1999 FEIS HAWAII
MAUNA KEA SCIENCE RESERVE MASTER PLAN
1 OF 2

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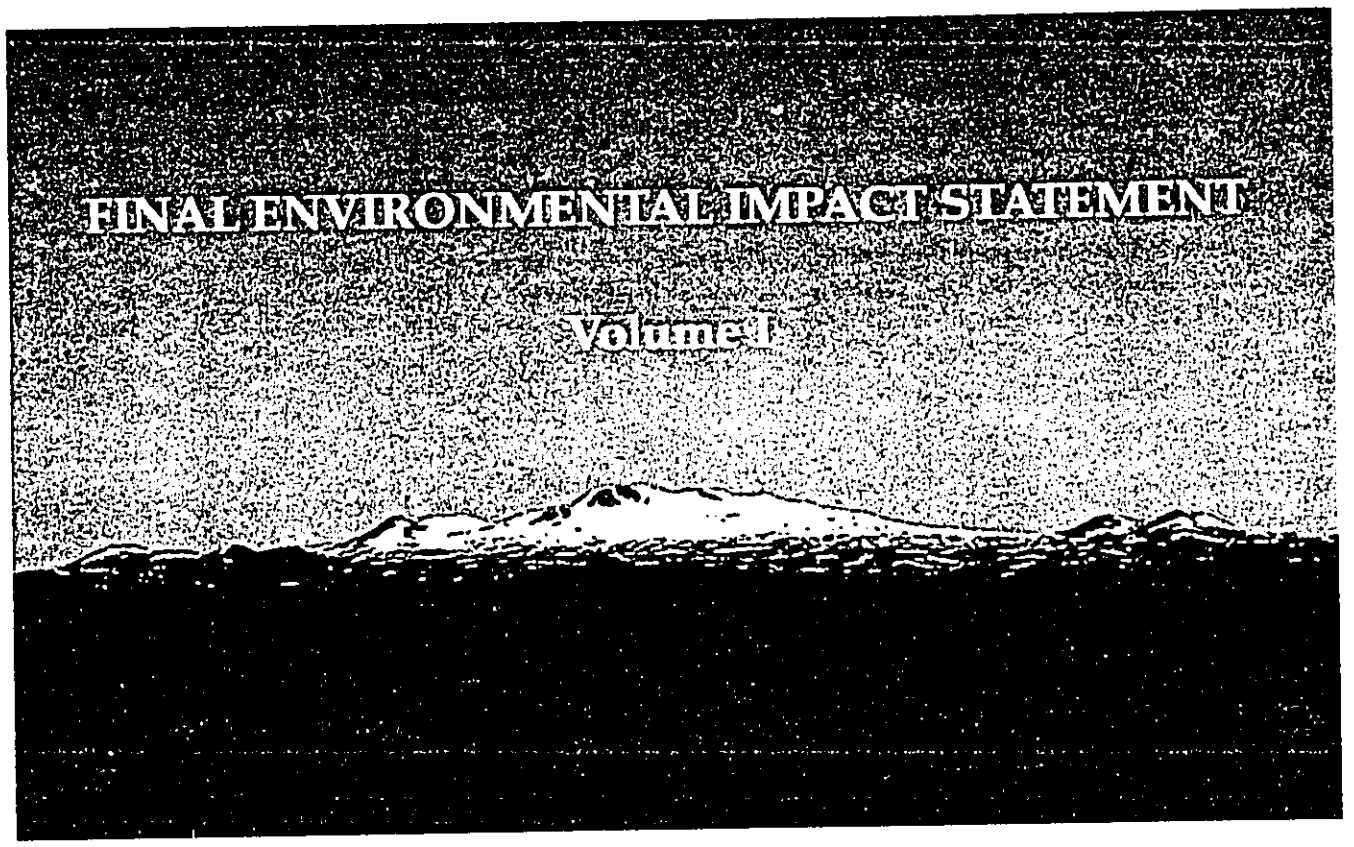
MAUNA KEA SCIENCE RESERVE MASTER PLAN



Prepared for:

The University of Hawai'i

Prepared by:

Group 70 International, Inc.

December 1999

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Mauna Kea Science Reserve
Master Plan

Hāmākua District, Island of Hawai'i

Final Environmental Impact Statement

This environmental document is prepared pursuant to Chapter 200 of Title 11, Administrative Rules, Department of Health, "Environmental Impact Statement Rules."

Proposing Agency:

University of Hawai'i

Accepting Authority:

Governor
State of Hawai'i

Responsible Official: _____ DEC 27 1999
Date

Eugene S. Imai
Senior Vice President for Administration
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REVISIONS INCLUDED IN THE FINAL ENVIRONMENTAL IMPACT STATEMENT

Based on the comments received on the Draft Environmental Impact Statement (DEIS), a number of revisions were made to the text which are included in the Final Environmental Impact Statement (FEIS). To facilitate review of the FEIS, significant changes in or additions to the text are shown in light gray shading. Most of the changes represent new additional text, and there are no significant text deletions.

New figures have been added in the Final EIS and several figures from the Draft EIS have been updated. Please refer to the shaded items in the Table of Contents List of Figures for revised and new figures.

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A. Astronomy Research Development Plan (Institute for Astronomy, August 1999)

B. Botanical Resources, Hale Pōhaku Mid-Elevation Facilities (Char, July 1999)

Botanical Resources, Mauna Kea Summit, Hawai'i (Char, July 1999)

C. 1999 Mauna Kea Science Reserve and Hale Pōhaku Complex Development Plan Update: Oral History and Consultation Study, and Archival Literature Research. Ahupua'a of – Ka'ohe (Hāmākua District) and Humu'ula (Hilo District), Island of Hawai'i (various TMK) (Maly, February 1999)

D. An Arthropod Assessment within Selected Areas of the Mauna Kea Science Reserve – Final Report (Howarth, Brenner, Preston, May 7, 1999)

E. Mauna Kea Science Reserve Archaeological Site Inventory: Formal, Functional, and Spatial Attributes (McCoy, February 1999)

Mauna Kea Science Reserve Site Descriptions – DRAFT (McCoy, 1999)

F. Mauna Kea Science Reserve Complex Development Plan Update – Roadway and Utilities Report (Sam O. Hirota, July 1999)

G. Economic Impact of Mauna Kea Observatories, Hawai'i County, State of Hawai'i (SMS Research and Marketing, Inc., July 1999)

H. Cultural Impact Assessment Study: Native Hawaiian Cultural Practices, Features, and Beliefs Associated with the University of Hawai'i Mauna Kea Science Reserve Master Plan Project Area (PHRI, Inc., August 1999)

I. Management Components of the Historic Preservation Plan for Mauna Kea – Outline and Review Draft (State Historic Preservation Division, November 1999)

J. Master Plan Responses to Community Input (Group 70 International, Inc., November 1999)

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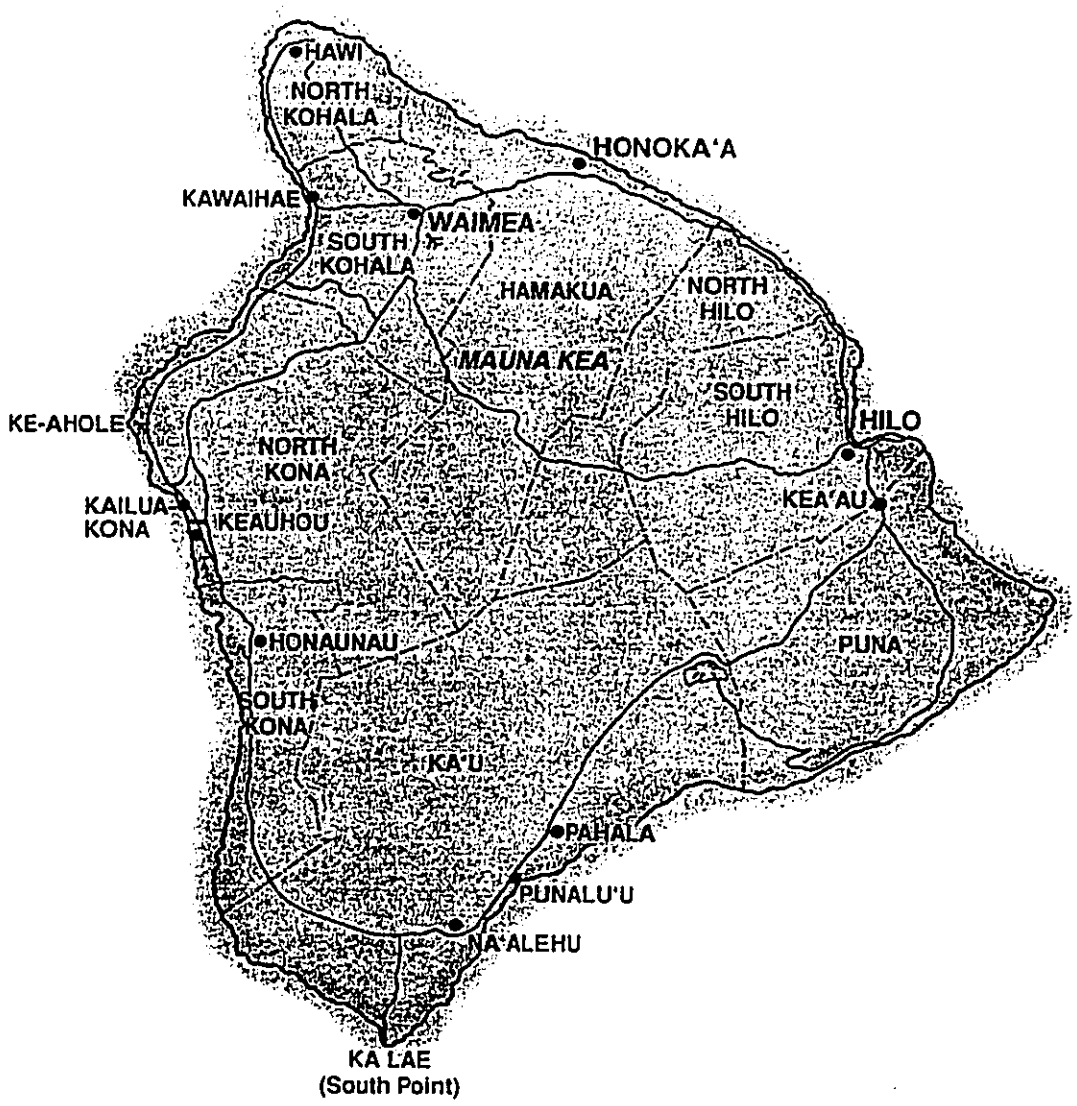
Section 1.0

Summary

1.0 SUMMARY

1.1 PROJECT INFORMATION SUMMARY

Project Name:	Mauna Kea Science Reserve Master Plan
Applicant:	University of Hawai'i 2444 Dole Street, Bachman Hall 112 Honolulu, Hawai'i 96822 Contact: Allan Ah San, Associate Vice President for Administration
Accepting Authority:	Governor State of Hawai'i
Planning/Environmental Consultant:	Group 70 International, Inc. 925 Bethel Street, 5th Floor Honolulu, Hawai'i 96813 Contact: Jeffrey Overton, AICP (808) 523-5866
Tax Map Keys/Land Area:	TMK 4-4-15:09, 12 Mauna Kea Science Reserve: 11,288 acres. Hale Pōhaku Mid-Elevation Facilities: 19 acres
Location:	Ka'ohe Ahupua'a, Hāmākua District, Island of Hawai'i (Figure 1-1)
Ownership:	State of Hawai'i
Existing Uses:	Mauna Kea Science Reserve Observatories: UH 0.6m, UH 2.2m, IRTF, Gemini, CFHT, UKIRT, Keck I & II, Subaru, JCMT, CSO, SMA, VLBA Hale Pōhaku Mid-Elevation Facilities, Visitor Information Station, Construction Camp, Stone Cabins, Arboretum
Proposed Action:	Master Plan and Management Plan for Existing and Proposed Uses in the Mauna Kea Science Reserve and Hale Pōhaku
State Land Use District:	Conservation District



Island of Hawai'i

No Scale

Mauna Kea Science Reserve Master Plan
Environmental Impact Statement

Figure 1-1

County of Hawai'i LUPAG Designation:	Conservation
County of Hawai'i General Plan Designation:	Conservation
County of Hawai'i Zoning Designation:	Not Applicable

1.2 DESCRIPTION OF THE MASTER PLAN

The planning process for the Mauna Kea Science Reserve Master Plan included the findings of the Mauna Kea Advisory Committee, a group of 23 stakeholders including native Hawaiians, State and County government representatives, environmental group leaders, local business representatives and other community leaders convened to advise the President and Board of Regents of the University of Hawai'i. The MKAC gathered for more than 20 working sessions, public meetings, and field trips beginning in June, 1998.

The Mauna Kea Advisory Committee discussed the following overall goals for the Master Plan:

1) Develop a vision for the sustainable use and enhancement of the Mauna Kea Science Reserve as a Hawaiian place with significant and unique cultural, natural, educational/research and recreational values, meanings and potentials, both locally and globally.

2) Integrate and balance cultural, natural, education/research and recreational values and uses in a physical and management plan which will remedy existing problems and provide a framework and structure for the responsible and sustainable stewardship of the Mauna Kea Science Reserve.

The Master Plan is divided into two major components: the Physical Plan and the Management Plan. The actions proposed in the Master Plan are addressed in this Environmental Impact Statement. Brief summaries of the Physical Plan and Management Plan are provided below.

The Physical Plan for the Mauna Kea Science Reserve consists of physical plans, maps, geographic information system, and criteria, which promote the sustainable use, enhancement and development of the resources of the Mauna Kea Science Reserve and Hale Pōhaku. The Plan has four components, including: (1) Natural Resources, (2) Cultural Resources, (3) Education and Research, and (4) Recreational Resources. The Physical Plan will guide the sustainable use and enhancement of these four resource components.

- The natural resource component documents the extent of significant habitat areas and unique geology areas, and delineates preservation areas to protect natural resources (e.g. Wēkiu bug habitat, alpine ecosystems).

- The historic and Hawaiian cultural component identifies archaeological sites and culturally significant landforms to be preserved.
- Appropriate sites for the future expansion of education and research at astronomy facilities are identified, with respect for natural and cultural resource preserve areas.
- The recreational uses of the mountain are defined as use areas, designated to protect and enhance recreational opportunities (e.g. skiing, hiking).

Highlights of the Physical Plan include:

1. Designation of a Natural and Cultural Preservation Area. The majority of the Science Reserve (95%) is re-designated as a Natural and Cultural Preservation Area to protect all undeveloped cinder cones (*pu'u*), archaeological sites (primarily shrines) and sensitive flora and fauna habitat from future development.

2. Establishment of an Astronomy Precinct. A 525-acre area is defined in the area of existing development near the summit within which future astronomy development is limited to the redevelopment ("recycling") of older existing observatories and limited construction of new observatories, following siting requirements and design guidelines to minimize impacts to natural and cultural resources.

The Management Plan proposes policies and strategies to integrate and balance the natural, cultural, educational/research and recreational values of Mauna Kea within a framework that provides responsible stewardship of the resources. It seeks to allocate resources and priorities toward sustainable use and enhancement of the Mauna Kea Science Reserve as a Hawaiian place with a unique and significant meaning, both locally and globally.

The Management Plan creates a structure for sustainable, focused management of the resources and operations of the Mauna Kea Science Reserve in order to:

- Protect historic/cultural resources: e.g. archaeology sites, traditional cultural practices;
- Protect natural resources: e.g. Wēkiu habitat, alpine ecosytem;
- Protect and enhance education and research: e.g. astronomy, Hawaiian language and culture, archaeology, ecology, geology;
- Protect and enhance recreational opportunities: e.g. hiking, snow play and skiing; and
- Promote public safety.

The Management Plan seeks to create a structure which meets the following objectives:

- Promotes community input.
- Establishes local management
- Establishes a focal point for management responsibility.
- Establishes clear lines of decision making and accountability.
- Economically and structurally feasible.
- Provides a base for future expansion of the scope of activities in the Science Reserve

Highlights of the Management Plan include:

1. Creation of a Locally-based Management Entity. The Office of Mauna Kea Management (MKM) will be created and funded within the University of Hawai'i at Hilo, which will bring management decision-making for Mauna Kea to a local Hawai'i Island level.

2. On-Mountain Management Presence. Rangers will be hired as staff of the MKM to provide on-going management and protection of the mountain resources, and to provide education to visitors to the mountain.

3. Creation of an On-Going Advisory Board. A Mauna Kea Advisory Board will be established, consisting of representatives from major stakeholder groups, to review future planning and management decisions, advise the University and the Office of Mauna Kea Management, and provide a continuous linkage with the broader community.

1.3 REASONS FOR PREPARING THIS ENVIRONMENTAL IMPACT STATEMENT

The Mauna Kea Science Reserve and Hale Pōhaku are leased to the University of Hawai'i from the State of Hawai'i. The proposed actions that are reviewed in this Environmental Impact Statement (EIS) involve the use of State land, which triggers the application of Chapter 343, Hawai'i Revised Statutes (HRS), and the Environmental Impact Statement Rules, Title 11, Chapter 200 of the Hawai'i Administrative Rules (HAR). This EIS has been filed with the State of Hawai'i's Office of Environmental Quality Control (OEQC) for publication in the Environmental Notice, and copies have been distribution to interested parties, as required under the EIS Rules.

1.4 SIGNIFICANT BENEFICIAL AND ADVERSE IMPACTS

As stated above, the Master Plan for the Mauna Kea Science Reserve and Hale Pōhaku is intended to protect natural and cultural resources, educational and research resources and recreational resources. The Management Plan establishes new management practices and other measures aimed at preserving and protecting those resources. The Physical Plan, and the actions proposed therein, is intended to avoid substantive impacts and enhance the natural habitat, culturally-significant areas and recreational uses. The new Management Plan will implement measures to protect and enhance the resources of the Science Reserve and Hale Pōhaku.

As such, the potential impacts of the Physical Plan and Management Plan may be beneficial. These are briefly enumerated below. Also listed below are the adverse impacts that may be expected to occur.

1.4.1 Beneficial Impacts

- Designation of a 10,760-acre Natural and Cultural Preservation Area, which creates a perpetual no-build preserve area including over 95% of the 11,228-acre Science Reserve and containing significant natural habitat and cultural areas.

- Potential adverse impacts to traditional Hawaiian archaeological sites and sensitive alpine ecosystems are avoided, and existing protective measures are maintained or enhanced.

- There will be no limits to traditional access for Hawaiian cultural practices and hunting.

- Education and research benefits will result from the creation of an Astronomy Precinct, providing for the limited redevelopment of older observatories at the summit, and the limited development of new observatories at pre-determined areas with the least potential to affect significant natural and cultural resources.

- Recreational benefits will result from the creation of a recreational support facility with parking at the summit for public use, especially during the winter snow play season, and the conversion of the construction cabins at Hale Pōhaku for educational and recreational group use.

- The diversity, meaningfulness and richness of users' contact with Mauna Kea's resources will be enhanced by new educational information provided at the Hale Pōhaku Visitor Information Station.

- A local-based management entity will be created and funded (Office of Mauna Kea Management) to establish local decision-making for Mauna Kea.

- On-going direct management of mountain resources will be established by rangers hired as staff of the MKM. Rangers will provide on-going management and protection of the mountain resources, including education of visitors to the mountain.

- A continuous linkage with the broader community will be maintained through a Mauna Kea Advisory Board, consisting of representatives from major stakeholder groups, to review future planning and management decisions, advise the University and the Office of Mauna Kea Management.

- A separate *Kahu/Kūpuna* Advisory Committee to the Advisory Board is proposed, to include *kūpuna* from the Island of Hawai'i who could guide decisions on cultural practices and preservation.

- Approximately 135 to 210 new jobs will be created to staff the new observatory facilities (on and off-mountain), management office and programs, and the Visitor Information Station.

- Direct and indirect revenues to the State of Hawai'i and the County of Hawai'i will be increased by $12.2 million to $16.6 million per year through new construction spending, income tax from employees, and general excise tax on spending in the community.

1.4.2 Adverse Impacts

- There will be construction-related impacts, such as soil disturbance, dust generation, noise, exhaust emissions and equipment/worker traffic, relating to each of the proposed locations for redeveloped and new observatories and recreational support building within the Science Reserve, and for improvements at the Hale Pōhaku Visitor Information Station.

- The proposed development of new observatories in the Science Reserve will place new structures in areas that have previously been undeveloped in the summit region of Mauna Kea, which will affect soils and surface geology, and flora and fauna habitat.

- Proposed development of new observatories will not impact individual archaeological features; however, they may be viewed as having broader cultural impact on the mountain.

- Views of Mauna Kea from on-mountain and off-mountain locations will be affected by the presence of redeveloped and new observatories.

- Traffic to and from the Mauna Kea Science Reserve and Hale Pōhaku relating to research activities and visitors will increase slightly.

- Electrical energy use, water use and wastewater generation will increase to serve new and expanded facilities in the Science Reserve and at Hale Pōhaku.

1.5 PROPOSED MITIGATIVE MEASURES

As noted above, there are potential adverse impacts resulting from the planned improvements. Mitigative measures that will be taken to minimize these impacts, as well to address and eliminate other potential adverse impacts, are as follows:

Construction Impact Mitigation. Potential impacts due to construction activities will be limited by following best management practices and applying soil stabilizers during site work to minimize dust generation.

