DLNR Agencies:
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_ Engineering Division
___Div. of Forestry & Wildlife
_X_ Div. of State Parks
_X_ Commission on Water Resource Management
_X_ Office of Conservation & Coastal Lands
_X_ Land Division – Maui District
_X_ Historic Preservation

TO:

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: The Modernization of Maui Space Surveillance Site (MSSC) Facilities and Equipment
LOCATION: Haleakala, Island of Maui; TMK: (2) 2-2-007:008
APPLICANT: U.S. Department of the Air Force, Air Force Research Laboratory (AFMC)

Transmitted for your review and comment is information on the above-referenced project. We would appreciate your comments on this project. Please submit any comments by **March 10, 2016.**

The DEA can be found on-line at: http://health.hawaii.gov/oeqc/ (Click on the Current Environmental Notice under Quick Links on the right.)

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Lydia Morikawa at 587-0410. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(X) Comments are attached.

Signed: _____

Print Name: Carty S. Chang, Chief Engineer
Date: 3/29/16

cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

To: Land Division/ Russell Y. Tsuji

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a designated Flood Hazard.

The owner or the project property and/or their representative is responsibile to research the Flood Hazard Zone designation for the project. Flood Hazard Zone designations can be found using the Flood Insurance Rate Map (FIRM), which can be accessed through the Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT).

National Flood Insurance Program establishes the rules and regulations of the NFIP - Title 44 of the Code of Federal Regulations (44CFR). The NFIP Zone X is a designation where there is no perceived flood impact. Therefore, the NFIP does not regulate any development within a Zone X designation.

Be advised that 44CFR reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may take precedence over the NFIP standards as local designations prove to be more restrictive. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7253.
- Kauai: County of Kauai, Department of Public Works (808) 241-4846.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: 3/29/16

United States Department of the Interior

NATIONAL PARK SERVICE
Haleakalā National Park
P.O. Box 369
Makawao, Maui, Hawai`i 96768

A4415 (HALE)

March 24, 2015

Joseph M. Volza
Air Force Research Laboratory, Directed Energy Directorate
3550 Aberdeen Ave. SE
Kirtland AFB, NM 87117

Dear Mr. Volza,

Thank you for the opportunity to comment on the Draft Environmental Assessment (EA) and Draft Finding of No Significant Impact (FONSI) for the Modernization of Facilities and Equipment at Maui Space Surveillance Site, Haleakalā, Maui, Hawaii. We have reviewed the documents and have concerns regarding the Draft EA and FONSI submitted on February 20, 2015. We offer the following comments.

Threatened & Endangered Wildlife:
Much of the information, especially those on Threatened and Endangered species, is extremely outdated (over 30 years old). Therefore, assessments on impacts and minimization measures to wildlife, and the park in general, may not be accurate and should be reassessed.

The Federal Endangered Species Act (ESA) of 1973 established a process for identifying and listing threated and endangered species. Page 16 of the Draft EA states this Proposed Action is said to have no anticipated effect on rare, threatened, or endangered species. However, no U.S. Fish and Wildlife (USFWS) consultation letters or correspondence was included in the Draft EA. Consultation with USFWS is required per 50 CFR § 402.12-14.

Cultural Resources:
The National Park Service recommends consultation with Native Hawaiian communities and elders (kūpuna) per the National Historic Preservation Act of 1966 (NHPA), as this proposed project has a five to ten year lifetime in a culturally sensitive location. As described, this proposed project will cause a short-term increase in traffic and a long-term increase in visible laser beam activities with the FASOR Sodium Guide Star instrument.

Section 4.5 Cultural Resources of the document states consultation has been initiated with the State Historic Preservation Division, but there was no mention of their feedback, nor a person consulted in Chapter 6, nor an appendix documenting the communication. Due to the known spiritual and cultural significance of the entire summit area, it is advisable to consult despite the lack of proposed expansion of the current building footprint .

Page 43 states, "a Cultural Specialist will be retained at the earliest stages of the planning process. This specialist will monitor the construction process, and consult with and advise the on-site Project Manager with regard to cultural or spiritual issues to be addressed." However, it is unclear if the kūpuna groups have been given an opportunity to comment on the draft EA or FONSI or have been made aware of the potential modernization.

NPS Inspections and Roadway Use:
The document makes statements concerning the National Park Service (NPS), such as NPS conducting vehicle inspections. Furthermore, proposed construction includes an increase in large vehicle traffic, Class 5 or larger, which could damage NPS roads, historic bridges and additional historic road features.

Limits on allowed weight of heavy equipment and loads, bill of lading and/or manifests, as well as anticipated quantity of traffic and vehicle class type need to be stipulated in the FONSI.

Park Operations:
It appears that the information used was duplicated from the document that was prepared in the 1990's for the AEOS project and is outdated. Park procedures and resources have changed since that time. We respectfully recommend that current information be used in order to accurately assess impacts to park operations and any needed mitigation.

In order to finalize the FONSI for approval, updated information on these points, as well as agreement with NPS regarding standards for repairs to roadway or roadsides, should be incorporated before signature. NPS staff is available for conferencing as needed for timely completion of the FONSI. Please see the following table (Appendix A) for page-specific comments and questions.

We hope this information is useful in your planning process. Thank you for the opportunity to review the documents provided, and we look forward to continued communication with your office.

Sincerely,

Natalie B. Gates
Superintendent

Attachments: Appendix A

Appendix A: Additional comments and questions for the Air Force Research Laboratory by Draft EA page number.

Page	Comment or Question
Definitions	*Corrections suggested in red:* Ali'i royalty Chief or Chiefess Kahuna priest, clergy man Spiritual Advisor to a Chief/Chiefess Kanaka maoli true aboriginal person Native to Hawaii Ko'i adze, a bladed tool Tool used to carve out (Ko'i) Kumu Hula hula teacher Source of Hula learning Makahiki ancient annual festivals Time of year, according to moon phases to give honor to Lono Paliku an order of priesthood, steep cliff
12	Correct Hawaiian names and diacritical marks should be used.
22	Will transport of crane and other construction-related traffic cause changes in park traffic? NPS and USFWS will require this information in order to determine with any degree of certainty whether traffic will increase the potential for nēnē or 'ua'u roadkill. There is potential for 'ua'u to fly into the crane. Furthermore, 'ua'u burrows are nearby. DKIST biologists have the latest updates on location and burrow activities. Effects on these nests would need to be evaluated by a qualified biologist. The park will require a formal arrangement and schedule for conducting the inspection mentioned. Costs of inspection constitute an economic impact to the park. Also, is the Air Force Research Laboratory seeking an MOU/MOA with NPS? More detail is required. The effects of operating sodium laser on flying 'ua'u would need to be assessed and addressed. Effects of this "glow" on 'ua'u would need to be addressed as well.
23	Effects to 'ua'u need to be assessed.
27	What is anticipated noise to park visitors?
28	This information is from 2003. Current information should be used. What time do the vehicles leave? There is the potential for night-time roadkills of 'ua'u in the park. Information in this section is outdated and should be supplemented and reanalyzed with current information, particularly information relating to the Haleakalā population. Also, please make corrections to Hawaiian spelling, common name and scientific name: 'ua'u, Hawaiian petrel, *Pterodroma sandwichensis*. Scientific names should be italicized or underlined throughout the documents.

29	Please correct the Hawaiian spelling and scientific name: *Nēnē Branta sandwichensis.* Information from this section is outdated and should include current information e.g. Haleakalā is not a sanctuary. Invertebrate studies are continuing and current information should be included Nēnē may fly to the summit and use the area.
36	This is information is also outdated. Recommend contacting DKIST biologists for updated information.
37	An increase in traffic increases the potential for nēnē and 'ua'u to be hit by vehicles traveling on road.
38	Even with minimizing measures, "take" of 'ua'u may occur and is dependent on information from DKIST biologists. Any information on compliance with Section 7 of the Endangered Species Act (ESA) is currently not included in the Draft EA. If increased "take" on nēnē may result from the proposed project, consultation with USFWS is necessary for ESA compliance.
39	Haleakalā National Park does not have current information in the project area. Please contact DKIST biologists for accurate information for this project area. Consultation with USFWS is necessary to determine effects to both bats and 'ua'u for ESA compliance.
40	This finding is neither definitive nor substantiated. Consultation with USFWS is necessary. Updated information on 'ua'u flyways are also necessary. To our knowledge, Haleakalā National Park did not provide information mentioned. Please remove this language. Information on laser illumination effects on bats needs to be investigated further. Also, bat presence data in the area should be updated and accurate in order to impacts to bats. Consultation with USFWS is necessary.

Native Hawaiian
LEGAL CORPORATION

1164 Bishop Street, Suite 1205 • Honolulu, Hawai'i 96813 • www.nhlchi.org
Phone (808) 521-2302 • Fax (808) 537-4268

Celebrating 40 Years • Serving Hawai'i Since 1974

March 12, 2015

Joseph Volza
Air Force Research Laboratory
3550 Aberdeen SE
Kirtland AFB, NM 87117.

Jim Gardner
Det 15, Air Force Research Laboratory
550 Lipoa Parkway
Kihei, HI 96753

Re: Modernization of Maui Space
Surveillance Complex DEA & AFONSI

Gentlemen:

The State of Hawaii's Office Environmental Quality Control's Environmental Notice included information regarding the Air Force's draft environmental assessment and draft finding of no significant impact. Our office represents Kilakila `O Haleakalā, a non-profit organization dedicated to protecting the natural and cultural resources of Haleakalā. Kilakila `O Haleakalā wishes to be a consulted party. The document shows widespread disregard for the law and a myopic analysis of impacts. Kilakila `O Haleakalā requests that the Air Force withdraw this document and instead fully comply with the law.

First, the Air Force completely ignores the fact that this project must comply with state law. The Air Force leases land from the University of Hawai`i. It does not own this land. As a lessee, the Air Force must comply with state law and all requirements that bind the lessor. As such, before this project can proceed, it must (a) prepare an environmental impact statement pursuant to HRS chapter 343; (b) prepare a modern archaeological inventory survey pursuant to HRS chapter 6E; (c) prepare a conservation district use application pursuant to HRS chapter 183C; and (d) prepare documents necessary for a consistency determination as required by the Coastal Zone Management Act. The Air Force recognized this fact when in 1994 and 1995 it asked the University of Hawai`i to prepare an environmental assessment and a conservation district use application to build the advanced electro-optical system (AEOS) telescope.

Services made possible with major funding from the Office of Hawaiian Affairs

Please note that the notice in OEQC's Environmental Notice states that this document was prepared pursuant to federal law only. But buried on page 14 of the document is a reference to HRS chapter 343. The Air Force, however, lacks the authority to accept or approve a document prepared pursuant to HRS chapter 343.

