UNIVERSITY OF HAWAI'I AT MĀNOA

Institute for Astronomy

September 12, 2005

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawai'i 96813

Dear Ms. Salmonson:

Final Environmental Assessment (EA) for Proposed Advanced Electro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC) Haleakalā, Maui, Hawai'i TMK-2-2-07:08

The University of Hawai'i has reviewed the Final EA for the above-referenced project proposed by the Air Force Research Laboratory and the comments received during the 30-day public comment period, which began on June 23, 2005. Based upon a review of the Final EA and the comments received, the University of Hawai'i has determined that this project will not have significant environmental effects and has issued a Finding of No Significant Impact. Please publish notice of availability for this project in the next available Environmental Notice.

We enclose the completed OEQC Publication Form, four copies of the Final EA, and the project summary on disk. Should you have any questions or comments, please contact Mr. Michael Maberry of the University of Hawai'i at (808) 876-7600 ext 107, or Ms. Arlette Meader of Belt Collins Hawaii at (808) 521-5361. Thank you.

Sincerely,

Rolf-Peter Kudritzki

Rolf-Peter Kudritzki
Director

Enclosures

c. Michael Maberry
Karen Rehbock

2680 Woodlawn Drive, Honolulu, Hawai'i 96822

2005-09-23- MA FONSI ADVANCED ELECTRO-OPTICAL SYSTEM (AEOS) COMPLETION AT THE MAUI SPACE SURVEILANCE COMPLEX

FINAL ENVIRONMENTAL ASSESSMENT

Proposed Advanced Electro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC) Haleakalā, Maui, Hawai'i

Proposed by:
U.S. Air Force Research Laboratory

Prepared by:
Belt Collins Hawaii
Honolulu, Hawai'i

September 13, 2005

FINDING OF NO SIGNIFICANT IMPACT

Proposed Advanced Electro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC) Haleakalā, Maui, Hawai'i

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 completing the Advanced Electro-Optical System (AEOS) telescope building by constructing a mirror coating shop (MCS) at the Maui Space Surveillance Complex (MSSC) 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 Finding of No Significant Impact (FONSI) includes the Final EA (see attached).

PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the Proposed Action is to provide a shop to properly maintain the highly sensitive AEOS telescope to meet its Department of Defense operational requirements and other research objectives. This maintenance action, specifically mirror recoating, is needed every six years to maintain the reflectivity necessary for its operational requirements, and more than six years has elapsed since the mirror was installed.

DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

Proposed Action

The AFRL is proposing to complete the AEOS telescope building by constructing and operating the AEOS MCS at the MSSC. MSSC is located within the University of Hawai'i's (UH) Institute for Astronomy (IfA) Haleakalā Observatories, on ceded land atop Haleakalā. The proposed AEOS MCS would be designed to accommodate the 3.6-meter (11.8-foot) diameter AEOS mirror. It would also be capable of recoating mirrors associated with other existing and proposed telescope facilities at UH IfA. The AFRL proposes to construct the two-story AEOS MCS on the southwest corner of the existing AEOS telescope building. The shop would be designed to house a staging area, assembly/disassembly area, mirror coating area, optics maintenance area, and mechanical and electrical utility rooms. Construction activities would include connection to utilities and lightning protection. Construction of the AEOS MCS could begin as early as November 15, 2005, is expected to end by August 25, 2006, and would cost approximately $7.5 million.

Construction activities would include the construction practices identified in the UH IfA's Long Range Development Plan (LRDP) for environmental protection of site resources such as: providing for a cultural monitor; painting the building exterior to match the surrounding ground surface and existing buildings; and coordinating the use of off-site sterilized fill material, if needed, with the National Park Service. In addition, construction activities will comply with measures identified by the U.S. Fish and Wildlife Service (USFWS) during informal consultation.

The State Department of Business, Economic Development and Tourism's Office of Planning concurred with the Coastal Zone Management (CZM) federal consistency determination that the proposed AEOS MCS is consistent, to the maximum extent practicable, with the enforceable policies of the Hawaii CZM Program. The AEOS completion is covered under the Conservation District Use Permit MA-2705.

The recoating process for the AEOS mirror would be completed in approximately four weeks. The revenue lost while the telescope is out of operation during the mirror recoating would be approximately $1.2 million.

Mauna Kea Alternative

The Mauna Kea Alternative considers recoating the AEOS mirror at one of three existing mirror coating chambers at the Mauna Kea Science Reserve atop Mauna Kea on the island of Hawai'i. Under this alternative, there would be no associated construction and the AEOS mirror would be out of operation for approximately 12 weeks (three times longer than the Proposed Action). An 18.1-metric ton (20-ton) crane would be assembled at MSSC to remove and reinstall the mirror. The crane would be disassembled during the three-month recoating process to prevent interference with water truck deliveries.

Use of a mirror coating facility atop Mauna Kea would involve multiple loading and unloading operations, shipment by barge, and travel over roads that are steep, narrow, curved, and unpaved. This places the mirror at high risk for breakages and results in extended downtime required for transportation. The roads to both Haleakalā and Mauna Kea summits are steep, and inclement weather can cause poor visibility and increase the risk of brake failure and weather-related accidents. Extreme weather conditions could also expose the mirror to moisture, cold, heat, and dust, increasing the potential for damage. Hence, transportation of the AEOS mirror would be limited to fair weather.

This alternative would cost $2.75 million to implement, plus an estimated $3.6 million loss of revenue while the AEOS telescope is out of operation. These costs would be incurred each time the AEOS mirror is recoated, approximately every six years.

No Action Alternative

Under the No Action Alternative, the AEOS MCS would not be constructed at MSSC and the AEOS mirror would not be recoated. The AEOS mirror would continue to degrade and be unable to maintain its current capabilities. Operations and experiments involving the AEOS telescope would decrease, resulting in a loss of a national asset.

SUMMARY OF ANTICIPATED ENVIRONMENTAL EFFECTS

The following affected resources were evaluated: land use, cultural, biological, visual, geologic, topographic and soils, hydrologic, air quality, and infrastructure. In addition, the potential effects to public health and safety (associated with hazardous materials and waste, and noise) and socioeconomics were also evaluated. A summary of potential impacts from the Proposed Action and alternatives follows.

Proposed Action

Land Use. The Proposed Action would have no significant impact on land use, as it would support and be consistent with the goals and objectives of State, County, community, and Haleakalā Observatories plans.

Cultural Resources. Consultation under Section 106 of the National Historic Preservation Act has been completed with the State Historic Preservation Division, which has concurred with AFRL's determination that "no historic properties will be affected" by the Proposed Action. There are no cultural resources, identified on the State Inventory of Historic Places or the State or National Register of Historic Places, within the project site. The Crater Historic District Haleakalā National Park extends outside the Haleakalā National Park boundaries, and includes non-Federal lands such as the Haleakalā Observatories, including the project area. Cultural resources located outside of the project site would not be disturbed and would be protected by implementing the management provisions identified in the UH IfA's LRDP and summarized in this EA.

Biological Resources. No significant impacts on biological resources are anticipated. Biological resources would be protected by implementing the management provisions in the UH IfA's LRDP and measures identified by the USFWS. Informal consultation under Section 7 of the Endangered Species Act has been completed with the USFWS, which has concurred with AFRL's determination that the Proposed Action is not likely to adversely affect the 'ahinahina, 'ua'u, nēnē, or Hawaiian hoary bat at Haleakalā.

Visual Resources. The AEOS MCS would not be visible from the Pu'u Ula'ula (Red Hill) Overlook or Pa Ka'oao (White Hill) Visitor Center, or from lower elevations, as the AEOS telescope building would block the view of the proposed AEOS MCS. The building exterior color would match the surrounding ground surface and existing buildings at MSSC and is not anticipated to significantly impact visual resources.

Geology, Topography, and Soils. No significant impacts to geology, topography, or soils would occur, as the Proposed Action would occur on previously graded and disturbed land. Minimal grading and excavation for structural footings would occur as construction would be on existing paved areas. If the area of disturbance, which will be determined during the design phase, is 0.4 hectare (1 acre) or greater, a National Pollutant Discharge Elimination System (NPDES) permit for storm water discharges would be obtained.

Hydrology. No significant impacts to hydrology would occur, as the Proposed Action would minimize construction-related storm water runoff and if the area of disturbance is 0.4 hectare (1 acre) or greater, a NPDES permit for storm water discharges associated with construction would be obtained.

Air Quality. No significant impacts on air quality would occur. Contractors would implement construction best management practices to minimize fugitive dust. The AEOS hazardous air pollutant emissions would increase slightly with the additional stripping of the AEOS mirror, but would continue to remain exempt from permitting.

Infrastructure. No significant impacts to infrastructure would occur. Construction-related traffic would be minimized and there would be no long-term increase in the number of vehicles associated with MSSC. The existing electrical and communication infrastructure is capable of handling the anticipated increased demands. There would be no increase in personnel; therefore, there would be no associated increase in demand for water or volume of waste generated.

Public Health and Safety

- *Hazardous Materials and Waste.* There would be no significant impact on public health and safety from hazardous materials and waste. Materials and waste would be properly stored, handled, and disposed of to prevent releases to the environment.
- *Noise.* No impacts to public health or safety from noise are anticipated. Construction activities would be short-term and temporary, and operational noise is expected to be minimal. Operation of the AEOS MCS would be contained within the shop interior.

Socioeconomics. There would be no significant socioeconomic impacts. There would be no change in the number of personnel at MSSC under the Proposed Action. Construction and operation would occur within a secured military facility that would continue to have restricted access. Therefore, no significant adverse impact to minority or low-income populations would occur, with respect to Executive Order 12898, *Federal Actions to address Environmental Justice in Minority Populations and low-Income Populations.*

Cumulative Impacts. Implementation of the Proposed Action would have no significant cumulative impacts associated with the resources.

Mauna Kea Alternative

Under this alternative, there would be no construction at MSSC or the Mauna Kea Science Reserve. Potential impacts from transportation of the AEOS mirror to the summit of Mauna Kea would be temporary and infrequent, occurring once every six years. Therefore, no significant direct impacts or cumulative impacts are anticipated under the Mauna Kea Alternative.

No Action Alternative

Under this alternative, there would be no significant impact to environmental resources as the proposed AEOS MCS would not be constructed. However, continued degradation of the AEOS mirror would ultimately result in loss of jobs and an estimated 75 percent loss (greater than $18 million) in the annual payroll for the MSSC research and operations would be anticipated.

CONCLUSION

After careful review of the EA, I have concluded that the Proposed Action would not have a significant impact on the quality of the natural or human environment. Therefore, issuance of a FONSI is warranted, and an Environmental Impact Statement is not required. This analysis fulfills the requirements of the NEPA and implementing regulations promulgated by the CEQ.

Approved By: Michelle L. Hedrick Date: 9/8/05

Michelle L. Hedrick
Lead Safety and Environmental Engineer
AFRL/DEOS

Approved By: _____ Date: 9 Sep 05

Lt. Col. Janet Augustine
Site Commander
Det 15/CC, AFRL/DESM

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CHAPTER FOUR
ENVIRONMENTAL CONSEQUENCES

LIST OF TABLES

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ACRONYMS AND ABBREVIATIONS

°C	degree Celsius
°F	degree Fahrenheit
A	ampere
ac	acre
AEOS	Advanced Electro-Optical System
AFRL	Air Force Research Laboratory (U.S.)
AMOS	Air Force Maui Optical and Supercomputing Site
AT/FP	Anti-terrorism/force protection
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
dBA	decibels A-weighted scale
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
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 Plan	Hazardous Material Emergency Planning and Response Plan
HECO	Hawaiian Electric and Light Company
HRS	Hawai'i Revised Statutes
IfA	Institute for Astronomy
INRMP	Integrated Natural Resources Management Plan
kV	kilovolt
kW	kilowatt
LRDP	Long Range Development Plan
LURE	Lunar and Satellite Ranging Observatory
MAGNUM	Multi-color Active Galactic Nuclei Monitor

MCS	Mirror Coating Shop
MECO	Maui Electrical Company, Inc.
MSO	C.E. 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
Pan-STARRS	Panoramic-Survey Telescope and Rapid Response System
RCRA	Resource Conservation and Recovery Act (Federal)
SHPD	State Historic Preservation Division
SHPO	State Historic Preservation Office
SIHP	State Inventory of Historic Places
UH	University of Hawai'i
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

GLOSSARY OF HAWAIIAN WORDS

ʻahinahina	silversword plant
ʻuaʻu	Hawaiian Dark-rumped Petrel
Aliʻi	royalty
Haleakalā	House of the Sun
iwi	bones
kāhuna	priest, clergyman
kanaka maoli	true aboriginal person
koʻi	adze, a bladed tool
Kumu Hula	hula teacher
kupuna	elder
Makahiki	ancient annual festivals
mana	supernatural or divine power
nēnē	Hawaiian Goose
Pa Kaʻoao	White Hill
Paliku	an order of priesthood
Puʻu Ulaʻula	Red Hill
wahi pana	legendary place

EXECUTIVE SUMMARY

Project Name:	Proposed Advanced Electro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC), Haleakalā, Maui, Hawai'i
Tax Map Key:	(2) 2-2-7: Parcel 8
Land Use/Ownership	Conservation District General Subzone / State of Hawai'i University of Hawai'i Institute for Astronomy (UH IfA)
Type of statement:	Environmental Assessment (EA)
Lead agency (NEPA)	United States Air Force Research Laboratory (AFRL)
Applicant (Chapter 343 HRS):	AFRL
Approving agency (Chapter 343 HRS):	UH IfA
For further information:	Lt. Col. Janet Augustine Det 15/CC, AFRL/DESM 535 Lipoa Parkway, Suite 200 Kihei, HI 96753 808-874-1591

PROPOSED ACTION AND ALTERNATIVES

The Air Force Research Laboratory (AFRL) is proposing to complete the Advanced Electro-Optical System (AEOS) telescope building by constructing and operating a mirror coating shop (MCS) at the Maui Space Surveillance Complex (MSSC). MSSC is located within the University of Hawai'i's (UH) Institute for Astronomy (IfA) Haleakalā Observatories, atop Haleakalā, Maui, Hawai'i. The proposed AEOS MCS would be designed to accommodate the 3.6-meter (11.8-foot) diameter mirror of the highly sensitive AEOS telescope, which requires recoating once every six years to maintain optimal capability. It would also be capable of recoating mirrors associated with other existing and proposed telescope facilities at UH IfA. The AFRL proposes to construct the two-story AEOS MCS on the southwest corner of the AEOS telescope building. The shop would be designed to house a staging area, assembly/disassembly area, mirror coating area, optics maintenance area, and mechanical and electrical utility rooms. Construction activities would include connection to utilities and lightning protection. Construction of the AEOS MCS could begin as early as November 15, 2005, and is expected to end by August 25, 2006.

Mirror recoating alternatives including the Proposed Action and the Mauna Kea Alternative, were considered along with the No Action Alternative. Under the Proposed Action, the AEOS MCS would be constructed at MSSC, allowing for the periodic recoating of the AEOS and other telescope mirrors atop Haleakalā. The Mauna Kea Alternative considers transporting the AEOS

mirror to the island of Hawai'i every six years for recoating at an existing facility atop Mauna Kea. Under the No Action Alternative the AEOS mirror would not be recoated and would continue to degrade.

ANALYSIS AND ANTICIPATED OUTCOME

The following affected resources were evaluated: land use, cultural, biological, visual, geologic, topographic and soils, hydrologic, air quality, and infrastructure. In addition, the potential effects to public health and safety (associated with hazardous materials and waste, and noise) and socioeconomics were also evaluated.

A Finding of No Significant Impact (FONSI) is anticipated for the Proposed Action, as it would have no significant adverse effects on the environment. Potential impacts were evaluated in accordance with NEPA and Chapter 343 HRS and their implementing rules, and are summarized as follows:

- Cultural resources identified near MSSC, but located outside the project area, would not be disturbed and would be protected by implementation of the UH IfA's Long-Range Development Plan (LRDP) provisions. Consultation under Section 106 of the National Historic Preservation Act has been completed with the State Historic Preservation Division, which has concurred with AFRL's determination that "no historic properties will be affected" by the Proposed Action.
- The AFRL has completed informal consultation with the USFWS, under Section 7 of the ESA, to evaluate the potential impacts of the Proposed Action on threatened and endangered species near the project area. The USFWS has concurred with AFRL's determination that the Proposed Action is not likely to adversely affect the 'ahinahina, 'ua'u, nēnē, or Hawaiian hoary bat at Haleakalā.
- The State of Hawaii Department of Business, Economic Development and Tourism, Office of Planning concurred with AFRL's Coastal Zone Management federal consistency determination that the proposed AEOS MCS is consistent, to the maximum extent practicable, with the enforceable policies of the Hawaii CZM Program.
- The AEOS completion is covered under the CDUP MA-2705 which expires on August 25, 2006. In the event the construction cannot be completed in this time frame another permit will be obtained.
- No significant adverse impact to minority or low-income populations would occur, with respect to Executive Order 12898, *Federal Actions to address Environmental Justice in Minority Populations and low-Income Populations*.

There would be no significant impacts from the Mauna Kea Alternative or No Action Alternative.

LIST INDIVIDUALS, COMMUNITY GROUPS AND AGENCIES CONSULTED

The individuals, community groups, and agencies consulted during the pre-assessment consultation phase of this process are listed in Section 1.7.

Chapter One

Purpose of and Need for Action

CHAPTER ONE
PURPOSE OF AND NEED FOR ACTION

1.1 PROPOSED ACTION

The Air Force Research Laboratory (AFRL) is proposing to complete the Advanced Electro-Optical System (AEOS) telescope building by constructing a mirror coating shop (MCS) at the Maui Space Surveillance Complex (MSSC). MSSC is located within the University of Hawai'i's (UH) Institute for Astronomy (IfA) Haleakalā Observatories. Figure 1 illustrates the location of the MSSC atop Haleakalā, Maui, Hawai'i.

The proposed AEOS MCS would be designed to accommodate the 3.6-meter (11.8-foot) diameter mirror of the highly sensitive AEOS telescope, which requires recoating once every six years to maintain optimal capability. It would also be capable of recoating mirrors associated with other existing and proposed telescope facilities at UH IfA. The AFRL proposes to construct the two-story AEOS MCS to the southwest corner of the existing AEOS telescope building. The shop would be designed to house a staging area, assembly/disassembly area, mirror coating area, optics maintenance area, and mechanical and electrical utility rooms. Construction activities would include connection to utilities, lightning protection, and other site improvements. Construction could begin as early as November 15, 2005, and is expected to be complete by August 25, 2006.

1.2 BACKGROUND

The AEOS telescope is the largest and most sensitive telescope within the Department of Defense (DoD). It provides superb spatial and temporal resolution and atmospheric measurement capabilities. Its sensors produce simultaneous images in the visible and infrared, it has the capability to track both satellites and missiles, and also has full hemispherical viewing at a highly favorable location. When constructed in 1997, the AEOS building was designed to house an integral 3.6-meter (11.8-foot) diameter mirror coating shop; however, due to budget-related constraints, this portion of the project was not included with the telescope construction. Since it has been over six years since AEOS construction, recoating of the telescope mirror is needed to maintain the operational capability of the highly sensitive telescope. To accomplish this operational requirement, the AFRL, in coordination with the UH IfA, proposes to complete the existing AEOS building at the MSSC by constructing a mirror coating shop.

MSSC is located on State-owned, ceded land within the Haleakalā Observatories complex, which is managed by the UH IfA. The U.S. Army Corps of Engineers (USACE) leases the MSSC land from UH IfA for the AFRL. MSSC is part of, and also known as, the Air Force Maui Optical and Supercomputing Site (AMOS), whose primary mission is to conduct space surveillance and research activities for the DoD. Limited amounts of non-DoD research associated with astronomy and atmospheric sciences are also conducted at MSSC. MSSC includes the following facilities: the Ground-Based Electro-Optical Deep Space Surveillance System (GEODSS); the Maui Space Surveillance System (MSSS); the Butler Building; and the AEOS telescope

building, which includes a 3.6-meter (11.8-foot) telescope, 2.4-meter (8-foot) mirror coating chamber, and optical maintenance room.

1.3 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The purpose of the action is to provide a shop to properly maintain the highly sensitive AEOS telescope to meet its DoD operational requirements and other research objectives. This maintenance action, specifically mirror recoating, is needed every six years to maintain the reflectivity necessary for its operational requirements, and more than six years has elapsed since the mirror was installed.

1.4 OBJECTIVES OF THE ACTION

The objectives of the action are as follows:

Objective 1. Provide a mirror coating shop that allows the AEOS telescope mirror to be periodically recoated in a timely manner, as determined by U.S. Air Force operational requirements.

Objective 2. Provide a mirror coating shop that minimizes risk of damage to the mirror, including breakage due to shock and extreme temperature changes, and introduction of dust, mildew, and water to the mirror's surface.

1.5 PURPOSE OF THIS DOCUMENT

This Environmental Assessment (EA) was prepared for two purposes: to satisfy the National Environmental Policy Act of 1969 (NEPA), as amended, 42 United States Code §4321 *et seq.*; and as a requirement under the State of Hawaii Chapter 343 Hawaii Revised Statues (HRS). The EA was prepared in accordance with NEPA; the implementing regulations of the Council on Environmental Quality (CEQ) (40 Code of Federal Regulations [CFR] Parts 1500-1508); and the Department of the Air Force 32 CFR Part 989 Environmental Impact Analysis Process. The EA is required by Chapter 343 HRS, as State land within an historic district is involved, and was prepared in accordance with Chapter 343 HRS and the Hawaii Administrative Rules (HAR) Environmental Impact Rules (Title 11, Chapter 200). The AEOS completion, consisting of construction of the AEOS MCS, is covered under the State Conservation District Use Permit (CDUP) MA-2705, which expires on August 25, 2006. In the event the construction cannot be completed in this time frame another permit will be obtained.

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. The results of the EA provide the decision makers with information needed to determine whether to prepare an Environmental Impact Statement (EIS) or issue a Finding of No Significant Impact (FONSI).

1.6 DECISION(S) TO BE MADE

The AFRL will recommend issuance of a FONSI or preparation of an EIS (under NEPA). The UH IfA will recommend issuance of a FONSI or preparation of an EIS (under HRS Chapter 343).

1.7 PUBLIC PARTICIPATION

1.7.1 Summary of Pre-Assessment Consultations and Relevant Issues

As part of the planning process for the Proposed Action, and in accordance with HAR 11-200, pre-assessment consultations were conducted to seek the advice and input of agencies having jurisdiction or expertise, as well as citizens groups and individuals that may be affected by the Proposed Action. The agencies, persons, and organizations contacted during this phase are listed in Table 1. The EA addresses the relevant issues identified during the pre-assessment which include those related to cultural resources, biological resources, hazardous materials, and access to recreational trails in the area.

Table 1
List of Pre-Assessment Consultation Contacts

Agency/Elected Official/Organization	Contact Name
Federal	
Department of Energy	Ms. Eileen I. Yoshinaka, Pacific Liaison
Department of Interior Fish and Wildlife Service	Mr. Jeff Newman, Acting Field Supervisor, Pacific Islands Ecoregion
Federal Aviation Administration	Mr. Galo Camacho, Facilities Manager
National Park Service	Mr. Donald W. Reeser, Superintendent
National Weather Service/National Oceanic and Atmospheric Administration	Mr. Carl Suekawa, Communications Manager
U.S. House of Representatives	Congressman Neil Abercrombie
U.S. House of Representatives	Congressman Ed Case
U.S. Senate	Senator Daniel Akaka
U.S. Senate	Senator Daniel Inouye
State	
Department of Accounting and General Services Public Works, Planning Branch	Mr. Ralph Morita
Department of Business, Economic Development & Tourism Office of Planning	Mr. John Nakagawa, Planner
Department of Land & Natural Resources Division of Forestry and Wildlife	Mr. Paul Conry, Wildlife Program Manager
Department of Land & Natural Resources Land Division	Mr. Nicholas Vicaro, Land Agent

Table 1
List of Pre-Assessment Consultation Contacts *(continued)*

Agency/Elected Official/Organization	Contact Name
Department of Land & Natural Resources Planning Office	Mr. Samuel J. Lemmo, Chief Planner
Department of Land & Natural Resources State Historic Preservation Division	Ms. Cathleen Dagher, State Historic Preservation Officer
Department of Transportation	Mr. Rodney Haraga, Director
Office of Hawaiian Affairs	Mr. Clyde Nāmu'o
State of Hawai'i	Governor Linda Lingle
State Senate	Senator J. Kalani English
County	
County of Maui	Mayor Alan Arakawa
Department of Land & Natural Resources Division of Forestry and Wildlife Maui Branch	Dr. Fern P. Duvall, II, DLNR Forestry Wildlife biologist
Maui County Council	Councilmembers Robert Carroll, Charmaine Tavares, and Michael Molina
Maui County Cultural Resources Commission	Ms. Dawn Duensing, Long Range Planner (Maui Dept. of Planning)
Maui Department of Planning	Mr. Mike Foley, Director, and Ms. Kivette Caigoi
Maui Department of Parks and Recreation	Mr. Glen Correa, Director
Maui Police Department	Chief Thomas Phillips, Chief of Police
Community	
East Maui Irrigation Company	Mr. Mark Vaught, Operations Manager
Friends of Haleakalā National Park	Dr. Charlie Fein, President
Friends of Polipoli	Brian Jenkins, Esq., Board Member
CKM Cultural Resources	Mr. Charles K. Maxwell, Sr., Chair
Hawai'i Public Radio	Mr. Michael Titterton, General Manager
KGMB	Mr. Kenny Elcock, Interim Chief Engineer
Kula Community Association	Mr. Dick Mayer, Vice President
Kipahulu Community Association	Ms. Tweetie Lind
Leeward Watershed Project	Mr. Art Medeiros, U.S. Geological Survey (USGS) biologist
Maui Electric Company, Inc.	Engineering Department
Maui Tomorrow	Ms. Lucienne de Naie, Vice President
Sierra Club, Maui	Mr. Lance Holter, Chair
Maui Na Ala Hele Advisory Council	Ms. Torrie Nohara, Trails and Access Specialist

Table 1
List of Pre-Assessment Consultation Contacts *(continued)*

Agency/Elected Official/Organization	Contact Name
Mobile One, Inc.	Mr. David Williams
Raycom Media, Inc.	Mr. Brian Kam, Comptroller
Royal Order of Kamehameha, Heiau O Kahekili and Maui County Fire Department	Mr. Carl Kaupalolo
Sandia Laboratories	Mr. Norman Nitta, Assistant Site Manager
The Nature Conservancy, Maui	Ms. Melissa Chimera, Natural Resources Manager
Verizon Hawai'i	Ms. Lynette Yoshida, Section Manager

1.7.2 Draft EA Comments and Responses

The availability of the Draft EA and the anticipated FONSI were announced in the June 23, 2005, issue of *The Environmental Notice*, published by the State of Hawaii Office of Environmental Quality Control. Copies of the Draft EA were distributed to the agencies, citizen groups, individuals, and libraries listed in Table 2.

Table 2
Distribution List

Agency/Elected Official/Organization	Name
Federal	
National Park Service	Mr. Donald W. Reeser Superintendent
Department of Interior Fish and Wildlife Service	Mr. Patrick Leonard Acting Field Supervisor, Pacific Islands Ecoregion
Federal Aviation Administration	Mr. Galo Camacho, Facilities Manager
Department of Energy/NOAA	Ms. Eileen I. Yoshinaka, Pacific Liaison
National Weather Service	Mr. Carl Suekawa, Communications Manager
State	
Office of Environmental Quality Control	
University of Hawaii, Institute for Astronomy	Mr. Michael Maberry
Department of Health Clean Air Branch	
Department of Health Clean Water Branch	
Department of Health Wastewater Branch	
Department of Land & Natural Resources Office of Conservation and Coastal Lands	Mr. Sam Lemmo, Administrator
Department of Land & Natural Resources State Historic Preservation Division	Mr. Peter Young, State Historic Preservation Officer
Office of Hawaiian Affairs	Mr. Clyde Nāmu'o, Administrator
Department of Transportation	Mr. Rodney Haraga, Director

Table 2
Distribution List *(continued)*

Agency/Elected Official/Organization	Name
Office of Planning – Coastal Zone Management Program	Mr. John Nakagawa, Planner
County	
Maui Department of Planning	Mr. Michael Foley, Director
Community	
Hana Public & School Library	
Kahului Public Library	
Kihei Public Library	
Makawao Public Library	
East Maui Irrigation Company	Mr. Mark Vaught, Operations Manager
Friends of Haleakala National Park	Dr. Charlie Fein, President
Friends of Polipoli	Brian Jenkins, Esq., Board Member
CKM Cultural Resources	Mr. Charles K. Maxwell, Sr., Chair
Hawaii Public Radio*	Mr. Michael Titterton, General Manager
Kipahulu Ohana Inc	Ms. Tweetie Lind
Kipahulu Community Association	Mr. Farley Jacob, President
Kula Community Association	Mr. Dick Mayer, Vice President
Lee Enterprises, Inc. DBA KGMB TV	Mr. Kenny Elcock
Leeward Watershed Project	Mr. Art Medeiros, USGS-BRD
Maui Electric Company	Engineering Dept.
Mobile One, Inc.	Mr. David Williams
Maui Na Ala Hele Advisory Council	Ms. Torrie Nohara, Trails and Access Specialist
Raycom Media Inc.	Mr. Brian Kam, Comtroller
Royal Order of Kamehameha, Heiau O Kahekili and Maui County Fire Department	Mr. Carl Kaupalolo
Sandia Laboratories	Mr. Norman Nitta, Assistant Site Manager
Sierra Club, Maui Group	Mr. Lance Holter, Chairperson
Maui Tomorrow	Ms. Lucienne de Naie, Vice President
The Nature Conservancy, Maui	Ms. Melissa Chimera, Natural Resources Manager
Hawaiian Telecom	Ms. Lynette Yoshida, Section Manager-OSPE

1.7.3 Comments Received

Following the procedures established in HAR 11-200, comments received or postmarked within the 30-day comment period between June 23, 2005, and July 22, 2005, are timely. Commenters providing their input within this period are listed in Table 3. Commenters providing their input

after the close of the 30-day comment period are identified with an asterisk. Comment and response letters are provided in Appendix D.

Table 3
List of Commenters on the Draft EA

Agency/Organization	Name
Federal Aviation Administration	Ms. Darice B. N. Young, Realty Contracting Officer
*Maui Department of Planning	Mr. Michael W. Foley
Office of Environmental Quality Control	Ms. Genevieve Slamonson, Director
Department of Health Clean Water Branch	Mr. Denis R. Lau, P.E., Chief
Office of Hawaiian Affairs	Mr. Clyde W. Nāmu'o, Administrator
Department of Health Environmental Planning Office	Ms. June F. Harrigan-Lum, Manager
Department of Transportation	Mr. Rodney K. Haraga, Director
Office of Planning – Coastal Zone Management Program	Ms. Laura H. Thielen, Director
Friends of Polipoli	Brian Jenkins, Esq., Presidentr
Maui Electric Company	Mr. Neal Shinyama, Manager, Engineering

1.8 RELATED DOCUMENTS

In 1994, an EA and a FONSI were prepared, and a CDUP was issued, for construction and operation of the AEOS telescope and related improvements which included a mirror coating shop in the AEOS telescope building at MSSC. However, due to budget-related constraints, the mirror coating shop portion of the project was not included with the telescope construction.

In January 2005, UH IfA prepared a Long Range Development Plan (LRDP) for the Haleakalā Observatories, which includes the AEOS MCS as a construction project planned in the next 10 years. The LRDP describes the general environmental and biological resources, cultural and historic conditions, site characteristics, and construction practices that will guide future development and protect resources at Haleakalā Observatories. The following LRDP attachments were used in preparation of this EA:

- *Archaeological Inventory Survey of 18.1-acre parcel at Science City, Haleakala Crater, Papa'anui Ahupua'a, Makawao District, Maui Island (TMK: 2-2-07 por. of 8)*, conducted by Xamanek Researches for KC Environmental, Inc. April 2003.
- *Traditional Practices Assessment for the Summit of Haleakalā,* conducted by Cultural Resources for KC Environmental, Inc. December 2002.
- *Cultural Resources Evaluation for the Summit of Haleakalā*, conducted by CKM Cultural Resources for KC Environmental, Inc. March 2003.
- *Botanical Survey, University of Hawai'i "Haleakala Observatories," Island of Maui, Hawai'i,* conducted by Forest Starr and Kim Starr for KC Environmental, Inc. November 2002.
- *Hawaiian Petrels Near the Haleakalā Observatories: A report to K.C. Environmental, Co. Inc., For Preparation of a Long-Range Development Plan,* conducted by the National

Park Service, U.S. Department of the Interior, Haleakala National Park. January 16, 2004.

- *Arthropod Inventory and Assessment, Haleakalā High Altitude Observatory Site Maui, Hawai'i,* conducted by Pacific Analytics, L.L.C. for K.C. Environmental Co., Inc. July 2003.
- *Arthropod Inventory and Assessment, Haleakalā High Altitude Observatory Site Maui, Hawai'i, Species List,* conducted by Pacific Analytics, L.L.C. for KC Environmental, Inc. October 2003.
- *Geological Survey of the University of Hawai'i Haleakalā Observatories at Haleakalā Summit Region, East Maui, Hawai'i,* conducted by S. Bhattacharji. May 4, 2004.
- *Haleakalā Observatory Vehicle Traffic,* conducted by Phillip Rowell and Associates. 2003.

1.9 PERMITS AND APPROVALS

The AFRL and UH IfA are responsible for ensuring that the project is executed in accordance with applicable environmental laws, regulations, and rules.

Government consultations and permits identified during development of this document are identified in Table 4. The AFRL will be responsible for obtaining permits and completing consultations for work at Haleakalā.

Table 4
Summary of Consultations and Permits

Consultations and Permits	Regulatory Agency
Federal	
Informal consultation in accordance with Section 7 Endangered Species Act (ESA)	U.S. Department of the Interior, U.S. Fish and Wildlife Service (USFWS)
Consultation in accordance with Section 106 of the National Historic Preservation Act (NHPA)	State DLNR, State Historic Preservation Division (SHPD)
Negative Determination under the Coastal Zone Management (CZM) Program	Department of Business, Economic Development and Tourism (DBEDT), State Office of Planning, CZM Program
State of Hawai'i	
Oversized and Overweight Vehicles on State Highways Permit	State Department of Transportation Highways Division
Individual Wastewater System Approval	State DOH, Wastewater Branch
National Pollutant Discharge Elimination System (NPDES), if area of disturbance is 0.4 hectares (1 acre) or greater	State Department of Health (DOH), Clean Water Branch

Chapter Two

Proposed Action and Alternatives

CHAPTER TWO
PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

This chapter describes the alternatives, including the Proposed Action, which were developed to meet the following project objectives: (1) provide a mirror coating shop that allows the AEOS telescope mirror to be periodically recoated in a timely manner and (2) provide a mirror coating shop that minimizes risk of damage to the mirror.

Alternatives considered include: the Proposed Action, with construction of the proposed AEOS MCS; the Mauna Kea Alternative, where the AEOS mirror would be recoated at an existing facility atop Mauna Kea on the island of Hawai'i, and the No Action Alternative.

2.2 PROPOSED ACTION

The AFRL is proposing to construct the AEOS MCS to complete the AEOS telescope building at the MSSC. The AEOS MCS would be located within the conceptual AEOS building area presented in the 1994 EA (Figure 2).[1] Implementation of the Proposed Action would complete most of the AEOS support facilities that were not included during construction in 1997. The shop would be designed to house a staging area, assembly/disassembly area, mirror coating area, optics maintenance area, and mechanical and electrical utility rooms.

The proposed two-story AEOS MCS would be on the southwest corner of the AEOS telescope building, with a total area of not greater than 906 square meters (9,749 square feet). The actual footprint area, to be determined during the design process, would be within the paved area surrounding the AEOS telescope building. The shop would not exceed the existing height of the AEOS building of approximately 12 meters (40 feet), excluding the telescope dome enclosure. To achieve the required floor strength for the AEOS MCS, concrete may be installed on top of the existing pavement, and some areas of existing pavement may be saw cut and removed for installation of concrete footings. The AEOS MCS would meet MSSC site constraints including: existing lease boundaries, dome actuator crane access, water truck access, access to electrical transformers in the existing AEOS telescope building, and MSSC circulation requirements.

Construction activities will utilize LRDP construction practices for environmental protection of site resources. Such practices include providing for a cultural monitor; painting the building exterior to match the surrounding ground surface and existing buildings; and coordinating the use of sterilized off-site fill material, if needed, with the National Park Service.[2] In addition, construction activities will comply with measures identified by the U.S. Fish and Wildlife Service during informal consultation.

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1 Belt Collins Hawaii. March 1994. *Final Environmental Assessment/Negative Declaration Advanced Electro-Optical System (AEOS) Telescope and Related Improvements at the Maui Space Surveillance Site (MSSC) Haleakala, Maui, Hawaii.* Prepared on behalf of the U.S. Air Force Space Systems Command.

2 KC Environmental, Inc. January 2005. *University of Hawai'i Institute for Astronomy Haleakalā High Altitude Observatory Site Long Range Development Plan.*

Infrastructure improvements would include the following: connection to the existing AEOS sewer septic system, connection to the existing water supply for fire and drinking water, connection to existing storm drains, and connection to existing electrical and communication sources. While the AEOS MCS would be connected to the existing sewer septic system, there would be no floor drains in the mirror stripping area. A grounding system and lightning protection system would also be installed. The utility and structural work may include saw cuts to remove some existing pavement.

Construction could begin as early as November 15, 2005, and is expected to end by August 25, 2006. Construction would cost approximately $7.5 million and would be done under a design-build contract that would be awarded after completion of the NEPA process.

Construction and operation of the AEOS MCS would not restrict access to public areas. MSSC is a secured military facility that will continue to have restricted access. Access to recreational areas, such as the Skyline Trail and the Polipoli Trail located beyond Haleakalā Observatories, would not be restricted. Building pad cement would be transported in trucks, with water added at or near the summit, to avoid the need for a concrete batch plant.

Operation of the AEOS MCS would involve stripping and recoating the telescope mirror. The mirror would be placed within a plastic-lined wash tank, where the degraded reflective surface would be stripped off the mirror using an acid solution. The mirror would then be transferred to a vacuum chamber, where the reflective surface of the mirror would be restored via vapor deposition. Tungston filaments with aluminum, located at one end of the chamber, would be turned on to melt and vaporize the aluminum which would then be deposited onto the surface of the glass. The AEOS telescope would be out of operation for approximately four weeks during this process and the revenue lost during the mirror recoating would be approximately $1.2 million.

No additional personnel are needed for mirror recoating operations, so no increase in MSSC personnel would occur and no additional Anti-Terrorism/Force Protection standoff would be required.

2.3 MAUNA KEA ALTERNATIVE

The Mauna Kea Alternative considers recoating the AEOS mirror at one of three existing mirror coating chambers at the Mauna Kea Science Reserve atop Mauna Kea on the island of Hawai'i (Figure 3). The facilities are located at: the Gemini Observatory, which is operated by an international partnership of seven countries managed by the Association of Universities for Research in Astronomy; the National Astronomical Observatory of Japan's Subaru Telescope; and the non-profit Canada-Hawai'i-France Telescope (Figure 4). Under this alternative, there would be no associated construction and the AEOS mirror would be out of operation for approximately 12 weeks (three times longer than the Proposed Action). An 18.1-metric ton (20-ton) crane would need to be assembled at MSSC to remove and reinstall the mirror. The crane would be disassembled during the three-month recoating process to prevent interference with water truck deliveries.

Transportation to this site involves multiple loading and unloading operations, shipment by barge, and travel over roads that are steep, narrow, curved, and unpaved. This places the mirror at high risk for breakages and results in extended downtime required for transportation. Utilizing

one of the Mauna Kea facilities would involve the following mirror loading and transport activities: removal from the AEOS telescope building by a crane, transport down Haleakalā to Kahului Harbor via truck, transport from, Kahului Harbor to Kawaihae Harbor or Hilo Harbor on the island of Hawai'i via barge, transport from one of the two harbors to the top of Mauna Kea via truck, load into the recoating chamber, and then reversing the process to return the mirror to the AEOS telescope building atop Haleakalā. The roads to both Haleakalā and Mauna Kea summits are steep, and inclement weather can cause poor visibility and increase the risk of brake failure and weather-related accidents. Extreme weather conditions could also expose the mirror to moisture, cold, heat, and dust, increasing the potential for damage. Hence, transportation of the mirror would be limited to fair weather.

This alternative would cost $2.75 million to implement, plus an estimated $3.6 million loss of revenue while the AEOS telescope is out of operation. These costs would be incurred each time the AEOS mirror is recoated, approximately every six years.

2.4 NO ACTION ALTERNATIVE

Under the No Action Alternative, the AEOS MCS would not be constructed at MSSC and the AEOS mirror would not be recoated. The project objectives identified in Section 1.4 would not be met. The AEOS mirror would continue to degrade and be unable to maintain its current capabilities. Operations and experiments involving the AEOS telescope would decrease, resulting in a loss of a national asset and educational opportunities. Government funding for the MSSC would decrease, and a 75 percent loss in the annual payroll (greater than $18 million) for the MSSC research and operations would be anticipated.

2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

Other alternatives were considered for recoating the AEOS mirror, however these alternatives were eliminated from further analysis due to the rationales provided.

Alternative MSSC Configuration. The other locations within the lease boundaries that could accommodate the mirror coating shop are west of the Proposed Action location. However, one location would prohibit delivery of fire and drinking water for MSSC and block crane access, which is needed for the dome actuator maintenance, and the other would require relocating threatened 'ahinahina plants.

Construct Mirror Coating Building Elsewhere on Maui. Under this alternative a mirror coating building would be constructed on Maui, but not at MSSC. The location of this structure may require acquisition of land prior to construction or purchase of existing structures that would need to be modified to perform the recoating operations. For the recoating, the mirror would be removed from the telescope, transported down and back up Haleakalā, and then reinstalled at AEOS. The transportation risks would be similar to those under the Mauna Kea Alternative. Construction of the mirror coating building would require identification and acquisition of appropriate land, and construction of an independent structure with appropriate infrastructure connections, setbacks, and security boundaries. Under this option, a location would have to be selected and acquisition documents may be required that would further extend the time that the

AEOS mirror is used beyond its 2003 recoating date. This delay could impair the reflectivity of the telescope, thereby adversely affecting the mission.

Recoat Mirror at Kitt Peak, Arizona. This alternative would require transporting the mirror approximately 9,976 kilometers (6,200 miles) roundtrip to an existing recoating facility located south of Tucson, Arizona. For the recoating, the mirror would be removed from the AEOS telescope building, transported down Haleakalā, shipped via plane to the continental United States, trucked to the recoating facility, and then the process would be reversed to return the mirror to AEOS atop Haleakalā. The transportation risks would be higher than those associated with the Mauna Kea Alternative because of the extensive distance traveled by plane. Under this alternative, the mirror would be out of operation for 15 weeks. This option would result in the AEOS telescope being inoperable for a longer period (nearly four times longer) than under the Proposed Action.

Build a New Mirror and Mirror Cell. This alternative would involve applying a reflective coating to a blank mirror and manufacturing a mirror cell and specialized equipment, which is customized for each mirror, on the continental United States. The new mirror would then be transported to AEOS atop Haleakalā via truck and plane. The original mirror would be transported to the continental United States, recoated, and then reinstalled at AEOS at the end of the new mirror's operational life. Thereafter, the two mirrors and cells would continue to rotate on a six-year cycle. This short-term solution would initially cost $3 to $5 million, would take two to three years to complete, and would not meet the project objectives.

2.6 SUMMARY COMPARISON OF ALTERNATIVES AND POTENTIAL CONSEQUENCES

Table 5 presents a summary of the anticipated environmental effects of the Proposed Action, Mauna Kea Alternative, and No Action Alternative. Planned management and design constraints are also identified.

Table 5
Comparison of Alternatives

Relevant Affected Resources / Issues	Alternatives		
	Proposed Action	Mauna Kea Alternative	No Action
Land Use			
	No significant impact on land use. The Proposed Action would support and be consistent with the goals and objectives of applicable State, County, community, and Haleakalā Observatories plans.	No significant impact on land use. The Mauna Kea Alternative would be consistent with the goals and objectives of applicable land use plans at the Mauna Kea Science Reserve.	No impact.
Cultural Resources			
	No significant impact on cultural resources. Consultation under Section 106 of the NHPA has been completed with the SHPD, which has concurred with AFRL's determination that "no historic properties will be affected" by the Proposed Action. Archaeological resources, historic properties, and traditional cultural practices would not be disturbed or affected. To ensure protection of nearby archaeological resources and respect the summit's cultural resources, the following LRDP provisions would be incorporated into the construction and operation of the proposed AEOS MCS. • A cultural specialist will be retained. • The cultural and archaeological sites and features identified near MSSC, but outside the project area, would not be affected. The two sites nearest to proposed construction and staging areas are already protected as Site 2806 is clearly marked with fence buffer and Site 5440 is separated from the staging area by a road. • Workers will attend UH-approved "Sense of Place" training prior to working at the site. • A cultural specialist shall be retained to conduct a cultural inspection of Haleakalā Observatories, including the proposed AEOS MCS site, three times per year. In addition, the contractor shall stop work if iwi (bones) or native Hawaiian cultural or traditional deposits are found during ground disturbance activities.	No impact. Existing facilities, roads, and harbors would be used.	No impact.

Relevant Affected Resources / Issues	Alternatives		
	Proposed Action	Mauna Kea Alternative	No Action
Biological Resources			
	The AFRL has completed informal consultation with the USFWS, under Section 7 of the ESA, to evaluate the potential impacts of the Proposed Action on threatened and endangered species near the project area. The USFWS has concurred with AFRL's determination that the Proposed Action is not likely to adversely affect the 'ahinahina, 'ua'u, nēnē, or Hawaiian hoary bat at Haleakalā. To minimize the potential effects of construction activities on the 'ahinahina, 'ua'u, and nēnē, the AFRL and USACE will ensure that construction of the AEOS MCS will be in accordance with the practices identified in the LRDP and with measures identified by the USFWS, as presented below. • Workers will attend UH-approved environmental sensitivity training. • Loads will be inspected for invasive species prior to being transported to Haleakalā. • Importation of fill material, if needed, will require sterilization and will be coordinated with the National Park Service. • Heavy equipment parking and materials storage will remain within Haleakalā Observatories boundaries. • Food trash will be collected in tight-lidded containers and removed on a daily basis to prevent increases to the population of mice and rats that prey on native species. • AFRL will mark nearby 'ahinahina locations and ensure construction activities and workers do not disturb the plants. • Current Haleakalā National Park maps of 'ua'u burrow locations will be provided to contractors to identify and avoid these areas. AFRL will work with the Haleakalā National Park Service to monitor the burrows during construction. The contractor will notify the UH IfA of any 'ua'u mortalities. • The contractor will not construct fences, to prevent 'ua'u mortality from collisions.	No significant impacts. No new construction. Mirror transport truck would be inspected for invasive alien species before ascending Mauna Kea. Existing facilities, roads, and harbors would be used.	No impact.

Relevant Affected Resources / Issues	Alternatives		
	Proposed Action	Mauna Kea Alternative	No Action
	• No night construction is planned and no extra lighting is anticipated to be needed. • The AFRL will not induce 'ua'u disturbing ground vibration during the mid-February to mid-November nesting season, and vibratory rollers will not be used during this time. During construction activities conducted when 'ua'u may be present outside the nesting season, steps will be taken to minimize the level of vibration. AFRL will measure ground vibration during all phases of construction and will work with the Haleakalā National Park Service biologist to interpret data relative to species impacts. • Ground disturbance activities at the construction staging area will not exceed current and past operations (vehicle movement, personnel walking, equipment/supply storage and handling).		
Visual Resources			
	No significant impacts would occur. • Construction equipment (such as cranes) would have short-term, temporary impacts. • Construction contractor would minimize the area of disturbance and properly store construction materials. • The proposed AEOS MCS would not be visible from Pu'u Ula'Ula (Red Hill) or Pa Ka'oao (White Hill) Visitor Center. The building exterior color would match the surrounding ground surface and existing buildings at MSSC. • The proposed AEOS MCS would not be visible from distant viewpoints.	No significant impacts would occur. • Construction and operation of the crane to remove and reinstall the mirror at the AEOS telescope on Haleakalā before and after transport would be short-term and temporary. • No permanent structures would be built under this alternative.	No impact.

Relevant Affected Resources / Issues	Alternatives		
	Proposed Action	Mauna Kea Alternative	No Action
Geology, Topography, and Soils			
Impacts on geological features, topography, and soils	No significant impacts would occur. • The Proposed Action would occur on previously graded and disturbed land. • Minimal grading and excavation for structural footings would occur as construction would be on existing paved areas. • Appropriate erosion control controls would be in place during construction activities. • If the area of disturbance, which will be determined during the design phase, is 0.4 hectare (1 acre) or greater, a National Pollutant Discharge Elimination system (NPDES) permit for storm water discharges would be obtained.	No impact.	No impact.
Hydrology			
	No significant adverse impacts to surface water or groundwater would occur: • Storm water and non-storm water runoff would be minimized during construction. • After construction, storm water runoff would drain into existing inlets in the pavement and/or onto surrounding areas and infiltrate.	No impact.	No impact.
Air Quality			
	No significant impacts to air quality. • Administrative and engineering controls would minimize fugitive dust during construction. • Emissions from mirror coating activities would remain exempt from permitting, as specified in HAR Title 11, Chapter 60.1-62(d).	No significant adverse impacts to air quality.	No impact.

Relevant Affected Resources / Issues	Alternatives		
	Proposed Action	Mauna Kea Alternative	No Action
Infrastructure			
Impacts to roads and traffic.	No significant impacts to infrastructure would occur. • Vehicle routes would be identified and scheduled with National Park Service. • Construction-related vehicles would slightly increase during construction which would be for a short duration. • Construction workers would carpool to the summit. • Transport of non-standard loads to the summit would occur during off-peak hours, and would be coordinated with National Park Service. • Construction practices would comply with the LRDP.	No significant impacts to infrastructure would occur. • Vehicle routes would be identified and scheduled with National Park Service, State authorities, and Mauna Kea Science Reserve. • Transport of the AEOS mirror to Mauna Kea would occur once every six years. • Transport would occur during off-peak hours, and would be coordinated with National Park Service.	No significant impacts. Decreased operation of the AEOS telescope could reduce the number of personnel commuting to the summit.
Impacts to water infrastructure.	No significant impacts to water infrastructure or demand would occur as there would be no increase in personnel or water usage at MSSC.	No significant impacts to water infrastructure or demand would occur as there would be no increase in personnel or water usage at Mauna Kea Science Reserve.	No impact.
Impacts to power and communication.	No significant impacts to electrical or communications infrastructure or demand would occur as the existing power and communications infrastructure is capable of handling the anticipated increased demands without upgrades outside of MSSC.	No impacts.	No impacts.
Impacts to waste collection and disposal.	No significant impacts to solid waste or wastewater infrastructure or demand would occur. • There would be no change in the number of MSSC users. • There would be no change in the long-term solid waste disposal activities.	No impacts.	No impacts.
Public Health and Safety			
Hazardous Materials and Waste	No significant impacts on public health or safety from hazardous materials or waste would occur. Hazardous materials and waste would be properly handled, stored, and disposed of to prevent release to the environment.	No significant impacts on public health or safety from hazardous materials or waste would occur for the same reasons described under the Proposed Action.	No impacts.

Relevant Affected Resources / Issues	Alternatives		
	Proposed Action	Mauna Kea Alternative	No Action
Noise	No significant impacts on public health or safety from noise would occur. • Construction noise would be short-term and temporary. • Operational noise would be limited to the shop interior.	No significant impacts on public health or safety from noise would occur as the truck transporting the AEOS mirror to the Mauna Kea Science Reserve once every six years would not increase the occasional vehicular noise.	No impacts.
Socioeconomics			
	No significant impact to socioeconomics would occur. • Construction would have a temporary, beneficial impact to the economy. • There would be no increase in personnel at MSSC to operate the AEOS MCS. • The Proposed Action would occur in a secured military facility that would continue to have restricted access. Therefore, with respect to Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, no significant adverse impacts to minority or low-income populations would occur.	No significant impacts to socioeconomics would occur. • There would be no change in the number of personnel at Mauna Kea Science Reserve. • No adverse impacts to minority or low-income populations would occur, with respect to Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, as an existing facility would be used for its intended purpose.	A 75 percent loss in the annual payroll (greater than $18 million) and educational opportunities for the MSSC research and operations would be anticipated.

Chapter Three

Affected Environment

CHAPTER THREE
AFFECTED ENVIRONMENT

Chapter Three describes the affected environment for the Proposed Action and Mauna Kea Alternative. Resources described include: land use, cultural, biological, visual, geologic, topographic and soils, hydrologic, air quality, and infrastructure. In addition, the existing public health and safety conditions (associated with hazardous materials and waste, and noise) and socioeconomics are described.

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 DLNR, are Protective, Limited, Resource, General, and Special.

3.1.1 Proposed Action

The proposed AEOS MCS site is adjacent to the AEOS telescope building located in the MSSC. MSSC is located in the UH IfA's Haleakalā Observatories at the summit of Haleakalā. Real estate records show that Haleakalā Observatories is ceded land, (former crown and government lands of the Kingdom of Hawai'i that were ceded to the U.S. upon annexation) that has been owned by the State since the institution of the modern system of land ownership.[1] In 1961, the Kolekole area was designated, by Executive Order 1987 from Governor Quinn, to be under the control and management of the UH, which established the Haleakalā High Altitude Observatory Site.[2]

The Haleakalā Observatories is State-designated as Conservation District General Subzone (Figure 5). The objective of the General Subzone is to designate open space where specific conservation uses may not be defined, but where urban use would be premature.[3]

In addition to MSSC, Haleakalā Observatories includes: the UH IfA's C. E. Kenneth Mees Solar Observatory (MSO); the UH IfA's LURE (formerly the Lunar and Satellite Ranging Observatory), which includes the University of Tokyo, the National Observatory of Japan, and the Australian National University's two-meter (6.6-foot) telescope that supports the Multi-color Active Galactic Nuclei Monitor (MAGNUM) Project; the UH IfA's Atmospheric Airglow, Zodiacal Light, and Cosmic Ray Neutron Monitor Station, which are being used in association

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1 Belt Collins Hawaii. March 1994. *Final Environmental Assessment/Negative Declaration Advanced Electro-Optical System (AEOS) Telescope and Related Improvements at the Maui Space Surveillance Site (MSSS) Haleakalā, Maui, Hawai'i.* Proposed by University of Hawai'i Institute for Astronomy. Prepared on behalf of U.S. Air Force Space Systems Command.

2 KC Environmental, Inc. January 2005. *University of Hawai'i Institute for Astronomy Haleakalā High Altitude Observatory Site Long Range Development Plan.*

3 State of Hawai'i. 2003. HAR 13-5. http://www.hawaii.gov/dlnr/land/rules/Ch13_5-Amend_200212.pdf. Accessed January 15, 2004.

with the University of Chicago Enrico Fermi Institute; and the Faulkes Telescope Facility, which is owned and operated by a non-profit organization (Figure 6).

Immediately east of Haleakalā Observatories is the General Broadcasting Area, with television transmitting and receiving stations on State-owned land. A Federal Aviation Administration (FAA) air traffic control repeater station and a U.S. Department of Energy (DOE) research facility are situated immediately to the west of Haleakalā Observatories. Other land bordering Haleakalā Observatories is owned by the State and controlled by the DLNR.

The road leading up to Haleakalā Observatories crosses through Haleakalā National Park, which is designated as a Conservation District Resource Subzone (Figure 5). Land to the east and south of Haleakalā Observatories is also designated as Conservation District Resource Subzone. The objective of the Resource Subzone designation is to develop, with proper management, areas to ensure sustained use of the natural resources such as park land, recreational uses, or harvest of forest products. Conservation District Limited Subzone land is designated to the west of Haleakalā Observatories. The objective of the Limited Subzone designation is to limit uses where natural conditions suggest constraints on human activities such as land susceptible to floods and soil erosion, or lands necessary for the protection of public health and safety.

3.1.2 Mauna Kea Alternative

The Mauna Kea Science Reserve, located atop Mauna Kea on the island of Hawai'i, is located in the Conservation District Resource Subzone.[4]

3.2 CULTURAL RESOURCES

3.2.1 Proposed Action

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. While it is a challenge to describe the cultural resources for such a culturally rich area, for the purposes of this EA, cultural resources are summarized under these categories: archaeological resources, historical resources, and traditional cultural practices.

A brief summary of historical uses of Haleakalā Observatories area is presented herein, as such uses have contributed to the area's archaeological, historical, and traditional cultural practices resources. In pre-historic times, Haleakalā was used as a trans-Maui thoroughfare and as a source of basalt for making ko'i (adze, a bladed tool).[5] In the late 1800s, Haleakalā Ranch grazed cattle in the crater area, and a rest house for travelers was built on the crater rim.[6] This structure was

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[4] State of Hawai'i. 2003. HAR 13-5. http://www.hawaii.gov/dlnr/land/rules/Ch13_5-Amend_200212.pdf. Accessed January 15, 2004.

[5] Rosendahl, M. 1978. *Preliminary Overview of Archaeological Resources at Haleakalā National Park, Island of Maui.* Bernice P. Bishop Museum, Honolulu. As reported in Belt Collins Hawaii. March 1994. *Final Environmental Assessment/Negative Declaration Advanced Electro-Optical System (AEOS) Telescope and Related Improvements at the Maui Space Surveillance Site (MSSS) Haleakalā, Maui, Hawai'i.* Proposed by University of Hawai'i Institute for Astronomy. Prepared on behalf of U.S. Air Force Space Systems Command.

[6] Xamanek Researches. April 30, 2003. *Archaeological Inventory Survey of 18.1-acre parcel at Science City, Haleakala Crater, Papa'anui Ahupua'a, Makawao District, Maui Island (TMK: 2-2-07: por. of 8).* Prepared for KC Environmental, Inc.

turned over to the National Park Service in 1934, and in the following year a paved highway to the summit was constructed. By 1941, the Army was investigating the use of Haleakalā for defense installations, and after World War II, the military continued using land outside of the Haleakalā National Park. In 1960, the UH commenced operations of a geophysical laboratory at Kolekole, which has grown to include the various facilities at Haleakalā Observatories.

3.2.1.1 Archaeological Resources

The archaeological resources at Haleakalā Observatories are described in several studies conducted at the summit in recent years, including an archaeological inventory survey prepared in 2003.[7] 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 nearby sites are listed in the State Inventory of Historic Places (SIHP) as: 2805, 2806, 5439, and 5440.[8] Sites 2805 and 2806 are individual wind shelters that consist of partial enclosures for temporary habitation. Sites 5439 and 5440 are each complexes of wind shelters consisting of level areas cleared of loose rock with some type of rock modification that form walls for protection from wind. Site 5440 also includes two petroglyph images and a possible burial. Other sites, identified at Haleakalā Observatories, included wind shelters, and a historic radio telescope foundation, plus a probable trail segment.

As a whole, the various sites are a remnant of a native Hawaiian cultural landscape. The sites at Haleakalā Observatories qualify for significance under Criterion "d" of the State HAR Title 13, Subtitle 13, Chapter 277 "Rules Governing Procedures for Historic Preservation Review," which means they have yielded, or are likely to yield, important information for research on prehistory or history.[9] In response to the significance criteria for the area, the Archaeological Inventory Study recommended passive in-place preservation and archaeological monitoring during future construction.

3.2.1.2 Historical Resources

State historic properties are identified in HAR 13-198 as any building, structure, object, district, area, or site that is significant in history, architecture, archaeology, or culture of the state, its communities, or the nation. National historic properties meet criteria identified in 36 CFR Part 60.4. Historic sites that meet eligibility criteria may be listed on the appropriate State or National Register of Historic Places (NRHP), or both (which are discussed in Section 3.2.1.1). This section addresses buildings, structures, and sites other than archaeological resources that are designated as historic properties.

The National and State registers of historic places do not include sites at Haleakalā Observatories. However, the 17,000-acre Crater Historic District Haleakalā National Park (Site

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7 Xamanek Researches. April 30, 2003. *Archaeological Inventory Survey of 18.1-acre parcel at Science City, Haleakala Crater, Papa'anui Ahupua'a, Makawao District, Maui Island (TMK: 2-2-07: por. of 8).* Prepared for KC Environmental, Inc.

8 Each site number is prefaced with 50-50-11 to indicate the State of Hawai'i (50), Maui (50), and the Kilohana quadrangle (11)

9 Xamanek Researches. April 30, 2003. *Archaeological Inventory Survey of 18.1-acre parcel at Science City, Haleakala Crater, Papa'anui Ahupua'a, Makawao District, Maui Island (TMK: 2-2-07: por. of 8).* Prepared for KC Environmental, Inc.

1739) extends outside the Haleakalā National Park boundaries, and includes non-Federal lands such as the Haleakalā Observatories, including the project area.[10]

3.2.1.3 *Traditional Cultural Practices*

A two-document report presenting the cultural resources at Haleakalā Observatories provides details on the traditional practices and cultural resources in the project area (Appendix A).[11] Traditional cultural practices on Haleakalā are associated with resources (e.g., basalt and hunting), trails, individual topographic features, burial locations, cultural landscapes, and navigational traditions.

The cultural significance of Haleakalā (House of the Sun) has connections to the legends of Pele, who died at Haleakalā during a battle with her rival sister, and the demi-god Māui, who lassoed the sun to slow it down.[12] Historical uses of Haleakalā included meditation and prayers by kāhuna (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).[13] The summit area has been used to train kāhuna 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 kāhuna, while commoners were only allowed there 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. The location of the burial was usually entrusted to one person, who kept the location secret until death.

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.[14] Modern uses of the Kolekole area include the gathering of flora and fauna for medicinal purposes and for adornments by Kumu Hula (hula teachers).

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10 State of Hawai'i DLNR, SHPD. *National and State Register of Historic Places* Kilohana Quadrant http://www.hawaii.gov/dlnr/hpd/index.htm. Accessed September 25, 2004.
Personal Communication. Ms. Elizabeth Gordon, National Park Service, with Ms. Arlette St. Romain Meader, Belt Collins, October 20, 2004.

11 CKM Cultural Resources. December 2002. *Traditional Practices Assessment for the Summit of Haleakalā.* Prepared for KC Environmental, Inc.
CKM Cultural Resources. March 2003. *Cultural Resources Evaluation for the Summit of Haleakalā.* Prepared for KC Environmental, Inc.

12 CKM Cultural Resources. December 2002. *Traditional Practices Assessment for the Summit of Haleakalā.* Prepared for KC Environmental, Inc.

13 CKM Cultural Resources. March 2003. *Cultural Resources Evaluation for the Summit of Haleakalā.* Prepared for KC Environmental, Inc.

14 Ibid.

3.2.2 Mauna Kea Alternative

The DLNR State Historic Preservation Division (SHPD) intends to propose the Mauna Kea summit region for inclusion in the NRHP as a historic district because "it encompasses a sufficient concentration of historic properties (i.e., shrines, burials and culturally significant landscape features) that are historically, culturally, and visually linked within the context of their setting and environment."[15] There are 93 archaeological sites identified within the Mauna Kea Science Reserve, including 76 shrines, four adze-manufacturing workshops with shrines, and three stone piles that served as markers. One burial site and four possible burial sites (marked by cairns, stones, memorials) have also been identified. The function of the five other sites is unknown.

Due to their association with ancient native Hawaiian mythology, three properties have been identified by SHPD as traditional cultural properties, the Kūkahau'ula summit cone, Pu'u Līlīnoe, and Waiau.

No historic structures have been identified within Mauna Kea Science Reserve. However, SHPD considers two stone buildings at Hale Pōhaku (located south of the reserve) to be historic properties. The buildings are believed to be more than 50 years old.

Traditional cultural practices conducted on Mauna Kea included gathering water, quarrying stone for adze, hunting, conducting burials, and performing and teaching navigational traditions.

3.3 BIOLOGICAL RESOURCES

Biological resources include floral and faunal species. Threatened and endangered species are identified by the USFWS and the State of Hawai'i. Species on the USFWS list are under the protection of the Endangered Species Act of 1973. Species on the State list are under the protection of DLNR, as directed by of Hawaii Endangered Species Law, at HRS Chapter 195D.

3.3.1 Proposed Action

Three recent biological surveys were conducted to identify botanical resources, assess the population of Hawaiian petrels, and inventory arthropods at Haleakalā Observatories.[16] The field surveys provide information (such as inventory, types, location, general descriptions, and status) of flora and fauna found in the Haleakalā Observatories area. As indicated by these surveys, threatened and endangered species identified on the Federal USFWS and State lists are near the proposed AEOS MCS. The AFRL's Integrated Natural Resources Management Plan (INRMP) also describes the natural resources and ecosystem management at the MSSC.[17]

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15 National Aeronautics and Space Administration (NASA), Office of Space Science. 2004. *Draft Environmental Impact Statement for the Outrigger Telescopes Project.* Volume I.