Cultural Resources Mitigation. The creation of the boundaries of the Natural and Cultural Preservation Area provide significant protection of cultural resources:

- Protection of all the undeveloped *pu'u* of the Science Reserve,
- Protection of the inter-relationship between shrines and culturally-significant landforms
- Protection of a view channel sector to the west from the summit (Kūkahau'ula), and

- Protection of all the shrines and other archaeological features found in the Science Reserve.

Enforcement of Management Rules by Rangers. Rangers hired under the new management plan will monitor and protect cultural areas and sensitive habitat areas, manage access, and educate visitors to help avoid impacts to the mountain's cultural and natural resources.

Archaeological Site Setbacks and Construction Mitigation. Known archaeology sites are mapped with Global Positioning System (GPS) coordinates. No known sites will be affected by the actions proposed under the Master Plan. New development will observe a minimum 200-foot setback from archaeological sites, which is 10 times the minimum distance required currently by the Hawai'i Island Burial Council. Construction activities will be monitored by a professional archaeologist, and in the event that remains or artifacts are found during construction, work will be stopped and the State Historic Preservation Office will be consulted to determine the appropriate measures.

Habitat Protection. Prior to new construction at any undeveloped site in the Astronomy Precinct, detailed surveys of flora and fauna species will be completed to avoid disturbance of significant habitat areas, with sensitive areas flagged to provide construction setbacks.

Visual Impact Mitigation Through Design Guidelines. Design guidelines will dictate the limits of new facilities to be constructed in the Science Reserve. The redevelopment of existing observatories on the summit ridge will be limited to facilities no larger than the existing Gemini observatory, and enclosure colors should blend with the sky background. Enclosures for new facilities to be built off the summit ridge should be colored to match the surrounding weathered lava landscape.

1.6 ALTERNATIVES

Alternatives to the proposed Physical Plan and Management Plan that were considered include the following options: (a) No Action Alternative, (b) Postponing Actions of the Master Plan Pending Further Study, (c) Alternative Locations for Proposed Actions of the Master Plan, (d) More Intensive Development than the Proposed Master Plan, and (e) Management Alternatives.

No Action – This alternative was rejected because it would have less beneficial and more adverse impacts than will the implementation of the proposed Master Plan. In addition, the recommendations of the 1998 Legislative Auditor's Report require that action be taken. In this scenario, there would be no improvement to the existing issues with astronomy development activities or management of the natural, cultural, educational and recreational resources. The entire 11,288-acre Science Reserve could remain open for possible future development of astronomy facilities, or other buildings associated with research or recreation.

The no action option would not provide any improvement to the current Management Plan, and there would be no move to place management responsibilities with a local Hawai'i Island entity. Efforts to involve the Hawai'i Island community in an ongoing advisory role would not be

instituted in this alternative. Altogether, the No Action Alternative would result in detrimental impacts to the resources of the mountain.

Postponing Actions of the Master Plan Pending Further Study – To postpone the actions of the Master Plan and Management Plan would result in many of the same negative effects anticipated to occur under the No Action Alternative. The Master Plan was developed over two years and there are few technical issues which are pending further study that could resolve outstanding questions about the Science Reserve resources and potential impacts. Previously completed and newly commissioned studies of flora, fauna, geology, archaeology, cultural resources, and infrastructure have been assessed and incorporated into the master planning process. As occurred in the period between the completion of the 1983 Complex Development Plan and this Master Plan, numerous studies are anticipated in the future. Each subsequent study adds to the overall knowledge base concerning the mountain.

The specific project designs and anticipated schedules for the new and redeveloped observatories have not been completed at the time of this document. Individual project proposals will have their own environmental studies and CDUA permit review; therefore, the details of each project will be evaluated and refined prior to the actual development proceeding.

Alternative Locations for Proposed Actions of the Master Plan – There are several possible alternative locations for the planned new observatories and recreational support facilities in the Master Plan. Alternative locations for these facilities could be considered using the following parameters: (a) Land–based locations for new observatories other than Mauna Kea, (b) Alternative locations for new observatories in the Science Reserve, and (c) Space-based facilities.

(a) Alternative Locations for Observatories Besides Mauna Kea – There are several possible locations that may be suitable for developing new observatories in the Northern Hemisphere. These include locations in Arizona, New Mexico, Canary Islands, California, and Mexico. Mauna Kea presents a number of unique qualities that make it the best location in the Northern Hemisphere, and possibly the world, for land-based astronomy. These factors include altitude, favorable atmospheric qualities, frequency of clear weather, latitudinal position, and mid-ocean position (lack of other visible land-based light sources), quality fiber optic communications system, and ease of accessibility. Development and operation of astronomy facilities on Mauna Kea provides significant economic benefit to the people of Hawai'i. Only the leading astronomy research proposals, in terms of new facilities, will be considered for development on Mauna Kea.

(b) Alternative Locations within the Science Reserve – The proposed establishment of the Astronomy Precinct would create a 525-acre area within which future observatories could be proposed, and developed if found to be consistent with the provisions of the Master Plan. A fundamental reason for proposing the Astronomy Precinct is to protect the rich archaeological and cultural resources of the upper slopes and summit region. Locations outside of the Astronomy Precinct pose the potential for significant adverse effects to both archaeological sites and culturally-significant landforms. Under this alternative, other locations within the Science Reserve could be considered for development of observatories, such as Pu'u Poli'ahu. However, this would violate an overriding principal of cultural sensitivity that underlies the Master Plan. It

is expected that facilities developed at locations outside the Astronomy Precinct would create greater impacts than those planned appropriately within the siting areas identified within the Astronomy Precinct.

(c) Space-based Observatory Facilities. The possible deployment of space-based telescopes to replace ground-based telescopes has been suggested as an alternative to future expansion on Mauna Kea. Yet there are limitations to space-based instruments that make ground-based telescopes superior. Certain types of observations cannot be made from space because of the equipment requirements. Ground-based telescopes are also needed to support a space-based instrument to aid in the resolution of images. In comparison to a ground-based telescope, there are also tremendous differences in the cost of constructing, deploying, operating and maintaining just one space-based instrument. The large number of astronomy research projects that are on-going could not be satisfied by one or two space-based instruments. Given the cost limitations, the types of research limitations, and the need for ground-based telescope support, there is no short to mid-term likelihood that space telescopes will replace ground-based telescopes on Mauna Kea.

Limiting New Development While Improving Existing Facilities. This alternative considers the possibility of limiting redevelopment of astronomy facilities to areas which are presently occupied with observatories. This would include the development of expanded recreational and visitor support facilities at Hale Pohaku. This scenario would include the redevelopment of the older observatories at the summit ridge and the older facilities in millimeter valley. There would be no new observatory sites developed in this alternative.

Given these constraints on the future use of Mauna Kea for locating new astronomy instruments, the world astronomy community would eventually need to look elsewhere to develop these "next generation" instruments. In this scenario, Mauna Kea would eventually diminish in its importance scientifically, and may no longer be considered as the world's premier observatory complex several decades from now. As compared to the proposed action, the potential impacts to wildlife, shrines and cultural resources would be less under this option. There would ultimately be a tangible impact upon the State and County economy due to the eventual diminished construction, employment, direct and indirect spending, and government revenues.

More Intensive Astronomy and Recreational Facilities Development – This alternative considers the possible expansion of astronomy facilities to areas outside the planned Astronomy Precinct. Another aspect of this alternative could be the development of larger and more expansive observatories within the Astronomy Precinct. Options such as the development of substantial recreational/visitor support facilities could expand development to locations such as the summit ridge, undeveloped *pu'u* such as Poli'ahu, or adjacent to the Natural Area Reserve. All of these scenarios would be in basic conflict with the goals of the Master Plan. The Master Plan proposal for limited astronomy development is within a confined area of least potential impact to natural and cultural resources. Expanded observatory development could have significant impacts to the natural and cultural resources of the Mauna Kea Science Reserve.

Management Organization Alternatives. There are numerous options that could be considered in terms of the management organization for the Mauna Kea Science Reserve. Several issues that

were discussed at length with the Mauna Kea Advisory Committee during 1998/99 included alternative structures possible for a local Hawai'i Island management, the extent of decision-making authority, and funding mechanism for a new management entity.

1.7 UNRESOLVED ISSUES

Several unresolved issues have been identified in the planning process for the Mauna Kea Science Reserve and Hale Pōhaku. There are both physical planning issues and management issues which remain unresolved at the time of this document. Brief summaries of each unresolved issue are discussed below, and a more detailed analysis is presented in Section 8.0.

Carrying Capacity of Mauna Kea Science Reserve – The capacity of the Science Reserve to accommodate new observatories and other research or recreational facilities is essentially limited by the infrastructure service, such as roadways and electrical power, and available sites. The current infrastructure serving the summit is adequate to support several times the existing number of observatories. Numerous excellent potential sites exist throughout the Science Reserve. Using these measures, there is the "capacity" to build over a hundred observatories on the summit of Mauna Kea. However, this would be antithetical to the objectives of the Plan. This disregards potential impacts to views and cultural sensitivities, landforms and practices, yet would be within a practical "capacity". There is no intention for future expansion of observatories beyond the Astronomy Precinct.

Scope of Future Astronomy Facilities Expansion - The limited expansion of astronomy facilities within the Astronomy Precinct is unacceptable to some who believe that no further expansion should occur. One position is that only the existing observatories should be allowed to redevelop, within strict guidelines that limit their size and color, and that no new observatories should be built. The astronomy research community continues to support the limited future expansion of the observatory complex on Mauna Kea to accommodate new technologies and demand for research at the leading edge of astronomy.

Access Management – The control of access for visitors to Mauna Kea is not resolved. Some interests would prefer that access remain unrestricted, while others would prefer that access is managed. Those in support of managed access believe that public safety and resource protection are best achieved through the creation of a check-in station. This station would help educate visitors about altitude health issues and monitor in/out travel, along with requiring only four-wheel drive vehicles between Hale Pōhaku and the summit. Some feel that a new management scheme should not place these types of constraints on visitors to the Science Reserve, and that open access be allowed at all times to the summit.

Decision Authority Over New Observatory Proposals – The policy authority of the proposed Mauna Kea Advisory Board and Office of Mauna Kea Management is directed toward protecting the resources of the Science Reserve. These new management entities would be responsible for managing the uses of the land in keeping with the Master Plan. New observatory construction proposals would be reviewed by these groups, and advisory recommendations would be passed

on to the Chancellor of UH Hilo. Some would prefer that the new management entity would replace the authority of the UH Board of Regents and have decision making powers over new astronomy development proposals.

Native Hawaiian Cultural Concerns – The comments offered during public meetings and information gathering during the master planning and EIS process have shown that there is a wide range of opinions regarding the native Hawaiian perspective toward future astronomy development on Mauna Kea. Some feel that in the present day context that the Master Plan offers a balanced approach to preserving the cultural landscape and spiritual integrity of the summit. Others have the belief that additional astronomy development would diminish the cultural setting and result in a negative impact on the spiritual integrity of Mauna Kea.

1.8 COMPATIBILITY WITH LAND USE POLICIES AND PLANS

The Master Plan and Management Plan for Mauna Kea Science Reserve and Hale Pōhaku are compatible with State of Hawai'i and County of Hawai'i land use policies, plans and regulations related to the natural environment, cultural resources, economy, research and education, and recreation. The Plan will also aid the future management of Conservation District resources. This section also addresses compatibility with earlier plans for Mauna Kea, including the DLNR 1970 plan and the 1983 Complex Development Plan. The updated plan will make a significant contribution to the implementation of these plans.

1.9 LIST OF PERMITS

The proposed planned improvements under the Master Plan are consistent with and support the intent of the State Conservation District, the County of Hawaii General Plan.

The following is an approximate list of major approvals and permits and their status required for implementation of the planned improvements.

Ministerial permits will be obtained as required such as building, grading, etc.

List of Approvals and Permits		
Permit or Approval	**Authority**	**Status**
Programmatic Master Plan Environmental Impact Statement	Chapter 343, HRS; Governor, State of Hawaii	In Progress
Individual Projects: Environmental Assessment or EIS Conservation District Use Permit	Board of Land & Natural Resources	In Progress

Section 2.0

Project Need: Issues and Opportunities

2.0 PROJECT NEED: ISSUES AND OPPORTUNITIES

The need for the current update of the Mauna Kea Science Reserve Master Plan is best presented through a discussion of the issues surrounding the past use and management of the mountain. Actions proposed in the subject Master Plan and Management Plan stem from the analysis of past and current issues, and thereby offer improvements to managing these uses, opportunities for future uses, and the resulting benefits.

2.1 Management and Use Issues

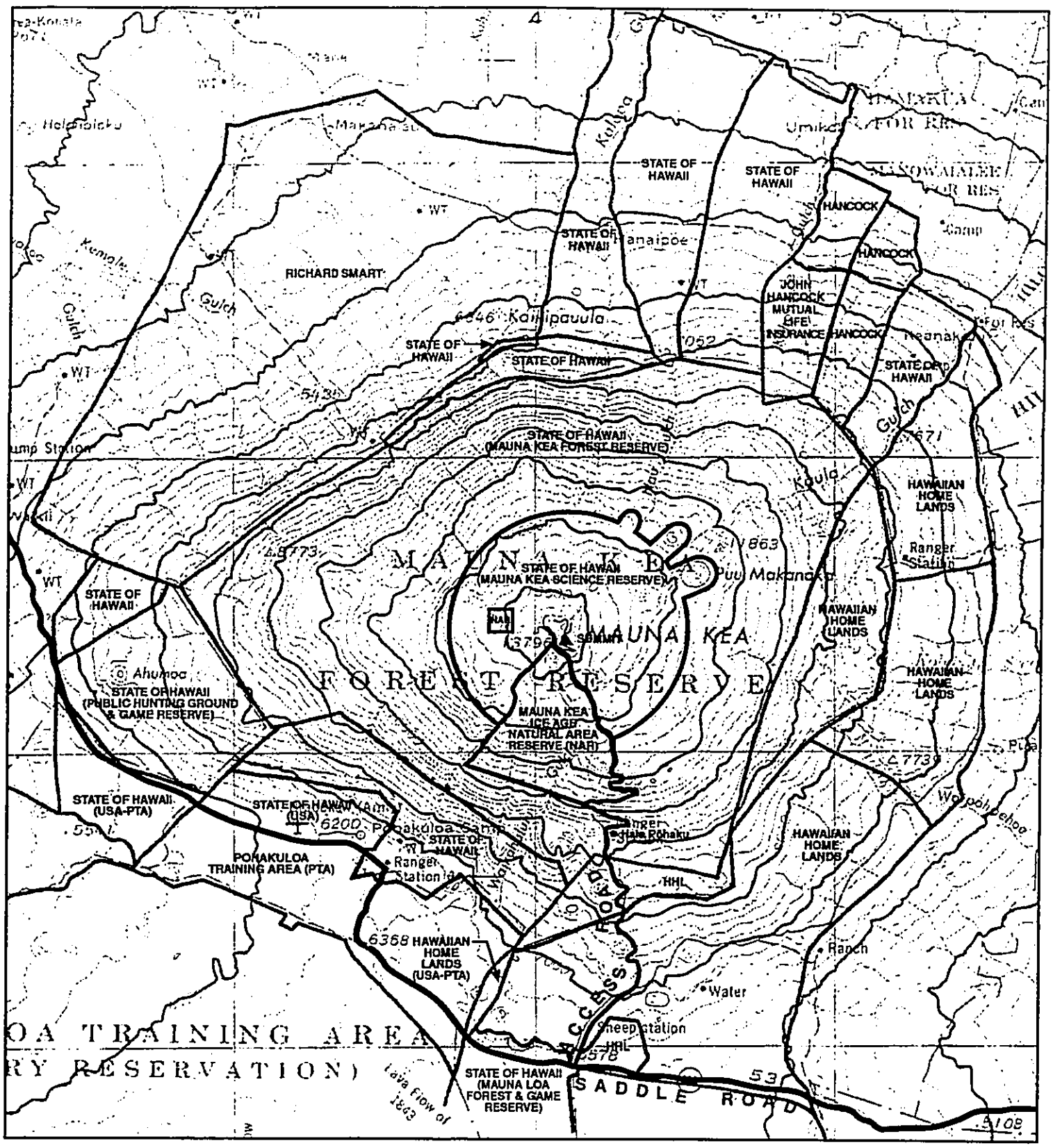
Management and use issues are not new to Mauna Kea. Soon after the introduction of the first cattle, goats and sheep, these animals roamed the slopes of Mauna Kea, contributing to the decline of vegetation in the *palila* habitat. Wildfire has also been a source of habitat destruction. Hunting was and is an important way of life for many Hawai'i Island residents; however, even the hunters could not keep pace with the rapidly growing animal population. In destroying portions of the *māmane-naio* forest, the animals impacted the only habitat of the *palila* bird. Territorial and State government agencies have attempted to control the population of ungulates through formal hunting efforts. However, the long-standing issue of balancing habitat protection and hunting traditions exists to this day.

With the development of the astronomy facilities and supporting infrastructure on Mauna Kea in the late 1960s, access to the summit area increased and the number and types of mountain users multiplied. As a response to user conflicts and concerns regarding the natural and cultural resources of the mountain, several management and planning efforts were undertaken.

In 1968, the Board of Land and Natural Resources (BLNR) approved a 65 year lease (General Lease No. S-4191; January 1, 1968 to December 31, 2033) to the University of Hawai'i for a 13,321-acre circular area (2.5 miles in radius) centered on the Mauna Kea summit (approximately all the lands above 12,000 feet elevation) and referred to this land as the Mauna Kea Science Reserve (Land ownership is presented in Figure 2-1). As stated in the language of the lease "The land hereby leased shall be used by the Lessee as a scientific complex, including without limitation thereof an observatory, and as a scientific reserve being more specifically a buffer zone to prevent the intrusion of activities inimical to said scientific complex."

Most of the broad responsibilities of the University of Hawai'i stem from this lease and include:

1. Maintenance of the premises in a clean and orderly fashion.
2. The right to develop improvements upon review and approval by the BLNR.
3. General liability resulting from negligence of UH.
4. Compliance with DLNR regulations and all other federal, state and county laws affecting land or improvements.
5. UH must not damage any cultural or historic site of value.
6. No planting of trees, shrubs or other vegetation except those approved by the Chairman of BLNR.



Source: City and County of Honolulu,
Real Property Assessment Division
Tax Maps Branch, 12/31/98

0' 7500' 15000' 30000'

NORTH

Land Ownership Map

In addition to the general retention of regulatory authority, the BLNR specifically identified and retained all water rights, rights to access through the Science Reserve, hunting and recreation rights, rights to use any part of the Science Reserve or permit another party to use parts of the Science Reserve with the mutual consent of the University.

2.2 1970s Planning

As astronomy development expanded in the early 1970s, concerns about further telescope developments were raised by hunters and conservationists. It was generally recognized that an overall Mauna Kea plan was necessary in order to control development on the mountain and to resolve the conflicting interests of the various users. Recognizing the increased scientific and recreational activity on Mauna Kea and expressing concern for native Hawaiian ecosystems, Acting Governor George Ariyoshi directed the Board of Land and Natural Resources to develop a master plan for all of Mauna Kea. DLNR initiated the planning study in 1975 and The Mauna Kea Plan was approved by the BLNR and published in 1977. The plan provides a policy framework for the management of the mountain from the Saddle Road area at 6,000 feet to the summit (DLNR, 1977).

The plan identifies areas of responsibility for DLNR, the University of Hawai'i and the State Department of Transportation. According to the plan, the University is responsible for management and upkeep of Hale Pōhaku area astronomy facilities and management and upkeep of Mauna Kea Science Reserve.