Second, the Air Force needs to comply with and discuss the Haleakalā High Altitude Observatory Site Management Plan, which was approved by the board of land and natural resources in December 2010. This management plan is intended to "regulate land use in the conservation district." It is the "governing document used for existing and future development." The Air Force must assess the degree to which the Air Force's plans are consistent with the management plan. The DEA refers to the Long Range Development Plan (e.g. pages 19, 36 and 42) instead of the Haleakalā High Altitude Observatory Site Management Plan, which largely supplanted the LRDP.

Third, the Air Force must assess the cumulative impacts of this project – including past actions. In 1994, an environmental assessment was prepared on behalf of the Air Force's AEOS telescope. At that time, the environmental disclosure document reached the following ridiculous conclusion:

> The proposed facility, approximately 120 feet above grade, would be the largest structure on the upper portions of Haleakala. However, it would be generally consistent with the existing structures, and it would not greatly alter the general appearance of the complex as seen from a distance. The proposed facilities would be clearly visible from the Pakaoao Visitor Center and Red Hill Overlook, where the height and mass of the proposed telescope dome enclosure would make it a strong visual element under certain conditions. The visual impact of the telescope dome would be mitigated by its reflective surface. This type of surface tends to take on the color of the sky, and does not stand out strongly. In addition, its proximity to the existing observatory structures that are readily recognizable as telescope housings would indicate the scientific purpose of the entire complex.

Despite these assurances, anyone with vision can see that the Air Force's large AEOS facility (a) is not consistent with the existing structures; (b) greatly altered the appearance of the complex; (c) was not mitigated by its reflective surface; and (d) stands out strongly. Given the inaccurate information provided to the public in 1994, the DEA should have discussed and acknowledged the significant adverse impact of the AEOs facility.

Fourth, the Air Force must disclose how much larger the domes will be. In 1994, the Air Force claimed that "at some later date, the 8-meter telescope and dome enclosure will be installed to replace the 3.67-meter telescope." Is that what is being proposed now? How much taller will the dome enclosure be? On page 46 of the DEA, the Air Force describes the project as "[m]inor increases in the dome dimensions? How much bigger?

Fifth, the Air Force fails to even mention the final environmental impact statement for the advanced technology solar telescope project, let alone refer to any of the relevant information in that document. That document is replete with information that reveals that the cumulative impact of this project is significant. Furthermore, the cumulative impact of this project and the ATST is certainly significant.

Sixth, the Air Force must acknowledge that this project significantly detracts from the sanctity of the summit. Many native Hawaiians visit the summit of Haleakalā to experience what their ancestors once did. The journey is an escape from modern Western civilization; it is a spiritual exercise to a natural wonder that should be devoid of industrial appearing structures. The Air Force's existing structures assault the senses. And the Air Force only proposes to make matters worse with this project. The continuing build out of this area is not conducive to allowing Native Hawaiians to enjoy the same experience that their kūpuna once had.

Seventh, where is the 106 process?

Eighth, an environmental impact statement, rather than an environmental assessment should fully consider the following issues (which the DEA ignores):

- the cultural significance and sensitivity of the area;
- the historic significance of the area (including its designation on the National Register of Historic Places);
- the beauty of the area;
- the natural quiet of the area;
- the terms of the lease that the Air Force operates under (and its expiration date);
- the impact of shooting a laser for 4-6 hours for 80 nights a year on cultural practitioners and visitors to Haleakalā National Park;
- the U.S. Fish & Wildlife Service's analysis of the impact of the lasers on `ua`u and petrel;
- where the lasers be visible from on Maui;
- the project's impact on natural beauty, quiet, wildlife, cultural resources and cultural practices;
- the character of the noise from the project (without saying that natural wind noise is of the same character as the noise from cranes, pneumatic tools and trucks);
- the impact of this noise on cultural practitioners;
- the visual impact of the laser operation as well as its impact on the feeling of the area;
- the height of the structures before and after this project;
- the duration of construction and the height of the construction cranes; and
- the on-going advanced technology solar telescope project and the cumulative impact; and
- prior hazardous waste spills at the Air Force facility;

Finally, the DEA's conclusion is patently false. This project significantly hurts cultural practices, cultural resources, natural beauty, and the wilderness qualities, natural quiet and spiritual value of the summit of Haleakalā.

Aloha,

David Kimo Frankel
Staff Attorney

copy John Nakagawa, CZM/OP
Sam Lemmo, OCCL/DLNR
Jessica Wooley, OEQC
William Wynhoff, AG

DAVID Y. IGE

GOVERNOR OF HAWAII

JESSICA E. WOOLEY

DIRECTOR

STATE OF HAWAI'I
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
Department of Health
235 South Beretania Street, Suite 702
Honolulu, Hawai'i 96813
Telephone (808) 586-4185
Facsimile (808) 586-4186
Email: oeqchawaii@doh.hawaii.gov

File No.

OEQC 15-038
MSSC

March 10, 2015

Mr. Joseph M. Volza
Senior Environmental Research Analyst
AFRL/RDMT
3550 Aberdeen AE
Kirtland AFB, NM 87114

Dear Mr. Volza,

SUBJECT: Modernization of Maui Space Surveillance Site (MSSC) Facilities and Equipment, Haleakala, Maui

In response to your February 20, 2015, transmittal to our office inviting comments on the subject project, the Office of Environmental Quality Control (OEQC) offers the following:

First, please note that the Draft Environmental Assessment (EA) and the Draft Finding of No Significant Impact prepared for the subject project were prepared pursuant to the National Environmental Policy Act (NEPA) and related implementing federal regulations. As you may know, OEQC was established pursuant to the State of Hawaii's Environmental Policy Act (HEPA); under this provision, our main duty is to implement Hawaii's Environmental Impact Statement Law (Chapter 343, Hawaii Revised Statutes [HRS]), and related Environmental Impact Statement Rules (Chapter 11-200, Hawaii Administrative Rules [HAR]). As a service, OEQC published a notice of availability of this NEPA project in the February 23, 2015, issue of The Environmental Notice.

Your Draft EA states the project will be located on land ceded at the University of Hawaii, and notes that the siting on state land within a historic district necessitates review in accordance with Chapter 343, HRS. Although not indicated, we presume the project is also sited within the State's Conservation District, which also triggers review in accordance with Chapter 343, HRS. While Section 1.9 of the document discusses a number of Federal laws and associated consultations that are relevant to the project, no such State of Hawaii laws are enumerated. No other mention is made in the document of compliance with Chapter 343, HRS.

Accordingly, the document does not address HEPA requirements, which must be met before the project can be implemented. If there are any questions on the process, please consult our

website at http://health.hawaii.gov/oeqc (see in particular the link to the Environmental Assessment Preparation Toolkit on the right panel) or contact our office at (808) 586-4185.

Thank you for the opportunity to review and comment on the Draft EA.

Sincerely,

Jessica Wooley

Jessica E. Wooley, Director
Office of Environmental Quality Control

c: Jim Gardner

DAVID Y. IGE
GOVERNOR OF HAWAII

CARTY S. CHANG
INTERIM CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

March 24, 2015

Department of the Air Force
AFRL/RDMT
Attention: Joseph M. Volza
3550 Aberdeen AE
Kirtland AFB, NM 87114

via email: AFRL.RDO.Test.Safety@Kirtland.af.mil

Dear Mr. Volza:

SUBJECT: The Modernization of Maui Space Surveillance Site (MSSC) Facilities and Equipment

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR) Land Division distributed or made available a copy of your report pertaining to the subject matter to DLNR Divisions for their review and comments.

At this time, enclosed are comments from the Engineering Division on the subject matter. Should you have any questions, please feel free to call Lydia Morikawa at 587-0410. Thank you.

Sincerely,

Kevin E. Moore
Acting Land Administrator

Enclosure(s)
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

CARTY S. CHANG
INTERIM CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

'15 FEB 27 AM 10:38 ENGINEERING
RECEIVED
LAND DIVISION

2015 MAR 23 PM 2:59
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

February 27, 2015

MEMORANDUM

TO: FR:

DLNR Agencies:
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_ Engineering Division
_X_ Div. of Forestry & Wildlife
___Div. of State Parks
_X_ Commission on Water Resource Management
_X_ Office of Conservation & Coastal Lands
_X_ Land Division – Maui District
_X_ Historic Preservation

TO:
FROM: Kevin E. Moore, Acting Land Administrator
SUBJECT: The Modernization of Maui Space Surveillance Site (MSSC) Facilities and Equipment
LOCATION: Kula, Makawao; Island of Maui; TMK: (2) 2-2-007:008
APPLICANT: Department of the Air Force, Air Force Research Laboratory

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by March 23, 2015.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Lydia Morikawa at 587-0410. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: Carty S. Chang
Print Name: Carty S. Chang, Chief Engineer
Date: 3/23/15

cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/ Kevin E. Moore
Ref.: Modernization of Maui Space Surveillance Site Facilities and Equipment, Kula Maui.005

COMMENTS

( ) We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zone ___.

(X) Please take note that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Zone X. The National Flood Insurance Program (NFIP) does not regulate developments within Zone X.

( ) Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is ___.

( ) Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is ___.

( ) Please note that the project must comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Title 44 of the Code of Federal Regulations (44CFR), whenever development within a Special Flood Hazard Area is undertaken. If there are any questions, please contact the State NFIP Coordinator, Ms. Carol Tyau-Beam, of the Department of Land and Natural Resources, Engineering Division at (808) 587-0267.

Please be advised that 44CFR indicates the minimum standards set forth by the NFIP. Your Community's local flood ordinance may prove to be more restrictive and thus take precedence over the minimum NFIP standards. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

( ) Mr. Mario Siu Li at (808) 768-8098 of the City and County of Honolulu, Department of Planning and Permitting.

( ) Mr. Frank DeMarco at (808) 961-8042 of the County of Hawaii, Department of Public Works.

( ) Mr. Carolyn Cortez at (808) 270-7253 of the County of Maui, Department of Planning.

( ) Mr. Stanford Iwamoto at (808) 241-4896 of the County of Kauai, Department of Public Works.

( ) The applicant should include project water demands and infrastructure required to meet water demands. Please note that the implementation of any State-sponsored projects requiring water service from the Honolulu Board of Water Supply system must first obtain water allocation credits from the Engineering Division before it can receive a building permit and/or water meter.

( ) The applicant should provide the water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update.