16 Starr, F. and Starr, K. November 2002. *Botanical Survey University of Hawai'i "Haleakala Observatories" Island of Maui, Hawai'i.*

National Park Service, U.S. Department of Interior, Haleakala National Park. January 16, 2004. *Hawaiian Petrels Near the Haleakalā Observatories: A report to K.C. Environmental, Co. Inc., For Preparation of a Long-Range Development Plan.*

Pacific Analytics, L.L.C. July 2003. *Arthropod Inventory & Assessment Haleakalā High Altitude Observatory Site Maui, Hawai'i.* Prepared for K.C. Environmental Co., Inc.

17 Boeing LTS. June 3, 2004. *Integrated Natural Resources Management Plan for the Maui Space Surveillance Complex, Revision 4.*

Flora. Flora at Haleakalā Observatories is sparse, low, and provides limited ground cover.[18] A one-day pedestrian botanical survey of Haleakalā Observatories identified 32 plant species including 11 native plants and 21 non-native plants.[19] One Federal- and State-listed threatened species, described below, occurs in the summit area.

One threatened plant species, the Haleakalā silversword or ʻahinahina (*Argyroxiphium sandwicense* subspecies *macrocephalum*), was identified at the MSSC. The ʻahinahina is listed as threatened on both the Federal and State lists. The ʻahinahina was near extinction by the 1920s, when human vandalism and browsing (grazing) by goats and cattle threatened the species.[20] Today, the primary threat to the ʻahinahina is from alien species introduction. Since 1935, the population has increased approximately 16-fold, with 64,800 plants surveyed in 1991. The increasing population trend of ʻahinahina has also been observed at the Haleakalā summit. During the 2002 botanical survey, nine live ʻahinahina were discovered at Haleakalā Observatories and during the summer of 2004, approximately 20 new young ʻahinahina plants were observed to have recently sprouted at the MSSC. The live plants are located in landscaped areas along retaining walls, on a steep slope near the parking area, and on MSSC's steep northern slope. One of the live plants is located approximately 2.4 meters (8 feet) from the proposed AEOS MCS, and is situated behind an existing retaining wall (Figure 7). Other nearby ʻahinahina plants are located south of an existing parking area and are at least 15 meters (50 feet) from the proposed AEOS MCS. No ʻahinahina critical habitats have been identified at the site.[21]

Fauna. Fauna at Haleakalā Observatories consist of avifaunal species, mammals, and invertebrates. Few insects inhabit the area due to the harsh climate. Three Federal- and State-listed endangered animal species, described below, occur in the summit area and slopes of Haleakalā.

The Hawaiian Dark-rumped Petrel, or ʻuaʻu (*Pterodroma phaeopygia sandwichensis*), a Federal- and State-listed endangered bird species, is present in the summit area.[22] Approximately 85 percent of the world's known ʻuaʻu population nests on Haleakalā, near the summit. There are approximately 55 burrows within a 400-meter (1,312-foot) radius of Haleakalā Observatories.[23] There were no burrows observed within the proposed AEOS MCS site or MSSC. Several burrows are located along the southeastern perimeter of Haleakalā Observatories, approximately 137 meters (450 feet) from the proposed facility, and several burrows are located northwest of Haleakalā Observatories, approximately 122 meters (400 feet) from the anticipated construction staging area.

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18 Starr, F. and Starr, K. November 2002. *Botanical Survey University of Hawai'i "Haleakala Observatories" Island of Maui, Hawai'i.* Prepared for KC Environmental, Inc.

19 Ibid.

20 Loope, Lloyd L. and Medeiros, Arthur C. *Haleakala Silversword.* National Biological Service. http://biology.usgs.gov/s+t/noframe/t172.htm. Accessed May 21, 2005.

21 Federal Register. May 14, 2003. Vol. 68, No.93, Rules and Regulations, page 26050. http://www.fws.gov/pacific/pacificislands/CHRules/mauifinal.pdf.

22 U.S. Fish & Wildlife Service. Threatened & Endangered Animals in the Hawaiian Islands, http://pacificislands.fws.gov/wesa/uau.html. Accessed September 15, 2004.

23 National Park Service, U.S. Department of Interior, Haleakalā National Park. January 16, 2004. *Hawaiian Petrels Near the Haleakalā Observatories: A report to K.C. Environmental, Co. Inc., For Preparation of a Long-Range Development Plan.*

The ʻuaʻu can be found nesting at Haleakalā from mid-February to mid-November every year. The birds make their nests in burrows and return to the same burrow every year. The species distribution during their non-breeding season is poorly known, but is suspected to disperse north and west of Hawaiʻi with very little movement to the south or east. The ʻuaʻu, which feed on ocean fish, typically fly to and from Haleakalā at night.[24] These birds have limited visibility of manmade objects such as fences, utility lines, and utility poles. Their high speed and erratic nocturnal flight patterns may increase the possibility of collisions with these objects.[25] The use of heavy equipment near ʻuaʻu burrows, which often results in noise and ground vibrations, could potentially affect ʻuaʻu fledging success.[26]

The Hawaiian Goose, or nēnē (*Branta sandvicensis* also known as *Nesochen sandvicensis*) is a Federal- and State-listed endangered species present on Haleakalā.[27] The non-migrating goose, which lives on the Haleakalā slopes and on the island of Hawaiʻi, nests from October to February. Once abundant, the nēnē population has declined due to predation by humans, habitat alteration, and introduced species. The current nēnē population on Maui is thought to consist of approximately 250 individuals. While the nēnē has been known to fly over the Haleakalā Observatories, the summit area is outside the known feeding range of the bird.[28]

The Hawaiian hoary bat (*Lasiurus cinereus semotus*) is a Federally listed endangered species that resides on the lower slopes of Haleakalā. Even though several sightings have been reported near the Haleakalā Observatories, it is unlikely that the bat is a resident of the area, because of the relatively cold summit temperatures and the lack of flying insects (the preferred food source) in the area.[29]

Introduced fauna that could be observed within the summit area include the chukar (*Alectoris chukar*), the feral goat (*Capra hircus*), the Polynesian rat (*Rattus exulans)*, and the roof rat (*Rattus rattus*).[30] The Indian mongoose (*Herpestes auropunctatus*) is occasionally observed on the summit. These species are not included on Federal or State threatened or endangered lists.

Due to the harsh environmental conditions on Haleakalā, fewer arthropods are present on the summit regions than in the warmer, wetter lowlands. An arthropod inventory and assessment identified 58 arthropod species, of which 29 are endemic. None of the identified species are on

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24 Birding Hawaii . The Hawaiian Petrel (*Pterodroma sandwichensis*): Distribution, Population Status and Species Status, http://www.birdinghawaii.co.uk/xHawaiianPetrel2.htm. Accessed September 15, 2004

25 National Park Service, U.S. Department of Interior, Haleakalā National Park. January 16, 2004. *Hawaiian Petrels Near the Haleakalā Observatories: A report to K.C. Environmental, Co. Inc., For Preparation of a Long-Range Development Plan.*

26 URS Consultants. 1988. *Biological Assessment for the BOLT Experiment on Maui, Hawai'i.* Prepared for: U.S. Air Force, Santa Barbara, California.

27 U.S. Fish & Wildlife Service, Division of Endangered Species: *U.S. Listed Bird Species Profiles, Current as of January 31, 2000.* http://endangered.fws.gov/birds1.html. Accessed September 16, 2004.

28 Birding Hawaii. Hawaiʻi's State Bird - The Nēnē. http://www.birdinghawaii.co.uk/XNene2.htm. Accessed September 15, 2004.

29 URS Consultants. 1988. *Biological Assessment for the BOLT Experiment on Maui, Hawai'i.* Prepared for the U.S. Air Force, Santa Barbara, California.

30 Belt Collins Hawaii. March 1994. *Final Environmental Assessment/Negative Declaration Advanced Electro-Optical System (AEOS) Telescope and Related Improvements at the Maui Space Surveillance Site (MSSC) Haleakalā, Maui, Hawai'i.* Proposed by University of Hawaiʻi Institute for Astronomy. Prepared on behalf of U.S. Air Force Space Systems Command.

Federal or State threatened or endangered lists.[31] One species of Lepidoptera (*Thyrocopa apatela*) found in the Haleakalā Observatory area, is listed as a Hawaiian species of concern.[32]

The arthropod species identified in the 2003 survey are consistent with what has been found in the summit area during previous studies. No arthropod species were found that are unique to the site.[33] Normal observatory operations do not appear to impact arthropod populations. The primary objectives of MSSC's INRMP include preventing the introduction of invasive species and increasing the suitability of habitat for some endemic arthropod species.[34]

3.3.2 Mauna Kea Alternative

Floral and faunal resources surveys have been conducted for Mauna Kea and are described relative to the following locations: (1) the Mauna Kea Science Reserve at elevations above 4,084 meters (13,400 feet), which includes summit area cinder cones; (2) the Silversword/Alpine Shrub Zone, between the 2,804- and 3,566-meter (9,200- to 11,700-foot) elevations; and, (3) the Māmane Subalpine Forest Zone, which extends from 2,804 meters (9,200 feet) to Saddle Road.

Flora. The lack of floral species on the summit area cinder cones is attributed to the area's extreme temperatures, high winds, and limited precipitation. The species located on the remaining areas of the Mauna Kea Science Reserve are limited to hardy lichens, mosses, grasses, shrubs, and ferns. These species are not listed as threatened or endangered on either Federal or State lists; however, the delicate fern (*Cystoperis douglasii)* is very rare and considered a species of concern by the USFWS.[35]

The upper portions of the Silversword/Alpine Shrub Zone are home to the 'ahinahina, which are listed as threatened on both Federal and State lists. An enclosure was built around the largest known population of approximately 30 plants near the 2,850-meter (9,350-foot) elevation. A single plant near the summit access road was also enclosed with protective fencing.

The open-canopied Māmane Subalpine Forest Zone is primarily comprised of Māmane trees (*Sophora chrysophylla*), but also houses 'iliahi (*Santalum paniculatum*) trees, akoko (*Euphorbia olowaluana*), and naio (*Myoporum sandwicense*). The most abundant groundcover consists of native grasses, pili uka (*Trisetum glomeratum*) and hairgrass (*Deschampsia nubigena*). The vegetation in open pastures consists of introduced grasses and forbs,[36] such as orchid grass (*Dactylis glomerata*), Kentucky bluegrass (*Poa pratensis*), velvet grass (*Holcus lanatus*), and gosmore (*Hypochaeris radicata*).

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31 Pacific Analytics, L.L.C. July 2003. *Arthropod Inventory & Assessment Haleakalā High Altitude Observatory Site Maui, Hawai'i.* Prepared for K.C. Environmental Co., Inc.

32 Bishop Museum. http://hbs.bishopmuseum.org/endangered/soc-artho.html. Accessed August 5 2004.

33 Pacific Analytics, L.L.C. July 2003. *Arthropod Inventory & Assessment Haleakalā High Altitude Observatory Site Maui, Hawai'i.* Prepared for K.C. Environmental Co., Inc.

34 Boeing LTS. June 3, 2004. *Integrated Natural Resources Management Plan for the Maui Space Surveillance Complex, Revision 4.*

35 National Aeronautics and Space Administration (NASA), Office of Space Science. 2004. *Draft Environmental Impact Statement for the Outrigger Telescopes Project.* Volume I.

36 Forb: a herbaceous plant other than a grass.

Fauna. Numerous avian species have been seen flying in the Silversword/Alpine Shrub Zone, but because primary food sources do not occur here, they are presumably just transitory.[37] The endangered 'ua'u formerly nested on Mauna Kea. However, no recent evidence of 'ua'u burrows has been found above 3,790 meters (12,400 feet) on Mauna Kea. Several species of birds are found in the Māmane Subalpine Forest Zone, such as the palila (*Loxiodes bailleui*) and akiapola'au (*Hemignathus munroi*), which are included on Federal and State endangered lists. The endangered Hawaiian Hoary bat has also been seen below the Mauna Kea Science Reserve, but is not thought to live above 2,804 meters (9,200 feet).

Feral sheep, goats, and cattle may occasionally roam up into the Mauna Kea Science Reserve; however, the vegetation is typically too sparse to support feral animal populations.

Loose packing of surface cinder on the summit area cinder cones creates shelter for resident arthropods protecting them from the area's harsh conditions. One of the arthropods found on the summit area cinder cones, the Wēkiu bug (*Nysius wekiuicola*), is a candidate for listing under the Endangered Species Act. None of the other species are listed as threatened or endangered on either Federal or State lists. In general, the same types of arthropods found on the summit area cinder cones are also found at the lower elevations of the Mauna Kea Science Reserve. An extensive arthropod survey of the Silversword/Alpine Shrub Zone has not yet been conducted. More than 200 arthropod species have been collected from the Māmane Subalpine Forest Zone, including several species of *Plagithmysus*, a wood-boring beetle; caterpillars (*Cydia*); showy koa bugs (*Coleotichus blackburniae)*, and the Kamehameha butterfly (*Vanessa tameamea*).[38]

3.4 VISUAL RESOURCES

3.4.1 Proposed Action

The summit of Haleakalā is an important visual resource for Native Hawaiians, Maui residents, and tourists. View planes have been identified from the summit, and towards the summit from several locations near the coast and from central Maui.[39] Most of the Haleakalā Observatories buildings, such as the MSO, LURE, Atmospheric Airglow, Zodiacal Light, Cosmic Ray Neutron Monitor Station, and the Faulkes Telescope North are not visible from Central Maui. However, 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. During midday, the reflective surface is less visible than the other white dome structures at MSSC.[40]

While the natural terrain hides the observatories from view from most points on the mountain, the Haleakalā Observatories are visible from the Pa Ka'oao (White Hill) Visitor Center and the Pu'u Ula'ula (Red Hill) Overlook (Figures 8 and 9).

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37 National Aeronautics and Space Administration (NASA), Office of Space Science. 2004. *Draft Environmental Impact Statement for the Outrigger Telescopes Project.* Volume I.

38 National Aeronautics and Space Administration (NASA), Office of Space Science. 2004. *Draft Environmental Impact Statement for the Outrigger Telescopes Project.* Volume I.

39 Marshall Kaplan, Gans, Kahn and Yamamoto, Honolulu, Hawai'i. 1974. *Open Space & Outdoor Recreation Plan.* Prepared for County of Maui, Planning Department.

40 KC Environmental, Inc. January 2005. *University of Hawai'i Institute for Astronomy Haleakalā High Altitude Observatory Site Long Range Development Plan.*

3.4.2 Mauna Kea Alternative

Visual resources at Haleakalā, where the AEOS mirror removal and reinstallation would occur, are the same as those described under the Proposed Action. Some of the Mauna Kea Science Reserve telescopes are visible from Hilo, Honoka'a, and Waimea (Figure 3).[41] As on Haleakalā, the mountain terrain blocks views of the telescopes from most points on the mountain. The telescopes are generally visible from the summit area.

3.5 GEOLOGY, TOPOGRAPHY, AND SOILS

3.5.1 Proposed Action

Haleakalā is a large shield volcano that forms the eastern half of Maui. The volcano, estimated to be between 410,000 and 860,000 years old, is capped by a large erosional crater to the east of the project area.[42] The Haleakalā volcano is considered to be in the post-shield stage of volcanic evolution, in which the volcano moves further from its heat source via plate tectonics, and eruptions decrease in frequency.[43] The last known eruption is estimated to have occurred around the year 1790, from vents on the southwest slope of the mountain; however, recent radiocarbon aging conducted by the USGS has indicated the last eruption occurred between the years 1480 and 1600.[44]

The proposed AEOS MCS is located in the crater area of the Kolekole cinder cone, which developed in the central region of the triple junction rift zone where the Southwest Rift Zone, the East Rift Zone and the North Rift Zone meet.[45] Lava deposits in the area are from both the Kula and Hana series and the proposed staging area is the likely site of an eruptive vent.[46] The area is classified as having a high risk of lava hazards (Lava Hazard Zone 1, with 1 being the highest and 5 being the lowest hazard ranking).[47] On Maui, Lava Hazard Zone 1 includes areas where the inferred frequency of lava flows has been at least one per 150 to 200 years during the last 1,000 years. This hazard level is comparable to Lava Flow Hazard Zone 3 for the island of Hawai'i.

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41 National Aeronautics and Space Administration (NASA). July 2004. *Draft Environmental Impact Statement for the Outrigger Telescopes Project*. Volume I.

42 University of Hawai'i at Hilo. Department of Geography. *Atlas of Hawai'i. Third Edition*. University of Hawai'i Press, Honolulu. Edited by Sonia P. Juvik and James O. Juvik.

43 U.S. Geological Survey, Hawaiian Volcano Observatory. December 27, 2001. *Volcano Watch*. http://hvo.wr.usgs.gov/volcanowatch/2001/01_12_27.html. Accessed September 24, 2004.

44 Macdonald, et al., 1983. *Volcanoes in the Sea Second Edition*, University of Hawai'i Press.
U.S. Geological Survey, Hawaiian Volcano Observatory. September 9, 1999. *Volcano Watch*. http://hvo.wr.usgs.gov/volcanowatch/1999/99_09_09.html. Accessed September 24, 2004.

45 Bhattacharji, S. May 4, 2004. *Geological Survey of the University of Hawai'i Haleakalā Observatories at Haleakalā Summit Region, East Maui, Hawai'i*.

46 Ibid.

47 Mullineaux, D.R., D.W. Peterson, and D.R. Crandell. *Volcanic Hazards in the Hawaiian Islands*. Quoted in Decker, R.W., T.L. Wright, and P.H. Stauffer, Eds. 1987. *Volcanism in Hawai'i*. U.S. Geological Survey Professional Paper 1350, v 1, p. 599-621.

Earthquakes in Hawai'i are generally associated with near surface magma movements. A report prepared for the UH IfA estimated that there is a 90 percent probability that an earthquake with a magnitude of 7 or greater could be felt on Haleakalā sometime within the next 75 years.[48]

The proposed AEOS MCS site is at an elevation of approximately 3,033 meters (9,950 feet), and is relatively flat with a graded concrete-paved area for parking/facility access (Figure 2).

The soil beneath the concrete at the proposed AEOS MCS site and in nearby exposed areas is identified as cinder land, consisting of areas of bedded magmatic ejecta (cinders, pumice, and ash) associated with cinder cones.[49] The cinder land material has jagged edges, a glassy appearance, and shows little or no evidence of soil development. The ground surface composition ranges from boulder-sized to fine cinder materials. The surface geology of East Maui is primarily comprised of andesitic and basaltic rocks.

3.5.2 Mauna Kea Alternative

Mauna Kea is a dormant volcano that last erupted around 4,400 years ago.[50] Mauna Kea has been geologically mapped and future volcanic activity is anticipated to be infrequent and centered around the lower flanks of the volcano. The lower flanks are located below the 2,743-meter (9,000-foot) elevation and future eruptions will most likely be preceded by substantial geologic activity, years in advance.

Three existing mirror coating facilities are located on Mauna Kea at an elevation of approximately 4,146 meters (13,603 feet). The existing facilities are located in an area classified as having a relatively low risk to lava hazards (Lava Hazard Zone 7, with 9 being the lowest hazard ranking).[51] On the island of Hawai'i, Lava Hazard Zone 7 includes areas where no eruptions have occurred in the last 3,500 years. This hazard level is comparable to Lava Flow Hazard Zone 3 for Maui.

The general slope of the area containing the Gemini and the Canada-Hawai'i-France telescopes is towards the west from an elevation of approximately 4,191 meters (13,750 feet), while the slope of the Subaru Telescope area is towards the south from an elevation of 4,130 meters (13,550 feet). The soil materials in the area are identified as cinder land, as described under the Proposed Action.

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48 Furumoto, A.S. 1991. *Seismic Risk of the Summit Area of Haleakalā Volcano.* An internal report submitted to the Solar Group, University of Hawai'i, Institute for Astronomy. Cited in *Final Environmental Assessment/Negative Declaration for Faulkes Telescope Facility at Haleakalā, Maui, Hawai'i.* Prepared by KC Environmental, Inc. May 2001.

49 U.S. Department of Agriculture, Soil Conservation Service. 1972. *Soil Survey of Islands of Kauai, Oahu, Moloka'i, and Lana'i, State of Hawai'i.*

50 National Aeronautics and Space Administration (NASA). July 2004. *Draft Environmental Impact Statement for the Outrigger Telescopes Project.* Volume I.

51 Mullineaux, D.R., D.W. Peterson, and D.R. Crandell. *Volcanic Hazards in the Hawaiian Islands.* Quoted in Decker, R.W., T.L. Wright, and P.H. Stauffer, Eds. 1987. *Volcanism in Hawai'i:* U.S. Geological Survey Professional Paper 1350, v 1, p.599-621.

3.6 HYDROLOGY

3.6.1 Proposed Action

Surface Water. Most streams on Haleakalā are intermittent because of the steep, permeable lava terrain. The nearest intermittent streams are located approximately 3 kilometers (1.9 miles) downslope of MSSC. Perennial streams that do exist occur at low elevations and originate from groundwater springs. No perennial streams or other surface water bodies are located within a 6.4-kilometer (4-mile) radius of the MSSC.[52] An area of lower elevation within Haleakalā Observatories to the southwest of the proposed AEOS MCS, acts as a ponding area for storm water at Kolekole cinder cone. Storm water flows through the interior of the cinder cone and collects in this depression, where it infiltrates the ground. The highly permeable cinder material at the summit promotes infiltration of storm water at MSSC. Storm water that does surface-flow across the site is generally directed through storm drain inlets to a depression southwest of the proposed AEOS MCS, where it infiltrates.

Groundwater. The proposed AEOS MCS is located near the division of two groundwater aquifer sectors and four aquifer systems.[53] A sector is a large region with hydrogeological similarities that primarily reflects broad hydrogeological features, and secondarily, geography. A system is an area within a sector showing hydrogeological continuity. The groundwater resources below the proposed AEOS MCS are characterized as part of the Kamaole system of the Central sector. The characteristics of the groundwater beneath the proposed AEOS MCS are the same as those of the nearby systems and sectors. A high level, unconfined, perched aquifer exists above a high level, unconfined aquifer in dike compartments.[54] Groundwater in both the upper and lower aquifers was identified as fresh water (containing less than 250 milligrams per liter of chloride [mg/L Cl^-]) that has the potential for future use as drinking water, but was not being used when the aquifer was classified. The upper aquifer is classified as being replaceable and highly vulnerable to contamination, while the lower dike aquifers are classified as being irreplaceable and moderately vulnerable to contamination. There are no drinking water wells within 17.7 kilometers (11 miles) of the summit.[55] The Maui County Board of Water Supply provides MSSC with potable water that is trucked to the summit.

3.6.2 Mauna Kea Alternative

Surface Water. Lake Waiau is located approximately 1.6 kilometers (one mile) south of the Mauna Kea Science Reserve and 152 meters (500 feet) lower in elevation than the mirror recoating facilities. Two intermittent streams are present near the lake. Rainfall and snowmelt

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52 Stearns, H.T., and G. A. Macdonald. 1942. *Geology and Groundwater Resources of the Island of Maui, Hawai'i.* Bulletin 7, U.S. Geological Survey, Advertiser Publishing Co., Ltd., Honolulu.

53 Mink, John F. and L. Stephen Lau. February 1990. *Aquifer Identification and Classification for Maui: Groundwater Protection Strategy for Hawai'i No. 185.*

54 High level aquifers are those where fresh water is not in contact with sea water. In unconfined aquifers, the water table is the upper surface of the saturated aquifer. A perched aquifer is contained above an impermeable layer.

55 State of Hawai'i, Department of Health Underground Injection Control Program. *Underground Injection Control quadrangles (Kilohana 1983, Lualailua Hills 1983, Haiku 1983, Nahiku 1983, Pu'u o Kali 1983, Paia 1983, Makena 1983, Keanae 1983, and Kaupo 1983).*

State of Hawai'i Commission on Water Resource Management. Well Index Database. http://www.state.hi.us/dlnr/cwrm/data/database.htm. Accessed July 12, 2001 (database is no longer available to the public).

runoff from impermeable surfaces in the area drain into existing inlets in the pavement and/or onto the surrounding areas and quickly infiltrate into the highly permeable cinder surface.

The project area would include the Kahului Harbor on Maui and either the Kawaihae Harbor or Hilo Harbor on the island of Hawai'i. The land-based areas of Kahului Harbor are zoned as areas of 100-year flood where base flood elevations have been determined to be 2.4 to 4.8 meters (8 to 15 feet). The land-based areas of Kawaihae and Hilo Harbors are within special flood hazard areas inundated by the 100-year flood. Kawaihae Harbor is affected by coastal flooding with velocity hazard (wave action) and the base flood elevations have been determined to be 2.7 to 3 meters (9 to 10 feet). At Hilo Harbor, the base flood elevations have been determined to range from 3.7 to 6 meters (12 to 20 feet).

Groundwater. The Mauna Kea Science Reserve is located near the division of two groundwater aquifer sectors and three aquifer systems.[56] The groundwater resources beneath the area are characterized as part of the Waimea system of the West Mauna Kea sector. The characteristics of the groundwater are similar to those of the nearby systems and sectors. A high level, unconfined, perched aquifer exists above a high level, unconfined aquifer in dike compartments. Groundwater in the upper aquifer was identified as fresh water (containing less than 250 mg/L Cl^-) that is currently used as a drinking water source. However, there are no drinking water wells identified within 12.9 kilometers (8 miles) of the summit.[57] The lower dike aquifer was identified as fresh water with the potential for future use as drinking water, but was not being used when the aquifer was classified. The upper aquifer is classified as being irreplaceable and highly vulnerable to contamination, while the lower dike aquifer was classified as being irreplaceable and moderately vulnerable to contamination.

3.7 AIR QUALITY

3.7.1 Proposed Action

The summit of Haleakalā experiences greater seasonal variations in meteorological conditions (temperature, wind velocity, and precipitation) than lower elevations. Temperatures at the Haleakalā Ranger Station (2,140-meter [7,000-foot] elevation) averaged 12 °Celsius (°C) (54 °Fahrenheit [°F]) over the 11-year period between 1990 and 2000, but reached as high as 24 °C (75 °F) and as low as -1 °C (30 °F).[58] Temperatures tend to be lower at the summit. Data collected at the MSSC between 1985 and 1991 show that December, January, and February have the lowest average temperatures (5.5 °C, or 42 °F) and August has the highest average

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[56] Mink, John F. and L. Stephen Lau. May 1993. *Aquifer Identification and Classification for the Island of Hawai'i: Groundwater Protection Strategy for Hawai'i No. 191.*

[57] State of Hawai'i, Department of Health Underground Injection Control Program. *Underground Injection Control quadrangles (Mauna Kea 1982, Umikoa 1982, Pu'u OO 1982, Keanakolu 1982, Pua Akala 1981, Upper Piihonua 1981, Makahalau 1981, Ahumoa 1982, and Pu'u Koli 1982).*

State of Hawai'i Commission on Water Resource Management. Well Index Database. http://www.state.hi.us/dlnr/cwrm/data/database.htm. Accessed July 12, 2001 (database is no longer available to the public).

[58] National Oceanic and Atmospheric Administration [NOAA] 1990 to 2000. *Climatological Data Annual Summary: Hawai'i and Pacific.* Compiled volumes 86-96, each Number 13.

temperature (10 °C, or 50 °F).[59] Sub-freezing temperatures and frost at the summit are common in the winter months. Snow, hail, and sleet fall occasionally from December to February, with thunderstorms sometimes preceding the snowfalls.

The wind environment is dominated by northeast trade winds, which are most persistent from March to November. Kona or southwesterly winds persist for a few days at a time and generally occur in the winter months. Kona wind conditions commonly bring clear weather to the summit, as they prevent formation of low-level clouds associated with the trade winds. Sustained winds of 22 meters per second (60 miles per hour) occur virtually every month of the year. The maximum wind recorded at the summit is over 56 meters per second (125 miles per hour). The strongest winds generally occur during the winter and are associated with North Pacific storm systems passing through the Hawaiian Islands.

The heaviest rainfall on Haleakalā occurs at elevations between 900 and 1,500 meters (3,000 to 5,000 feet) where the moisture-laden trade winds are cooled as they rise against the mountain. Average annual rainfall at the Haleakalā Ranger Station is 122 centimeters (48 inches).[60] The air at higher elevations is much drier, and rainfall is substantially lower. At MSSC, precipitation averages about 64 centimeters (25 inches) per year, with most of the rainfall occurring from November through May.

The state of Hawai'i is in an attainment area for U.S. Environmental Protection Agency (EPA) "criteria" air pollutants.[61] The largest sources of airborne emissions of criteria pollutants at MSSC are two emergency generators, which are exempt from permitting. Operations at MSSC that generate minor quantities of volatile organic compounds and/or hazardous air pollutants include mirror coating activities, welding and metal working activities, and maintenance shop activities. These emissions are exempt, as specified in HAR Title 11, Chapter 60.1-62(d) and do not require a permit.

3.7.2 Mauna Kea Alternative

As with Haleakalā, Mauna Kea is subject to trade winds, resulting in extensive rainfall on the windward side. The Mauna Kea Science Reserve is approximately 1,530 meters (5,000 feet) above the atmospheric temperature inversion in the area, resulting in a cold, dry tundra-like environment.[62] The average temperature range at the Mauna Kea summit is between 0 and 8 °C (32 and 46 °F).[63] The average minimum nighttime winter temperature is -4 °C (25 °F), with average maximum daytime temperature of about 4 °C (40 °F). Annual average precipitation at

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59 Belt Collins Hawaii. March 1994. *Final Environmental Assessment/Negative Declaration Advanced Electro-Optical System (AEOS) Telescope and Related Improvements at the Maui Space Surveillance Site (MSSC) Haleakalā, Maui, Hawai'i.* Proposed by University of Hawai'i Institute for Astronomy. Prepared on behalf of U.S. Air Force Space Systems Command.

60 National Oceanic and Atmospheric Administration [NOAA] 1990 to 2000. *Climatological Data Annual Summary: Hawai'i and Pacific.* Compiled volumes 86-96, each Number 13.

61 EPA "criteria" pollutants are ozone, particulate matter, carbon monoxide, nitrogen dioxide, sulfur dioxide, and lead [ref: US EPA website, http://www.epa.gov/air/urbanair/6poll.html. Accessed June 18, 2003]

62 National Aeronautics and Space Administration (NASA). July 2004. *Draft Environmental Impact Statement for the Outrigger Telescopes Project.* Volume I.

63 University of Hawai'i, 1983. *Atlas of Hawai'i, Second Edition.* University of Hawai'i, Department of Geography.

the summit is 15 centimeters (6 inches).[64] Most rain at the summit is associated with winter storms from the southeast.

Winds at the Mauna Kea Science Reserve usually range from 16 to 48 kilometers (10 to 30 miles) per hour. However, winds associated with severe winter storms can exceed 160 kilometers (100 miles per hour).[65]

The existing mirror coating facilities are within the State attainment area for U.S. EPA "criteria" pollutants. Air pollutants generated at the summit include exhaust from combustion engines and fugitive dust associated with construction activities and unpaved surfaces.

3.8 INFRASTRUCTURE

3.8.1 Roads and Traffic

3.8.1.1 Proposed Action

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 adjacent to Haleakalā Observatories. In accordance with the lease agreement, AFRL contributes financially to maintenance of the road through the Haleakalā National Park. Maintenance of the road segment within Haleakalā Observatories is the responsibility of UH, while the AFRL maintains the roads within MSSC.

Most vehicles using Haleakalā Crater Road carry visitors to the Haleakalā National Park. In April 1991, Haleakalā Crater Road traffic averaged approximately 1,900 vehicles per day.[66] Of this, fewer than five percent (95 vehicles) were estimated to be associated with facilities located in Haleakalā Observatories. The 1991 findings are consistent with a 2003 vehicular traffic study, which indicated an average of 96 vehicle trips associated with the Haleakalā Observatories on a daily basis (an average of 48 vehicles entering and leaving the area). The highest traffic volumes for the Haleakalā Observatories occur in the afternoon, with vehicles leaving the area. The high elevations, relatively steep grades, numerous switchback curves, and touring bikers on the road limit vehicle speeds.[67]

3.8.1.2 Mauna Kea Alternative

The summit of Mauna Kea is accessed from Saddle Road (Route 200) to Pu'u Huluhulu, then along a 9.7-kilometer (6-mile) long paved portion of the Mauna Kea Access Road to Hale

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64 Cruikshank, D. 1986. *Mauna Kea: A Guide to Upper Slopes and Observatories, University of Hawai'i Institute for Astronomy* as cited in National Aeronautics and Space Administration (NASA), July 2004, *Draft Environmental Impact Statement for the Outrigger Telescopes Project*. Volume I.

65 University of Hawai'i. June 16, 2000. *Mauna Kea Science Reserve Master Plan, 2000*, as cited in National Aeronautics and Space Administration (NASA), July 2004, *Draft Environmental Impact Statement for the Outrigger Telescopes Project*. Volume I.

66 Belt Collins Hawaii. March 1994. *Final Environmental Assessment/Negative Declaration Advanced Electro-Optical System (AEOS) Telescope and Related Improvements at the Maui Space Surveillance Site (MSSC) Haleakalā, Maui, Hawai'i*. Proposed by University of Hawai'i Institute for Astronomy. Prepared on behalf of U.S. Air Force Space Systems Command.

67 Phillip Rowell and Associates, Kaneohe, Hawai'i. 2003. Haleakalā Observatory "Vehicle Traffic."

Pōhaku.[68] The road then continues unpaved for approximately 7.2 kilometers (4.5 miles), and is paved again between the 3,596-meter (11,800-foot) elevation to the Mauna Kea Science Reserve.

A total of 34,659 vehicle trips were made to the summit between January and December 2003, of which approximately 10 percent of the trips (3,620 vehicle trips) were made in commercial vehicles.[69] Traffic associated with the observatories accounts for approximately 59 percent (20,545 vehicle trips) of the annual traffic to the summit. Travel hazards include brake failures on the steep summit road and weather-related accidents.

3.8.2 Water

3.8.2.1 Proposed Action

The MSSC relies on Maui County Board of Water Supply for water, which is trucked to the summit. Potable water is stored in a 280,090-liter (74,000-gallon) capacity underground storage tank. Water usage at the MSSC ranges from approximately 18,930 to 75,700 liters (5,000 to 20,000 gallons) per week, with an average of 47,313 liters (12,500 gallons), depending on the type of projects being conducted at the facility.[70] The tank is refilled twice per week to maintain the minimum 227,100 liters (60,000 gallons) required for the fire sprinkler system.

3.8.2.2 Mauna Kea Alternative

As with Haleakalā, water is trucked to the summit and stored in tanks at the telescope facilities. The total water usage for the various telescope facilities is approximately 6,737 liters (1,780 gallons) per day, or approximately 47,313 liters (12,500 gallons) per week.[71]

3.8.3 Power and Communication

3.8.3.1 Proposed Action

Electrical power from Maui Electrical Company, Inc. (MECO) is transmitted up Haleakalā by overhead 69 kilovolt (kV) lines from the Wailea Substation and the Pukalani Substation to the Kula Substation. At the Kula Substation, the voltage is transformed to 23 kV before being transmitted to the Haleakalā Substation, which further reduces the voltage to 4.16 kV. MSSC is served by an underground line from the Haleakalā Substation. Electrical service for the AEOS facility is provided via an underground incoming primary service and a transformer located in a vault next to the main electrical room on the ground floor. The emergency electrical service is comprised of two emergency generators connected in parallel (750 kilowatts [kW], 4,160 kV, 3-phase) and a 1,500 kV ampere (A) transformer rated at 480-277 V, 3-phase.

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[68] National Aeronautics and Space Administration (NASA), Office of Space Science. 2004. *Draft Environmental Impact Statement for the Outrigger Telescopes Project.* Volume I.

[69] Office of Mauna Kea Management. Personal communication with Tetra Tech, Inc. regarding vehicle count. March 4, 2004. As reported in the 2004, National Aeronautics and Space Administration (NASA), *Draft Environmental Impact Statement for the Outrigger Telescopes Project.* Volume I.

[70] Belt Collins Hawaii. March 1994. *Final Environmental Assessment/Negative Declaration Advanced Electro-Optical System (AEOS) Telescope and Related Improvements at the Maui Space Surveillance Site (MSSC) Haleakalā, Maui, Hawai'i.* Proposed by University of Hawai'i Institute for Astronomy. Prepared on behalf of U.S. Air Force Space Systems Command.

[71] National Aeronautics and Space Administration (NASA), Office of Space Science. 2004. *Draft Environmental Impact Statement for the Outrigger Telescopes Project.* Volume I.

Hawaiian Telcom supplies telephone service to Haleakalā Observatories, which includes a fiber optic line. The MSSC telephone lines are located within an underground conduit.

3.8.3.2 *Mauna Kea Alternative*

The Mauna Kea summit is served by a Hawaiian Electric and Light Company (HELCO) 69 kV overhead transmission line to Hale Pōhaku substation.[72] This substation consists of two 3,000 kVA transformers with a total capacity of 6,000 kVA. From the substation, there is an underground 12.47 kV dual loop feed system that provides electricity to the Mauna Kea summit.

Communications infrastructure, which is provided by Hawaiian Telcom, was upgraded in the 1990s to include fiber optics; remote observing is also possible via the Internet.[73]

3.8.4 Waste Collection and Disposal

3.8.4.1 *Proposed Action*

There are two Maui County-owned and -operated municipal solid waste landfills on Maui, the Central Maui Landfill and the Hana Landfill.[74] The Central Maui Landfill accepted 122,470 metric tons (135,000 tons) in 1998, or 98 percent of the island's waste. The privately owned and operated DeCoite construction and demolition landfill, located in the Mā'alaea area of Maui, receives over 12,701 metric tons (14,000 tons) of waste per year. Municipal solid waste from MSSC, such as food trash, is collected twice a week for off-site disposal at the Central Maui Landfill. Other wastes associated with MSSC operations and maintenance, such as used oil, are collected in containers within the AEOS facility and transported off-site for recycling or disposal as non-hazardous waste.

Domestic wastewater at AEOS is disposed of in a septic system, which is located north of the AEOS telescope building.

Handling and disposal of hazardous waste, including waste generated during mirror maintenance and recoating activities, is discussed in Section 3.9.

3.8.4.2 *Mauna Kea Alternative*

Hawai'i County owns and operates two municipal solid waste landfills, one of which is in South Hilo and the other is in North Kohala. Municipal solid waste generated at Mauna Kea Science Reserve is collected by a contractor for off-site disposal at a landfill on the island of Hawai'i.

Domestic wastewater is disposed of in a septic tank leachfield system. Handling and disposal of hazardous waste is discussed in Section 3.9.

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72 University of Hawai'i. December 27, 1999. *Final Environmental Impact Statement: Mauna Kea Science Reserve Master Plan.* Volumes I and II. As reported in National Aeronautics and Space Administration (NASA), Office of Space Science. 2004. *Draft Environmental Impact Statement for the Outrigger Telescopes Project.* Volume I.

73 National Aeronautics and Space Administration (NASA), Office of Space Science. 2004. *Draft Environmental Impact Statement for the Outrigger Telescopes Project.* Volume I

74 State of Hawai'i, Department of Health, Office of Solid Waste Management. July 2000. *Hawai'i 2000 Plan for Integrated Solid Waste Management.* Table 7.2.

3.9 PUBLIC HEALTH AND SAFETY

3.9.1 Hazardous Materials and Waste

The state of Hawai'i does not have a hazardous waste disposal facility. Hazardous waste is shipped to the continental United States for proper disposal.

3.9.1.1 Proposed Action

The existing AEOS telescope building includes optics maintenance and mirror stripping operations that involve the storage, use, and generation of limited amounts of hazardous materials at AEOS. Solvents are used to maintain the optics and acids are used to strip the reflective surfaces off mirrors before recoating. MSSC stores most of its hazardous materials in specially built storage units which are located on the west side of the MSSS building. The hazardous material storage units have secondary containment, and fire detection and suppression systems. Hazardous materials that are used and stored in laboratories and maintenance areas are stored in flammables or corrosive liquids cabinets with built-in secondary containment. MSSC has a Hazardous Material Emergency Planning and Response Plan (HAZMAT Plan) that provides guidance on the handling of hazardous materials.

Hazardous wastes generated at MSSC are segregated at the generation point for appropriate handling. Hazardous waste at MSSC is managed in the 270-day hazardous waste storage units, located near the hazardous materials storage units, and the average storage time in fiscal year 2004 ranged from 42 to 153 days. The hazardous waste storage units have built-in secondary containment, and fire detection and suppression systems. A waste disposal contractor transports and disposes of hazardous waste two to three times per year. Sampling and analysis of hazardous wastes are performed by the waste disposal contractor prior to off-site disposal. MSSC is recorded as a small quantity generator with the U.S. EPA Region 9, which means it can generate between 100 and 1,000 kilograms (220 and 2,205 pounds) of hazardous waste per month. MSSC is in compliance with, and does not have recorded violations or enforcement actions against, its small quantity generator status.[75] The fiscal year 2004 records show that 310 kilograms (684 pounds) of hazardous waste was generated at MSSC.

MSSC has a Hazardous Waste Management Plan to ensure that management procedures are in place to comply with the Federal Resource Conservation and Recovery Act (RCRA), as amended, and implementing regulations. MSSC has a Contingency Plan and a Spill Prevention, Control and Countermeasures Plan that set forth the procedures for conducting response actions in case of hazardous waste releases into the air, soil, or water that pose a threat to the environment. MSSC has a spill response team trained in accordance with OSHA, and spill response equipment is staged at the hazardous material and waste storage units. MSSC also has several administrative plans in place to prevent release of materials and promote environmentally responsible management, such as the Pollution Prevention Plan, which addresses measures to

75 U.S. Environmental Protection Agency website. http://www.epa.gov/cgi-bin/getIcReport.cgi?tool=echo&IDNumber=HI4570090064. Enforcement & Compliance History Online (ECHO) for the Maui Space Surveillance Complex. Accessed August 22, 2005.

achieve pollution prevention program goals, funding, management procedures, and identifies cost effective processes or technologies.

3.9.1.2 *Mauna Kea Alternative*

The facilities at the Mauna Kea Science Reserve have procedures in place for the handling and storage of the hazardous materials used at the site. Hazardous wastes, including those generated during mirror maintenance and stripping activities, are disposed of off-site at appropriate disposal facilities.[76]

3.9.2 Noise

Noise levels are dependent on (1) sound pressure measured in decibels (dB) and usually based on an A-weighted scale (dBA), which simulates the range of sound that is audible by the human ear; (2) distance to the affected individual; (3) medium present between the source and the affected individual; and (4) period of exposure.

3.9.2.1 *Proposed Action*

Sources of noise at the MSSC include those associated with wind, vehicles (including twice weekly deliveries by the water truck), air conditioning compressors, and exhaust fans. Two diesel-powered emergency generators, located in enclosed trailers at MSSC, run infrequently.

Existing noise levels in the MSSC area are low, with wind-associated noises accounting for the majority of background noise. Vehicles driving to and from Haleakalā Observatories are the loudest man-made noise sources, with construction trucks generating 82 to 93 dBA at a distance of 50 feet. Air conditioning compressors and exhaust fans can be heard in certain areas, with compressors generating 73 to 84 dBA. Instantaneous noise levels on the order of 45 to 50 dBA were measured near the Butler Building on a day with moderate wind speeds.[77]

3.9.2.2 *Mauna Kea Alternative*

Background sources of noise at the Mauna Kea Science Reserve are primarily associated with wind and occasional vehicular noise. The summit normally has a low ambient noise level.[78]

3.10 SOCIOECONOMICS

3.10.1 Proposed Action

Of the three inhabited islands that make up Maui County (Maui, Moloka'i, and Lana'i), more than 90 percent of the population resides on Maui. Between 1990 and 2000, the population of Maui County increased approximately 28 percent. This compares to a 9.3 percent growth rate for

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[76] National Aeronautics and Space Administration (NASA), Office of Space Science. 2004. *Draft Environmental Impact Statement for the Outrigger Telescopes Project.* Volume I.

[77] Belt Collins Hawaii. March 1994. *Final Environmental Assessment/Negative Declaration Advanced Electro-Optical System (AEOS) Telescope and Related Improvements at the Maui Space Surveillance Site (MSSC) Haleakalā, Maui, Hawai'i.* Proposed by University of Hawai'i Institute for Astronomy. Prepared on behalf of U.S. Air Force Space Systems Command.

[78] National Aeronautics and Space Administration (NASA), Office of Space Science. 2004. *Draft Environmental Impact Statement for the Outrigger Telescopes Project.* Volume I.

the state of Hawai'i during the same period. In 2000, Maui County's population of 128,241 residents accounted for approximately 11 percent of the state population (a slight increase from 1990).[79] The racial makeup of Maui County includes 34 percent Caucasian, 31 percent Asian, 11 percent Native Hawaiian or other Pacific Islander, 8 percent Latino or Hispanic, 0.4 percent African American, and 0.4 percent Native American.[80] While there are no permanent residents at Haleakalā Observatories, the summit has a small transient population, which includes observatory staff and visiting scientists.

Maui is Hawai'i's second-most popular tourist destination, and Haleakalā National Park is one of the island's most popular visitor attractions. Maui drew 724,596 tourists in the first half of 2003, an increase of about 9.5 percent from the previous year.[81] According to Haleakalā National Park, there were 1,919,356 visitors in 2000.[82]

In the second quarter of 2001, the civilian labor force in Maui County totaled approximately 73,600 people, an increase of 1.5 percent over the previous year.[83] The major industries on Maui are agriculture and tourism. However, Maui is also an important center for the technology industry. An estimated 1,150 people work in the high technology sector on Maui. Over half of those jobs are directly or indirectly related to activities at the summit of Haleakalā, as Haleakalā Observatories is one of the five best astronomical and space surveillance locations in the world. AFRL has an Educational Partnership Agreement with the UH IfA and supports observational programs for National Science Foundation with infrastructure, equipment, and intellectual collaboration to support research. Not all of the Haleakalā astronomy jobs are located at the summit; some are in nearby towns, down slope from the summit, such as the Waiakoa Laboratory in Kula. MSSC employs 106 people, of which 64 work at the AEOS facility. The majority of the employees permanently reside on Maui, and 100 of them are civilians. Approximately half of the personnel of MSSC conduct research and development, the other half work in maintenance, support, administration, mechanical, telescope operation, security, supply, and engineering positions.

The entire technology industry on Maui had a 2003 payroll of over $40 million. The average wage for a technology industry employee is $71,000 per year.[84] Haleakalā Observatories accounts for $263.8 million in annual capital expenditures, and $32.7 million in annual operating expenditures for the State of Hawai'i.[85] In the past five years, MSSC has contributed $180 million to the Maui economy, with salaries making up more than half of the total contribution. Annual lease rents for AFRL astronomy-related properties on Maui total $2.3 million, with the

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79 Forstall, R.L. 2002. *U.S. Census, Population of Counties by Decennial Census: 1900 to 1990.* www.census.gov/population/cencounts/hi90090.txt. Accessed September 13 2004.

80 U.S. Census Bureau, Hawai'i Quick Facts. http://quickfacts.census.gov/qfd/states/15/15009.html. Accessed 13 September 2004.

81 Song, J. June 10, 2003. *More Tourists Looking Beyond Waikiki.* Honolulu Star Bulletin. http://starbulletin.com/2003/06/10/business/story2.html. Accessed September 13, 2004.

82 Hurley, T. February 25, 2001. *Haleakalā Park Visits Reach Record-High.* Honolulu Advertiser. http://the.honoluluadvertiser.com/2001/Feb/25/225localnews17.html. Accessed September 15, 2004.

83 State of Hawai'i, Department of Business, Economic Development, and Tourism. http://www.hawaii.gov/dbedt/qser/0901/county.html. Accessed 10 August 2004.

84 Personal Communication, Mr. Michael Maberry, UH IfA, with Ms. Arlette St. Romain Meader, Belt Collins, August 30, 2004.

85 Dicus, H. April 16, 2004. *Astronomy open house lets public see stars.* Pacific Business News (Honolulu).

majority for contractor-owned and -operated properties located outside Haleakalā Observatories, and $5,000 for the UH-owned MSSC property.

3.10.2 Mauna Kea Alternative

The area surrounding Mauna Kea is relatively unpopulated. Resident populations notably increase towards Hilo to the east, Waimea to the northwest, and Kailua-Kona to the west. In 2003, Hawai'i County's population of 158,423 residents accounted for approximately 13 percent of the state's population.[86] Between 1990 and 2000, Hilo, Waimea, and Kailua-Kona all experienced an overall increase in population. Hilo's population grew eight percent, Waimea's population grew approximately 18 percent, and Kailua-Kona's grew seven percent. Residents self-designated as Asian, African American, Native American, Native Hawaiian or other Pacific Islander, or Hispanic or Latino (of any race), make up approximately 61 percent of Hilo's population, 44 percent of Waimea's population, and 43 percent of Kailua-Kona's population.[87]

There are no permanent residents living at the Mauna Kea Science Reserve, which has a small transient population consisting primarily of observatory staff and visiting scientists. The average number of individuals that stay at Hale Pōhaku varies, but averages 38 per day.

In 2000, the average daily visitor census for the County of Hawai'i was 21,831, approximately four percent less than the previous year.[88] As many as 40,000 visitors per year travel to the Hale Pōhaku mid-level facilities, to star gaze and view natural history exhibits. Hale Pōhaku is located downslope from the Mauna Kea Science Reserve, near the 2,438-meter (8,000-foot) elevation, and includes temporary housing, a visitors center, and support buildings.[89] Hikers and skiers also frequently visit the summit area during favorable weather conditions.

The employed civilian labor force in Hawai'i County averaged 65,450 in 2000, an increase of 2,100 over the previous year. The County's average unemployment percentage declined from nine percent in 1999 to almost seven percent in 2000.[90] Astronomy operations on the island of Hawai'i provide almost 500 high-paying jobs, and contribute approximately $61 million annually to the local economy. According to a 1999 UH study, the astronomy industry generates direct and indirect economic activity of approximately $131 million a year on the island, and $142 million for the state as a whole.[91]

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86 U.S. Census Bureau, Hawai'i Quick Facts. http://quickfacts.census.gov/qfd/states/15/15001.html. Accessed September 15, 2004.

87 U.S. Department of Commerce, Minority Business Development Agency. *The Emerging Minority Marketplace: Minority Population Growth: 1995 to 2050.* www.mbda.gov/documents/mbdacolor.pdf. Accessed September 10, 2004.

88 National Aeronautics and Space Administration (NASA), Office of Space Science. 2004. *Draft Environmental Impact Statement for the Outrigger Telescopes Project.* Volume I.

89 UH IfA. *Hale Pohaku – Onizuka Center for International Astronomy.* http://www.ifa.hawaii.edu/images/aerial-tour/hp.html Accessed September 22, 2004.

90 National Aeronautics and Space Administration (NASA), Office of Space Science. 2004. *Draft Environmental Impact Statement for the Outrigger Telescopes Project.* Volume I.

91 Dayton, K. August 31, 2004. *Rival emerges for Mauna Kea telescope project.* Honolulu Advertiser. http://the.honoluluadvertiser.com/article/2004/ Aug/31/ln/ln21a.html. Accessed August 31, 2004.

Chapter Four

Environmental Consequences

CHAPTER FOUR
ENVIRONMENTAL CONSEQUENCES

Chapter Four describes the direct, short-term, long-term, indirect, and cumulative impacts of the Proposed Action, Mauna Kea Alternative, and No Action Alternative. Direct impacts are those caused by the action and occur at the same time and place; short-term impacts are those associated with construction and long-term impacts are those associated with operation activities. Secondary and cumulative impacts are addressed in Section 4.11.

4.1 LAND USE

4.1.1 Proposed Action

The Proposed Action would have no significant impact on land use; it would support and be consistent with the goals and objectives of the following State, County, community, and Haleakalā Observatories plans:

- The Proposed Action would continue the AFRL's management of MSSC's cultural and biological resources, which is consistent with HRS Chapter 344 State Environmental Policy.[1]
- The Proposed Action would also be consistent with acceptable land uses designated for the Conservation District General Subzone.[2] The AEOS completion is covered under the CDUP MA-2705 which expires on August 25, 2006. In the event the construction cannot be completed in this time frame another permit will be obtained.
- The Proposed Action would be consistent with Maui County's General Plan for growth in a manner sensitive to the protection and enhancement of cultural and historical resources. It would also support economic diversity by continuing to provide jobs in the high technology industry.[3]
- The Proposed Action would be consistent with the objectives identified in the Makawao-Pukalani-Kula Community Plan including: complying with the UH IfA's LRDP for Haleakalā Observatories, protecting cultural resources, protecting endangered biological resources, working to prevent the establishment and spread of invasive species, and participating in recycling.[4]

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1 Hawai'i State Legislature, Status and Documents. http://www.capitol.hawaii.gov/hrscurrent/vol06_ch0321-0344/hrs0344/hrs_0344-.htm. Accessed September 16, 2004.

2 State of Hawai'i, Office of Planning. 2004. Hawai'i Statewide GIS Program Internet Website, http://www.state.hi.us/dbedt/gis/. Accessed August 2004.

3 County of Maui. June 22, 1990. *The General Plan of the County of Maui 1990 Update.*

4 County of Maui. July 23, 1996. *Makawao-Pukalani-Kula Community Plan.*

- The Proposed Action would be consistent with the UH IfA's LRDP for new facilities at Haleakalā Observatories, and the construction and management practices identified under Environmental Protection of Site Resources.[5]

The Hawai'i CZM area includes all lands within the state of Hawai'i. The DBEDT, Office of Planning concurred with AFRL's Coastal Zone Management federal consistency determination that the proposed AEOS MCS is consistent, to the maximum extent practicable, with the enforceable policies of the Hawaii CZM Program. A copy of the concurrence letter is included in Appendix D.

Implementation of the Proposed Action would not restrict access to public areas. MSSC is a secured military facility that will continue to have restricted access. Access to recreational areas, such as the Skyline Trail and the Polipoli Trail located beyond Haleakalā Observatories, would not be restricted.

4.1.2 Mauna Kea Alternative

The Mauna Kea Alternative would have no significant impact on land use, as the existing facilities, roads, and harbors would be used for their intended purposes. Implementation of this alternative would be consistent with the goals and objectives of applicable land use plans at the Mauna Kea Science Reserve.

There would be no associated increase to security at the Mauna Kea Science Reserve.

4.1.3 No Action Alternative

There would be no impact to land uses under the No Action Alternative as the proposed AEOS MCS would not be constructed.

4.2 CULTURAL RESOURCES

4.2.1 Proposed Action

The Proposed Action would have no significant impact on cultural resources. Consultation under Section 106 of the NHPA has been completed with the SHPD, which has concurred with AFRL's determination that "no historic properties will be affected" by the Proposed Action. Correspondence between AFRL and the SHPD is provided in Appendix B.

A two-document report was prepared by CKM Cultural Resources to evaluate the potential effects of future development planned for Haleakalā Observatories, including the Proposed Action, on Hawaiian culture and traditional customary rights, in accordance in Act 50, House Bill Number 2895 (Appendix A).[6] Archaeological resources identified to the east and south of the MSSC, would not be disturbed or affected by the proposed activities. However, to ensure

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5 KC Environmental, Inc. January 2005. *University of Hawai'i Institute for Astronomy Haleakalā High Altitude Observatory Site Long Range Development Plan.*

6 CKM Cultural Resources. December 2002. *Traditional Practices Assessment for the Summit of Haleakalā.* Prepared for KC Environmental, Inc.
CKM Cultural Resources. March 2003. *Cultural Resources Evaluation for the Summit of Haleakalā.* Prepared for KC Environmental, Inc.

protection of nearby archaeological resources and respect the summit's cultural resources, the following LRDP provisions would be incorporated into the construction and operation of the proposed AEOS MCS.

- 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, and will serve as a liaison to native Hawaiian groups and individuals in the community. The cultural specialist would be a kanaka maoli (true aboriginal person), preferably a kupuna (elder), and a kāhuna (priest, clergyman) as well, and one who has personal knowledge of the spiritual and cultural significance of Haleakalā.
- The cultural and archeological sites and features identified near MSSC, but outside the project area, would not be affected. The two sites nearest to proposed construction and staging areas are already protected as Site 2806 is clearly marked with fence buffer and Site 5440 is separated from the staging area by a road.
- Construction crew members and permanent employees working on the AEOS MCS will attend UH-approved "Sense of Place" training prior to working at the project site. This training will instruct individuals on the cultural and historic significance of the Haleakalā Summit, as well as describe the spiritual essence of the area's natural resources.
- A cultural specialist shall be retained to conduct a cultural inspection of Haleakalā Observatories, including the proposed AEOS MCS site, two times per year, to ascertain compliance with HAR Title 13, Sub-Title 13, Chapter 277 "Rules Governing Requirements for Archaeological Site Preservation Development."

In addition, the contractor shall stop work if iwi (bones) or native Hawaiian cultural or traditional deposits are found during ground disturbance activities.

4.2.2 Mauna Kea Alternative

Under the Mauna Kea Alternative, there would be no impacts to cultural resources. Existing facilities, roads, and harbors would be used.

4.2.3 No Action Alternative

There would be no impact to cultural resources under the No Action Alternative as the proposed AEOS MCS would not be constructed.

4.3 BIOLOGICAL RESOURCES

4.3.1 Proposed Action

The AFRL has completed informal consultation with the USFWS, under Section 7 of the ESA, to evaluate the potential impacts of the Proposed Action on threatened and endangered species near the project area. The USFWS has concurred with AFRL's determination that the Proposed Action is not likely to adversely affect the 'ahinahina, 'ua'u, nēnē, or Hawaiian hoary bat at Haleakalā. Correspondence between AFRL and the USFWS is provided in Appendix C.

The primary threat to the ʻahinahina is invasive alien species introduction, either some plant species which could compete for the ground within ʻahinahina habitat or some invertebrate (like the Argentine ant) that could eat the plant or eliminate pollinators. The use of heavy equipment near ʻuaʻu burrows, which often results in noise and ground vibrations, could potentially affect ʻuaʻu fledging success.[7] Construction vehicles ascending and descending the mountain could slightly increase the risk of traffic collisions with nēnē; however, according to a biological assessment prepared for similar work at Haleakalā Observatories, the risk of vehicle collision with nēnē is expected to remain low.[8]

To minimize the potential effects of construction activities on the ʻahinahina, ʻuaʻu, and nēnē, the AFRL and USACE will ensure that construction of the AEOS MCS will be in accordance with the practices identified in the LRDP and with measures identified by the USFWS, as presented below.[9]

- The contractor will participate in UH IfA and AFRL pre-construction briefings on environmental sensitivities. Biological resource topics addressed in the briefings will include protecting the biological species in the area, preventing the introduction of unwanted species to the area, confining activities to the construction site and staging area, and minimizing the risk to species from vibration, noise, and lighting.
- A qualified biologist or agricultural inspector will inspect equipment, supplies, and containers that originate from other islands or the continental United States prior to these items being transported from Kahului. Materials suspected to contain prohibited or harmful organisms would be handled under the direction of the National Park Service and USFWS. The contractor will provide the National Park Service a one-week notification, prior to the initial entry, for coordination of inspections. Construction vehicles will be steam cleaned before being transported through Haleakalā National Park. Certification of inspections and vehicle cleaning will be maintained by the contractor.
- Importation of fill material, if needed, will require sterilization and will be coordinated with the National Park Service. Fill will be handled as necessary to remove seeds, larvae, and other biota that could survive and propagate at the summit.
- The contractor will not park heavy equipment or store construction materials outside of the Haleakalā Observatories boundaries. Their activities will be limited to the construction site and staging area to minimize risk to ʻuaʻu in adjacent areas.
- The contractor will use tight-lidded trash containers and on a daily basis will remove organic waste and trash, in particular materials that could serve as a food source and increase the population of mice and rats that prey on native species. Construction-related trash will be removed on a timely basis.

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7 URS Consultants. 1988. *Biological Assessment for the BOLT Experiment on Maui, Hawai'i.* Prepared for: U.S. Air Force, Santa Barbara, California.

8 URS Consultants. 1988. *Biological Assessment for the BOLT Experiment on Maui, Hawai'i.* Prepared for: U.S. Air Force, Santa Barbara, California.

9 KC Environmental, Inc. January 2005. *University of Hawai'i Institute for Astronomy Haleakalā High Altitude Observatory Site Long Range Development Plan.*

- ARFL will mark nearby 'ahinahina locations and ensure construction activities and workers do not disturb the plants.
- The National Park Service will give the contractor current Haleakalā National Park maps of 'ua'u burrow locations to identify and avoid these areas. AFRL will work with the Haleakalā National Park Service to monitor the burrows during construction. The contractor will notify the UH IfA of any 'ua'u mortalities.
- The contractor will not construct fences, to prevent 'ua'u mortality from collisions.
- No night construction is planned and no extra lighting is anticipated to be needed.
- The AFRL will not induce 'ua'u disturbing ground vibration during the mid-February to mid-November nesting season, and vibratory rollers will not be used during this time. During construction activities conducted when 'ua'u may be present outside the nesting season, steps will be taken to minimize the level of vibration. AFRL will measure ground vibration during all phases of construction and will work with the Haleakalā National Park Service biologist to interpret data relative to species impacts.
- Ground disturbance activities at the construction staging area will not exceed current and past operations (vehicle movement, personnel walking, equipment/supply storage and handling).

Construction and operation of the AEOS MCS would follow the established practices designed to prevent impacts to flora and fauna; therefore, no significant impacts on biological resources are anticipated with the Proposed Action. The construction methods would include pouring concrete on the existing concrete pad and some areas of existing pavement may be saw cut and removed for installation of concrete footings. This approach does not induce ground vibration associated with typical foundation construction activities.

4.3.2 Mauna Kea Alternative

No significant impacts on biological resources are anticipated under this alternative. The Mauna Kea Alternative would use an existing mirror coating facility atop Mauna Kea, so there would be no new construction. The truck transportation needed at Haleakalā and Mauna Kea to load and unload the mirror would be inspected for invasive alien species before proceeding up the access roads.

4.3.3 No Action Alternative

There would be no impacts to biological resources under the No Action Alternative as the proposed AEOS MCS would not be constructed.

4.4 VISUAL RESOURCES

4.4.1 Proposed Action

No significant impacts to visual resources are anticipated with the proposed orientation and design of the AEOS MCS. Construction-related visual impacts may occur; however these impacts would be temporary and not significant.

Construction activities at the summit would be visible from Pu'u Ula'ula (Red Hill) Overlook. In addition, large construction equipment could be visible from the Pa Ka'oao (White Hill) Visitor Center and from the road leading to the summit. The equipment would generally be smaller than the existing structures and the visual impacts would be temporary. Given the composition of the natural environment at the summit, landscaping cannot be used to hide construction-related alterations and equipment. Therefore, the construction contractor would be required to minimize the area disturbed, maintain the disturbed area and properly store construction materials.

A viewshed analysis, prepared for a four-kilometer (2.5-mile) radius from the summit, used topography to indicate the areas where the summit can be seen within the designated radius (Figure 10). The viewshed analysis confirmed that the summit area is visible from some areas to the north, and the view of the summit is blocked from much of the land to the east, west, and south. The AEOS MCS would not be visible from the Pu'u Ula'ula (Red Hill) Overlook or Pa Ka'oao (White Hill) Visitor Center, as the AEOS telescope building would block the view of the proposed AEOS MCS (Figures 8 and 9). Nor would the AEOS MCS be visible from lower elevations. To minimize visual impact, the color of the building exterior would be similar the color of the surrounding ground surface and existing buildings at MSSC.

4.4.2 Mauna Kea Alternative

There would be no significant impact to visual resources as the Mauna Kea Alternative would use an existing mirror coating facility atop Mauna Kea on the island of Hawai'i. Activities that could temporarily affect visual resources include construction and operation of a crane to remove and reinstall the mirror at the AEOS telescope. The crane could be visible from Pu'u Ula'ula (Red Hill) Overlook, the Pa Ka'oao (White Hill) Visitor Center, and from the road leading to the summit. This temporary and infrequent impact would occur once every six years and would not be a significant. No permanent structures would be built atop Haleakalā or Mauna Kea under this alternative.

4.4.3 No Action Alternative

There would be no impact to existing structures or views under the No Action Alternative as the proposed AEOS MCS would not be constructed.

4.5 GEOLOGY, TOPOGRAPHY, AND SOILS

4.5.1 Proposed Action

No significant impacts to geology, topography, or soils are anticipated, as the proposed AEOS MCS would be constructed on previously graded and disturbed land. Minimal grading and excavation for structural footings would occur as construction of the proposed AEOS MCS would be on existing paved areas. The use of off-site fill material, if needed, would be coordinated with the National Park Service, and managed as discussed in Section 4.3.1. No excavated soil material would be removed from Haleakalā Observatories. Earth moving activities would be conducted under the guidance of a cultural specialist as described in Section 4.2.