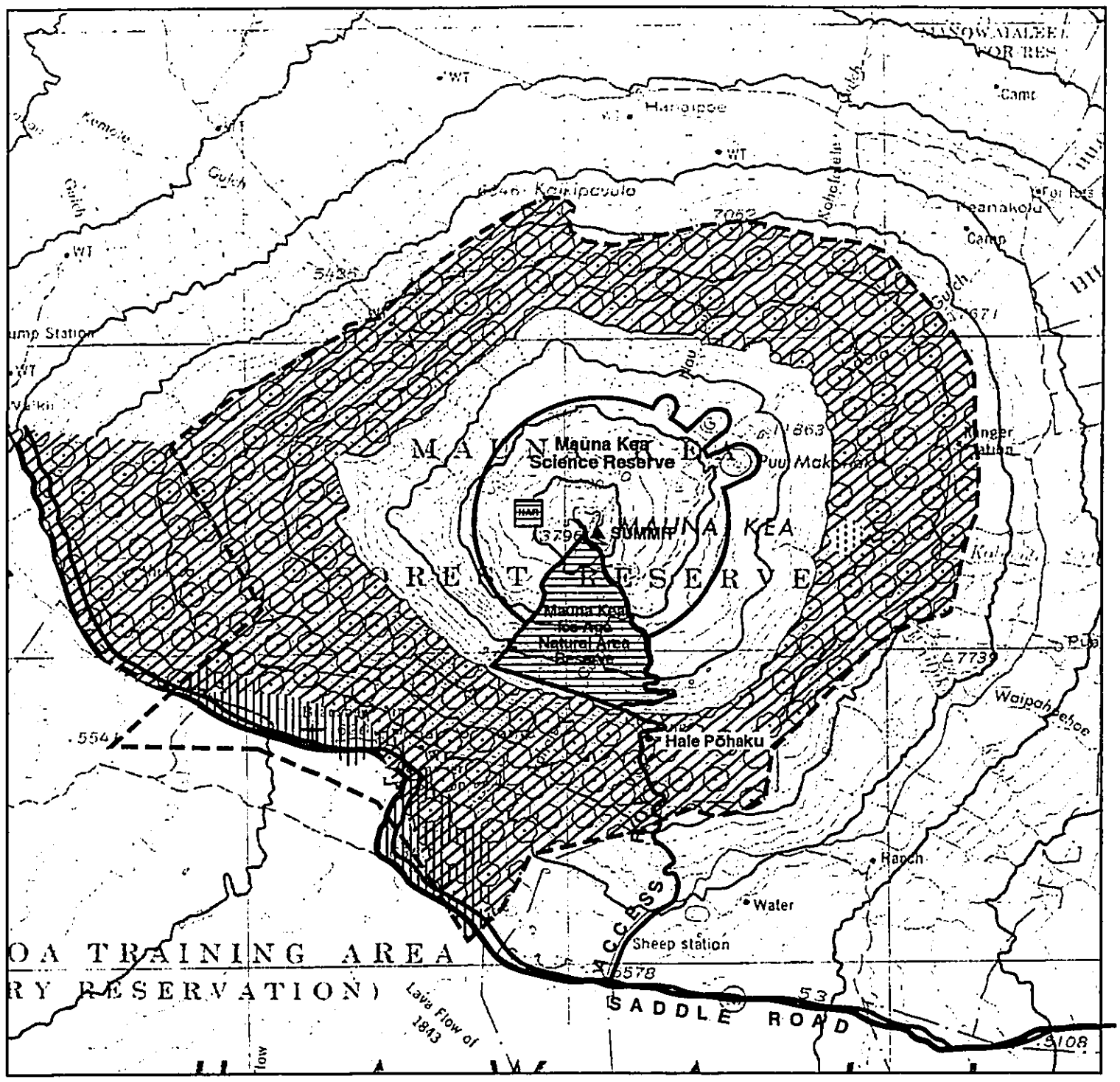
All other management functions were retained by DLNR except for control of the Summit Access Road which was designated for the State Department of Transportation.

The 1977 Plan established five management areas and described acceptable use and management controls for each area. These management areas are shown in Figure 2-2.

1. *Māmane-naio* Forest Ecosystem Management Area
2. Science Reserve Management Area
3. Special Natural Area and Historic/Archaeological Management Area
4. Silversword Management Area
5. Military Management Area

2.3 1980s Planning

During the initial years of increased astronomy support activity at Hale Pōhaku, other mountain users expressed concern about that area's development. Hunters worried about the potential decrease in the size of the hunting range. Environmentalists expressed concern that the *palila* habitat would be damaged by new construction. Recreational users asked that park facilities be included for public use.



Source: The Mauna Kea Plan
Hawai'i Department of Land
and Natural Resources, 1977

1977 Mauna Kea Plan Management Areas

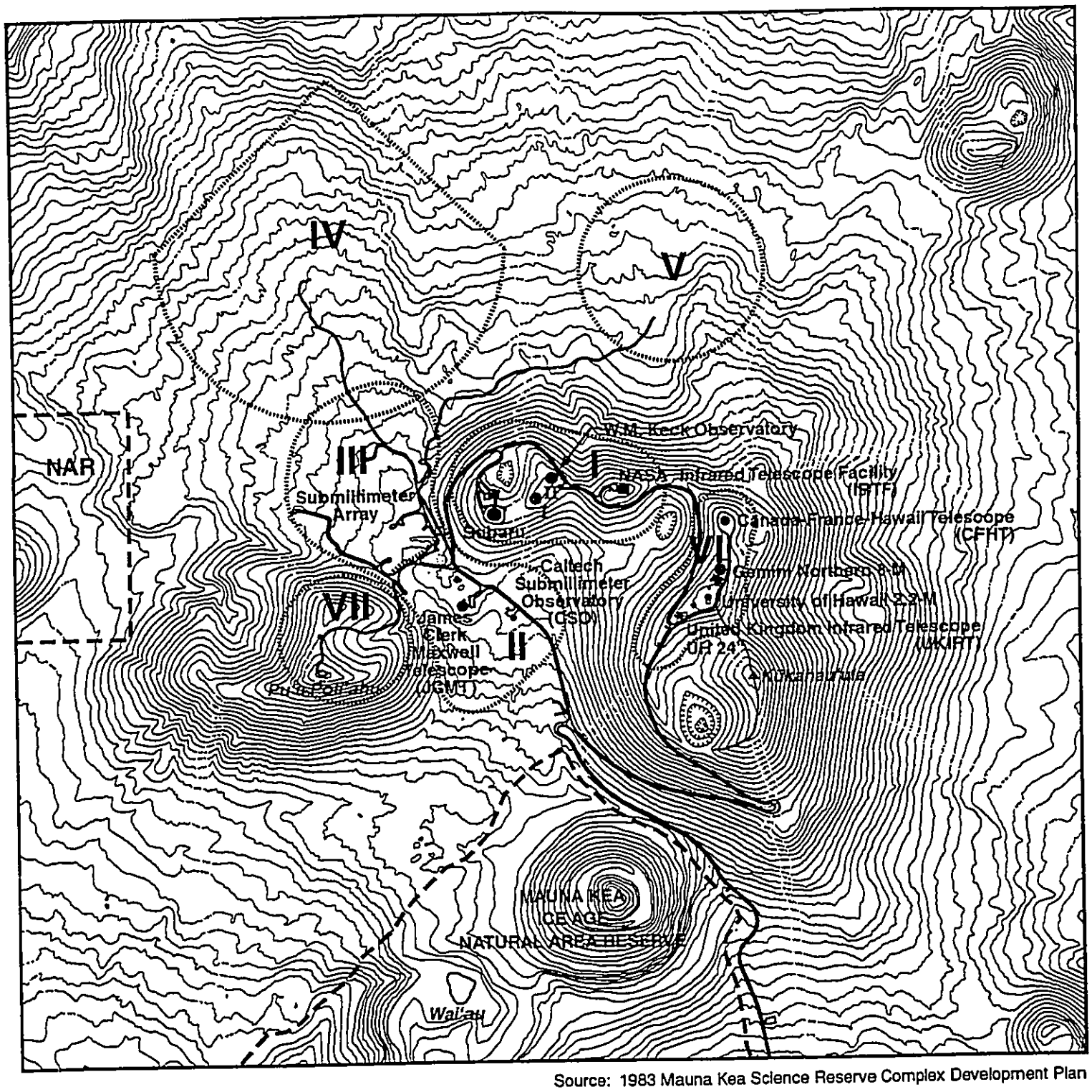
Recognizing the concerns raised by various interest groups, and a need to replace temporary structures with permanent astronomy support facilities, the Hale Pōhaku Complex Development Plan (CDP) was prepared by Group 70 in 1980. The report recommended specific siting, organization, and general characteristics of the permanent facilities proposed for Hale Pōhaku in support of the six telescopes developed on the summit at that time. The CDP also provided design guidelines which call for minimized disturbance of the *māmane-naio* ecosystem and integration of facilities into the landscape. These guidelines were followed in the development of the main food and lodging complex. These facilities are built on pier type foundations following the natural terrain. Building colors blend into the landscape and surfaces are designed to be only minimally reflective. The entire complex was designed to incorporate the area's vegetation with minimum disturbance of the *māmane-naio* ecosystem.

In an administrative action that occurred during this time, Executive Order No.3101 dated November 16, 1981 identified two Natural Area Reserve parcels to be set aside from the Science Reserve and placed under the management of the DLNR. One parcel was a 1,889.7-acre pie-shaped parcel encompassing much of the adze quarry and Wai'au and the other was a 143.5-acre rectangular parcel surrounding Pu'u Pōhaku (both parcels are identified in Figure 2-1). The formal withdrawal of the parcels from the general lease occurred on March 23, 1998. These actions removed the University from responsibility for management of these areas.

While the Hale Pōhaku facilities were being constructed, the University of Hawai'i was also looking towards the future of ground-based astronomy at Mauna Kea. The University of Hawai'i Research Development Plan (RDP) was adopted by the UH Board of Regents in 1982. The RDP provided the programmatic basis for the continued development of the Science Reserve and Hale Pōhaku with the goal of developing a pre-eminent state, national, and international resource for astronomical observations. The Research Development Plan called for future development of telescopes, infrastructure improvements and expansion of the mid-elevation facilities at Hale Pōhaku to support proposed telescope development.

The Mauna Kea Science Reserve Complex Development Plan (CDP) (1983) was prepared by Group 70 to provide the physical planning framework and management guidelines necessary to implement the UH Research Development Plan. The CDP serves as a guide for development which preserves the scientific, physical and environmental integrity of the mountain. It also provides proposals for managing the mountain's resources and visitor use. During this planning effort, the summit's biological and archaeological features were scientifically documented for the first time. Extensive flora and fauna studies, in addition to further archaeological work, were undertaken. As a result of the analysis of this information, a mixed-use plan was developed for the summit and mid-elevation areas.

In the plan, areas of the summit plateau above 13,000 were analyzed using scientific, natural resource, and cultural resource criteria. Areas selected for potential facility development met scientific wind turbulence and obscuration requirements, were in areas where the ground was suited for construction, and where the impacts to recreational uses, visibility, biological resources, and archaeological sites would be minimized. The seven areas (Figure 2-3) initially analyzed were refined to four planning areas to accommodate development of appropriate proposals through the end of the 1990's. The 1983 plan specifically identified proposed new



Source: 1983 Mauna Kea Science Reserve Complex Development Plan

25' Contour Intervals

Natural Area Reserve

Telescope Analysis Areas

0' 750' 1500' 3000' NORTH

Telescope Analysis Areas (1983)

Figure 2-3

telescopes which became the facilities now known as CSO, JCMT, and Keck I. It also envisioned proposals for additional optical/infrared and millimeter telescopes. In addition to defining four siting areas and supporting infrastructure requirements, the plan called for parking, trash, and toilet facilities at the summit to support recreational users of the mountain. This plan also called for the expansion of the Hale Pōhaku facilities to accommodate the new astronomy facilities proposed for the summit. The plan called for these facilities to be consistent in character with the mid-level facilities that had just opened. One new dormitory was subsequently developed.

Much of the 1983 plan has been implemented. The astronomy facilities that were projected have been realized. Policies were laid out for non-astronomy research and educational use for the mountain. Guidelines were established for such activities as commercial use and off-road vehicles.

The plan encouraged the University to hold open nights at the Visitor Information Station to share astronomy with the public. Today, the MKSS sponsors star-gazing programs four nights a week. With respect to infrastructure, the plan called for the paving of the entire road from Hale Pōhaku to the summit. To date, the upper half (approximately 4 miles) of the road has been paved with further work awaiting funding.

While much of the 1983 plan was carried out, a number of the plan's recommendations have not been implemented. For example, the plan recommended that rangers be hired to patrol the mountain and, in fact, the Institute for Astronomy established these job positions at one time. However, the unfilled position were eliminated during budget cuts that affected all University programs.

With respect to recreational uses, the plan called for visitor parking and trash facilities in the summit area, and established enforcement guidelines aimed at encouraging visitors to use the designated parking areas. Other facilities proposed in the plan included a multipurpose research laboratory in the summit area and a permanently installed telescope for visitor use in the Hale Pōhaku area. These facilities have not been developed.

In an effort to remedy the difficulties caused by multiple jurisdictions, the plan called for the establishment of a management committee that would be advisory to the Department of Land and Natural Resources and the University of Hawai'i. This committee has never been formed.

2.4 1990s Planning

In 1995, a joint revised management plan was adopted by the University of Hawai'i and the DLNR. This plan clarifies and redefines the rights and responsibilities of the two organizations in the Science Reserve. The UH retained the following rights and responsibilities:

1. Mauna Kea Science Reserve Access:

   - The right to control, maintain and manage access in the Science Reserve; including the Access Road and associated parking areas.
   - The right to limit vehicle type or impose driving requirements.
   - The right to restrict hours of access.
   - The right to close the road for maintenance, hazards, snow removal or road repairs.
   - The right to ask others to assist in crowd control (similar to deputizing).
   - The right to require liability waivers.
   - The right to comment on commercial permit applications.
   - The right to control visitor activities around astronomy facilities.
   - The right to limit commercial vehicles in the Science Reserve.

2. Activities at Hale Pōhaku Visitor Information Station:

   - The right to limit 14 passenger commercial vehicles.
   - The authority to enforce rules and institute crowd control policies at the Visitor Information Station.
   - Authority to set the hours of operation at the Visitor Station.
   - The right to issue special permits for the use of the Visitor Station.

3. Commercial Activities at UH Facilities:

   - The right to operate concessions.
   - The right to contract for shuttle service to the summit.

Approval of this management plan came with several conditions. The following identifies major or special responsibilities of the University:

1. Historic Preservation Plan to be completed and implemented by UH IfA.
2. This management plan replaces the plan identified in CDUA HA-1573.
3. Include cultural uses that do not involve physical impacts.
4. MKSS (Mauna Kea Support Services) staff be educated and instructed to report violations of the Mauna Kea Plan.
5. Additional specifications on protection of historic sites intentionally or otherwise.
6. Reporting back to the BLNR after the completion of archaeological and biological studies to review possible needs for change.
7. Additional signage for various purposes.
8. 7 day a week Visitor Station hours and DOCARE for Mauna Kea (not exclusive), subject to funding.

Under the current conditions, DLNR retains the following responsibilities:

1. Authority to determine permitted public and commercial uses of the UH management areas (Science Reserve, Access Road, Hale Pōhaku).
2. Authority over recreational uses and commercial tours within the Science Reserve.
3. Authority over research and education, natural resources, historical and cultural resources, recreation, and commercial use on State land, including the Natural Area Reserve.
4. Statutory responsibility for treatment of historic sites.
5. The responsibility to make sure commercial permits have consistent fees, set terms and are subject to review and renewal by DLNR. These permits may be superceded by Land Division permits in the future.

These existing management responsibilities, based on the latest plans and statutory requirements are depicted in Table 2-1.

2.5 1998 Legislative Auditor's Report

In 1997, the State Legislature, through Senate Concurrent Resolution No. 109, requested that the State Auditor conduct an audit of the management of the mountain. The Auditor's report was issued in February 1998 as Report No. 98-6. Both the University of Hawai'i and the Department of Land and Natural Resources were criticized in the report which concluded that new technology impacted development of the Science Reserve and management of the summit area did not adequately protect cultural and natural resources. The audit concluded with the following recommendations to address issues raised in the report:

Management
- Develop rules and regulations for summit area and Hale Pōhaku
- Hire ranger/guides at Hale Pōhaku who will be there on a daily basis
- Require registration of visitors for education and safety reasons
- Develop milestones, specific timeframes & other controls to ensure implementation
- Develop a forum for continuous community input
- New method for measuring impact
- Measure impacts individually and cumulatively
- State specific carrying capacity
- Require management plans that have time frames
- Ensure internal deadlines prior to release of land or leases.
- Make sure all responsibilities are assigned; either UH or DLNR

Historic/Cultural Resources
- Address cultural and historic issues
- Complete the Historic Preservation Plan

Table 2-1 MAUNA KEA RESPONSIBILITY MATRIX
EXISTING AUTHORITY

Responsibility	Science Reserve (Includes Summit Road)	Hale Pōhaku	State Land (Includes NAR)
Research/Education			
Astronomy	UH	UH	DLNR
Other Disciplines	UH	UH	DLNR
Public Education	---	UH	---
Natural Resources			
Ice age/Periglacial	DLNR/UH	---	DLNR
Wekiu Habitat	DLNR/UH	---	DLNR
Palila Habitat	---	DLNR/UH	DLNR
Endangered Species	---	DLNR/UH	DLNR
Feral Ungulates	DLNR	DLNR/UH	DLNR
Alien Species	DLNR/UH	DLNR/UH	DLNR
Ecosystem Restoration	DLNR/UH	DLNR/UH	DLNR
Historical and Cultural Resources			
Historic Sites	DLNR/UH	DLNR/UH	DLNR
Burials	DLNR-BC/UH	DLNR-BC/UH	DLNR-BC
Cultural Practices	DLNR/UH	DLNR/UH	DLNR
Recreation			
Skiing and Snow Play	DLNR	---	---
Hiking	DLNR	DLNR/UH	DLNR
Camping	---	DLNR/UH	DLNR
Sightseeing/FIT Tourism	---	DLNR/UH	DLNR
Hunting	DLNR	DLNR	DLNR
Other Recreation	DLNR/UH	DLNR/UH	DLNR
Commercial Uses			
Tours	DLNR	DLNR	DLNR
Concessions	DLNR/UH	DLNR/UH	DLNR
Movies/Commercials	DLNR	DLNR	DLNR
Cabin/room accommodations	---	UH	---
Access			
Summit Road	UH	UH	UH
Trails	DLNR/UH	DLNR/UH	DLNR
Safety and Security			
Road Conditions (above HP)	---	UH*	UH
Dangerous Weather	---	UH*	---
Altitude Education	---	UH*	---
Medical Emergencies	UH/CTY	UH/CTY	CTY
Fire	UH/CTY	UH/CTY	CTY
Crime	CTY	CTY	CTY
Maintenance			
Road (above HP)	---	---	IfA
Utilities	UH/Utilities	UH/Utilities	UH/Utilities
Trash Removal	UH	UH	DLNR
Removal of Old equipment	UH	UH	
Graffiti	UH	UH	DLNR
Community Participation			
Public Restrooms	Keck*	UH	---
Programs	---	UH	---
Notification	UH	UH	---

--- = None or not applicable
UH = University of Hawai'i at Mānoa (Includes IfA)
BC = Burial Council
* = Done but not required
DLNR has rights to authorize other uses of the Science Reserve as long as it does not interfere with lease conditions

Maintenance
- Periodic inspection and documentation of trash control
- Remove remnants of old equipment

Physical Planning Guidance
- Identify areas suitable for astronomical development
- Identify critical habitats for plants, invertebrates and other endangered species
- Identify no build zones
- Include facilities besides telescopes.

Statutory Recommendations/Lease Agreements
- Incorporate EIS mitigation measures as CDUA conditions
- Relate permit conditions to leases
- Adopt rules for Chapter 6E, Historic Preservation Program.

2.6 Planning Today

This Mauna Kea Science Reserve Master Plan will serve to address current concerns and guide the planning for the Mauna Kea Science Reserve for the next 20 years. While the projections of the 1982 Research Development Plan and the 1983 Complex Development Plan have largely been implemented as scheduled (the planning period was to the year 2000), the goals of balanced use and protection of resources have not been fully achieved. Issues and opportunities for the future use and management of the mountain beyond 2000 are explored below. Recommendations concerning these issues are detailed in the physical and management plans discussed in Section 3.0.

2.6.1 Management Authority

The joint responsibilities and the layers of historical leases, plans, permits and written or verbal commitments have created a complex and often confusing pattern of management responsibility for Mauna Kea.

ISSUES

Unclear Responsibility: The legal and constitutional mandates to various agencies are articulated in the general lease, Hawai'i Revised Statutes and various plans and permits that have been adopted. Over the years, changes in plans, permits and personnel have resulted in a complex web of responsibility. Table 2-1 summarizes the major areas of responsibility at the current time. A quick glance at this matrix shows the complexity of the arrangements. DLNR has had no permanent personnel on the mountain while UH has a number of people. UH IfA also has control and responsibility for the Summit Access Road. Therefore, some assume that UH has had *de facto* control and responsibility over the whole summit region even when it has no statutory authority to manage all the

resources and activities in the Science Reserve. Management of the whole summit area requires management of both the Science Reserve and the Natural Area Reserve. There has been no authority that has been fully responsible for the whole summit area. As a result, some concerns were not addressed or were only addressed after much delay. This lack of functional clarity has created a situation which sometimes frustrates the general public because it is unclear to them who can address their concerns.

Lack of Confidence in Current Organizations: At the present time DLNR and the University are the key agencies with authority and management responsibilities for the mountain. Both entities will continue to be key stakeholders in all future scenarios. The problem is the lack of confidence held by some members the general public in the ability or will of these agencies to protect the natural and cultural resources of the mountain. While some of this lack of confidence is, arguably, a matter of perception rather than fact, there are some real shortcomings. DLNR's current structure and priorities are not likely to provide improved management or significant resources to address these shortcomings. IfA, by mission and expertise, is not focussed to provide overall property management services. Another management structure with the specific charge to manage the Science Reserve is perceived by many to be an appropriate alternative to IfA/DLNR Management.

Local Control: A commonly held perception on the Island of Hawai'i is that a major source of problems is the lack of local control. Decision-makers for both IfA and the DLNR are headquartered in Honolulu. The representatives of IfA who interact most with the Hawai'i Island public are mostly with Mauna Kea Support Services (MKSS), the organization which provides support services for the observatories. As service providers, MKSS does not have the authority to speak for the University. In late 1998, the IfA began construction of a Hawai'i Island headquarters building in University Park at UH Hilo.