( ) Additional Comments: _____

_____

( ) Other: _____

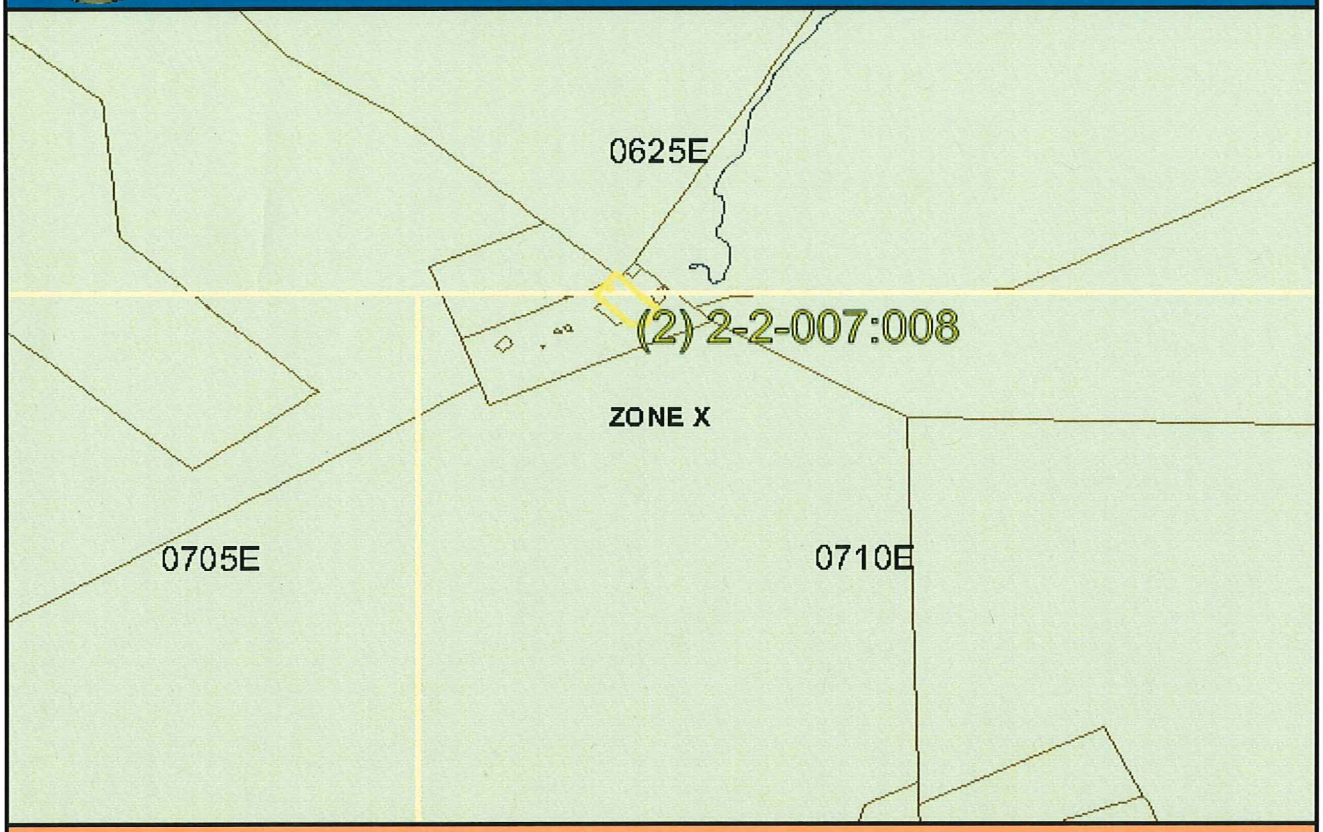
Should you have any questions, please call Mr. Dennis Imada of the Planning Branch at 587-0257.

Signed: Chris Takaichi
for CARTY S. CHANG, CHIEF ENGINEER

Date: 3/23/15

State of Hawaii

FLOOD HAZARD ASSESSMENT REPORT



NATIONAL FLOOD INSURANCE PROGRAM

FLOOD ZONE DEFINITIONS

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD – The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zone A, AE, AH, AO, V, and VE. The Base Flood Elevation (BFE) is the water-surface elevation of the 1% annual chance flood. Mandatory flood insurance purchase applies in these zones:

- **Zone A:** No BFE determined.
- **Zone AE:** BFE determined.
- **Zone AH:** Flood depths of 1 to 3 feet (usually areas of ponding); BFE determined.
- **Zone AO:** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined.
- **Zone V:** Coastal flood zone with velocity hazard (wave action); no BFE determined.
- **Zone VE:** Coastal flood zone with velocity hazard (wave action); BFE determined.
- **Zone AEF:** Floodway areas in Zone AE. The floodway is the channel of stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without increasing the BFE.

NON-SPECIAL FLOOD HAZARD AREA – An area in a low-to-moderate risk flood zone. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

- **Zone XS (X shaded):** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
- **Zone X:** Areas determined to be outside the 0.2% annual chance floodplain.

OTHER FLOOD AREAS

- **Zone D:** Unstudied areas where flood hazards are undetermined, but flooding is possible. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

PROPERTY INFORMATION

COUNTY:	MAUI
TMK NO:	(2) 2-2-007-008
PARCEL ADDRESS:	PAPAANUI KULA, HI 96790
FIRM INDEX DATE:	SEPTEMBER 19, 2012
LETTER OF MAP CHANGE(S):	NONE
FEMA FIRM PANEL(S):	1500030625E-SEPTEMBER 25, 2009 1500030710E-SEPTEMBER 25, 2009

PARCEL DATA FROM:	JULY 2013
IMAGERY DATA FROM:	MAY 2005

IMPORTANT PHONE NUMBERS

County NFIP Coordinator	
County of Maui	
Carolyn Cortez	(808) 270-7253
State NFIP Coordinator	
Carol Tyau-Beam, P.E., CFM	(808) 587-0267

OFFICE OF PLANNING
STATE OF HAWAII

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

DAVID Y. IGE
GOVERNOR

LEO R. ASUNCION
ACTING DIRECTOR
OFFICE OF PLANNING

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http://planning.hawaii.gov/

Ref. No. P-14680

March 17, 2015

Ms. Michelle L. Hedrick
Lead Test & Environmental Engineer
Air Force Research Laboratory, Directed Energy Directorate
3550 Aberdeen SE
Kirtland AFB, New Mexico 87117

Ms. Michelle L. Hedrick:

Subject: Coastal Zone Management Act (CZMA) Federal Consistency Review Required for Modernization of Maui Space Surveillance Complex (MSSC), Mount Haleakala, Maui, Hawaii

This responds to the National Environmental Policy Act notice ("The Environmental Notice," February 23, 2015, Office of Environmental Quality Control) for the Draft Environmental Assessment (EA) for the proposed modernization of facilities and equipment at the Maui Space Surveillance Complex located on Mount Haleakala, Maui, Hawaii. We are informing you that a CZMA federal consistency review is required for the proposed federal agency activity. Pursuant to the Coastal Zone Management Act of 1972, as amended, Section 307(c)(1), and as required by Title 15, Code of Federal Regulations (CFR), Part 930, Subpart C: "Federal agencies shall provide State agencies with consistency determinations for all Federal agency activities affecting any coastal use or resource." (15 CFR 930.34(a)(1); and, "Federal agencies shall consider all development projects within the coastal zone to be activities affecting any coastal use or resource." (15 CFR 930.33(b) The federally approved Hawaii Coastal Zone Management area includes all lands of the State. Therefore, a coastal consistency determination for the proposed federal agency activity must be submitted to and reviewed by the Hawaii CZM Program.

There is precedent for CZMA federal consistency review for federal agency activities occurring at the MSSC. Previously, on July 22, 2005, a federal consistency determination was submitted by the Air Force Research Laboratory for the Advanced Electro-Optical System (AEOS) completion at the MSSC. On August 3, 2005, the Hawaii CZM Program issued a conditional consistency concurrence for the proposed activity (enclosed).

Furthermore, the Draft EA, section 1.9 Regulatory Overview and Required Permits/Approvals, does not identify the CZMA as a federal law that is relevant to the proposed activity. This should be corrected.

If you have any questions, please call John Nakagawa with the Hawaii CZM Program at (808) 587-2878.

Sincerely,

Leo R. Asuncion
Acting Director

Enclosure

c: William Spence
Planning Department, County of Maui

Mr. Jim Gardner
Det 15, Air Force Research Laboratory

✓Mr. Joseph Volza
Air Force Research Laboratory

Ref. No. P-11049

August 3, 2005

Lieutenant Colonel Brent Richert
U.S. Air Force Research Laboratory
535 Lipoa Parkway, Suite 200
Kihei, Hawaii 96753

Dear Lt. Col. Richert:

Subject: Hawaii Coastal Zone Management (CZM) Program Federal Consistency Review for the Advanced Elcctro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC), Haleakala, Maui (FC05-038)

The proposal to construct a mirror coating shop (MCS) adjacent to the existing AEOS telescope building at the MSSC within the University of Hawaii Institute for Astronomy (UH IfA) Haleakala Observatories, has been reviewed for consistency with the Hawaii CZM Program. We concur with your CZM consistency determination that the proposed activity is consistent to the maximum extent practicable with the enforceable policies of the Hawaii CZM Program based on the following conditions:

1. Protection of historic, archaeological, and cultural resources. In accordance with the CZM federal consistency assessment (p. 4) and the Draft Environmental Assessment (June 2005, p. 4-3), to ensure protection of nearby archaeological resources and respect the summit's cultural resources, the following provisions from the Long Range Development Plan for the UH IfA Complex shall be incorporated into the construction and operation of the AEOS MCS.

    a. A cultural specialist will be retained at the earliest stages of the planning process. This specialist will monitor the construction process and consult with and advise the on-site Project Manager with regard to cultural or spiritual issues to be addressed. The cultural specialist would be a kanaka maoli (full-blooded Hawaiian person), preferably a kupuna (elder) and a kahuna (priest, clergyman) as well, and one who has personal knowledge of the spiritual and cultural significance of Haleakala.

CZM consistency concurrence is not an endorsement of the project nor does it convey approval with any other regulations administered by any State or County agency. Thank you for your cooperation in complying with the Hawaii CZM Program. If you have any questions, please call John Nakagawa of our CZM Program at 587-2878.

Sincerely,

Laura H. Thielen
Director

c: Ms. Arlette St. Romain Meader, Belt Collins Hawaii Ltd.
Mr. Michael Maberry, University of Hawaii Institute for Astronomy
U.S. Fish and Wildlife Service, Pacific Islands Ecoregion
Department of Land and Natural Resources,
Historic Preservation Division
Department of Planning, County of Maui

JDN/do
Disk #7

DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

LORRIN W. PANG, M.D., M.P.H.,
DISTRICT HEALTH OFFICER

STATE OF HAWAII
DEPARTMENT OF HEALTH
MAUI DISTRICT HEALTH OFFICE
54 HIGH STREET
WAILUKU, HAWAII 96793-3378

March 5, 2015

Mr. Joseph M. Volza
Senior Environmental Research Analyst
AFRL/RDMT
3550 Aberdeen AE
Kirtland AFB, NM 87114

Dear Mr. Volza:

Subject: **Modernization of Maui Space Surveillance Site (MSSC) Facilities and Equipment, Haleakala, Maui, HI**

Thank you for the opportunity to review this project. We have the following comments to offer:

The noise created during the construction phase of the project may exceed the maximum allowable levels as set forth in Hawaii Administrative Rules (HAR), Chapter 11-46, "Community Noise Control." A noise permit may be required and should be obtained before the commencement of work. The Indoor & Radiological Health Branch should be contacted at 808 586-4700.