The ground surface in the project area is covered with concrete and the underlying soil has little or no evidence of soil development. Fine cinders present in areas of disturbance have the

potential to migrate in storm water runoff. Appropriate erosion controls, such as drain inlet protection or fiber berms, would be in place during construction activities. Structural controls would be maintained and checked periodically and after storm events. The area of disturbance, including the staging area, will be determined during the design process. If the area of disturbance is 0.4 hectare (1 acre) or greater, a NPDES permit for storm water discharges associated with construction will be obtained. As part of this permit requirement, a best management practices plan would be written and implemented to minimize discharge of sediment in storm water runoff and discharge of non-storm water, such as from dust control activity. Water for dust control would be minimal and would infiltrate or evaporate and not result in runoff. The potential for fugitive dust generated during construction is addressed under Section 4.7 Air Quality.

The construction plan for the project would include a Contingency Plan to prevent pollutant spills onto the ground. Hazardous materials would be handled as described in Section 4.9.1. Wastewater would be handled as described in Section 4.8.4.

Operation of the proposed AEOS MCS would not impact geology, soils, or topography as mirror recoating activities would take place indoors.

4.5.2 Mauna Kea Alternative

Continued operation of the existing mirror coating facilities and temporary use of cranes to load and unload the AEOS mirror would not impact the geology, topography, or soils atop Mauna Kea.

4.5.3 No Action Alternative

There is no construction proposed under the No Action Alternative; therefore, no impact on geologic resources, topography, or soils would occur.

4.6 HYDROLOGY

4.6.1 Proposed Action

Construction-related storm water runoff would be minimized by implementing erosion control best management practices. Non-storm water generated from pressure testing utility lines would be discharged to the existing septic system. The area of disturbance, including the staging area, will be determined during the design process. If the area of disturbance is 0.4 hectare (1 acre) or greater, a NPDES permit for storm water discharges associated with construction will be obtained in compliance with applicable sections of HAR Chapter 11-55 Water Pollution Control, including Sections 11-55-04 application for NPDES permit and submittal of notice of intent, Section 11-55-38 historic and burial sites review, and Appendices A-L. Although the Proposed Action does not include work in water, construction of the AEOS MCS would adhere to the applicable requirements of HAR 11-54 Water Quality Standards.

The AEOS MCS would not increase the impermeable surface area at MSSC. As with storm water runoff from existing impermeable surfaces in the area, runoff from the proposed AEOS MCS would drain into existing inlets in the pavement and/or onto the surrounding areas and quickly infiltrate into the highly permeable cinder surface, or be retained in the depression

southwest of the facility prior to infiltration. Therefore, no significant adverse impacts to surface water are anticipated.

No groundwater wells would be installed as part of the AEOS MCS construction. Sewage and domestic wastewater would be disposed of via connection to the existing sewage system, as discussed in Section 4.8.4. Therefore, no significant adverse impacts to groundwater are anticipated.

4.6.2 Mauna Kea Alternative

Continued operation of the existing mirror coating facilities would not impact the groundwater or surface water atop Mauna Kea.

4.6.3 No Action Alternative

There is no construction proposed under the No Action Alternative; therefore, no impacts to surface water or groundwater are would occur.

4.7 AIR QUALITY

4.7.1 Proposed Action

No significant impacts on air quality would occur from the Proposed Action. Maintenance of the existing air quality conditions is critical to the continued full use of the existing MSSC facilities, thus the AFRL has a vested interest in limiting air emissions. To this end, the AFRL has developed an air quality maintenance plan, which specifies the measures to be taken to limit emissions. To ensure that MSSC maintains compliance with Federal and State air quality rules, the AFRL implements their own air quality permit review procedures.[10]

Criteria and hazardous air emissions would occur with the Proposed Action, but would be small and temporary or small and negligible. Criteria air pollutants would be emitted from construction-related equipment, vehicles, and site development activities. Equipment would include mobile source emissions from cranes and possibly generators to power other construction-related equipment. These emissions, plus the tail-pipe emissions from the approximately six construction-related vehicles per day, would be temporary and would not significantly impact air quality.

Site development activities are likely to generate fugitive dust. To minimize fugitive dust emissions, the building foundation would be completed as soon as possible after construction begins and the construction area would be limited to the paved parking area at MSSC (Figure 6). As required by HAR 11-60.1-33, reasonable precautions (e.g., the application of water and the covering of moving, open-bodied trucks containing materials that could result in fugitive dust) would be taken to minimize fugitive dust. Water would be applied to exposed ground surface to suppress dust; however, amounts would be minimal and would infiltrate or evaporate and not result in runoff. In addition, the AFRL's air quality maintenance plan specifies the measures to be taken to limit emissions, and adherence to its provisions would be required by the

[10] Rocketdyne Technical Services Boeing North American, Inc. June 4, 1997. *Air Quality Management Plan for Maui Space Surveillance Complex Haleakalā Summit*. CDRL M508M

construction contract.[11] Specific information about site development and fugitive dust controls follows.

- The construction area consists of concrete pavement and the construction staging areas consist of concrete pavement or cinders that range from boulder-sized to fine-grained materials. Dust controls would be implemented 24-hours a day using water sprinkling or similar methods that would control fugitive dust from ground disturbance. In accordance with the LRDP, contractors at Haleakalā Observatories would implement construction best management practices to minimize fugitive dust, and would not use oil or chemicals for dust control. For these reasons, no significant impacts on air quality would occur from fugitive dust.
- Under the Proposed Action, the mirror stripping operations and restoration of the reflective surface, via vapor deposition, would occur once every six years at MSSC. The AEOS hazardous air pollutant emissions would increase slightly with the additional stripping of the AEOS mirror, but would continue to remain exempt from permitting, as specified in HAR Title 11, Chapter 60.1-62(d). There are no emissions of hazardous air pollutants associated with the vapor deposition process.

4.7.2 Mauna Kea Alternative

Continued operation of the existing mirror coating facilities would not impact the air quality atop Mauna Kea. The truck transporting the mirror to the Mauna Kea summit could generate fugitive dust from the unpaved section of road from Hale Pōhaku to the 3,596-meter (11,800-foot) elevation. However, as this activity would occur once every six years, there would be no significant adverse impact. Hazardous air pollutant emissions from the mirror recoating would be similar to those described under the Proposed Action.

4.7.3 No Action Alternative

There is no construction proposed under the No Action Alternative; therefore, no impacts to air quality are anticipated.

4.8 INFRASTRUCTURE

4.8.1 Roads and Traffic

4.8.1.1 Proposed Action

There would be no significant impact to roads or traffic from the Proposed Action. Prior to construction activities, vehicle routes would be identified and scheduled with the National Park Service for transporting equipment and supplies to the summit. Construction-related vehicles would slightly increase the number of vehicles to the summit during construction, which would be for a short duration (approximately 10 months). These vehicles would be used to transport workers, heavy equipment, and construction materials and supplies to the summit.

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[11] Belt Collins Hawai'i. March 1994. *Final Environmental Assessment/Negative Declaration Advanced Electro-Optical System (AEOS) Telescope and Related Improvements at the Maui Space Surveillance Site (MSSS) Haleakalā, Maui, Hawai'i.* Proposed by University of Hawai'i Institute for Astronomy. Prepared on behalf of U.S. Air Force Space Systems Command.

Construction workers would carpool to minimize the number of vehicles transporting personnel up and down Haleakalā to approximately three vehicles per day. The majority of the heavy equipment would be brought to the project area at the start of each construction phase and would remain there for the duration, with approximately three pieces of equipment involved in each phase. As transportation of non-standard loads could cause traffic delays, vehicle transportation would generally be scheduled to avoid interference with peak traffic flow. The construction-related traffic would not have a significant adverse impact on traffic, as it would be coordinated with the National Park Service and scheduled during off-peak hours.

Once at the construction site, the vehicles and equipment would be operated within the Haleakalā Observatories boundary and specifically within the area of the proposed AEOS MCS and the designated construction staging area. Construction practices would comply with the LRDP and would prohibit parking of heavy equipment and storage of construction materials outside the Haleakalā Observatories property.

Operation of the AEOS MCS would not result in an increase in the number of AEOS employees; therefore, there would be no impact on traffic.

4.8.1.2 Mauna Kea Alternative

There would be no significant impact to roads or traffic. Transportation of the AEOS mirror between the summits and harbors would occur once every six years and would not have a significant adverse impact on roads or traffic. Vehicle routes would be identified and scheduled with the Haleakalā National Park Service for the Maui route to and from Kahului, and vehicle routes between Kawaihae Harbor or Hilo Harbor and the Mauna Kea facility would be coordinated with local and State authorities and the Mauna Kea Observatories Science Reserve staff. Transportation would be scheduled to avoid interference with normal traffic flow, by transporting the mirror during off-peak hours.

4.8.1.3 No Action Alternative

There would be no significant impacts to roads or traffic under the No Action Alternative as the proposed AEOS MCS would not be constructed. Since the AEOS mirror would continue to degrade and be unable to maintain its current capabilities, operations and experiments involving the AEOS telescope could decrease, resulting in a decrease in the number of personnel and vehicular traffic commuting to the summit.

4.8.2 Water

4.8.2.1 Proposed Action

The water line connections would not have a significant impact to the infrastructure. The potable water supply to the proposed AEOS MCS would be provided via a connection to the existing AEOS domestic water line. The water supply for the fire sprinkler line would be via a connection to the existing AEOS fire suppression water line. Water generated during pressure testing of the potable water lines would temporarily remain in the lines to allow the chlorine to dissipate prior to being slowly discharged into the wastewater system.

AEOS mirror recoating activities are not anticipated to increase the volume of potable water used at MSSC, and there would be no impact to water infrastructure from operation of the proposed AEOS MCS. To prevent mirror stripping waste from inadvertently being disposed of in the septic system, the mirror coating area within the AEOS MCS would not have drains connected to the domestic wastewater system.

4.8.2.2 Mauna Kea Alternative

Under this alternative, there would be no increase in personnel at the Mauna Kea Science Reserve to recoat the AEOS mirror; therefore, there would be no associated increase in potable water use by personnel or for mirror recoating activities. No significant impact to water resources is anticipated.

4.8.2.3 No Action Alternative

There would be no impact to water infrastructure under the No Action Alternative as the proposed AEOS MCS would not be constructed.

4.8.3 Power and Communication

4.8.3.1 Proposed Action

The electrical system for the AEOS MCS would be connected to and extended from the existing AEOS power service. An electrical utility room would be constructed within the AEOS MCS to contain new service equipment, switchboards, distribution panels, and dry type transformers. The existing electrical system has the capacity to provide sufficient power to operate the new system, which has a proposed load of approximately 680 kVA.[12] The AEOS MCS would be constructed so access to the MECO transformers would be retained. Figure 2 shows the area available to build the shop; however, the actual footprint would be determined during the design process and would still allow required access to the MECO transformer and ductlines. The new foundation would avoid the existing electrical duct. The increase in power usage is dependent upon experiments being conducted at MSSC, but is not anticipated to exceed an eight percent increase to 5,000 megawatt hours per year.

The communication system for the AEOS MCS would be connected to the existing AEOS telecommunications room.

The existing power and communications infrastructure is capable of handling the anticipated increased demands without upgrades outside of MSSC; therefore, there would be no significant impact to these utilities.

4.8.3.2 Mauna Kea Alternative

Under this alternative, there would be no change in electricity or communications atop Mauna Kea; therefore, there would be no significant impact to the associated infrastructure.

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[12] Design Partners Incorporated. June 9, 2003. *Partnering Agreement Charrette Report Mirror Coating Facility Maui Space Surveillance Site (SUR). Hawai'i.*

4.8.3.3 No Action Alternative

There would be no impacts to electrical or communications infrastructure under the No Action Alternative as the proposed AEOS MCS would not be constructed.

4.8.4 Waste Collection and Disposal

4.8.4.1 Proposed Action

There would be no significant impact to solid waste or wastewater infrastructure under the Proposed Action. Solid waste generated during construction would be handled and disposed of by the contactor at Maui's construction and demolition landfill in Mā'alaea. Construction waste and debris would be secured, particularly during non-working hours, to minimize windblown materials. In accordance with the LRDP, the contractor would remove materials that could serve as a food source on a daily basis, to prevent attraction of rats and other pests. There would be no change in the long-term solid waste disposal activities from the Proposed Action.

AEOS MCS would be connected to the existing AEOS sewer septic system. The leachate from this system is, and would continue to be, discharged to a seepage pit located on the north side of the Butler Building. Water generated during pressure testing of new water and sewer lines would be discharged into the wastewater system. There would be no change in the number of users at MSSC; therefore, there would be no associated increase in volume of domestic wastewater generated.

Hazardous waste generated during mirror recoating operations is discussed in Section 4.9.1.

4.8.4.2 Mauna Kea Alternative

Under this alternative, there would be no increase in personnel or associated domestic wastewater generated at the Mauna Kea. Therefore, there would be no impact to solid waste or wastewater infrastructure.

4.8.4.3 No Action Alternative

Under this alternative, there would be no change in the volume of solid waste or wastewater generated at MSSC; therefore, there would be no impact to the wastewater infrastructure.

4.9 PUBLIC HEALTH AND SAFETY

4.9.1 Hazardous Materials and Waste

4.9.1.1 Proposed Action

There would be no significant impacts to public health or safety associated with hazardous materials used or hazardous waste generated at MSSC. Materials would be properly stored, used, and disposed of to prevent releases and to protect the ground from contamination. Releases of hazardous materials would be prevented at the site, and accidental spills of a hazardous material would be immediately reported to AFRL and the on-site UH IfA supervisor and containment activities would be implemented under UH and U.S. Air Force supervision. Additional release reporting requirements would also be implemented in accordance with MSSC policies and plans,

State of Hawai'i Revised Statutes, U.S. EPA law, and U.S. Air Force Instruction 32-4002 *Hazardous Material Emergency Planning and Response Compliance.*

The materials used in stripping and recoating the AEOS mirror would be the same as those currently used for maintaining smaller mirrors at the existing AEOS telescope building. The mirror would be placed within a plastic-lined wash tank, where the degraded reflective surface would be stripped off the mirror using an acid solution. As an additional precaution to prevent potential release of hazardous waste to the subsurface, the mirror stripping area of the AEOS MCS would not have floor drains. The glass would then be rinsed off in the tank. The resulting hazardous waste would be captured in a drum and stored in MSSC's 270-day hazardous waste storage unit until it can be manifested for disposal, at which time it would be transported off-site for proper disposal. The volume of hazardous waste that would be generated from stripping the AEOS mirror is anticipated to be between 207 and 376 kilograms (456 to 829 pounds), once every six years.

The restoration of the reflective surface, via vapor deposition within the vacuum chamber, would not generate hazardous waste.

4.9.1.2 Mauna Kea Alternative

No significant impact on public health or safety from hazardous materials is anticipated as the materials would be properly stored, used, and disposed of to prevent releases and to protect the ground from contamination. Moreover, the volume and types of hazardous materials stored at the Mauna Kea Science Reserve is not anticipated to change under this alternative and no new activities would occur at the summit. AEOS mirror stripping and recoating activities atop Mauna Kea would use the same materials and generate the same type of waste as under the current conditions. The volume of materials used and waste generated would increase slightly, by approximately the same amount as under the Proposed Action.

4.9.1.3 No Action Alternative

Under this alternative, the AEOS mirror would not be recoated. Therefore, there would be no impact.

4.9.2 Noise

4.9.2.1 Proposed Action

Construction of the proposed AEOS MCS would involve noise associated with excavation, trenching, grading, and other typical building construction activities. The loudest potential noise sources include derrick cranes (88 dBA), cement mixers (88 dBA), scrapers (93 dBA), pavers (88 dBA), pneumatic tools (88 dBA), and trucks (93 dBA). Rock drills are the noisiest pieces of equipment that might be used (98 dBA), but their use (if used at all) would be limited to a few weeks during the construction of the shop foundation. Noise levels decrease significantly with

increasing distance from the source; a 6 dB decrease is generally exhibited with each doubling of the distance between the source and the location at which noise is audible.[13]

Noise-sensitive human uses identified within Haleakalā Observatories could include native Hawaiian traditional cultural practices and spiritual use. Other nearby noise-sensitive locations are the Pu'u Ula'ula (Red Hill) Overlook and the Pa Ka'oao (White Hill) Visitor Center. Construction activities would be short-term and temporary, and operational noise is expected to be minimal. The employees at MSSC and Haleakalā Observatories would be working within enclosed structures that would greatly attenuate the noise.

Construction workers in close proximity to the noise-generating equipment would be protected against noise exposure by following the State guidance provided in HAR §12-200.1 Occupational Noise Exposure. Noise permits for construction would be obtained as required, and appropriate noise-reducing measures, such as limiting unnecessary idling of equipment, equipping combustion engine-driven equipment with mufflers, or using quiet equipment where possible, would be considered as appropriate.

Operation of the AEOS MCS would be contained within the shop interior. Exterior operations would not represent a change from current conditions. Therefore, no noise impacts are anticipated from operation of the AEOS MCS.

4.9.2.2 Mauna Kea Alternative

Under the Mauna Kea Alternative, no building construction would occur. Construction of the crane at MSSC to remove and reinstall the mirror would occur once every six years, and is expected to be around 84 dBA. The noise generated by the truck transporting the AEOS mirror to the mirror coating facility atop Mauna Kea would not increase the occasional vehicular noise. No significant impact from noise is anticipated.

4.9.2.3 No Action Alternative

Under the No Action Alternative, there would be no impacts to the existing noise conditions.

4.10 SOCIOECONOMICS

4.10.1 Proposed Action

There would be no significant socioeconomic impacts from implementation of the Proposed Action. Construction of the AEOS MCS, which is expected to take ten months, would have a temporary, beneficial impact on the state economy. Approximately half of the $7.5 million project construction cost would be expended in Hawai'i.[14] This would be less than one percent of the total $3.9 billion of construction work in Hawai'i in 1997.[15] Therefore, the beneficial impact of the project's construction cost on the economy of the state is not expected to be significant.

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[13] For example, if an activity generates 90 dBA at a distance of 15 meters (50 feet), the noise level at a distance of 30 meters (100 feet) would decrease to 84 dBA, and would further decrease to 78 dBA at a distance of 61 meters (200 feet).

[14] *KC Environmental, Inc. January 2005. University of Hawai'i Institute for Astronomy Haleakalā High Altitude Observatory Site Long Range Development Plan.*

[15] State of Hawai'i, Department of Business, Economic Development, and Tourism. August 2004. *The State of Hawai'i Data Book, A Statistical Abstract.*

Construction and operation of the AEOS MCS would help insure the continuation of the employment, educational opportunities, and economic activity associated with astronomical activities at Haleakalā. The proposed construction could also provide mirror coating capabilities for other existing or proposed telescopes at Haleakalā Observatories, such as the Panoramic-Survey Telescope and Rapid Response System (Pan-STARRS), and the Advanced Technology Solar Telescope (ATST). The proposed AEOS MCS is not anticipated to create new jobs or affect the population of Maui County. There would be no increase in personnel at MSSC to operate the AEOS MCS.

Construction and operation would occur within a secured military facility with no minority or low-income populations. Therefore, with respect to Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, there would be no significant adverse impacts to minority or low-income populations under this alternative.

4.10.2 Mauna Kea Alternative

No construction or change in the number of employees would be associated with this alternative. There would be no adverse impacts to minority or low-income populations under this alternative, as these populations are not in the area. There would be no related socioeconomic impacts.

4.10.3 No Action Alternative

Under the No Action Alternative, there would be no new construction, no associated economic benefits, and no adverse impacts to socioeconomics. As the mirror's reflectivity continues to degrade, jobs and educational opportunities at AEOS would eventually be lost. Government funding for the MSSC would decrease, which would cause an economic downturn for the community. A 75 percent loss in the annual payroll (greater than $18 million) and educational opportunities for the MSSC research and operations would be anticipated.

4.11 SECONDARY AND CUMULATIVE IMPACTS

4.11.1 Secondary Impacts

As defined by the CEQ regulations at 40 CFR 1508.8 and HAR 11-200-2, the term "secondary impacts" (also called "indirect effects") means those impacts caused by the action that are later in time or farther removed in distance but still reasonably foreseeable. They may include effects related to induced changes in land use patterns and population density or growth rate, and related effects on air, water, or other natural systems, including ecosystems.

The Proposed Action involves construction and operation of the AEOS MCS at MSSC within Haleakalā Observatories, and the Mauna Kea Alternative involves the use of an existing mirror coating facility on the island of Hawai'i. A No Action Alternative is also evaluated as required under CEQ regulations at 40 CFR 1502.14. The Proposed Action and Mauna Kea Alternative would not represent changes in land use, population density, growth rate, or secondary effects on natural resources. No secondary impacts have been identified and none are anticipated from either of these alternatives. The No Action Alternative, which could result in the eventual loss of capability of the AEOS telescope and associated jobs and economic losses, would have

associated secondary impacts to the socioeconomic environment of the local community and the nation.

4.11.2 Cumulative Impacts

"Cumulative impacts" are defined in the CEQ regulations at 40 CFR 1508.7 and in HAR 11-200-2 as environmental impacts resulting from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. As such, all the impacts on affected resources could be considered cumulative. Analysis of cumulative effects should occur at a practical scale, therefore the list of environmental effects must focus on those that are truly meaningful, not produce superficial analyses of a long list of issues that have little relevance to the effects of the proposed action or the eventual decisions.[16] Under the Proposed Action and alternatives, cumulative impacts could result when combined with the effects of other development projects during the same period of time or at different times (defined by the geographic boundary for the resource it affects, as described below). In certain cases, projects cumulatively affecting a similar resource, e.g., endangered species habitat, can be geographically distant.

Other actions considered in this cumulative impact analysis were identified by defining the cumulative impact study timeframe and geographic boundaries. The timeframe used in this analysis was determined by considering the period beginning with the initial development of astronomy facilities on Haleakalā in 1960 and extending through 2014 to include the next 10 years of development, as identified in the 2004 UH IfA LRDP for Haleakalā Observatories. This future timeframe is consistent with the anticipated duration of the AFRL's lease renewal of the MSSC property from UH. Because the cumulative impacts analysis evaluates the cumulative impacts on resources, reasonable geographic boundaries are specified for each of the potentially affected resources of the Proposed Action as follows:

- Land Use: Summit of Haleakalā
- Cultural Resources: Haleakalā
- Biological Resources: critical habitat and ranges of the threatened and endangered species
- Visual Resources: viewplanes of Haleakalā Observatories from as far as Central Maui
- Geology, Topography, and Soils: Haleakalā Observatories
- Hydrology: Haleakalā Observatories and the underlying aquifer
- Air Quality: Haleakalā Observatories
- Infrastructure:
  - Roads and Traffic: route to Haleakalā Observatories
  - Water: collective drinking water sources on Maui

16 Council on Environmental Quality. January 1997. *Considering Cumulative Effects Under the National Environmental Policy Act.*

  - Power and Communication: MECO power supply and Hawaiian Telcom communication system
  - Waste Collection and Disposal: permitted disposal facilities on Maui and septic system Haleakalā Observatories
- Hazardous Materials: Haleakalā Observatories
- Noise: nearest noise sensitive locations in the Haleakalā Observatories
- Socioeconomic Environment: Island of Maui

Proposed projects identified in UH IfA's LRDP and information from the National Park Service were used to identify other actions for consideration in this cumulative impact analysis. Past, present, and reasonably foreseeable future actions with impacts associated with the Proposed Action considered in this EA are described in Table 6 below.

Table 6
Past, Present, and Reasonably Foreseeable Future Actions Associated With the Proposed Action

Facility/Action	Status	Future Action
Mees Solar Observatory (MSO)	1966, currently used	Remain as-is, or be replaced by the proposed Advanced Technology Solar Telescope (ATST) or another similar, but likely smaller solar facility
LURE Satellite Laser Ranging	1971, ending in 2004	Undergo renovation for a Panoramic-Survey Telescope and Rapid Response System (Pan-STARRS) test bed
LURE MAGNUM telescope	1971, currently used	Remain as-is
Atmospheric Airglow	1961, currently used	Remain as-is, or be replaced by Pan-STARRS or the proposed ATST or another similar, but likely smaller solar facility
Zodiacal Light	1961, currently used	Remain as-is
Cosmic Ray Neutron Monitor Station	1961, currently used	Remain as-is
Baker-Nunn Site (Numerous, Small, Temporary Experiments)	1957, currently used	Remain as-is
Faulkes Telescope North	2003, currently used	Remain as-is
MSSC	Construction occurred over several years since 1963, currently used	Proposed construction of AEOS MCS to AEOS telescope
Pan-STARRS	Proposed	New site/reuse site
SLR-2000	Proposed	New site/reuse site
Haleakalā Visitor Center Comfort Station renovation	Renovations in 2002	Upgrades to water and wastewater treatment system
National Park Service road cattleguards	Proposed	Proposed addition to National Park Service Road (National Park Service project)
Federal Aviation Administration road rebuilding	Proposed	Proposed renovation to accommodate traffic increases (National Park Service project)

Cumulative impacts associated with the Proposed Action and Mauna Kea Alternative follow. Information from the Mauna Kea Alternative was tiered from the *Environmental Impact Statement for the Outrigger Telescopes Project.*[17] Cumulative impacts associated with the No Action Alternative were not evaluated because this alternative would not contribute to impacts from past, present, or reasonably foreseeable actions.

Land Use

In 1961, the Haleakalā summit area was designated by Governor Quinn under Executive Order 1987, to be under the control and management of the UH.[18] This order established the Haleakalā High Altitude Observatory Site. The Haleakalā Observatories site has been used for astronomy facilities since the 1960s, and the use is consistent with the Conservation District General Subzone designation from the State. The Proposed Action and future projects at the summit would obtain appropriate land use approvals as required, and activities would support and be consistent with State and local land use plans and the UH IfA LRDP. Construction of the AEOS MCS is recognized in the LRDP. For these reasons, no significant cumulative impact on land use would occur.

The Mauna Kea Alternative would support and be consistent with current land use at the Mauna Kea Science Reserve. No land use changes would occur at the Mauna Kea Science Reserve; therefore, no cumulative impacts would occur with this alternative.

Cultural Resources

Past activities at Haleakalā Observatories have had a cumulative impact on cultural resources. As part of the UH IfA's commitment to preserving the cultural resources at Haleakalā Observatories, future construction projects, including the Proposed Action, are required to follow the recommendations of the Cultural Resources Assessment described in the LRDP.

Cumulative impacts on cultural resources at Haleakalā Observatories include those from earth-moving activities that potentially disturb subsurface archaeological resources. While archaeological resources have not been identified within the project site, they are within the reasonable geographic boundary being evaluated for cumulative impacts, and are considered to be a part of the native Hawaiian cultural landscape because of their ceremonial and traditional importance. The National and State registers of historic places do not include sites at Haleakalā Observatories; however, the Crater Historic District Haleakalā National Park (Site 50-11-1739) extends outside the Haleakalā National Park boundaries, and includes non-Federal lands such as the Haleakalā Observatories, including the project area.[19] Since no historic properties (buildings, structures, or sites), as listed on Federal and State registers of historic places, are present at the summit of Haleakalā, no cumulative impacts to historic properties would be associated with the Proposed Action.

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17 National Aeronautics and Space Administration (NASA), Office of Space Science. July 2004. *Draft Environmental Impact Statement for the Outrigger Telescopes Project.* Volume I.

18 *KC Environmental, Inc. January 2005. University of Hawai'i Institute for Astronomy Haleakalā High Altitude Observatory Site Long Range Development Plan.*

19 State of Hawai'i DLNR, SHPD. *National and State Register of Historic Places* Kilohana Quadrant http://www.hawaii.gov/dlnr/hpd/index.htm. Accessed September 25, 2004.
Personal Communication. Ms. Elizabeth Gordon, National Park Service, with Ms. Arlette St. Romain Meader, Belt Collins, October 20, 2004.

Cumulative impacts on cultural resources at Haleakalā Observatories include those associated with visible man-made structures and audible noise that affect the use of the area as a spiritually sensitive place. While cumulative impacts on cultural resources have occurred, efforts to minimize current and future impacts have been established in the LRDP and will be followed. For example, UH IfA intends to provide continued access to areas of spiritual value at the summit. This includes setting aside 2,230 square meters (24,000 square feet) in perpetuity for the sole use of kanaka maoli for religious and cultural purposes on a non-interference basis with site activities.

Cumulative impacts to cultural resources from past, present, and future actions at the summit of Mauna Kea have been identified in the *Environmental Impact Statement for the Outrigger Telescopes Project*. The Mauna Kea Alternative, described as an alternative to the proposed AEOS MCS, would not involve construction at Mauna Kea Science Reserve, as it would use an existing facility currently conducting mirror coating operations. Therefore, it would not contribute to cumulative impacts on cultural resources at Mauna Kea.

Biological Resources

Threatened and endangered species present at the project site are found elsewhere within the state. The known distribution of the threatened ʻahinahina includes Haleakalā Observatories, Haleakalā National Park, and The Nature Conservancy of Hawaiʻi's Waikamoi Preserve, which is located just outside the Haleakalā National Park entrance. Critical habitat designated for this species on Maui does not include MSSC.[20] The known nesting range of the endangered ʻuaʻu, is on the islands of Maui, Hawaiʻi, Molokaʻi, Lānaʻi, and Kauaʻi; however, the largest nesting colony is located in and around Haleakalā National Park. Populations of nēnē currently exist on the islands of Maui, Hawaiʻi, and Kauai, with an estimated statewide population of approximately 1,300 birds. The known range of the endangered nēnē on Maui includes the slopes of Haleakalā, primarily between elevations of 2,000 to 2,300 meters (6,300 to 7,700 feet) and a small distribution in west Maui. On the island of Hawaiʻi, nēnē are known to occur at elevations from sea level to 2,400 meters (7,900 feet) in several areas including the slopes of Mauna Kea and the saddle between Mauna Kea and Mauna Loa.[21]

Factors contributing to the past decline of these species, and subsequent listing under the Federal Endangered Species Act, are varied and could include habitat loss, predation, disease, or competition from invasive species. The continuation of these actions which have cumulatively impacted these species has been curtailed by the protections offered by listing as threatened or endangered under the Federal ESA. Listing also minimizes potential impacts from present and future actions for as long as the species is listed.

Construction of the AEOS MCS would include coordination with the USFWS and implementation of the practices described in the LRDP and measures identified by the USFWS to minimize impacts to threatened and endangered species. Operation of the AEOS MCS and implementation of the Mauna Kea Alternative would also include implementation of the

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20 U.S. Fish and Wildlife Service, Department of the Interior. May 14, 2003. *Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for 60 Plant Species from the Islands of Maui and Kahoolawe, HI; Final Rule.* Federal Register, Volume 68, No. 93.

21 U.S. Fish and Wildlife Service. July 2004. *Draft Revised Recovery Plan for the Nēnē or Hawaiian Goose (Branta sandvicensis).*

practices in the LRDP. Projects conducted by other Federal agencies that could impact these species would require coordination with the USFWS. Actions by State agencies, such as the UH IfA, would be subject to the requirements of the Federal Endangered Species Act. Therefore, cumulative impacts on biological resources associated with the Proposed Action and Mauna Kea Alternative are not anticipated.

Visual Resources

Prior to development for astronomy facilities, the natural barren landscape was visible from areas of Haleakalā and Central Maui. The telescope facilities built on Haleakalā during the past several decades have had a cumulative impact on the scenic value of the summit. When there is no cloud cover on the mountain, the white domes of the facilities can be visible from various locations on Maui, and during the early morning and late afternoon hours, the reflection of sunlight off the AEOS dome can be seen from Central Maui. The proposed AEOS MCS would be oriented and designed to minimize visual impacts, would not be visible from Central Maui or the nearby visitor center and overlook, and is therefore not anticipated to significantly contribute to cumulative impacts on visual resources.

Under the Mauna Kea Alternative, no new permanent structures would be constructed on Haleakalā or Mauna Kea so no cumulative impacts on visual resources would occur.

Geology, Topography, and Soils

The ground at the Haleakalā summit has been disturbed during previous construction activities. Excavation and grading of soil has modified the topography of the Haleakalā Observatories. Minimal excavation and grading for the Proposed Action would occur in a paved and previously disturbed area, and would not alter the surrounding geology, topography, or soils at the summit. Therefore, no cumulative impacts on these resources would be associated with construction or operation of the proposed AEOS MCS.

The Mauna Kea Alternative would have no impact on geology, topography, or soils and there would be no associated cumulative impact.

Hydrology

There would be no impacts to surface or groundwater from the Proposed Action and Mauna Kea Alternative; therefore, no cumulative impacts to these resources would occur.

Air Quality

While cumulative impacts have occurred on air quality in the Haleakalā Observatories area, no significant cumulative impacts on air quality would occur related to the Proposed Action as impacts would be short-term and temporary. Compliance with existing DOH rules and the U.S. Air Force air quality maintenance plan would minimize fugitive dust emissions during construction. Future projects at Haleakalā Observatories are planned to re-use existing sites and would comply with DOH guidance. Operation of the AEOS MCS would not contribute to significant cumulative air quality impacts as the mirror coating process would occur once every six years and would remain at annual levels that are below those requiring a permit for MSSC, per HAR Title 11, Chapter 60.1-62(d). For these reasons no significant cumulative impacts on air quality would occur from the Proposed Action.

Infrastructure

Construction of astronomy and National Park Service facilities atop Haleakalā have resulted in the installation of infrastructure at the previously undeveloped slopes and summit areas. Upgrades of the utilities to meet increasing demands have occurred periodically over time since the original installation.

The road up to Haleakalā summit is regularly used, mostly by Haleakalā National Park visitors. The potential road surface wear from construction vehicles would contribute to the need for periodic road maintenance.

There would be no increase in demand for infrastructure associated with water supply, waste disposal, or communications and there would be no associated cumulative impacts to these resources. The Proposed Action would slightly increase the electrical demand at MSSC. However, no infrastructure upgrades outside of MSSC or at Mauna Kea Science Reserve would be needed, so no cumulative impacts on infrastructure would occur.

Public Health and Safety

Hazardous Materials and Waste. Hazardous materials have been used and hazardous waste has been generated during the construction and operation of existing facilities at Haleakalā Observatories. The UH IfA and U.S. Air Force have written procedures for the handling and disposal of such materials and future construction and operation activities involving hazardous materials would follow these written protocols. The Proposed Action and Mauna Kea Alternative would contribute to the cumulative impact of the continued storage, use, and disposal of hazardous materials, but materials and waste would be properly handled and disposed of off-island in accordance with existing laws and regulations. For this reason, no significant cumulative impact associated with hazardous materials would occur.

Noise. Noise generated from construction of the proposed AEOS MCS would be short-term and temporary. No other construction at Haleakalā Observatories is anticipated to occur during the planned construction of the AEOS MCS; therefore, no cumulative noise impacts from construction activities are anticipated. No noise impacts from the proposed mirror coating operations are anticipated; therefore, no cumulative impacts on noise levels would occur under the Proposed Action or Mauna Kea Alternative.

Socioeconomic Environment

The beneficial impact from construction and operation of the Proposed Action would contribute, but not significantly, to the past cumulative economic contributions of the U.S. Air Force and UH IfA to the County of Maui. The cumulative economic and educational impacts have been significant and beneficial.

There would be no significant socioeconomic impacts from the Mauna Kea Alternative, and no cumulative impacts to socioeconomics would occur.

4.12 IRRETRIEVABLE AND IRREVERSIBLE COMMITMENT OF RESOURCES

Use, consumption, destruction, or degradation of resources resulting from implementation of the proposed project, such that the resource cannot be retrieved or replaced in any form, is

considered an irretrievable commitment of resources. A commitment of resources is considered irreversible when it precludes restoration of those resources to their pre-project condition. Most resource commitments for the Proposed Action are temporary and would only occur during construction. Irreversible and irretrievable resource commitments would include:

- construction materials, including materials that make up the building structure and associated infrastructure upgrades;
- money;
- manpower; and
- energy in the form of direct consumption of fossil fuel for vehicles.

4.13 CHAPTER 343 HAWAI'I REVISED STATUTES

The potential direct, secondary, and cumulative impacts of the proposed AEOS MCS were evaluated relative to the 13 criteria defined in HAR 11-200-12 to determine whether the action will have a significant impact on the environment. Significance determinations for each of the potential impacts, relative to these criteria, are presented below and show that no significant impacts are anticipated.

(1) *Involves an irrevocable commitment to loss or destruction of any natural or cultural resource.*

No irrevocable commitment to loss or destruction of any natural or cultural resource would be associated with the Proposed Action. As part of the UH IfA's commitment to preserving the cultural and natural resources at Haleakalā Observatories, future construction projects, including the Proposed Action, are required to follow the construction practices described in the LRDP. The identified cultural and natural resources near the proposed AEOS MCS would be protected under the provisions of the LRDP. Consultation under Section 106 of the NHPA has been completed with the SHPD, which has concurred with AFRL's determination that "no historic properties will be affected" by the Proposed Action. The AFRL has completed informal consultation with the USFWS, under Section 7 of the ESA, to evaluate the potential impacts of the Proposed Action on threatened and endangered species near the project area. The USFWS has concurred with AFRL's determination that the Proposed Action is not likely to adversely affect the 'ahinahina, 'ua'u, nēnē, or Hawaiian hoary bat at Haleakalā.

(2) *Curtails the range of beneficial uses of the environment.*

The construction and operation of the AEOS MCS would not curtail the range of beneficial uses of the environment. Construction of the AEOS MCS would complete most of the originally planned support facilities for the AEOS telescope, would be within a previously disturbed area that has been designated for research use, would not interfere with existing activities in the area, and is included as one of the planned future projects described in the LRDP for the summit.

(3) *Conflicts with the state's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.*

The Proposed Action is consistent with the State's long-term environmental policies and guidelines as expressed in HRS Chapter 344. It will be consistent with the State's policies to (1) conserve natural resources and (2) enhance the quality of life. With respect to the State's guidelines, the Proposed Action will protect endangered species and will be consistent with the guidelines related to population, land use, economic development, transportation, energy, community life and housing, education and culture, and citizen participation.

(4) *Substantially affects the economic or social welfare of the community or state.*

The Proposed Action would not substantially affect the economic or social welfare of the MSSC, the County of Maui, or the State of Hawai'i. Construction and operation of the proposed AEOS MCS would continue the U.S. Air Force's beneficial contributions to the employment, educational opportunities, and economic activity associated with astronomy facilities at Haleakalā, which are approximately $180 million per year.

(5) *Substantially affects public health.*

The Proposed Action would not substantially affect, or have a measurable effect on, public health. Measures needed to ensure compliance with existing health standards have been incorporated into the project. During construction, noise levels and air emissions would comply with State rules so that public health and safety are not jeopardized. Hazardous materials and waste stored, used and generated during mirror recoating activities would be captured at the source in drums, transported off-site, and properly disposed of as hazardous waste.

(6) *Involves substantial secondary impacts, such as population changes or effects on public facilities.*

No secondary impacts have been identified and none are anticipated. The Proposed Action would complete the AEOS telescope building and would not represent changes in land use, population density, growth rate, or secondary effects on natural resources.

(7) *Involves a substantial degradation of environmental quality.*

No substantial degradation of environmental quality would result from the Proposed Action. Construction and operational activities would not involve the use of materials or cause releases to water or ground that could substantially degrade environmental quality. Potential fugitive dust and noise generated during construction would be temporary and controlled using construction practices. Fugitive dust emissions will be minimized in accordance with HAR 11-60.1. Limited air emissions associated with current and future mirror coating activities do not and would not trigger the requirement for air permitting. Hazardous waste generated during mirror coating would be captured in drums at the source, to prevent potential release to the ground, and transported off-site for proper disposal.

(8) *Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions.*

The Proposed Action would contribute to cumulative impacts on cultural resources; however, the protocols outlined in the LRDP would be adhered to in order to ensure preservation of cultural resources, and the resulting impact would not be considerable. The proposed AEOS MCS would be oriented and designed to minimize cumulative visual impacts, would not be visible from Central Maui or the nearby visitor center and overlook, and would not have a considerable effect on visual resources.

(9) *Substantially affects a rare, threatened, or endangered species, or its habitat.*

The Proposed Action is not anticipated to substantially affect a rare, threatened, or endangered species, or its habitat. The AFRL has completed informal consultation with the USFWS, under Section 7 of the ESA, to evaluate the potential impacts of the Proposed Action on threatened and endangered species near the project area. The USFWS has concurred with AFRL's determination that the Proposed Action is not likely to adversely affect the 'ahinahina, 'ua'u, nēnē, or Hawaiian hoary bat at Haleakalā.

(10) *Detrimentally affects air or water quality or ambient noise levels.*

The state of Hawai'i is in an attainment area for criteria air pollutants. The Proposed Action would not detrimentally affect air quality, and air emissions for construction activities would be minimized by adhering to the construction practices described in the LRDP and as required by HAR 11-60.1.

The Proposed Action would not detrimentally affect water quality. No impacts to surface or groundwater are anticipated. A NPDES permit associated with construction activities would be obtained, if the total area of ground disturbance, including staging, is to be 0.4 hectare (1 acre) or greater.

The Proposed Action would not detrimentally affect ambient noise levels, as noise generated from construction of the proposed AEOS MCS would be short-term and temporary.

(11) *Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.*

The Proposed Action would not occur in a flood plain, tsunami zone, erosion-prone area, estuary, fresh water, or coastal waters. The potential for volcanic activity on the dormant Haleakalā volcano exists; however, the last known eruption is estimated to have occurred several hundred years ago, from vents at a lower elevation on the southwest slope of the mountain.

(12) *Substantially affects scenic vistas and viewplanes identified in county or state plans or studies.*

The Proposed Action would not substantially affect scenic vistas or viewplanes identified in the County of Maui's *Open Space & Outdoor Recreation Plan*. Once constructed, the proposed AEOS MCS would be blocked by terrain and surrounding buildings and it would be the color of the surrounding ground surface and existing buildings.

(13) *Requires substantial energy consumption.*

The energy consumed to construct and operate the proposed AEOS MCS would not be substantial. The Proposed Action does not require an increase in generating capacity or to the electrical infrastructure that currently transmits electricity to the summit.

Chapter Five

References

CHAPTER FIVE
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Figures

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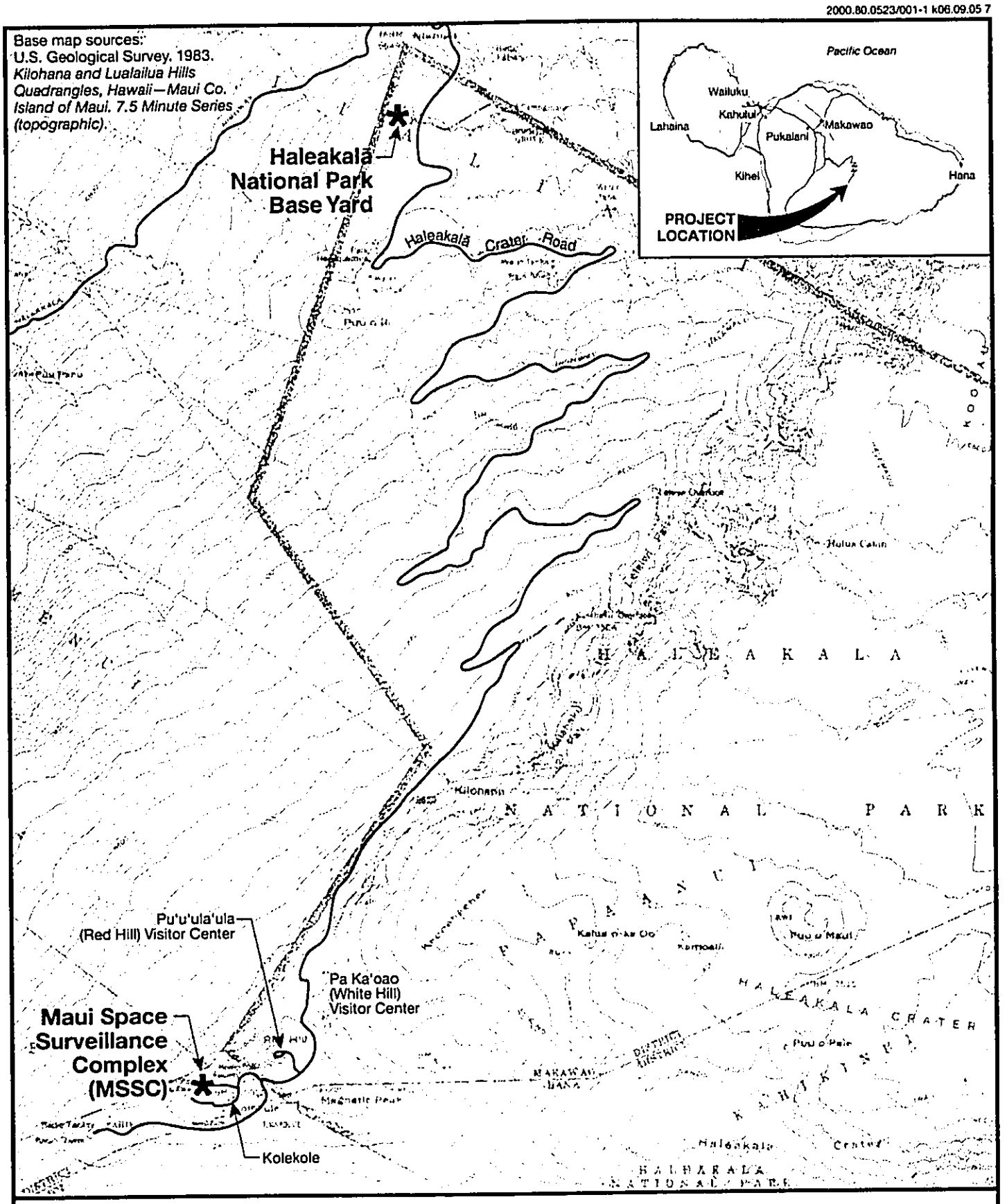
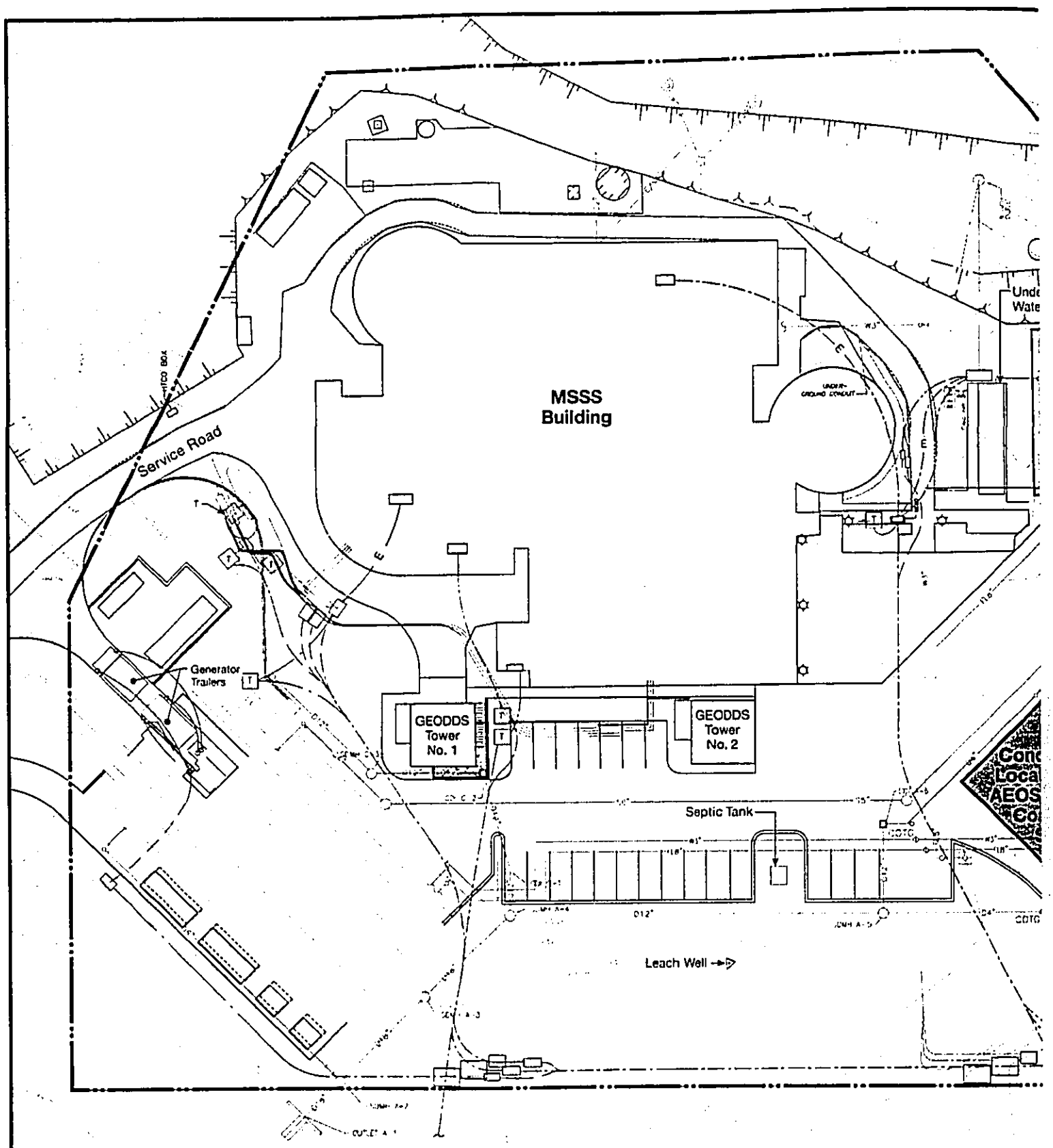


Figure 1
LOCATION MAP

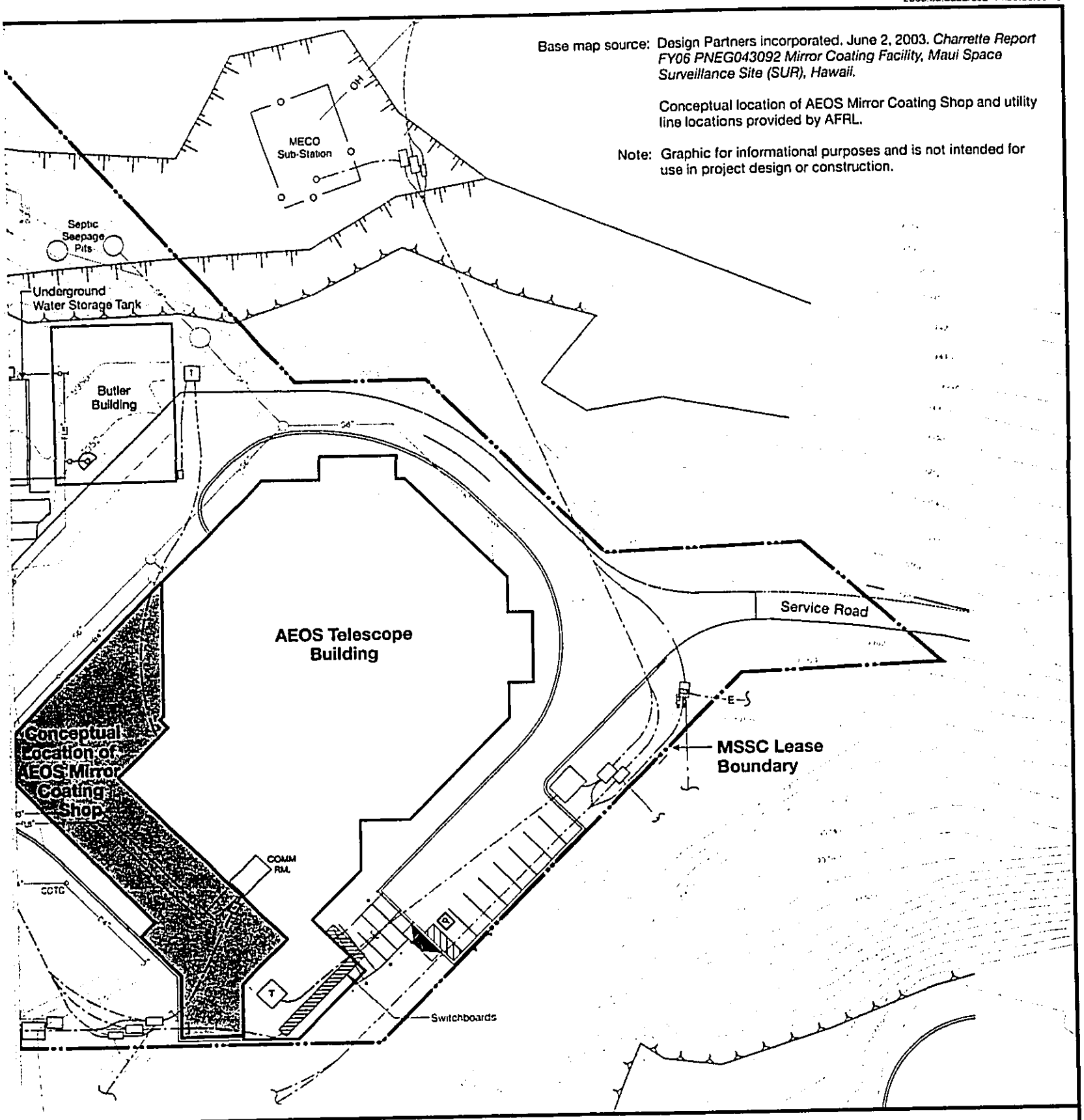
Environmental Assessment
Proposed AEOS Completion


MSSS
Building
Service Road
Generator
Trailers
GEODDS
Tower
No. 1
GEODDS
Tower
No. 2
Septic Tank
Leach Well
Unde
Wate
Conc
Loca
AEOS
Co
0 10 20 30
SCALE IN METERS
0 10 20 30 40 50 100
SCALE IN FEET
NORTH
LEGEND
MSSC Lease Boundary
Existing Structures
Proposed AEOS
Mirror Coating Shop
EXISTING UTILITY LINES
Sewer Line
SMH (Sewer Manhole)
Drainage Line
CDI
Curb Drop Inlet
COTG

Base map source: Design Partners incorporated. June 2, 2003. *Charrette Report FY06 PNEG043092 Mirror Coating Facility, Maui Space Surveillance Site (SUR), Hawaii.*

Conceptual location of AEOS Mirror Coating Shop and utility line locations provided by AFRL.

Note: Graphic for informational purposes and is not intended for use in project design or construction.



SDMH (Sewer Drainage Manhole)
COTG Cleanout to Grade
W Water Line
FL Fire Line
T Electrical Transformer
E Electrical/Communication Line
OH Overhead Line

Figure 2
CONCEPTUAL LAYOUT OF THE PROPOSED AEOS MIRROR COATING SHOP
Environmental Assessment
Proposed AEOS Completion

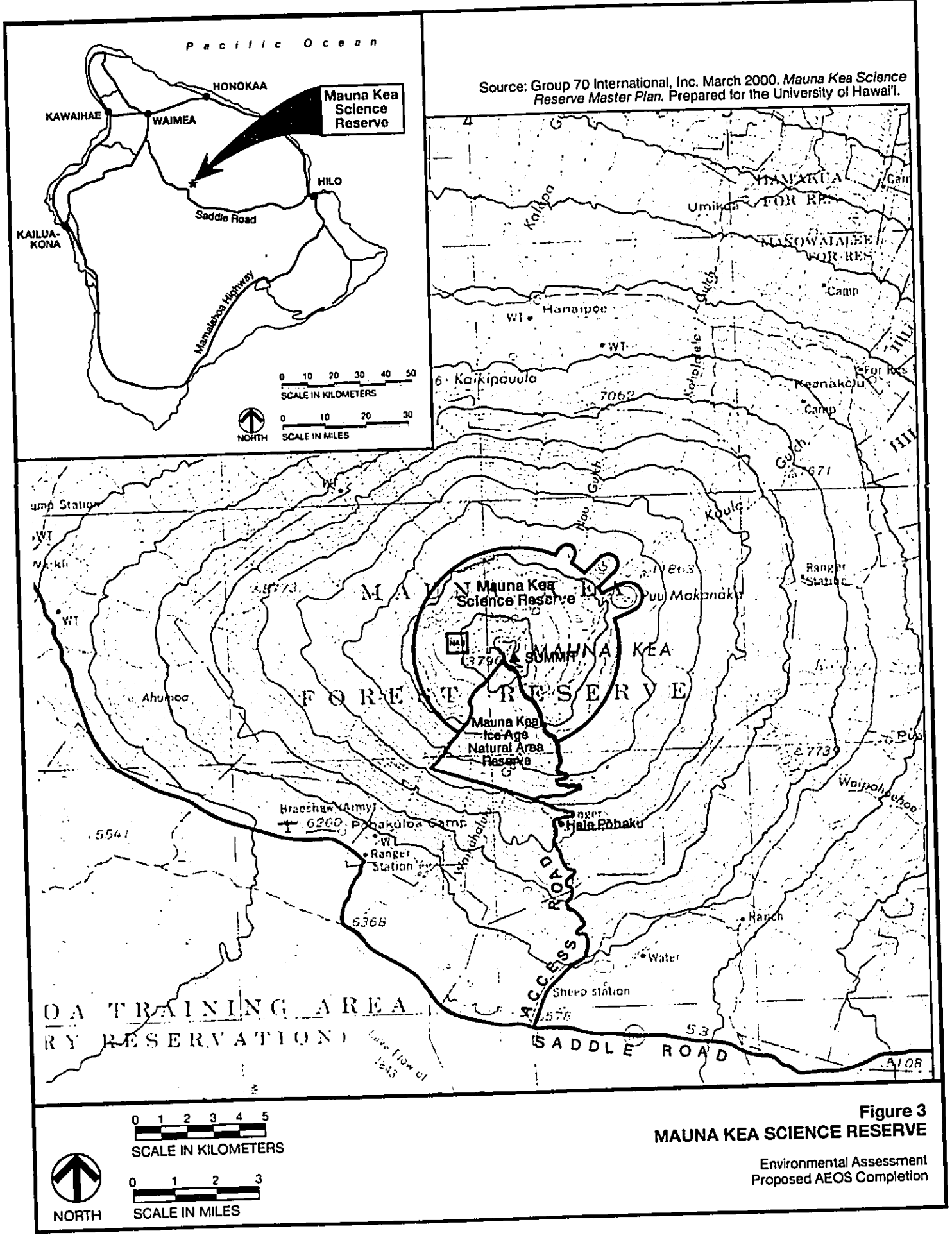


Figure 3
MAUNA KEA SCIENCE RESERVE

Environmental Assessment
Proposed AEOS Completion

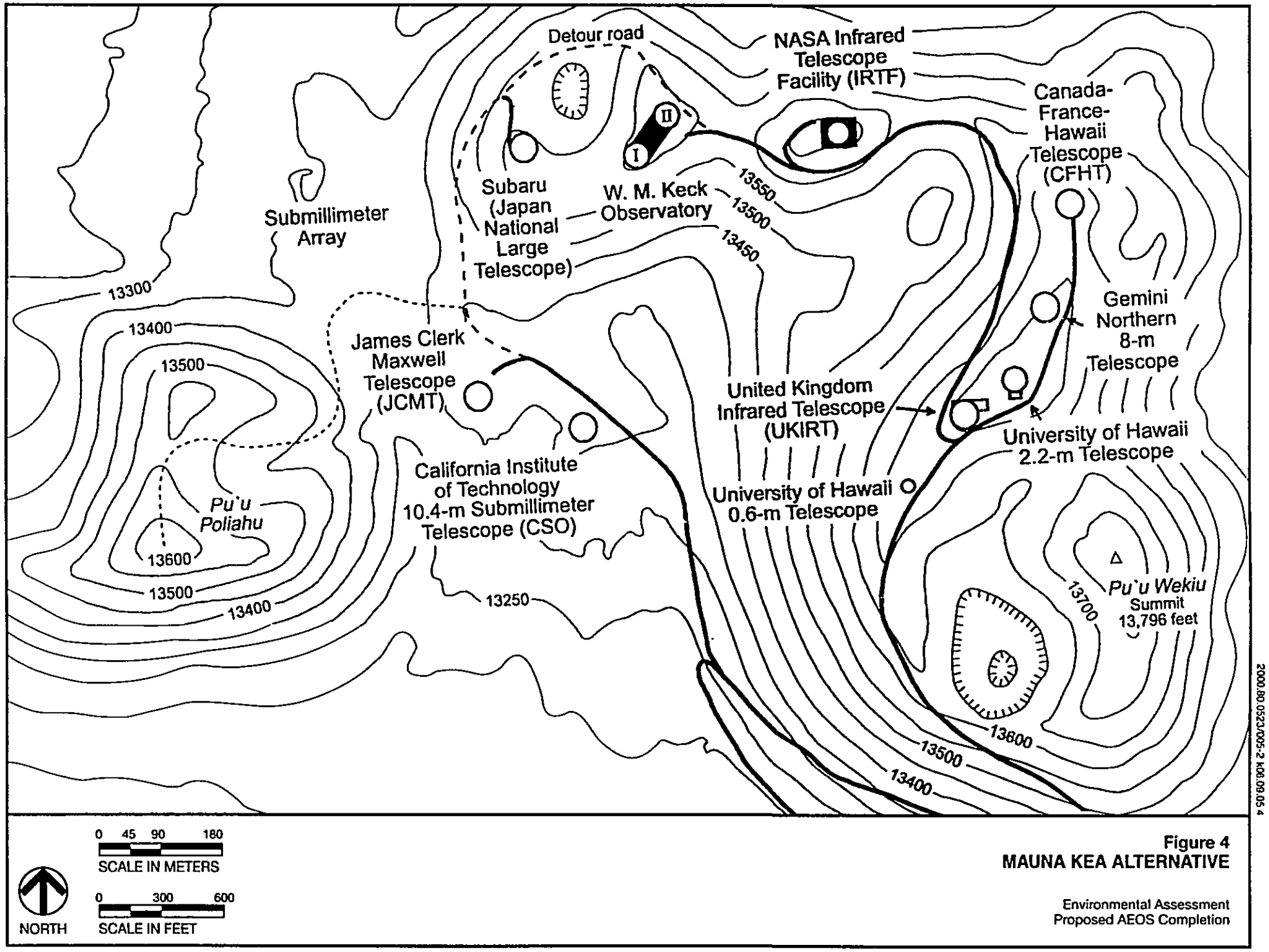


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Figure 4
MAUNA KEA ALTERNATIVE

Environmental Assessment
Proposed AEOS Completion

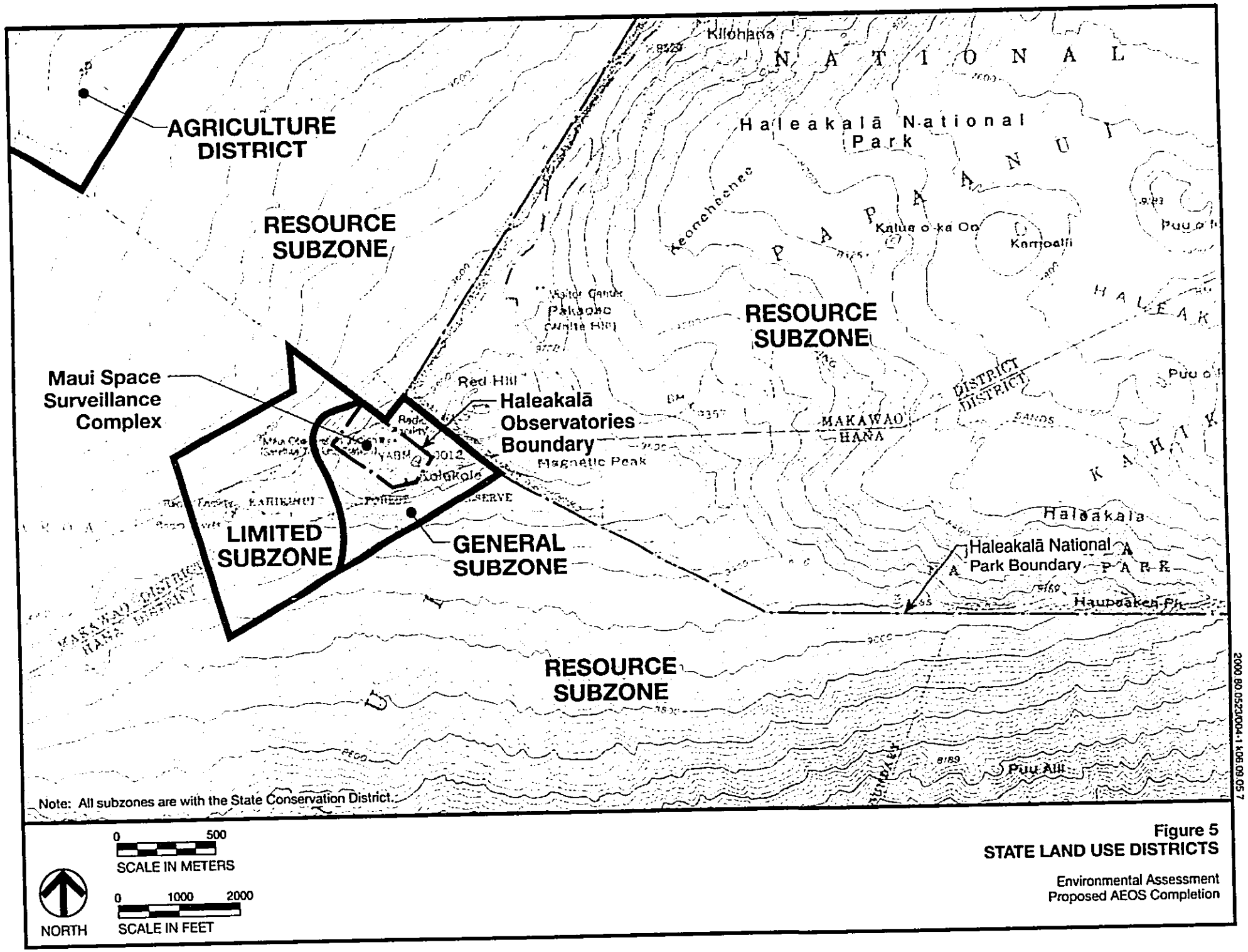
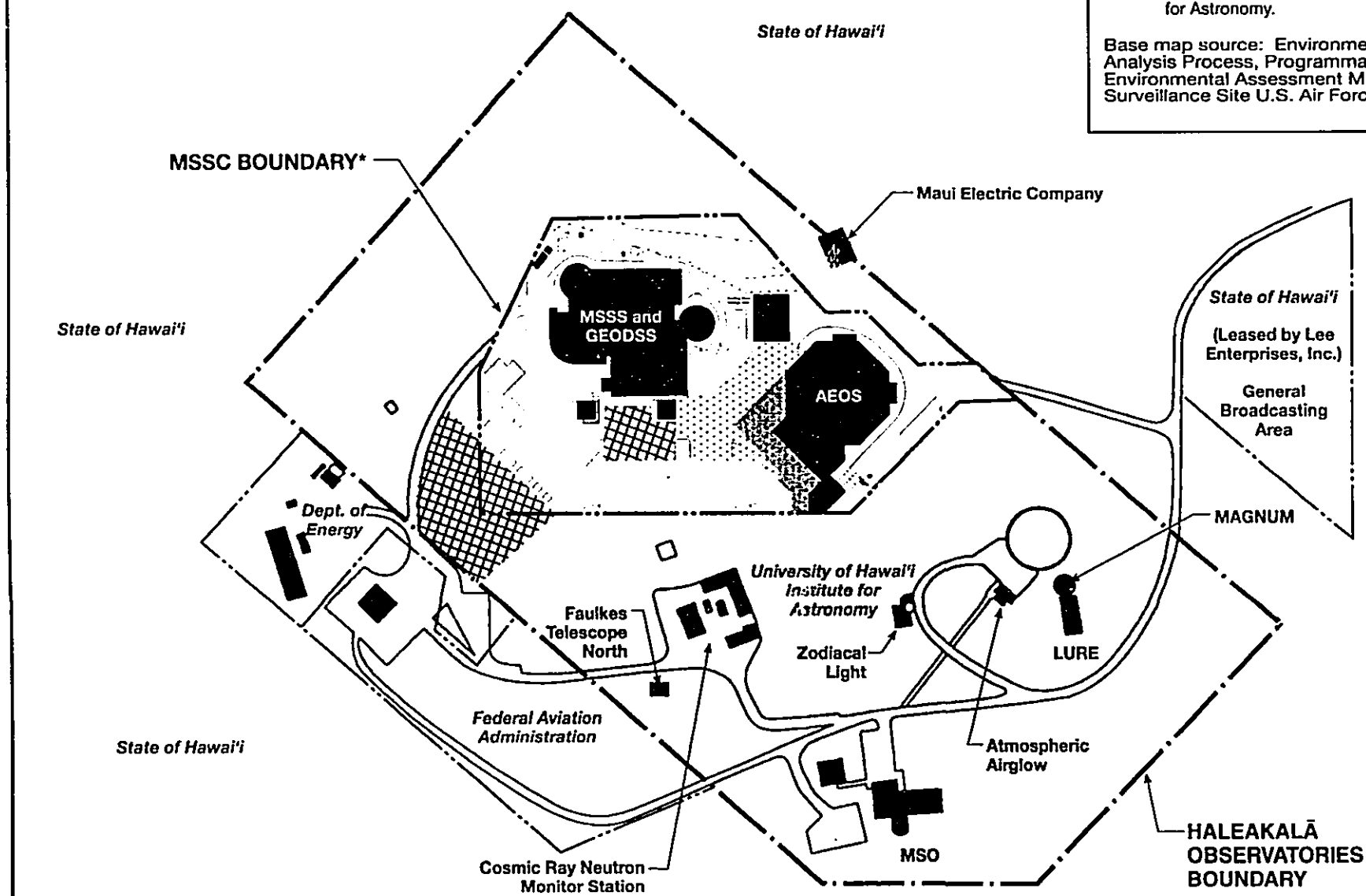


Figure 5
STATE LAND USE DISTRICTS

Environmental Assessment
Proposed AEOS Completion

* Note: Leased from the University of Hawai'i Institute for Astronomy.