The DLNR has offices for the Division of Forestry and Wildlife, State Historic Preservation Division, and the Land Division in Hilo but these offices often do not have the authority or resources to respond to the concerns that are raised regarding Mauna Kea. The lack of decision-making on Hawai'i Island makes it difficult for people to have their concerns addressed in a timely manner. Mauna Kea often does not receive the priority or attention it deserves because it must compete with other state-wide issues and priorities.

Staff Presence on the Mountain: There are currently no designated rangers stationed in the summit area to educate visitors about the resources and safety requirements of the mountain. However, MKSS does have astronomy support personnel on the mountain who are able to provide some of this guidance. In addition, a number of IfA and MKSS staff are concentrated at Hale Pōhaku during the day. Three ranger positions were once included in the Institute for Astronomy budget but were cut during University-wide budget reductions in the early 1990s. These positions could have been used to address many of the management concerns that subsequently arose. Today, if an IfA or MKSS staff member witnesses a car going off the road or any dangerous activity, he or she will

talk to the individual about safety and the rules on the mountain and provide assistance as needed. Litter pick-up also occurs on an ad hoc basis.

Unfunded Mandate: A persistent concern is the lack of adequate funding for management of the mountain. The 1983 plan recommended a policy advisory committee and baseline studies of natural and cultural resources. These activities were either not conducted or late in receiving funding. General lease S-4191 sets conditions for trash clean-up and removal of old facilities. The Auditor's report identified many problems that require changes but did not identify sources of financing to implement the changes. In any case, management responsibilities must be funded. Potential sources for funding are contributions from astronomy facilities, appropriations within the University of Hawai'i or the Department of Land and Natural Resources, and fees from commercial activities.

Unbalanced Priorities: Some feel that management of the summit area has been excessively dominated by astronomy. While official UH policy does not restrict other uses, critics have felt that academic programs outside of IfA have not been supported. The perceived dominance of astronomy research has evolved into a criticism that cultural and natural resource values and programs, and astronomy education programs, have been neglected and that in some cases resources have been damaged.

Unmanaged Access: Currently, access is loosely regulated and hardly managed. It has been stated repeatedly that the creation of the Summit Access Road for astronomy opened the summit to general use and potential environmental degradation. If the road had not been built, the reasoning goes, the impacts would not have occurred or would have been minimal because the numbers of users would have been much lower. Additionally, the rise in popularity of off-road vehicles has increased the potential impacts and conflicts of uses arising from unrestricted access. Concerns related to access, particularly off-road vehicle use, include destruction of archaeological sites, impacts to sensitive environmental areas, increased dust, conflicts of use and increased hazards to visitors.

Maintenance: The University and the astronomy community has been criticized for creating trash on the mountain and not cleaning it up in a timely manner. In the past, construction debris has been widely scattered in the summit area by high winds. Recently, the University has conducted clean up days to remove this debris. Litter is also left on the mountain by non-astronomy users.

Financial Issues: The Science Reserve is comprised of ceded lands. Some claim that the Office of Hawaiian Affairs deserves 20% of all revenues. It is also noted that education is also a beneficiary under State law. Other charges include the criticism that astronomy facilities are being undercharged and that the resource (the mountain) is being unfairly exploited without benefits to the broader community.

OPPORTUNITIES

With the Auditor's report and current planning process, management problems and concerns have been comprehensively articulated. With the preparation of this Master Plan, the University, DLNR, and the community now have the opportunity to redefine management responsibilities and priorities for the Science Reserve. The resulting recommendations are presented in Section 3.0 of the EIS.

2.6.2 Access

ISSUES

Safety: Unmanaged access increases concerns about safety. Hazards in the Science Reserve include accidents in wilderness places, brake failures on the steep Summit Road, quick changes in weather that could lead to hypothermia and disorientation, pulmonary edema and various physiological problems that could arise from high altitude and reduced oxygen environments. Brake failures and vehicular malfunctions are a common occurrence in the summit area. These conditions raise potential safety and liability concerns. Over the past few years there have been about six accidents each year where a vehicle must be towed down the mountain (Koehler, 1998). In several cases, vehicles have run off the road and overturned.

Increased Access and Traffic: The Mauna Kea Access Road and Summit Access Road are increasingly busy roads used by observatory crews, construction workers, cultural practitioners, recreational users, and Mauna Kea Support Services staff.

Because of the steep grade and sharp turns on the Summit Road, only four-wheel-drive (4WD) vehicles are recommended above Hale Pōhaku. The IfA-led summit tours require that participants drive 4WD vehicles. In the Fall of 1998, an average of 560 vehicles per week drove to the summit area (Koehler, 1998). Construction schedule variations cause fluctuations in vehicle counts. The following user breakdown is estimated for the time period.

Construction Projects (Gemini/Subaru/SMA)	150 per week
Observatory Day Crews	150 per week
Observatory Evening Crews	85 per week
Commercial Tours	30 per week
MKSS vehicles	20 per week
Tourists and Local Traffic	125 per week

Another 100 to 150 vehicles per week visited the Visitor Information Station only during the day and for evening stargazing programs. During the 1999 periods of snowfall, it was estimated that over 200 vehicles drove beyond Hale Pōhaku during the busiest days (Koehler, 1998). While it is recommended that only four-wheeled-drive vehicles go

above Hale Pōhaku, there are no staff assigned to prevent two-wheel drive vehicles from using the summit road.

Beyond permitted vehicular access, individuals occasionally take their vehicles off of the paved roads. In seeking their own thrills, these people risk damage to archaeological sites, arthropod and flora habitats, and to the serenity of the natural landscape. Prominent signage advises visitors that off-road driving is prohibited. Although there are no permanent barriers preventing vehicles from leaving the summit access road, access points are blocked with rocks where instances of off-road driving occur.

Improvements to the Saddle Road and further publicity about Mauna Kea's resources and astronomy complex are likely to increase the number of individuals who visit the mountain. On the other hand, the development of the Mauna Kea Education Center in Hilo's University Park may serve to decrease traffic to the summit of Mauna Kea by providing displays and programs that explore the mountain's astronomical, natural and cultural resources.

OPPORTUNITIES

With the understanding that Mauna Kea will continue to be a popular destination for large numbers of people, the opportunity to manage access for the health and safety of people and the environment is clear. Education can be provided by personnel stationed on the mountain and at the Visitor Information Station. Furthermore, education can take place at the Mauna Kea Education Center proposed for Hilo and in those observatory base facilities which have visitor galleries.

2.6.3 Natural Resources

ISSUES

Astronomy Facility Development: Concern has been expressed about the impact of the development of astronomy facilities and supporting infrastructure on the mountain's natural resources, to include specific habitats and the overall landscape.

Arthropod Habitat: The Wēkiu bug, a true bug found only on the summit of Mauna Kea, has been studied since the early 1980s. Researchers speculate that undisturbed cinder cones allow the bug to migrate vertically within the substrate to escape cold and drought and to seek moisture. Larger pore spaces in the cinder allow movement and provide resting and hiding spaces. The Wēkiu survives on the water and food carried by the wind and deposited to the substrate in melting snow.

In the summit area, research done by Dr. Francis Howarth in 1982, 1997, and 1998 has shown a dramatic decline in the population of the Wēkiu bug (refer to Appendix D). The cause of the difference has not been determined and could be due to any of several factors

including sampling methods, changing weather patterns, habitat disturbances, presence of harmful alien species, and long-term population cycles.

In all but one case, arthropod activity on Pu'u Hau'Oki was greater than or equal to that found on Kūkahau'ula. Kūkahau'ula is supposedly less disturbed, although substrate disturbance was evident, apparently caused by the greatly increased foot traffic along the ridge and within the crater since the 1982 study. Trap capture rates for Wēkiu bugs were significantly higher in disturbed areas than in undisturbed areas. These results raise the possibility that observatory construction and other human activities have not impacted the Wēkiu bug distributions at the summit, outside of the immediate vicinity of the paved and covered areas. The difference in capture rates may be attributable to other factors. For example, capturing Wēkiu bugs in the ash-like and compacted substrate common to disturbed areas is inherently more effective that the same trapping methods used in undisturbed substrate areas characteristically comprised of larger cinder material. Secondly, it is known that Wēkiu bugs used disturbed areas only for foraging territory rather than as shelter habitat, and disturbed areas may not be suitable habitat for the Wēkiu bug (USFWS, October 1999).

In an effort to preserve the habitat and encourage growth in the Wēkiu's population, Howarth and team recommend caution during activities such as hiking and trash collection efforts. They also recommend monitoring and additional field work to track population and assess reasons for the population decline (Howarth, 1999). The Wēkiu and other arthropods are discussed more fully in Section 4.0.

Increased Access: There is concern that recreational users may have a negative impact on natural resources on the mountain. Off-road vehicles and unmanaged hiking can crush loose cinder and create dust, damaging arthropod and flora habitat in the summit area.

OPPORTUNITIES

The extensive flora and fauna information gathered in the early 1980s and subsequent studies of arthropods provide a foundation of knowledge about the natural resources of the mountain. Future research and monitoring will increase knowledge about the mountain's resources and aid in the protection of these resources.

In addition, understanding of potential damage caused by vehicles, hikers, and skiers will encourage management policies that educate and provide guidance to mountain users.

2.6.4 Culture

The Auditor's report emphasized the neglect of cultural resources and cultural practices. There has been one verified case of damage to an archaeological site by astronomy-related development (destruction of a lithic scatter near Hale Pōhaku). However, changes in historic preservation policies and the growth of the Hawaiian cultural renaissance have brought new sensitivity toward cultural values and issues. As a result, issues of current cultural practices and

the significance of the mountain have emerged. Ethnographic studies have become a standard part of cultural interpretation in the last 10 to 15 years and the values that emerge from such studies have contributed new knowledge and sensitivity to our attitudes toward the land and its culture. Cultural landscapes, geophysical forms and associated cultural attachments, have also emerged as a resource of value. These perspectives require a re-evaluation of the archaeological, geophysical and ethnographic dimensions of the mountain.

ISSUES

Cultural Resources: Cultural associations with Mauna Kea and specific archaeology sites are important cultural resources. Important archaeological and cultural features of the mountain are located in both the Natural Area Reserve (NAR) and the Science Reserve, with Wai'au and most of the adze quarry located in the NAR. Concern has been expressed regarding the access made available by the summit road and the potential for uninformed individuals to inflict damage on resources in both the Science Reserve and NAR. There is concern that astronomy facility development and other uses of the mountain may harm these features. Some have expressed the sentiment that the presence of telescopes upsets the views of the natural and cultural landscape of the summit plateau. Off-road driving, uninformed hikers and impacts of snow play have all been highlighted as concerns to specific archaeological sites and a broader respect for the mountain.

Another potential issue is the modification of archaeology sites for modern cultural practice. As an example, concern has been expressed that an individual or family may add stones or modify an existing shrine in their own practice of worship. It is not clear how much of a concern this would actually be as a number of Hawaiians have stated that other Hawaiians will not alter an *ahu* that is not associated with their own family.

Cultural Practice: There is a perception among some that modern practice of traditional Hawaiian culture is not welcome on Mauna Kea. There are no existing or proposed restrictions placed on this activity. Isolated interference with the cultural practice of one individual, which was caused by ignorance of the significance of a site, has led to concern in the larger Hawaiian community that undue interference could be a problem.

OPPORTUNITIES

Numerous archaeology and ethnographic studies have been conducted for Mauna Kea. During this master planning process several studies were conducted or initiated to include the State Historic Preservation Division's Mauna Kea Historic Preservation Management Plan, Kepā Maly's oral history and archival research study, and PHRI's cultural impact assessment (refer to Appendices C, E and H).

This wealth of written and recorded information provides a base from which others, including mountain staff, can be educated about Mauna Kea's cultural resources. Education and management strategies will play an important role in the preservation of these resources over time.

2.6.5 Education and Research

ISSUES

Development of Astronomy Facilities
Ever since the first telescopes were proposed for Mauna Kea, there has been mixed sentiments in the community concerning development on the mountain summit. Some members of the community ask that development upon Mauna Kea continue no further. Others see Mauna Kea as one of the real success stories of economic development in Hawai'i.

Economic Impact of Astronomy
SMS Research analyzed the economic impact of astronomy conducted on Mauna Kea for this Master Plan. In addition to established facilities, new facilities Subaru, Gemini Northern, and the Submillimeter Array are considered as operating facilities in the economic analysis.

From the construction of new facilities, to the employment of a trained technician, to the purchases made by a visiting scientist, the astronomy industry contributes widely to the Big Island economy.

Approximately 400 full-time positions will be supported by Hawai'i's astronomy industry in the year 2000. These include astronomers, engineers and engineering technicians, software programmers, equipment technicians, and administrative personnel.

SMS Research (1999) estimates the direct impacts of Mauna Kea astronomy in the State to include (refer to Appendix G):

Operating Budget	$51.9 million/year
Workforce	397
Visiting Researchers	3,755 trips/year
Visitor Spending	$0.7 million/year

Total economic impact of astronomy, assuming operation of Subaru, Gemini, and the SMA, is estimated at $175.4 annually for the County and $191 annually for the State. Direct impacts include employment and expenditures directly associated with the operation of the astronomy industry and represent $89.3 million for the County and $92.4 for the State annually. Indirect impacts occur when astronomy-related firms purchase goods and services from other firms. Induced impacts are due to spending by the astronomy workforce in the local community.

Over the next two decades, two trends may have large economic effects. First, with continuing support of science education and internships, and continuing need for staff, the observatories will encourage a local pool of skilled technical personnel. Second, tourism on the island may draw more extensively on astronomy as a resource. This

activity does not necessarily have to occur on Mauna Kea as it can be encouraged in the new Mauna Kea Education Center being proposed in Hilo.

Future Astronomy Facilities
It is the hope of the UH and many in the State that Mauna Kea continue as the leading astronomy complex in the Northern Hemisphere or even the world and remains a driver of the Hawai'i Island economy. It is envisioned that because of the sensitive environment and cultural landscape that only world class telescopes should be located on Mauna Kea. Mauna Kea is not the place for just any instrument. It is a premier location and environment that should host only those facilities that are unique.

The world astronomy community is looking forward to the next decade with a focus toward space telescope development and complementary ground-based telescopes. Recent developments in astronomy technology have led to greater ability to identify previously unknown objects. The world astronomy community now projects the need for additional state-of-the-art 10-meter instruments (such as the Keck I and II), as well as specialized instruments to address defined research objectives. The following categories of telescope facilities are foreseen for the future (Refer to the Astronomy Research Development Plan in Appendix A).

Conventional Optical/Infrared Telescopes: These telescopes would have mirror sizes of 2 to 12 meter diameter. The smaller 2 to 6 m telescopes could be modern versions of the UH 2.2m, CFHT and IRTF. Larger telescopes with 6 to 12 m mirrors would be similar to Keck, Subaru and Gemini.

Next Generation Large Telescope. Planning for a large optical/IR telescope (aperture 25-50 m) is advancing. This instrument is significantly bigger than any existing telescope and would have much greater light collection potential than a space telescope. One major goal is to study a spectra of galaxies as they were forming approximately 10 billion years ago. This telescope would also provide the capability to study planets around nearby stars.

Sub-millimeter Interferometer. The creation of additional and larger sub-millimeter interferometer arrays is also being contemplated by the world astronomy community. There will be a need to expand the viewing capabilities in the sub-millimeter band to support growing research efforts in this area of astronomy (radio interferometry).

Optical/IR Interferometer. An optical interferometer could contain a number of light-collecting devices at separations up to several hundred meters. Prime objectives of this type of telescope are the detection of planets around nearby stars and the study of star formation.

Large Array/Millimeter Array. The astronomy community (Japan Radio Astronomy Array and National Radio Astronomy Array) is planning to develop a large array for millimeter astronomy during the next decade. This facility is not

likely to be located at Mauna Kea due its large area requirement (3 km) and the large number of collection devices (about 50). A consortium of U.S. and European astronomy organizations is currently planning to develop this large millimeter array in Chile.

Non-Astronomy Science and Education: Currently there is the perception that educational opportunities are limited to programs related to the Institute for Astronomy or individual telescope facilities. A process for proposing other educational programs or activities is not widely communicated or understood.

OPPORTUNITIES

The environmental and technical qualities of the Mauna Kea Science Reserve make it the superior site in the Northern Hemisphere for ground-based astronomy. First, the natural conditions are ideal for astronomical observations. Second, there is now the critical mass of world class telescope facilities for Mauna Kea to continue to be at the forefront of ground-based astronomy. Third, the astronomy and astronomy support technologies that have been developed on Hawai'i Island can be the catalyst for other research and education programs.

Mauna Kea's unique natural and cultural resources provide a wealth of opportunities for research and education that is coordinated and conducted in a manner that is most appropriate for the resource. Supporting facilities could include the construction camp cabins below the Visitor Information Station.

2.6.6 Recreation

Issues related to recreational use include safety concerns and possible inadvertent damage to archaeological sites. Off-road driving is also a major concern because of the cultural and natural resources which may be damaged.

ISSUES

Snow Season Activity. While hikers and other recreationalists are active throughout the year, the greatest number of recreational users come to the mountain during snow season. With so many people on the mountain enjoying the snow, cars must park on the side of the road. The large number of people skiing, hiking, snowboarding and sledding in the snow at such a high elevation, can be hazardous to individuals and to cultural resources such as *ahu*.

A portable toilet and the facilities at the Keck Observatory are the only public restrooms available and often these do not meet demand or are inconvenient to access. As a result, individuals often relieve themselves on the side of the road or wherever is convenient, resulting in unsanitary conditions.

Safety. The high altitude environment hosts natural resources that provide recreational opportunities that are unavailable anywhere else in Hawai'i. Skiing and various forms of snow play attract large numbers of people when conditions are right. Recently, there have been requests for more extreme sports on the mountain such as hang gliding and cycling down the summit. Hikers are attracted to the summit area for its natural and scenic qualities. With easy access and increases in numbers concerns about safety, liability, resource impact and compatibility with the spiritual values of the mountain have begun to emerge.

OPPORTUNITIES

Recreational activities need to be managed to reduce potential conflicts of use, enhance recreational opportunity, avoid damage to cultural and environmental resources, and improve safety. Facilities could be provided in the summit and mid-elevations areas to support the safe use of the mountain.

The discussion above highlights many of the issues that have persisted in the Mauna Kea Science Reserve over time and reviews past plans for the management of the area. The physical and management plans within the Master Plan offer solutions which are aimed at resolving problems/issues that exist today and enable the potentials of tomorrow to be realized. These plans are described further in Section 4.0.

Section 3.0

Description of the Master Plan

3.0 DESCRIPTION OF THE MASTER PLAN

3.1 OVERALL GOALS OF MASTER PLAN

The overall goals of the Master Plan for the Mauna Kea Science Reserve are as follows:

1) Develop a vision for the sustainable use and enhancement of the Mauna Kea Science Reserve as a Hawaiian place with significant and unique cultural, natural, educational/research and recreational values, meanings and potentials, both locally and globally.

2) Integrate and balance cultural, natural, education/research and recreational values and uses in a physical and management plan which will remedy existing problems and provide a framework and structure for the responsible and sustainable stewardship of the Mauna Kea Science Reserve.

The Master Plan is divided into two major components, including a Physical Plan and a Management Plan which are described below. An Implementation Plan for accomplishment of the objectives set under the Master Plan and Management Plan is summarized later in this section.

3.2 PHYSICAL PLAN

The Physical Plan for the Mauna Kea Science Reserve consists of physical plans, maps, geographic information system, and criteria, which promote the sustainable use, enhancement and development of the resources of the Mauna Kea Science Reserve. The plan has four components, including: (1) Natural Resources, (2) Cultural Resources, (3) Education and Research, and (4) Recreational Resources. The physical plan will guide the sustainable use and enhancement of these four resource components.

- The natural resource component documents the extent of significant habitat areas and unique geology areas, and delineates preservation areas to protect natural resources (e.g. Wēkiu bug habitat, alpine ecosystems).
- The historic and Hawaiian cultural component identifies archaeological sites and culturally significant landforms to be preserved.
- Appropriate sites for the future expansion of education and research at astronomy facilities are identified, with respect for natural and cultural resource preserve areas.
- Lastly, the recreational uses of the mountain are defined as use areas, designated to protect and enhance recreational opportunities (e.g. skiing, hiking).

A description of each of the four component plans is presented below.