It is strongly recommended that the Standard Comments found at the Department's website: http://health.hawaii.gov/epo/home/landuse-planning-review-program/ be reviewed and any comments specifically applicable to this project should be adhered to.

Should you have any questions, please call me at 808 984-8230 or E-mail me at patricia.kitkowski@doh.hawaii.gov.

Sincerely,

Patti Kitkowski

Patti Kitkowski
District Environmental Health Program Chief

c EPO

DAVID Y. IGE
GOVERNOR OF HAWAII

CARTY S. CHANG
INTERIM CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DANIEL S. QUINN
INTERIM FIRST DEPUTY

W. ROY HARDY
ACTING DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

ref:OCCL:MC

Corr MA-15-136

MAR 19 2015

Joseph M. Volza
AFRL/RDMT
3550 Aberdeen AE
Kirtland AFB, NM 87114 .

SUBJECT: MODERNIZATION OF MAUI SPACE SURVEILLANCE COMPLEX FACILITIES AND EQUIPMENT
Haleakalā High Altitude Observatories Site (HO)
Pu`u Kolekole, Makawao District, Maui
TMK (2) 2-2-007:008

Dear Mr. Volza,

The Department of Land and Natural Resources (DLNR) Office of Conservation and Coastal Lands has reviewed the draft Environmental Assessment for the proposed modernization of the Maui Space Surveillance Complex (MSSC) at the Haleakalā High Altitude Observatories Site. This area is in the General Subzone of the State Land Use Conservation District.

The Haleakalā High Altitude Observatories Site (HO), popularly known as "Science City," lies in the Pu`u Kolekole volcanic cone near the summit of Haleakalā. The 18-acre parcel is owned by the State of Hawai`i, and set aside by Executive Order 1987 to the University of Hawai`i. The MSCC is on a 4.4-acre area that is leased by the Air Force Research Laboratory (AFRL) Directed Energy Directorate, Detachment 15.

MSSC was constructed in 1965, and consisted of two large telescopes (the 1.2-meter and 1.6-meter systems, both 47'4" Ø), two smaller domes (the 15 ½' Ø Laser Beam Director and the 4' Ø project dome), and a rail-mounted box dome that retracts for the beam & director tracker (BDT).

In 2011 MSCC received Conservation District Use Permit (CDUP) MA-3603 for the installation of three new 12-foot diameter (Ø) telescopes atop the existing main building of the complex, and the removal of one of the larger existing domes. The new domes were designed to house new commercial off-the-shelf (COTS) telescopes.

The proposed work plan includes conducting repairs and maintenance on the existing buildings, replacing the existing domes, possibly replacing lead paint on the complex's exterior, improving connections to utilities, and installing new sensors and equipment, among them a new Frequency Addition Source of Optical Radiation (FASOR) sodium laser.

According to the information provided, the draft Environmental Assessment was developed pursuant to §102(2)(c) of the National Environmental Policy Act (NEPA) of 1969 and the implementing regulations of the Council on Environmental Quality (CEQ) (40 Code of Federal Regulation, Parts 1500-1508).

OCCL notes that this project should also show compliance with Hawai`i Revised Statutes (HRS) Chapter 343, also known as the Hawai`i Environmental Policy Act (HEPA). We also request that the draft EA discusses any permitting requirements for land uses in the Conservation District pursuant to Hawai`i Administrative Rules (HAR) Chapter 13-5. More information on land uses in the Conservation District, as well as copies of HAR 13-5, can be found on our website at dlnr.hawaii.gov/occl.

Please feel free to call Michael Cain at OCCL at 808-587-0048 should you have any questions.

Sincerely,

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

copy: Chair; DLNR Land Division

Institute for Astronomy
Office of the Director

UNIVERSITY of HAWAI'I®
MĀNOA

March 3, 2015

Mr. Joseph M. Volza,
AFRL/RDMT
3550 Aberdeen AE
Kirtland AFB, NM 87114

SUBJECT: Modernization of Maui Space Surveillance Complex (MSSC) Facilities and Equipment, Haleakalā, Maui, HI

Dear Mr. Volza,

Thank you for the opportunity to review and comment on the Draft Environmental Assessment (DEA) for AFRL's proposed Modernization of the Maui Space Surveillance Complex Facilities and Equipment located at the University of Hawaii's, Haleakalā High Altitude Observatory Site, Maui, Hawaii.

We have been in consultation with AFRL/DE Lead Test and Environmental Engineer, Ms. Michelle Hendrick, and understand that AFRL intends to release a Finding of No Significant Impact (FONSI) for the proposed modernization project.

We do not have any comments at this time, but would like to continue to be consulted.

Sincerely,

Günther Hasinger
Director

2680 Woodlawn Drive
Honolulu, Hawai'i 96822

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD, STE 555
KAPOLEI, HAWAII 96707

January 28, 2016

IN REPLY REFER TO:
LOG: 2015.04377
DOC: 1601JLP08
"no adverse effect"

Joseph M. Volza
AFRL/RDMT
Senior Environmental Research Analyst
Department of the Air Force
Air Force Research Laboratory, Directed Energy Directorate
3550 Aberdeen Ave. SE
Kirtland AFB, NM 87117

RE: Section: Section 106 Cultural Resources Management
Agency: Department of the Air Force (Air Force)
Project Name: Air Force Research Laboratory Proposed Modernization of Maui Space Surveillance Site (MSSC) Equipment
Location: Haleakala, Maui, Hawaii
TMK: (2) 2-2-007:008

Dear Mr. Volza:

On December 31, 2015, the State Historic Preservation Division (SHPD) received a submittal from the Department of the Air Force (Air Force) for the proposed modernization of Maui Space Surveillance Site (MSSC) equipment at Haleakala, Maui, Hawaii (TMK (2) 2-2-007:008). The proposed modernization plan includes: replacement of sensor and instrumentation; operation of a sodium laser known as FASOR propagated from the existing AEOS 3.6m telescope; installation and operation of an improved adaptive optics system which would be used throughout the year for observation of stars and satellites; and, installation of other supporting research equipment. Equipment includes an improved security system, installation of baffles on the 3.6 meter telescope, and an upgrade of existing weather monitor system. Security equipment includes replacement of alarms, locks, and cameras.

The area of potential effect (APE) for the proposed project includes the 4.4 acres leased by the United States Air Force and owned by the University of Hawaii. The APE includes visual perception of the FASOR at a maximum distance of 1200m. All activities performed for the proposed undertaking will occur within existing facilities and no soil will be disturbed.

Per Section 106 of the National Historic Preservation Act of 1966, as amended, SHPD has reviewed the undertaking and the State Historic Preservation Officer (SHPO) **concurs** with the determination of the Air Force that the project will have **no adverse effect** on the National Register Eligible Maui Space Surveillance Site or adjacent archaeological sites within the APE.

The Air Force is the office of record for this undertaking. Please maintain a copy of this letter with your environmental review record for this undertaking. If you have any questions about this undertaking or if there is a change to the scope of work, please contact Jessica Puff, Architectural Historian, at (808) 692-8023 or by email at jessica.l.puff@hawaii.gov.

Mahalo,

Dr. Alan Downer
Deputy State Historic Preservation Officer

ALAN M. ARAKAWA
Mayor

DAVID TAYLOR, P.E.
Director

PAUL J. MEYER
Deputy Director

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793-2155
www.mauiwater.org

March 10, 2016

Ms. Michelle L. Hedrick, Lead Test & Environmental Engineer
Air Force Research Laboratory, Directed Energy Directorate
3550 Aberdeen Ave., SE
Kirtland AFB, NM 87117

Re: The Modernization of Maui Space Surveillance Site (MSSC) Equipment, Haleakala, Maui
TMK: (2)2-2-007:008

Dear Ms. Hedrick:

Thank you for the opportunity to comment on this Draft Environmental Assessment (DEA). However, the project is not served by the Department of Water Supply, and we have no jurisdiction over projects served by private water systems.

Should you have any questions, please contact Staff Planner Marti Buckner at 463-3104 or marti.buckner@co.maui.hi.us.

Sincerely,

David Taylor, P.E. Director
mlb

cc: DWS engineering division

"By Water All Things Find Life"

DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

LORRIN W. PANG, M.D., M.P.H..
DISTRICT HEALTH OFFICER

STATE OF HAWAII
DEPARTMENT OF HEALTH
MAUI DISTRICT HEALTH OFFICE
54 HIGH STREET
WAILUKU, HAWAII 96793-3378

March 10, 2016

Mr. Joseph Volza
AFRL/RDMT
3550 Aberdeen SE
Kirtland AFB, NM 87114

Dear Mr. Volza:

Subject: The Modernization of Maui Space Surveillance Site (MSSC) Equipment
Haleakala, Maui, Hawaii

Thank you for the opportunity to review this project. We have no comments to offer.
It is strongly recommended that the Standard Comments found at the Department's website: http://health.hawaii.gov/epo/home/landuse-planning-review-program/ be reviewed and any comments specifically applicable to this project should be adhered to.

Should you have any questions, please contact me at 808 984-8230.

Sincerely,

Patti Kitkowski

Patti Kitkowski
District Environmental Health Program Chief

c EPO

Native Hawaiian
LEGAL CORPORATION

1164 Bishop Street, Suite 1205 • Honolulu, Hawai'i 96813 • www.nhlchi.org
Phone (808) 521-2302 • Fax (808) 537-4268

March 8, 2016

Joseph Volza
Michelle Hedrick
Air Force Research Laboratory
3550 Aberdeen SE
Kirtland AFB, NM 87117.

Jim Gardner
Det 15, Air Force Research Laboratory
550 Lipoa Parkway
Kihei, HI 96753

Re: Draft EA for the Modernization of Maui Space Surveillance Complex DEA & AFONSI

Air Force officials:

The document you sent to us on February 17, 2016 is much better than the one prepared a year ago. It makes clear that the Air Force's revised proposal does not involve an expansion of the facilities at the summit of Haleakalā in any way.

Nevertheless, Kilakila `O Haleakalā, a non-profit organization, objects. Kilakila `O Haleakalā seeks to protect the natural and cultural resources of Haleakalā. To that end, Kilakila `O Haleakalā would like to see the Maui Space Surveillance Complex removed from the summit of Haleakalā. It is an eyesore. Its construction was authorized pursuant to a misleading and inaccurate 1994 environmental assessment. The EA falsely asserted that the facility "would not greatly alter the general appearance of the complex as seen from a distance. . . . The visual impact of the telescope dome would be mitigated by its reflective surface. This type of surface tends to take on the color of the sky, and does not stand out strongly." Despite these assurances, anyone with vision can see that the Air Force's large AEOS facility (a) is not consistent with the existing structures; (b) greatly altered the appearance of the complex; (c) was not mitigated by its reflective surface; and (d) stands out strongly.