Base map source: Environmental Impact Analysis Process, Programmatic Environmental Assessment Maui Space Surveillance Site U.S. Air Force, May 1991.



0 15 30 60
SCALE IN METERS

0 100 200
SCALE IN FEET

NORTH

LEGEND

- Proposed Construction Area
- Proposed Staging Areas
- Conceptual Location of AEOS Mirror Coating Shop

Figure 6
HALEAKALĀ OBSERVATORIES FACILITIES AND LAND MANAGEMENT
Environmental Assessment
Proposed AEOS Completion

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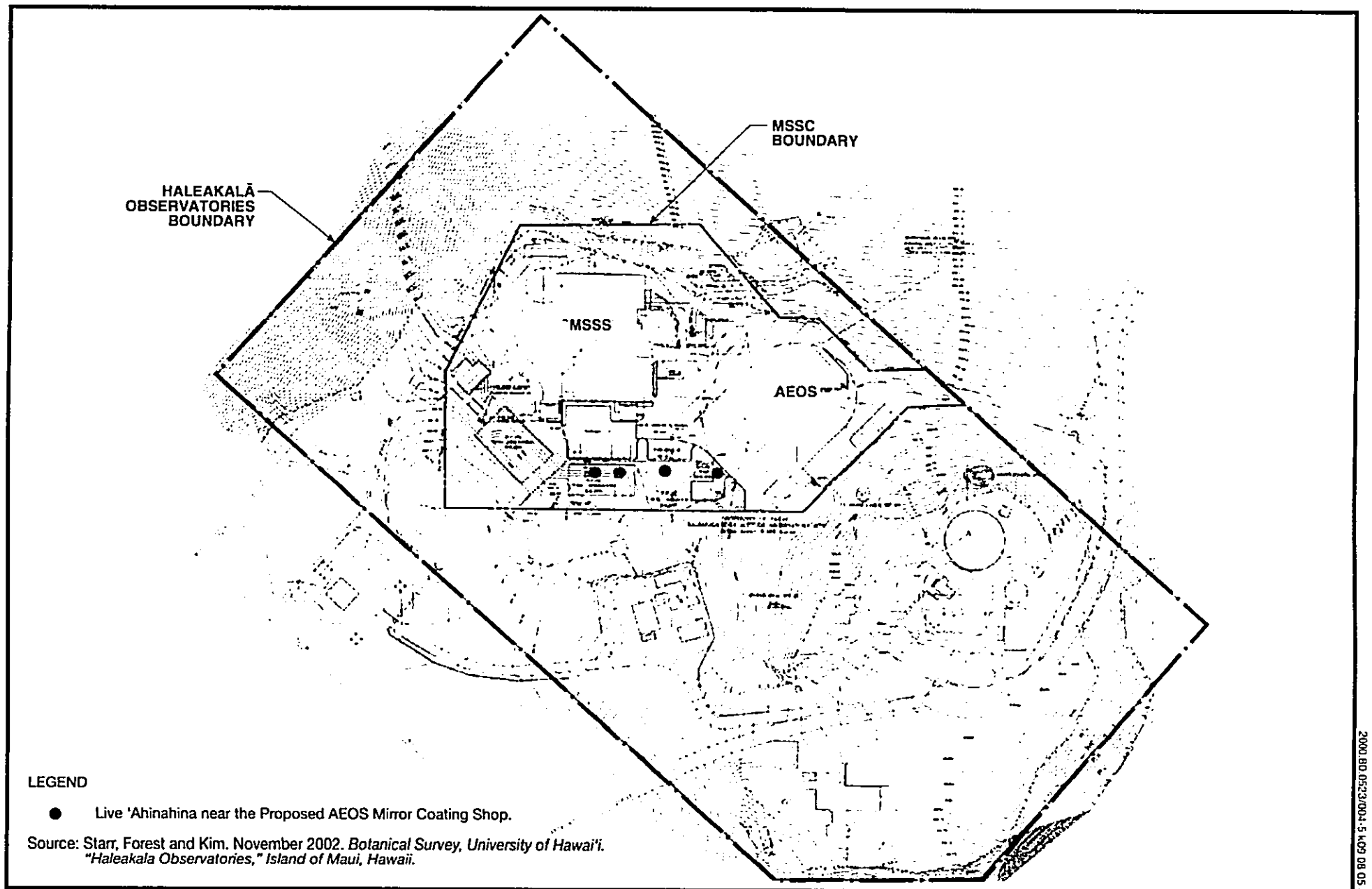

LEGEND

● Live 'Ahinahina near the Proposed AEOS Mirror Coating Shop.

Source: Starr, Forest and Kim. November 2002. *Botanical Survey, University of Hawai'i. "Haleakala Observatories," Island of Maui, Hawaii.*

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NORTH NOT TO SCALE

Figure 7
LOCATION OF LIVE 'AHINAHINA NEAR PROPOSED AEOS MIRROR COATING SHOP SITE

Environmental Assessment
Proposed AEOS Completion

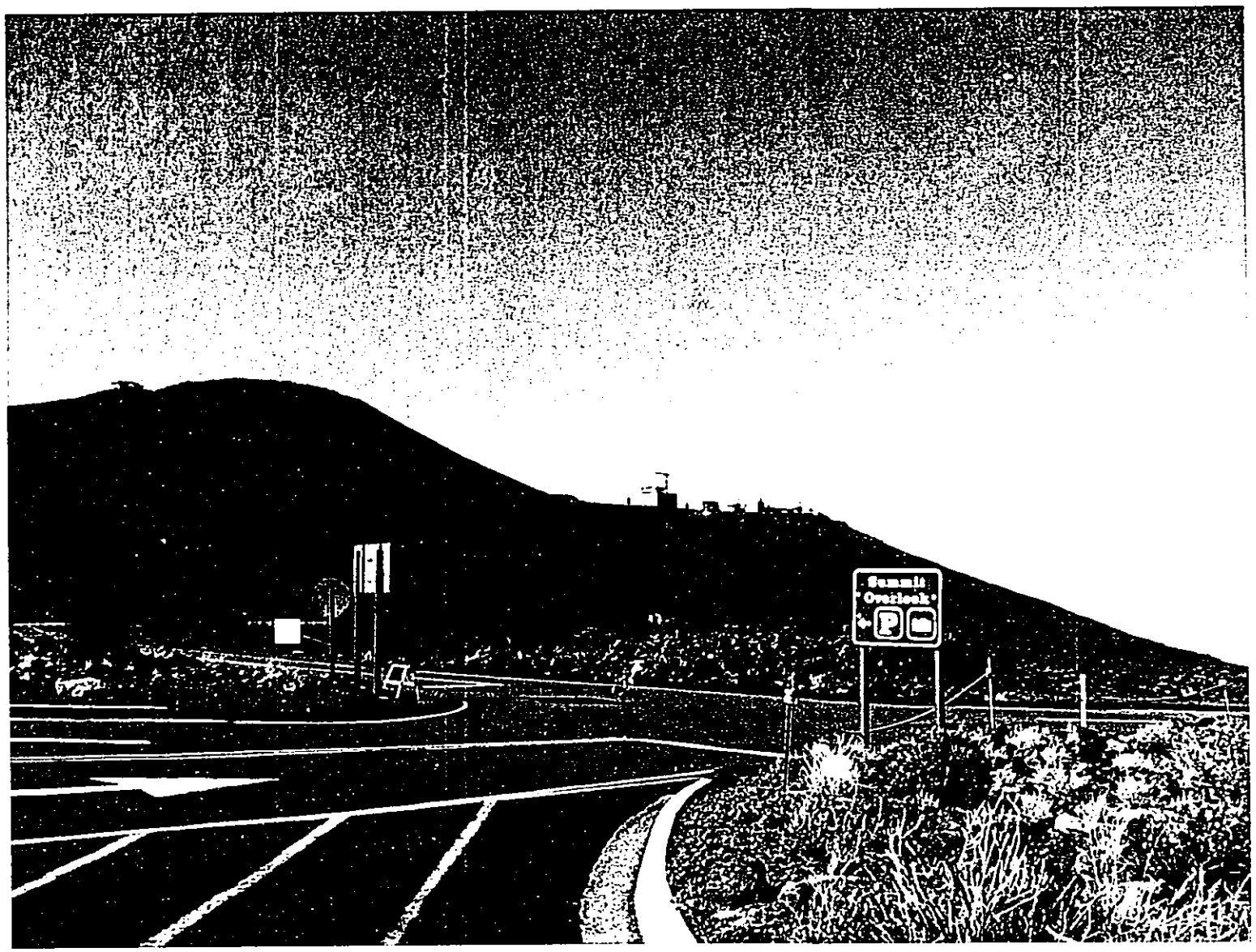


Figure 8
VIEW FROM THE PA KA'OAO (WHITE HILL) VISITORS CENTER

Environmental Assessment
Proposed AEOS Completion

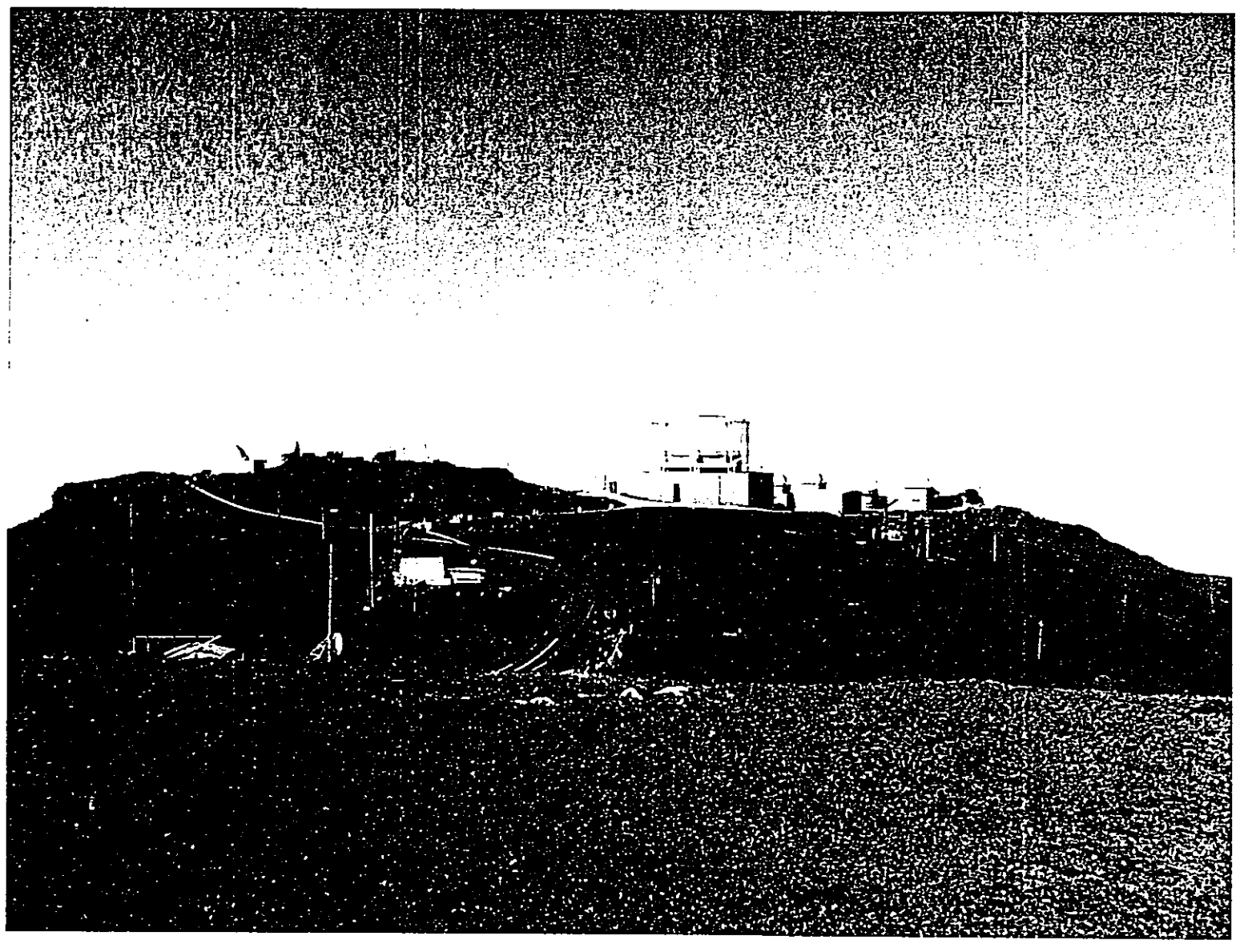


Figure 9
VIEW FROM THE PU'U ULA'ULA (RED HILL) OVERLOOK

Environmental Assessment
Proposed AEOS Completion

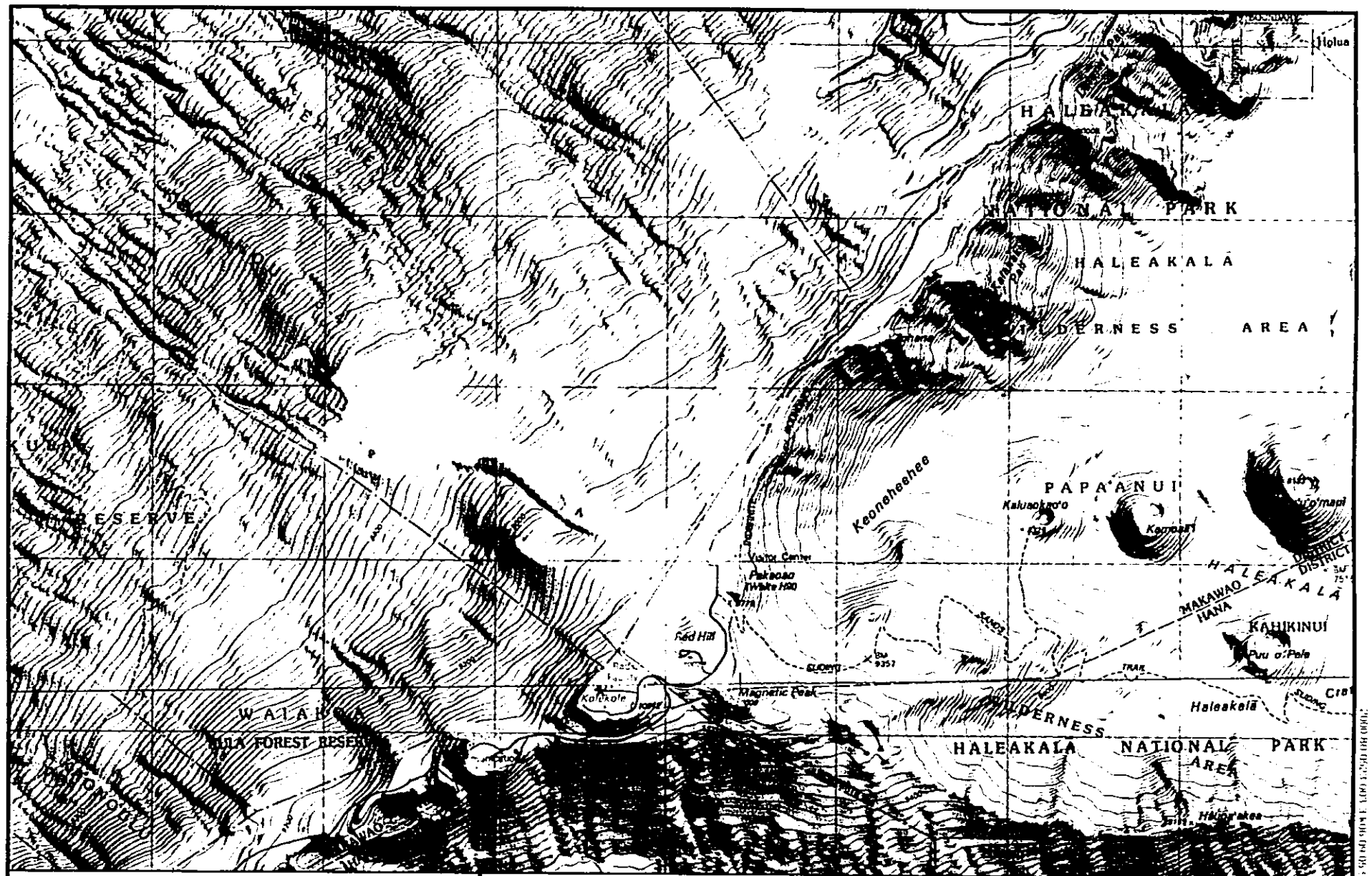
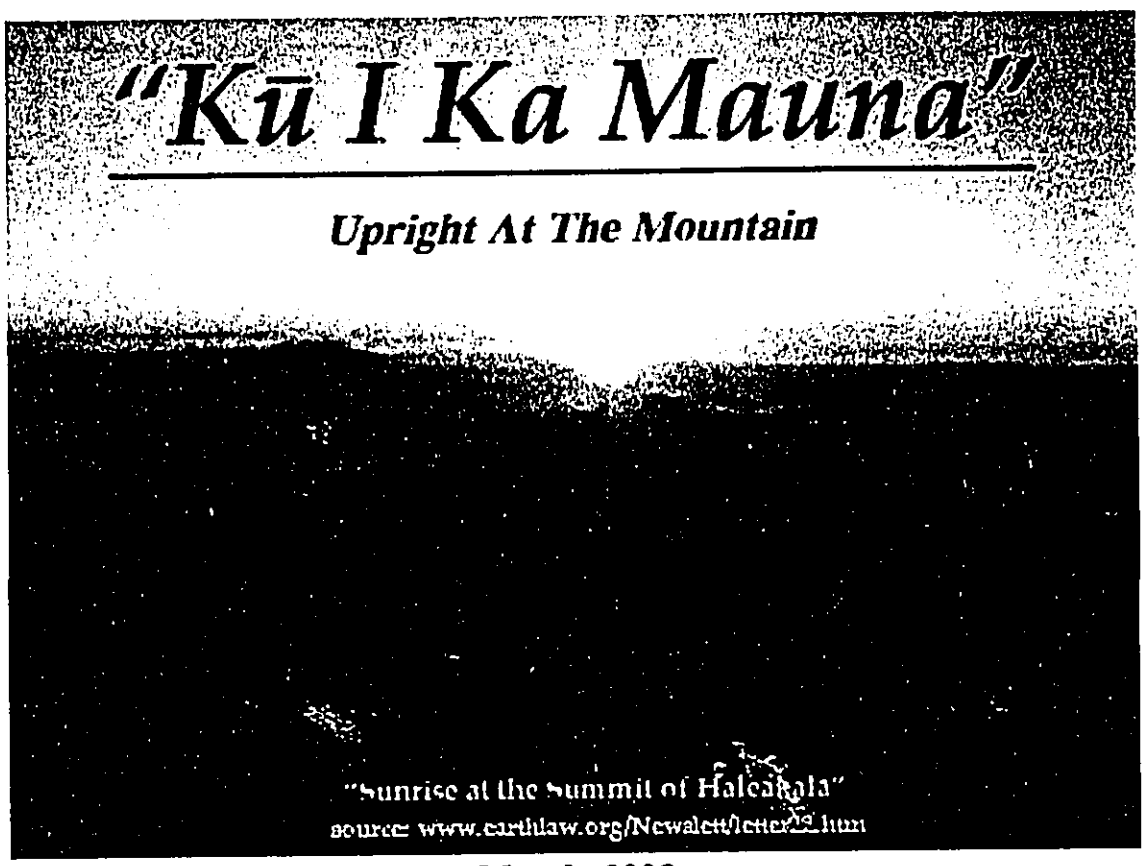


Figure 10
FOUR-KILOMETER (2.5-MILE) VIEWSHED RADIUS

Environmental Assessment
Proposed AEOS Completion

Appendix A

Cultural Impact Assessment Reports



March, 2003

Cultural Resources Evaluation for the Summit of Haleakalā

Prepared for
KC ENVIRONMENTAL, INC.
P.O. Box 1208
Makawao, HI 96768

CKMculturalresources

Summit of Haleakalā
Report #2

Final

Tax Map Key 2-2-7-08 18.1 Acre Site

Cultural Resources Evaluation for the Summit of Haleakalā[1]

[1] Haleakalä: Kaupö District. 8,201 feet in height. North (+) Latitude: 20o 4217. West(-) Longitude: 156o 1036. This data was extracted from the United States Geological Survey GNIS Database(November 2000).

TABLE OF CONTENTS

SECTIONS

ABSTRACT

CKM Cultural Resources conducted a Hawaiian Cultural Resources Evaluation for the Summit of Haleakalā, 18.1 acres at Kolekole[1], Mākena/Kilohana, Maui, Hawai'i.

The study is in accordance with the Office of Environmental Quality Control guidelines, which describes resources having Hawaiian cultural value. It will describe potential impacts from further development, along with measures that could be employed to possibly mitigate those impacts. The study will evaluate the cultural significance of historic and prehistoric resources identified during an archaeological inventory survey and assist in the development of a general preservation plan for those resources. It will also address the requirement of the Office of Hawaiian Affairs for cultural impacts. Specifically, the document will address potential effects on Hawaiian culture, and traditional and customary rights, as described in the legislation known as Act 50, Sessions Laws of Hawai'i, 2000.

The summit of Haleakalā is considered throughout the Polynesian culture as a *Pu'u Honua*[2] (a sacred place). For the entire island of Maui, it is the most sacred site in terms of its past history and association to the ancient primordial gods and goddess of the past who dwell there. Prior to the arrival of the Hawaiians, which is estimated have been in the 3rd Century, the entire Hawaiian island chain was immersed in mythology, and Haleakalā was the focal point of spiritual activity.

The lives of the ancient Hawaiian people depended on the appeasement of the gods. Much work and devotion was bestowed on the *aumakua*[3] (personal gods) and other gods that they dealt with on a daily basis. Every natural element (the wind, rain, thunder, lightning, sun, moon, and ocean) had a definite impact on their lives.

Just by looking at the foundation of the clouds on Haleakalā, the ancient fishermen in Waikapū (and elsewhere) would know what type of fishing they were going to do that day, and would appropriately take their pole, throw net, spear, or canoe to go deep sea fishing. They would also pay tribute to their fishing shrine (Ku'ula) after catching what fish they needed for the day. Thus, the elements were an integral part of the *kāpo'e Kahiko*[4] (the people of old).

Hopefully this report will enhance the knowledge of the readers, and help them to grasp the life and times of the ancient Hawaiian people that roamed these islands and who paid tribute to the complexities in their culture. The same understanding should be afforded to the modern day Hawaiians, who are trying to survive in

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[1] Kolekole – Kilohana Mākena District: 10,012 feet tall. North (+) Latitude: 20o 4238, West (-) Longitude 156o 1533. This data was extracted from the United States Geological Survey GNIS Database (November 2000)
[2] Glossary: Term
[3] Glossary: Term
[4] Glossary: Term

today's culture. They have been left a legacy that is thousands of years old, but it must be understood using today's logic. That is a challenge indeed.

Note: As much as possible, throughout this report, the spelling of Hawaiian vocabulary and place names have been standardized to present orthography.

OUTLINE

Introduction

I. Specific Area Of Research
   a. Kolekole ("Science City")
   b. Cultural Resources of Kolekole
   c. Ancient and modern use of Kolekole
   d. Kolekole's relationship to surrounding area

II. Impact of facilities on Kolekole
   b. How modern facilities impact cultural resources
   c. Affect on Hawaiian spirituality
   d. Affect on customary use, past and present

III. What cultural resources remain at Kolekole

   c. Predominate feature of Kolekole
   d. Passing knowledge to next generation
   e. Preservation of Cultural Resources

IV. Long term method for preservation of Cultural Resources
   a. "Sense of place" classes given to everyone involved in planning and construction on site
   b. Consultation with Cultural Specialist on building plans and ground disturbance
   c. Everyone working at Kolekole attend cultural classes that are given twice a year or sooner, especially to new hires, before any construction begins
   d. Brochure designed on Kolekole with cultural information and a must-read bases for anyone entering area

V. Approval of all renovations, additions and buildings on Kolekole

   a. Hawaiian Cultural Organization to be involved in the planning and building, and give a proper blessing of Kolekole when construction occurs

VI. Important names of Haleakalā

INTRODUCTION

"Kū I Ka Mauna"
Upright at the Mountain)
(Report #2)
Cultural Resources Evaluation for the Summit of Haleakalā

March 1, 2003

Introduction – *Eia ka lā hiki:*
The Scope;

The scope of this report is to compile Cultural Resources information that is on the 18.1 acre site at Kolekole, on the summit of Haleakalā. This evaluation will follow the guidelines of the Office of Environmental Quality Control, as it relates to Act. 50, Sessions Laws of Hawaii, 2000. The study will describe resources having cultural value, and will describe potential impacts from further development, along with measures that could be employed to mitigate those impacts. Using information provided by the archeologist, chants, *mo'olelo*[1](stories), and knowledgeable informants of this area, a general preservation plan for these cultural resources can be developed.

This report is the second of a two phase study. The first report was submitted on December 31st, 2002. It consisted of the Traditional Cultural Practices Assessment on Kolekole, located at the summit of Haleakala. This report shall include the association Haleakalā has to the surrounding *Pae'āina O Hawai'i*[2] (Islands of Hawai'i).

I. Specific and Tangent Areas Of Research

a. Kolekole

Kolekole is sometimes referred to as "Science City" because of the telescopes and observatories that have been built on the summit over the years. From a single telescope it has blossomed into a "complex" consisting of:
Mees Observatory[3].
LURE Observatory.

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[1] Glossary: Term
[2] Glossary: Term
[3] Hawai'i Institute for Astronomy, University of Hawai'i Access: October 1, 2002, http://www.ifa.hawaii.edu/haleakala

University of Tokyo MAGNUM Project, LURE Observatory.
University of Chicago Neutron Monitor.
Maui Space Surveillance Complex.
The Faulkes Telescope Project[4] (Still under construction)

All of these projects are located in an area of 18.1 acres, which in 1961, an Executive Order by Governor Quinn set aside land on the summit of Haleakalā, in a place known as Kolekole. The land was placed under the control and management of the University of Hawai'i, who established the "Haleakalā High Altitude Observatory Site", sometimes referred to as "Science City". This land is part of the Ceded Land Trust, which includes the *Kanaka Maoli*[5] (Aboriginal Hawaiian) as beneficiaries.

The Tangent Areas of Research: Refer to Report #1 on "Traditional Practices Assessment", submitted December 2002.

b. Cultural Resources of Kolekole

The Cultural Resources of Kolekole date back several thousand years, and is an integral part of the Hawaiian culture, both past and present. One can only imagine the sacredness that was afforded to this place because of its association to the primordial gods and goddesses of Polynesian history. Commoners could not even walk on the summit, because, it belonged to the gods. The sacred class of *Na Po'o Kāhuna*[6] (Priest, Sorcerer, Magician, Wizard, and Minister) used this place as an ancient learning center. It was a place where the *Kahuna*[7] could absorb the tones of ancient prayer, and balance within the vortex of energy, for spiritual manifestation.

Kahu David Ka'alakea[8], a very venerated Hawaiian Priest, stated that Haleakalā was used by our ancient ancestors to "*kāhea*[9]" (or call) the Sun, and the ancient name for Haleakalā was *Ala Hea Kālā*[10] (The Calling of the Sun). Only *Ali'i* (Royalty) and *Kāhuna* could visit the summit. He said that Kolekole was used to train Kahuna in the arts of healing, and navigating through the use of the stars and constellations. The ancient people felt that they were close to the *Ao holo'oko'a*[11](Universe) when they were at the summit. The only times that the commoners were allowed on the summit was for specific purposes, such as for gathering certain

---

4 http://www.ifa.hawaii.edu/faulkes/construction.html
5 Glossary: Term
6 Glossary: Term
7 Glossary: Term
8 Majority of the information shared in this report, was obtained by word of mouth, from people like the late Kahu David Ka'alakea, as it was the method or our ancestors to preserve the culture orally because we had no written language. One method of preservation was to train children who had the capacity to retain information. They would be given to the *Kahuna*, and taught to memorize entire genealogies, historical events that occurred and became the counselors to the Ali'i.
9 Glossary: Term
10 Ancient name of Haleakalā as stated by the late Kahu David Ka'alakea
11 Glossary: Term

pōhaku (stone) to make their stone implements, or to *Kanu*[12] (bury) their dead. The royal remains were secreted in caves throughout the crater and surrounding area. Usually, the retainers that took the dead to their final resting place were sacrificed and buried with the *Ali'i*[13] (royalty). A specially chosen person was trusted with the location of the burials, and usually when he died, he took the secrets with him. He related to me that he remembered when he was a young boy going up to Haleakalā. The trips were a solemn occasion, and they would "walk feet" or go up on horseback. They only went there to hunt goats and pigs, and were not allowed to go everywhere because they were told that it was *kapu*[14] (sacred, forbidden) place. "Papa David", as he was well known, has passed away several years ago.

c. Ancient and modern use of Kolekole

Ancient Use of Kolekole and Its Surrounding Area.

For the ancient *Kanaka Maoli* (Aboriginal Hawaiian), Haleakalā and the Kolekole area were considered a *piko*[15] (the navel, or center of *Maui Nui a Kama*[16] - Greater Maui which includes Maui, Moloka'i, Lana'i and Kaho'olawe). It is a sacred place, one which our ancestors believed was a *Waoakua*[17] (a place were gods and spirits walk). Other *Kupuna*[18] (Elder) related that they were taught that when they went to Haleakalā, they would have to be very careful if they wanted to survive the trek to the summit, for they could be killed by the gods. They would have to wrap a *mau'ula'ili*[19] *(sysrinchium acre)* around their arms, and the acid from the iris plant branded their skin. This would indicate that they had, in fact, made the trek to the top of the mountain. On Maui, this plant is found near the summit of Haleakalā.

Pele [20], the goddess of fire (*Ka Wahine o ka lua* - the woman of the pit) is one of the most popular of the gods in ancient and modern times. Stories of her sightings abound, occurring both before and after volcanic eruptions. Sometimes, she appears as a beautiful woman, and other times an old "hag". There are many versions of the accounts about *Pele* in her travels to Hawai'i. Her family accompanied her on the voyage from Kahiki, including her brother, *Kamohoali'i*[21] (the great shark of Polynesia), and her other family members. The most famous were her youngest sisters, *Hi'iaka-ikapoli-O-pele*[22], the goddess of lightning and *Namakaokahai*, the goddess of the sea. *Pele* was known to have been constantly

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[12] Glossary: Term
[13] Glossary: Term
[14] Glossary: Term
[15] Glossary: Term
[16] Glossary: Term
[17] Glossary: Term
[18] Glossary: Term
[19] Glossary: Term
[20] Handy, E.S. Craighill, et al. Native Planters: In Old Hawaii – their life, lore and environment, Bishop Museum Press, Honolulu, Hawaii, 1972: 336-337.
[21] Beckwith 1970: 167-179
[22] Hawaiian Legends Of Volcanoes, by William D. Westerville, 72-86

fighting, and when the lava of *Pele* would enter the sea, *Namakaokaha'i* would extinguish the fire as it entered the ocean.

According to our *Mo'olelo* about the travels of *Pele*, she went from Tahiti to Hawai'i in search of a home. After looking on each island, she finally found Haleakalā. Using her divining rod, *Pāoa,*[23] *Pele* dug a great quantity of lava and thru it out of her fire-pit. She and *Namakaokaha'i* fought from her home in Haleakalā (at the summit), down through Kahikinui. *Namakaokaha'i* tore the body of Pele and broke her lava bones into great pieces, which lie to this day along the seacoast of the district called Kahikinui. The masses of broken lava are called *Naiwi-o*-Pele [24](the bones of Pele). Some of her bones were buried in the pu'u called *Kaiwiopele* (which means the bones of *Pele*), in Haleakalā Crater.

That was the last time that *Pele* was a physical being. While her bones were being buried in the Pu'u in Haleakalā, her family looked across the *'Alanuihāhā* [25]Channel to the Island Of Hawai'i, and saw her spirit manifest there. They could see in the high mountains of Maunaloa and Maunakea, which was covered with snow, clouds of volcanic smoke tinged red from the flames of raging fire-pits below. The spirit of *Pele* was present. To this very day, *Pele* resides in Halema'uma'u Crater, on the island of Hawai'i.

There were numerous other gods and goddess that reside on the summit, in the crater and all around the Haleakalā Mountain. There is *Poli'ahu*[26], the goddess of snow, and *' Māui,* who is famous throughout the Pacific but more so to Haleakalā. (Refer to Traditional Practices Assessment report, <u>In the Beginning</u>, Page 4, and Para. 3) In preparing his cordage to "lasso" the sun, *Māui*[27] built a *heiau* (temple) on the ridge-top of Kapalaoa. When the Maui Space Surveillance Complex was built, they wanted to place a sensor on this ridge. They were informed that this *heiau* existed. Investigation by helicopter substantiated that the *heiau* is still intact on Kapalaoa Ridge within Haleakalā Crater. It is said that *Māui* stood with one foot on Kolekole and the other foot on Hanakauhi Peak[28] when he lassoed the Sun.

As mentioned in "Kū I Ka Mauna", Upright at the Mountain, December 2002, Traditional Practices Assessment for the Summit of Haleakalā, in the beginning of Page 4, it mentions about the Kanaka Maoli perception of Haleakalā. Kolekole was a *Wahi-Pana*[29], a very special religious place. It also was used by the Kahuna Po'o, who trained students in the arts, by passing on the enormous wisdom they possessed.

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[23] Glossary Term
[24] Glossary Term
[25] Glossary Term
[26] Glossary: Term
[27] Mäui snaring of the Sun is a Hawai'i-centric story, however Mäui was not only a Hawai'i demigod, and he was demigod of all of Polynesia. Therefore, Haleakalä is a pinnacle of power for all of Polynesia.
[28] Glossary Term
[29] Glossary Term

Modern use of Kolekole

A view of the entire 18.1 Acre Site that is being studied here is shown on page 18 of the Traditional Practices Assessment for the Summit of Haleakalā,. The saying, "A picture says a thousand words" holds true here because just by looking at the "Science City" complex, one can see the modern uses of Kolekole. A question which will be answered further on in this report is "How has the Kanaka Maoli been affected in terms of their Use and Access, and Religious, Spiritual, and Cultural Practices?", as noted in Act. 50 of the HRS.

d. Kolekole's relationship to surrounding area.

It is difficult to separate Kolekole from the rest of the summit of Haleakalā because of the fact that past accounts of its history is not only interrelated with other areas on the summit, but it includes the entire Haleakalā and the island of Maui. It also is related to the other islands in the Hawaiian chain, culturally and otherwise.

There is a stone on the north-east side of the crater rim, called *Pōhaku Palaha*[30], which is the beginning of the eight *Ahupua'a*[31] (land divisions) that surround the East Maui District.

II. Impact of facilities on Kolekole

The impact of facilities on Kolekole and the surrounding area started when the University of Hawai'i's Haleakalā High Altitude Observatory Site ("Science City") and communications facilities were constructed on Haleakalā some time ago. When this happened, it opened the door to more facilities being constructed (refer to Report #1, Traditional Practices Assessment, Page 16, picture of "Science City") at Kolekole.

a. How modern facilities impact cultural resources

Considering the amount of cultural history on Kolekole, as brought forth in this report and the Traditional Practices report, it is easy to surmise that the impact on the cultural resources by modern facilities built on Kolekole is traumatic at best, and devastating at worst, on the Kanaka Maoli who use this area to practice their culture in a spiritual manner. The disturbance by the buildings, and the activity that is going on, interferes with the quietness and solitude one should have when visiting a place like this for cultural purposes. It is like going into a church for prayer and meditation, then being interrupted by humming sounds coming from

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[30] Pōhaku Palaha is a stone on the beginning of the Kapalaoa Ridge of Haleakalā and from this stone originates the eight land division district around Haleakalā.
[31] Ahu Pua'a is a term for land division from the mountain to the sea. An "Ahu" stone alter and on the top would be placed the skull of a pig.

electronic equipment, and the bustle of human activity working around the telescopes and observatories in the area.

III. What cultural resources remain at Kolekole

The cultural resources remaining at Kolekole are limited because of the structures that were constructed. However, remnants of our past physical and spiritual culture have survived, and in some places remain intact.

Spiritual sensitivity can still be experienced because of the fact that one is at the highest point overlooking Maui and the rest of the Islands. Cultural sensitivity can still be enjoyed by touching the *'āina*[32] (provider of food and the mystical food for the Kanaka Maoli). Also, knowing that *Pele* created everything on Kolekole bestows a cultural sense of connection to the ancient gods and goddesses, and to the traditions of the past.

a. Predominate feature of Kolekole

The predominate feature of Kolekole is, of course, the Maui Space Surveillance Facility, which is the largest structure there. The "Science City" complex dominates the rest of the Kolekole area. Refer to page 16 of Report #1, High Altitude Observatory, "Overhead view of Kolekole, ("Science City") Haleakalā Island of Maui Hawai'i".

b. Passing knowledge to next generation.

Kolekole and the entire summit of Haleakalā is a very valuable asset to the Hawaiian culture, both physically and spiritually. Efforts have to be taken to set aside areas where Kanaka Maoli can worship, uninterrupted by the activities that are taking place at the astronomy facilities. By doing this, they can pass on the knowledge to the next generation.

IV. Long term method for preservation of Cultural Resources

Long term method for preservation of Cultural Resources should include the entire 18.1 acre site at Kolekole. For the Kanaka Maoli, the lava, cinders, dust, rocks, and boulders are all sacred to *Pele,* the Goddess of the Volcano. In fact, the Hawaiian word for lava is "Pele". Refer to first eight photographs in this report, showing the construction of the Faulkes Telescope, and it is clear how the Kanaka Maoli religious and cultural beliefs were completely ignored. There were no special prayers given when the hole for the platform was dug. The workers were not instructed to be culturally sensitive to the lava they dug up and the soil that they

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[32] Glossary: Term

removed. There was no "asking" permission of the gods to dig into the soil, for the purpose of building a telescope to explore the universe.

RULES FOR LONG TERM METHOD FOR PRESERVATION OF CULTURAL RESOURCES FOR ALL FACILITES PAST, PRESENT, AND FUTURE, ON KOLEKOLE, HALEAKALA.

1....A Kanaka Maoli Cultural Specialist, who is both a Kūpuna (elder) and a Kahu (Reverend), and who is also aware of the spiritual and cultural protocol of the site, should be consulted and included in the first stages of the construction planning. That person would also monitor all ground alterations, renovations of buildings which increase existing footprints, and all phases of any new construction.

2....Cultural sites and other identified features found in the inventory survey should be marked as a cultural site and protected from inadvertent damage. Proper buffer zones should be created to protect these sites. It should also be placed on a centralized map, clearly delineated for future identification purposes.

3....All permanent employees working at Kolekole, both present and future, should attend "Sense of Place Classes" prior to working at the facilities. It could be in the form of a 1-hour video and reading prepared brochures which explain how culturally and spiritually important the summit is to the Hawaiian people.

4....A cultural inspection should be conducted of Kolekole 3 times a year.

5....Consultation with Kanaka Maoli in constructing a platform where cultural ceremonies, spiritual and otherwise, could be performed. This would be built strictly for Kanaka Maoli people. This idea was proposed when the Air force built their facilities, but so far it has not come to fruition.

6....These rules will be requirements specified in all land use agreements, leases, and memoranda.

These rules would have to be strictly enforced by the University Of Hawai'i Institute of Astronomy (UH-IFA) because it is the responsible agency in charge of these lands according to the Executive Order of 1961. One must bear in mind that these lands are Ceded Lands and originally was owned by the Hawaiian Kingdom. Sec. 5-f of the Admissions Act (Statehood Act) specifically recognizes the Native Hawaiian as beneficiaries of these trust lands. More so, the Hawaiian Cultural and Spiritual beliefs should be adhered to and respected at the summit of Haleakalā.

V. Mitigating impact of Summit

Numerous impacts have occurred on Kolekole, the summit of Haleakalā, due to the buildings and on going activities. The best method of controlling the impact would be to stop all construction and tear down all the existing buildings. Because of the caliber of these structures, it would be highly unlikely that this would ever happen.

To really mitigate the impacts that have happened to this site, there must be a stop to anymore construction on this 18.1 acre site. It is common sense that this suggestion is not going to occur because of the astronomical interest in building facilities on Haleakala, because of the optimum conditions Haleakala has compared to any other place in the world. For the Hawaiian people, it is just as important for cultural protocol to be observed. If this is so, then strong stringent rules have to be adopted, such as the above 7 conditions that are suggested. It has to appear on the building or extension plans, and must be adhered to by the contractors and developers that are involved in constructing these facilities. Only then can the future generations enjoy the spiritual and cultural attributes the summit has to offer, and it would be preserved forever.

SACRED NAMES ON HALEAKALĀ

The names of places, cones, vents, ridges and peaks are central to the history of Maui and the Native Hawaiian Culture. They mark time, legends, characters, and events of the primordial existence of the Kanaka Maoli.

- Pu'u 'Ula'ula
  - Pu'u 'Ula'ula literally means red hill

- Kolekole
  - There are two versions of what Kolekole means: (1) One account explicates that Kolekole was named after the fish Kole. Kole's skin color is a rusty deep brown, almost like the cinders at Kolekole. (2) The second account states that Kolekole is the Hawaiian word for "talk story." Some believe that it was an area where Kahuna Po'o (Head Priests) would convene to discuss issues.

- Pākaoao
  - There is no literal translation for this inoa(name). However, one could surmise the intent of this specific name, and also, I believe that this is a fairly recent name. "Pāka" means park. "Ao" means light, day, dawn or clouds. Therefore, one could assume that Pākaoao means "Park of the dawn," or "Park of the clouds." It is with these translations that I surmise the meaning of the name of this park.

- Kalua o ka Ō`ō
  - Ka-Lua-O-Ka-'Ō'ō, this literally means "The pit of the digging stick."

- Kamoali`i
  - There is no direct translation for this word. I will offer two options: (1) the word could be spelt as such: Ka-Moa- Li'i . This literally means, "the small chicken." (2) the second of two translations could be spelt as such: Kāmoa-Li'i . This means, "Little Sāmoa."

- Pu`u o Pele
  - This literally means the "hill of Pele."

- Pu`u o Maui
  - Spelt: Pu'u-O-Māui. This means the "Hill of [the demigod] Māui."

- Ka Moa o Pele
  - This means, "The Chicken of Pele [Goddess of Fire]."

- Halāli`i
  - There is no direct translation for the name of this crater that has any direct affiliation to this area. I will offer one such interpretation based on the translation of this word. (1) This word can be spelt: Halāli'i . This is the name of a pleasure

loving Ali'i on the island of Ni'ihau. (2) This word can also be spelt: Hala-li'i . This means small hala (pandanus tree). This may have grown either in the pit of the crater or the surrounding areas.

- Pu`u Naue
  - Pu'u Naue (or Nauwe) when spelt together, i.e. pu'unaue, means a division or section. When spelt as such: Pu'u-Naue, means "shaking hill."

- Pu`u Māmane
  - Spelt: Pu'u Māmane. Meaning: Māmane Tree Hill

- Pu`u Kumu
  - Meaning: Foundation Hill

- Pu`u Kauaua
  - There is no direct translation of this place. Pu'u Ka-Ua-Ua means "Rainy Hill." This one translation that I surmise would be best fitting.

- Pu`u Maile
  - Meaning: Maile Vine Hill

- Pu'u 'Alaea
  - Spelt: Pu'u-'Alaea Meaning: Ocherous Earth Hill.

- Pu`u o Li`i
  - There is no direct translation in written text. When translated in this fashion: Pu'u-O-Li'i, literally means: Hill of the Small.

- Pu`u Nianiau
  - Meaning: Peaceful Hill

- Pu'u Lā'ie
  - There is no meaning in written text for the name of this Pu'u (hill). However when translated as such: Pu'u Lā'ie, it means: "Hill of the 'ie'ie leaf."

- Kilohana
  - Meaning Lookout point, or best / superior.

- Kalahaku
  - Meaning: Proclaiming [the] Lord.

- Hōlua
  - Spelt: Hōlua. Meaning: Sled.

- Lele iwi

    - Meaning: Bone altar (poetically, a symbol of disaster or anger.)

- Hale mau'u
    - Spelt: Hale mau'u Meaning: Grass House.

- Kapalaoa
    - Ka-palaoa; the whale or the whale tooth: as in "Lei niho *palaoa*."

- Mauna Hina
    - Meaning: Gray Mountain

- Nā mana o ke Akua
    - Spelt: Nā-Mana-O-Ke-Akua. Meaning: the powers of the god.

- Honokahua
    - Meaning: Sites Bay

- Lā'ie
    - Spelt: Lā'ie. Meaning: The leaves of the 'ie'ie plant.

- Hanakauhi
    - Meaning: The cover bay

- Kalapawili
    - There is no direct translation for name of this wahi (place). However when broken down into: Kalapa-Wili; "kalapa" means "sulfur". "Wili" in this case could mean "spiral". Therefore, I would surmise that this is an area that may have had pockets of sulfur.

- Lau 'ulu
    - Spelt: Lau'ulu. Meaning: Breadfruit Leaf

- Pōhaku Pālaha
    - Spelt: Pōhaku Pālaha; Meaning: Flat Rock. Rock where the eight Ahūpua'a of west Maui originates.

- Pali kū
    - Spelt: Pali kū. Meaning: Vertical Cliff

- Wai keke'ehia
    - There is no direct translation in written text. Based on this spelling: Wai-Keke'e-'Ehia, I would surmise the translation to be: "How many crooked streams?"

- Kukui
    - Meaning: (1)light, or (2)Candlenut Tree.

ARCHAEOLOGICAL OVERVIEW OF HALEKALĀ SUMMIT 18.1 ACRES AT KOLEKOLE, ("SCIENCE CITY").

In developing a general preservation plan for cultural resources, sites of historic and prehistoric significance were identified during the archeological inventory survey. Mr. Erik Frederickson of Xamanek Resources was interviewed on March 5, 2003, at 12:30pm. The meeting was held in my car, at the Pukalani Shopping Cent. After signing the Interview Form (which is attached here-to), the interview began.

Mr. Frederickson stated that he conducted the archeological inventory survey on this site, and that all of the sites that were found will be recommended for passive preservation in place. The most significant find was the possible burial site that is located on the Maalaea-Kahului side, down slope of the AEOS Air force complex.

The possible burial is a small platform, completely different from any other feature on the site. It is located in a complex structure, which includes a wind shelter, and two petroglyphs which are on the upslope. There are other features which are associated with this site in the surveyed area, and some were previously discovered. Most of the sites are wind shelters, indicating that the area was used a lot. These short-term temporary shelters were utilized for protection from the wind and cold. There was also a remnant of a possible trail on the southern side of the Air Force facilities.

These sites are unique in the sense that they were most likely used by persons who were involved in ceremonial activities. There were some remnants of coral in these sites, indicating that it was brought up to the summit for ceremonial purposes.

He went on to say that when a site is determined for preservation, S.H.P.D. will determine the type of preservation, the buffer zones that are to be constructed for protection, and signage if needed. This site, because of its density, should be totally preserved due to it's spiritual and cultural relationship to the host culture. He concluded by saying that his final report will reflect the comments made here.

ARCHAEOLOGICAL OBSERVATIONS OF HALEAKALĀ 18.1 ACRE SITE

There are 29 plus archaeological features presently on the site, not including the features that might have been destroyed by the past and present construction. Coupled with the spiritual and cultural history, which was recorded and passed down orally from one generation to the other, this site is the most sacred to the Kanaka Maoli, both past and present.

This 18.1 acre site significantly meets with the State Procedures for Historic Preservation Review (DLNR, 1966; Chapter 275). It also qualifies under the Federal Guide Lines of preservation. The archeological features far surpass the following criteria:

Criterion "a" Be associated with events that have made an important contribution to the broad patterns of history; {please refer to Introduction of this report}

Criterion "b" Be associated with the lives of persons important in our past. {Please refer to Introduction of this report}

Criterion "c" Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value; {please refer to the Archaeologist table, Item 3-T (d & e)2 petroglyph boulders}

Criterion "d" Have yielded, or is likely to yield, important information for research on prehistory or history; {refer to Introduction of this report and other documentation submitted}

The archeology report, and information from Kūpuna and other informants gathered over the last 40 years, clearly associates Kolekole (summit) and all of Haleakalā Mountain as a special Hawaiian spiritual and cultural place for the Kūpuna that have passed on, the present population, and the future generations yet to come.

It is important that the remnants of the Hawaiian Culture be preserved, not only for the host culture of Hawaii, but for everyone that comes here to make Maui their home. The cultural and spiritual health of Maui depends on how we preserve our sacred and cultural sites.

On Kolekole("science city"), there has to be some balance, and the Kanaka Maoli have to be involved by having a seat at the table. Kanaka Maoli have to be involved in the planning, building, approving and care of this sacred site. The Hawaiian's values have to be recognized, and no matter how important Haleakalā is for astronomy or "National Defense", the spiritual and cultural essence should never be compromised. What has happened over the last several years, with broken promises, should not be allowed to continue. The number of archeological sites found on Kolekole substantiates the essence of this report.

CKM CULTURAL RESOURCES

Specializing in Cultural Impact Statements
(using State of Hawaii O.E.Q.C. methods),
Blessings, Weddings, Lectures
and Ho'oponopono

INOA I KA 'ŌLELO E PAU I KA MAKE 'IMI 'IA
(Seeking the knowledge to push us forward)

INTERVIEW FORM

NAME – PRINTED: Erik Frederichsen

SIGNITURE: Erik Frederichsen

ADDRESS: P.O. Box 880023 Pukalani, HI

TELEPHONE: 572-6118

PLACE OF INTERVIEW: Pukalani Shopping Center

DATE & TIME OF INTERVIEW: 3/5/03 at 12:30pm.

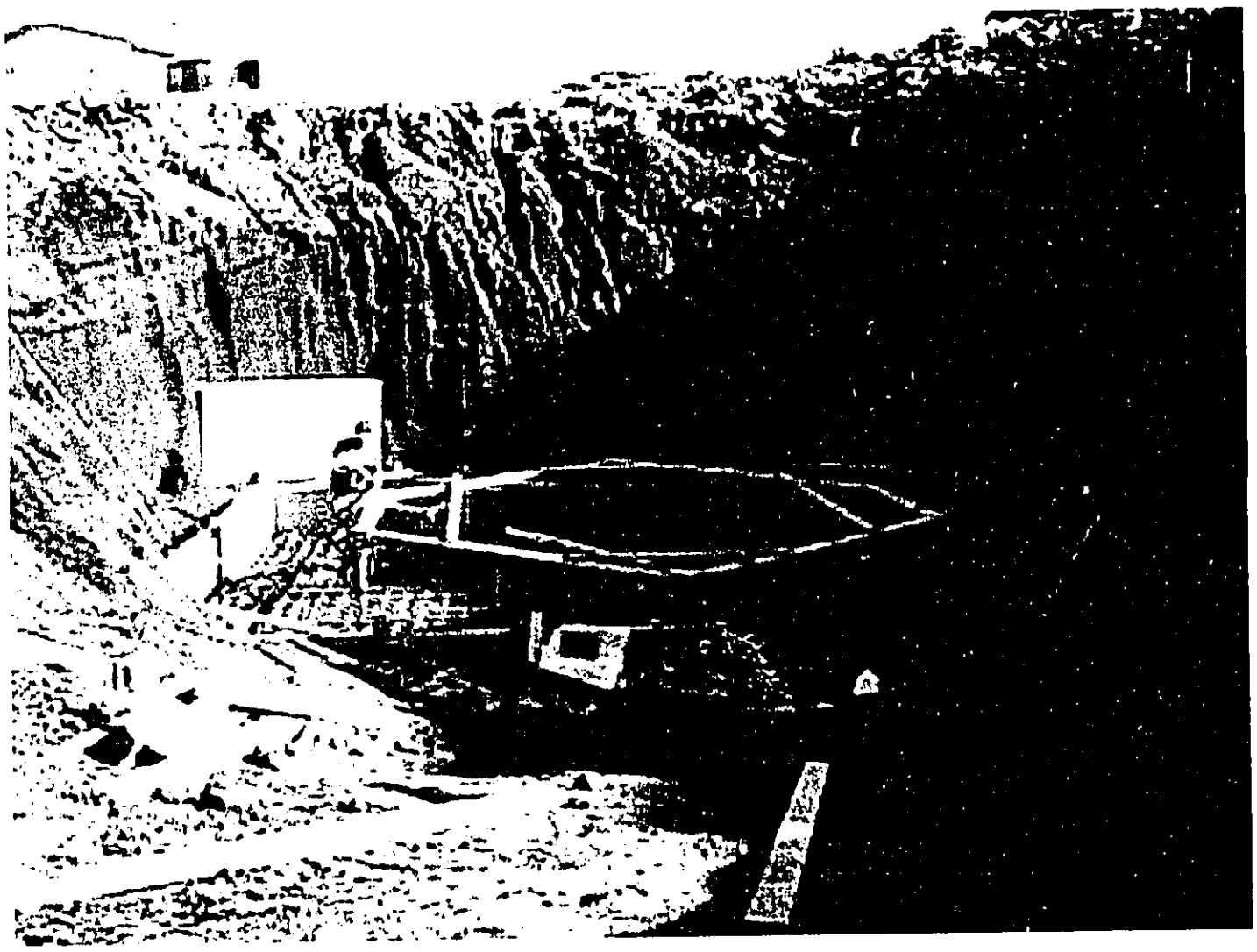
INTERVIEWER: Charles K. Maxwell Sr.

I understand that my statement will be used in a public document and it is my understanding that before it is published, I will have a chance to see it and make corrections if needed. INITIAL: EF

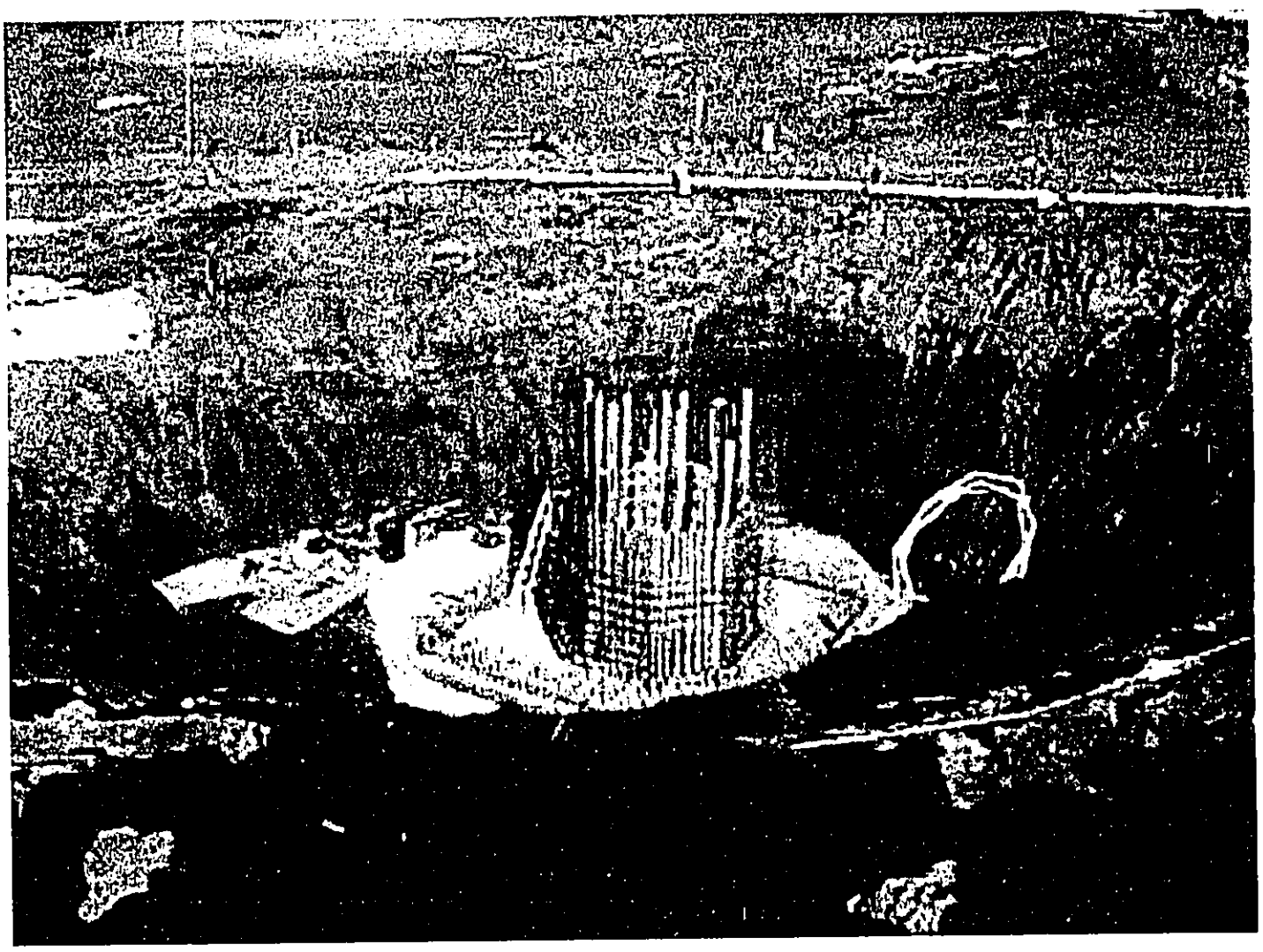
INTERVIEWERS SIGNITURE:

DATE & TIME: 3/5/03 12:30pm.