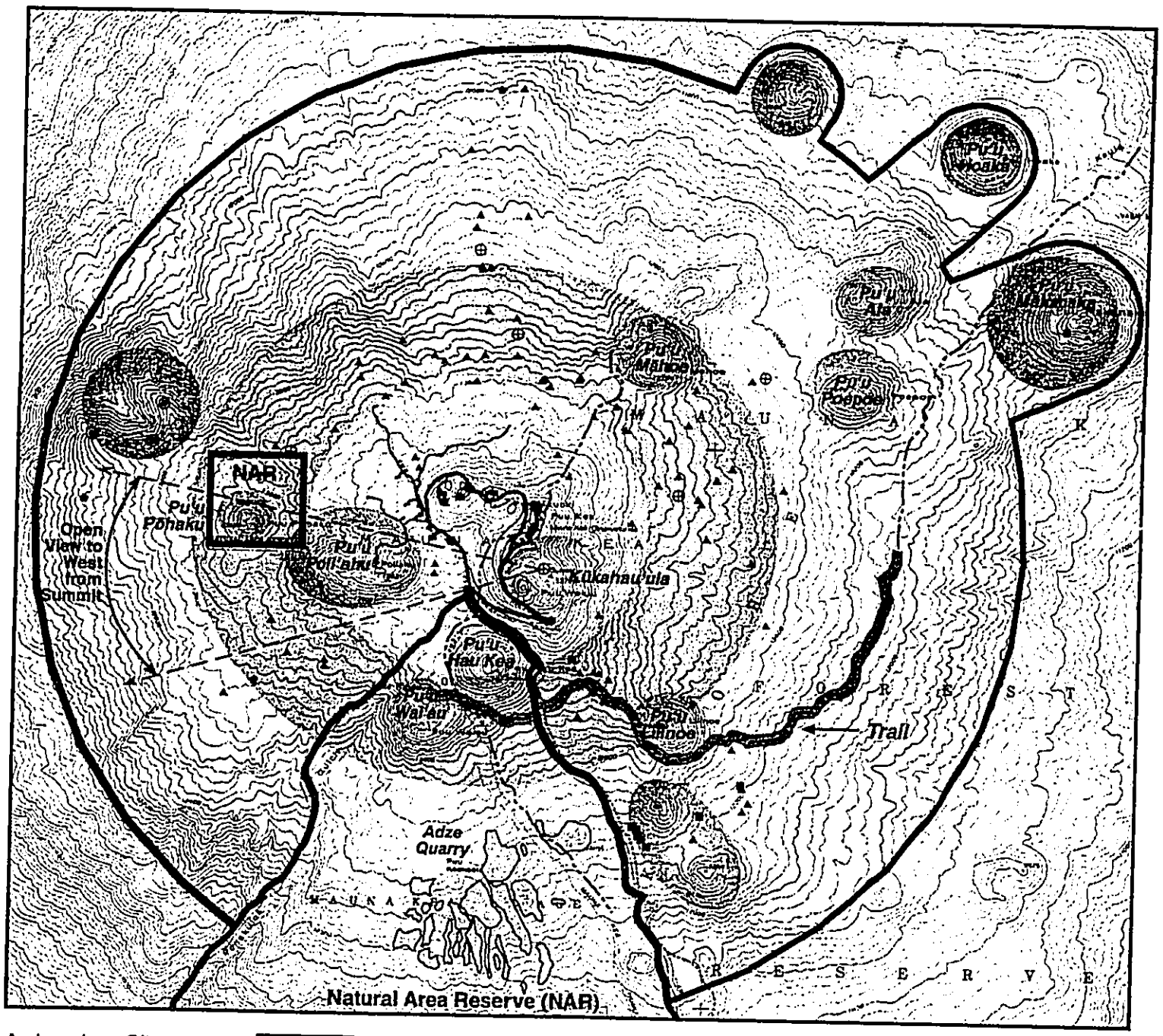
3.2.1 Natural and Cultural Resources Components

In the recent past, the mountain's natural and cultural resource issues have each been handled in an isolated manner, whether it has involved the Wēkiu bug population, archaeological sites, or the use of *pu'u* to locate astronomy facilities. We now have better knowledge of these resources and understand that they are inter-related and need to be planned in an integrated fashion, not individually. For example, the natural direction for past astronomy development has been to utilize the highest elevation locations found at the tops of the *pu'u*. Years ago, Pu'u Poli'ahu was tested for its qualities as an astronomy site, and from a technical basis, it is considered to be a prime potential site. However, our increased understanding of the Hawaiian cultural importance of the mountain's *pu'u*, as well as their unique ecological components, now guide future planning toward preserving these important features.

From a natural resource perspective, the primary issues concern the Wēkiu bug and scenic views. The major *pu'u* in the upper slopes of Mauna Kea provide the only known habitat area for the Wēkiu bug. Some *pu'u* have been found to contain the Wēkiu bug, while others have similar habitat qualities and have the potential for supporting populations of this endemic arthropod, thereby motivating plans to preserve all *pu'u*.

Scenic views of the summit are experienced within the Science Reserve and from off-mountain locations. All major cinder cones which are undeveloped, such as Pu'u Pōhaku, Pu'u Poli'ahu, Pu'u Hau Kea, Pu'u Līlīnoe, Pu'u Kūkahau'ula and Pu'u Māhoe, will be protected from future development by astronomy or other interests. Prohibition of development of modern man-made features on all the currently undeveloped *pu'u* will also protect the scenic natural views to and from these landforms. Preservation of each *pu'u* will retain the integrity of a cultural landscape spanning from Kūkahau'ula (the summit) through Poli'ahu, including Lake Wai'au and the adze quarry at Keanakāko'i in the adjoining Natural Area Reserve. A principal recommendation of this Plan is the preservation of the natural and cultural landscape of the Science Reserve by protecting all of the major undeveloped *pu'u* and the intervening areas from disturbance.

Archaeological sites are found with the greatest frequency in a band below the summit area, mostly evident at about the 13,000 ft. elevation. According to cultural sources, Wai'au (in the NAR) and its surroundings, including the *pu'u* within the Science Reserve are all culturally significant places. The Plan views the archaeological sites of the summit region as a whole rather than in an isolated context. According to McCoy (February 1999), the abundance of shrine complexes and the accounts of cultural importance of the *pu'u* in the upper slopes, indicates that the area was a ritual center. Therefore, the physical plan links the significant landforms with the archaeological sites clusters, Wai'au and the adze quarry at Keanakāko'i. There is an historical trail that extends through this area, and the Figure 3-1 delineates this trail as providing a linkage between all of these elements. The cultural landscape is thereby preserved within the Science Reserve and to the NAR, in a manner where people may experience the cultural resources of Mauna Kea in the traditional manner at the 13,000 ft. elevation without interacting with the modern astronomy facilities. A composite of natural and cultural resource features is presented in Figure 3-2.



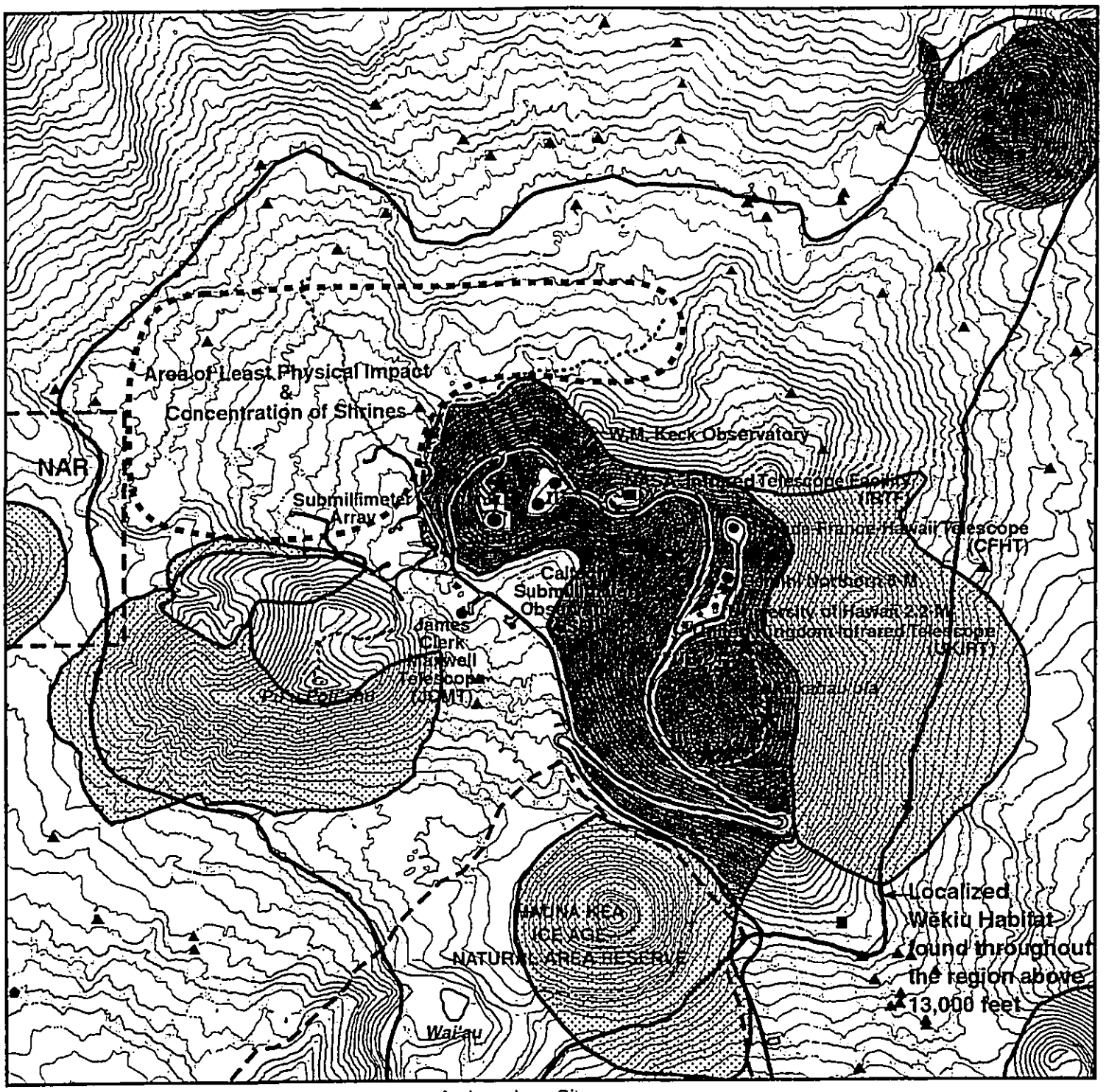
Archaeology Sites

- Shrines
- Marker
- Unknown
- Workshop

- 25' Contour Intervals
- Band of Archaelogical Sites at 13,000 ft. elev.
- Historic Trail Linking Cultural Resources
- Undeveloped Pu'u

Existing Trail Linking Hawaiian Cultural Resources

0' 2000' 4000' 8000' NORTH



Wēkiu Habitat

- Likely Habitat/Specimens Found
- Likely Habitat
- Likely Habitat/Presence Unknown
- Specimens Found 1997-1998

Archaeology Sites

- Shrines
- Marker
- Unknown
- Workshop

- 25' Contour Intervals
- Natural Area Reserve
- Slope 20% or Greater

0' 750' 1500' 3000' NORTH

Natural & Cultural Resources Composite

3.2.2 Education and Research Components

Mauna Kea is the world's premier astronomical research location, and astronomy on Mauna Kea is an essential element of Hawai'i's economy and high technology future. The evolution of astronomy technology, and world-wide interest in astronomy research at this location, presents a current need to upgrade and expand telescope facilities. However, since the time the first telescopes were proposed on Mauna Kea, there have been differing viewpoints about astronomy development, as discussed in the previous section. There is a concern that astronomy development has been distributed across the summit in an unattractive fashion, and that this development might eventually overtake the mountain. There also are concerns about the potential impacts of development to natural resources, such as the Wēkiu bug habitat, archaeological sites and Hawaiian cultural resources.

The education and research component is the second integration of the physical plan, which joins the projected education and research uses with the natural and cultural resource component. The natural and cultural resources map identifies the preservation areas where resource values are highest, and development activity is guided elsewhere. Portions of the summit have no archaeological resources and few environmental resources, and some areas have already been developed with infrastructure and facilities. These locations represent potential development areas for new education and research facilities.

The overall objectives for education and research resources are listed below.

<u>Overall objectives for education and research:</u>

1. Expand knowledge of the Science Reserve as an educational resource for the benefit of the community, students, researchers, and visitors, through the planning process.

2. Protect natural and cultural resources and insure managed access to the Science Reserve for education and research use.

3. Protect and enhance astronomy research at Mauna Kea as it is the premier observatory site in the Northern Hemisphere.

4. Define areas, criteria and support facilities for education and research as applicable, to allow for sustainable, integrated planning and management.

An "Astronomy Precinct" is defined in the plan where development will be consolidated to maintain a close grouping of astronomy facilities, roads and support infrastructure. This approach minimizes the potential impact to the natural and cultural resources of the summit region. The criteria to be followed for new facilities proposed in the Astronomy Precinct include:

- Emphasize the recycling of existing sites so as not to disturb existing habitat areas, archaeology, and landforms;
- Limit visual impact and scattering of facilities by clustering within the existing development area, recognizing that facilities have already been built in this area and presently have a visual impact;
- Utilize the natural forms in the summit area to shield views of built facilities, from both off-mountain and atop this mountain;
- Implement design measures to allow facilities to blend in better with the natural landscape, to minimize the sense of disruption to the landscape; and
- Minimize infrastructure development by locating near the existing roadway and utility network.

As shown in Figure 3-3, the Astronomy Precinct is defined by the limits of the critical resource areas identified within the natural and cultural resources component of the Master Plan, as well as considering the siting needs of future astronomy facilities. The Astronomy Precinct will be approximately 525 acres, or less than five percent (4.65%) of the existing Science Reserve. The boundaries of the Precinct have been established based on the following resources:

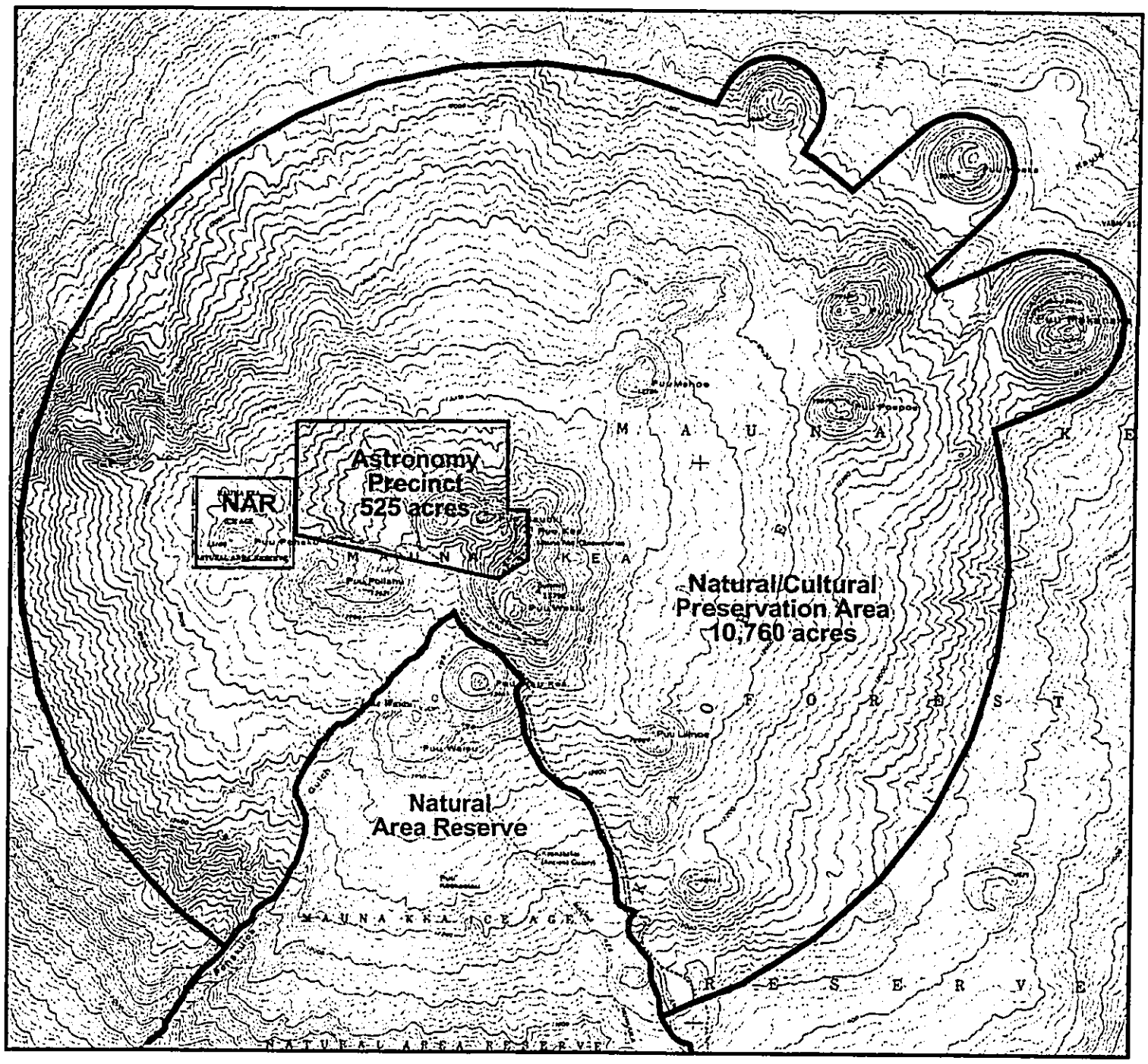
- Northern boundary: The boundary to the North avoids clusters of archaeological sites (shrines) found at the 13,000 ft. elevation, providing a minimum 200 ft. setback. This setback distance is 10 times the setback distance required by the Hawai'i Island Burial Council for development near existing burials.

- Eastern boundary: The Eastern slope of the summit is a broad natural area, with no development at present and which is highly visible from the Hilo area. This will ensure no development on this slope.

- Southern boundary: The culturally significant places of Poli'ahu and Kūkahau'ula, and the intervening area between Poli'ahu and Wai'au, set the Precinct limits to the south. This also respects the Wēkiu bug habitat associated with the summit cinder cone. The precinct boundary also retains an open view from Kūkahau'ula toward the western slope of Mauna Kea, which some have identified as a potentially important resource of cultural and religious significance.

- Western boundary: The NAR and Pu'u Pōhaku and steep slopes set the western limit.

Included within the Astronomy Precinct are three shrines out of the 93 archaeological features identified in the Science Reserve. The Precinct includes relatively flat areas, and the potential development locations within the Precinct are largely shielded from Wai'au and the existing roads. In addition, the implementation of design guidelines outlined at the end of this chapter will minimize the visibility of new astronomy facilities within the Astronomy Precinct.



Astronomy Precinct

Mauna Kea Science Reserve
Environmental Impact Statement

Figure 3-3

Astronomy Precinct Detailed Plan - Siting Criteria. Specific siting criteria have been set for locating new facilities within the Astronomy Precinct. These criteria include:

1. Minimal impact on existing facilities. Existing astronomy facilities require a clear line of sight to approximately 12 degrees above the horizon in a full circle. The location of new facilities cannot obscure the observation function of the existing telescopes on the mountain. New facilities must be spaced accordingly within the Astronomy Precinct.

2. Minimum impact of Wēkiu bug habitat. The major *pu'u* in the area of the summit all possess confirmed or likely habitat for Wēkiu bug where the cinder cone surface geology is present. Only the existing disturbed locations on *pu'u* or areas outside of the Wēkiu bug habitat will be considered as potential siting areas.

3. Avoidance of archaeological sites. There are three existing archaeological shrines within the Astronomy Precinct, and these sites must be avoided in future facility siting. In addition, any new facilities will be set back at least 200 feet from the clustered group of shrines found outside the Precinct boundary on the northern slope. This setback distance is 10 times the setback distance required by the Hawai'i Island Burial Council for development near existing burials.

4. Suitability for Observations. Potential sites for new observatories within the Astronomy Precinct must meet specific standards for conducting astronomical observations, including acceptable obscuration and wind flow conditions.

5. Minimum visual impact from significant cultural areas. Views from the *pu'u* and archaeological sites will be respected in the siting of future facilities. The location of new facilities will avoid interference with the visual connections between the major *pu'u* and the shrine complexes.

6. Avoid or minimize views from Waimea, Honoka'a and Hilo. Sites for new facilities will maximize the use of the existing topography to shield views from the downslope communities. Prominent sites along the ridges or *pu'u* will not be selected for new development of astronomy or other research and education facilities.

7. Close to roads and existing infrastructure. New development sites will be selected close to the existing roadways to minimize the amount of disturbance to the natural terrain. Utilities and communications service to new sites will be extended along the existing roadway routes to minimize disturbance.