Services made possible with major funding from the Office of Hawaiian Affairs

While the current proposal does not appear to exacerbate the visual impact of the project, it does explicitly extend the life of the facility. The no action alternative would, according to page 23 of the draft EA, more quickly lead to the facility becoming "obsolete."

The current lease expires in 2031. At that time, the lease should **not** be renewed and all the structures that form a part of the Maui Space Surveillance Site should be torn down. To the extent that this project may lead the Air Force to think that it has the right to (or even an interest in) a new (or extended) lease, Kilakila `O Haleakalā opposes it.

The Air Force should be making plans to take down its culturally insensitive and ugly facilities – instead of attempting to prolong their useful lifespans. The Air Force's proposed commitment to a longer life span for this facility – apparently beyond the term of the lease – suggests that the project's impact may well be quite significant.

Finally, Kilakila `O Haleakalā re-incorporates the comments it made last year to the extent that they are still applicable to the Air Force's revised plans.

Aloha,

David Kimo Frankel
Staff Attorney

copy John Nakagawa, CZM/OP
Sam Lemmo, OCCL/DLNR

From:	Puff, Jessica L
To:	VOLZA, JOSEPH M DR-03 USAF AFMC AFRL/RDMT
Cc:	Annalise Kehler
Subject:	Air Force Research Laboratory proposed modernization of Maui Space Surveillance Site (MSSC) Equipment project
Date:	Wednesday, March 23, 2016 3:05:10 PM

Aloha Joseph,

I've received some information from the County of Maui that suggests there may be part of a Native Hawaiian Traditional Cultural Property within the area of potential effect for your proposed project. And, that the use of the laser could potentially adversely affect the TCP, particularly on nights where traditional cultural practices may be taking place on an adjacent peak. Could you help to clarify what consultation you've done with the public, Native Hawaiian Organizations, and other interested consulting parties to help us to better assess a potential previously unidentified affect from your undertaking? I've copied Annalise Kehler from Maui County to keep her informed of any additional information you can provide.

Best,

Jess

Jessica L. Puff

Architectural Historian

Hawaii State Historic Preservation Division

#: (808) 692 8023

@: Jessica.l.puff@hawaii.gov <mailto:Jessica.l.puff@hawaii.gov>

ATTACHMENT 3. Comment Responses

Revised EA Comments and Responses; Public Comment Period Ending March 2016				
#	Date Submitted	Commenter	Comment	Response
1	3/8/2016	Native Hawaiian Legal Corp.	1. Kilakila ‘O Haleakala would like to see the MSSC removed from the summit of Haleakala. It is an eyesore.	Your comment is acknowledged and will appear in the Final EA.
2	3/8/2016	Native Hawaiian Legal Corp.	The visual impact of the AEOS telescope dome would be mitigated by its reflective surface. “This type of surface tends to take on the color of the sky, and does not stand out strongly.” (1994 AEOS EA) Despite these assurances, anyone with vision can see that the Air Force’s large AEOS facility (a) is not consistent with the existing structures; (b)greatly altered the appearance of the complex; (c) was not mitigated by its reflective surface; and (d) stands out strongly.	Your comment is acknowledged and will appear in the Final EA.
3	3/8/2016	Native Hawaiian Legal Corp.	2. While the current proposal does not appear to exacerbate the visual impact of the project, it does explicitly extend the life of the facility…The current lease expires in 2031. At that time, the lease should not be renewed and all the structures that form a part of the Maui Space Surveillance Site should be torn down. …The Air Force's proposed commitment to a longer life span for this facility – apparently beyond the term of the lease –suggests that the project's impact may well be significant. To the extent that this project may lead the Air Force to think that it has the right to (or even an interest in) a new (or extended) lease, Kilakila ‘O Haleakala opposes it.	Your comment is acknowledged and will appear in the Final EA.
4	3/8/2016	Native Hawaiian Legal Corp.	The Air Force should be making plans to take down its culturally insensitive and ugly facilities instead of attempting to prolong their useful	Your comment is acknowledged and will appear in the Final EA.

			lifespans. The Air Force's proposed commitment to a longer life span for this facility – apparently beyond the term of the lease – suggests that the project's impact may well be quite significant.	
5	3/10/2016	Department of Water Supply, County of Maui	Thank you for the opportunity to comment on this Draft EA. However the project is not served by the Department of Water Supply and we have no jurisdiction over projects served by private water systems.	Thank you for taking the time to review and comment on this Draft EA.
6	3/10/2016	State of Hawaii, DOH Maui District Health Office	Thank you for the opportunity to review this project. We have no comments to offer. It is strongly recommended that the Standard Comments found at the Department's website be reviewed and any comments specifically applicable to this project should be adhered to.	Website comments have been reviewed and the EA has been updated accordingly. Thank you for your response.
7	3/23/2016	Comment received by Hawaii State Historic Preservation Division from Ms. Kehler.	I've received some information from the County of Maui that suggests there may be part of a Native Hawaiian Traditional Cultural Property within the area of potential effect for your proposed project. And, that the use of the laser could potentially adversely affect the TCP, particularly on nights where traditional cultural practices may be taking place on an adjacent peak. Could you help to clarify what consultation you've done with the public, Native Hawaiian Organizations, and other interested consulting parties to help us to better assess a potential previously unidentified affect from your undertaking? I've copied Annalise Kehler from Maui County to keep her informed of any additional information you can provide.	In response to the question regarding our interaction with agencies and the public, please find below a summary of the effort we have made to contact the community for input on our proposed action. 1. The AF initiated discussions with the Maui SHPO office, USFWS and the Haleakala NPS in June 2014 regarding the AF interest in Modernization of Equipment at MSSC. 2. After obtaining input from these agencies, we prepared the NEPA Draft Environmental Assessment (EA). 3. The Draft EA was published 23 Feb 2015 on the OEQC website and the AMOS website, it was placed at local libraries and mailed to 31 community organizations and individuals. 4. The Maui SHPO indicated that the Maui Lanai Island Burial Council (M/LIBC) was interested in the project, so the AF briefed the council and attending public members on the 30th of April 2015. 5. Council member Jo Kamaunu was contacted on 11

				may 2015 to obtain names and contact information for outreach to additional Native Hawaiian community. The draft EA was mailed or e-mailed on 15 May 2015 to: Aha Moku o Maui LLC, Ke'eaumoku Kapu; Kilakila o Haleakala; Kiope Raymond UH Maui College; Leiohu Ryder DKIST - NHWG Committee, Daniel Kanahele Joyclynn Costa; Hui Pono Ike Kanawai - Kaniloa Kamaunu; Wilmont Kahaialii 6. Responding to the SHPO request and M/LIBC to reach out the Native Hawaiian community the AF mailed an additional 45 draft EAs to individuals and organizations. 7. Due to a change in mission requirements, the AF removed all construction activities from the EA. The AF briefed DLNR Conservation and Coastal Land Director, Sam Lemmo regarding the proposed changes, 27 May 2015 8. A new consultation request was sent to SHPO with the revised Draft EA on September 15, 2015 9. The AF published the revised EA on the OEQC website and AMOS website, placed it in local libraries and mailed it to 83 Maui community members and Native Hawaiian individuals, 23 Feb 2016. Please see the attached list of all persons and organizations contacted to review the proposed EA.
8	3/31/2016	State of Hawaii DLNR, Land Division	The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a designated Flood Hazard. The owner or the project property and/or their	Your comment is acknowledged that the National Flood Insurance Program (NFIP) does not regulate developments within Zone X of the Flood Insurance Rate Zone Map (FIRM).

			representative are responsible to research the Flood Hazard Zone designation for the project. Flood Hazard Zone designations can be found using the Flood Insurance Rate Map (FIRJVI), which can be accessed through the Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT). National Flood Insurance Program establishes the rules and regulations of the NFIP - Title 44 of the Code of Federal Regulations (44CFR). The NFIP Zone X is a designation where there is no perceived flood impact. Therefore, the NFEP does not regulate any development within a Zone X designation. Be advised that 44CFR reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may take precedence over the NFIP standards as local designations prove to be more restrictive. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinator is: Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7253.	
9	4/11/2016	Maui Planning Department, Paul Fasi	Thank you for the opportunity to comment on the above referenced project. At this time, the Maui Planning Department has no comment on the proposed comment.	Thank you for taking time to review and comment on the proposed action.
DRAFT EA Comments and Responses; Public Comment Period Ending March 2015				
1	3/03/2015	County of Maui, Department of Water Supply	Thank you for the opportunity to offer the following comment on the referenced project. The project will not negatively impact the Department of Water Supply's (DWS) water	We appreciate the time you and your staff spent reviewing the document and understand that you concur that the project will not negatively impact the Department of Water Supply’s water systems.

			systems.	
2	3/03/2015	University of Hawaii	We have been in consultation with AFRL/DE Lead Test and Environmental Engineer, Ms. Michelle Hedrick, and understand that AFRL intends to release a Finding of No Significant Impact (FONSI) for the proposed modernization project. We do not have any comments at this time, but would like to continue to be consulted.	We appreciate the opportunity to consult with Mr. Mike Maberry of the University's Institute for Astronomy. The proposed action described in the revised EA meets the requirements established in the University's Haleakala High Altitude Observatory Site Management Plan. We appreciate the time you and your staff spent reviewing the document and understand that you have no comments at this time.
3	3/05/2015	State of Hawaii, Department of Health, Maui District Office	Thank you for the opportunity to review this project. We have the following comments to offer: The noise created during the construction phase of the project may exceed the maximum allowable levels as set forth in Hawaii Administrative Rules (HAR), Chapter 11-46, "Community Noise Control". A noise permit may be required and should be obtained before the commencement of work. The Indoor & Radiological Health Branch should be contacted. It is strongly recommended that the Standard Comments found at the Department's website: http://health.hawaii.gov/epo/home/landuse-planning-review-program/ be reviewed and any comments specifically applicable to this project should be adhered to.	The revised EA has incorporated your request that we contact your office prior to any activities that may produce noise in access of the maximum allowable levels set for in Hawaii Administrative Rules (HAR) chapter 11-46, *Community Noise Control.*
4	3/06/2015	County of Maui, Department of Environmental Management	We reviewed the subject application and have the following comments: 1. Solid Waste Division comments: a. None. 2. Wastewater Reclamation Division (WWRD) comments: a. None.	We appreciate the time you and your staff spent reviewing the document and understand that you have no comments at this time.
5	3/17/2015	State of Hawaii,	There is precedent for CZMA federal	As requested, we submitted coastal zone consistency