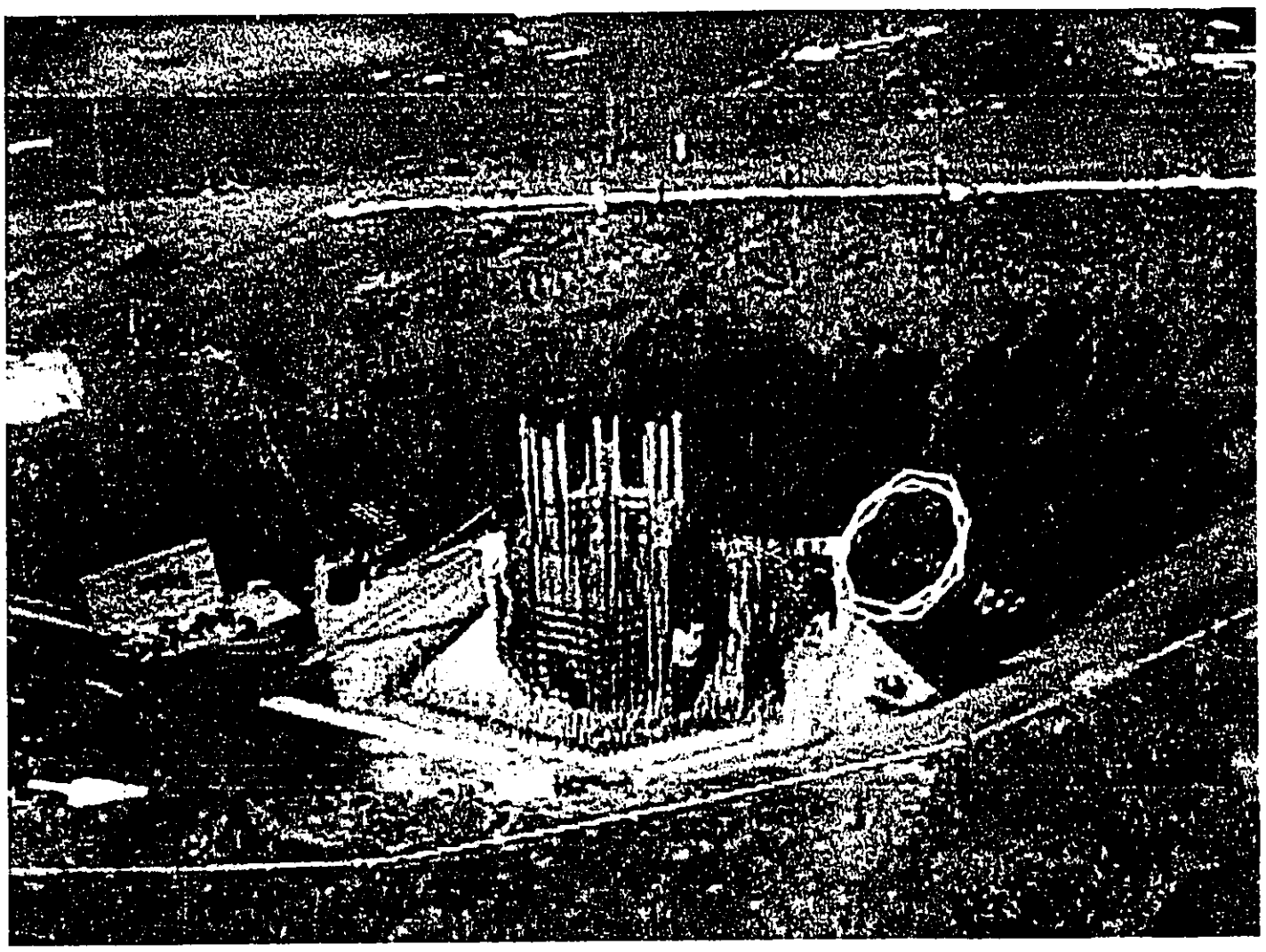
Kahu Charles Kauhuwehi Maxwell, Sr.
157 Alea Place · Pukalani, Maui, HI 96768
Phone: (808) 572-8038 · Fax: (808) 572-0602 · Cell: 870-5345
Email: kalei@moolelo.com · Website: www.moolelo.com



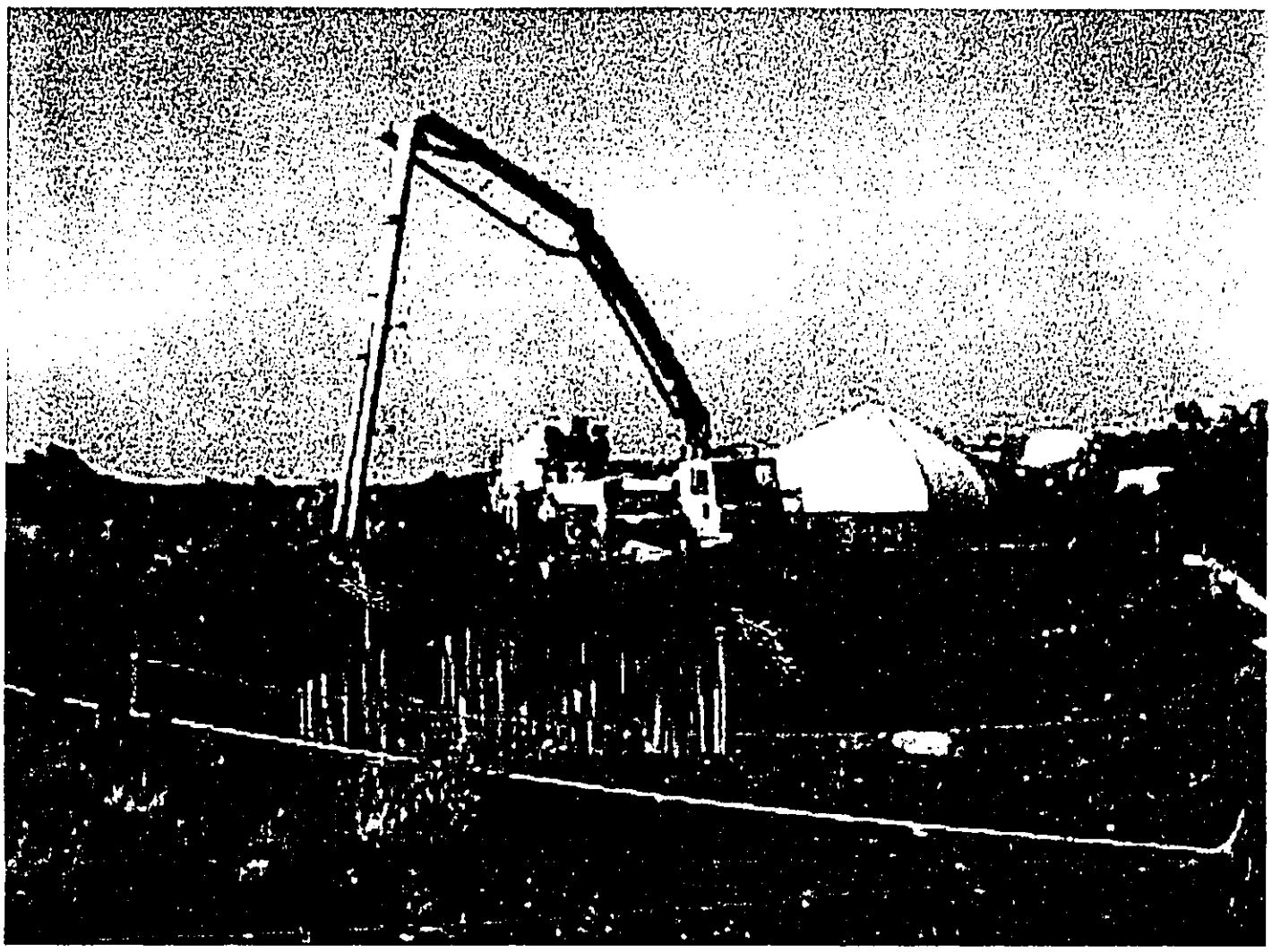
Shows excavation for Faulkes telescope foundation.



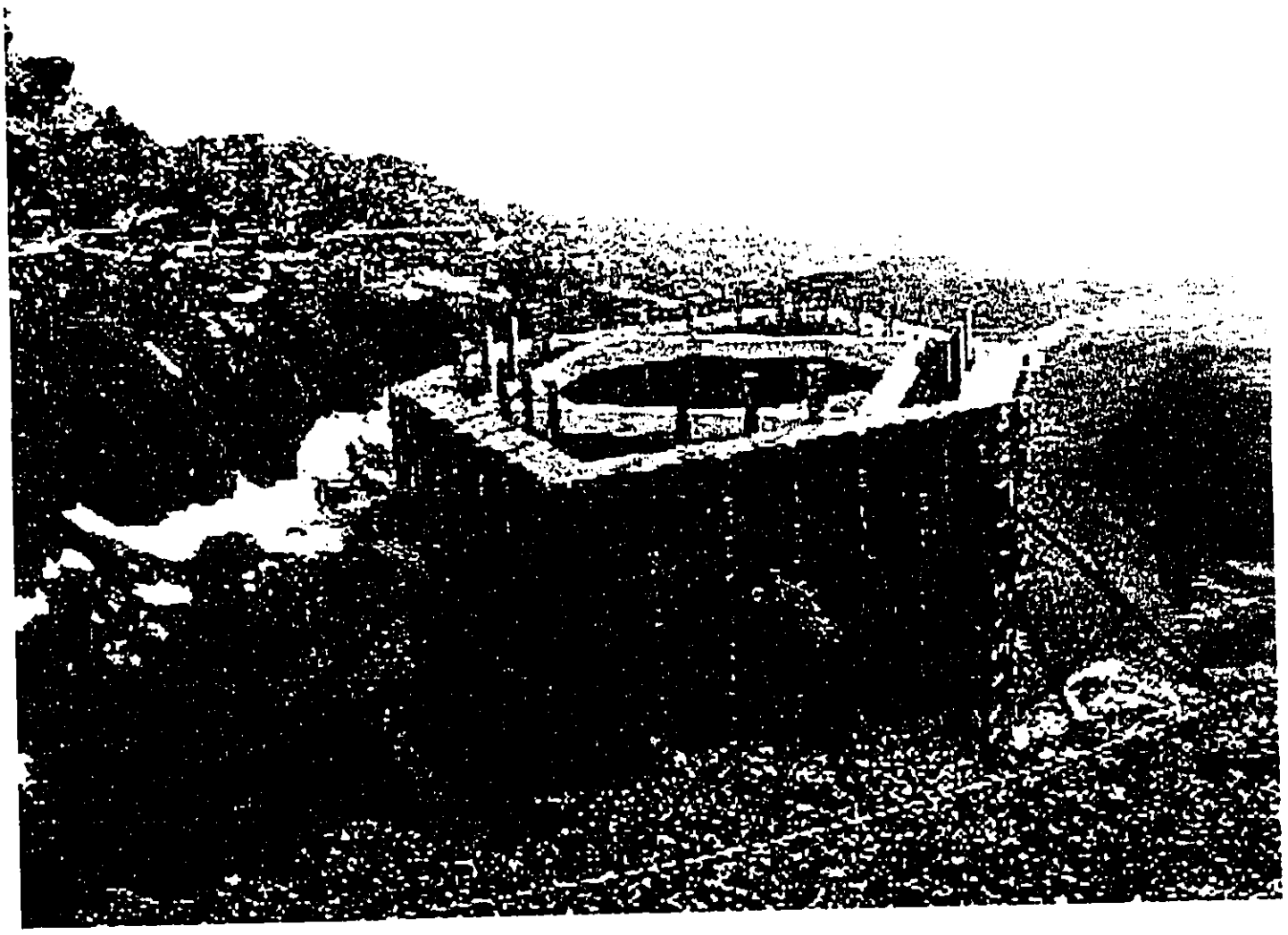
Concrete foundation, Faulkes Telescope



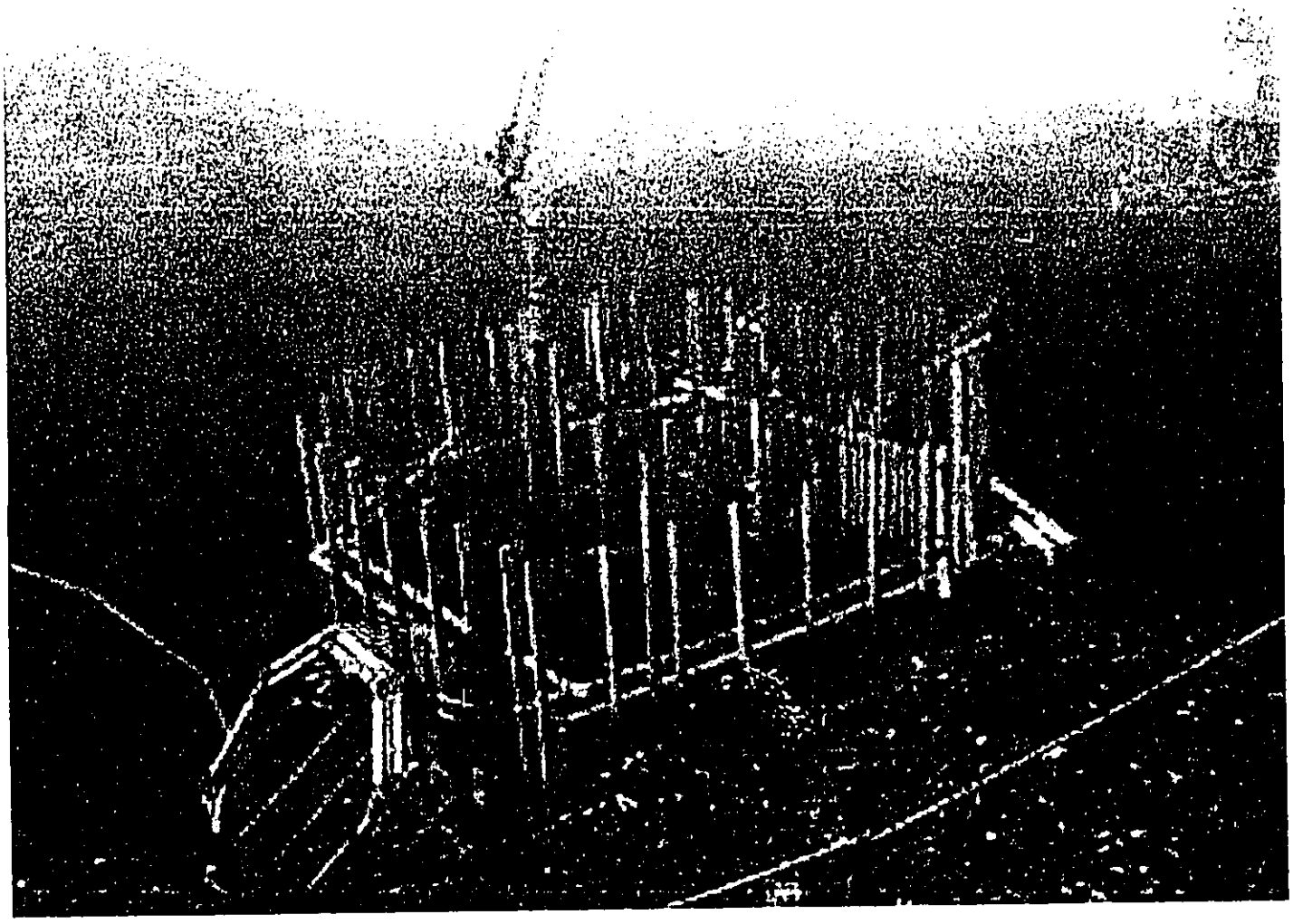
Shows the entire pit dug for the foundation.



Shows boom truck pouring concrete into form of platform.

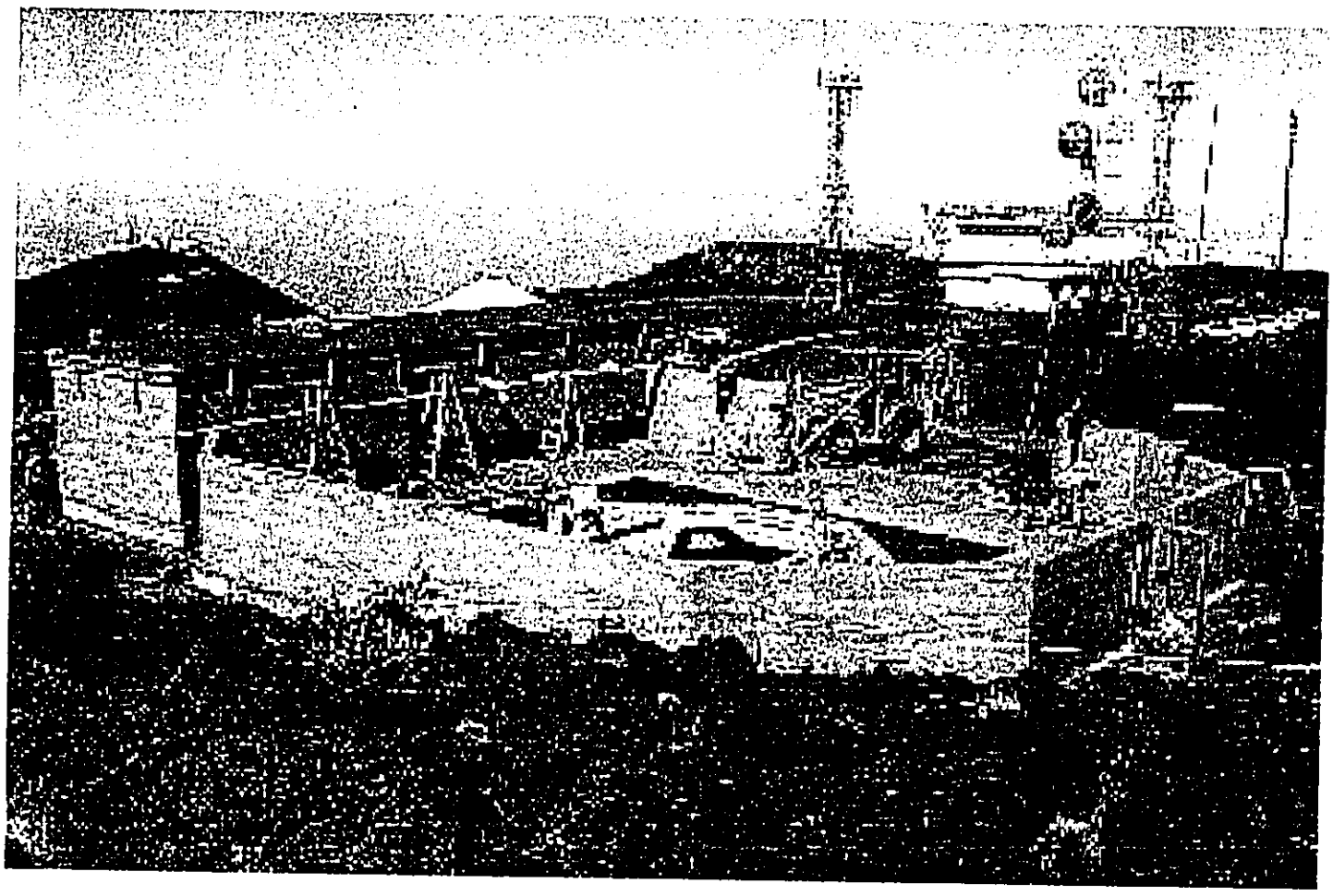


Shows structure with snow.

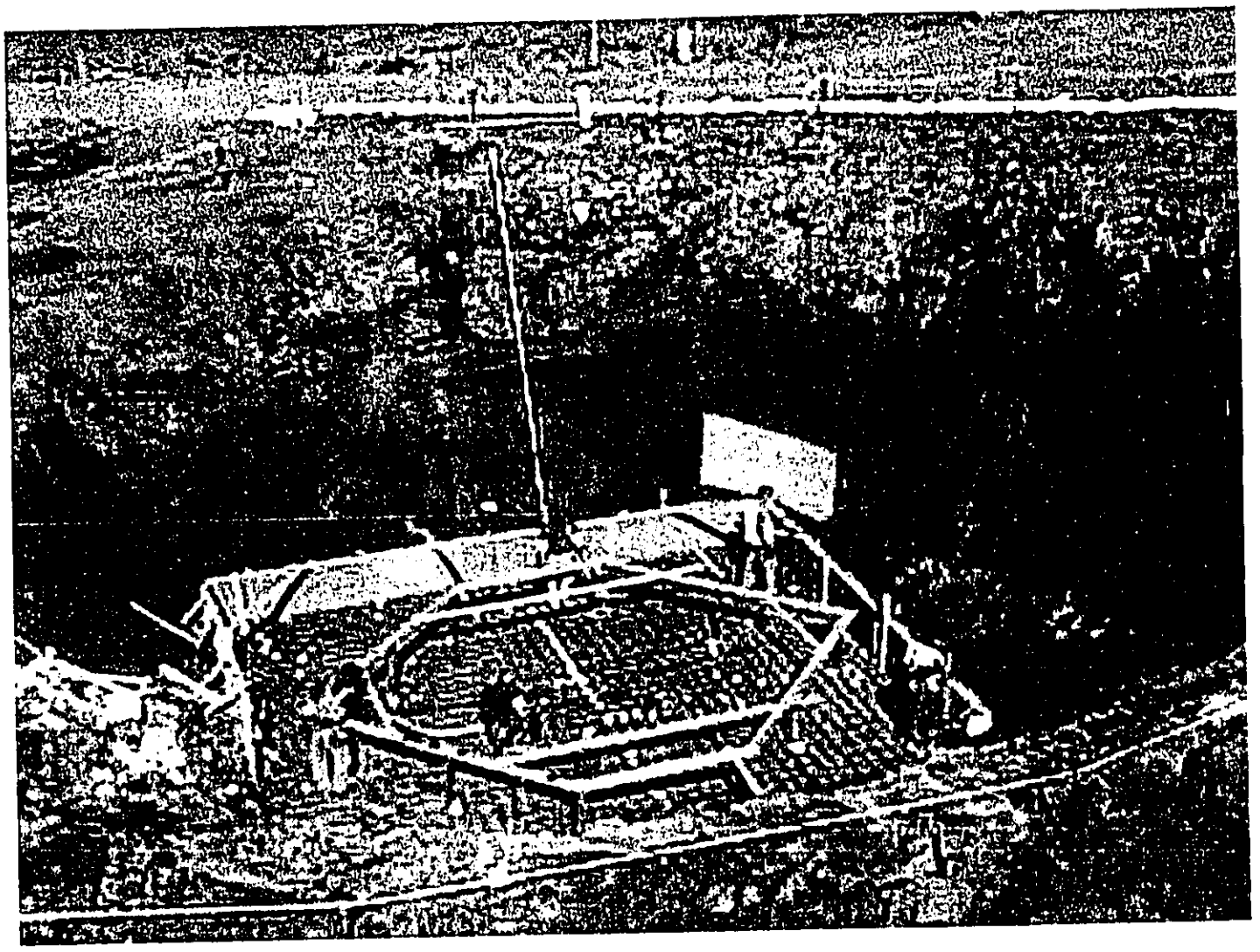


Construction of the foundation.

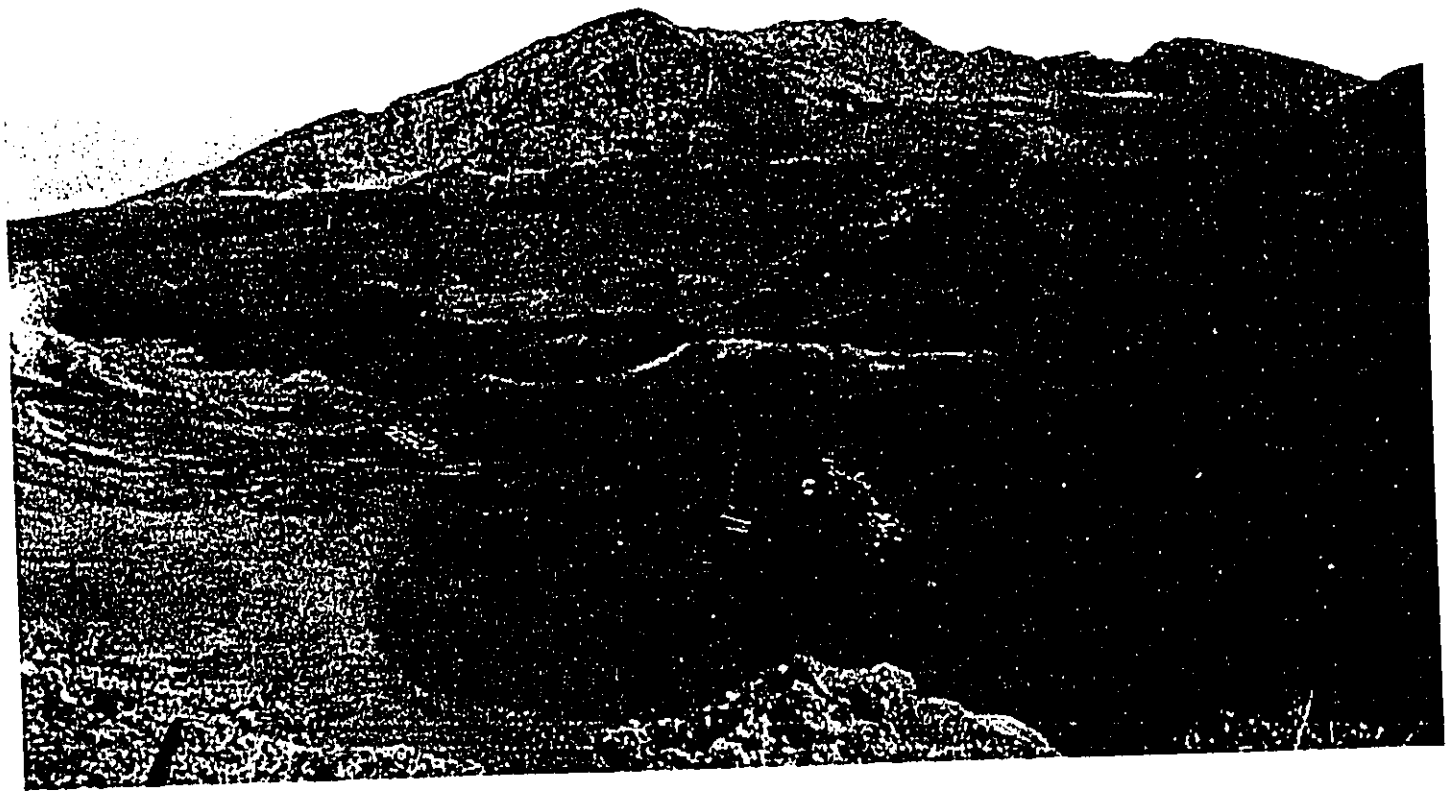
Charles Fein of F.C. Environmental and Dr. Faulkes, with telescope foundation in the background.



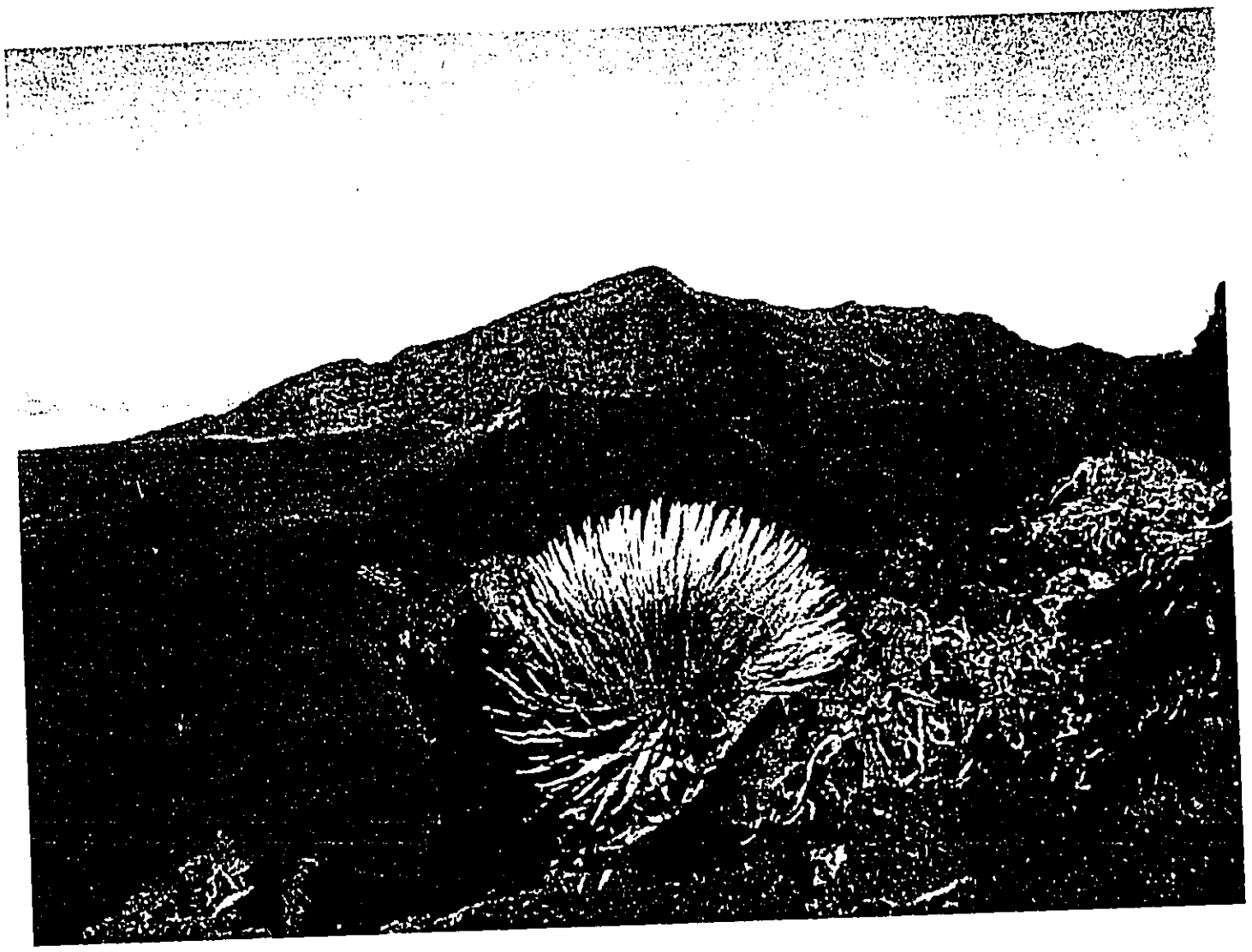
Concrete enclosure of Faulkes Telescope.



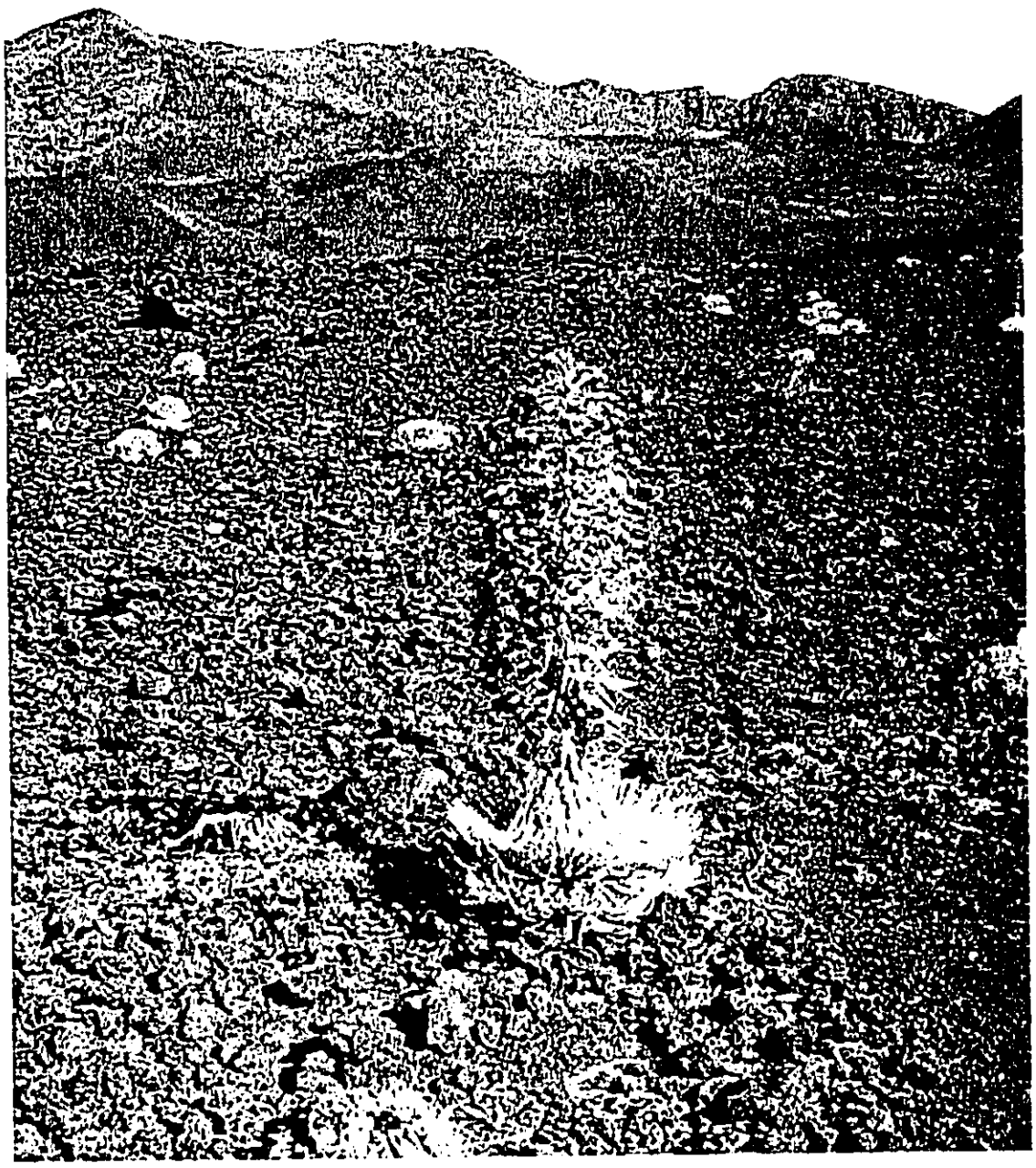
Workers constructing base of telescope in "pit".



Halehaku Overlook, shows the cinder cones (or Pu'u). Names of Pu'u can be obtained from "Sacred Names of Haleakalā".



Ahinahina (Haleakalā silversword)
Argyroxiphium sandwicense* ssp. *Macrocephalum
Looking into crater towards Hana Mountain (Hanakauhi).



Silversword ending it's bloom with young plants growing on rim, overlooking Haleakalā Crater.

CONCLUSION – *EIA KA LĀ KAU:*

HIGH ALTITUDE OBSERVATORY
18.1 ACRE SITE, Tax Map Key 2-2-7-08
HALEAKALĀ, ISLAND OF MAUI, HAWAI'I.

In Report #1, "Kū I Ka Mauna" (Upright at the Mountain), Traditional Practices Assessment submitted on December 2000, and this Report #2, "Kū I Ka Mauna" (Upright at the Mountain), Cultural Resources Evaluation, May 2003, the following summary is being submitted.

Kolekole, known as the summit of Haleakalā, or even "Science City" as it is sometimes referred to, is a very sacred place for the Kanaka Maoli, past and present. It is surprising, at best, that the buildings were even allowed to be built in this place that the Hawaiians call "*Wahi Pana*" (a legendary place). It was considered the *Piko* (navel), the center of Maui Nui O Kama (the greater Maui), and legends abound about the gods and goddesses that dwelled there in mythological times. These identities are still revered by the Kanaka Maoli of modern times. People from all over the world have felt the "essence" of Haleakala on their visits, and have documented in numerous publications their feelings of being "one with the gods" at the summit.

In a study published in May 2001 by KC Environmental, titled "Final Environmental Assessment Negative Declaration for the Faulkes Telescope Facility at Haleakala, Maui Hawaii", the last paragraph in Section 3.10 of the Traditional Practices Assessment mentions that; "The study did not identify impacts to burials, Hawaiian trails, hunting and gathering practices for plant or animal resources, religious sites, archeological sites or historic properties." The report determined a "finding of no significant impact".

Hawaiian's history, from the beginning of their ancient culture, shows that they consider lava, cinders, rocks and other material from the land sacred because it was created by *Pele*. That is why when a geothermal exploration team came to Maui to explore the possibility of drilling at several places around Mt. Haleakalā, there were protests by Native Hawaiians that did not want to see the drilling "disturb" the essence of *Pele*. The "essence" being the rock, cinders, and ash, which are the *Kinolau*(supernatural forms taken by *Pele*).

Photographs 1 to 10, which are attached to this report, shows how a backhoe has dug a pit of 20' deep, in a large diameter, consisting of volcanic rock, cinders and ash, the *Kinolau* of *Pele*. How can this action be interpreted as having "No significant impact", when it actually has the opposite effect. To add insult to injury, prayers were only offered during the ground breaking ceremonies. No Cultural protocol prayers were performed for "asking" permission from the ancient gods to

build the Faulkes Telescope. And, as construction continued, there was no reverence to the beliefs of the ancient and modern host culture of Hawai'i.

In his testimony, Erik Fredrickson of Xamanek Researches said that from his findings of the archaeological sites at Kolekole, he interprets this area as having a lot of sites and features for a small area, compared to the surrounding areas of Haleakalā. And, there were a lot of cultural and spiritual and ceremonial activities at the site.

In conclusion, it is of utmost importance that the suggestions made in the Introduction page of the report under the heading, <u>RULES FOR LONG TERM METHOD FOR PRESERVATION OF CULTURAL RESOURCES FOR ALL FACILITES PAST, PRESENT, AND FUTURE ON KOLEKOLE, HALEAKALĀ</u>, be brought to fruition. In this section, it outlines 7 procedures that should take place, and these recommendations would be a win-win situation for all involved. But, most importantly, it would establish a cultural protocol that would preserve the site, not only as a place for astronomy, but as a place where its Hawaiian Cultural aspects are ingrained in perpetuity.

GLOSSARY:

Kolekole – Land section in Kilohana and Mākena. There are two versions of what Kolekole means: (1) One account explicates that Kolekole was named after the fish, Kole. Kole's skin color is a rusty deep brown, almost like the cinders at Kolekole. (2) The second account stated that Kolekole is the Hawaiian word for "talk story". Some believe that it was an area where Kahuna Po'o (Head Priests) would convene to discuss issues.

'Āina – Land.

Ka wā kahiko – In the time of the traditional.

Pu'u Honua – Place of refuge, sanctuary; a place of peace and safety.

'Aumakua – Family or personal gods: Deified ancestors who might assume the shape of a shark (all islands except Kauai) owls, mud hens, octopuses, eels, almost all animals in Hawai'i.

Ka po'e Kahiko – People of old.

Mo'olelo – Story, history, literature, legend, journal, essay, chronicle.

Pae'āina O Hawai'i – Group of Hawaiian Islands; archipelago.

Kanaka Maoli – True aboriginal person.

Na Po'o Kahuna – High Priest.

Kāhea – To call out.

Ao holo'oko'a – The Universe.

Kanu – To plant or bury.

Ali'i – Hawaiian Royalty.

Kapu – Prohibition, taboo, "Keep out".

Piko – Navel; center.

Kupuna -Ancestor, generation, grandparent.

Mau'ula'ili (sysrinchium acre) – Native Iris, with long grass like leaves and small yellow flowers, found on Maui and Hawai'i above 2 thousand feet elevation.

Pele – Goddess of the volcano; Lava flow, volcano, eruption - all named for the Goddess Pele.

Kamo'oali'i – King of the Sharks; He led the *Pele* family from Kahiki to Hawai'i, ending up on Kaho'olawe Island.

Hi'iaka-ikapoli-O-pele – The youngest sister of Pele, and the god of thunder.

Pāoa – The divining rod by which Pele tested the suitability of areas for excavation on the island of Nihoa, at various places on O'ahu (Salt Lake, Punchbowl, Leahi, Makapu'u) and on Maui. Finally she planted the staff at Pana'ewa, Hawai'i, and it became a tree.

'Alanuihāhā – Channel between Maui and Hawai'i.

Māui – The demigod and trickster who snared the Sun, so that his mother's tapa cloth could dry.

Poli'ahu – The goddess of the snow.

Wahi-Pana - Sacred place; spiritual place.

Pōhaku Palaha - A stone located on the Kapalaoa Ridge of Haleakalā Crater, that is the beginning of the 8 land districts or Ahupua'a in the East Maui area.

'Āina - Land.

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United States Geological Survey GNIS Database (March 2003)

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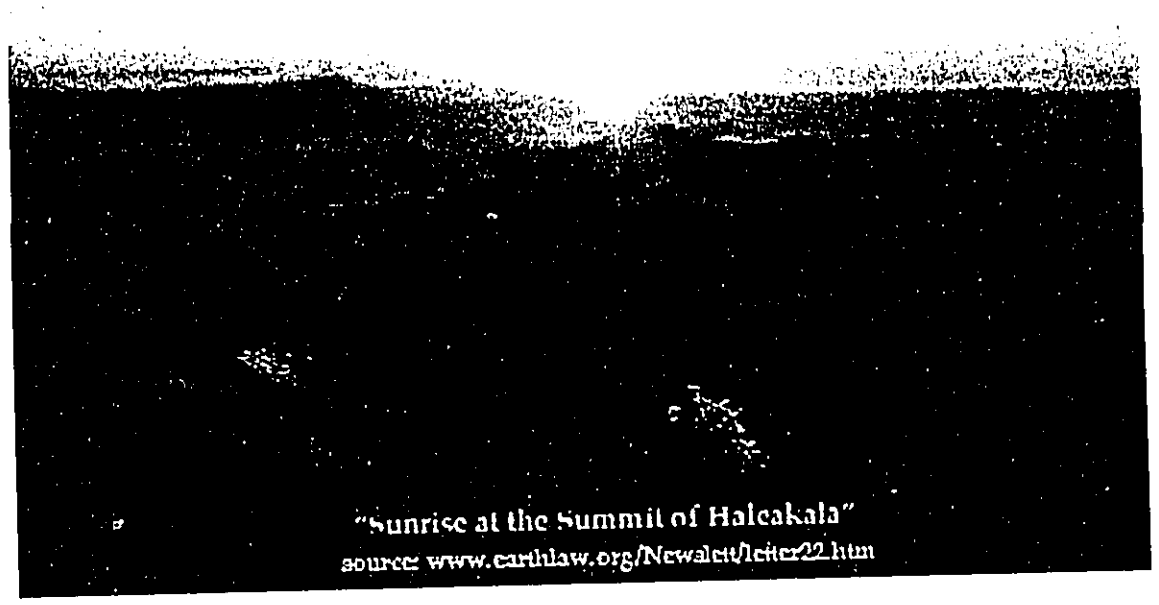
Archaeological Cultural Assessment Survey at Haleakala

"Kū I Ka Mauna"

Upright At The Mountain



December 2002

Traditional Practices Assessment for the Summit of Haleakalä

Prepared for
KC ENVIRONMENTAL, INC.
P.O. Box 1208
Makawao HI 96768

CKMculturalresources

Summit of Haleakalā
Report #1

Tax Map Key 2-2-7-08 18.1 Acre Site

Traditional Assessment for the Summit of Haleakalā

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ABSTRACT

CKM Cultural Resources conducted a Hawaiian Traditional Practices Assessment of the 18.1 acres at Kolekole, Mākena/Kilohana ("Science City") on the top of Haleakalā. The reason for this traditional practices assessment was to identify the past and present practices used by the ancient and present Hawaiian people.

Because most of the informants that had information about the traditional practices of Kolekole, Haleakalā, have passed on, it is very difficult to document the traditional practices. Fortunately, a few people still held this information through the tradition of oral history, and people such as *Kūpuna* Papa David Ka'alakea, Henry Kekoanui, Daisy Kekoanui, 'Iolani Luahine and Edith Kanaka'ole told me of the past uses of Haleakalā.

For those of us who travel to Haleakalā's peak in an hour, it is quite a thrill. But imagine the length of time the journey would have taken in old Hawai'i.
According to the *Kūpuna* informants, it took the ancient people a day or so to reach the summit. Only the *Kāhuna Po'o* (High Priest) was allowed to be at the very top of the highest hills because they had the ability to talk to the Gods.

The area of study, Kolekole, was used by the *Kāhuna Po'o* to teach the arts of reading the stars and being one with the celestial entities above. It was very significant to the Hawaiians of old to have the knowledge of the changing seasons, the alignment of the sun and the moon, and the ability to predict changes in the weather.

From this high vantage point, all the other islands, except Kauai, could be seen. Students would learn of the creation of the islands in a Hawaiian mythological concept. And, being close to the heavens they had a "living classroom" as a learning tool.

With the construction of the recent telescopes and buildings on Kolekole, within the area that is being studied, the Hawaiian's spiritual and cultural association to this mountain has been seriously compromised. Also, it affects the other *pu'u* (hills) around this site, because it prohibits the natural association it once had to the surrounding area and no longer would be considered pristine.

One does not have to be Kanaka Maoli to realize that all facets of the Hawaiian Culture should be saved, and places as culturally important as Haleakalā (what our people call a *pu'u honua*) must not be sacrificed for modern technology. Our ancient forefathers passed on this cultural treasure to us, their *kupukupu*, and the future generations to come. We will have a connection to our cultural and spiritual roots, and we all must "Kū I Ka Mauna" (stand up to protect the mountain).

Note: As much as possible, throughout this report, the spelling of Hawaiian vocabulary and place names have been standardized to present orthography.

Outline

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   a. Mākena (In its entirety)
   b. Pu'u O Kali
   c. Kilohana
   d. Nāhiku
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   f. Luala'i Lua

II. In the beginning...
   a. Beginning of the islands
   b. Traditional ties to 'āina[2]
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III. Native Vegetation and Habitat
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   B. Pele's relation to Haleakalā / Hi'iakaikapoliopele
   C. Burial Pit
   D. Ala Hea Ka Lā
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[1] Glossary Term
[2] Glossary Term.

INTRODUCTION

"Kū I Ka Mauna"
(Upright at the Mountain)
(Report #1)
Traditional Practices and
Research Composition of Haleakalā

December, 2002

Introduction – Eia ka lā hiki:
The Scope:

The scope of this report will be to compile historical and cultural information, learn about the traditional practices of the area, and review the topography of Haleakalā and its surrounding areas. The report will consist of two phases, the first being Traditional Practices (Report#1) and the second being the Spiritual and Cultural Association to Haleakalā and to the rest of the Pae'āina O Hawai'i (Islands of Hawai'i), (Report#2).

Specific Area of Research:

The area in question is commonly referred too simply as Haleakalā. The name Haleakalā[1] speaks of one specific mountain and not the entire perceived area. However, what needs to be determined is the specificity of the area in question. According to University of Hawai'i's Institute for Astronomy's (UH-IFA) website it explicates the following:

In 1961, an Executive Order by Governor Quinn set aside land on the summit of Haleakalā in a place known as Kolekole, to be under the control and management of the University of Hawai'i which established the "Haleakalā High Altitude Observatory Site," sometimes referred to as Science City.[2]

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[1] Haleakalä: Kaupö District. 8,201 feet tall. North (+) Latitude: 20° 42 17. West (-) Longitude: 156° 10 36. This data was extracted from the United States Geological Survey GNIS Database (November 2000).
[2] http://www.ifa.hawaii.edu/haleakala. However, for the greater portion of this report, the upper mountains of the Kilohana *ahupua'a* will be referred to as Haleakalä.

In its own admittance, the UH-IFA clearly understands the relevance of the importance of the specific name of the area. Therefore, this report's focus area shall be Kolekole.

Conflicting results were discovered during the process of researching the *ahupua'a* that Kolekole dwells. According to Mary Kawena Pūku'i's Place Names of Hawai'i[3], Kolekole is located in the Mākena *ahupua'a* of Maui. However according to a November 2000 United States Geological Survey GNIS Database, it places Kolekole[4] in the Kilohana *ahupua'a*. According to these maps the *ahupua'a* of Mākena and Kilohana meet. Therefore, it is assumed that Kolekole is in the vicinity where both *ahupua'a* convene.

Tangent Areas of Research:

The study of Kolekole is difficult to conduct unless the tangent areas are congruently studied. Therefore, the tangent areas will also be accounted in this specific section of the report.

Mākena:

Mākena is located on the southeastern portion of Maui. The area, however, does not reflect the same landscape as that of the upper summits of Kilohana and various other *ahupua'a* in the upper portions of Maui.

Pu'u O Kali:

Pu'u O Kali is an *ahupua'a* which sits above Mākena *ahupua'a* and next to Kilohana *ahupua'a*.

Kilohana:

Kilohana encompasses most of the region that people today consider to be Haleakalā. The area includes a portion of what is a focus of this paper, Kolekole.

Nāhiku:

Nāhiku resides directly next to Kilohana and Hāna. Nāhiku was extremely important in the study of celestial navigation. Nāhiku is the Hawaiian name for the "Big Dipper," or Ursa Major.

Kaupō:

Kaupō was a major living area in *ka wā kahiko*[5]. Kaupō's fame comes from the thought of this area as being the back of Kilohana, or Haleakalā.

Lualaʻi Lua:

Lualaʻi Lua literally means "two fold tranquility." From several accounts, it is in this specific area that tranquility would be obtained for the purpose of traveling to the summit.

This is just a few *ahupua'a* that borders the area of Kilohana and will become imperative to the research of Kolekole.

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3 Püku'i, Mary Kawena, et al. Place Names of Hawai'i. University of Hawai'i Press, Honolulu, 1974.
4 Maui: Kolekole – Kilohana District: 10,012 feet tall. North (+) Latitude: 20° 42 38, West (-) Longitude 156° 15 33. This data was extracted from the United States Geological Survey GNIS Database (November 2000).
5 Glossary: Term

In the beginning...

Hawai'I, to some, was pulled out of Oceania's vast holdings. For others, the islands were born of Papahānaumōkū (Papa) and Wākea. And, to others, these islands were produced through the lineage of the *Kumulipo*. Through the line of Mānaiakalani[6], or the passages of Papa and Wākea, or the verbs of the *Kumulipo*, the islands come alive with its rich and vibrant history.

Without taking a side to any version of Hawai'i's beginnings, *ka po'e o ka wā kahiko*[7] recognized: "Akāka wale o Haleakalā[8]." It is indeed recognized that Haleakalā stands in full view. From time immemorial Hawaiians have revered the sanctity of the slopes of Haleakalā and the summits of Kilohana.

Some people believe that the beginning of Maui happened when the Demigod Māui attempted to catch a fish, by the name of Pīmoe, for his mother Hina. He, along with his brothers, tried to find this magical fish, and in turn ended up breaking a spell. When this happened Pīmoe turned into the eight major islands and some 125 minor islands. Māui's response to his mother's dismay was simply this, "We no longer need a large fish to eat; we have the land that will be here for generations to come." What needs to be made clear here is the importance and relevance of the 'āina to its people. The relationship of the 'āina that the Demigod Māui furnished to his mother can be experienced right up to this very day.

In the context of Papa and Wākea's story, these two "people" are the parents of the islands. Therefore, the point that needs to be made is that when the 'āina is hurt, so are the siblings – *Kanaka Hawai'i*[9]. According to Dr. Lilikalā Kame'eleihiwa's statement before the United States Commission on Civil Rights, she stated:

> From time immemorial, Native Hawaiians have had a special genealogical relationship to the Hawaiian Islands... As such, we have an ancient duty to love, cherish and cultivate our beloved grandmother, the land... And in the reciprocal relationship, when we Native Hawaiians care for and cultivate the land, she feeds and protects us.[10]

From Māui's expressions to his mother, to Dr. Kame'eleihiwa's expression of the Hawaiians' relationship to the 'āina, there is a correlation between the bond and attachment, and the care and protection, that Hawaiians have for their 'āina. Therefore,

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[6] Mānaiakalani is the name of the fishhook used by the Demi-God Mäui, to pull up the islands known as Hawai'i.
[7] Glossary: Term
[8] Pūku'i, Mary Kawena, et al. 'Ōlelo No'eau: Hawaiian Proverbs and Poetical Sayings. Bishop Museum Press, Honlulu, Hawai'i, 1983. [Glossary: Term]
[9] Glossary: Term
[10] Kame'eleihiwa, Lilikalä, Ph.D., statement before the Hawai'i Advisory Committee to the U.S. Commission on Civil Rights, " The Impact of the Decision in Rice v. Cayetano on Entitlements," community forum, Honolulu, HI, Sept. 29 2000, transcript.

Hawaiians have every right to analyze the use of their most sacred lands. With that mentioned, Haleakalā will now be studied in depth.

Native Vegetation and Habitat:

The vegetation in the Kolekole/Haleakalā area does not flourish as generously as various other *ahupua'a* on Maui. However, Haleakalā is known to have endemic plants and wildlife, along with some of the world's rarest plants and animals.

Every aspect of the traditional Kanaka Hawai'i culture was closely interconnected with the life forms of these islands. The saying "He Hawai'i Au" - I Am Hawai'i - reveals this basic truth: the people and their environment are one, as previously made clear. All of the needs of the population (which numbered nearly as many as inhabit Hawai'i today) were provided for abundantly from the life of the land and ocean, passed on by the stored energy of the *lā*[11] in multitudes of useful and beautiful forms.

Being the most isolated land in the world (5,000 miles from the nearest continent), the Hawaiian archipelago evolved incredibly diverse and unique ecosystems, with myriad species of flora and fauna found nowhere else on the planet.

Today, Hawai'i is known as the extinction capital, with more extinct and endangered species than all the rest of the United States put together. More than sixty species of endemic Hawaiian birds have become extinct, and an additional 29 are endangered, totaling over 80 percent of Hawai'i's unique bird fauna. This year, there were 10 more species from the island of Maui that have been nominated for the endangered species list.

This signifies a deep rending of the fabric of life which can never be repaired in human time frames. And, vanishing with these species are the cultural interrelations that developed with them, through the generations, over hundreds of years.

In the delicate ecology of the alpine climate of Haleakalā's mountaintop, there are over thirty plants, as well as seven birds and numerous insects, listed as endangered species just within the National Park boundaries alone. Many others are listed as threatened species or species of concern.

Plants found on Haleakalā mountain, many of which are endemic (native and unique) to this part of the island were used for a variety of cultural purposes.

A well-known tree is the sandalwood (Santalum freycinetianum), known in Hawaiian as 'Iliahi. The wood was traditionally used to scent tapa cloth. It was sometimes used to make 'ukeke (a musical bow), the only traditional Hawaiian stringed instrument. The leaves and wood of Sandalwood trees were also used medicinally, often in combination

[11] Glossary Term

with ʻawa and other woods. One variety of Sandalwood occurs near the Park headquarters and Hosmer's Grove. The lanaiense variety, with a red flower, found only on East Maui and Lānaʻi, is endangered. Only around 100 plants survive today, with a population found on the south slope of Haleakalā.

Other medicinal plants from this area include the *ʻAhina Kuahiwi* (*Gunnera petaloidea*), also called *Kaʻapeʻape* or *ʻApeʻape*, and the *Mauʻu Laʻili* (Sisyrinchium acre), a crawling grass (native Iris) found on top of the mountain, which was used to treat skin disorders.

The durable wood of the golden-flowered lacy *Mamane* or *Kolomona* tree (*Sophora chrysophylla*) was utilized to make *oʻo* (digging sticks), house poles, and *hōlua* sleds. One of the most outstanding examples of a *hōlua* slide was just recently discovered on the southeast slope of Haleakalā.

Many plants found on Haleakalā were traditionally, and are still, used in lei making. The *Pukiawe* (*Styphelia tameiameiae*), the park's most abundant shrub, is a popular element in elaborate haku lei, as well as being food for the endangered Nēnē (*Nesochen sandvicensis*), the Hawaiian goose, Hawai'i's state bird.

The famous *ʻAhinahina* - Haleakalā Silversword (*Argyroxiphium sandwicense* ssp. *macrocephalum*) - a variety found only on Maui was also used to make leis. Overexploitation by outsiders contributed greatly to its near demise. Once numbering less than 100 plants, it is now listed as threatened, with a recovering population of around 65,000 plants.

For some endangered flora and fauna, it may already be too late, as the ebb of human predominance elucidates its presence to untouched history beyond the common understanding. However, as long as the endangered flora and fauna continue to survive, we must do our utmost to protect and restore these species.

On March 20, 1999, Earth Law, Inc.'s[12] staff attorney, Debbie Sivas[13], made mention to their supporters in a letter (regarding airplane flights near Haleakalā), of Haleakalā's fragility:

> Haleakalā protects more imperiled species than any other national park -- 6 endangered bird species, 12 endangered plant species, and many rare invertebrate and plant "species of concern." Some 90 percent of the Haleakalā's 650 plant species and 800 invertebrate species live only on the Hawaiian Islands. Eight forest birds reside only within the Park's borders. Its little wonder that the Park has been designated an International Biosphere Reserve.

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[12] Formerly Earth Law, Inc., has since merged with Earth Justice, Inc.
[13] http://www.earthlaw.org/Newslett/letter22.htm

Sivas continued to state:

> This is the reason we brought an action on behalf of the National Parks and Conservation Association and Maui Mālama Pono, a Hawaiian grassroots organization that promotes slow growth, to block the creation of an international airport on Maui.

One might wonder what tangent these quotes would have to a composition of this sort. In this particular case, a lawsuit was filed because the Kahului Airport had plans to expand. According to Sivas, many were concerned about the indirect impact Haleakalā might receive. Three years later, and now Haleakalā is in direct impact with the proposal to build new infrastructure.

The flora and fauna mentioned (and then some) thrive in this very fragile environment. Many may be brought back from the brink of extinction if their habitat is preserved and restored. To build any more infrastructures at Haleakalā would only be adding fuel to the fire. Both the Silversword and the Nēnē goose are examples of species on Haleakalā that nearly became extinct from human exploitation, which are now increasing in numbers due to our positive intervention.

Haleakalā: The Historical Context

Māuiākamalo

Haleakalā is the location of one of Polynesia's[14] most famous stories. The demigod Māui managed to snare the sun after repeated verbal foresights of failure. Haleakalā became the focal point of the Universe; it is the beginning of the sun.

Some may not believe this legend, primarily because it is "fictitious." Given that point, the moral behind the story is not fictitious. In an anthropological sense, legends tell the habitual lifestyles of the people in focus. In this case, Māui's legend tells a lot about the importance of the sun to Hawaiians, hence the name: Haleakalā – House of the Sun.

Haleakalā's Importance:

Of course Haleakalā is the sacred home of our Sun, and the ancient "Path to Calling the Sun", as depicted in its ancient name: Ala Hea Ka Lā. Why is this critical to our survival? The Sun's energy is the source of all life, and governs our most basic rhythm of

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[14] Point of clarification: Most believe the story of Mäui's snaring of the Sun is a Hawai'i-centric story. However, Mäui was not only a Hawai'i demigod, he was a demigod of all of Polynesia. Therefore, Haleakalä is a pinnacle of power for all of Polynesia.

day and night. Ancient cultures have venerated its being, and we as a human race follow its course without thought, and are insignificant in respect of its power. However, our Native Hawaiian Culture praises its existence, and until this very day the sun is praised for its cycle:

E ala e	**Rise**
Ka lā I kahikina	**The sun at the east**
I ka moana	**At the ocean**
Ka moana hōlıonu	**At the deep ocean**
Pi'i ka lewa	**As it climbs**
Ka lewa nu'u	**To the highest**
I kahikina	**In the east**
A I ka lā	**Is the Sun**
E ala e	**Rise**

The cycle of the rise of the sun is still honored through chants like the one shown above. "E ala e" was written in the late 1980's by Hawaiian scholar, historian, and *Kumu Hula*[15], Pualani Kanaka'ole Kanahele. The sun's appreciation and worship is not something of the past, but very tangible and real.

The ancient spiritual use of the mountain is for meditation and receiving of spiritual information by Kahuna Po'o. It is a place where the tones of ancient prayer are balanced within the vortex of energy for spiritual manifestations. In ancient times, only Kahuna and their haumāna (students) lived at Haleakalā, and used it for their initiation rites and practices.

Pele:

It is said through chants that Pele created every single *pu'u*[16] in the Kilohana region on Maui. During Pele's first visit to Haleakalā she began to dig a deep pit and made sixteen cinder cones that stand there to this very day. She went below Paukela, Naholaku and Maua, and from Kaumunui to Paukela. These *pu'u* are in a sacred alignment with the tip of Haneo'o for about 30 miles into the ocean. We are beginning to relearn the significance of the astro-archeology of that period and how these points are interrelated with the many *Heiau*. On the east side of Haleakalā, there are over 300 *Heiau*[17] - a higher concentration of ancient temples than any place else on the planet.

Pele's journey to Hāna, Maui, was said by the ancients to be her very first experience in going under the earth from Haleakalā to the north-western side of the peak of Kahuakalā (the Sun's nose). On the northwest side of the peak is Hale o Pele (Pele's House). From there she caused a flow of lava to pour as far as Kawaipapa, Wakiu, Honokalani, Ka'eleku and between Honoma'ele and Makapu'u in 'Ula'ino and the bed of Akiala.

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[15] Glossary Term
[16] Glossary Term
[17] Glossary Term

During this flow she also made Olopawa, Hina'i, Kaiwiopele, Leho'ula and Alau. These are all consequences of and interrelated with the crater and its activities. She also returned and died at Haleakalā later in history during a battle between her rival sister Namakaokaha'i[18] - where her and Hi'iakaikapoliopele's *iwi*[19] were scattered through the crater and the hill at Aleamae named Kaiwiopele.

Burial Pit:

Haleakalā was well known for its *lua meki*[20], according to Hawaiian scholar Samuel Mānaiakalani Kamākau:

> The disposal pit of Ka'a'awa is a deep disposal pit inside the crater of Haleakalā. It is on top of a lava mound in a pit on the north side, close to Wai'ale'ale[21] on the eastern edge of the Ke'anae gap that opens at Ko'olau...several miles deep, with fresh or sea water at the bottom. Because of the taste of the waters, some people have supposed that the waters of Waiu and Waipu at Kaupō have their source at this pit of Ka'a'awa...[22]

This is one account of the noted by Samuel Kamākau. To support this piece of evidence E.S. Craighill Handy et al., has also noted events similar to those mentioned by Kamākau:

> ...Maui natives of the Kula and Honua'ula areas journeyed during the nighttime to toss into the crater the bones of their dead. The Maui people living on the semi-arid leeward slopes, who threw their bundles into the pit of the extinct volcano, were presumably of the "Clan of Pele."[23]

Haleakalā is not only significant for its purpose as a sacred area, but it is a burial site as well. Hawaiians treated their bones with much respect, for it was the purest form of *mana*.

Ala Hea Ka Lā:

It is said, through oral tradition[24], that Haleakalā's traditional name was Ala Hea Ka Lā, "the path to calling the sun."

In the Hawaiian religion, physically higher places were always sacred. If one were to notice the structure of the traditional homes of the *ali'i*, or the structure of various *heiau*,

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[18] Goddess of the Ocean; Pele's nemesis and sister.
[19] Glossary Term
[20] Glossary Term
[21] A swamp just outside the crater wall
[22] Kamäkau, Samuel Mänaiakalani. Ka Po'e Kahiko: The People of Old. Bishop Museum Press. Honolulu, Hawai'i, 2000.
[23] Handy, E.S. Craighill, et al. Native Planters: In old Hawai'i – their life, lore, and environment. Bishop Museum Press, Honolulu, Hawai'i, 1972: 336-337.
[24] Made mention on numerous occasions by the late Kahu David Käwika Ka'alakea.

they would observe that the structures always reached for the sky above. This vicinity was the area of the *waoakua*[25]; it is the dwelling of the gods, the home to where all formations of each of the 40,000 Hawaiian gods and goddesses placed their powers. Haleakalā was not only "home of the sun," it was also home to the gods.

Ke Koʻi (The Adz)

Adzes were an important part of the lives of all traditional Hawaiians. Archival records at the Hāna Cultural Center say, "The Hawaiians were the finest stone adz makers in Polynesia. One of the best quarries was atop Haleakalā." The various quarries throughout the islands were incomparable to Haleakalā's second-to-none quarry.

There were certain protocols to commence prior to excavating the basalt rock which was used to create the adzes. The following is a chant from David Malo's Hawaiian Antiquities.

E Kāne uakea, Eia ka ʻālana
He moa ualehu. He moa uakea, He moa ʻula hiwa.
He ʻālana kēia iā ʻoe Kāne,
No ke koʻi kalai,
Koʻi kua,
Koʻi kikoni,
Koʻi lou,
He koʻi e kai e, kalai ai ke kiʻi,
He koʻi ou e Kāne,
ke Akua ola.
ke Akua mana,
ke Akua noho i ka ʻiuʻiu,
ke Akua i ke ao polohiwa.

This is a praise given to Kāne, he who was responsible for the excavation and making of the koʻi. The chant explicates, "He ʻālana kēia iā ʻoe Kāne." (an offering to you, Kāne).

Hawaiians were extremely skilled in crafting the adz. As historic sculpture reveals, the carving techniques of ancient Hawaiʻi were not crude, nor did they hinder the control of the medium. Carvers of the large temple images, and probably of many smaller types, were not mere craftsmen, but instead they were the Kahuna Kalai (Priest Carvers) - selected by traditional methods, they were trained and initiated in the rites of the order of the type of work that they would do.

It is interesting to note that there are no differences found in the quality of tools used by Kahuna and Aliʻi, and those used by farmers, fishermen, and other professions. All

[25] Glossary Term

maintained the same high quality, across the lines of what western society termed as class distinction.

Adzes are older than the time of Wākea. The adzes used to hew Kumu'eli and Kaloliamaiele [Kaloloamaile] - the canoes of Wākea ma -- were ko'i meki, of iron, possibly. Their names were Haumeku and 'Olopu, and they were adzes that belonged to Hawai'i nei from remote times. Makilihoahoa'aikalani was the large chisel, kila nui, that gouged the canoes; it was also iron.

As shown through the chants, and the relation of Wākea's adzes, there is a strong bond between the tool and the kanaka. There was also a strong relation between the process of making ko'i and the areas of gathering the basalt rocks they used. Haleakalā was known to be the prime spot to gather the rocks to create these useful tools.

ARCHAEOLOGICAL CULTURAL ASSESSMENT SURVEY
Archaeological Survey at Mount Haleakala, Maui Hawai`i
Locations of Archaeological Sites 50-11-2805 through 50-11-2808
Around the Rim of Kolekole Hill in relation to Existing and Proposed MSSS Facilities

By Sheldon Brown and Erik Fredericksen

Walking assessments of archaeological sites were made in August and November, 2002 at the summit of Mount Haleakalā within the Science City Boundaries as outlined by the University of Hawai'i. The survey area was concentrated around the rim of Kolekole hill and the surrounding observatories of the Maui Space Surveillance System and Faulkes Telescope complex. (See map)

The sites documented were Hawaiian ceremonial rock formations, petroglyph, a possible Hawaiian burial site and a number of temporary habitation shelters.