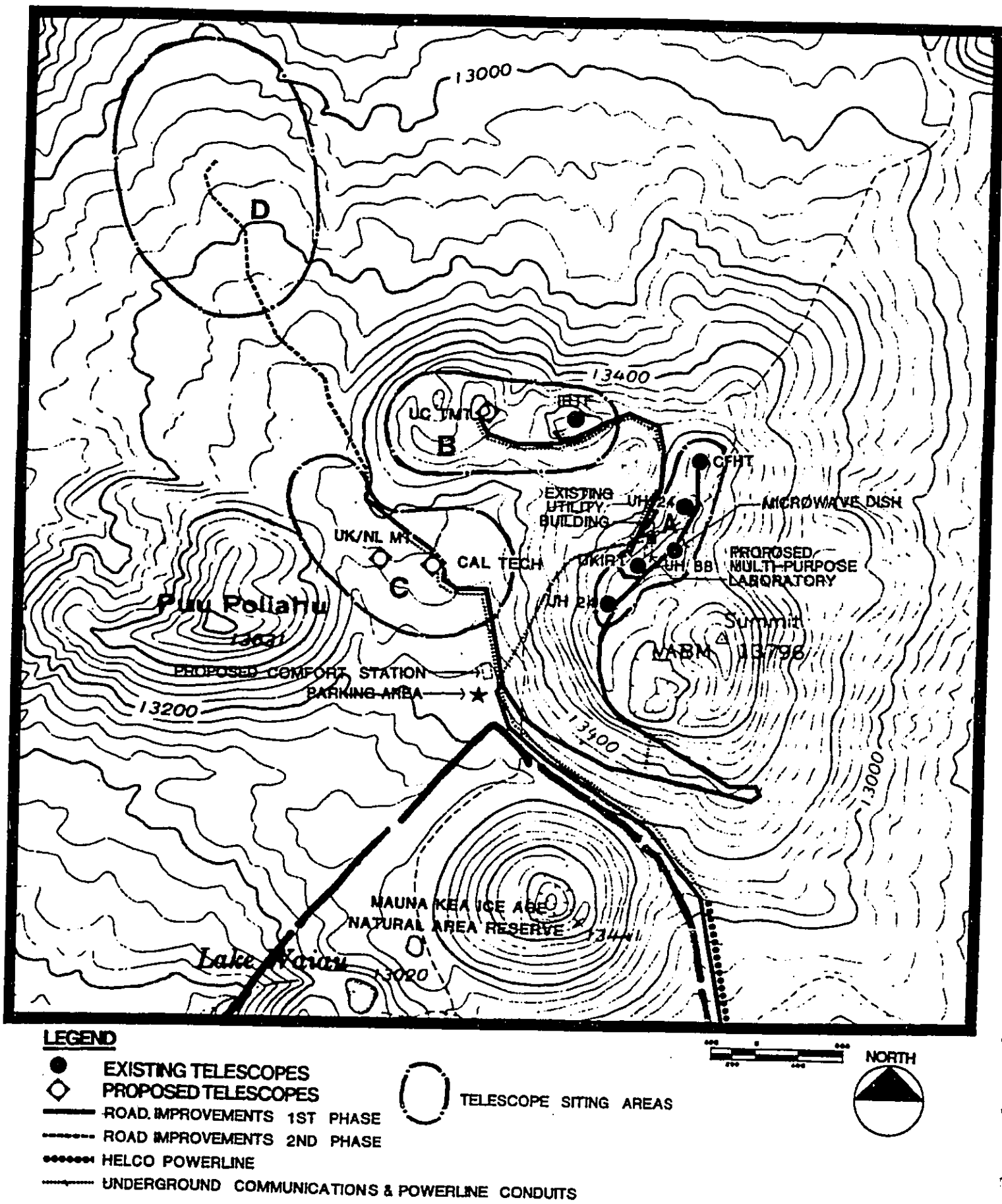
Astronomy Precinct – Telescope Siting Areas. The 1983 plan included seven areas in the Science Reserve that were designated as Analysis Areas, as shown in Figure 3-4. Of these seven areas, four areas (A-D) were designated as Telescope Siting Areas. There was an ample allocation of space in each of the 1983 Siting Areas, to allow for flexibility in the siting of telescopes that had yet to be designed and built on the summit.

The total area allocated in the 1983 plan for telescope siting in the four areas totaled approximately 160 acres. All of the existing observatories and anticipated new facilities in 1983 Plan were to be sited within these four areas, as shown in Figure 3-4. Only the Siting Areas A, B and C have been utilized for observatory development up to this point.

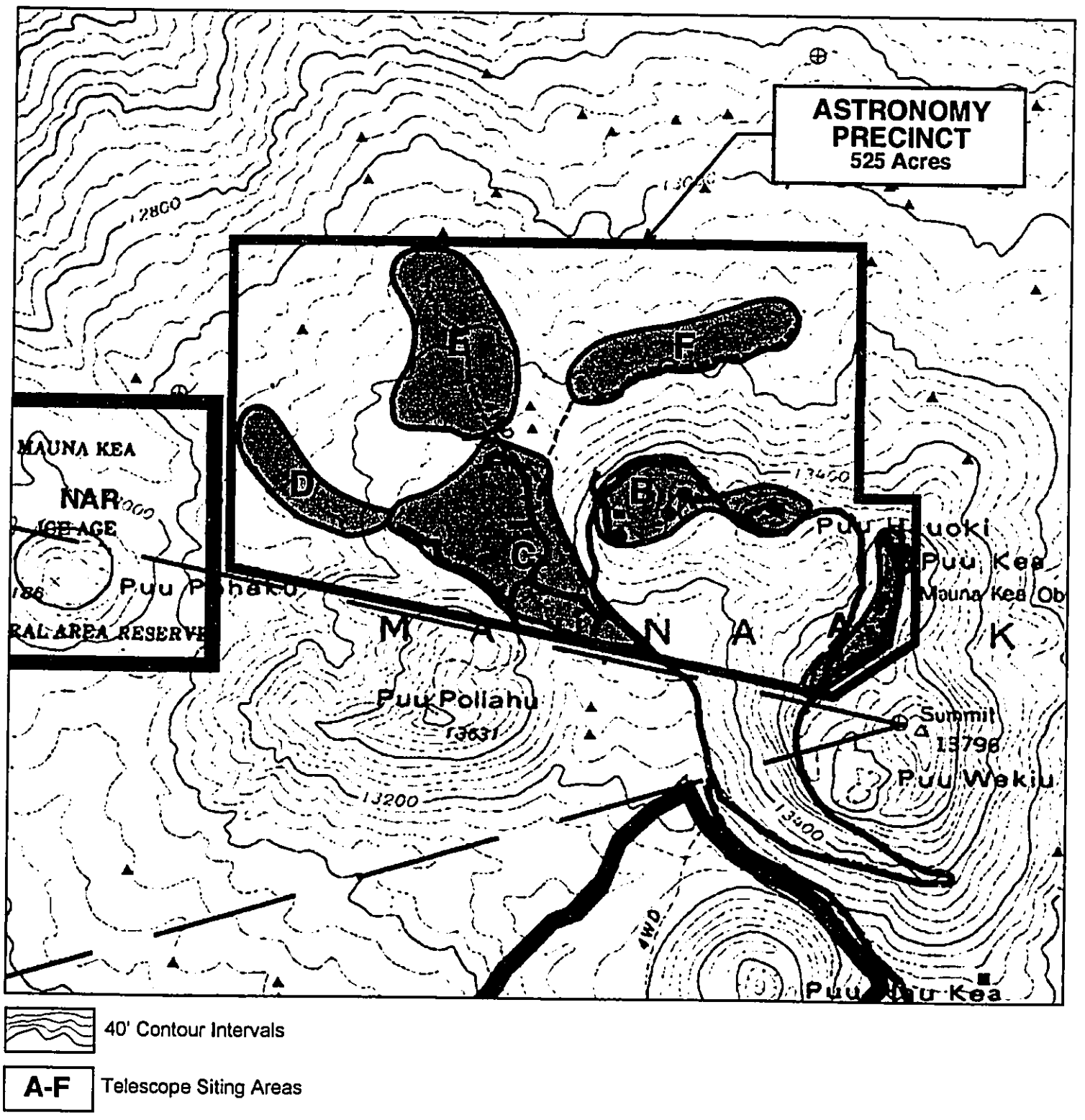
The update of the Master Plan enables the refinement of the Telescope Siting Areas within the Astronomy Precinct, to include all existing observatories, proposed redeveloped facilities and new facility sites. Proposed Telescope Siting Areas (2000-2020) are shown in Figure 3-5, consistent with criteria described above.

Siting Areas A, B and C are already developed with observatories. All the instruments proposed in the previous plan are constructed, and the limits of these observatory sites define Areas A, B and C. There is little area available for new telescope development in these three siting areas, however, redevelopment of existing facilities would be possible.

Within the Astronomy Precinct, new telescope siting areas were identified consistent with the siting criteria described earlier. The areas which are anticipated to provide suitable observation conditions with minimum impact on existing facilities, wēkiu bug habitat, archaeological sites and visual appearance were selected as the new telescope areas D, E and F, as delineated in Figure 3-5. Each expansion area is linked to the existing unpaved roads, which minimizes disturbance to the natural terrain. In the new plan, Areas D and E are expansion areas that are located in the vicinity of Area D from the 1983 plan; however, the new Areas D & E will avoid sensitive shrines that were previously located in the siting area. Area F is located in the vicinity of a Analysis Area V from the 1983 plan.



Telescope Siting Areas (1983)



0' 750' 1500' 3000'

NORTH

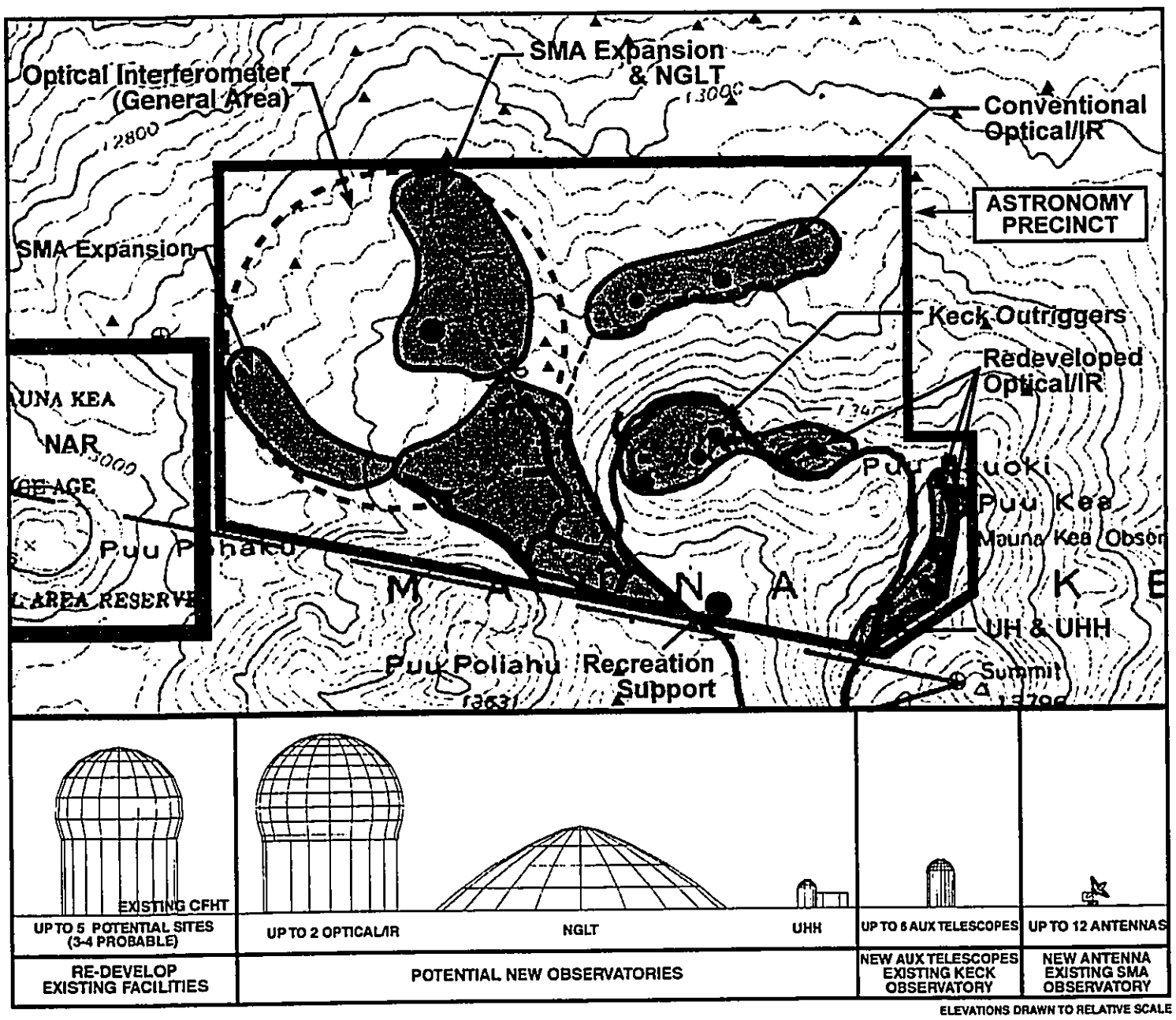
Telescope Siting Areas (2000-2020)

Compared to the 1983 Telescope Siting Areas, the current plan reduces Areas A and B, reconfigures Areas C and D, and adds Areas E and F. The current Master Plan reduces the total area allocated for Telescope Siting Areas to approximately 150 acres, as compared to approximately 160 acres in the 1983 plan.

Telescope Siting Areas (1983 Complex Development Plan)		Telescope Siting Areas (Updated Master Plan 2000-2020)	
Area Designation	**Approximate Area (ac.)**	**Area Designation**	**Approximate Area (ac.)**
A	18	A	10
B	34	B	22
C	35	C	43
D	75	D	16
		E	36
		F	23
Total	**160**	**Total**	**150**

Astronomy Precinct – Definition of a Telescope. The 1998 report by the State Legislative Auditor recommends departing from the simplistic counting of "telescopes" at the Mauna Kea Science Reserve. To help clarify the issue of counting telescopes, it is appropriate to examine the definition of a telescope. Webster defines "telescope" as follows: *An instrument for collecting and examining electromagnetic radiation.* This is consistent with the working definition for telescopes within astronomy. A telescope must have the capacity to *collect* as well as *examine* visible light and/or invisible radiation — i.e., it must be capable of making astronomical observations.

By this definition, Keck, Gemini, Subaru, Canada-France-Hawaii, both U.H. facilities, UKIRT, JCMT (Maxwell), VLBA, and Caltech are telescopes. The Submillimeter Array (SMA), when taken as a whole, is a telescope, but not each antenna. Each antenna collects radiowaves, but is not capable of providing astronomy observations. If a control building were attached to each antenna, then these antenna would be considered telescopes. The control buildings would, of course, be larger than the antenna. In the same way, the proposed 4-6 Keck outriggers are collectors which are part of an interferometer and not individual telescopes. When connected to the control building within the existing Keck, they would form one interferometric telescope.



Physical Plan and Proposed Astronomy Facilities

An analogy for an array telescope is a stereo system. Each speaker is not a stereo system in itself but all the components make up one system. Each part is considered a component with a specific name and purpose. The use of the term "stereo" to refer to a speaker, receiver, tape deck, etc. is inappropriate. In the same way, the use of the term "telescope" for components is inappropriate.

The approach taken by the Master Plan is to describe the actual components of proposed astronomy development. This approach provides for full disclosure to the extent possible when viewing the future of astronomy facilities atop Mauna Kea, and is consistent with the Auditor's recommendation to get away from the simplistic counting of "telescopes".

Astronomy Precinct - Anticipated Program for Astronomy Development. The projected expansion of astronomy research facilities at Mauna Kea is specified in the Institute for Astronomy's Astronomy Research Development Program (2000-2020), which is included in Appendix A. The anticipated program for astronomy development envisions five different categories of facility development projects (Types I-V), as listed below and summarized in Table 3-1.

Table 3-1

EXISTING AND PROPOSED OBSERVATORIES AT THE MAUNA KEA SCIENCE RESERVE

Observatory (Aperture Diameter)	Proposed Master Plan Action
University of Hawaii (0.6 m.)	Redevelop: 2-3 m.
University of Hawaii (2.2 m.)	Redevelop: 4-12+ m.*
Canada-France-Hawaii Telescope (3.6 m.)	Redevelop: 4-12+ m.*
United Kingdom Infrared Telescope (3.8 m.)	Redevelop: 4-12+ m.*
NASA Infrared Telescope Facility (3.0 m.)	Redevelop: 4-12+ m.*
Caltech Submillimeter Observatory (CSO) (10 m.)	Remain As-Is
James Clark Maxwell Telescope (JCMT) (15 m.)	Remain As-Is
Very Large Baseline Array (VLBA) (25 m.)	Remain As-Is
W. M. Keck Observatory (Keck I & II) (10 m.)	Add 4-6 1.8 m. Aux. Telescopes
Gemini Telescope (8 m.)	Remain As-Is*
Subaru Telescope (8 m.)	Remain As-Is*
Submillimeter Array (SMA) (12 6-m. Antenna)	Add 12 Antenna
New: University of Hawaii – Hilo	**New Site, 1 m. (Instructional)**
New: Conventional Optical/IR No. 1	**New Site, 4-12+ m.***
New: Conventional Optical/IR No. 2	**New Site, 4-12+ m.***
New: Next Generation Large Telescope (NGLT)	**New Site, 25+ m.**
New: Optical/IR Interferometer	**General Location Only**

* It is expected there will be a range of telescope sizes proposed in this group. Exterior dimensions of those on the ridge will be limited by Design Guidelines.

Type I. Redevelopment of Existing Observatory Sites on the Summit Ridge:
Redevelopment or "recycling" of up to five existing telescopes, including NASA/IRTF, CFHT, UH 2.2 m, UKIRT, and UH 0.6 m. It is anticipated that up to three or four facilities may be redeveloped over the next 20 years.

Type II. Expansion of Existing Observatories:
The existing Keck Observatory will be expanded with four to six 72-inch outrigger telescopes. Four are being proposed for development in 2000-2001. The Submillimeter Array may add up to 12 new antenna over the next 20 years.

Type III. New Conventional Optical/IR Telescopes
Two new sites and facilities are added for conventional telescopes comparable to the Keck or Gemini Observatories. An instructional telescope for UH-Hilo is also projected.

Type IV. Next Generation Large Telescope (NGLT)
A single optical/IR telescope of 25 m. aperture or greater. This is currently only being discussed in the astronomy community and there is a 50 percent possibility that this facility may be developed in the next 20 years.

Type V. Optical/IR Interferometer Array Site (General Area Only)
A general area for this observatory is proposed for planning purposes only. No facilities are projected/or included in this Plan. Facilities must undergo the major Master Plan amendment process for approval.

Given the prescribed criteria for site selection, and UH's anticipated program for astronomy development in the next 20 years, specific sites or areas within the Astronomy Precinct have been identified. A summary of all proposed research facilities development in the Astronomy Precinct is presented in Figure 3-6. An expanded discussion of each of the proposed facility type and locations is presented below.

Type I. Redevelopment of Existing Observatory Sites on the Summit Ridge.

The most likely type of astronomy development at Mauna Kea would be the replacement or upgrading of facilities at existing sites, as a first preference, or the development of new sites as a second preference. It is expected that the proposed new or upgraded conventional optical/IR telescopes will come in a range of sizes, from 2 to 15 m. mirror sizes. The 8 to 10 m. mirrors of the existing Keck, Gemini and Subaru telescopes represent the current state-of-the-art instrument.

The first priority for siting these facilities will be the recycling of existing facilities that have aging technology, such as the IRTF, CFHT, UKIRT, UH 2.2 m. and UH 0.6 meter. These five telescope sites have already been disturbed by development activities, and the facilities are part of the existing visual setting. The IRTF, CFHT, UKIRT, UH 2.2 m. and UH 0.6 meter are all over 20 years old, and the current technology for conventional telescopes is far superior. The present sites on the summit ridge are attractive for locating new or upgraded facilities because of known high quality locations and existing infrastructure. Most of the existing observatory

organizations may be unable to operate both a new facility and the existing one, so they will prefer to recycle their existing site.

During the 20-year period of this Master Plan, it is expected that there may be proposals to upgrade or replace each of these five telescopes on the summit ridge with conventional optical/IR telescopes. Over the next 20 years, it is estimated that only three or four ridge facility upgrades will actually be constructed over this time period, including the replacement of the UH 0.6 m telescope with a facility in the 2-3 meter size range.

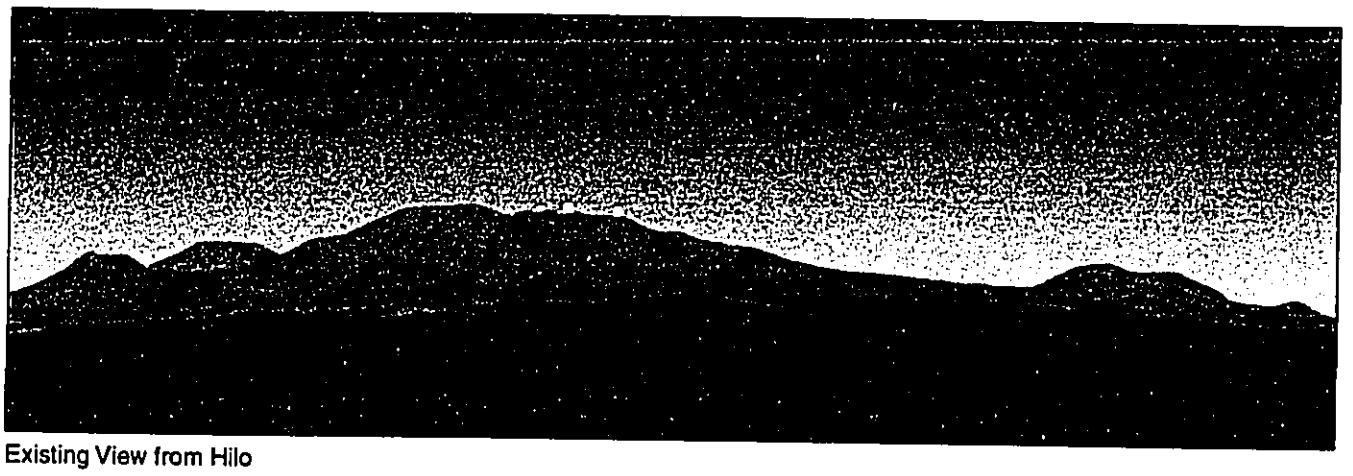
In addition to the replaced/upgraded conventional optical/IR telescopes on the ridge, UH Hilo plans to construct an instructional telescope (1 m. mirror) adjacent to the existing UH 0.6 meter telescope on the existing site of a utility/storage building. Use of the facility is anticipated to be primarily instructional, with research uses only for programs with substantial academic or other instructional content, or when the telescope is not needed for such programs.