		Office of Planning	consistency review for federal agency activities occurring at the MSSC. Previously, on July 22, 2005, a federal consistency determination was submitted by the Air Force Research Laboratory for the Advanced Electro-Optical System (AEOS) completion at the MSSC. On August 3, 2005, the Hawaii CZM Program issued a conditional consistency concurrence for the proposed activity (enclosed). Furthermore, the Draft EA, section 1.9 Regulatory Overview and Required Permits/ Approvals, does not identify the CZMA as a federal law that is relevant to the proposed activity. This should be corrected.	review documentation to your office in accordance with the Coastal Zone Management Act of 1972 and 15 CFR 930, *Federal Consistency with Approved Coastal Management Programs*. This reference has been added to section 1.9 *Regulatory Overview and Required Permits/Approvals* of the final EA. The revised EA no longer includes construction activities or changes to the exterior of the MSSC facilities and is not expected to adversely impact coastal zones.
6	3/19/2015	State of Hawaii DLNR-OCCL	OCCL notes that this project should also show compliance with Hawai'i Revised Statutes (HRS) Chapter 343, also known as the Hawai'i environmental Policy Act (HEPA). We also request that the draft EA discusses any permitting requirements for land uses in the Conservation District pursuant to Hawai'i Administrative Rules (HAR) Chapter 13-5. More information on land uses in the Conservation District, as well as copies of HAR 13-5, can be found on our website at dlnr.hawaii.gov/occl.	The AF revised the original Draft EA published February 23, 2015 to clarify the scope of proposed activities. The original Draft EA reviewed by your office discussed two primary actions: 1. Equipment upgrades including installation of the FASOR laser, and 2. Facility modifications, installation and replacement of domes. The original Draft EA contemplated potential construction activity associated with the installation of a dome for the National Solar Observatory (NSO) known as the Synoptic Optical Long-term Investigations of the Sun (SOLIS) telescope. The AFRL MSSC at Haleakala, Maui HI, is no longer a potential candidate site for SOLIS telescope and dome. Therefore, the AF decided to remove this proposed activity and published a revised draft EA on 23 Feb 2016. The following major construction activities have been removed from the EA: new construction; construction that causes a change in visual perspectives of the facility or line changes/height increase of equipment/structures above the roofline; use of large heavy equipment that requires permits or road closures; use of any large or heavy equipment that

				could cause disturbance within MSSC boundaries or to Haleakala Crater Road or to the Crater Historic District. The Air Force Research Laboratory Directed Energy Directorate, Detachment 15 now proposes the modernization of research equipment at the Maui Space Surveillance Complex (MSSC) located on Haleakalā, Maui, HI over the next five to ten years. The modernization of research equipment consists of: (1) the replacement of sensors and instrumentation, (2) operation of a sodium laser known as Frequency Addition Source of Optical Radiation (FASOR) propagated from the existing AEOS 3.6m telescope, and (3) installation and operation of an improved adaptive optics system which would be used throughout the year for the observation of stars and satellites. All equipment would be installed inside the existing facilities and no change would occur to the exterior building lines or dimensions. In response to your comment regarding Hawai'i Administrative Rules (HAR) Chapter 13-5 the proposed action would not trigger the need for a land use permit as the revised proposed action does not include construction or changes to the exterior of the facilities, see Chapter 4.0 paragraph 4.1 for discussion. No federal or state permits or approvals will be required for this action. This action does not trigger compliance with Hawai'i Revised Statutes (HRS) Chapter 343, the Hawaii Environmental Policy Act, because the action does not require an approval, defined under Hawaii law as a discretionary consent required from a state or county agency prior to actual implementation of the action, HRS § 343-2, 343-5(e). A detailed description of how the Air Force Research

				Lab (AFRL) has complied with the Hawai'i Revised Statutes (HRS) Chapter 343 has been added to the Final Environmental Assessment and FONSI located online at http://prs.afrl.kirtland.af.mil/AMOS/.
7	3/24/2015	State of Hawaii DLNR	Please take note that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Zone X. The National Flood Insurance Program (NFIP) does not regulate developments within Zone X.	We acknowledge that the National Flood Insurance Program (NFIP) does not regulate developments within Zone X of the Flood Insurance Rate Zone Map (FIRM).
8	3/24/2015	National Park Service	1. Much of the information, especially those on the Threatened and Endangered species, is extremely outdated (over 30 years old). Therefore, assessments on impacts and minimization measures to wildlife, and the park in general, may not be accurate and should be reassessed. 2. The Federal Endangered Species Act (ESA) of 1973 establishes a process for identifying and listing threatened and endangered species. Page 16 of the Draft EA states this Proposed Action is said to have no anticipated effect on rare, threatened, or endangered species. However, no U.S. Fish and Wildlife (USFWS) consultation letter or correspondence was included in the Draft EA. Consult with USFWS is requires per 50 CFR 402.12-14.	1. The AF has revised the original Draft EA published February 23, 2015 to clarify the scope of proposed activities. We have added current information on the numbers and location of threatened and endangered species from information gathered by the biologist working on the DKIST. We believe your concerns have been addressed in the revised EA. 2. As stated in Section 4.4.2 of the revised EA, consultation under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*) was completed with the U.S. Fish and Wildlife Service on 3 Jan 2015. Based on AFRL's avoidance and minimization measures, USFWS has determined that the proposed project may affect, but is not likely to adversely affect the Hawaiian petrel, Haleakalā silversword, Hawaiian goose, and Hawaiian hoary bat. The correspondence will be included in the Final EA. The AF contacted the USFWS to confirm this determination remained the same for the revised Draft EA published 23 Feb 2016.
9	3/24/2015	National Park Service	3. The National Park Service recommends consultation with the Native Hawaiian Communities and elders (Kupuna) per the National Historic Preservation Act of 1966	3. The Air Force (AF) recognizes and respects the historic and cultural sensitivity of Haleakalā and fully embraces the NHPA process. As part of this process, we worked closely with the Department of Land and

			(NHPA), as this proposed project has a five to ten year lifetime in a culturally sensitive location. As described, this proposed project will cause a short-term increase in traffic and a long-term increase in visible laser beam activities with the FASOR Sodium Guidestar instrument. 4. Section 4.5 Cultural Resources of the document states consultation has been initiated with the State Historic Preservation Division, but there was no mention of their feedback, nor a person consulted in Chapter 6, nor an appendix documenting the communication. Due to the known spiritual and cultural significance of the entire summit, it is advisable to consult despite the lack of proposed expansion of the building footprint. 5. Page 43 states "a cultural Specialist will be retained at the earliest stages of the planning process. This specialist will monitor the construction process, and consult with and advise the on-site project manager with regard to cultural or spiritual issues to be addressed." However it is unclear if the Kupuna groups have been given an opportunity to comment on the draft EA or FONSI or have been made aware of the potential modernization.	Natural Resources State Historic Preservation Office (SHPO) to ensure the local community had adequate opportunity to comment on our proposed action. We presented our proposed action to the Maui Lana'i Islands Burial Council at its 30 April 2015 meeting and answered council member questions regarding our future plans. At that time the council requested that we reach out to more of the community, so in response to this request the AF sent the Draft EA to an additional 45 members of the Hawaiian community. 4. The National Historic Preservation Act Section 106 process with the SHPO was on 28 January 2016. The SHPO determined that our proposed activity will have no adverse effect on the National Register Eligible Maui Space Surveillance Site or adjacent archeological sites within the APE. 5. Due to the changes in the revised EA no construction will occur to the facility profile or exterior. The AF contacted a total of 83 organizations, individuals and Native Hawaiian community members in addition to publishing the draft documents online. The draft EA documents were placed at Maui libraries for both comment periods.
10	3/24/2015	National Park Service	6. The documentation makes statements concerning the National Park Service (NPS), such as NPS conducting vehicle inspections. Furthermore, proposed construction includes an increase in large vehicle traffic, class 5 or larger, which could damage NPS road, historic bridges and additional historic road features.	6. The AF has removed all references to NPS performing any activities associated with the revised proposed action. The original Draft EA published February 23, 2015 was revised and an updated Draft EA was published to clarify the scope of proposed activities. The original draft EA reviewed by your office discussed two primary actions: 1. Equipment

			Limits on allowed weight of heavy equipment and loads, bill of lading and/or manifests, as well as anticipated quantity of traffic and vehicle class type need to be stipulated in the FONSI.	upgrades including installation of the FASOR laser, and 2. Facility modifications, installation and replacement of domes. The original Draft EA contemplated potential construction activity associated with the installation of a dome for the National Solar Observatory (NSO) known as the Synoptic Optical Long-term Investigations of the Sun (SOLIS) telescope. The AFRL MSSC at Haleakala, Maui HI, is no longer a potential candidate site for SOLIS telescope and dome. Therefore, the AF has decided to remove this proposed activity and publish a revised draft EA. The following major construction activities have been removed from the EA: new construction; construction that causes a change in visual perspectives of the facility or line changes/height increase of equipment/structures above the roofline; use of large heavy equipment that requires permits or road closures; use of any large or heavy equipment that could cause disturbance within MSSC boundaries or to Haleakala Crater Road or to the Crater Historic District.
11	3/24/2015	National Park Service	7. It appears that the information used was duplicated form the document that was prepared in the 1990's for the AEOS project and is outdated. Park procedures and resources have changed since that time. We respectfully recommend that current park information be used in order to accurately assess impacts to the park operations and any needed mitigation.	Information related to the National Park Service has been updated from current sources including the NPS website and the DKIST Final EIS.
12	3/24/2015	National Park Service	8. *Definition Corrections:* Ali'i royalty: Chief or Chiefess Kahuna priest, clergy man: Spiritual Advisor to a Chief/Chiefess Kanaka maoli true aboriginal person: Native to Hawaii Ko'i adze, a bladed tool: Tool used to carve out	All recommended changes have been made in the Final EA.