Photographs that were taken documented the formations and the overhang "dew" or "blister" shelters.

Archaeologist **Erik Fredericksen**, Principal Archeologist for Xamanek Researches and CKM Cultural Resource Personnel, **Sheldon Brown**, spent the morning and afternoon doing documentation work of the area sites. Accompanied photos were taken by Mr. Brown.

SUMMARY

Mount Haleakalā has been considerably impacted by the latest construction of the various telescope observatories and building facilities. Previous unidentified cultural resources were identified during the archaeological inventory survey of the Science City area. Most of the area sites identified consist of temporary habitation or wind shelters, two petroglyph images, one site interpreted as a possible burial and two are believed to have possible ceremonial significance.

The sites are of important cultural value and have yielded important information for research on prehistory and qualify for significance because of their information content, under the State and Federal historic preservation guidelines. In addition, the possible burial and petroglyph sites qualify for cultural significance. The Native Hawaiian people, due to their association with cultural practices that were once carried out(and still performed today), know that this area provides significant traditional cultural value.

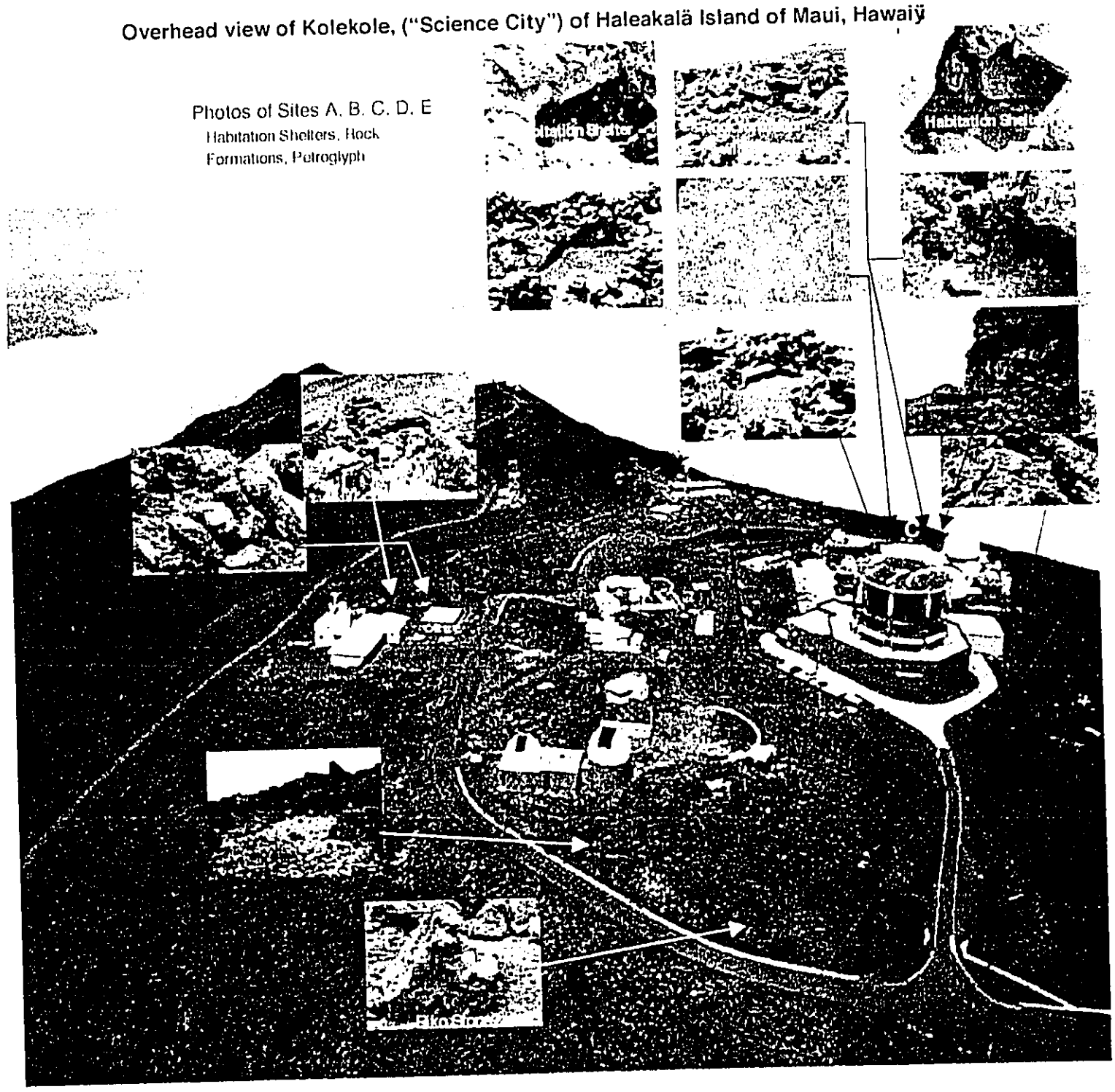
Finally, it is of great importance that the various sites surveyed on mount Haleakalā be assessed as a remnant of a Native Hawaiian cultural landscape, because of its ceremonial and traditional

importance to the Native Hawaiian people. The entire Science City site complex may qualify for importance under all guidelines set forth by Rules Governing Procedures for Historic Preservation Review (DLNR 1996; Chapter 275)

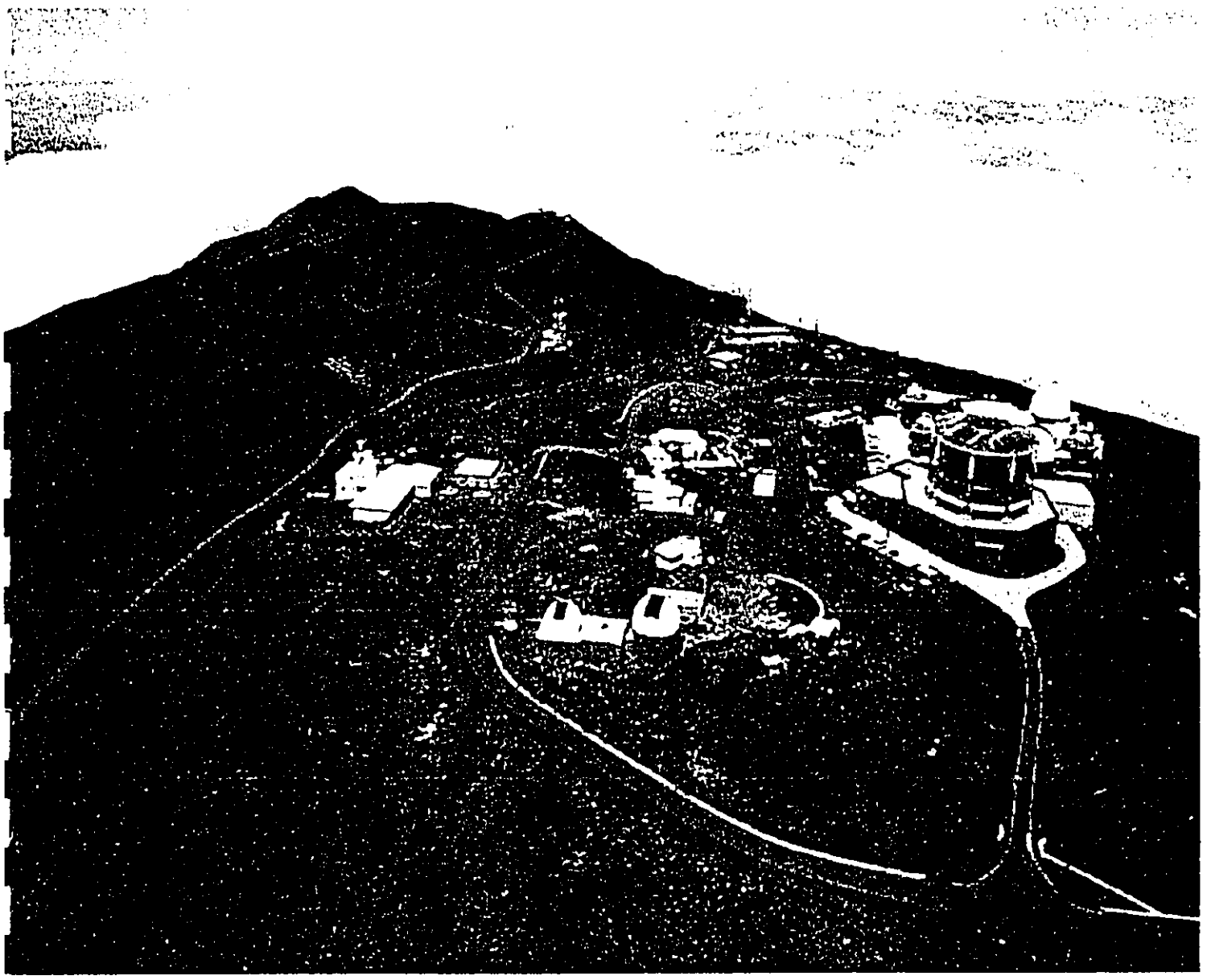
Photographs associated in relation to Archaeological Site 50-11-28
50-11-2808 around Rim of Kolekole Hill in relation to existing and
MSSS Facilities

Overhead view of Kolekole, ("Science City") of Haleakalä Island of Maui, Hawaiÿ

Photos of Sites A, B, C, D, E
Habitation Shelters, Rock
Formations, Petroglyph

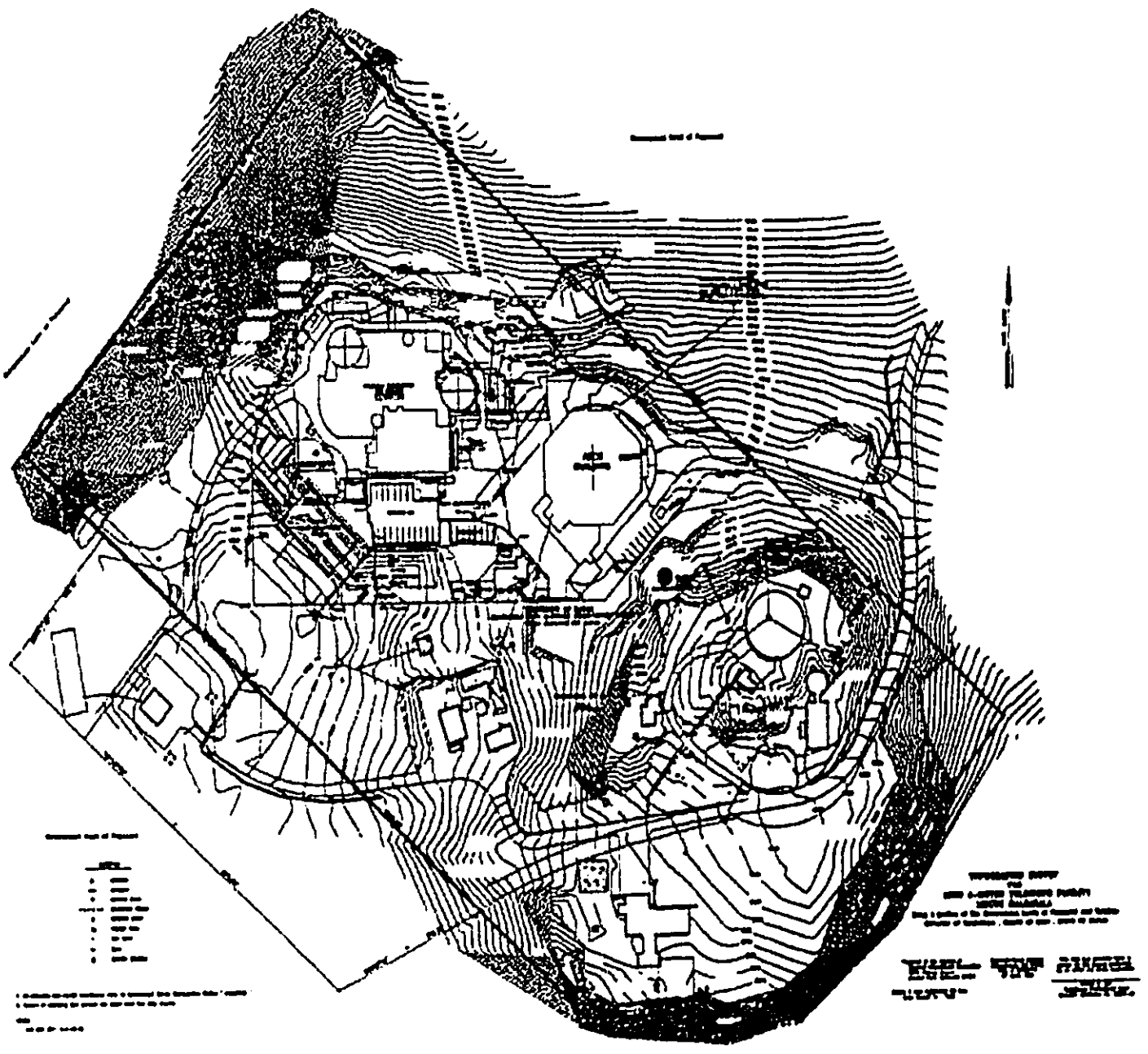


High Altitude Observatory
18.1 Acre Site
Tax Map Key 2-2-7-08, Island of Maui

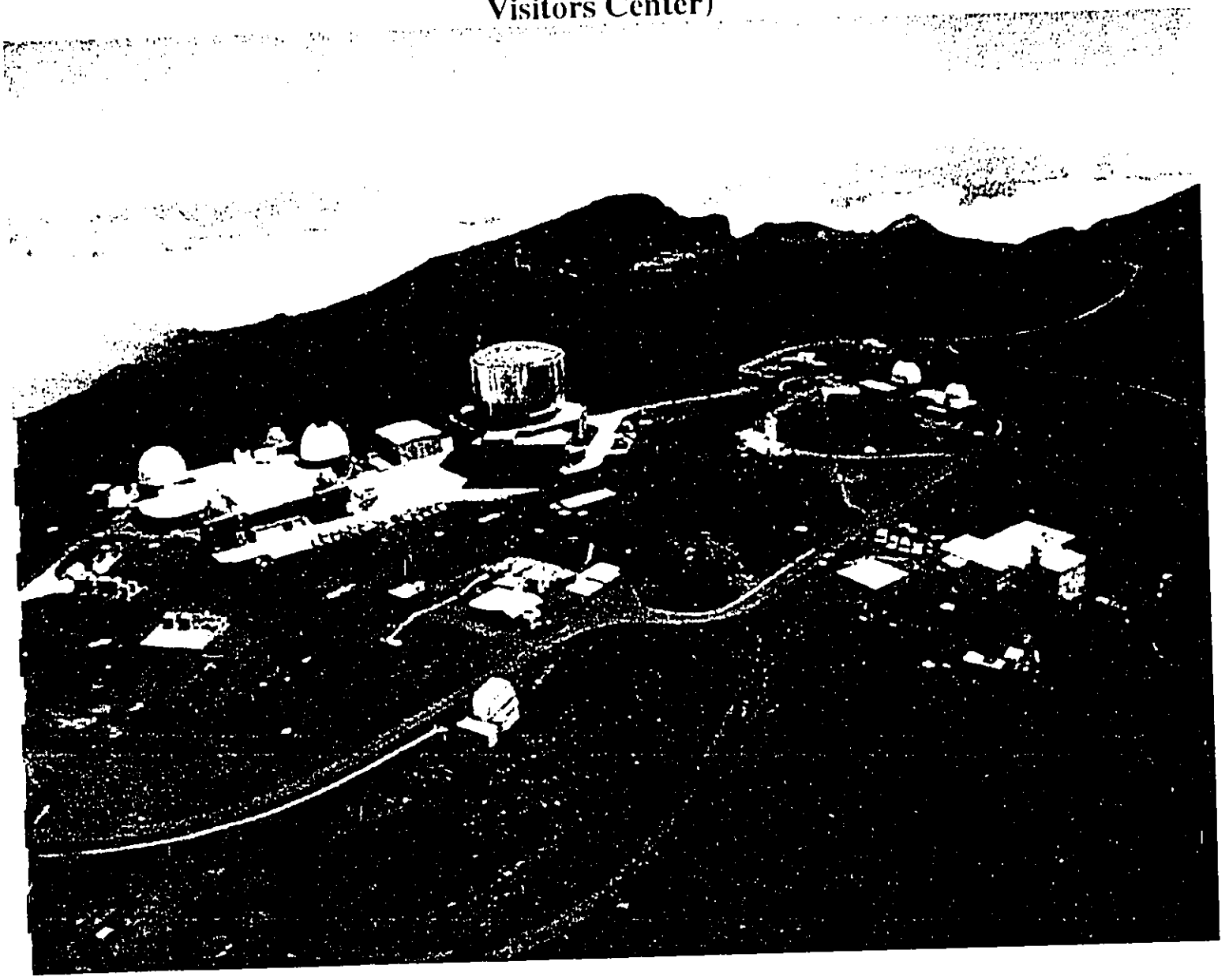


Overhead view of Kolekole, ("Science City") of Haleakalā Island of Maui Hawai'i

TOPOGRAPHY MAP OF HIGH ALTITUDE OBSERVATORY 18.1 ACRE SITE KOLEKOLE, HALEAKALĀ



High Altitude Observatory
18.1 Acre Site
(Picture taken looking towards Haleakala National Park Visitors Center)



INTERVIEWS

CHARLOTTE NINA MAXWELL

INTERVIEWER: Charles Kauluwehi Maxwell Sr.

PERSON INTERVIEWED: Charlotte Nina Maxwell, 64 years old

OCCUPATION: Kumu Hula of 33 years

DATE AND TIME: 12/28/02 7:00 p.m.

PLACE OF INTERVIEW: Home, Pukalani, Maui, Hawai'i

I have been a resident of Pukalani for almost forty years. As a child during World War II, my father worked for the military as an electrician at the top of Haleakalā. I remember the roads being very narrow and winding.

Now, as a Kumu Hula for over thirty years, I have traveled to Haleakalā many times for spiritual guidance. In doing chants or mo'olelo (storytelling), you must go to the source, to the inspiration that connects you so that you may experience the spiritual essence of what you are trying to convey. It is not something that you can hold in your hand, it is not tangible, but you actually can feel the presence of the Gods.

Many legends are associated with this famous mountain, where two Goddess reside but not in tandem. The Goddess Pele of the volcano and the Goddess *Poliahū* of the snow. *Poliahū* will only grace us with her presence when Pele is not in residence of her domain. Sometimes the two may battle but only if a male suitor is involved.

The Order of *Palikū*, a priestly order, conducted their ceremonies upon this mountain top. They painted their bodies red with lepo *'ālae*, wore white kapa, carried a *ki'i* mounted with a pig's head and ceremoniously walked around the crater rim, Kolekole and the entire crater area. They usually performed this ritual during *Makahiki*.
I have also heard that in ancient times travel from Haleakalā to the Big Island was achieved by traveling in an underground lava tube underneath the *Alanuihāhā* channel. Also, a lava tube from the mountain top to Keanae afforded them another way to travel between these points.

To me these buildings and further construction are an obstruction to the spiritual environment and breaks the *mana* of Haleakalā. It would also cause me further restrictions in being able to walk the grounds that I find sacred. As a Kumu Hula, I gather many types of flora and fauna for adornments. But, on this area the

spiritual essence is of greatest importance to me and my teachings. This area affords me a connection to the *Kapo'e ka wā Kahikō.*

FRED KANOHO

INTERVIEWER: Charles Kauluwehi Maxwell Sr.

PERSON INTERVIEWED: Fred Kanoho, 81 years old

OCCUPATION: Retired Mechanic

DATE AND TIME: December 12, 2002

PLACE OF INTERVIEW: 1082 Puana St. Makawao, Maui

Mr. Kanoho related that he was born in Waikapu on March 21, 1921. In the later part of his life he worked in Haleakalā Crater with the Civilian Conservation Corp. and lived in Haleakalā Crater for months at a time. He belonged to a group of workers that were hired in 1940 to 1944 by the Federal Government. They were employed to repair the trails within Haleakalā Crater. Even though they worked throughout the Crater, he did not hear or know of any stories or legends about Haleakalā. When he was young he knew of several Kūpuna who had information about the spiritual and cultural aspects of Haleakalā, but they have long pasted on. He had no further information to offer.

DAVID PU'U

INTERVIEWER: Charles Kauluwehi Maxwell Sr.

PERSON INTERVIEWED: David Pu'u, 69 years old

OCCUPATION: Self employed

DATE & TIME: Dec. 11, 2002

PLACE OF INTERVIEW: 80 Hoōmaha St., Makawao Maui

Mr. Pu'u was born in Huelo, May 25, 1933. He stated that he did not know much about Haleakalā because whenever he would go into the Crater, it would be only

for the purpose of hunting. He did not know of any cultural practices that were done at the top of Haleakalā. He had heard that people still go up to do cultural things, but he did not know where and when it is done. Most of the Kūpuna that had information have long passed away.

IN-DEPTH CULTURAL OVERVIEW

An in-depth Cultural Overview of the High Altitude Observatory
18.1 acre site
Tax Map Key 2-2-08, Haleakalā, Island Of Maui, Hawaii

Prepared by Kahu Charles Kauluwehi Maxwell Sr.
CKM Cultural Resources

Introduction:

In conducting a Traditional Practices Assessment for the summit of Haleakalā, one must realize that due to the construction of the existing buildings over the past seventy plus years, much of the physical evidence of ancient Hawaiian traditional and cultural practices in the area was destroyed. Also, the use of western man in the construction played a role in the destruction, because they were unknowingly destroying and building upon sites used for traditional practices.

As shown in *oli* (chants) and the *mo'olelo* (stories) about the summit of Haleakalā, these speak of this exact site being used for a training ground in the art of *Kāhuna*, (priest, wizard, expert in a profession) by *Kāhuna Po'o* (High Priest). This site was sacred to them because of its height and closeness to the heavens. In primordial times, legend tells us that this site was revered by the demi-god Maui. He stood with one foot on this site (Kolekole) and the other foot in the Crater, and lassoed the sun as it went by to slow it down so that his mother could dry her *kapa* cloth. Maui prepared his lasso at the *heiau* (temple)located on the Kapalaoa ridge, on the south ridge of Haleakalā Crater, which can still be seen today.

According to the archaeological survey attached to this report, evidence was found of ko'a (ceremonial rock formations) and temporary habitation shelters which are located throughout this study area.

According to informant Kumu Hula Nina Maxwell, an order of priesthood called Palikū were caretakers of the summit and would conduct ceremonies during the Makahiki festivals. She further mentions that she frequents the site to get "spiritual guidance" from the gods of this area.

The ancient spiritual use of the mountain was for meditation and receiving of spiritual information by Kāhuna Po'o. It is a place where the tones of ancient prayer are balanced within the vortex of energy for spiritual manifestations. In ancient times, only Kahuna and their *haumāna* (students) lived at Haleakalā, for conducting their initiation rites and practices. Commoners were not allowed anywhere on the summit of Haleakala, with the exception of practitioners, who were practicing their arts.

Conclusion - Eia ka lā kau:

Throughout this report it has been shown that Haleakalā was more than a sacred vicinity. It is the temple. It is the graveyard. It is a focal point for *mana*. Traditional Hawaiians lived on a reciprocal life style: *aloha 'āina*[1] - one expresses *aloha* to the land and the land expresses *aloha* back by providing food and shelter, and every other necessity. Many traditional ceremonies and procedures were conducted at the summit of Haleakalā. As a Kanaka Maoli and having been brought up in a traditional Hawaiian family, it is difficult to describe in western words the feeling of being part of the 'āina and the intricacies that is mandated of one who is with the *koko* (the blood).

When the first buildings were built on Haleakalā, the Hawaiian people could not voice their opinion or their disapproval of the construction because it was not proper at the time. To do so, they would suffer all kinds of retributions to themselves and their families. They would only grumble amongst themselves about how the sacred mountain was being desecrated by these buildings. Only within the last 30 years would the Hawaiians share their concerns about issues like Haleakalā, and the proliferation of Western culture on other sacred sites. In the past it was not proper to talk about the sacred practices that occurred on Haleakalā, but because of the danger of these sacred sites being obliterated forever, the *mo'olelo* (story) is now being told.

Haleakalā's environment is extremely fragile, and unnecessary construction will only threaten the environment further. Such actions will cause the downfall of wanton amounts of endangered species, including the fauna, flora and wildlife. It would cause a cultural destruction of this *Wahi Pana* (Legendary) place.

The title of this report is simple: "Kū I Ka Mauna - Upright at the Mountain." This phrase has more meaning than just what is literally translated. "Kū I Ka Mauna," also refers to the resistance needed to prevent further destruction of one of the most sacred places belonging to Hawaiians. It also refers to the strength that is needed too, like the "'a'ali'i kū makani," the 'a'ali'i - untouched from the strong winds.

Certainly, no one would build in the middle of Vatican City, Mecca, or the even White House, for that matter. Hawaiians expect the same respect for their sacred sights as well.

Kū I Ka Mauna!

---

[1] Glossary Term

Glossary:

Kolekole – Land section in Kilohana and Mākena. There are two versions of what Kolekole means: (1) One account explicates that Kolekole was named after the fish, Kole. Kole's skin color is a rusty deep brown, almost like the cinders at Kolekole. (2) The second account states that Kolekoke is the Hawaiian word for "talk story." Some believe that it was an area where Kahuna Po'o (Head Priest) would convene to discuss issues.

'Āina - Land

Ka wā kahiko – In the time of the traditional.

Ka po'e o ka wā kahiko – The people of old.

Akāka wale o Haleakalā – In full view is Haleakalā.

Kanaka Hawai'i – Kanaka: Person, Hawai'i: Descriptive. *lit.* native of Hawai'i.

Lā – Sun

Koko - Blood

Kumu Hula – Master Hula Teacher

Kupuku- General name for fern, but also used as offspring

Mo'olelo - Story

Pu'u – Hill, point.

Heiau – Temple, place of worship.

Iwi – bones

Lua meki – Burial pit

Waoakua – Vicinity in which the gods and goddesses reside.

Wahi Pana – Legendary place.

Aloha 'āina – Love for the land; aloha implies reciprocation, therefore to survive one must love the land and in return in will care for you.

Mana – Supernatural or divine power

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Appendix B

Section 106 Consultation Letters

DEPARTMENT OF THE AIR FORCE
Air Force Research Laboratory (AFMC)

21 Oct 04

Det 15, AFRL/CC
535 Lipoa Parkway, Suite 200
Kihei, HI 96753

Ms. Cathleen Dagher
State Historic Preservation Officer
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, HI 96707

Dear Ms. Dagher,

The Air Force, in coordination with the University of Hawai'i Institute for Astronomy (UH IfA), is preparing an Environmental Assessment (EA) under the National Environmental Policy Act of 1969 (NEPA). Pursuant to Section 106 of the National Historic Preservation Act (NHPA), the Air Force is initiating consultation with your office regarding the proposed construction of a Mirror Coating Facility addition to the Advanced Electro-Optical System (AEOS) telescope structure atop Haleakalā, island of Maui, Hawai'i (see Attachment).

The Air Force seeks your concurrence with our determination that the project is not likely to adversely affect cultural resources. This conclusion is based on information from the *Draft Long Range Development Plan for UH IfA Complex* (LRDP) (KC Environmental, July 2004). The LRDP included: a *Cultural Resources Evaluation for the Summit of Haleakalā* (CMKculturalresources March 2003), a *Traditional Practices Assessment for the Summit of Haleakalā* (CMKculturalresources December 2002), and an *Archaeological Inventory Survey of 18.1-acre parcel at Science City* (Xamanek Researches April 2003).

The project area is located within the Crater Historic District Haleakalā National Park (National Register of Historic Places Site 50-11-1739). While no archaeological sites have been recorded within the proposed Mirror Coating Facility site or at the proposed construction laydown areas, there are 10 sites located in the vicinity. Archaeological resources identified to the east and south of the AEOS telescope, would not be disturbed by the proposed activities (see Attachment). However, to ensure protection of all nearby archaeological resources and maintain respect for the summit's cultural resources during the project's construction phase, the following measures would be implemented.

- 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, preferably a kupuna (elder), and a kahu (clergyman) as well, and one who has personal knowledge of the spiritual and cultural significance of Haleakalā.

- The cultural and archeological sites and features identified in the *Archaeological Inventory Survey* will be protected and preserved per Hawaii Administrative Rules, Title 13, Sub-Title 13, Chapter 277 "Rules Governing Requirements for Archaeological Site Preservation Development." Protection will include the establishment of clearly marked buffer zones and periodic monitoring by both the project Archaeologist and Cultural Specialist throughout the construction process.

- Construction crew members and permanent employees working at Haleakalā Observatories will attend UH-approved "Sense of Place" training prior to working at the project site. This training will instruct individuals on the cultural and historic significance of the Haleakalā Summit, as well as describe the spiritual essence of the area's natural resources.

- An area consisting of approximately 24,000 square feet and located southwest of the AEOS, will be set aside in perpetuity for the sole use of the kanaka maoli for religious and cultural purposes, on a non-interference basis with site activities.

- Passive in-place preservation will be continued for features that were identified and listed with SHPO (i.e., sites 4836, 2806, and 2805), and those previously delineated with post and railing boundaries. No new fencing or other demarcations would be added to the more recently identified features, so attention will not be drawn to them.

We would appreciate any comments you may have on our proposed approach. Our planning schedule is such that we must prepare the Draft Environmental Assessment by November 2004; therefore, we hope to hear from you within 30 days. We will be in touch with you by telephone shortly to follow up on this letter.

Thank you for your attention to this request. We look forward to working with you.

Sincerely,

BRENT A. RICHERT, Lt Col, USAF
Commander

1 Atch
Cultural Resources at Haleakalā Observatories

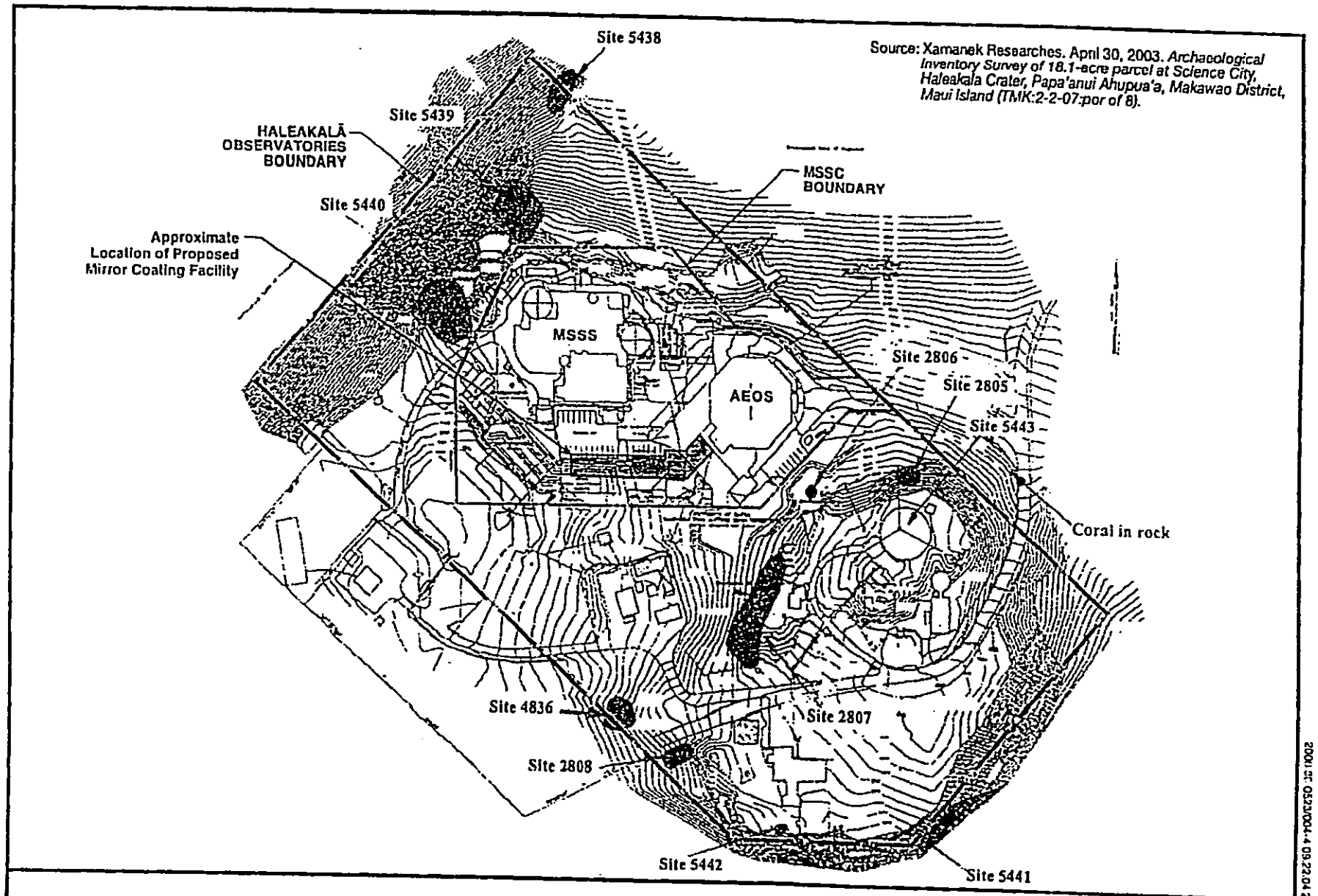

Figure 6
CULTURAL RESOURCES AT HALEAKALĀ OBSERVATORIES
Environmental Assessment
Proposed AEOS Mirror Coating Facility

2001 ST: 05/20/2004 4:09:22:04 2

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

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

54149

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

HAWAI'I HISTORIC PRESERVATION DIVISION REVIEW

Log No.: 2005.0669
Doc No.: 0504CD14

Applicant/Agency:	Brent A. Richert, Lt Col, USAF Commander
Address:	Department of the Air Force Air Force Research Laboratory Det 15, AFRL/CC 535 Lipoa Street Kihei, Hawaii 96753
SUBJECT:	REVISED: National Historic Preservation Act Section 106 Review – Initiation of Consultation/Request for Concurrence Regarding the Construction of the Proposed Mirror Coating Facility Addition to the Advanced Electro-Optical System at Haleakala
Ahupua`a:	Papa`anui
District, Island:	Makawao, Maui
TMK:	(2) 2-2-007:008

1. We believe there are no historic properties present, because:

___ a) intensive cultivation has altered the land
✓ b) residential development/urbanization has altered the land
✓ c) previous grubbing/grading has altered the land
___ d) an acceptable archaeological assessment or inventory survey found no historic properties
✓ e) other: Although historic sites are in the vicinity, none are in close proximity to the project area

2. This project has already gone through the historic preservation review process, and mitigation has been completed.

✓ Thus, we believe that "no historic properties will be affected" by this undertaking

In the event that historic sites (human skeletal remains, etc.) are identified during the construction activities, all work needs to cease in the immediate vicinity of the find, the find needs to be protected from additional disturbance, and the State Historic Preservation Office needs to be contacted immediately at 243-5169, on Maui, or at (808) 692-8023, on O`ahu.

Staff: _____ Date: APR 14 2005

Peter T. Young
State Historic Preservation Officer

CD:jen

Appendix C

Section 7 Consultation Letters

DEPARTMENT OF THE AIR FORCE
Air Force Research Laboratory (AFMC)

22 Oct 04

Det 15, AFRL/CC
535 Lipoa Parkway, Suite 200
Kihei, HI 96753

Mr. Jeff Newman
Acting Field Supervisor
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, HI 96850-0056

Dear Mr. Newman,

The Air Force, in coordination with the University of Hawaii Institute for Astronomy (UH IfA), is preparing an Environmental Assessment (EA) under the National Environmental Policy Act of 1969 (NEPA). Pursuant to Section 7 of the Endangered Species Act (ESA), the Air Force is initiating informal consultation with your office regarding the proposed construction of a Mirror Coating Facility addition to the Advanced Electro-Optical System (AEOS) telescope structure atop Haleakalā, island of Maui, Hawaii (see Attachment 1).

The Air Force seeks your concurrence with our determination that the project is not likely to adversely affect any listed species under U.S. Fish and Wildlife Service (USFWS) jurisdiction. This conclusion is based on information from the *Draft Long Range Development Plan for UH IfA Complex* (LRDP) (KC Environmental, July 2004) and the *Biological Assessment for Maui Space Surveillance Site Expansion*, which was prepared for previous construction in the area and was included as an appendix to the 1994 EA for the AEOS telescope facility.

According to the LRDP, the project site includes one Federally listed threatened flora species and the summit area includes three Federally listed endangered faunal species. A discussion of each of the four species and the anticipated effects follows.

1. The Haleakalā silversword (*Argyroxiphium sandwicense* subsp. *Macrocephalum*) has been identified at the proposed construction site (see Attachment 2). Approximately 20 new plants have recently been found growing at MSSC. Three of the previously observed plants at Haleakalā Observatories are located within the proposed Mirror Coating Facility site and would be relocated within the Haleakalā Observatories, with USFWS coordination and National Park Service (NPS) direct supervision. No silversword critical habitats have been identified at the site. Construction activities would include NPS inspections of loads and equipment to prevent the inadvertent introduction of non-native species to the summit.

2. The Hawaiian Dark-rumped Petrel, or ʻUaʻu (*Pterodroma phaeopygia sandwichensis*), is present in the summit area. There are no burrows located within the proposed Mirror Coating Facility site or construction staging area. However, several burrows are located along the southeastern perimeter of Haleakalā Observatories, approximately 475 feet from the proposed facility and greater than 200 feet from the anticipated construction staging area (see Attachment 3, which will not be included in the EA). The following measures would be implemented to minimize potential impacts on the ʻUaʻu:

contractors would be required to participate in IfA pre-construction briefings on environmental sensitivities; heavy equipment would not be operated within 300 feet of burrows during the February to November nesting season; the use of fencing would be avoided, if possible; the contractors would make every effort not to use lighting the same color as stars, and instead use colors such as red, blue, or orange; all lighting would be shielded from above and would focus on the ground; and contractors would frequently remove trash to avoid attracting 'Ua'u predators. The *Biological Assessment* anticipated that construction noise levels up to 84 dBA at a burrow would have no effects on 'Ua'u reproductive success. Noise levels at the nearest burrow are not anticipated to reach or exceed 84 dBA.

3. The Hawaiian Nene (*Nesochen sandvicensis*) has been known to fly over Haleakalā Observatories, although the entire summit area is outside the known range of the bird.[1] During construction of the Mirror Coating Facility, construction-related traffic at Haleakalā is anticipated to temporarily increase, as it did during construction of the AEOS telescope facility. However, as stated in the *Biological Assessment*, the risk of vehicle collisions with nene are expected to be extremely unlikely.

4. The Hoary Bat (*Lasiurus cinereus semotus*) resides in the lowlands of the Haleakalā slopes. Even though several sightings have been reported near the Haleakalā Observatories, it is considered unlikely that the bat is a resident of the area, due to the relatively cold summit temperatures and the very low abundance of flying insects, the primary prey of the bat.[2] Therefore, no adverse impacts to the Hoary bat are anticipated.

Our planning schedule is such that we must prepare the Draft EA by November 2004; therefore, we hope to hear from you within 30 days. We will be in touch with you by telephone shortly to follow up on this letter.

Sincerely,

BRENT A. RICHERT, Lt Col, USAF
Commander

3 Atch
1. Proposed MSSS Site Plan, proposed Mirror Coating Facility location
2. Silversword (*Argyroxiphyium sandwicense* subsp. *macrocephalum*) locations at Haleakalā Observatories
3. Location of 'Ua'u burrows in Relation to Haleakalā Observatories

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[1] Boeing LTS, The Boeing Company. 2004. Integrated Natural Resources Management Plan for the Maui Space Surveillance Complex.

[2] ibid.

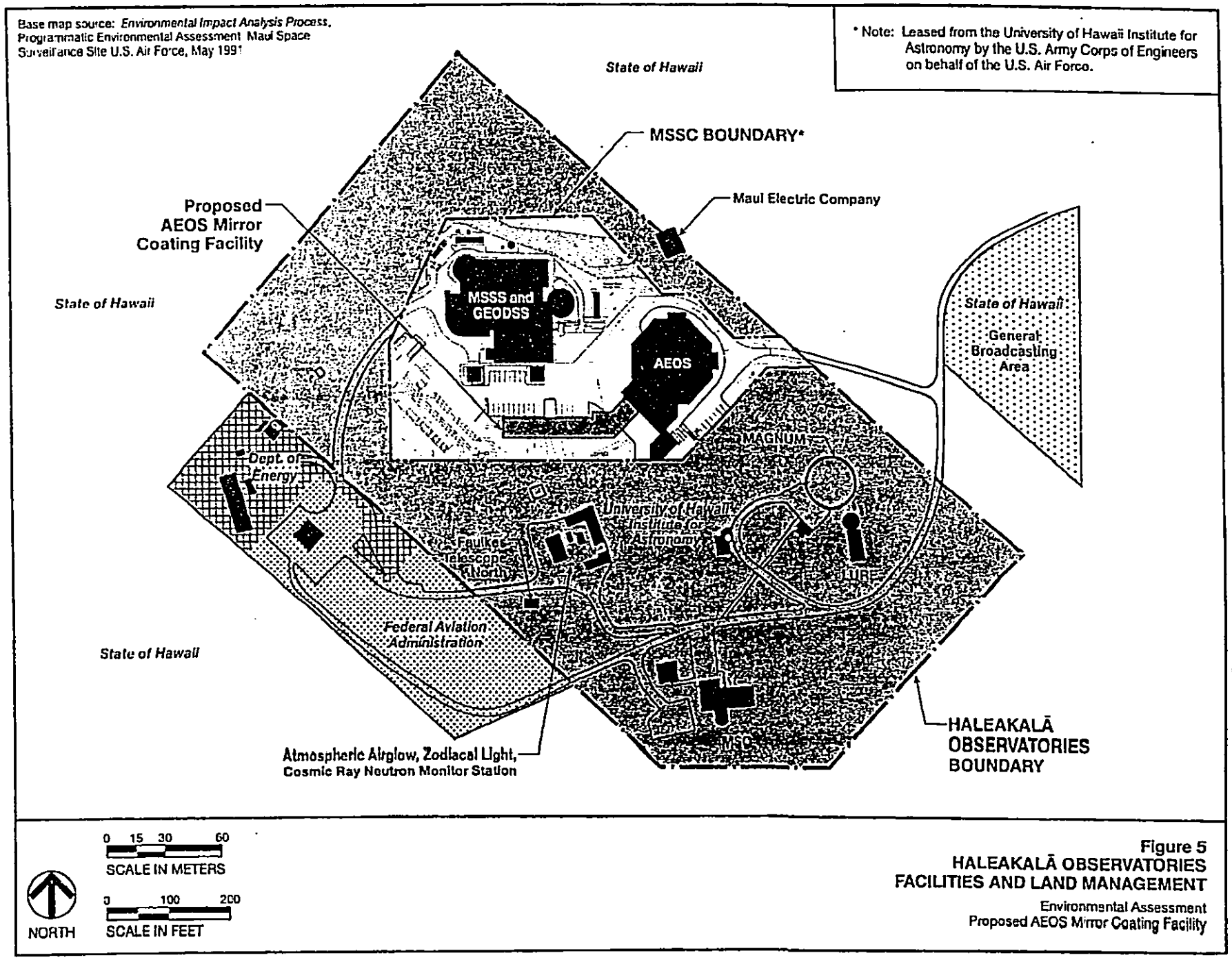

Figure 5
HALEAKALĀ OBSERVATORIES
FACILITIES AND LAND MANAGEMENT
Environmental Assessment
Proposed AEOS Mirror Coating Facility

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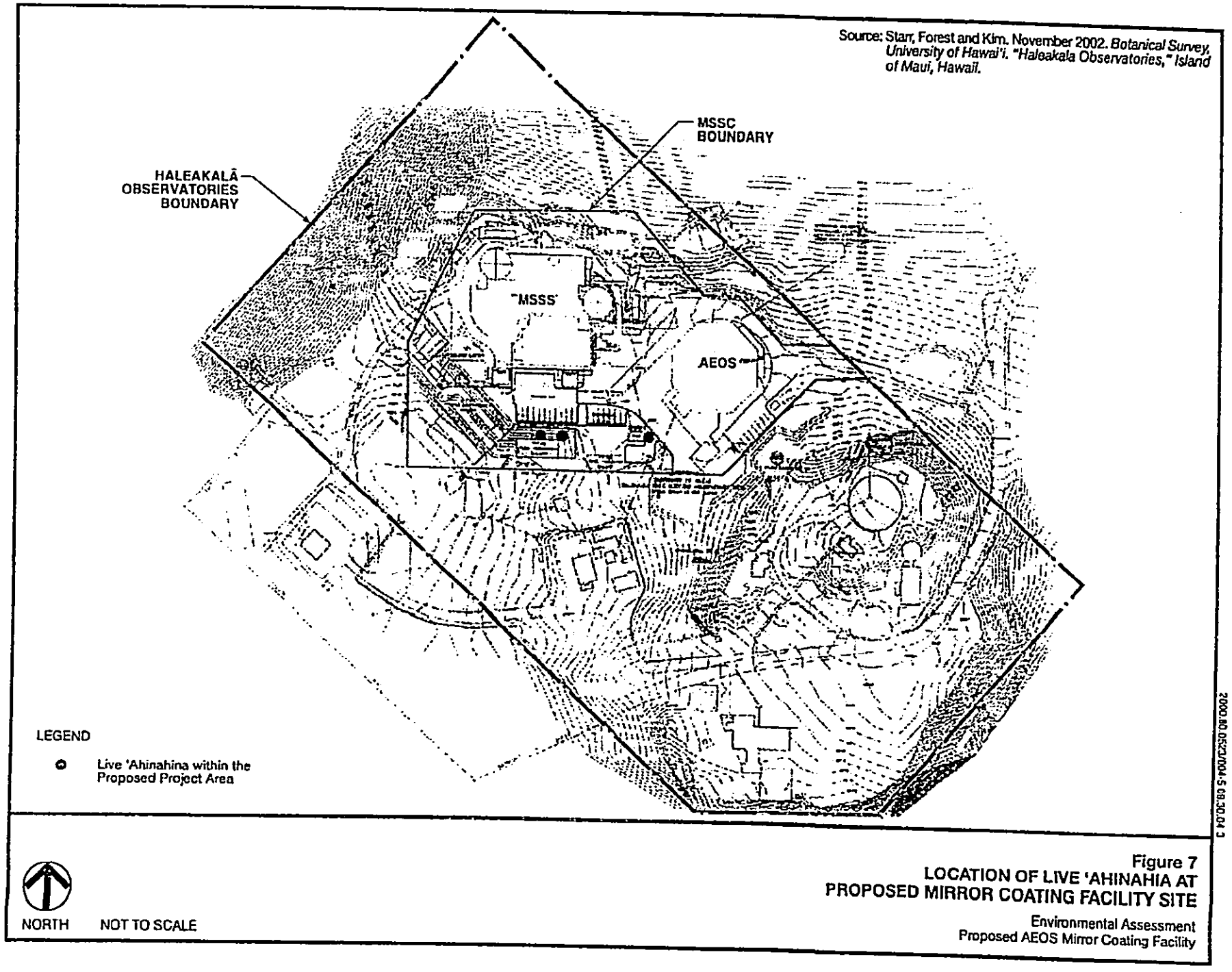
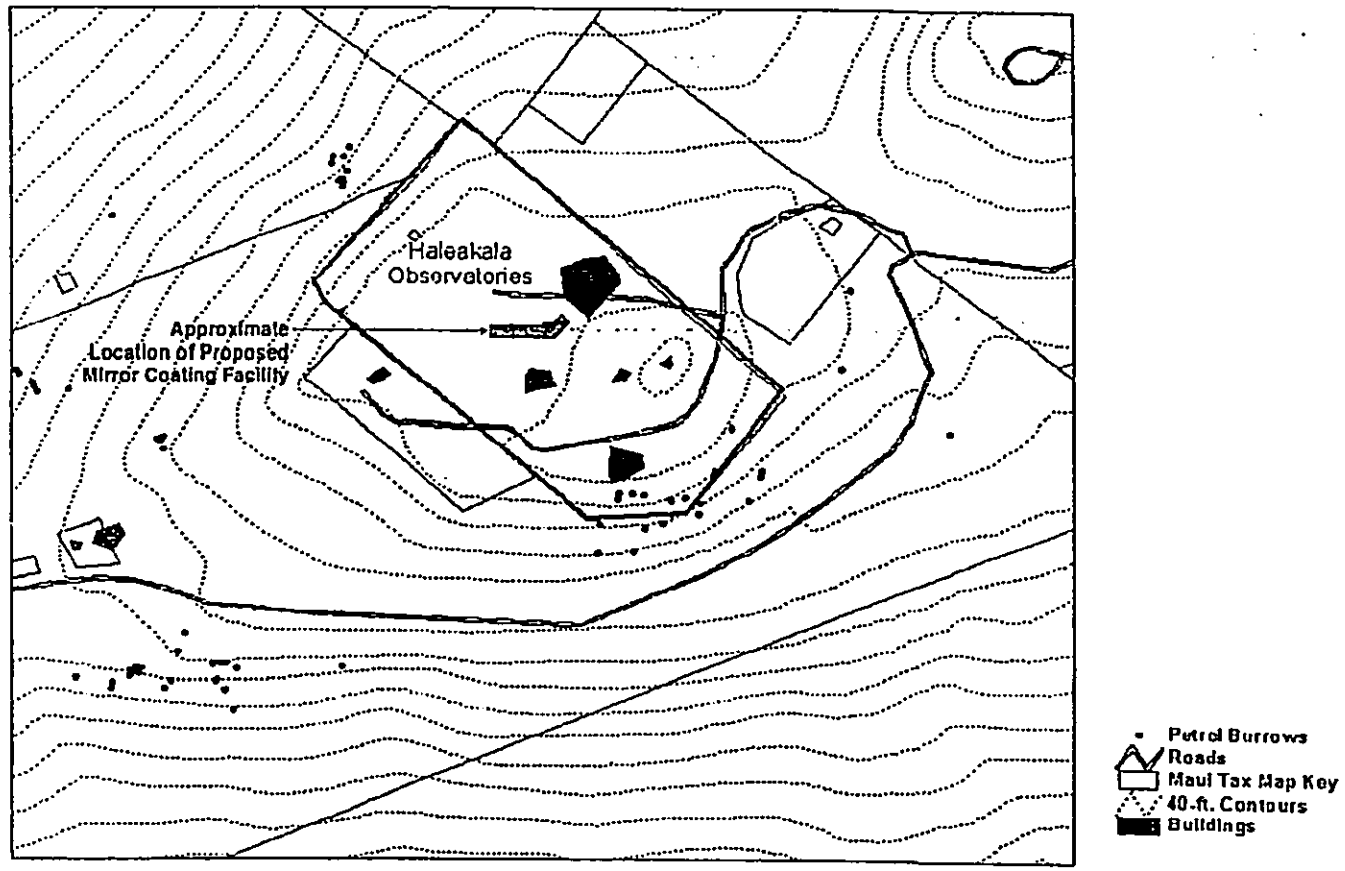


Figure 7
LOCATION OF LIVE 'AHINAHIA AT PROPOSED MIRROR COATING FACILITY SITE

Environmental Assessment
Proposed AEOS Mirror Coating Facility

Page 2-

Source: National Park Service, Department of the Interior, Haleakalā National Park, Makawao, Hawai'i, January 16, 2004. *Hawaiian Petrels Near the Haleakalā Observatories: A Report to K.C. Environmental, Co., Inc., For Preparation of a Long-Range Development Plan.*



2000.80.05\23\004-09.30.04 3

0 100 200
SCALE IN METERS

NORTH

0 100 200 300 400 500
SCALE IN FEET

Figure 8
LOCATION OF 'UA'U BURROWS IN RELATION TO HALEAKALĀ OBSERVATORIES
Environmental Assessment
Proposed AEOS Mirror Coating Facility

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard
Room 3-122, Box 50088
Honolulu, Hawai'i 96850

In Reply Refer To:
1-2-2005-I-032

DEC -3 2004

Brent A. Richert, Lieutenant Colonel
Department of the Air Force
Air Force Research Laboratory (AFMC)
Det 15, AFRL/CC
535 Lipoa Parkway, Suite 200
Kihei, Hawaii 96753

Dear Lieutenant Colonel Richert:

Thank you for your letter dated October 22, 2004, regarding your proposed project to construct a mirror coating facility addition to the Advanced Electro-Optical System telescope structure atop Haleakala, Maui. We received your letter on October 26, 2004.

Based on our review of the information contained in your letter and in our files, including data compiled by the Hawaii Natural Heritage Program, we concur with that the federally listed Hawaiian dark-rumped petrel (*Pterodroma phaeopygia sandwichensis*), Hawaiian goose (*Branta sandvicensis*), Hawaiian hoary bat (*Lasiurus cinereus semotus*), and the Haleakala silversword (*Argyroxiphium sandwicense* subsp. *macrocephalum*) occur within the project area. However, we do not concur with your determination that the proposed project is not likely to adversely affect the Haleakala silversword and the Hawaiian dark-rumped petrel.

Although relocating Haleakala silverswords can be successful when they are small in size, relocating larger silverswords is not very successful (Marie Bruegmann and Greg Koob, personal communication, 2004). According to the report entitled Botanical Survey University of Hawaii "Haleakala Observatories" Island of Maui, Hawaii, conducted by Forest and Kim Starr in November, 2002, the silverswords that are to be relocated are larger in size (approximately 20 inches in diameter); therefore, we anticipate that relocation is likely to adversely affect them.

In addition to negatively impacting Haleakala silverswords, the Hawaiian dark-rumped petrel may also be adversely affected by the proposed project as a result of ground vibrations from large equipment. This negative impact was shown in the 2001 road resurfacing project in Haleakala, where as a result of the road project, significantly lower numbers of birds fledged.

TAKE PRIDE IN AMERICA

Brent A. Richert, Lieutenant Colonel

We understand from your letter, that heavy equipment will not be operated within 300 feet of the burrows during the nesting season; however, we do not know if this is far enough to ensure that the burrows will not be negatively impacted. Your letter refers to the Biological Assessment for Maui Space Surveillance Site Expansion which was included in your 1994 Environmental Assessment. Unfortunately, we do not have this document on file and can not confirm that noise levels up to 84 dBA at a burrow will have no effect on the Hawaiian dark-rumped petrel's reproductive success. In addition to impacts from ground activities, lights will be operated at the sight and it may not be possible to place the lights in a manner that avoids negatively impacting the petrels.

We appreciate your efforts to conserve endangered species and would like to discuss this project with you. Please contact Elizabeth Sharpe, Fish and Wildlife Biologist (phone: 808/792-9400; fax: 808/792-9581).

Sincerely,

for Gina M. Shultz
Acting Field Supervisor

DEPARTMENT OF THE AIR FORCE
Air Force Research Laboratory (AFMC)

02 June 2005

Det 15, AFRL/CC
535 Lipoa Parkway, Suite 200
Kihei, HI 96753

Mr. Patrick Leonard
Acting Field Supervisor
Pacific Islands Fish and Wildlife Office
United States Department of the Interior
Box 50088, Room 3-122
300 Ala Moana Boulevard
Honolulu, HI 96850-0056

Dear Mr. Leonard,

The Air Force Research Laboratory (AFRL), in coordination with the University of Hawai'i Institute for Astronomy (UH IfA), submitted a letter to your office on 22 October 2004 requesting concurrence that the proposed construction of a mirror coating facility addition to the Advanced Electro-Optical System (AEOS) telescope structure atop Haleakalā, Island of Maui, Hawai'i is not likely to adversely affect any listed species under U.S. Fish and Wildlife Service (USFWS) jurisdiction. USFWS had concerns about potential construction impacts on the 'ua'u and the 'ahinahina. Due to your concerns that the federally listed Haleakalā silversword or 'ahinahina (*Argyroxiphium sandwicense* subsp. *Macrocephalum*), and Hawaiian dark-rumped petrel or 'ua'u (*Pterodroma phaeopygia sandwichensis*) might be impacted a second letter was sent to you requesting formal consultation on 2 May 2005. We have reconsidered the configuration of this facility, reconfigured it to be built on existing paved areas, and now believe that the construction of the AEOS addition is not likely to adversely affect the 'ua'u, 'ahinahina, the nēnē or the Hawaiian horay bat.

The AEOS Mirror Coating Facility (MCF) addition would be located within conceptual building outline presented in the 1994 EA and would not extend outside the existing paved area. The contract for the construction of the proposed mirror coating facility is a "design-build" effort so the exact dimensions are not known at this time but the facility cannot be greater than 9,752 square feet (906 square meters) due to cost and scope constraints. The contractor will be required to construct the facility within the area shown in attachment 1. The project is located in previously disturbed areas, entirely on existing pavement, and is not within or near any critical habitats of listed species. The staging area will not be located in a sensitive area where species may be present, their constituent elements may be present, or where burrows may be present. Construction activities will be kept within the proposed project and staging area footprints. The construction areas will be flagged and marked so the work area is well defined and so contractors do not wander into any areas that may have undiscovered seedlings or burrows.

The earliest construction would begin is 15 November 2005 and is expected to be complete by 25 August 2006 (CDUP expires on August 25th). The "design-build" approach

allows the government to identify specific construction practices that will minimize vibration levels and to conscientiously manage the impact on the environment. In 1993, the Air Force contracted Dames and Moore to perform vibration measurements of construction equipment to ensure proper planning for construction of the AEOS facility, see attachment 2. Results of the study in Attachment 2 indicate that the 12-ton vibratory smooth drum roller produced greater vibrations than did any other piece of construction equipment, 0.0032 ips (transverse), 0.0010 ips (vertical) and 0.0020 ips (longitudinal) operating at maximum vibration energy. The typical human perception level for transient type vibrations is about 0.033 ips. Construction of the mirror coating addition will not even approach this level. We are planning to leave the existing pavement in place. To achieve the required floor strength for the mirror coating facility, we may add additional concrete on top of the existing pavement, and we may also need to saw cut and remove some existing pavement for the footings and add stronger or deeper concrete at those points. The vibrations from the footing construction should be minimal in time and intensity, and we will not use vibratory rollers during the mid-February to mid-November 'ua'u nesting season, or other construction equipment that could cause ground impacting vibration.

'Ua'u burrows are not located in the proposed construction site or staging area. Several burrows are located along the southeastern perimeter of Haleakalā Observatories, approximately 450 feet from the proposed facility and greater than 200 feet from the construction staging area. Several burrows are also located northwest of Haleakalā Observatories, approximately 400 feet from the anticipated construction staging area, see attachment 3. Informal consultation has occurred between Ms. Elizabeth Sharpe, USFWS, and Ms. Michelle Hedrick, AFRL, on 25 February 2005 and follow up discussions have taken place with Ms. Marliet Zablan on 1 June 2005.

AFRL plans to take the following measures to ensure the Hawaiian dark-rumped petrel, 'ua'u, is not adversely impacted from the proposed construction.

1. Contractors will be required to participate in IfA pre-construction briefings on environmental sensitivities;
2. The AF will not induce 'ua'u disturbing-ground vibration during the mid-February to mid-November nesting season. When construction activities must be conducted while the 'ua'u are present, steps will be taken to minimize the level of vibration. AF will measure ground vibration during construction activities;
3. Ground disturbance activities at the construction staging area will not exceed current and past operations (vehicle movement, personnel walking, equipment/supply storage and handling);
4. The contractor will not construct fences, to prevent 'ua'u mortality from collisions.
5. Contractors will not perform construction at night;
6. Contractors will be required to use tight lidded trash containers and remove trash and organic waste from the construction site daily to avoid attracting 'ua'u predators;
7. AF will work with Haleakalā NPS to monitor the burrows during the construction.

One 'ahinahina plant is currently located near the construction area but is not in the newly defined construction site. This plant is greater than 8 feet away from the construction area and is protected by a retaining wall located at the edge of the concrete pad, attachment 4. No 'ahinahina critical habitats have been identified at the AFRL site. Discussions between Ms. Christa Russell, USFWS and Ms. Michelle Hedrick, AFRL, regarding the 'ahinahina have been ongoing. The following activities would be implemented to further protect the 'ahinahina.

1. The AF will prevent the introduction of invasive, non-native species to Haleakalā summit during construction by:
    a. Requiring the contractor to use new materials in construction, to minimize importation of freshly quarried aggregate materials.
    b. All vehicles and equipment will be visually inspected for plant material and invertebrates which will be removed at the lowest possible elevation prior to transit through the park to the jobsite, or if being transported onto the Island of Maui, at the port of origin. Construction equipment requires steam cleaning.
    c. All construction personnel will be required to wear clean footwear and clothing prior to driving up to the summit area.
2. The AF will prevent the spread of an invasive, non-native species from the project area to other areas at the summit and into Haleakalā National Park by:
    a. Botanical and entomological inspections of project area will be performed during construction and at two month intervals to one year after construction is completed. If any new non-native plant or invertebrate species are detected, AF will coordinate with HNP on eradication.

Cumulative impacts on the 'ahinahina and the 'ua'u for the proposed construction are not anticipated. Please let us know if you concur with our determination that the proposed construction project is not likely to adversely affect any federally listed species at Haleakalā; the Hawaiian dark-rumped petrel or 'ua'u, Haleakalā silversword or 'ahinahina; and the Hawaiian nēnē and Hawaiian horay bat as identified in our 22 October 2004 submission. If you have any questions, please contact Ms. Michelle Hedrick at 505-846-4574.