Figure 3-6 identifies the sites on the summit ridge with the greatest potential for upgrades, expansion or redevelopment. Future telescope redevelopment on the summit ridge will limit these facilities to a maximum height and diameter of approximately 130 feet, to limit the visual impact along the ridge. This standard is derived from the approximate dimensions of the existing Gemini and Keck class of telescope. For more specific standards for these facilities, refer to the design guidelines at the end of this chapter.

A three-dimensional perspective of the summit ridge under existing conditions and with recycled/upgraded telescopes, as viewed from the access roadway in "Millimeter Valley" near the James Clerk Maxwell Telescope, is included in Figure 3-7. The view from off-mountain locations of the summit ridge with the redeveloped conventional Optical/IR telescopes is shown from Hilo (Figure 3-8), Honoka'a (Figure 3-9) and Waimea (Figure 3-10).

Type II. Expansion of Existing Observatories.

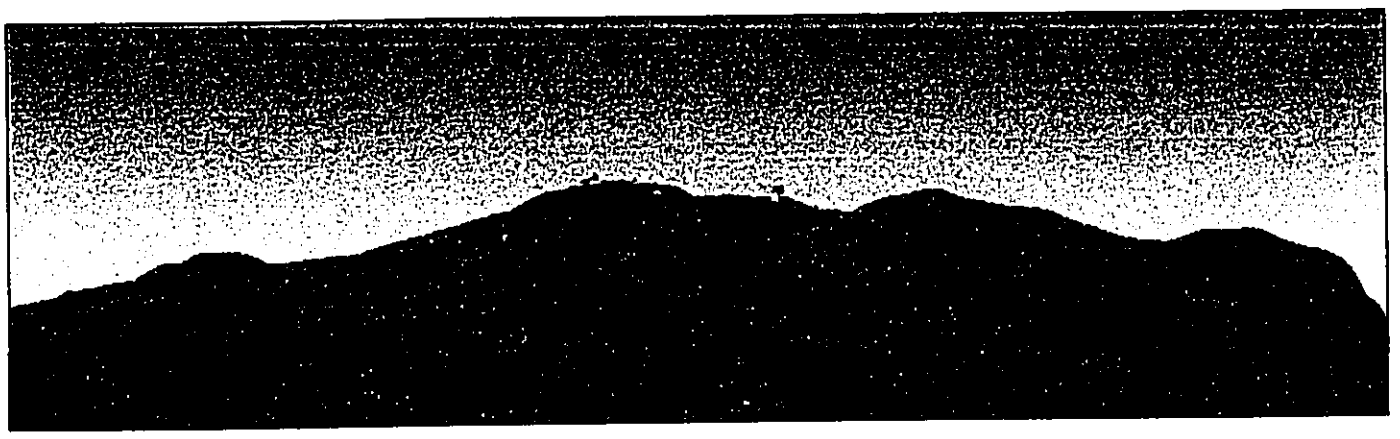
Expansion of the W. M. Keck Observatory. The addition of four to six 1.8-m. Outrigger Telescopes is planned to create a powerful IR interferometer on the existing Keck site. The primary purpose is to study planetary systems around nearby stars. Funding is to be provided by NASA, with four of six outriggers already funded. The Outrigger Telescopes will test the feasibility and capability of IR interferometers, as a precursor to space-based interferometry missions including the Terrestrial Planet Finder. On a tight schedule because of its link to planned space missions, NASA would like to start construction in 2000. The Keck Outrigger Telescopes project is the only new project proposed for Mauna Kea at present.



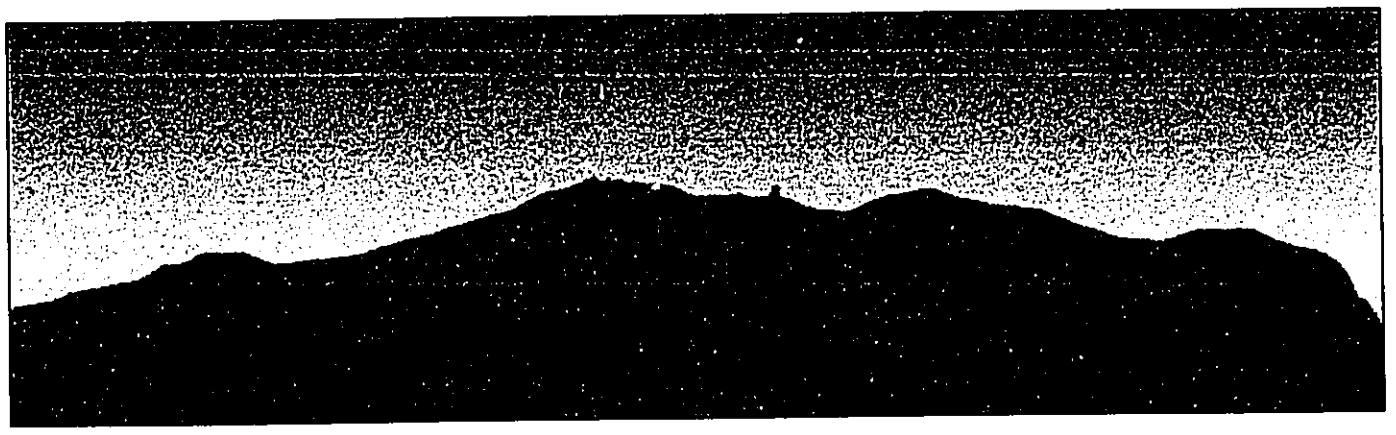
Existing View from Hilo

Future View from Hilo

Views from Hilo



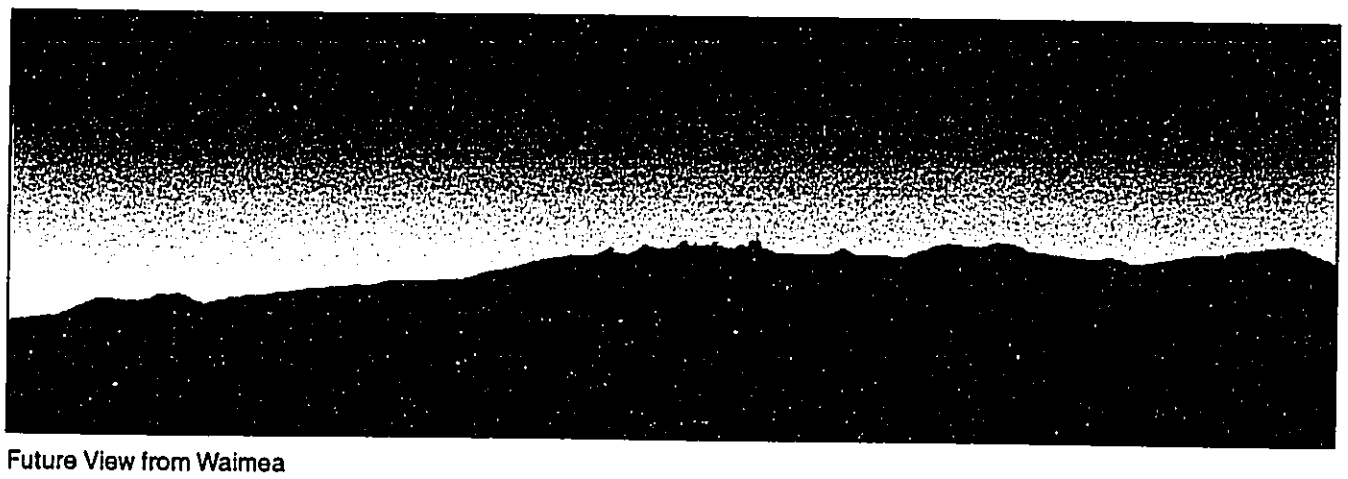
Existing View from Honoka'a



Future View from Honoka'a

Views from Honoka'a

Existing View from Waimea



Future View from Waimea

Views from Waimea

The location of the Keck Outrigger Telescopes on the existing Keck site is shown in Figure 3-6. This site is already disturbed from the development of the two Keck facilities, and the Outrigger Telescopes project will not extend beyond the existing site. From a natural and cultural resource perspective, the impact of the project is negligible. There is no better location for this facility since it requires a combination with the existing Keck facilities. The proposed use of the existing site allows for the project to be built without damaging existing Wēkiu bug habitat found in the surrounding area.

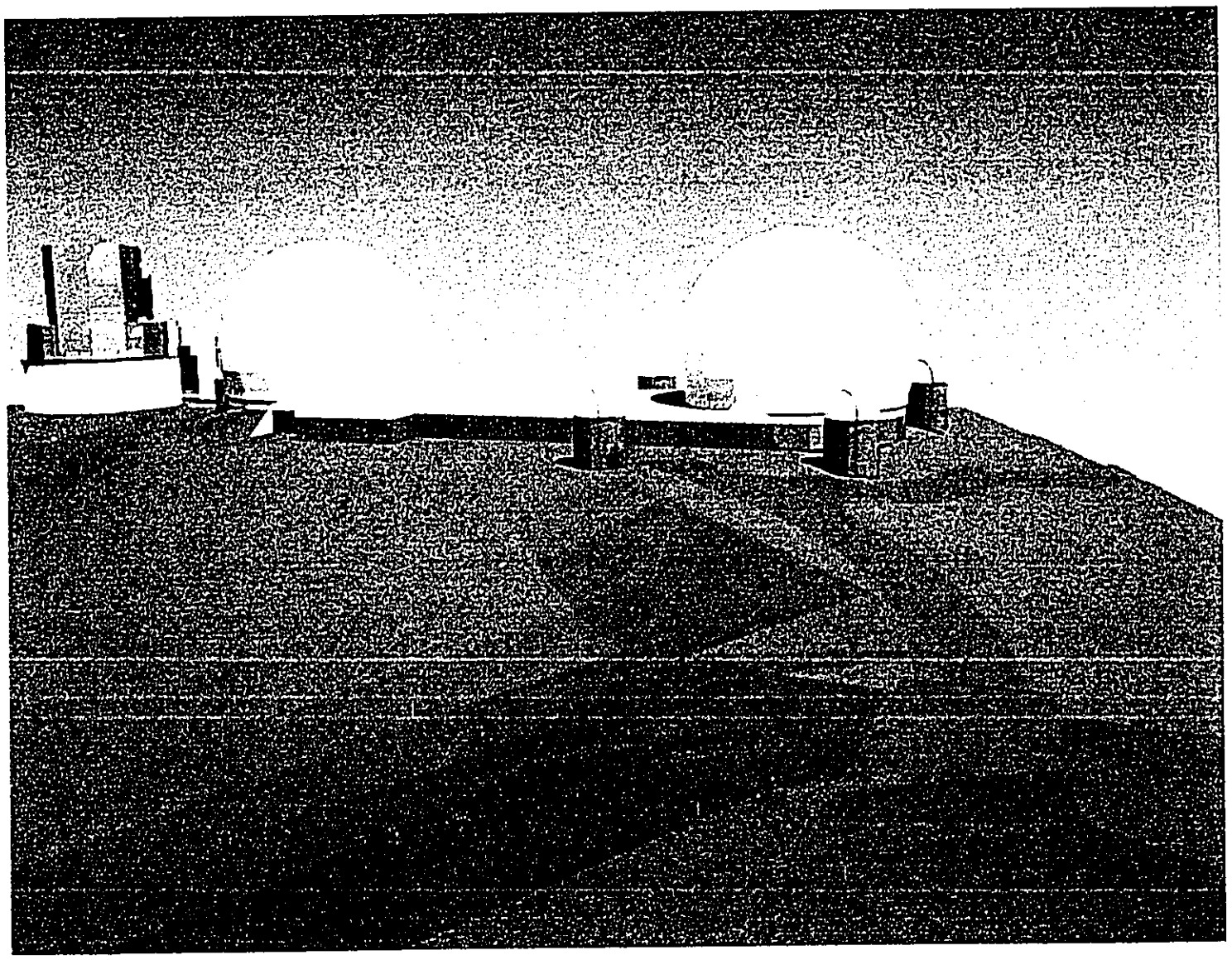
A three-dimensional view of the Keck Outrigger Telescopes is presented in Figure 3-11. The new Outrigger Telescopes will be much smaller in scale in comparison to the existing Keck telescopes, only about 35 ft. in height. The visibility of the Outriggers from areas at the summit is very limited, and off-mountain views will not be affected. A simulated view of the summit from off-mountain locations at Hilo, Honoka'a and Waimea, including the completed Keck Outrigger Telescopes, is shown in Figures 3-8, 3-9 and 3-10.

Expansion of the Submillimeter Array (SMA). The existing SMA is anticipated to be operating in 2000. Within the next 20 years, it is likely there will be a need to expand the existing SMA, to include up to 12 new antennas and 24 additional pads. Some of these antennas may differ somewhat in size and structure from the current SMA antennas and operate independently of the others. This expansion will increase the sensitivity and angular resolution of the SMA and will allow for multiple studies to take place concurrently within a densified and elongated array.

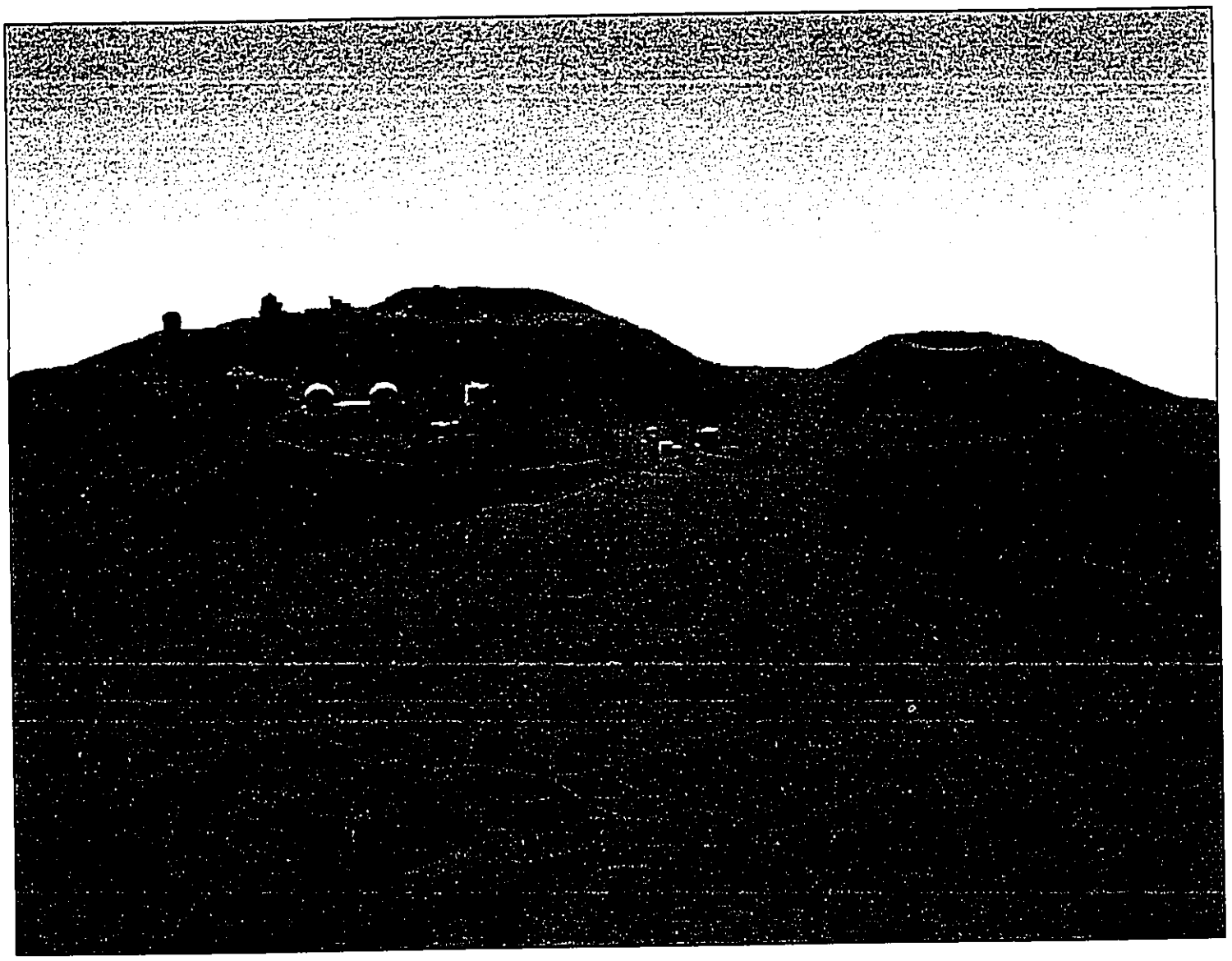
Location issues involved with the sub-millimeter involve technical siting issues (slope and obscuration) and natural/cultural resource constraints. One of the potential array configurations, considered prior to this Master Plan, included expansion in the area to the south of the existing array. Use of this area, however, would not fit with the natural and cultural resource component of the Plan. The inter-relationship between Poli'ahu, Wai'au and Kūkahau'ula (summit) is recognized as culturally significant, and the placement of antennas in the valley between these features would detract from this resource.

The expansion area will extend the baseline for this antennae complex approximately 0.5 km to the north and west of the existing array. Figure 3-6 shows the potential expansion area for the sub-millimeter array. A three-dimensional perspective view of the expanded sub-millimeter array is included in Figure 3-12.

The submillimeter array expansion will be concentrated in the area to the north of Pu'u Poli'ahu, and will not be visible from Hilo and Honoka'a (Figures 3-8 and 3-9). It will probably not be visible from Waimea, as shown in Figure 3-10. Due to the relatively small size of the SMA antennas (25 ft. in height) they are virtually invisible from a distant perspective. To further diminish the visual impact of the SMA facilities, the concrete pads for the new antennas will be colored in a brown tone to match the surrounding lava/ash landscape. To the extent possible the SMA facilities will be sited to utilize the existing road and pathways.



W.M. Keck Observatory with Proposed Outrigger Telescopes



Proposed Submillimeter Array Expansion

Type III. New Conventional Optical/IR Telescopes

The second priority for siting conventional optical/IR telescopes will be at two new sites within the Astronomy Precinct, and only if a suitable summit ridge site cannot be utilized for redevelopment. In the event there is no existing conventional optical/IR telescope site available, there is an area to the north of the summit ridge that could potentially support new conventional optical/IR telescopes. Infrastructure expansion issues are a concern for any new facility that is not accessible from existing roadways. The north shield has not been thoroughly tested for seeing conditions, and future sites for facility development in this area would be contingent on positive findings from seeing analysis. During the 20-year period of this Master Plan, it is anticipated that at least one of the two new sites will be utilized.

The proposed sites for two new conventional optical/IR telescopes is shown in Figure 3-6. The selection of these new sites within the Astronomy Precinct generally satisfies the specific siting criteria, including:

1. Minimal impact on existing facilities. Facilities proposed at the locations to the north of the summit ridge will not cause obscuration of any existing telescopes on the mountain.

2. Minimum impact of Wēkiu bug habitat. The area to the north slope is outside of the known Wēkiu bug habitat with no *pu'u* or cinder cone surface geology

3. Avoidance of archaeological sites. There are no existing archaeological features in the north slope portion of the Astronomy Precinct. The new facilities will be set back at least 200 feet from the clustered group of shrines found outside the Precinct boundary further the north (toward Honoka'a and Waimea). This setback distance is 10 times the minimum setback distance required by the Hawai'i Island Burial Council for development near existing burials.

4. Minimum visual impact from significant cultural areas. Sites on the north slope would be visible from archaeological sites toward the summit. The location of new facilities will avoid interference with the visual connections between the major *pu'u* and the shrine complexes. By locating new conventional optical/IR telescope sites off the summit cinder cones, this will mitigate further diminishment of the integrity of the summit ridge as an historic property.

5. Avoid or minimize views from Waimea, Honoka'a or Hilo. This location is not a prominent site such as the ridges or *pu'u*. The existing topography of the north slope shields views of new facilities from Hilo. New telescopes at this location would be visible from the Waimea and Honoka'a communities.

6. Close to roads and existing infrastructure. The proposed sites for the conventional telescopes were selected near to the existing roadways to minimize the amount of disturbance to the natural terrain. Utilities and communications service to new sites will be extended along the existing roadway routes to minimize disturbance.

The two proposed sites for conventional optical/IR telescopes satisfy the selection criteria. A perspective view of the two new conventional optical/IR telescopes on the north slope is shown in Figure 3-13. In order for their visual impact to be minimized, it will be required that the enclosures for these new telescopes should be colored to match the surrounding lava/ash terrain. Further, if a new observatory is proposing to develop a mirror with an aperture of greater than 10 m., a partial buried strategy must be applied to diminish the visual impact of these facilities. These requirements are specified in the proposed Design Guidelines.