			(Ko'i) Kumu Hula hula teacher: Source of Hula learning Makahiki ancient annual festivals: Time of year, according to moon phases to give honor to Lono Paliku an order of priesthood: steep cliff	
13	3/24/2015	National Park Service	9. Page 12: Correct Hawaiian names and diacritical marks should be used.	The Final EA document has been updated as recommended.
14	3/24/2015	National Park Service	10. Page 22: Will transport of crane and other construction-related traffic cause changes in park traffic? NPS and USFWS will require this information in order to determine with any degree of certainty whether traffic will increase the potential for nēnē or 'ua'u roadkill. There is potential for 'ua'u to fly into the crane. Furthermore, 'ua'u burrows are nearby. DKIST biologists have the latest updates on location and burrow activities. Effects on these nests would need to be evaluated by a qualified biologist. The park will require a formal arrangement and schedule for conducting the inspection mentioned. Costs of inspection constitute an economic impact to the park. Also, is the Air Force Research Laboratory seeking an MOU/MOA with NPS? More detail is required. The effects of operating sodium laser on flying 'ua'u would need to be assessed and addressed. Effects of this "glow" on 'ua'u would need to be addressed as well.	The following major construction activities have been removed from the EA: new construction; construction that causes a change in visual perspectives of the facility and line changes/height increase of equipment/structures above the roofline; use of large heavy equipment that requires permits or road closures; use of any large or heavy equipment that could cause disturbance within MSSC boundaries or to Haleakala Crater Road or to the Crater Historic District.
15	3/24/2015	National Park Service	11. Page 23: Effects to 'ua'u need to be assessed.	Effects on ‘ua’u is assessed in section 4.3 Biological resources.
16	3/24/2015	National Park Service	12. Page 27: What is anticipated noise to park visitors?	The major construction activities have been removed from the EA. There will be no noise that might affect park visitors generated as a result of the proposed activity.
17	3/24/2015	National Park	13. Page 28: This information is from 2003.	Current information has been added from sources

		Service	Current information should be used. What time do the vehicles leave? There is the potential for night-time roadkill's of 'ua'u in the park. Information in this section is outdated and should be supplemented and reanalyzed with current information, particularly information relating to the Haleakala population. Also, please make corrections to Hawaiian spelling, common name and scientific name: 'ua'u, Hawaiian petrel, *Pterodroma sandwichensis.* Scientific names should be italicized or underlined throughout the documents.	including the National Park Service website and reports prepared for the DKIST Final EIS. The Hawaiian petrel's name was updated as requested.
18	3/24/2015	National Park Service	14. Page 29: Please correct the Hawaiian spelling and scientific name: *Nene Branta sandwichensis.* Information from this section is outdated and should include current information e.g. Haleakala is not a sanctuary. Invertebrate studies are continuing and current information should be included Nene may fly to the summit and use the area.	Information in this section has been updated from sources including the DKIST Final EIS. The spelling of the Nene *Branta sandwichensis* has been corrected.
19	3/24/2015	National Park Service	15. Page 36: This is information is also outdated. Recommend contacting DKIST biologists for updated information.	As suggested, the AF contacted DKIST biologists in preparing the revised draft EA.
20	3/24/2015	National Park Service	16. Page 37: An increase in traffic increases the potential for nēnē and 'ua'u to be hit by vehicles traveling on road.	The major construction activities have been removed from the EA. There will be no increase in road traffic as a result of the proposed activity.
21	3/24/2015	National Park Service	17. Page 38: Even with minimizing measures, "take" of 'ua'u may occur and is dependent on information from DKIST biologists. Any information on compliance with Section 7 of the Endangered Species Act (ESA) is currently not included in the Draft EA If increased "take" on nēnē may result from the	Consultation under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq*.) was completed with the U.S. Fish and Wildlife Service on 3 Jan 2015. Based on AFRL's avoidance and minimization measures, USFWS has determined that the proposed project may affect, but is not likely to adversely affect the Hawaiian petrel, Haleakalā

			proposed project, consultation with USFWS is necessary for ESA compliance.	silversword, Hawaiian goose, and Hawaiian hoary bat. The AF contacted the USFWS to confirm this determination remained the same for the revised Draft EA published 23 Feb 2016.
22	3/24/2015	National Park Service	18. Page 39: Haleakala National Park does not have current information in the project area. Please contact DKIST biologists for accurate information for this project area. Consultation with USFWS is necessary to determine effects to both bats and 'ua'u for ESA compliance.	Haleakala National Park has been removed as a reference. As stated above, we have consulted with the USFWS.
23	3/24/2015	National Park Service	19. Page 40: This finding is neither definitive nor substantiated. Consultation with USFWS is necessary. Updated information on 'ua'u flyways are also necessary. To our knowledge, Haleakala National Park did not provide information mentioned. Please remove this language. Information on laser illumination effects on bats needs to be investigated further. Also, bat presence data in the area should be updated and accurate in order to impacts to bats, Consultation with USFWS is necessary	Consultation under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq*.) was completed with the U.S. Fish and Wildlife Service on 3 Jan 2015. Based on AFRL's avoidance and minimization measures, USFWS determined that the proposed project may affect, but is not likely to adversely affect the Hawaiian petrel, Haleakalā silversword, Hawaiian goose, and Hawaiian hoary bat. The AF contacted the USFWS to confirm this determination remained the same for the revised Draft EA published 23 Feb 2016. The Final EA does not cite to the Haleakala National Park as a reference.
24	4/02/2015	County of Maui, Office of Economic Development	We are pleased to report that after thoroughly reviewing the draft EA, our office has no objection to this project moving forward. We believe the draft EA adequately studied the pertinent areas of Cultural Resources, Air Quality, Infrastructure, Traffic, and Road, Biological resources, Land Use/Noise, and Hazardous Material which have shown no significant impacts.	We appreciate the time you and your staff spent reviewing the document and understand that you have no comments at this time.
25	3/12/2015	Native Hawaiian	1. As a lessee, the Air Force must comply with	(a) No federal or state permits or approvals will be

		Legal Corp.	state law and all requirements that bind the lessor. As such, before the project can proceed, it must (a) prepare an environmental impact statement pursuant to HRS chapter 343; (b) prepare a modern archaeological inventory survey pursuant to HRS chapter 6E; (c) prepare a conservation district use application pursuant to HRS chapter 183C; and (d) prepare documents necessary for a consistency determination as required by the Coastal Zone Management Act.	required for this action. This action does not trigger compliance with Hawai'i Revised Statutes (HRS) Chapter 343, the Hawaii Environmental Policy Act, because the action does not require an approval, defined under Hawaii law as a discretionary consent required from a state or county agency prior to actual implementation of the action, HRS § 343-2, 343-5(e). A detailed description of how the Air Force Research Lab (AFRL) has complied with the Hawai'i Revised Statutes (HRS) Chapter 343 has been added to the Final Environmental Assessment and FONSI located online at http://prs.afrl.kirtland.af.mil/AMOS/. (b) Construction activities have been removed from the EA. All equipment will be installed inside the existing facilities and no change will occur to the exterior building lines or dimensions. The use of any large or heavy equipment that could cause disturbance within MSSC boundaries or to Haleakala Crater Road or to the Crater Historic District has been removed from the EA. An archeological survey is not needed since there is no longer potential for ground disturbances. (c) In response to your comment regarding Hawai'i Administrative Rules (HAR) Chapter 13-5 the proposed action would not trigger the need for a land use permit as the revised proposed action does not include construction or changes to the exterior of the facilities, see Chapter 4.0 paragraph 4.1 for discussion. (d) Documents were submitted on April 14, 2015 to the State of Hawaii, Office of Planning for a coastal zone consistency review in accordance with the

				Coastal Zone Management Act of 1972 and 15 CFR 930, *Federal Consistency with Approved Coastal Management Programs*. This reference has been added to section 1.9 *Regulatory Overview and Required Permits/Approvals* of the final EA. The revised EA no longer includes construction activities or changes to the exterior of the MSSC facilities and is not expected to adversely impact coastal zones.
26	3/12/2015	Native Hawaiian Legal Corp.	2. The Air Force needs to comply with and discuss the Haleakalã High Altitude Observatory Site Management Plan.	The proposed action is consistent with the HO Management Plan: "It is a principal site for optical and infrared surveillance, inventory and tracking of space debris, and active laser illumination of objects launched into Earth orbit, activities that are all crucial to the nation's space program." The action supports the continuing current operations, new scientific experiments, and research at the MSSS facilities and does not require any new facility construction.
27	3/12/2015	Native Hawaiian Legal Corp.	3. The Air Force must assess the cumulative impact of this project – including past actions.	This action supports continuing R&D efforts in space optical and surveillance technologies at the MSSS. Cumulative impacts are discussed in the revised EA, Chapter 5.
28	3/12/2015	Native Hawaiian Legal Corp.	4. The Air Force must disclose how much larger the domes will be.	The draft EA was revised to reflect that the actions related to the potential installation of a dome for the National Solar Observatory (NSO), Synoptic Optical Long-term Investigations of the Sun (SOLIS) telescope have been removed. The AFRL MSSC at Haleakala, Maui HI, is no longer a potential candidate site for the SOLIS telescope and dome.
29	3/12/2015	Native Hawaiian Legal Corp.	5. The Air Force fails to even mention the final environmental impact statement for the advanced technology solar telescope project…Furthermore, the cumulative impact of this project and the ATST is certainly significant.	Cumulative impacts are discussed in Chapter 5 of the revised draft EA. The incremental impact of the proposed project, which is interior to an existing building, will not be significant when added to other past, present, and reasonably foreseeable future actions.
30	3/12/2015	Native Hawaiian	6. The Air Force must acknowledge that this	The Air Force respects the right of all native

		Legal Corp.	project significantly detracts from the sanctity of the summit.	Hawaiians to visit the summit of Haleakala to experience what their ancestors once did. The AF has removed any construction that would change the exterior appearance of the existing structures as described in the revised EA. Access to native Hawaiian sacred sites will not change as result of this proposed action.
31	3/12/2015	Native Hawaiian Legal Corp.	7. Where is the 106 process?	The National Historic Preservation Act Section 106 process with the SHPO was completed on 28 January 2016. The SHPO determined that the proposed activity will have no adverse effect on the National Register Eligible Maui Space Surveillance Site or adjacent archeological sites within the APE.
32	3/12/2015	Native Hawaiian Legal Corp.	8. An environmental impact statement, rather than an environmental assessment should fully consider the following issues: a) the cultural significance of the area; b) the historic significance; c) the beauty of the area; d) the natural quiet of the area; e) the terms of the Air Force lease; f) the impact of shooting a laser 4-6 hours for 80 nights per year; g) the USFWS analysis of the impact of the lasers on 'ua'u and petrel; h) where the lasers be visible on Maui; i) the projects impact on natural beauty, quiet, wildlife, cultural resources and cultural practices; j) the character of the noise from the project k) the impact of noise on cultural practitioners; l) the visual impact of the laser operation as well as its impact on the feeling of the area;	AFRL feels that an EA, vice an EIS, is appropriate for the proposed project. The listed issues are addressed in the EA as follows: a) Cultural resources are addressed in section 4.4 of the Final EA. b) Cultural resources are addressed in section 4.4 of the Final EA. c)Visual resources are discussed in section 4.4 of the Final EA d) The major construction activities have been removed from the EA. There will be no noise generated as a result of the proposed activity. e) The current lease between USA CE and UH commenced on 14 May 2006 and has a term of 25 years. f) The environmental impacts of operating the FASOR laser are discussed in Chapter 4 of the EA. This EA focuses on the following environmental resources and issues of concern: Land Use, Safety and Occupational Health, Biological Resources, and Cultural and Visual Resources, and Cumulative Impacts. g) Consultation under the Endangered Species Act