Sincerely,

Brent A. Richert

BRENT A. RICHERT, Lt Col, USAF
Commander

Attachments:
1. Proposed location of AEOS Mirror Coating Facility
2. Dames and Moore Report 1993
3. 'Ua'u burrows locations
4. Location of MSSC 'ahinahina

cc:
AFRL/DEOS, M. Hedrick
UH IfA, M. Maberry
HNP, C. Bailey
Boeing LTS Maui, S. Shimko

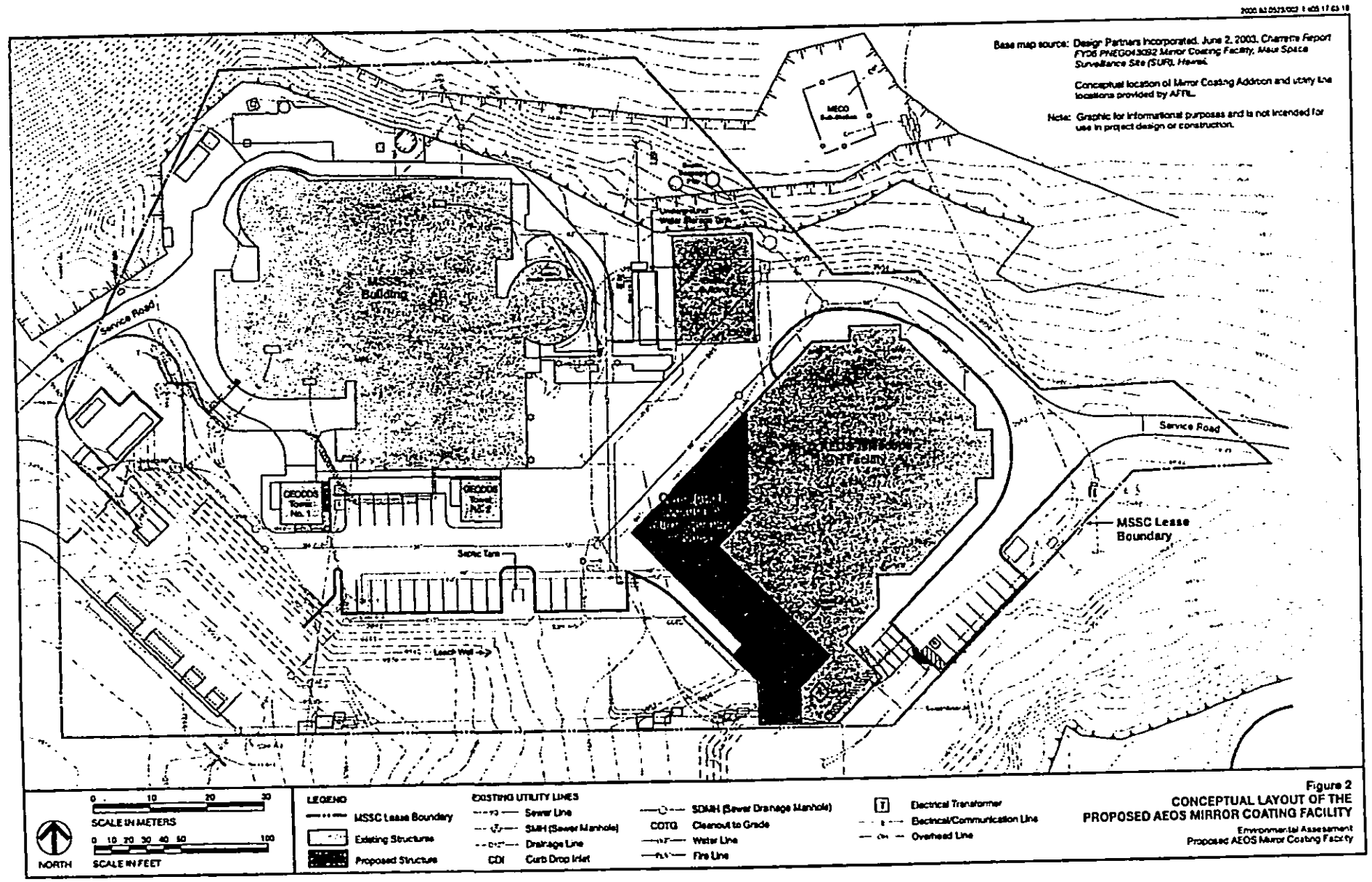
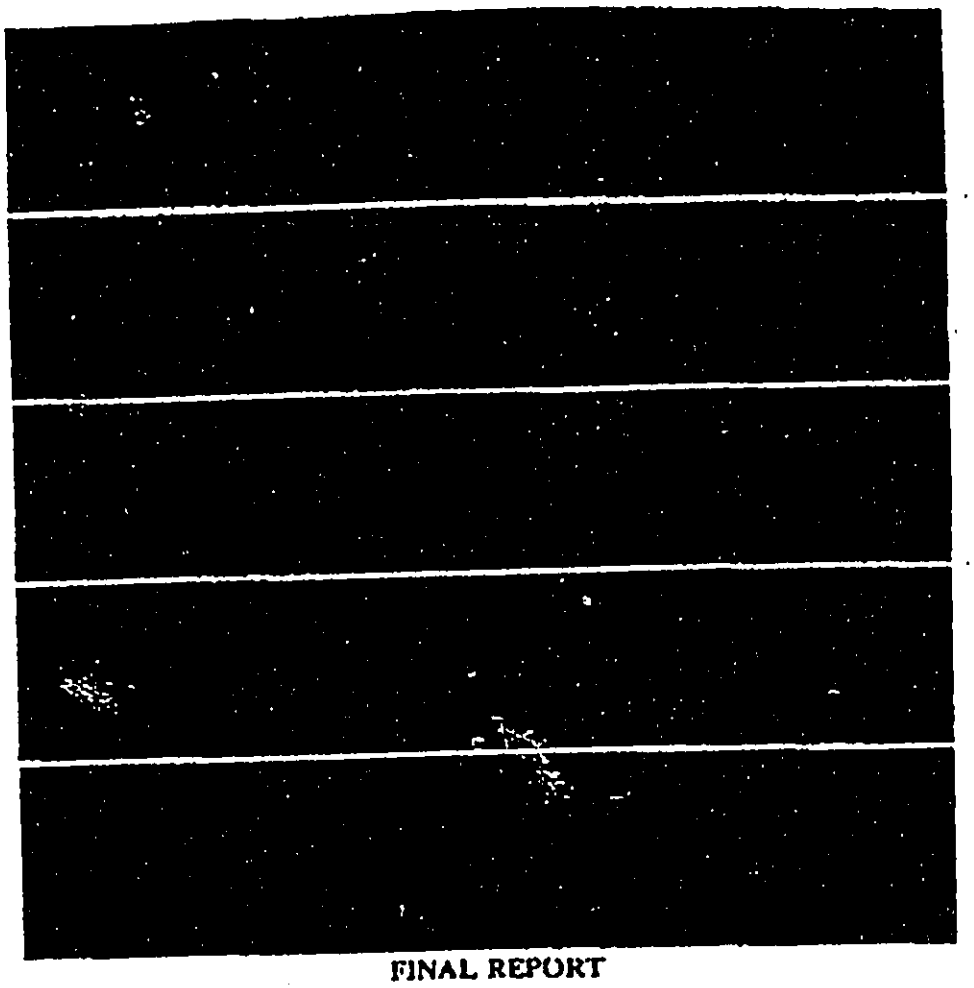


Figure 2
CONCEPTUAL LAYOUT OF THE PROPOSED AEOS MIRROR COATING FACILITY
Environmental Assessment
Proposed AEOS Mirror Coating Facility



FINAL REPORT
GROUND VIBRATION MEASUREMENTS DURING SOIL CEMENT TEST PAVING MSSS ACCESS ROAD HALEAKALA, MAUI, HAWAII

Job Number 01016-361-011

May 3, 1993

DAMES & MOORE

Attachment 2

DAMES & MOORE

1050 QUEEN STREET, SUITE 204, HONOLULU, HAWAII 96814
(808) 593-1116 FAX: (808) 593-1198

May 3, 1993

Mr. Walt Randle
Rockwell Power Systems
Premier Place
535 Lipoa Parkway, Suite 200
Kihei, Hawaii 96753

Final Report
Ground Vibration Measurements During
Soil Cement Test Paving
MSSS Access Road
Haleakala, Maui, Hawaii
Job Number 01016-361-011

Dear Mr. Randle:

Dames & Moore is pleased to submit this final report presenting the results of our measurements of ground vibrations observed during the test paving of the soil cement section of the MSSS access road. Measurement of vibrations generated by operation of construction equipment used in the test paving program are reported, as are vibration measurements obtained for operation of one of the MSSS existing domes and for tourist related activities which take place in National Park areas near the summit of Mount Haleakala.

The purpose of this investigation was to evaluate likely ground vibration which may occur at petrel burrow sites during future construction, and to compare these with vibrations which have been occurring in burrow areas on an ongoing basis.

If you have any questions concerning the findings presented in this report, please feel free to contact this office at your convenience. We appreciate this opportunity to have been of service to you.

Yours very truly,
DAMES & MOORE

Thomas E. Jensen
Principal Geophysicist

TEJ/MJF
(3 copies submitted)

(01016-361-011:208A)

Attachment 2

FINAL REPORT
GROUND VIBRATION MEASUREMENTS DURING
SOIL CEMENT TEST PAVING
MSSS ACCESS ROAD
HALEAKALA, MAUI, HAWAII

1.0 INTRODUCTION

The proposed Advanced Electro-Optical System (AEOS) is to be constructed as a part of the Maui Space Surveillance Site (MSSS) at the summit of Haleakala, Maui. The U.S. Air Force - Phillips Laboratory, Rockwell Powers Systems, and the National Park Service have a concern over the possibility of construction operations causing disturbance to an endangered bird, the dark rumped petrel, which inhabits burrows in the vicinity of the summit of Haleakala.

To quantify an estimate of the vibrations which will be caused by future construction activities and their possible disturbance of the petrel, this ground vibration study was undertaken jointly by Rockwell Power Systems, the National Park Service, and Dames & Moore in January, 1993.

This report presents findings which indicate that vibrations from probable future construction activity at the proposed AEOS site are within the range of vibration magnitudes, and can be controlled with proper planning to not exceed the vibration levels that these birds are currently experiencing.

During the vibration study, we took measurements of various pieces of representative construction equipment to simulate probable vibrations to be generated during full construction operations. These measurements of ground vibrations were observed during the test paving of a soil cement section of the MSSS access road.

In addition to measurement of vibrations generated by operation of construction equipment used in the test paving program, vibration recordings were also obtained for operation of one of the existing domes and for tourist related activities which take place in National Park areas near the summit of Mount Haleakala. The location of the MSSS facility and the ground vibration observation locations in the National Park area are shown on the Map of Area, Plate 1.

Vibration recordings related to construction activities were obtained on January 20, 1993 during the test paving of the access road. Vibrations related to operation of the existing facility dome were also obtained on that date. Recordings made in the National Park area were obtained on January 25, 1993. Assistance in obtaining the recordings in the park area and designation of locations in the park where recordings were to be made was provided by National Park Service personnel.

2.0 PROJECT CONSIDERATIONS

The proposed telescope facility which is to be located at the summit of Mount Haleakala is planned for construction in an area situated to the east and southeast of the existing facilities. Additionally, appurtenant facilities for the proposed telescope will be located immediately adjacent and south of the existing facilities. Some known petrel burrows are located approximately 225 feet to the west of the existing facilities. These burrows lay in openings in the basalt lava outcrops. Their location is annotated as Observatory Monitoring Site on the Plot Plan, Plate 2. At the time the vibration recordings were made, the petrel burrows were unoccupied, as they are reported to be during each winter season.

The construction activities undertaken to place a test strip of soil cement access road provided the opportunity to measure ground vibrations generated by those activities. The roadway test strip is located approximately 600 to 650 feet distant from the burrows, as shown on the Plot Plan, Plate 2. The proposed telescope site is about 100 feet west of the test strip.

In addition to the burrow sites located in the vicinity of the MSSS facilities, other burrow sites are found in National Park areas where activities related to the tourist industry take place nearby to the burrow sites. Such activities include the operation of large tour buses along the roadway and in the parking area at the crater overlook.

3.0 EQUIPMENT USED DURING TEST STRIP CONSTRUCTION

The primary purpose of the roadway test strip was to test soil cement pavement methods and the durability of such pavement. The soil cement pavement is believed to be more environmentally compatible than is conventional asphaltic concrete pavement.

A secondary purpose of test strip construction was to record the vibrations generated by various equipment to be used during construction. The construction equipment used is listed as follows:

1 - 12 Ton Smooth Vibratory Roller, 8 feet wide	1 - 950E Loader
1 - 10 Ton Pneumatic Tire Roller	1 - Paving Spreader
1 - Grader with ripper	1 - Tandem End Dump Truck
1 - 4,000-gallon Water Truck	1 - Pug Mill with Hopper
	1 - Screen All

Of the equipment listed, we believe that the 12 ton vibratory roller and the pug mill are the 2 pieces of equipment most likely to generate the largest vibrations during construction. The roller can be operated at adjustable vibration energy levels. For this study, the roller was operating at the maximum vibration level. We note that this 12 ton vibratory roller is one of the largest on Maui and is normally used for highway construction.

Other equipment that we anticipate may be used during construction includes rotary drilling equipment, erection cranes, ready-mix cement trucks, bulldozers, and possibly a hoe-ram. Based upon our experience in monitoring vibrations at other construction sites, we anticipate that this equipment will generate lower vibrations than the vibratory roller.

4.0 METHODS

Ground vibration recordings were obtained using a three-component transducer connected to a signal conditioning amplifier with output made to a strip chart recorder and to an analog magnetic tape recorder. The transducer, a Sprengnether model S6000, is a velocity transducer with a natural frequency of 2 Hertz. The transducer is configured to measure vibrations along each of three mutually orthogonal axes. The signal conditioner, a Sprengnether model VS1200, provides calibrated output with the amplitude of signal directly related to the particle velocity of ground motion. The VS1200 processes each of the three input signals corresponding the three axes of the transducer.

Hard copy records were obtained using three channels on a Gulton Industries four-pen strip chart recorder. The strip chart recorder was configured with Gulton model TSC-801 amplifier plug-in modules. Both chart sensitivity and paper speed are selectable. Vibration time-histories were made at a chart speed of 1 mm per second. Archive recordings were made on magnetic tape using a TEAC model R61 four-channel portable tape recorder.

At each recording location, the velocity transducer was buried and covered with sandbags to ensure good coupling with the ground. In each location, the transducer was oriented such that the longitudinal (radial) component of motion was aligned towards the source of vibration energy. Thus, for the observatory site, the longitudinal axis was towards the roadway test strip. At the overlook, the longitudinal axis was towards the parking area. At the roadway location, the longitudinal axis was set perpendicular to the road.

The observatory transducer location was 600 to 650 feet from the access road test strip, with the transducer placed at an elevation 20 feet below the elevation of the MSSS facility. This location was approximately 200 to 225 feet from the observatory dome located at the northwest corner of the facility. The overlook transducer location was selected to be over the edge of the crater rim at a spot below the overlook observation building. The transducer was about 25 feet below and 15 to 20 feet east of the eastward wall of the building. The roadway transducer location was selected to be on the crater side of the roadway, with the transducer approximately 75 feet off of the centerline of the road and about 5 to 10 feet below the road elevation.

Recordings were obtained at each of the locations on an intermittent basis. The records were made to obtain recordings of representative vibration generating activities and sources. For construction activities, the equipment described earlier was in operation. For activities at the overlook, records were made of bus traffic in the parking lot and of the activities by people in and around the overlook building. For the roadway location, records were obtained for passing automobiles, trucks, and buses. During the period when recordings were made along the roadway, work was underway by a contractor to resurface the road. A grader and a front-end loader were intermittently in the area of the recordings.

5.0 RESULTS

Representative time-histories of the vibrations recorded at each of the locations included in this study are presented in the Appendix. These time-histories demonstrate the level of vibrations observed for the various sources included in the study. Following is a description of the findings

for each of the locations. All vibration amplitudes are reported as single amplitude, in units of inches per second (ips).

A comparison of maximum vibrations from time histories with distance from the vibration source, and human perception levels is shown on Plate 3, Recorded Maximum Vibrations Related to Various Activities at Haleakala Summit.

5.1 OBSERVATORY

The vibration records obtained during work on completion of the test strip paving indicated that operation of the vibratory smooth-drum roller produced greater vibrations than did any other piece of equipment. The smooth-drum roller resulted in peak vibrations of about 0.0032 ips (transverse), 0.0010 ips (vertical), and 0.0020 ips (longitudinal) when operating at maximum vibration energy. Vibration levels were much smaller when the smooth-drum roller was operated at a static condition. Other activities yielded peak events ranging from about 0.0004 ips to about 0.0018 ips. Horizontal motions typically exceeded vertical motions. Sustained motions during equipment operation ranged from about 0.0004 ips to 0.0015 ips.

During operation of the existing telescope dome, recordings showed that as the speed of dome rotation was increased from a low of about 2 revolutions per minute (RPM) to a maximum of about 10 RPM, vibration amplitudes typically increased. Peak motions at 2 RPM were about 0.0003 ips to 0.0012 ips (transverse), 0.0004 ips to 0.0010 ips (vertical), and 0.0008 ips to 0.0020 ips (longitudinal). At 10 RPM, peak values increased to maximums of 0.0040 ips (transverse), 0.0024 ips (vertical), and 0.0040 ips (longitudinal).

Motions were not significantly different when the dome was rotated counter clockwise as opposed to clockwise. Neither was there a consistent variation for rotation with the observation slot open as opposed to being closed. Sustained motions during dome operation typically reached a maximum of about 0.003 ips or less on the horizontal axes.

5.2 OVERLOOK

Our review of data at the overlook site indicates that while the objective of monitoring was to observe vibrations related to tourist buses operating in the summit area, the largest vibrations measured were related to footsteps and opening and closing of the visitor center doors. Peak vibrations of about 0.0040 ips (transverse), 0.0032 ips (vertical), and 0.0024 ips (longitudinal) occurred with the hard closing of the sliding doors on the overlook building. Buses operating in the parking area yielded peak vibrations of about 0.0004 ips to 0.0015 ips on the horizontal axes and about 0.0010 ips on the vertical axis.

5.3 ROADWAY

Vibrations along the roadway were seen to range from peaks of about 0.0002 to 0.0022 ips (horizontal axes) and 0.0004 ips (vertical) for automobiles; to 0.0009 ips to 0.0025 ips (horizontal axes) and 0.0007 ips to 0.0008 ips (vertical) for larger trucks and tour buses. The considerable variation in these vibration ranges was related to not only vehicle size, but also to the speed of passing of the vehicles. Faster moving cars and lighter trucks, in some cases, yielded vibrations equal to or even greater than those from slower moving heavier vehicles.

6.0 CONCLUSIONS

1. Vibration amplitudes as measured at the observatory, overlook, and roadside sites are well below the typical human perception threshold level for transient type vibrations which is about 0.033 ips.

2. The 12-ton vibratory roller operating at maximum energy, when measured at a distance of 600 feet, had a peak vibration of about 0.003 ips. This vibration level is lower than the normal vibrations that petrel birds have been experiencing due to the opening and closing of visitor center doors at overlook, and due to rotation of the telescope dome. It is only slightly higher than vibration levels from vehicular traffic along the roadway and in the parking lot at the crater overlook.

3. Because the 12-ton vibratory roller will likely be the most severe vibration generator among all the construction equipment that will be used in the telescope construction, we conclude that the future vibrations associated with the telescope construction can be controlled with proper planning to be lower than the vibration levels that petrels are already experiencing.

4. Since the vibration energy of the 12-ton roller is adjustable, when compaction is required close to any known petrel burrows, the vibration mode of the roller can switched off and compaction can be performed under the static mode in order to minimize disturbance.

- o0o -

The following Plates and Appendix are attached and complete this report:

Plate 1-Map of Area
Plate 2-Plot Plan
Plate 3-Recorded Maximum Vibrations Related to Various Activities at Haleakala Summit

Appendix - Representative Vibration Time-Histories

Respectfully Submitted,

DAMES & MOORE

Thomas E. Jensen
Principal Geophysicist

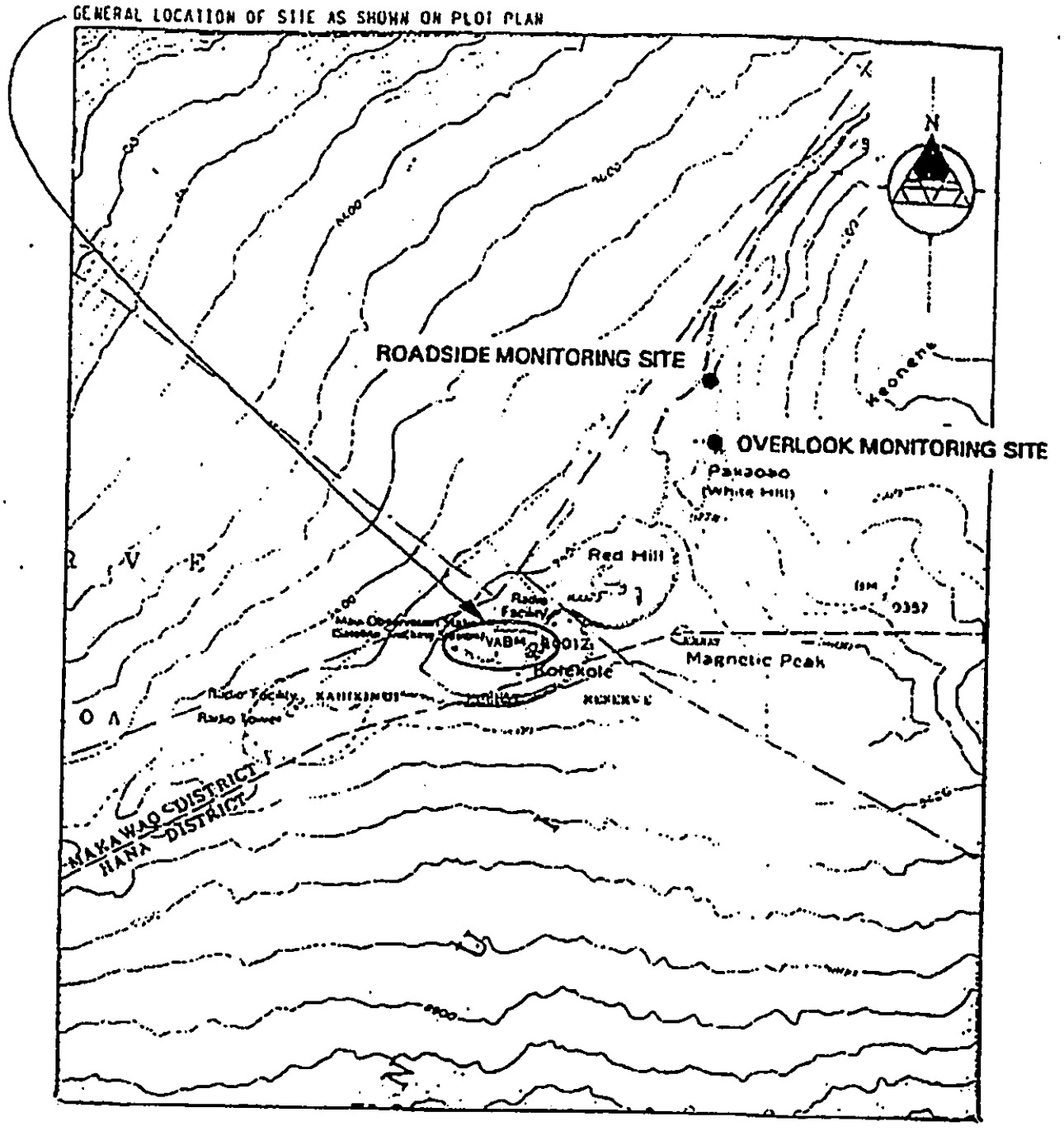
S.K. Djou, P.E.
Managing Principal

SIH-KONG DJOU
REGISTERED PROFESSIONAL ENGINEER
No. 3587-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

TEJ/SKD/MJF

(0101B-341-011:20AA)



MAP OF AREA

SCALE 1:24000

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET

DOTTED LINES REPRESENT 20-FOOT CONTOURS

DATUM IS MEAN SEA LEVEL

Reference:

U.S.G.S. Topographic Map

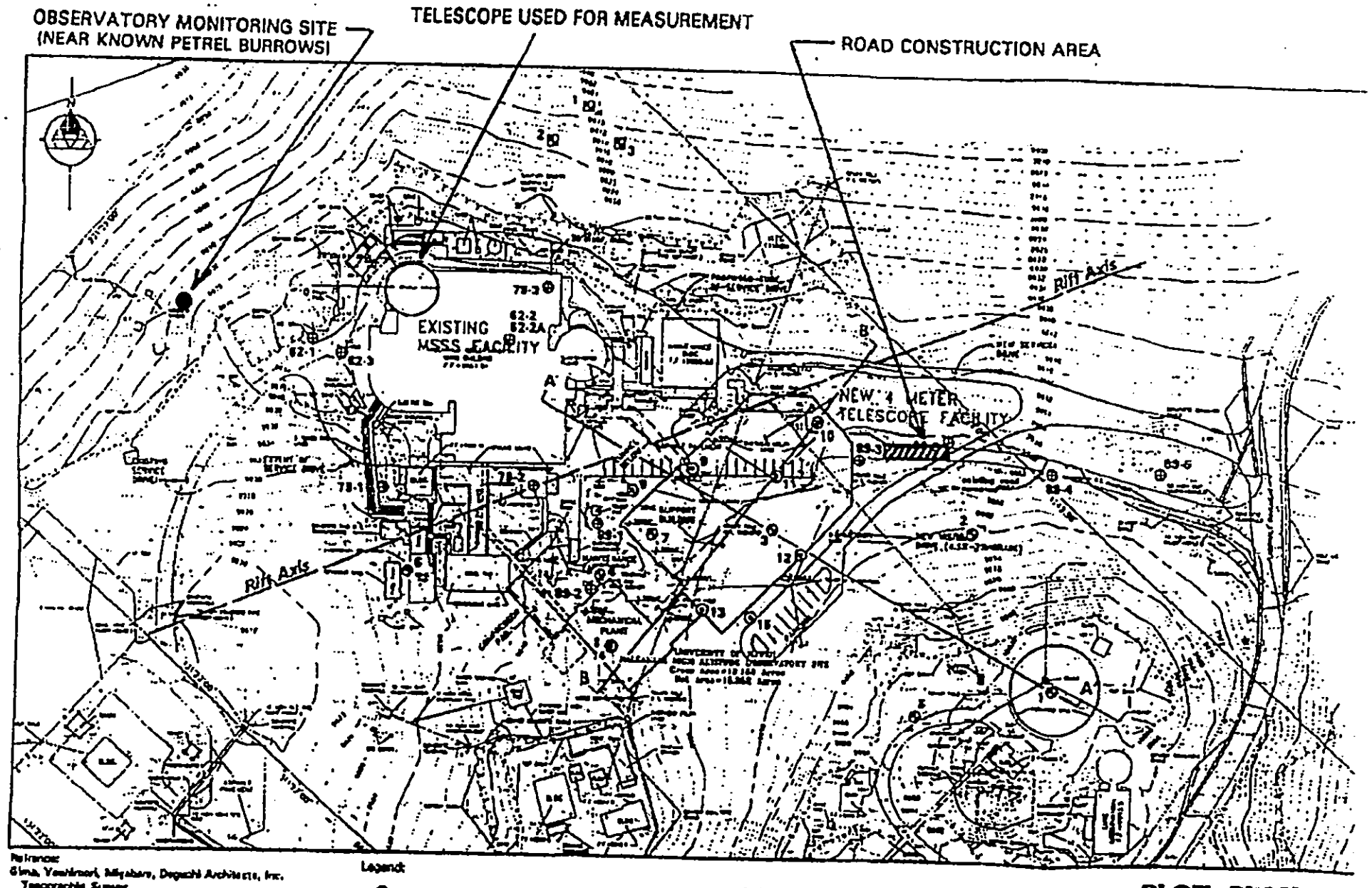
Kilohana, Maui, Hawaii (1983)

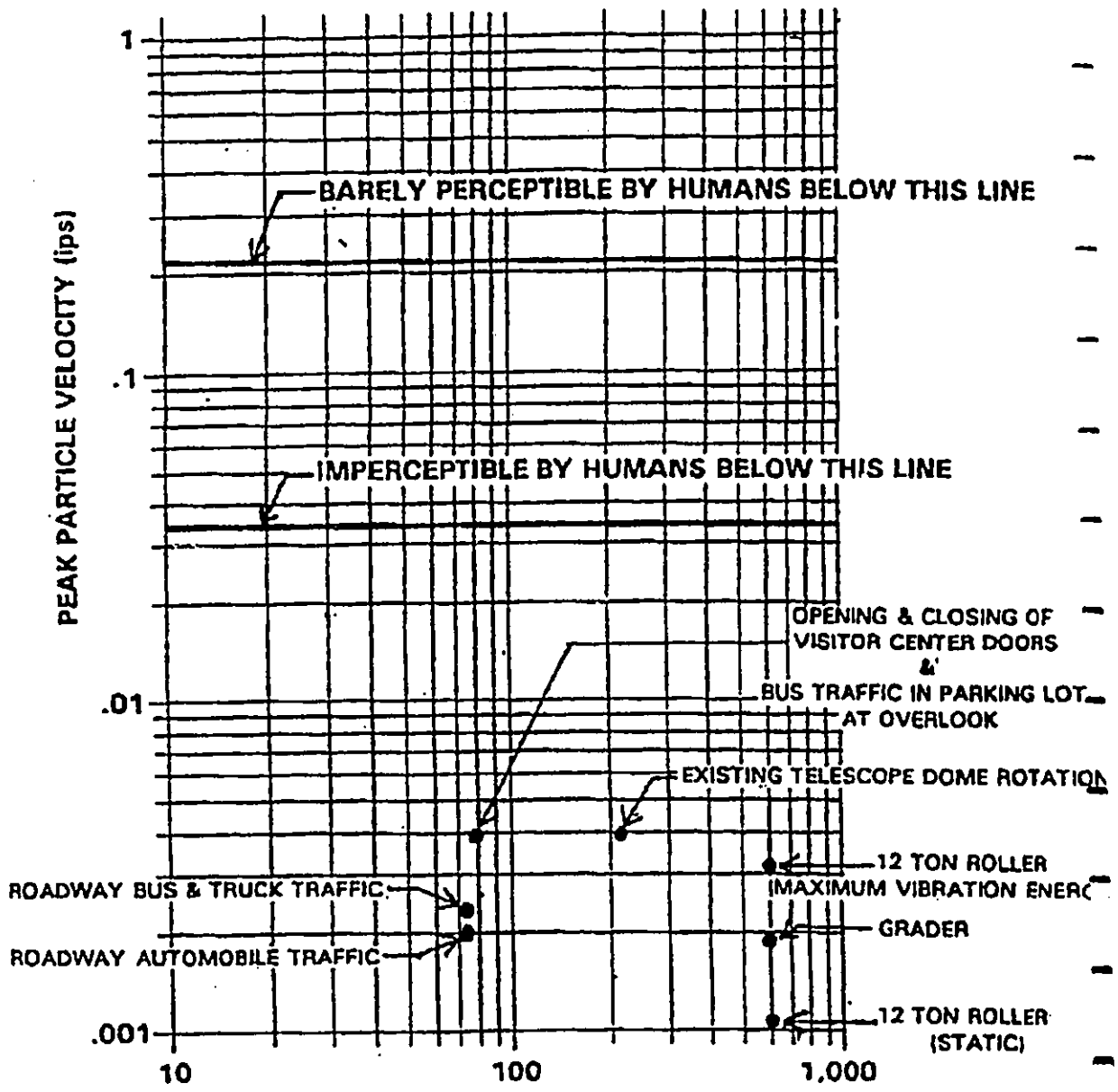
DAMES & MOORE

Attachment 2

PLATE 1

Attachment 2



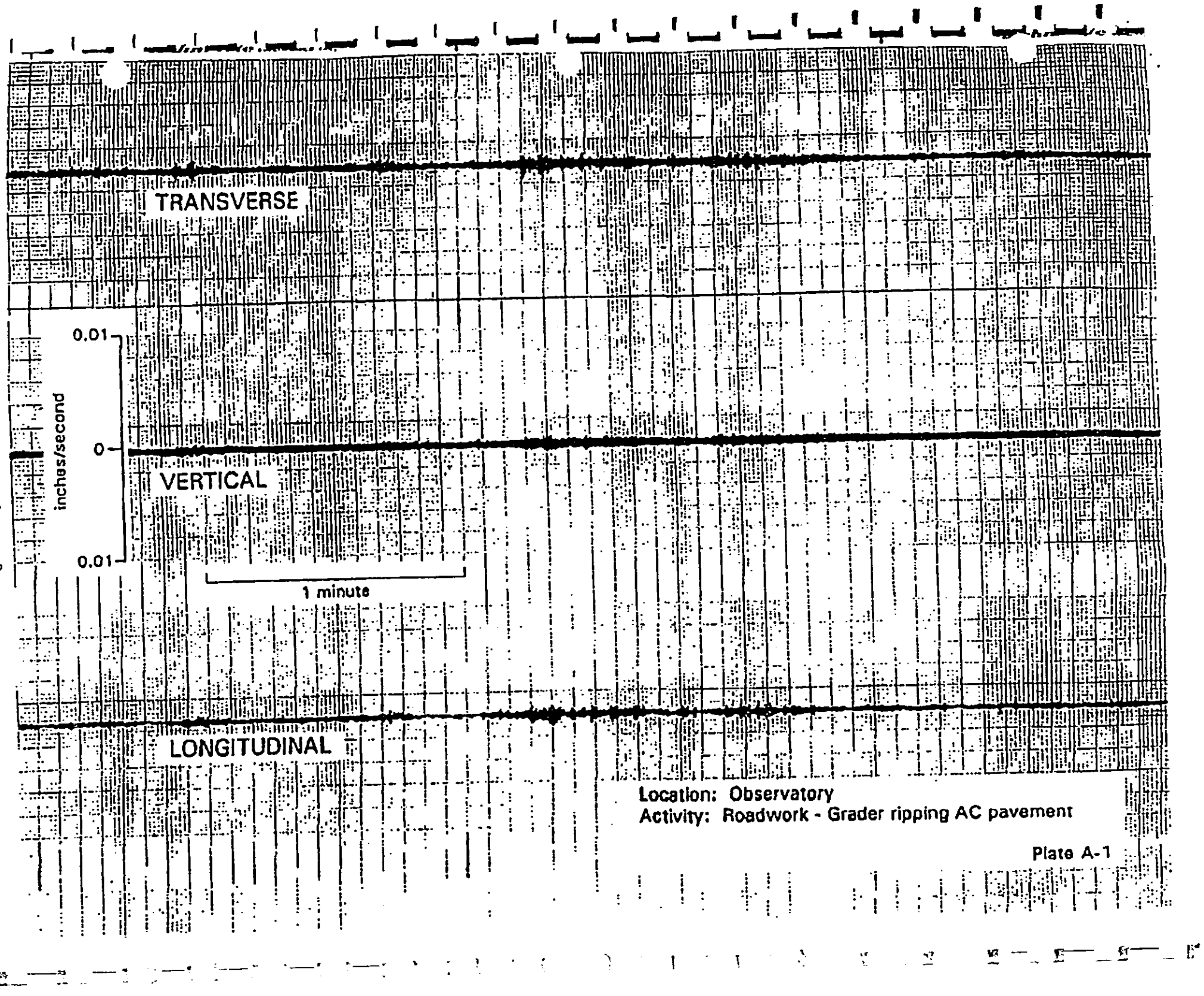


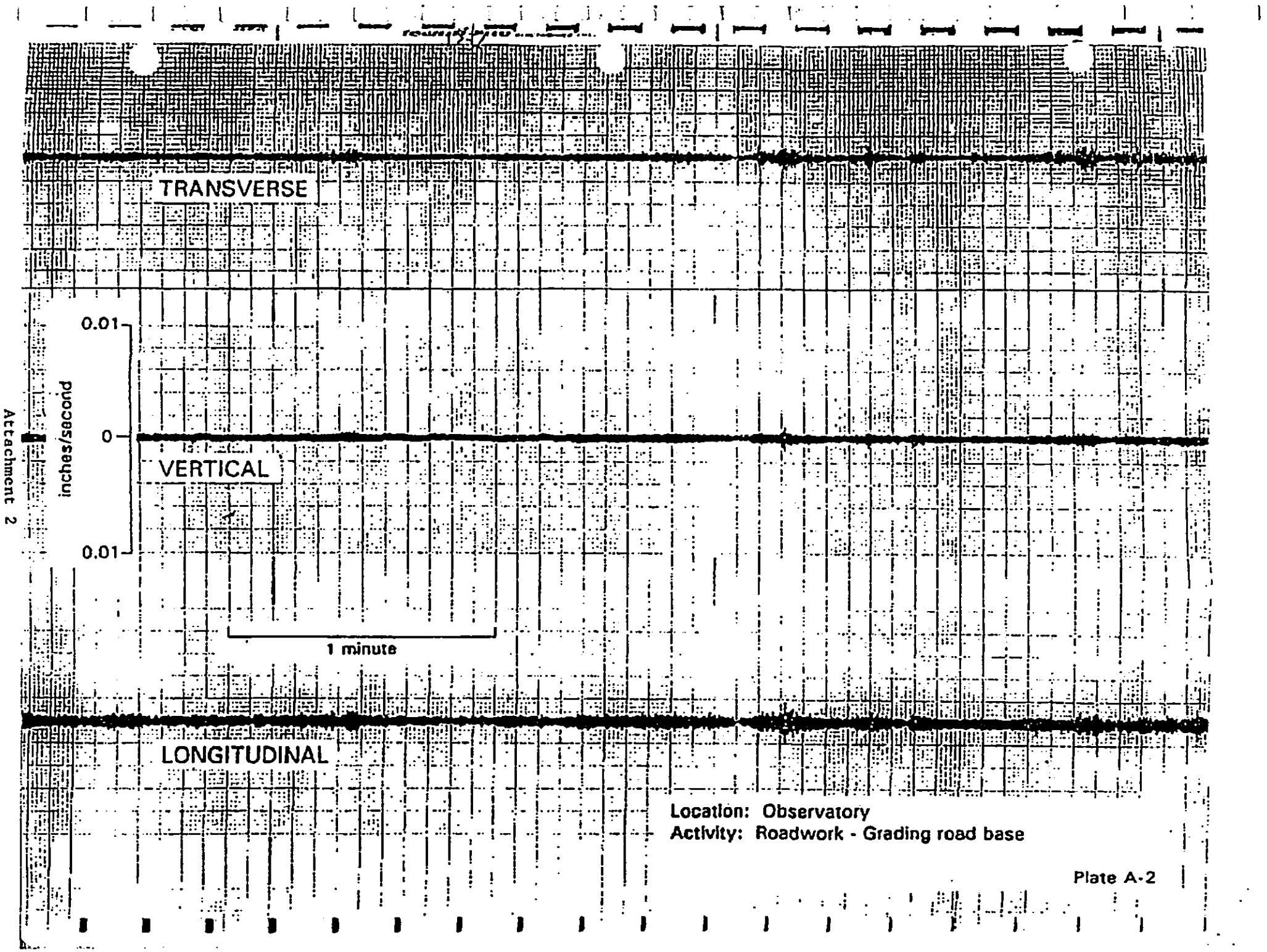
RECORDED MAXIMUM VIBRATIONS RELATED TO VARIOUS ACTIVITIES AT HALEAKALA SUMMIT

Dames & Mc
Plate 3

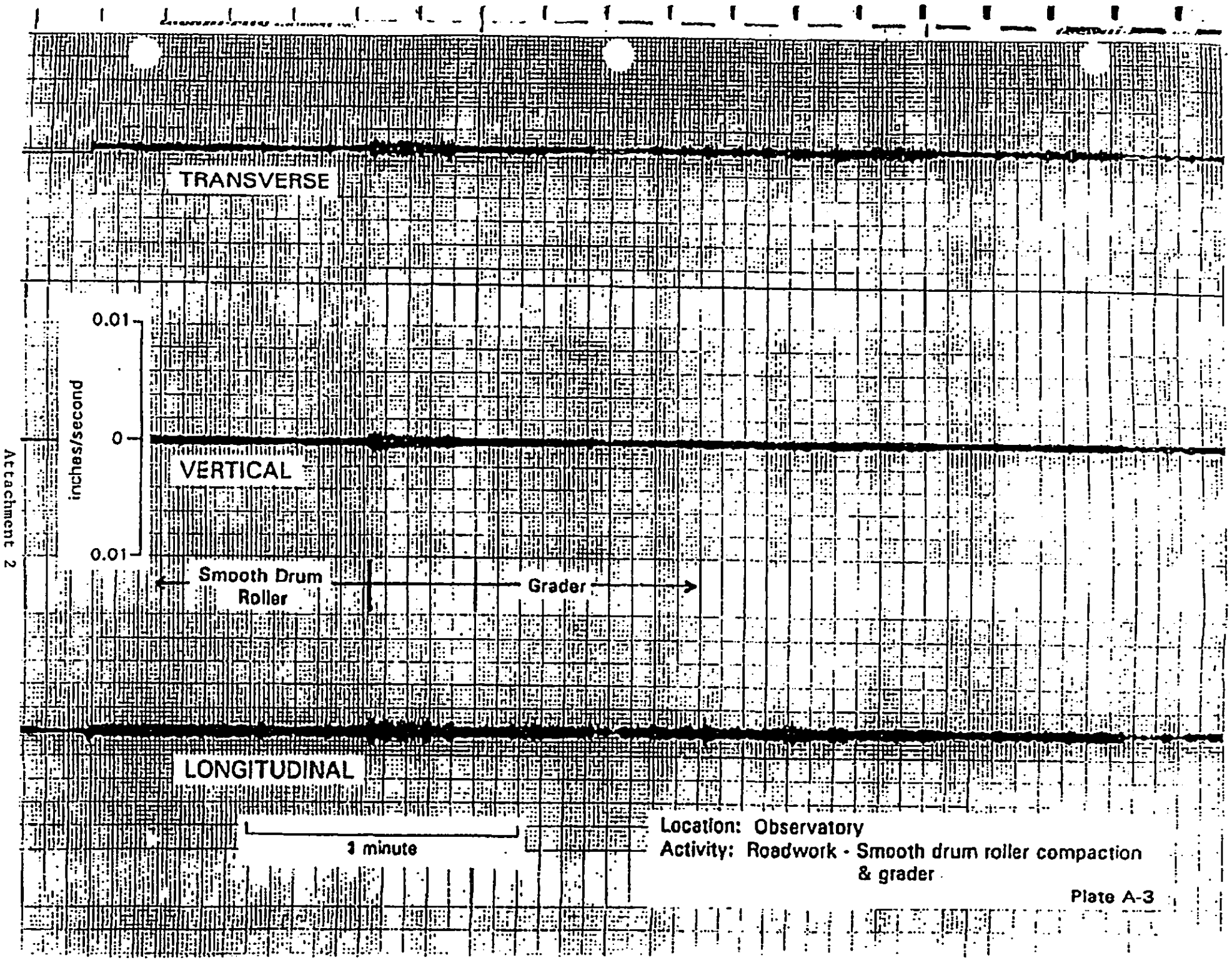
Attachment 2

Attachment 2

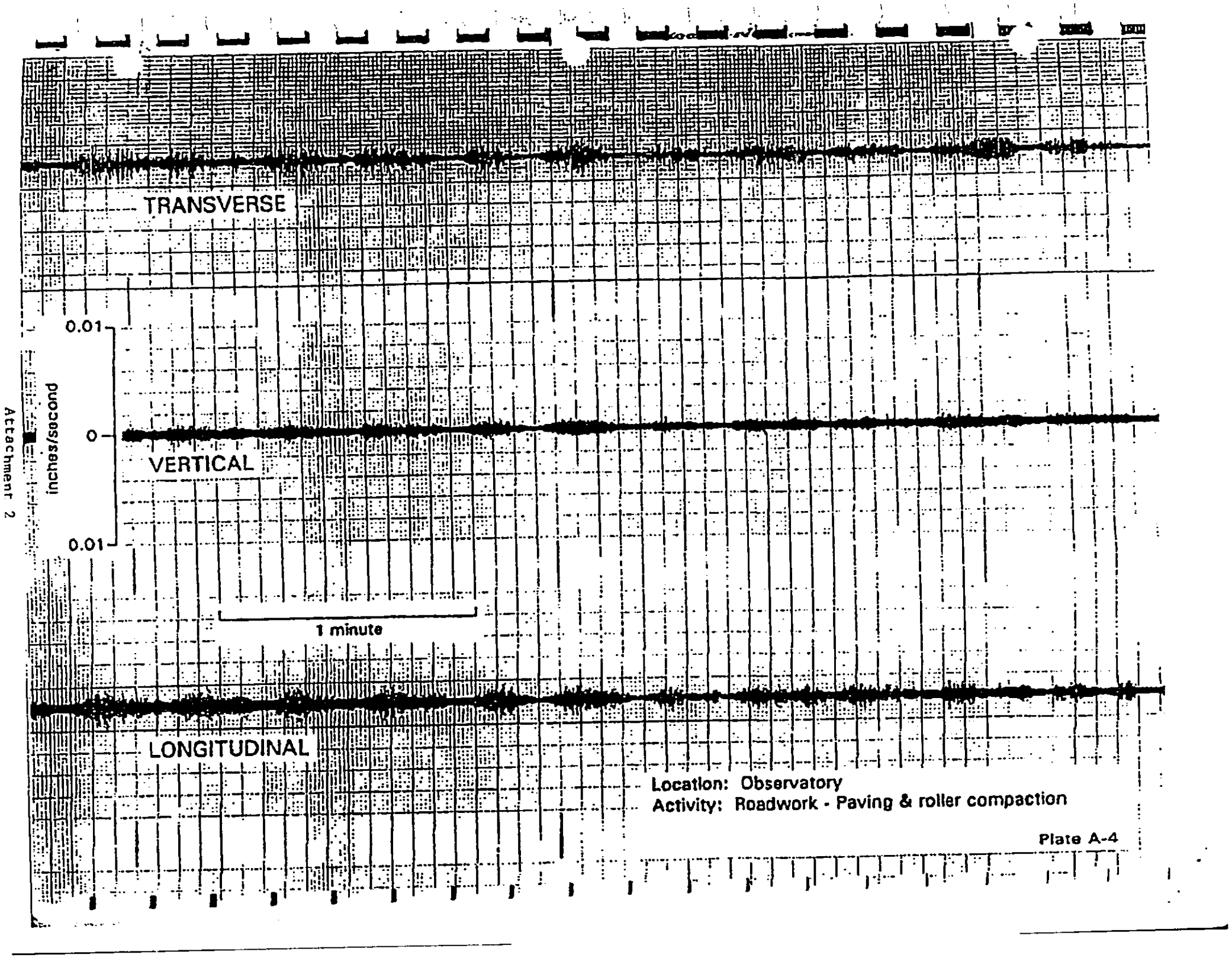


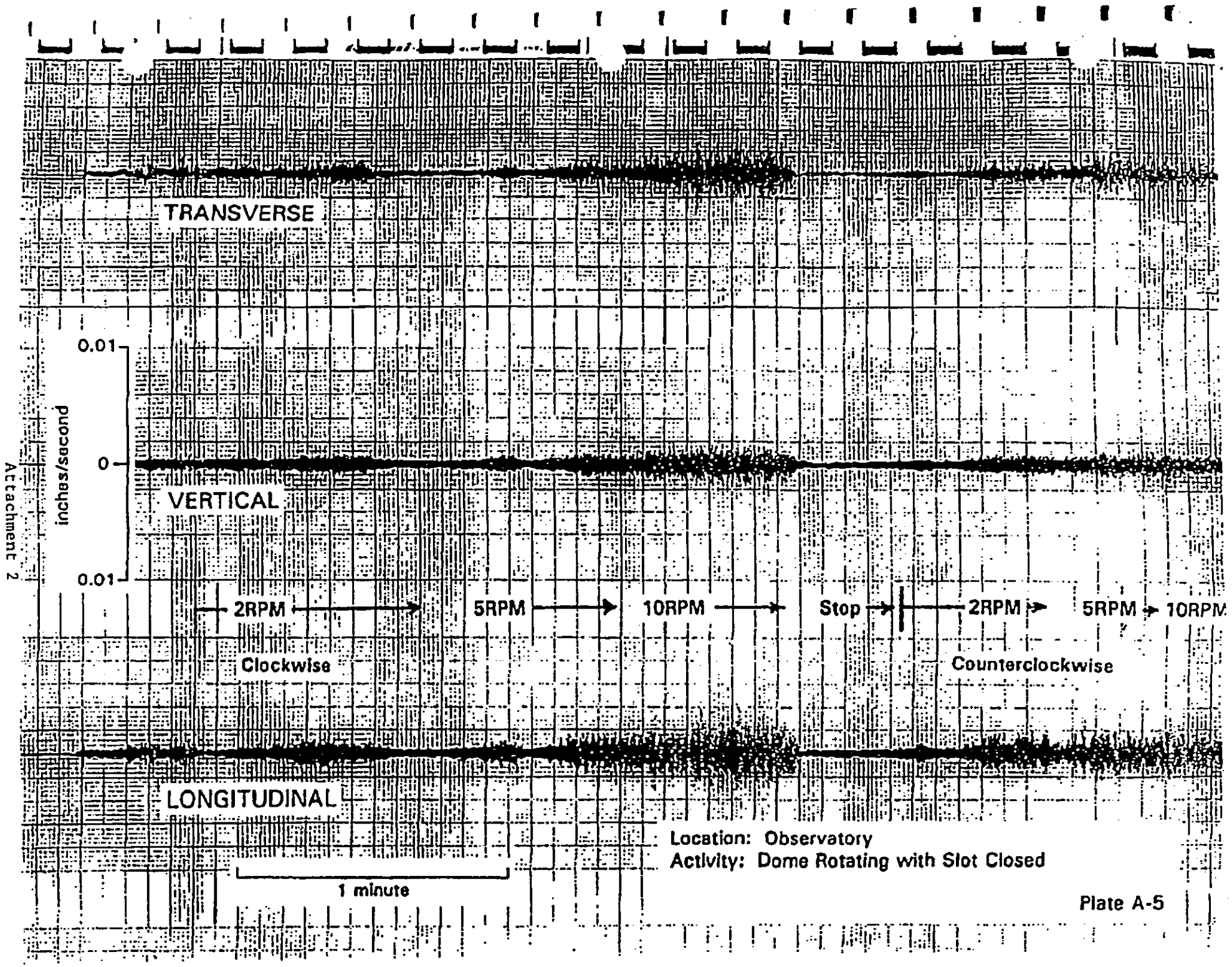


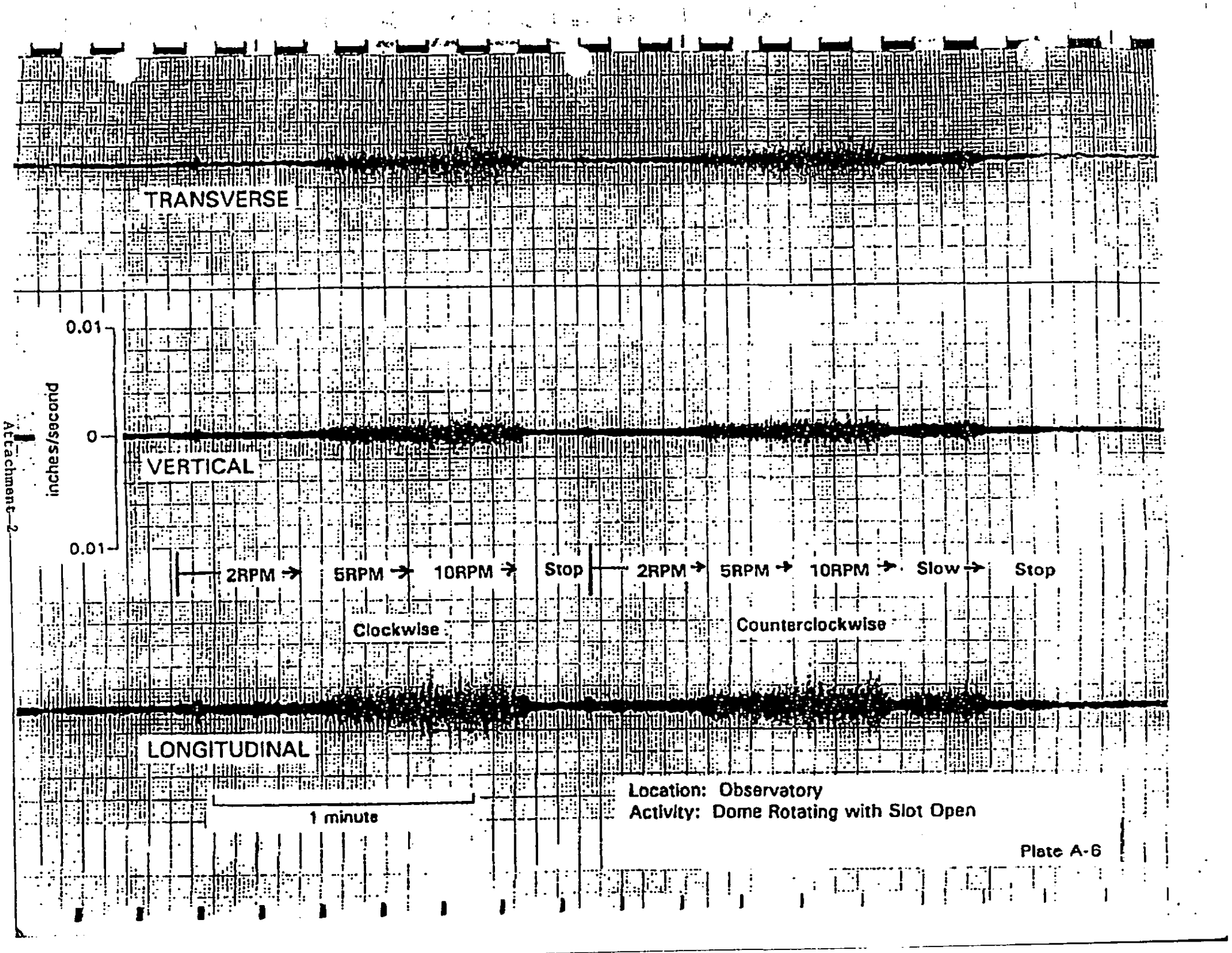
Attachment 2

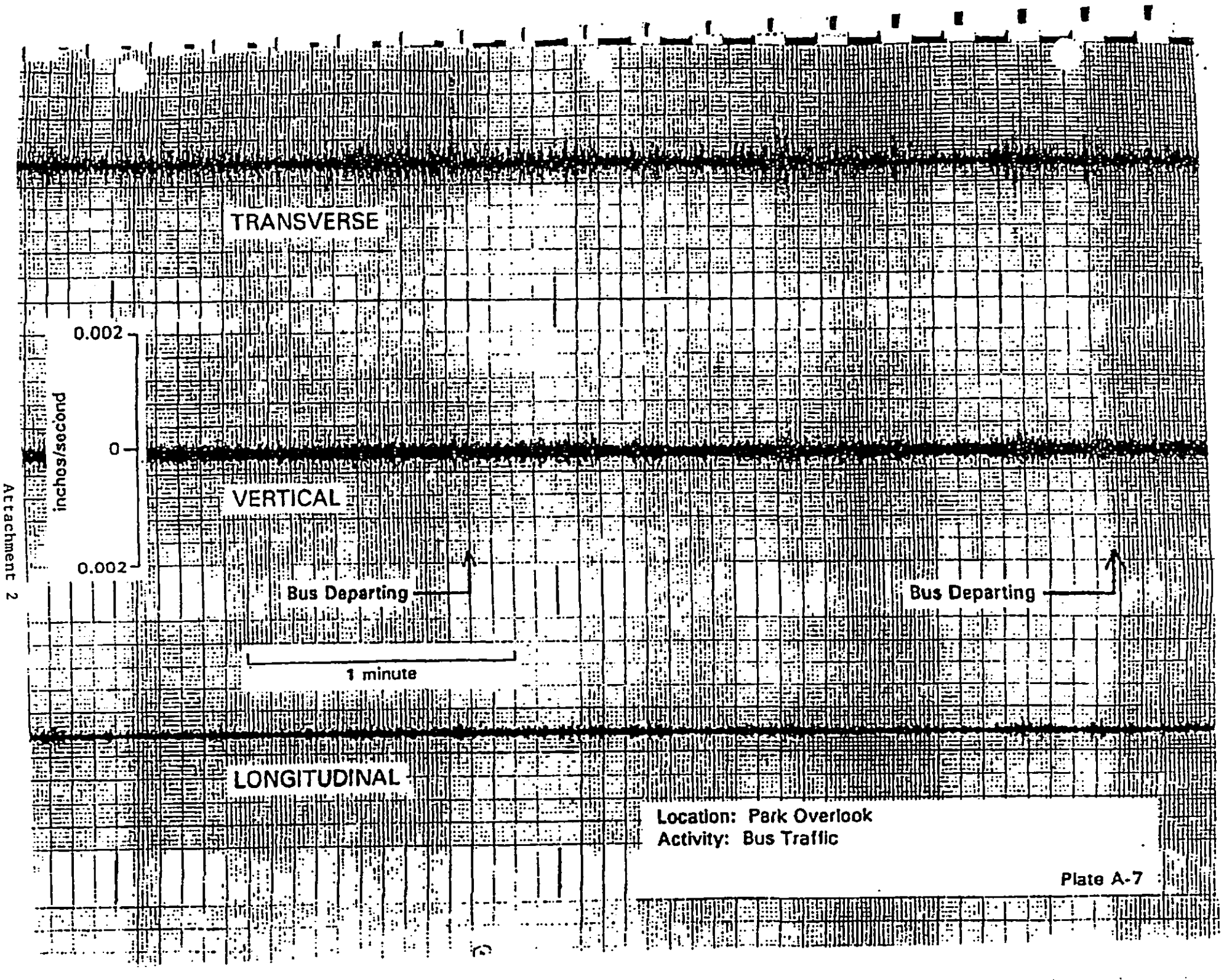

TRANSVERSE
0.01
0
0.01
inches/second
VERTICAL
Smooth Drum Roller
Grader
LONGITUDINAL
1 minute
Location: Observatory
Activity: Roadwork - Smooth drum roller compaction & grader
Plate A-3

Attachment 2

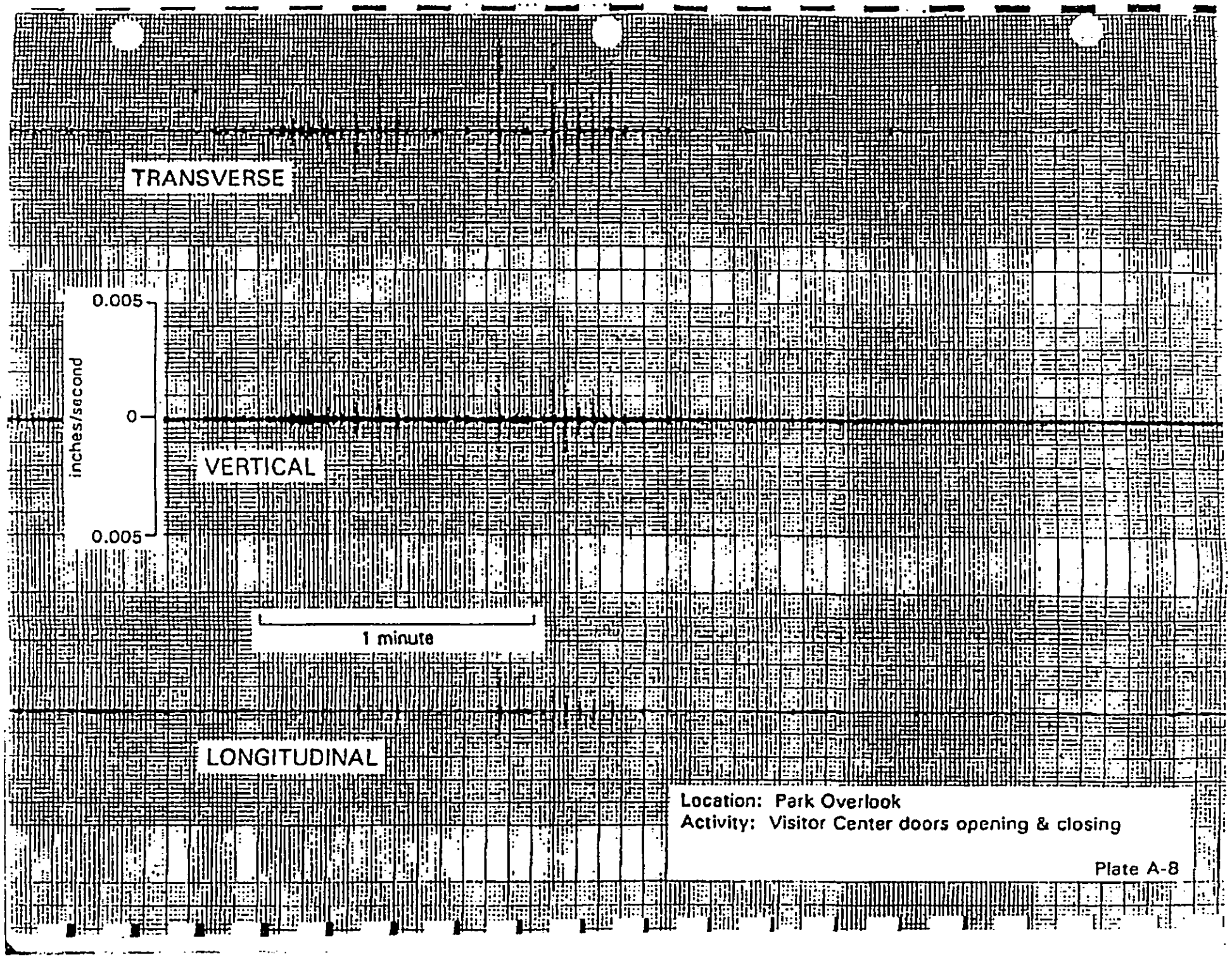


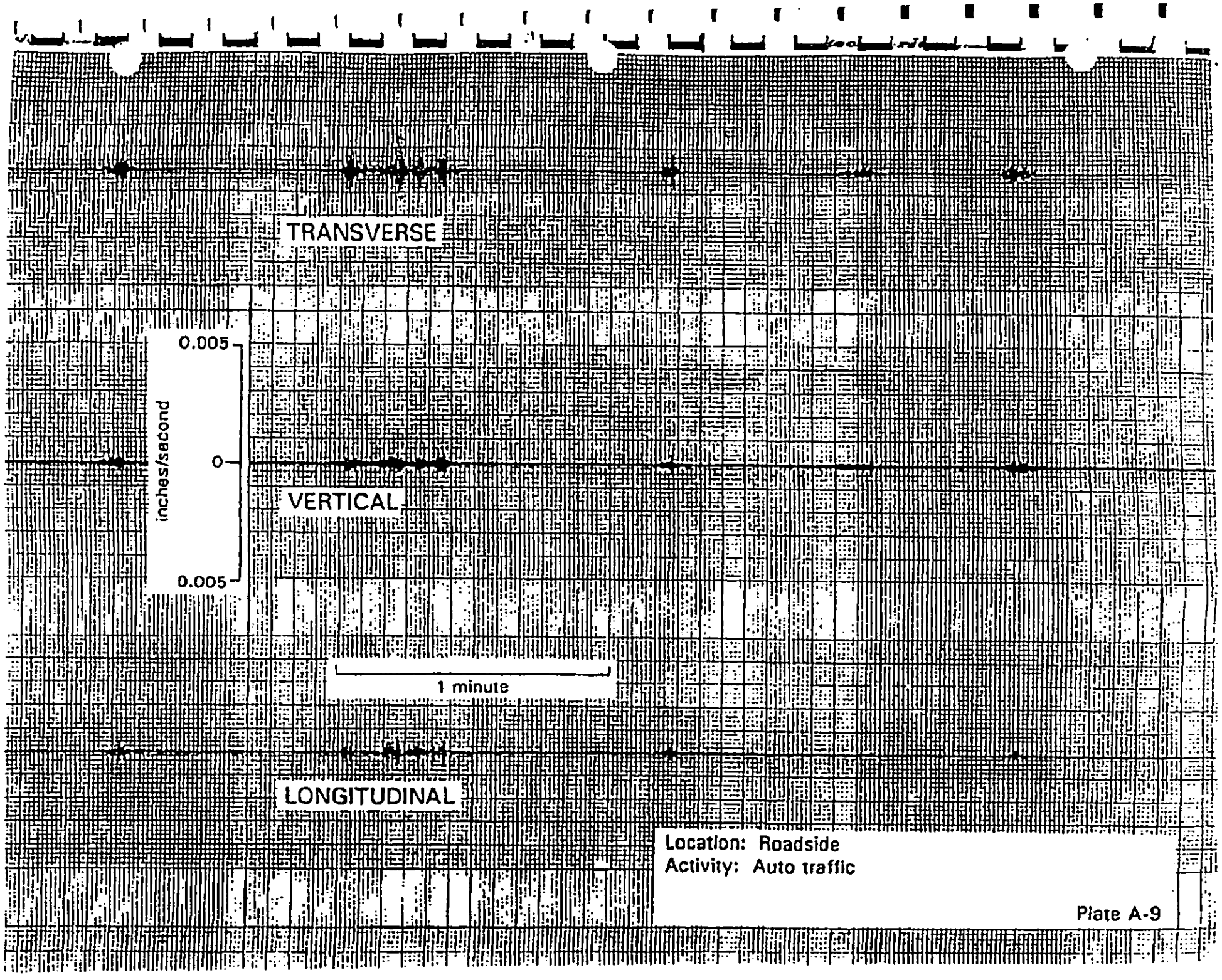

TRANSVERSE
0.01
0
VERTICAL
0.01
Attachment 2
inches/second
2RPM
5RPM
10RPM
Stop
2RPM
5RPM
10RPM
Clockwise
Counterclockwise
LONGITUDINAL
1 minute
Location: Observatory
Activity: Dome Rotating with Slot Closed
Plate A-5

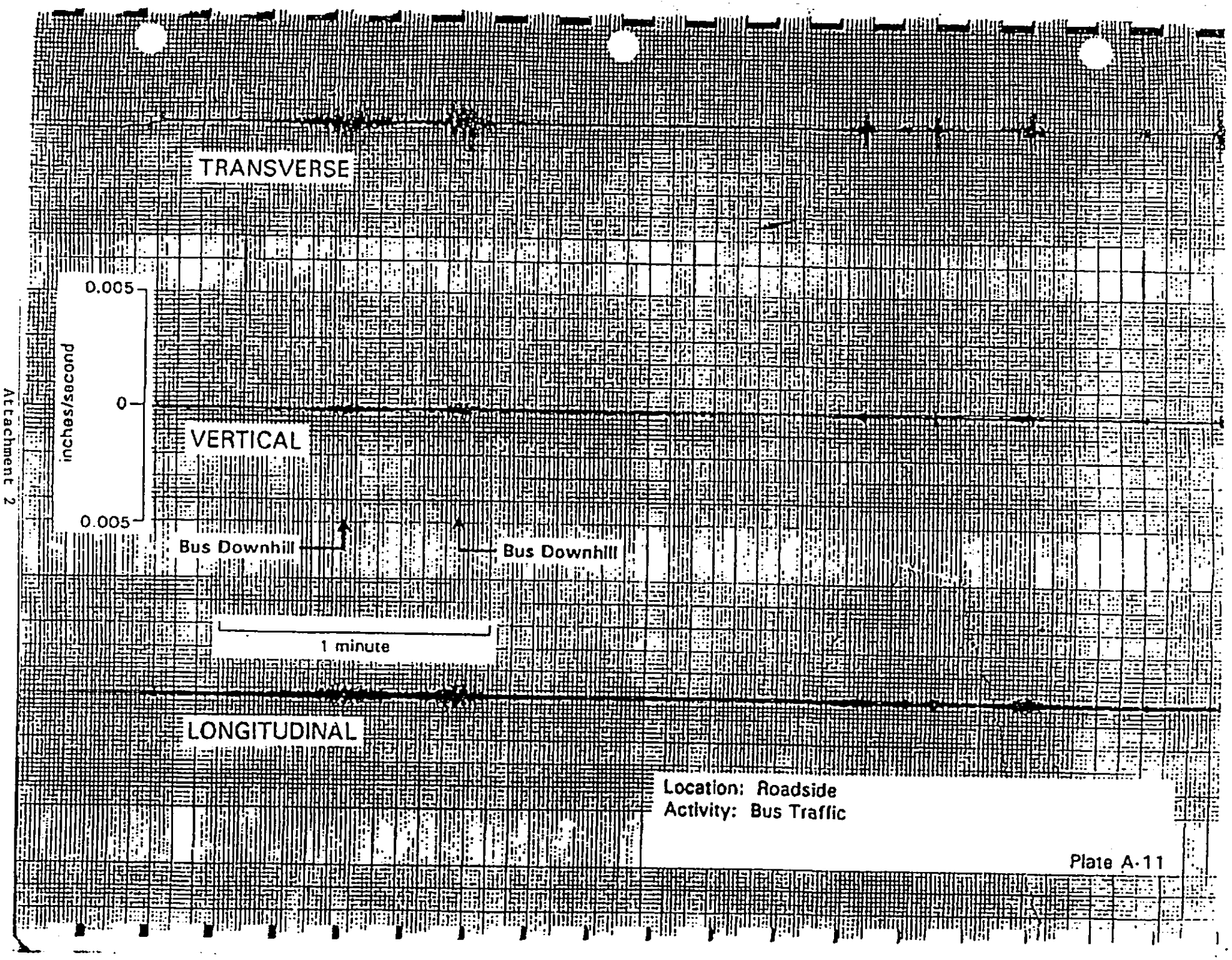

TRANSVERSE
0.01
0
VERTICAL
0.01
inches/second
Attachment-2
2RPM
5RPM
10RPM
Stop
2RPM
5RPM
10RPM
Slow
Stop
Clockwise
Counterclockwise
LONGITUDINAL
1 minute
Location: Observatory
Activity: Dome Rotating with Slot Open
Plate A-6


TRANSVERSE
0.002
0
0.002
inches/second
VERTICAL
Bus Departing
Bus Departing
1 minute
LONGITUDINAL
Location: Park Overlook
Activity: Bus Traffic
Plate A-7

Attachment 2




TRANSVERSE
0.005
0
0.005
inches/second
VERTICAL
1 minute
LONGITUDINAL
Location: Roadside
Activity: Auto traffic
Plate A-9


TRANSVERSE
0.005
0
0.005
inches/second
VERTICAL
Bus Downhill
Bus Downhill
1 minute
LONGITUDINAL
Location: Roadside
Activity: Bus Traffic
Plate A-11

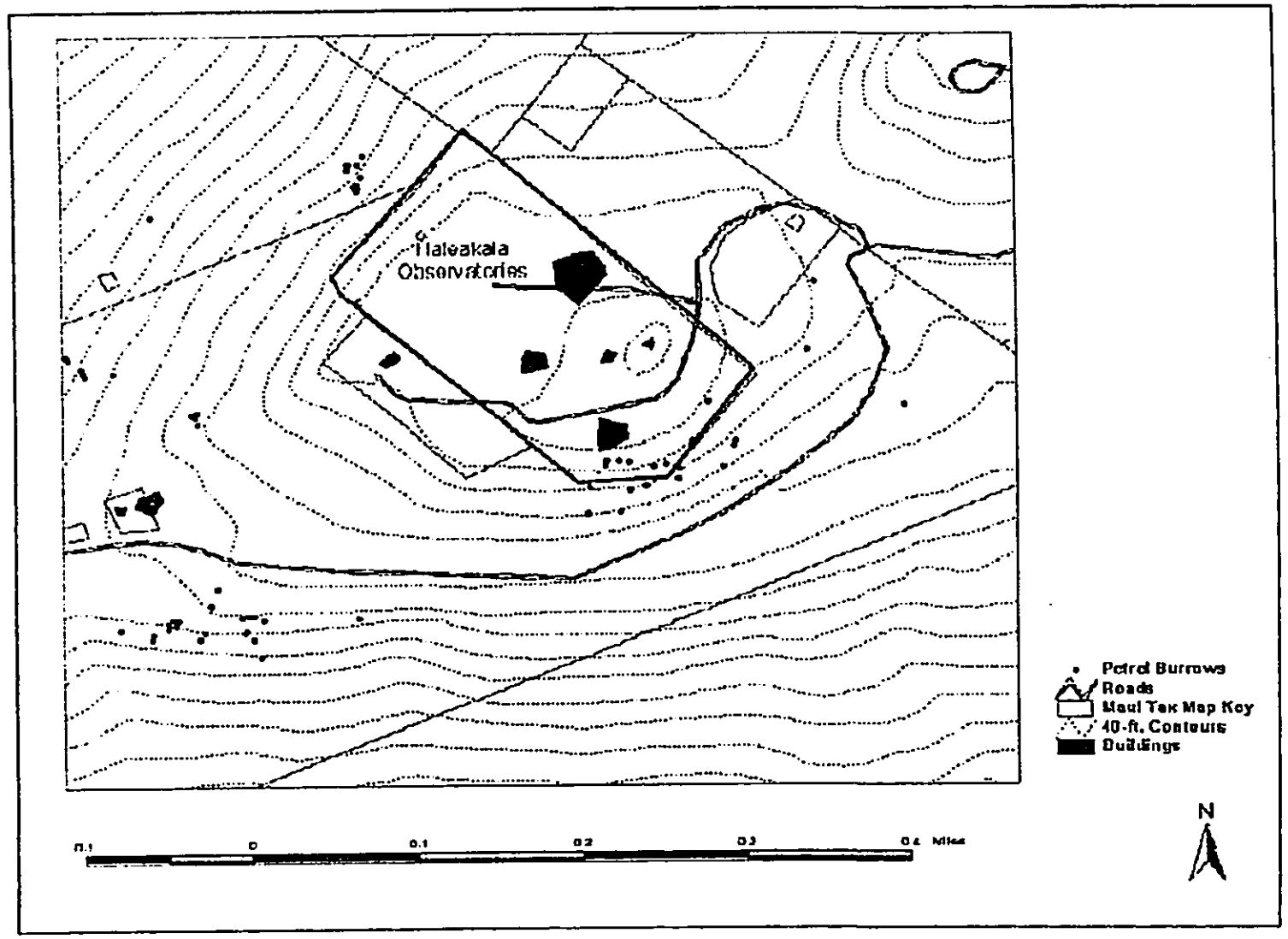


Figure 2. Location of Petrel Burrows in Relation to Haleakalā Observatories

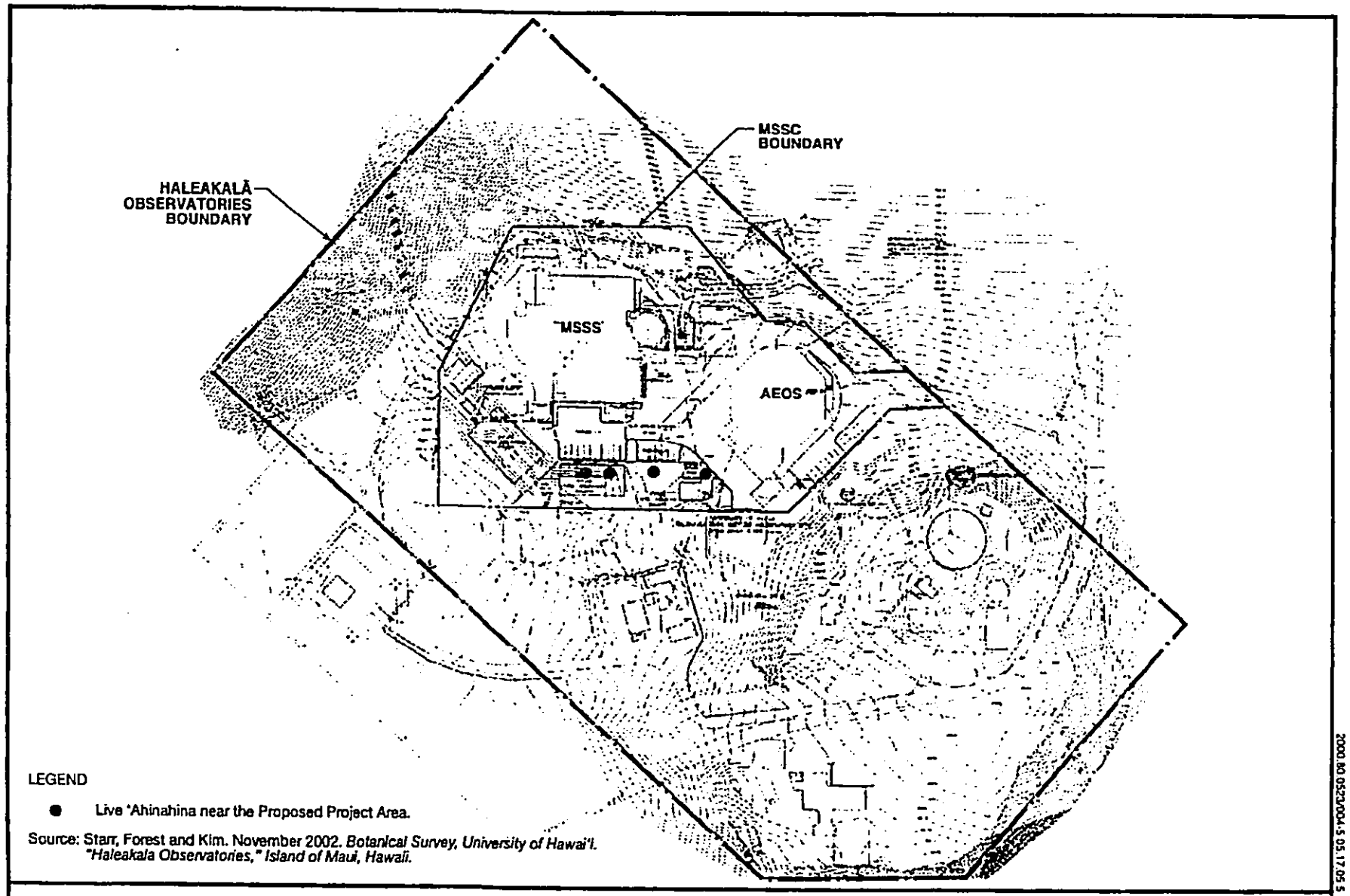


Figure 8
LOCATION OF LIVE 'AHINAHIA NEAR
PROPOSED MIRROR COATING FACILITY SITE

Environmental Assessment
Proposed AEOS Mirror Coating Facility

2000.080502004501725

Attachment 4

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard
Room 3-122, Box 50088
Honolulu, Hawaii 96850

In Reply Refer To:
1-2-2005-I-212

JUL 8 2005

Lt. Col. Brent A. Richert, Commander
U.S. Air Force
Det 15, AFRL/CC
Box 535 Lipoa Parkway, Suite 200
Kihei, Hawaii 96753

Dear Lt. Col. Richert:

Thank you for your request of June 2, 2005 for our concurrence under section 7 of the Endangered Species Act (Act) with the determination of the Air Force Research Laboratory (AFRL) regarding the proposed construction of a mirror coating facility addition to the Advanced Electro-Optical System telescope at the summit of Haleakala. We received your letter on June 6, 2005. We understand that you have determined that the proposed project will not adversely affect the federally listed Haleakala silversword or ahinahina (*Argyroxiphium sandwicense* ssp. *macrocephalum*) or Hawaiian petrel or uau (*Pterodroma sandwichensis*).

We have reviewed the measures proposed by AFRL to avoid adverse impacts to the uau as a result of this project. In your letter, you also describe the protected location of the one ahinahina near the project area and additional measures that AFRL will undertake to ensure that this project does not result in the introduction of alien plant species to the Haleakala summit. These measures adequately address our concerns, and we concur with your determination that with these modifications the project is not likely to adversely affect these two listed species. I appreciate the close collaboration between your staff, especially Ms. Michelle Hedrick, and U.S. Fish and Wildlife Service biologists to develop these project modifications.

Thank you for your efforts to conserve endangered species. If you have any questions, please contact Marilet A. Zablan, Vertebrate Conservation Program Leader or Elizabeth Sharpe, Fish and Wildlife Biologist (phone: 808/792-9400; fax: 808/792-9581).

Sincerely,

Patrick Leonard
Field Supervisor

Appendix D

Public Comment and Response Letters

LINDA LINGLE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

RODNEY K. HARAGA
DIRECTOR

Deputy Directors
BRUCE Y. MATSUI
BARRY FUKUNAGA
BRENNON T. MORIOKA
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

STP 8.1809

June 30, 2005

Lt. Col. Brent Richert, AFRL
U.S. Air Force Research Laboratory
535 Lipoa Parkway, Suite 200
Kihei, Hawaii 96753

Dear Lieutenant Colonel Richert:

Subject: Advanced Electro-Optical System (AEOS) at the
Maui Space Surveillance Complex (MSSC)
Draft Environmental Assessment (DEA)
TMK: (2) 2-2-07: Parcel 8

Thank you for your transmittal requesting our review of the subject project.

As noted in Section 1.8.1 Permits and Approval, of the DEA, the developer will need to apply with our Highway Division Maui District Office for a permit for Oversize and Overweight Vehicles on State Highways.

We appreciate the opportunity to provide our comments.

Very truly yours,

RODNEY K. HARAGA
Director of Transportation

DEPARTMENT OF THE AIR FORCE
AIR FORCE RESEARCH LABORATORY (AFMC)

8 Sep 05

Detachment 15, AFRL/CC
535 Lipoa Parkway, Suite 200
Kihei, HI 96753

State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, HI 96813-5097

RE: Draft Environmental Assessment for the Proposed Advanced Electro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC) Haleakalā, Maui Hawaii, TMK: 2-2-007:008, Haleakalā, Island of Maui, Hawaii, STP 8.1809

Dear Mr. Haraga,

Thank you for reviewing the subject document. AFRL will ensure the contractor will obtain the required Oversize and Overweight permit from your Highway Division Maui District Office. The Draft EA states this requirement in the following section.

1.8.1 Permits and Approvals -The AFRL and UH IfA are responsible for ensuring that the project is executed in accordance with applicable environmental laws, regulations, and rules. Government consultations and permits identified during development of this document are identified in Table 2.

Table 2 (excerpt)
Summary of Consultations and Permits

Consultations and Permits	Regulatory Agency
State of Hawai'i	
Oversized and Overweight Vehicles on State Highways Permit	State Department of Transportation Highways Division

Thank you for participating in the review of the Draft Environmental Assessment for the Proposed AEOS Completion. If you have any questions regarding this effort please contact Ms. Michelle Hedrick at 505-846-4574.

Sincerely,

JANET C. AUGUSTINE, Lt Col, USAF
Commander

Maui Electric Company, Ltd. • 210 West Kamehameha Avenue • PO Box 398 • Kahului, Maui, HI 96733-6898 • (808) 871-8461

July 5, 2005

Ms. Arlette S. Meader
Belt Collins Hawaii Ltd.
2153 North King Street, Suite 200
Honolulu, Hawaii 96819

Dear Ms. Meader,

Subject: Proposed Advanced Electro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC) – Draft Environmental Assessment
Makawao, Maui, Hawaii
TMK: (2) 2-2-007:008

Thank you for allowing us to comment on the documents for the subject project, which was received on June 22, 2005.

In reviewing our records and the information received, Maui Electric Company (MECO) has no objections to the proposed project at this time. However, since the proposed load appears substantial and may adversely affect our system, we highly encourage the owner's electrical consultant to meet with us as soon as practical and submit drawings to confirm the project's new electrical demand requirements. In addition, "Figure 2 – Conceptual Layout.." indicates the new building structure over existing electrical ductlines. This contradicts statements within section 4.8.3.1 – Proposed Action.

If you have any questions or concerns, please call Ray Okazaki at 871-2340.

Sincerely,

Neal Shinyama
Manager, Engineering

NS/ro:lh

cc: Lt. Col. Brent Richert – U.S. Air Force Research Laboratory
Ms. Genevieve Salmonson– Office of Environmental Quality Control
Mr. Michael Maberry – State of Hawaii-University of Hawaii Institute for Astronomy

DEPARTMENT OF THE AIR FORCE
AIR FORCE RESEARCH LABORATORY (AFMC)

8 Sep 05

Detachment 15, AFRL/CC
535 Lipoa Parkway, Suite 200
Kihei, HI 96753

Maui Electric Company
Engineering Manager
P.O. Box 398
Kahului, HI 96732

RE: Draft Environmental Assessment for the Proposed Advanced Electro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC) Haleakalā, Maui Hawaii, TMK: 2-2-007:008, Haleakalā, Island of Maui, Hawaii, July 5, 2005

Dear Mr. Shinyama,

Thank you for reviewing the subject document. AFRL provides the following in response to your input:

1. Comment: "We highly encourage the owner's electrical consultant to meet with us as soon as practical ..." Reply: When a contractor is selected for the design-construction effort, AFRL and the contractor will meet with MECO to ensure any questions you may have are answered.

2. Comment: "Figure 2 - Conceptual Layout, indicated the new building structure over existing duct lines. This contradicts statements within section 4.8.3.1. Proposed Action". Reply: The Conceptual Location of the AEOS Mirror Coating Shop, shown on Figure 2, actually shows the "Location Available for Building the AEOS Mirror Coating Shop". The figure title in the final environmental assessment will be updated. EA section 4.8.3 Power and Communication, 4.8.3.1 Proposed Action will be changed to include the added under lined sentence:

   4.8.3 Power and Communication - 4.8.3.1 Proposed Action – "The electrical system for the AEOS MCS would be connected to and extended from the existing AEOS power service. An electrical utility room would be constructed within the AEOS MCS to contain new service equipment, switchboards, distribution panels, and dry type transformers. The existing electrical system has the capacity to provide sufficient power to operate the new system, which has a proposed load of approximately 680 kVA. The AEOS MCS would be constructed so access to the MECO transformers would be retained. Figure 2 shows the area available to build the shop, but the actual footprint would be determined during the design process and would still allow required access to the MECO transformer and ductlines. The new foundation would avoid the existing electrical duct. The increase in power usage is dependent upon experiments being conducted at MSSC, but is not anticipated to exceed an eight percent increase to 5,000 megawatt hours per year."

Thank you for participating in the review of the Draft Environmental Assessment for the Proposed AEOS Completion. If you have any questions regarding this effort please contact Ms. Michelle Hedrick at 505-846-4574.

Sincerely,

JANET C. AUGUSTINE, Lt Col, USAF
Commander

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD05/1917

July 7, 2005

Lt. Col. Brent Richert, AFRL
U.S. Air Force Research Laboratory
535 Lipoa Parkway, Suite 200
Kihei, HI 96753

RE: Proposed Advanced Electro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC), Haleakalā, Maui, TMK (2) 2-2-07: Parcel 8.

Dear Mr. Richert,

The Office of Hawaiian Affairs (OHA) is in receipt of your June 21, 2005 request for comment on the above listed proposed project, TMK (2) 2-2-07: Parcel 8. OHA offers the following comments:

As was recommended by both the archaeological and cultural consultants for the proposed project, OHA recommends that all archaeological sites be permanently preserved with an adequate buffer zone. Similar developments atop Haleakalā have severely impacted the cultural landscape and have limited the traditional use of the area. With this in mind, OHA recommends that both an archaeological monitor and a cultural monitor be present during all ground altering activities related to the proposed project.

OHA also asks that concerned Native Hawaiian parties and individuals be kept in the loop throughout the project as construction-related and cultural issues arise. A cultural specialist should be employed to assist with pertinent issues and serve as a liaison to groups and individuals in the community.

The location of the proposed AEOS has been identified as ceded lands in the Department of Land and Natural Resources (DLNR) SLIMS Inventory. As a consequence, in accordance with the Admission Act, OHA requests that the Environmental Assessment include recognition that the subject parcel is ceded land.

OHA further requests your assurances that if the project goes forward, should iwi or Native Hawaiian cultural or traditional deposits be found during ground disturbance, work will cease, and the appropriate agencies will be contacted pursuant to applicable law.

Thank you for the opportunity to comment. If you have further questions or concerns, please contact Jesse Yorck at (808) 594-0239 or jessey@oha.org.

'O wau iho nō,

Clyde W. Nāmu'o
Administrator

CC: Genevieve Salmonson, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, HI 96813

Michael Maberry
University of Hawaii Institute for Astronomy
4761 Lower Kula Road
Kula , HI 96790-0209

Arlette Meader
Belt Collins Hawaii Ltd.
2153 North King Street, Suite 200
Honolulu, HI 96819

Thelma Shimaoka
OHA Community Affairs Coordinator (Maui)
140 Hoohana St., Ste. 206
Kahului, HI 96732

DEPARTMENT OF THE AIR FORCE
AIR FORCE RESEARCH LABORATORY (AFMC)

8 Sep 05

Detachment 15, AFRL/CC
535 Lipoa Parkway, Suite 200
Kihei, HI 96753

State of Hawaii
Office of Hawaiian Affairs
711 Kapiolani, Boulevard, Suite 500
Honolulu, HI 96813

RE Draft Environmental Assessment for the Proposed Advanced Electro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC) Haleakalā, Maui Hawaii, TMK: 2-2-007:008, Haleakalā, Island of Maui, Hawaii, HRD05/1917

Dear Mr. Namuo,

Thank you for reviewing the subject document. The following responses are provided to your comments:

1. Comment: "As was recommended by both the archaeological and cultural consultants for the proposed project, OHA recommend that all archaeological sites be permanently preserved with an adequate buffer zone. Similar developments atop Haleakalā have severely impacted the cultural landscape and have limited the traditional use of the area. With this in mind, OHA recommends that both an archaeological monitor and a cultural monitor be present during all ground altering activities related to the proposed project."
Response: AFRL will work closely with archaeological and cultural consultants and the University of Hawaii to ensure archaeological sites have adequate clearance from all construction activities. EA section 4.2.1 states "The two sites nearest to proposed construction and staging areas are already protected as Site 2806 is clearly marked with fence buffer and Site 5440 is separated from the staging area by a road." Buffer zones around sensitive sites will be enforced and contractor personnel will be briefed. Since the Mirror Coating Shop will be constructed adjacent to the AEOS on the existing concrete where previous ground disturbance occurred, archaeological and cultural disturbance is not expected. However, AFRL will comply with the construction practices identified in the University of Hawaii Long Range Development Plan and will ensure a cultural specialist (monitor) and archaeological monitor will be on site during ground altering activities.

2. Comment: "OHA also asks that concerned Native Hawaiian parties and individuals be kept in the loop throughout the project as construction related and cultural issues arise. A cultural specialist should be employed to assist with pertinent issues and serve as a liaison to groups and individuals in the community."
Response: AFRL will employ the expertise of a cultural specialist, to include serving as a liaison to Native Hawaiian parties and individuals to apprise them of any project construction related cultural issues, and will monitor the construction process, and consult with and advise the on-site Project Manager with regard to any cultural or spiritual correction. Underlined text shows revisions to section 4.2.1 paragraph 3 of the Final Environmental Assessment. "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, and will serve as a liaison to native Hawaiian groups and individuals in the community. The cultural specialist would be a kanaka maoli (true aboriginal person), preferably a kupuna (elder), and a kāhuna (priest, clergyman) as well, and one who has personal knowledge of the spiritual and cultural significance of Haleakalā."

3. Comment: "The location of the proposed AEOS has been identified as ceded lands in the Department of Land and Natural Resources (DLNR) SLIMS Inventory. As a consequence, in accordance with the Admission Act, OHA requests that the Environmental Assessment include recognition that the subject parcel is ceded land.
Response: The Final Environmental Assessment for the Advanced Electro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC) Haleakalā, Maui Hawaii has been modified to recognize the area affected as ceded lands in the Department of Land and Natural Resources (DLNR) SLIMS Inventory as follows:
Section 1.2 Background, the second paragraph is revised to include the following underlined text. "MSSC is located on State-owned, ceded land within the Haleakalā Observatories complex, which is managed by the UH IfA."
Section 3.1.1 Land Use, Proposed Action, the first paragraph is revised to include the following underlined text." Real estate records show that Haleakalā Observatories is ceded land. (former crown and government lands of the Kingdom of Hawai'i that were ceded to the U.S. upon annexation) that has been owned by the State since the institution of the modern system of land ownership."

4. Comment: "OHA further requests your assurances that if the project goes forward, should iwi or native Hawaiian cultural or traditional deposits be found during ground disturbance, work will cease, and the appropriate agencies will be contacted pursuant to applicable law."
   Response: Section 4.2.1 of the Final EA has been revised to include the following sentence after the bullet list "In addition, the contractor shall stop work if iwi (bones) or native Hawaiian cultural or traditional deposits are found during ground disturbance activities."

Thank you for participating in the review of the Draft Environmental Assessment for the Proposed AEOS Completion. If you have any questions regarding this effort please contact Ms. Michelle Hedrick at 505-846-4574.

Sincerely,

JANET C. AUGUSTINE, Lt Col, USAF
Commander

LINDA LINGLE
GOVERNOR OF HAWAII

CHIYOME L. FUKINO, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801-3378

In reply, please refer to:
EMD / CWB

07026PKP.05

July 11, 2005

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

Dear Lieutenant Colonel Richert:

Subject: Proposed Advanced Electro-Optical System Completion at the Maui Space Surveillance Comples, Haleakala, Maui, Hawaii

The Department of Health (DOH), Clean Water Branch (CWB), acknowledges receipt of the subject document on June 22, 2005. The CWB has reviewed the limited information contained in the subject document and offers the following comments:

1. The Army Corps of Engineers should be contacted at (808) 438-9258 for this project. Pursuant to Federal Water Pollution Control Act (commonly known as the "Clean Water Act" (CWA)), Paragraph 401(a)(1), a Section 401 Water Quality Certification (WQC) is required for "[a]ny applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may **result** in any discharge into the navigable waters..." (emphasis added). The term "discharge" is defined in CWA, Subsections 502(16), 502(12), and 502(6); Title 40, Code of Federal Regulations, Section 122.2; and Hawaii Administrative Rules (HAR), Chapter 11-54.

2. In accordance with HAR, Sections 11-55-04 and 11-55-34.05, the Director of Health may require the submittal of an individual permit application or a Notice of Intent (NOI) for general permit coverage authorized under the National Pollutant Discharge Elimination System (NPDES).

   a. An application for an NPDES individual permit is to be submitted at least 180 days before the commencement of the respective activities. The NPDES application forms may also be picked up at our office or downloaded from our website at http://www.hawaii.gov/health/environmental/water/cleanwater/forms/indiv-index.html.

   b. An NOI to be covered by an NPDES general permit is to be submitted at least 30 days before the commencement of the respective activity. A separate NOI is needed for coverage under each NPDES general permit. The NOI forms may be picked up at our office or downloaded from our website at: http://www.hawaii.gov/health/environmental/water/cleanwater/forms/genl-index.html.

i. Storm water associated with industrial activities, as defined in Title 40, Code of Federal Regulations, Sections 122.26(b)(14)(i) through 122.26(b)(14)(ix) and 122.26(b)(14)(xi). [HAR, Chapter 11-55, Appendix B]

ii. Construction activities, including clearing, grading, and excavation, that result in the disturbance of equal to or greater than one (1) acre of total land area. The total land area includes a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under a larger common plan of development or sale. **An NPDES permit is required before the commencement of the construction activities.** [HAR, Chapter 11-55, Appendix C]

iii. Discharges of treated effluent from leaking underground storage tank remedial activities. [HAR, Chapter 11-55, Appendix D]

iv. Discharges of once through cooling water less than one million gallons per day. [HAR, Chapter 11-55, Appendix E]

v. Discharges of hydrotesting water. [HAR, Chapter 11-55, Appendix F]

vi. Discharges of construction dewatering effluent. [HAR, Chapter 11-55, Appendix G]

vii. Discharges of treated effluent from petroleum bulk stations and terminals. [HAR, Chapter 11-55, Appendix H]

viii. Discharges of treated effluent from well drilling activities. [HAR, Chapter 11-55, Appendix I]

ix. Discharges of treated effluent from recycled water distribution systems. [HAR, Chapter 11-55, Appendix J]

x. Discharges of storm water from a small municipal separate storm sewer system. [HAR, Chapter 11-55, Appendix K]

xi. Discharges of circulation water from decorative ponds or tanks. [HAR, Chapter 11-55, Appendix L]

3. In accordance with HAR, Section 11-55-38, the applicant for an NPDES permit is required to either submit a copy of the new NOI or NPDES permit application to the State Department of Land and Natural Resources, State Historic Preservation Division (SHPD), or demonstrate to the satisfaction of the DOH that the project, activity, or site covered by the NOI or application has been or is being reviewed by SHPD. If applicable, please submit a copy of the request for review by SHPD or SHPD's determination letter for the project.

4. Any discharges related to project construction or operation activities, with or without a Section 401 WQC or NPDES permit coverage, shall comply with the applicable State Water Quality Standards as specified in HAR, Chapter 11-54.

The Hawaii Revised Statutes, Subsection 342D-50(a) requires that "[n]o person, including any public body, shall discharge any water pollutants into state waters, or cause or allow any water pollutant to enter state waters except in compliance with this chapter, rules adopted pursuant to this Chapter, or a permit or variance issued by the director."

If you have any questions, please contact Mr. Alec Wong, Supervisor of the Engineering Section, CWB, at (808) 586-4309.

Sincerely,

Alec Wong

DENIS R. LAU, P.E., CHIEF
Clean Water Branch

KP:cf

c: DOH/OEQC
Mr. Michael Maberry, University of Hawaii Institute for Astronomy
Ms. Arlette S. Meader, Belt Collins Hawaii Ltd.

DEPARTMENT OF THE AIR FORCE
AIR FORCE RESEARCH LABORATORY (AFMC)

8 Sep 05

Detachment 15, AFRL/CC
535 Lipoa Parkway, Suite 200
Kihei, HI 96753

State of Hawaii
Department of Health
Clean Water Branch
P.O. Box 3378
Honolulu, HI 96801-3378

RE: Draft Environmental Assessment for the Proposed Advanced Electro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC) Haleakalā, Maui Hawaii, TMK: 2-2-007:008, Haleakalā, Island of Maui, Hawaii, EMD/CWB 07026PKP.05

Dear Mr. Wong,

Thank you for reviewing the subject document. The following responses are provided to your comments:

1. The United States Army Corps of Engineers (USACE) is managing all contracting efforts for this military construction. The AEOS mirror coating shop would be located approximately 3 kilometers (1.9 miles) from the nearest State or U.S. waterway and there would be no construction within State or U.S. waters.
2. Current planning indicates that the construction effort will not disturb one acre or more and consequently will not require a permit application nor a Notice of Intent. If this should change, AFRL will comply with HAR Sections 11-55-04, 11-55-34.05 and HAR, Chapter 11-55 Appendices A-L and HAR Section 11-55-38. The Draft EA states this requirement in section 1.8.1 and more detailed statement will be added in section 4.6.1. See below.

1.8.1 Permits and Approvals -The AFRL and UH IfA are responsible for ensuring that the project is executed in accordance with applicable environmental laws, regulations, and rules. Government consultations and permits identified during development of this document are identified in Table 2.

Table 2 (excerpt)
Summary of Consultations and Permits

Consultations and Permits	Regulatory Agency
State of Hawai'i	
National Pollutant Discharge Elimination System (NPDES), if area of disturbance is 0.4 hectares (1 acre) or greater	State Department of Health (DOH), Clean Water Branch

4.6 Hydrology 4.6.1 Proposed Action - Construction-related storm water runoff would be minimized by implementing erosion control best management practices. Non-storm water generated from pressure testing utility lines would be discharged to the existing septic system. The area of disturbance, including the staging area, will be determined during the design process. If the area of disturbance is 0.4 hectare (1 acre) or greater, a NPDES permit for storm water discharges associated with construction will be obtained in compliance with applicable sections of HAR Chapter 11-55 Water Pollution Control, including Section 11-55-04 application for NPDES permit and submittal of notice of intent, Section 11-55-38 historic and burial sites review, and Appendices A-L

3. As stated in section 4.2.1 of the EA, "Consultation under Section 106 of the NHPA has been completed with the SHPD, which has concurred with AFRL's determination that "no historic properties will be affected" by the Proposed Action. Correspondence between AFRL and the SHPD is provided in Appendix B." If the area of disturbance is 0.4 hectare (1 acre) or greater, AFRL will comply with HAR 11-55-38 and provide SHPD appropriate information at that time.

4. Section 4.6.1 Hydrology of the EA has been revised to include the following sentence, "Although the Proposed Action does not include work in water, construction of the AEOS MCS would adhere to the applicable requirements of HAR 11-54 Water Quality Standards."

Thank you for participating in the review of the Draft Environmental Assessment for the Proposed AEOS Completion. If you have any questions regarding this effort please contact Ms. Michelle Hedrick at 505-846-4574.

Sincerely,

JANET AUGUSTINE, Lt Col, USAF
Commander

LINDA LINGLE
GOVERNOR OF HAWAII

GENEVIEVE SALMONSON
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
235 SOUTH BERETANIA STREET
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186
E-mail: oeqc@health.state.hi.us

July 11, 2005
Rolf-Peter Kudritzki
Institute for Astronomy
2680 Woodlawn Drive
Honolulu, HI 96822

Attn: Mike Maberry

Subject: Draft environmental assessment (EA)
Maui Space Surveillance Complex Mirror Coating Shop

Dear Mr. Kudritzki:

Thank you for the opportunity to review this draft EA. We have no comments at this time.
If you have any questions call Nancy Heinrich at 586-4185.

Sincerely,

Genevieve Salmonson

GENEVIEVE SALMONSON
Director

c: Arlette Meader, Belt Collins

DEPARTMENT OF THE AIR FORCE
AIR FORCE RESEARCH LABORATORY (AFMC)

8 Sep 05

Detachment 15, AFRL/CC
535 Lipoa Parkway, Suite 200
Kihei, HI 96753

State of Hawaii
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, HI 96813

RE: Draft Environmental Assessment for the Proposed Advanced Electro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC) Haleakalā, Maui Hawaii, TMK: 2-2-007:008, Haleakalā, Island of Maui, Hawaii, July 11, 2005

Dear Ms. Salmonson,

Thank you for participating in the review of the Draft Environmental Assessment for the Proposed AEOS Completion. We understand that your department, State of Hawaii Office of Environmental Quality Control has no comments to offer at this time. If you have any questions regarding this effort please contact Ms. Michelle Hedrick at 505-846-4574.

Sincerely,

JANET C. AUGUSTINE, Lt Col, USAF
Commander

FRIENDS OF POLIPOLI
P.O. BOX 431
WAILUKU, HAWAI'I 96793

July 13, 2005

U.S. Air Force Research Laboratory
Att'n.: Lt. Col. Brent Richert, AFRL
535 Lipoa Parkway, Suite 200
Kihei, Hawai'i 96753

Re: Comments on Draft Environmental Assessment Regarding Proposed Advanced Electro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC), Haleakala, Maui, Hawai'i

Dear Lt. Co. Richert:

Thank you for allowing Friends of Polipoli the opportunity to provide comments on the above-referenced matter. The principal concerns of Friends of Polipoli are as follows:

1. That any construction at the summit of Haleakala be in accordance with an established and approved master plan that will protect and preserve the summit area as a place of special significance to native Hawaiian people as well as non-native Hawaiian residents.

2. That any construction be implemented so as to prevent the introduction of plant seeds, insects, rodents and other potential pests to the summit area.

3. That any construction be implemented so as to avoid any hazards to native birds, such as the 'ua'u, or Hawaiian petrel (*Pterodroma sandwichensis*). These hazards can include inappropriate lighting and support cables and guy wires.

4. That no aspect of the proposed construction, including any potentially increased security needs for the military installation, have an adverse impact to the public's access to the top of the Skyline Drive hiking trail.

5. That the storm water drainage system from the large paved and developed area surrounding the construction site be modified so as to prevent erosion to the surrounding area during times of heavy rain.

The Draft Environmental Assessment that was sent to Friends of Polipoli by Belt Collins Hawaii Ltd. on June 21, 2005 did not address these concerns. In order to reach a position on the proposed construction, the Directors of Friends of Polipoli would require more information on how, or if, these concerns will be addressed. Friends of Polipoli will not be able to support the proposed project until and unless these concerns are addressed in a satisfactory manner. Please feel free to contact me at (808) 242-5545 if I can answer any questions. Again, thank you for allowing Friends of Polipoli to provide its input.

Sincerely,
Friends of Polipoli

Brian R. Jenkins, President

cc. Charles Kauluwehi Maxwell, Sr.
Mary Evanson
Office of Environmental Quality Control
State of Hawai'i University of Hawai'i Institute for Astronomy
Belt Collins Hawai'i Ltd.

DEPARTMENT OF THE AIR FORCE
AIR FORCE RESEARCH LABORATORY (AFMC)

9 Sep 05

Detachment 15, AFRL/CC
535 Lipoa Parkway, Suite 200
Kihei, HI 96753

Mr. Brian Jenkins, President
Friends of Polipoli
P.O. Box 431
Wailuku, Hawaii 96793

RE: Comments on Draft Environmental Assessment (EA) Regarding Proposed Advanced Electro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC), Haleakalā, Maui, Hawaii

Dear Mr. Jenkins,

Thank you for reviewing the Draft Environmental Assessment for the Proposed AEOS Completion. The following responses are provided to your comments:

Comment 1: "That any construction at the summit of Haleakalā be in accordance with an established and approved master plan that will protect and preserve the summit area as a place of special significance to native Hawaiian people as well as non-native Hawaiian residents."

Response: AFRL is working closely with the University of Hawaii, our landlord, to comply with the approved Haleakalā Observatories (HO) Long Range Development Plan (LRDP). The LRDP is a master plan for the 18-acre HO area that describes future development and related construction practices that consider the environmental, cultural, and historical importance of Haleakalā. The proposed project is included in the LRDP as a future development project. Project construction activities will comply with the construction practices outlined in the LRDP. The following section of the Draft Environmental Assessment addresses your concerns on the preservation of the summit area as a place of special significance to native Hawaiian people as well as non-native Hawaiian residents. Underlined text shows revisions to the Final Environmental Assessment.

> 4.2 Cultural Resources - 4.2.1 Proposed Action -The Proposed Action would have no significant impact on cultural resources. Consultation under Section 106 of the NHPA has been completed with the SHPD, which has concurred with AFRL's determination that "no historic properties will be affected" by the Proposed Action. Correspondence between AFRL and the SHPD is provided in Appendix B. A two-document report was prepared by CKM Cultural Resources to evaluate the potential effects of future development planned for Haleakalā Observatories, including the Proposed Action, on Hawaiian culture and traditional customary rights, in accordance in Act 50, House Bill Number 2895 (Appendix A).

Archaeological resources identified to the east and south of the MSSC would not be disturbed or affected by the proposed activities. However, to ensure protection of nearby archaeological resources and respect the summit's cultural resources, the following LRDP provisions would be incorporated into the construction and operation of the proposed AEOS MCS.

> • 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, and will serve as a liaison to native Hawaiian groups and individuals in the community. The cultural specialist would be a kanaka maoli (true aboriginal person), preferably a kupuna (elder), and a kāhuna (priest, clergyman) as well, and one who has personal knowledge of the spiritual and cultural significance of Haleakalā.
> • The cultural and archeological sites and features identified near MSSC, but outside the project area, would not be affected. The two sites nearest to proposed construction and staging areas are already protected as Site 2806 is clearly marked with fence buffer and Site 5440 is separated from the staging area by a road.
> • Construction crew members and permanent employees working on the AEOS MCS will attend UH-approved "Sense of Place" training prior to working at the project site. This training will instruct individuals on the cultural and historic significance of the Haleakalā Summit, as well as describe the spiritual essence of the area's natural resources.
> • A cultural specialist shall be retained to conduct a cultural inspection of Haleakalā Observatories, including the proposed AEOS MCS site, three times per year, to ascertain compliance with HAR Title 13, Sub-Title 13, Chapter 277 "Rules Governing Requirements for Archaeological Site Preservation Development."

Comment 2: "That any construction be implemented so as to prevent the introduction of plant seeds, insects, rodents and other potential pests to the summit area."

Comment 3: "That any construction be implemented so as to avoid any hazards to native birds such as the 'ua'u, or Hawaiian petrel (*Pterodroma sandwichensis*).

> Response: Actions associated with the protection of biological resources, including preventing the introduction of non-native species and avoiding hazards to native birds, are addressed in the Draft Environmental Assessment for the Proposed AEOS Completion. Project construction activities will comply with the construction practices outlined in the Long Range Development Plan. The following Draft EA section addresses your concerns; underlined text which includes USFWS concurrence information, will be added to the Final EA.
>
> > 4.3 Biological Resources - 4.3.1 Proposed Action - The AFRL has completed informal consultation with the USFWS. under Section 7 of the ESA, to evaluate the potential impacts of the Proposed Action on threatened and endangered species near the project area. The USFWS has concurred with AFRL's determination that the Proposed Action is not likely to adversely affect the 'ahinahina, 'ua'u, nēnē, or Hawaiian hoary bat at Haleakalā. Correspondence between AFRL and the USFWS is provided in Appendix C. The primary

threat to the ʻahinahina is invasive alien species introduction, either some plant species which could compete for the ground within silversword habitat or some invertebrate (like the Argentine ant) that could eat the plant or eliminate pollinators. The use of heavy equipment near ʻuaʻu burrows, which often results in noise and ground vibrations, could potentially affect ʻuaʻu fledging success. Construction vehicles ascending and descending the mountain could slightly increase the risk of traffic collisions with nēnē; however, according to a biological assessment prepared for similar work at Haleakalā Observatories, the risk of vehicle collision with nēnē is expected to remain low.

To minimize the potential effects of construction activities on the ʻahinahina, ʻuaʻu, and nēnē, the AFRL and USACE will ensure that construction of the AEOS MCS will be in accordance with the practices identified in the LRDP and with measures identified by the USFWS, as presented below.

- The contractor will participate in UH IfA and AFRL pre-construction briefings on environmental sensitivities. Biological resource topics addressed in the briefings will include protecting the biological species in the area, preventing the introduction of unwanted species to the area, confining activities to the construction site and staging area, and minimizing the risk to species from vibration, noise, and lighting.
- A qualified biologist or agricultural inspector will inspect equipment, supplies, and containers that originate from other islands or the continental United States prior to these items being transported from Kahului. Materials suspected to contain prohibited or harmful organisms would be handled under the direction of the National Park Service and USFWS. The contractor will provide the National Park Service a one-week notification, prior to the initial entry, for coordination of inspections. Construction vehicles will be steam cleaned before being transported through Haleakalā National Park. Certification of inspections and vehicle cleaning will be maintained by the contractor.
- Importation of fill material, if needed, will require sterilization and will be coordinated with the National Park Service. Fill will be handled as necessary to remove seeds, larvae, and other biota that could survive and propagate at the summit.
- The contractor will not park heavy equipment or store construction materials outside of the Haleakalā Observatories boundaries. Their activities will be limited to the construction site and staging area to minimize risk to ʻuaʻu in adjacent areas.
- The contractor will use tight-lidded trash containers and on a daily basis will remove organic waste and trash, in particular materials that could serve as a food source and increase the population of mice and rats that prey on native species. Construction-related trash will be removed on a timely basis.
- ARFL will mark nearby ʻahinahina locations and ensure construction activities and workers do not disturb the plants.
- The National Park Service will give the contractor current Haleakalā National Park maps of ʻuaʻu burrow locations to identify and avoid these areas. AFRL will work with the Haleakalā National Park Service to monitor the burrows during construction. The contractor will notify the UH IfA of any ʻuaʻu mortalities.
- The contractor will not construct fences, to prevent ʻuaʻu mortality from collisions.
- No night construction is planned and no extra lighting is anticipated to be needed.

• The AFRL will not induce ʻuaʻu disturbing ground vibration during the mid-February to mid-November nesting season, and vibratory rollers will not be used during this time. During construction activities conducted when ʻuaʻu may be present outside the nesting season, steps will be taken to minimize the level of vibration. AFRL will measure ground vibration during all phases of construction and will work with the Haleakalā National Park Service biologist to interpret data relative to species impacts.
• Ground disturbance activities at the construction staging area will not exceed current and past operations (vehicle movement, personnel walking, equipment/supply storage and handling).

Construction and operation of the AEOS MCS would follow the established practices designed to prevent impacts to flora and fauna; therefore, no significant impacts on biological resources are anticipated with the Proposed Action. The construction methods would include pouring concrete on the existing concrete pad and some areas of existing pavement may be saw cut and removed for installation of concrete footings. This approach does not induce ground vibration associated with typical foundation construction activities.

Comment 4: "That no aspect of the proposed construction, including any potentially increased security needs for the military installation, have an adverse impact to the public's access to the top of the Skyline Drive hiking trail."

Response: The proposed action will not impact the public's access to the top of Skyline Drive hiking trail, as addressed in section 4.1 Land Use, 4.1.1 Proposed Action of the EA: "Implementation of the Proposed Action would not restrict access to public areas. MSSC is a secured military facility that will continue to have restricted access. Access to recreational areas, such as the Skyline Trail and the Polipoli Trail located beyond Haleakalā Observatories, would not be restricted." In addition, public access in the vicinity is addressed in the following sentence in section 4.8 Infrastructure, 4.8.1 Roads and Traffic, 4.8.1.1 Proposed Action, "The construction-related traffic would not have a significant adverse impact on traffic, as it would be coordinated with the National Park Service and scheduled during off-peak hours."

Comment 5: "That the storm water drainage system from the large paved and developed area surrounding the construction site be modified so as to prevent erosion to the surrounding area during times of heavy rain."

Response: The current construction plan is located on existing pavement and the new mirror coating shop will use existing storm water drains, as addressed in the text below from section 4.6 Hydrology, 4.6.1 Proposed Action. Although this drainage system will not be modified for this project, AFRL has submitted a request to initiate a separate project to conduct a study of the storm water drainage at MSSC for consideration and funding to its major command.

4.6 Hydrology 4.6.1 Proposed Action - Construction-related storm water runoff would be minimized by implementing erosion control best management practices. Non-storm water generated from pressure testing utility lines would be discharged to the existing septic system.

The area of disturbance, including the staging area, will be determined during the design process. If the area of disturbance is 0.4 hectare (1 acre) or greater, a NPDES permit for storm water discharges associated with construction will be obtained.

The AEOS MCS would not increase the impermeable surface area at MSSC. As with storm water runoff from existing impermeable surfaces in the area, runoff from the proposed AEOS MCS would drain into existing inlets in the pavement and/or onto the surrounding areas and quickly infiltrate into the highly permeable cinder surface, or be retained in the depression southwest of the facility prior to infiltration. Therefore, no significant adverse impacts to surface water are anticipated.

Thank you for participating in the review of the Draft Environmental Assessment for the Proposed AEOS Completion. If you have any questions regarding this effort please contact Ms. Michelle Hedrick at 505-846-4574.

Sincerely,

JANET AUGUSTINE, Lt Col, USAF
Commander

LINDA LINGLE
GOVERNOR OF HAWAII

CHIYOME L. FUKINO, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. Box 3378
HONOLULU, HAWAII 96801-3378

In reply, please refer to:
EPO-05-059
Ref# 2000.80.0523/05EP-177

July 18, 2005

Lt. Col. Brent Richert, AFRL
U.S. Air Force Research Laboratory
535 Lipoa Parkway, Suite 200
Kihei, Hawaii 96735

Dear Lt. Col. Richert:

SUBJECT: Draft Environmental Assessment for Proposed Advanced Electro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC) Haleakala, Maui, Hawaii, TMK: (2) 2-2-07: Parcel 8

Thank you for allowing us to review and comment on the subject document. We have no comment at this time. Please refer to our website for the Standard Comments (http://www.state.hi.us/health/environmental/env-planning/landuse/landuse.html). If there are any questions about these standard comments please contact Jiacai Liu with the Environmental Planning Office at 586-4346.

Sincerely,

June F. Harrigan-Lum

JUNE F. HARRIGAN-LUM, MANAGER
Environmental Planning Office

c: EPO

DEPARTMENT OF THE AIR FORCE
AIR FORCE RESEARCH LABORATORY (AFMC)

8 Sep 05

Detachment 15, AFRL/CC
535 Lipoa Parkway, Suite 200
Kihei, HI 96753

State of Hawaii
Department of Health
Environmental Planning Office
P.O. Box 3378
Honolulu, HI 96801-3378

RE: Draft Environmental Assessment for the Proposed Advanced Electro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC) Haleakalā, Maui Hawaii, TMK: 2-2-007:008, Haleakalā, Island of Maui, Hawaii, EPO-05-059

Dear Ms. Harrigan-Lum,

Thank you for participating in the review of the Draft Environmental Assessment for the Proposed AEOS Completion. The USAF has reviewed the standard comments on the referenced website and will comply with regulatory requirements. If you have any questions regarding this effort please contact Ms. Michelle Hedrick at 505-846-4574.

Sincerely,

JANET C. AUGUSTINE, Lt Col, USAF
Commander

Western-Pacific Region
Real Estate and Utilities Section, AHNL-54B

P. O. Box 50109
Honolulu, Hawaii 96850-5000

U.S. Department
of Transportation
Federal Aviation
Administration

July 21, 2005

U.S. Air Force Research Laboratory
Attn: Lt. Col. Brent Richert, AFRL
535 Lipoa Parkway, Suite 200
Kihei, Hawaii 96753

Dear Lt. Col. Richert:

By letter from Belt Collins Hawaii Ltd. of June 21, 2005, comments were requested regarding the draft *Environmental Assessment* for your proposed Advanced Electro-Optical System (AEOS) completion project at the Maui Space Surveillance Complex (MSSC), Haleakala, Maui, Hawaii.

The Federal Aviation Administration (FAA) requests your submission of a "Notice of Construction or Alteration" FAA Form 7460-1 for your project. This form and instructions are available at our website http://www.faa.gov.

We appreciate this opportunity to comment. Please contact me at (808) 541-1236 if there are any questions.

Sincerely,

Darice B. N. Young
Realty Contracting Officer

cc:
Office of Environmental Quality Control
Attn: Ms. Genevieve Salmonson, Director
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

State of Hawaii
University of Hawaii Institute for Astronomy
Attn: Mr. Michael Maberry
4761 Lower Kula Road
Kula, Hawaii 96790-0209

Belt Collins Hawaii Ltd.
Contact: Ms. Arlette S. Meader
2153 North King Street, Suite 200
Honolulu, Hawaiii 96819

DEPARTMENT OF THE AIR FORCE
AIR FORCE RESEARCH LABORATORY (AFMC)

8 Sep 05

Detachment 3, AFRL/CC
535 Lipoa Parkway, Suite 200
Kihei, HI 96753

U.S. Department of Transportation
Realty Contracting Officer
Federal Aviation Administration
Western-Pacific Region
P.O. Box 50109
Honolulu, HI 96850-5000

RE: Draft Environmental Assessment for the Proposed Advanced Electro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC) Haleakalā, Maui Hawaii, TMK: 2-2-007:008, Haleakalā, Island of Maui, Hawaii, 21 July 2005

Dear Ms. Young,

Thank you for reviewing the subject document. AFRL will complete FAA Form 7460-1 "Notice of Construction or Alteration" and will submit prior to construction.

Thank you for participating in the review of the Draft Environmental Assessment for the Proposed AEOS Completion. If you have any questions regarding this effort please contact Ms. Michelle Hedrick at 505-846-4574.

Sincerely,

JANET C. AUGUSTINE, Lt Col, USAF
Commander

ALAN M. ARAKAWA
Mayor

MICHAEL W. FOLEY
Director

WAYNE A. BOTEILHO
Deputy Director

COUNTY OF MAUI
DEPARTMENT OF PLANNING

July 27, 2005

Lt. Col. Brent Richert, AFRL
U.S. Air Force Research Laboratory
535 Lipoa Parkway, Suite 200
Kihei, Hawaii 96753

Dear Lt. Col. Richert:

RE: Draft Environmental Assessment for the Proposed Advanced Electro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC), TMK: 2-2-007: 008, Haleakala, Island of Maui, Hawaii (LTR 2005/1759)

The Maui Planning Department has reviewed the Draft Environmental Assessment (EA) for the proposed completion of the Advanced Electro-Optical System (AEOS) at the Maui Space Surveillance Complex (MSSC) atop Haleakala, Maui. The proposed action involves constructing and operating a two-story mirror coating shop to accommodate the 3.6-meter diameter mirror of the highly sensitive AEOS telescope near the southwest corner of the AEOS telescope building. The shop would be designed to house a staging area, assembly/disassembly area, mirror coating area, optics maintenance area, and mechanical and electrical utility rooms.

The Department provides the following comments on the Draft EA:

1. As indicated in the Draft EA, the MSSC is listed as a Small Quantity Generator (SQG) and can produce up to 1,000 kg of acute hazardous waste per month. Please clarify whether this status has been obtained from State Department of Health and discuss if there have been any violations of this status.

2. Provide further discussion relative to management practices of hazardous, regulated, and/or toxic materials/wastes that are stored, consumed, and generated on-site.

   a. Where are these substances stored?

b. Are impermeable secondary containment structures constructed around these areas?

c. Discuss any potential of these substances impacting the subsurface soils via stormwater drainage and septic systems.

3. The Department of Land and Natural Resources (DLNR), Land Division was formerly in the process of developing a Master Plan for Science City. Discuss the relationship of the proposed action with the master plan.

4. The Department recommends consulting with the County Fire Department.

5. The Department recommends consulting with the Cultural Resources Commission staffed by the Department. Please contact Mr. Stan Solamillo, Staff Planner, at 270-7506 for more information.

Although the 30-day public comment period has elapsed, the Department respectfully requests the foregoing comments be included in the Final EA. Thank you for your consideration. Should you require further clarification, please contact Ms. Kivette Caigoy, Environmental Planner, at 270-7735.

Sincerely,

MICHAEL W. FOLEY
Planning Director

MWF:KAC:lar
c: Wayne Boteilho, Deputy Planning Director
Kivette Caigoy, Environmental Planner
OEQC
Fire Department
Michael Maberry, University of Hawaii Institute for Astronomy
Arlette Meader, Belt Collins Hawaii Ltd.
TMK File
General File
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DEPARTMENT OF THE AIR FORCE
AIR FORCE RESEARCH LABORATORY (AFMC)

9 Sep 05

Detachment 15, AFRL/CC
535 Lipoa Parkway, Suite 200
Kihei, HI 96753

Mr. Michael Foley
Planning Director
County of Maui Department of Planning
250 South High Street
Wailuku, Hawaii 96793

RE: Draft Environmental Assessment for the Proposed Advanced Electro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC) Haleakalā, Maui Hawaii, TMK: 2-2-007:008, Haleakalā, Island of Maui, Hawaii, 27 JUL 2005 letter.

Dear Mr. Foley,

AFRL has received comments from Maui Planning Department on the Draft Environmental Assessment for the Proposed AEOS Completion at the MSSC, Haleakalā, Maui, Hawaii.

1. MSSC is a Small Quantity Generator (SQG), which can generate up to 1,000 kg per month of hazardous waste, *not* acute hazardous waste. MSSC's SQG status is recorded as required with the US EPA Region 9. The Hawaii Department of Health does not require direct submission of the "Notification of Regulated Waste Activity", EPA Form 8700-12, but coordinates directly with EPA Region 9. MSSC has not exceeded 1,000 kg of hazardous waste generated per month. The actual amount MSSC generates qualifies the MSSC as a Conditionally Exempt Small Quantity Generator (100 kg or less per month), but the AFRL wishes to maintain the higher regulatory requirements due to the sensitive nature of the summit area and to retain the ability to exceed 100 kg per month if needed.

   The second paragraph of section 3.9.1.1 of the Final Environmental Assessment will be revised to include the following underlined text, "...MSSC is <u>recorded as</u> a small quantity generator <u>with the US EPA Region 9</u>, which means it can generate between 100 and 1,000 kilograms (220 and 2,205 pounds) of hazardous waste per month. The fiscal year 2004 records show that 310 kilograms (684 pounds) of hazardous waste was generated at MSSC. <u>MSSC is in compliance with, and does not have recorded violations or enforcement actions against, its SQG status</u>." (source: EPA Enforcement & Compliance History Online (ECHO) for the Maui Space Surveillance Complex).

2. items a and b. The MSSC stores most of its hazardous materials and hazardous waste in specially built storage units which are located on the west side of the MSSS building. The hazardous material and hazardous waste storage units have secondary containment, and fire detection and suppression systems. Smaller amounts of hazardous materials, that are used and stored in labs and maintenance areas, are stored in flammables or corrosive liquids cabinets which have secondary containment. Drums stored outside the buildings are in covered drum storage units with secondary containment. The emergency generator diesel fuel tanks and piping are double walled with interstitial monitoring systems. Revisions to the Final Environmental Assessment are provided below.

item c. MSSC has a number of plans and practices in place to prevent release of hazardous materials and waste and prevent impacts to the environment, including subsurface soils via storm water drainage and the septic system. At MSSC, hazardous materials are monthly inventoried and inspected for container integrity, compatible storage and secondary containment cleanliness. Hazardous waste accumulation areas receive daily and weekly inspections for waste segregation and container integrity. The above ground diesel tanks have trained fuel tank custodians to monitor fueling and transfer operations in accordance with US EPA requirements. As an additional precaution to prevent potential release of hazardous waste to the subsurface, the mirror stripping area of the AEOS MCS would not have floor drains. Revisions to the Final Environmental Assessment are provided below.

The first paragraph of section 3.9.1.1 of the Final Environmental Assessment is revised to include the following underlined text, "Solvents are used to maintain the optics and acids are used to strip the reflective surfaces off mirrors before recoating. MSSC stores most of its hazardous materials in specially built storage units which are located on the west side of the MSSS building. The hazardous material storage units have secondary containment, and fire detection and suppression systems. Hazardous materials that are used and stored in laboratories and maintenance areas are stored in flammables or corrosive liquids cabinets with built-in secondary containment. MSSC has a Hazardous Material Emergency Planning and Response Plan (HAZMAT Plan) that provides guidance on the handling of hazardous materials.

The second paragraph of section 3.9.1.1 of the Final Environmental Assessment is revised to include the following underlined text, "Hazardous wastes generated at MSSC are segregated at the generation point for appropriate handling. Hazardous waste at MSSC is managed in the 270-day hazardous waste storage units, located near the hazardous materials storage units, and the average storage time in fiscal year 2004 ranged from 42 to 153 days. The hazardous waste storage units have built-in secondary containment, and fire detection and suppression system. Sampling and analysis..."

The third paragraph of section 3.9.1.1 of the Final Environmental Assessment is revised to include the following underlined text, "MSSC has a Contingency Plan and a Spill Prevention, Control and Countermeasures Plan that set forth the procedures for conducting response actions in case of hazardous waste releases into the air, soil, or water that pose a threat to the environment. MSSC has a spill response team trained in accordance with OSHA, and spill response equipment is staged at the hazardous material and waste storage units. MSSC also has several administrative plans in place to prevent

release of materials and promote environmentally responsible management, such as the Pollution Prevention Plan, which addresses measures to achieve pollution prevention program goals, funding, management procedures, and identifies cost effective processes or technologies."

The second paragraph of section 4.9.1.1 of the Final Environmental Assessment is revised to include the following underlined text, "The materials used in stripping and recoating the AEOS mirror would be the same as those currently used for maintaining smaller mirrors at the existing AEOS telescope building. The mirror would be placed within a plastic-lined wash tank, where the degraded reflective surface would be stripped off the mirror using an acid solution. As an additional precaution to prevent potential release of hazardous waste to the subsurface, the mirror stripping area of the AEOS MCS would not have floor drains. The glass would then be rinsed off in the tank. The resulting hazardous waste would be captured in a drum and stored in MSSC's 270-day hazardous waste storage unit until it can be manifested for disposal, at which time it would be transported off-site for proper disposal. The volume of hazardous waste that would be generated from stripping the AEOS mirror is anticipated to be between 207 and 376 kilograms (456 to 829 pounds), once every six years."

3. The proposed action has been included in the University of Hawai'i's (UH) Long Range Development Plan (LRDP) for the Haleakalā Observatories (HO). The LRDP is a master plan for the 18-acre HO area that describes future development and related construction practices that consider the environmental, cultural, and historical importance of Haleakalā. Please see the attached UH Institute for Astronomy letter dated August 26, 2005.

4. Mr. Carl Kaupalolo, of the Maui Fire Department and the Royal Order of Kamehameha, Heiau O Kahekili, was contacted during the pre-assessment consultation activities and was provided a copy of the Draft EA.

5. Ms. Dawn Dunsing, Cultural Resources Commission, was contacted during the pre-assessment consultation phase and stated that she would review the copy of the Draft EA that was sent to your office. After receipt of your letter, we understand that Ms. Dunsing no longer works for the Cultural Resources Commission. Belt Collins has contacted Mr. Stanley Solamillo and mailed a copy of the Draft EA for his review. AFRL will comply with the UH's LRDP with regards to protection of historic and cultural resources by following the identified construction practices.

Thank you for participating in the review of the Draft Environmental Assessment for the Proposed AEOS Completion. If you have any questions regarding this effort please contact Ms. Michelle Hedrick at 505-846-4574.

Sincerely,

JANET AUGUSTINE, Lt Col, USAF
Commander

DEPARTMENT OF BUSINESS,
ECONOMIC DEVELOPMENT & TOURISM

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

LINDA LINGLE
GOVERNOR
THEODORE E. LIU
DIRECTOR
MARK K. ANDERSON
DEPUTY DIRECTOR
LAURA H. THIELEN
DIRECTOR
OFFICE OF PLANNING

Telephone: (808) 587-2846
Fax: (808) 587-2824

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 Electro-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.

b. The cultural and archeological sites and features identified near MSSC, but outside the project area, would not be affected. The two sites nearest to the proposed construction and staging areas are already protected, as Site 2806 is clearly marked with fence buffer and Site 5440 is separated from the staging area by a road.

c. Construction crew members and permanent employees working on the AEOS MCS will attend UH-approved "Sense of Place" training prior to working at the project site. This training will instruct individuals on the cultural and historic significance of the Haleakala Summit, as well as describe the spiritual essence of the area's natural resources.

d. A cultural specialist shall be retained to conduct a cultural inspection of Haleakala Observatories, including the proposed AEOS MCS site, three times per year, to ascertain compliance with Hawaii Administrative Rules, Title 13, Sub-Title 13, Chapter 277, "Rules Governing Requirements for Archaeological Site Preservation Development."

2. Protection of threatened and endangered species. In accordance with the CZM federal consistency assessment (p. 9) and the Draft Environmental Assessment (June 2005, pp. 4-4, 4-5), measures identified in the Long Range Development Plan for the UH IfA Complex and measures identified by the U.S. Fish and Wildlife Service shall be implemented to minimize the potential effects of construction activities on threatened and endangered species, specifically the 'ahinahina (Haleakala silversword), 'ua'u (Hawaiian Dark-rumped Petrel) and nene (Hawaiian Goose).

3. Hazardous materials. In accordance with the CZM federal consistency assessment (p. 8) and the Draft Environmental Assessment (June 2005, p. 4-12), hazardous materials will be properly stored, used, and disposed of to prevent releases and to protect the ground from contamination. State of Hawaii, Federal, and U.S. Air Force requirements for storage, handling, and disposal of hazardous materials shall be complied with. Any spill of a hazardous material will be immediately reported to the Air Force Research Laboratory and the on-site UH IfA supervisor. Hazardous material spill containment activities will be implemented under UH and U.S. Air Force supervision. Release reporting requirements will also be implemented in accordance with MSSC policies and plans, State of Hawaii Revised Statutes, U.S. EPA law, and U.S. Air Force Instruction 32-4002, *Hazardous Material Emergency Planning and Response Compliance*.

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

DEPARTMENT OF THE AIR FORCE
AIR FORCE RESEARCH LABORATORY (AFMC)

8 Sep 05

Detachment 15, AFRL/CC
535 Lipoa Parkway, Suite 200
Kihei, HI 96753

State of Hawaii
Department of Business Economic
Development & Tourism
Office of Planning
P.O. Box 2359
Honolulu, HI 96804

RE: Hawaii Coastal Zone Management (CZM) Program Federal Consistency Review for the Proposed Advanced Electro-Optical System (AEOS) Completion at the Maui Space Surveillance Complex (MSSC) Haleakalā, Maui Hawaii, TMK: 2-2-007:008, Haleakalā, Island of Maui, Hawaii, August 3, 2005 letter.

Dear Ms. Thielen,

The USAF will comply with the conditions set forth in your letter and the USAF's CZM application and assessment form.

Thank you for participating CZM Program Federal Consistency Review for the Proposed AEOS Completion at the MSSC. If you have any questions regarding this effort please contact Ms. Michelle Hedrick at 505-846-4574.

Sincerely,

JANET C. AUGUSTINE, Lt Col, USAF
Commander