			m) the height of the structures before and after this project; n) the duration of construction and height of construction cranes; o) the on-going advanced technology solar telescope project and cumulative impact; p) prior hazardous waste spills at the Air Force facility	(ESA) of 1973, as amended (16 U.S.C. 1531 *et seq*.) was completed with the U.S. Fish and Wildlife Service on 3 Jan 2015. Based on AFRL's avoidance and minimization measures, USFWS has determined that the proposed project may affect, but is not likely to adversely affect the Hawaiian petrel, Haleakalā silversword, Hawaiian goose, and Hawaiian hoary bat. The AF contacted the USFWS to confirm this determination remained the same for the revised Draft EA published 23 Feb 2016. h) Based upon the analysis in section 4.3 of the EA, the proposed action would not affect visual resources and view planes from distances greater than 1200 m. i) The environmental impacts of operating the FASOR laser are discussed in Chapter 4 of the EA. This EA focuses on the following environmental resources and issues of concern: Land Use, Safety and Occupational Health, Biological Resources, and Cultural and Visual Resources, and Cumulative Impacts. j) Construction activities have been removed from the EA. There will be no noise generated as a result of the proposed activity. k) Construction activities have been removed from the EA. There will be no noise generated as a result of the proposed activity. l) Visual resources are addressed in section 4.4 of the Final EA. m) Construction activities have been removed from the EA. The actions related to the potential installation of a dome for the National Solar Observatory (NSO), Synoptic Optical Long-term Investigations of the Sun (SOLIS) telescope have been removed. n) Construction activities have been removed from the EA. Cranes will not be used for this proposed

				action. o) Cumulative impacts are discussed in Chapter 5 of the revised draft EA. The incremental impact of the proposed project, which is interior to an existing building, will not be significant when added to other past, present, and reasonably foreseeable future actions. p) AF activities comply with Federal, State and local Hazardous Waste regulations.
33	3/12/2015	Native Hawaiian Legal Corp.	9. The DEA's conclusion is patently false. This project significantly hurts cultural practices, cultural resources, natural beauty, and the wilderness qualities, natural quiet and spiritual value of the summit of Haleakalā.	Your comment is acknowledged and will appear in the Final EA.

ATTACHMENT 4. National Historic Preservation Act, Section 106 Consultation

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD, STE 555
KAPOLEI, HAWAII 96707

January 28, 2016

IN REPLY REFER TO:
LOG: 2015.04377
DOC: 1601JLP08
"no adverse effect"

Joseph M. Volza
AFRL/RDMT
Senior Environmental Research Analyst
Department of the Air Force
Air Force Research Laboratory, Directed Energy Directorate
3550 Aberdeen Ave. SE
Kirtland AFB, NM 87117

RE: Section: Section 106 Cultural Resources Management
Agency: Department of the Air Force (Air Force)
Project Name: Air Force Research Laboratory Proposed Modernization of Maui Space Surveillance Site (MSSC) Equipment
Location: Haleakala, Maui, Hawaii
TMK: (2) 2-2-007:008

Dear Mr. Volza:

On December 31, 2015, the State Historic Preservation Division (SHPD) received a submittal from the Department of the Air Force (Air Force) for the proposed modernization of Maui Space Surveillance Site (MSSC) equipment at Haleakala, Maui, Hawaii (TMK (2) 2-2-007:008). The proposed modernization plan includes: replacement of sensor and instrumentation; operation of a sodium laser known as FASOR propagated from the existing AEOS 3.6m telescope; installation and operation of an improved adaptive optics system which would be used throughout the year for observation of stars and satellites; and, installation of other supporting research equipment. Equipment includes an improved security system, installation of baffles on the 3.6 meter telescope, and an upgrade of existing weather monitor system. Security equipment includes replacement of alarms, locks, and cameras.

The area of potential effect (APE) for the proposed project includes the 4.4 acres leased by the United States Air Force and owned by the University of Hawaii. The APE includes visual perception of the FASOR at a maximum distance of 1200m. All activities performed for the proposed undertaking will occur within existing facilities and no soil will be disturbed.

Per Section 106 of the National Historic Preservation Act of 1966, as amended, SHPD has reviewed the undertaking and the State Historic Preservation Officer (SHPO) **concurs** with the determination of the Air Force that the project will have **no adverse effect** on the National Register Eligible Maui Space Surveillance Site or adjacent archaeological sites within the APE.

The Air Force is the office of record for this undertaking. Please maintain a copy of this letter with your environmental review record for this undertaking. If you have any questions about this undertaking or if there is a change to the scope of work, please contact Jessica Puff, Architectural Historian, at (808) 692-8023 or by email at jessica.l.puff@hawaii.gov.

Mahalo,

Dr. Alan Downer
Deputy State Historic Preservation Officer

ATTACHMENT 5. Endangered Species Act, Section 7 Consultation

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850

In Reply Refer To:
2015-I-0099

Lieutenant Colonel James D. Phillips
Department of the Air Force
Air Force Research Laboratory
3550 Aberdeen Avenue SE
Kirtland Air Force Base, New Mexico 87117

JAN 3 0 2015

Subject: Informal Consultation for the Proposed Modernization of Maui Space Surveillance Complex Facilities/Equipment Project, Haleakala, Maui

Dear Commander Phillips:

The U.S. Fish and Wildlife Service (Service) is in receipt of your letter, dated December 8, 2015, requesting our concurrence with your determination that the proposed Modernization of Maui Space Surveillance Complex Facilities/Equipment project may affect, but is not likely to adversely affect federally listed species, including the endangered Hawaiian petrel (Pterodroma sandwichensis), Hawaiian goose (Branta sandvicensis), Hawaiian hoary bat (Lasiurus cinereus semotus), and Haleakala silversword (*Argyroxiphium sandwicense* subsp.*macrocephalum*).

The proposed project involves repairing, maintaining, and updating existing equipment at the Maui Spaces Surveillance Complex (MSCC) as well as the installation and operation of a sodium laser (known as FASOR) on an existing telescope. The installation of the laser would not create a change to the done or structure of the existing telescope and would not require heavy equipment for installation. Once installed, the laser would be operated in accordance with American National Standards for the Safe Use of Lasers (ANSI Z136.1 and U.S. Air Force, AFOSH Standard 161.10). Laser operations would occur primarily at night approximately 80 nights per year. During each night of use, the laser would be on only intermittently (5-10 minutes at a time) over a period of 4-6 hours. We reviewed the proposed project pursuant to the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Hawaiian Petrel
Hawaiian petrels fly at night and are attracted to artificially-lighted areas. This attraction to light sources may result in disorientation and subsequent fallout due to exhaustion or collision. Seabirds are also susceptible to collision with objects that protrude above the vegetation layer when traversing between the ocean and their mountainous breeding areas, such as utility lines, guy-wires, and communication towers. Additionally, once grounded, they are vulnerable to

predators and are often struck by vehicles along roadways. Any increase in the use of nighttime lighting, particularly during each year's peak fallout period (September 15 through December 15), could result in additional seabird injury or mortality.

To minimize potential project impacts to Hawaiian petrels, the following measures are included in the implementation of this project:

- Contractors will be required to participate in pre-construction briefings on environmental sensitivities;
- The project will avoid any ground-disturbing vibrations during the Hawaiian petrel breeding season (mid-February through mid-November);
- The contractor will keep construction activities at least 91 meters (300 feet) away from Hawaiian petrel burrows during the breeding season (mid-February through mid-November);
- Construction staging areas will not be permitted outside the existing MSSC footprint and all activities will be confined to previously disturbed areas (vehicle movement, personnel walking, equipment/supply storage and handling);
- No fences will be constructed as part of this project;
- No night-time construction work will occur as part of this project;
- Contractors will be required to use tight lidded trash containers and remove trash and organic waste from the construction site daily to avoid attracting predators;
- The Air Force will coordinate with the Service and Haleakala National Park to monitor nearby Hawaiian petrel burrow as appropriate during construction activities.

Haleakala Silversword

Haleakala silversword is a long-lived perennial and a member of the aster family (Asteraceae). This monocarpic (flowers only once at the end of its lifetime) plant matures from seed to its final stage in approximately 15 to 50 years. The Haleakala silversword is endemic to 2,500 acres between 6,900 and 9,800 feet elevation in the crater and outer slopes of Haleakala Volcano within the Park and The Nature Conservancy of Hawaii's Waikamoi Preserve. Near extinction in the 1920s due to human vandalism and browsing by goats and cattle, Haleakala silverswords have increased substantially due to protection and vigorous conservation efforts. Threats to the species include loss of native pollinators caused by predation by the non-native Argentine ant and yellow jackets; seed predation by native seed-eating and herbivorous insects; herbivory and trampling by non-native ungulates; competition and habitat alteration due to invasive introduced plant species; and human impacts (trampling and site degradation). The limited natural range of this taxon makes it vulnerable to extinction due to a single catastrophic event such as a natural disaster or non-native plant or animal introduction.

To minimize potential project impacts to Haleakala silverswords, the following measures are included in the implementation of this project:

- Contractors will be required to participate in pre-construction briefings on environmental sensitivities;

- Construction staging areas will not be permitted outside the existing MSSC footprint and all activities will be confined to previously disturbed areas (vehicle movement, personnel walking, equipment/supply storage and handling);
- Any facility repair projects near Haleakala silverswords will use mesh barriers to protect the plants from equipment, tools, and personnel working in the area.

Hawaiian Goose and Hawaiian Hoary Bat

The endangered Hawaiian goose and Hawaiian hoary bat occur within Haleakala National Park at lower elevations than at the proposed project site (below 7000 feet). The Hawaiian hoary bat has occasionally been sited at elevations up to 13,000 feet, but these sightings are rare. It is anticipated that the conservation measures incorporated into the project description for other listed species would fully avoid adverse impacts to these species in the unlikely event that they transited through the project site.

Based on the above avoidance and minimization measures, the Service concurs with your determination that the proposed project may affect, but is not likely to adversely affect the Hawaiian petrel, Haleakala silversword, Hawaiian goose, and Hawaiian hoary bat. Should project plans change, or if additional information on the distribution of listed species becomes available, we recommend you contact our office so that we may assist you in re-assessing project impacts. Should monitoring efforts by the Air Force, contractors, or the National Park, indicate that project components are having an effect on listed species in a way not anticipated in this informal consultation, please contact us immediately so we may assist you in ensuring project compliance with the ESA.

We appreciate your efforts to conserve protected species. If you have questions regarding this informal consultation, please contact Michelle Bogardus, Fish and Wildlife Biologist (phone: 808-792-9437; fax: 808-792-9581).

Sincerely,

Michelle Bogardus
Island Team Manager
Maui Nui and Hawaii Islands