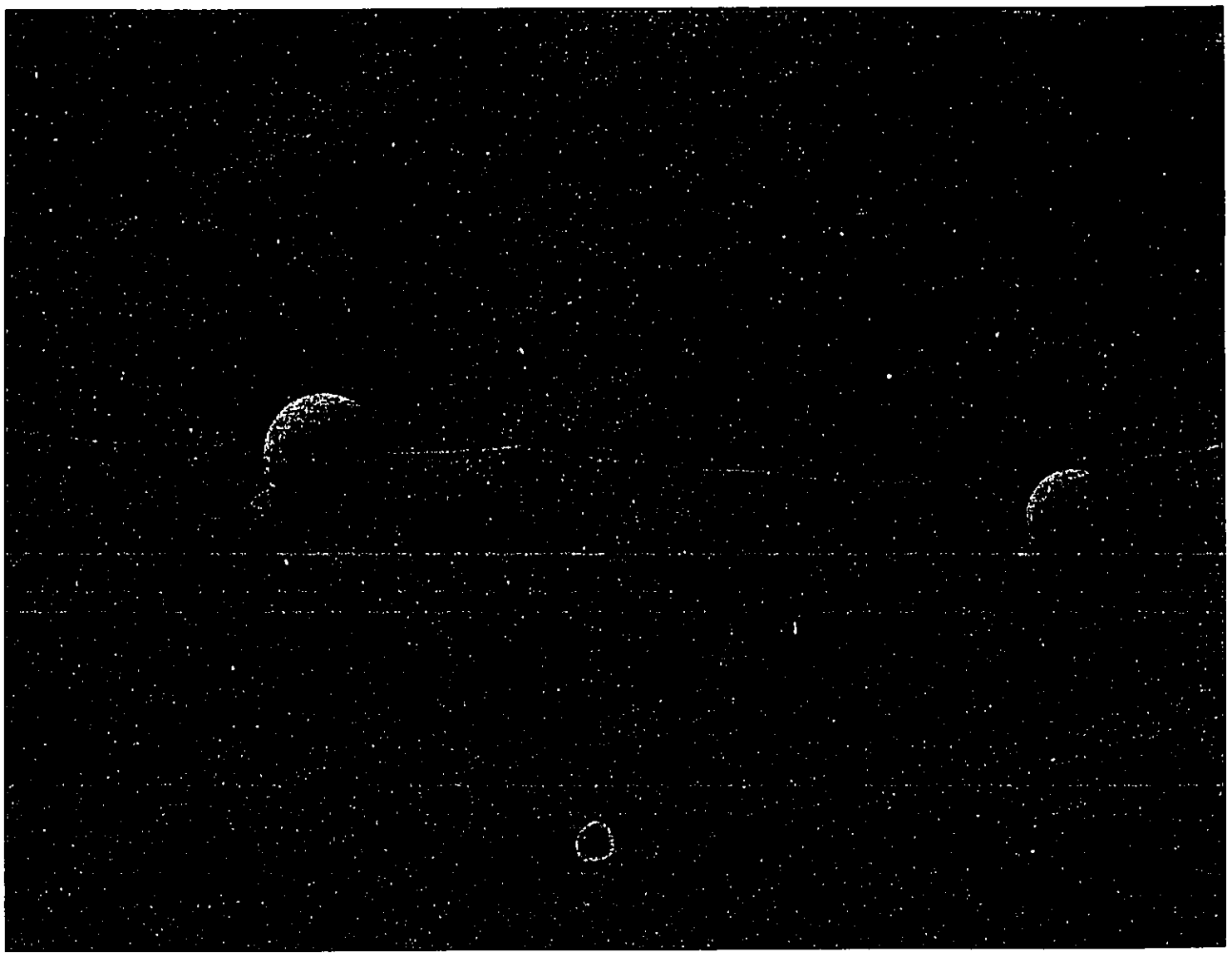
Type IV. Next Generation Telescope Site

A single large optical/IR telescope may be proposed for Mauna Kea in the 20-year life of this plan. A ground-based telescope with a mirror of 25 to 50 m. in diameter is being considered by the astronomy community, which would complement the planned Next Generation Space Telescope. This facility would be the largest telescope in the world, and is currently called the Next Generation Large Telescope (NGLT).

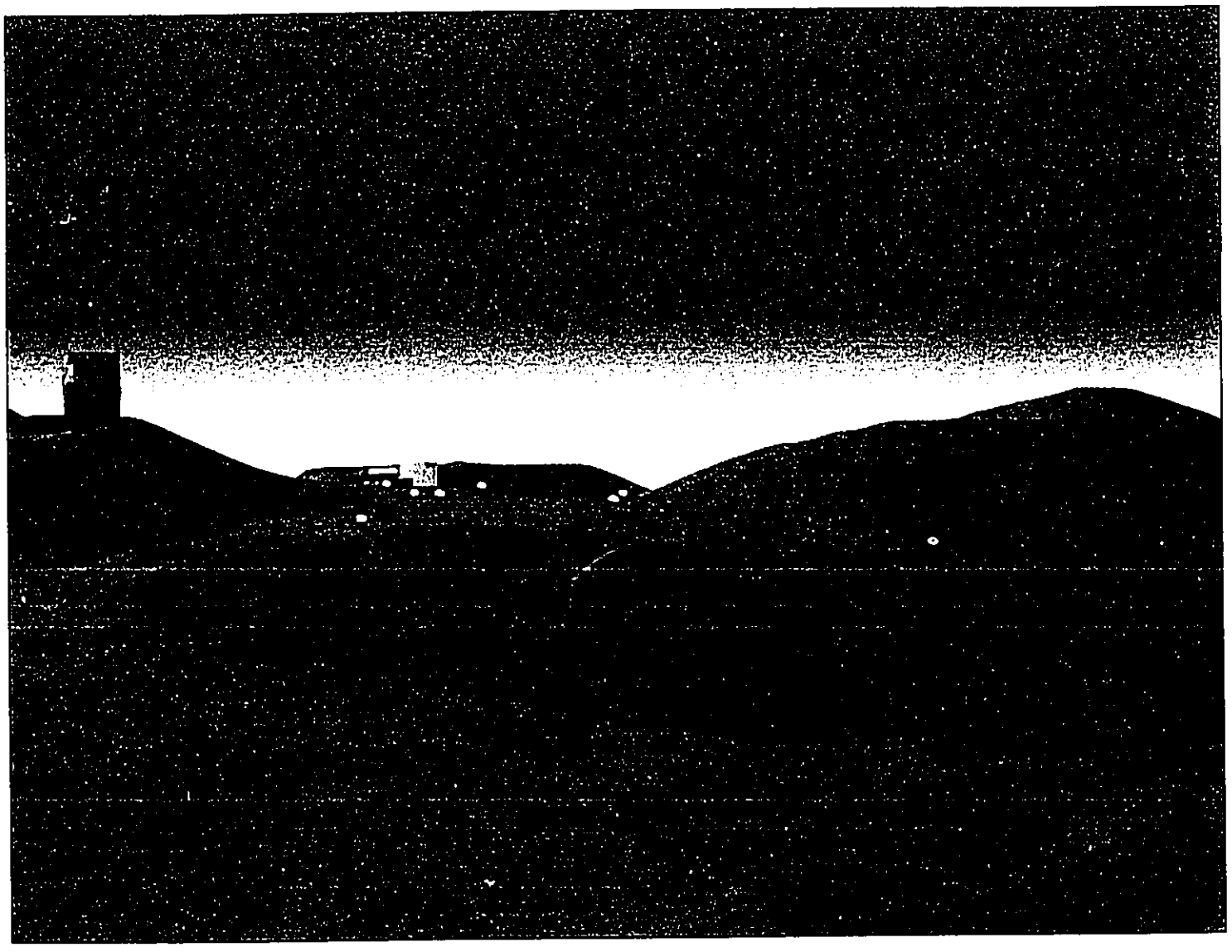
The large scale of this instrument makes the visual impact considerations very important in the facility siting and design. The NGLT would not be appropriately located at Mauna Kea's summit ridge, due to the major earthwork requirements that would disturb Wēkiu bug habitat and the visibility of a large telescope placed atop the ridge. In addition, telescope engineers have indicated that wind forces acting on the structure are expected to be severe and problematic. To minimize potential obscuration of existing observatories, the potential site for this facility must also be located in an area that is distant from the prominent topography at the summit ridge and nearby *pu'u*.

A location that would minimize its visibility and reduce wind shear forces, and minimize potential obscuration impacts, would be on the slope to the northwest of the summit ridge. The proposed location of the telescope will take advantage of a northerly extension of the summit ridge to entirely block views of the new facility from Hilo and Honoka'a. Figure 3-6 shows the proposed location for the NGLT, which is located between the SMA service roadway and a jeep road that was built decades ago for preliminary testing of viewing conditions to the northwest of the summit ridge. The presence of the existing roadways will help minimize potential site disturbance for the infrastructure extension to this site.

Strict design guidelines will dictate the size and color of the NGLT. The preliminary design concept proposed for the NGLT employs a unique sliding dome mirror enclosure with a sub-grade foundation, as shown in Figure 3-14. The lower half of this observatory will be built below grade to minimize the apparent height and mass of the facility. The facility shown in the concept has a 30-m. mirror, with a dome shaped and colored to simulate a small *pu'u* to blend well with the surrounding landscape.



Proposed Conventional Optical/Infrared Telescopes



The siting criteria for locating new facilities were applied in selecting the site for the NGLT, discussed as follows:

1. Minimal impact on existing facilities. The observation function of the existing telescopes on the mountain would not be affected by new facilities located to the north or northwest of the summit ridge. The proposed location of the NGLT in the center of the SMA expansion area and the optical/IR interferometer area could potentially obscure some antennas in the SMA expansion and some new optical/IR interferometer elements. These potential obscuration effects can be minimized or eliminated by cooperative planning for these three facilities.

2. Minimum impact of Wēkiu bug habitat. The proposed site is outside of the Wēkiu bug habitat.

3. Avoidance of archaeological sites. The closest archaeological feature to the proposed NGLT site is a shrine located approximately 1,200 ft. to the east. For reference, this distance is 60 times the minimum setback distance required by the Hawai'i Island Burial Council for development proposed near existing burials.

4. Minimum visual impact from significant cultural areas. The siting of the NGLT respects views from the *pu'u* and archaeological sites. The NGLT is located to the northwest of the summit ridge, which does not interference with the visual connections between the major *pu'u* and the shrine complexes.

5. Avoid or minimize views from Waimea, Honoka'a or Hilo. The existing topography shield views of the NGLT from Hilo, however, the facility will be partially visible from Waimea and Honoka'a (Figures 3-9 and 3-10). The proposed design guidelines for the NGLT will minimize the visual impact of the facility, as discussed previously.

6. Close to roads and existing infrastructure. The NGLT site is close to the existing SMA service roadway, which will minimize the amount of disturbance to the natural terrain. Utilities and communications service to the NGLT site will be extended along the existing roadway routes to minimize disturbance.

To mitigate the visual impact of the telescope, requirements will be imposed to color the telescope enclosure to blend into the site. The technology for coloring telescope enclosures has yet to be applied in practice, however, this technology is presently being considered by telescope engineers. This design measure will serve to significantly diminish the visual impact of the telescope from both on-mountain and off-mountain locations. Coloring of the telescope enclosure and other strategies are included in the Design Guidelines.

Type V. Optical/IR Interferometer Array (General Area Only)

Development of an Optical/IR interferometry array requires a large and relatively level area of up to 1.0 km. in diameter. Within Mauna Kea's Astronomy Precinct, there is a plateau area to the northwest of the summit ridge that is approximately 0.8 km in diameter. At this location, the

facility would extend 0.8 km in diameter, with multiple telescope elements collecting light, arranged in a roughly circular array. The number of collecting elements cannot be accurately quantified at present due to the current state of the technology for optical/IR interferometry. It is anticipated that 6 to 10 optical/IR light collecting instruments would be placed in this interferometry array (Please see the Astronomy Research Development Plan in Appendix A). The light collected by these devices would need to be combined at a central location to resolve the image of the target object.

At present, the technology has yet to be developed which would allow for the light to be combined from an optical interferometer of this scale, without the construction of massive light combining structures and miles of vacuum tube being installed. These types of support facilities are deemed inappropriate for Mauna Kea. Advances in the use of fiber optics and light processing technology for this purpose are required before a facility such as this could be appropriately built at Mauna Kea. These advances are currently being studied intensively by telescope development engineers.

In anticipation of the advances of the light combining technology, and to provide direction for telescope designers, a general area is identified as shown in Figure 3-6. In anticipation of the advances of the light combining technology, and to provide direction for telescope designers, the physical plan guides the possible placement of this instrument within the northwestern quadrant of the Astronomy Precinct. Only a general area for this array instrument is indicated on the plan, due to the formulative state of the design parameters for the new optical/IR interferometer. There is no Telescope Siting Area defined to accommodate this possible instrument. For general planning purposes, the Master Plan presents a general area to provide an opportunity for possible further study of the instrument at some point in the next 20 years. A lengthy and thorough process of a General Amendment to the Master Plan would be required to advance this project to the facility siting, design and permitting phase, including a full EIS and CDUA.

A proposed design strategy for minimize the visual impact of the interferometer includes partial burial of the interferometer elements and creating visually minimized enclosures. A clamshell enclosure with "pop-up" collecting device should be considered. Along with these design measures, the enclosures should be colored to match the surrounding landscape. Together with the low profile of the instruments, these measures would essentially shield and camouflage the interferometer from view.

Due to the unspecified project characteristics at this time, only a general area for the optical/IR interferometer is proposed within this Master Plan. If an optical/IR interferometer proposal is advanced in the next 20 years, the project will require a major Master Plan amendment, involving the full range of planning analysis, visual impact analysis, and preparation of an environmental impact statement (EIS), and final review by the UH Board of Regents.

Detail Plan of Astronomy Precinct

A list of the existing and proposed observatories is included in Table 3-1 and locations are shown in Figure 3-6. This listing includes all of the upgraded and new facilities that could potentially

be proposed by the astronomy community within the 20-year timetable of this update to the Mauna Kea Science Reserve Master Plan. The likelihood of all of the identified facility upgrades and new facilities being developed is extremely remote, and the anticipated scope of development is closer to 50 or 75 percent of the observatories listed. The timing for development of these facilities is undefined, except for the Keck Outriggers project. The progress of some of the new observatories will depend entirely on the progress of technological advancements which would are necessary for the optical/IR interferometer and next generation large telescope to move forward. Each of the new or redeveloped facilities, including non-astronomy facilities, will undergo individual project reviews which include environmental analysis pursuant to Chapter 343 HRS.

3.2.3 Recreational Components

The final integration of the Master Plan involves the recreational resource components in the Science Reserve. This plan provides direction for future recreational uses within the Science Reserve, including any potential facilities to support recreation on Mauna Kea. Recreation components, such as hiking, hunting, skiing, snow play and tourism, are addressed in an integrated approach overlaid upon the integrated plan of natural and cultural resources and education and research resources. The overall objectives for recreational resources are listed below.

Overall Objectives

1. Expand understanding of recreational uses and potentials of the Science Reserve.

2. Retain and enhance recreational opportunities within the Science Reserve, while protecting natural, cultural resources, and cultural practices.

3. Define areas, criteria and support facilities for recreational uses, sight seeing and commercial tours, as applicable, to allow for sustainable, integrated planning and management.

Recreational Resources Plan. The traditional uses for recreation on Mauna Kea, and the pattern of these uses, determines the form of the recreational plan component. Access to recreational resources will be enhanced and managed to ensure the protection of the natural, cultural, education and research resources. Hiking trails, ski areas and scenic viewpoints will be delineated within the Science Reserve to allow people to witness the unique resource areas while ensuring their protection. As part of the plan, the following facilities are planned:

- Recreational support facility in the summit region to support skiing, snow play, visitor tours and scenic resource enjoyment;
- A parking area that is primarily planned to serve cultural resource interests, located along the access road at the 13,000 ft. elevation; and,
- Cabin camping by organized groups, using the planned conversion of the construction cabins built by the Subaru observatory at Hale Pōhaku.

Further details of the Recreational Plan elements are discussed in the following section.

Physical Plan: Expanded Understanding of Recreational Resources

While there are physical components to the recreational plan, most recreational issues are addressed in the management plan. There are modest facilities needs for recreational support, and support facilities to serve the cultural resource component overlap in certain cases.

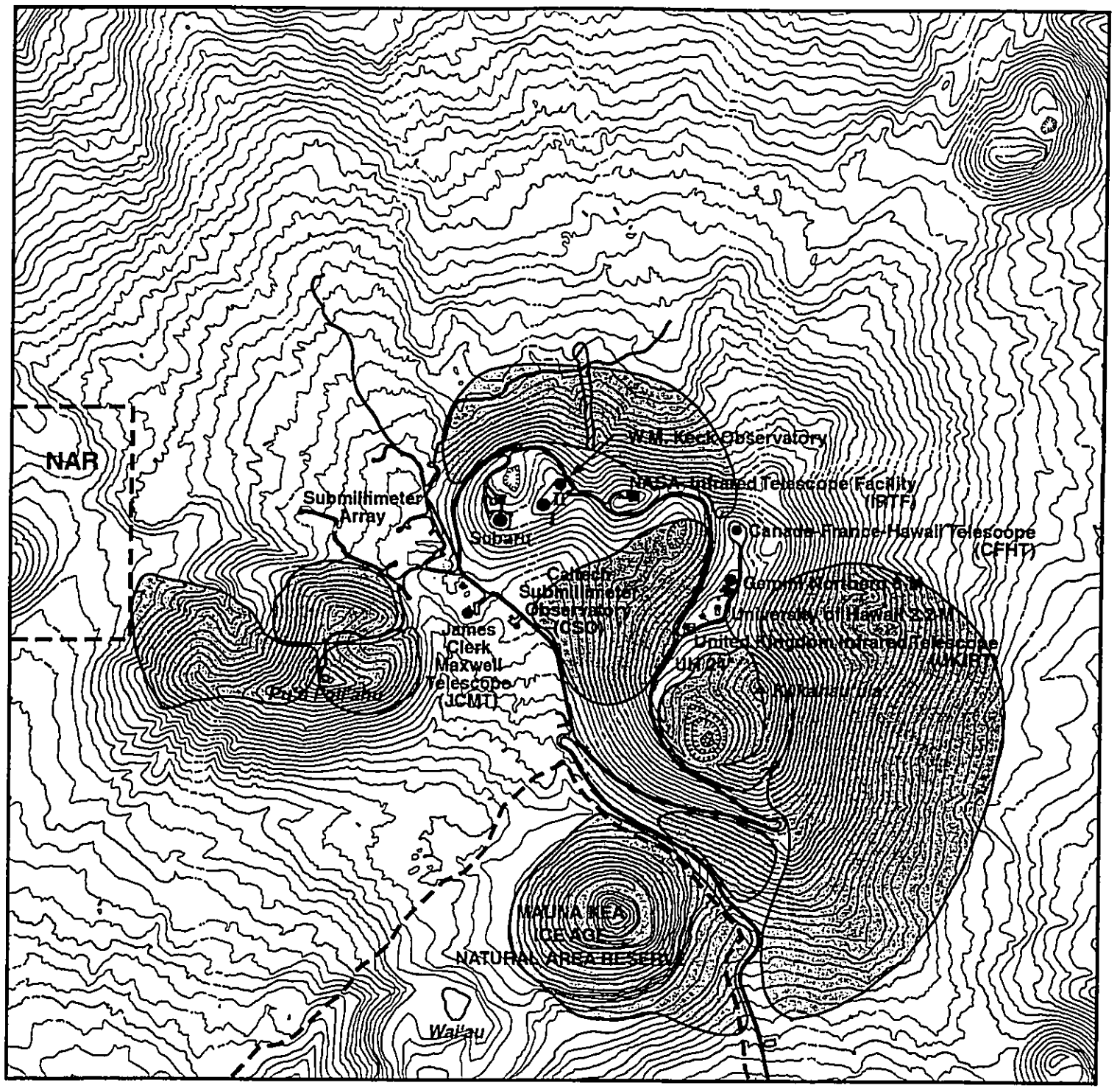
Skiing and Snow Play. Skiing and snow play activities are very popular recreational uses of Mauna Kea during periods of winter snowfall. Figure 3-15 shows the extent of popular ski runs and snow play areas in the summit area. It is also proposed that skiing and snow play use be restricted from the significant cultural landform of Pu'u Poli'ahu. Snow play activities are centered around the Poi Bowl area. Snow play will also be restricted to areas without archaeological sites and cultural preserve areas. Parking and bathroom facilities are existing needs to support skiing and snow play activities.

A recreational support facility is planned within the summit region to support skiing, snow play, visitor tours and scenic resource enjoyment. The support facility is planned to be located at the base of "Poi Bowl" along the summit access road in Millimeter Valley, at the center of skiing and snow play activity at the summit during winter months. The facility would include a shelter, rest rooms, emergency equipment storage, an emergency telephone, and possibly a small office space for the rangers. The design of the facility is envisioned as a building built into the surrounding landscape such that its presence will not detract from its natural setting. It is not to be a "ski lodge".

Individual Visitors and Tours/ Scenic Vista Out-Look Locations. The Master Plan defines areas for specific visitor stopping points in Science Reserve and at summit. Scenic lookout points will be organized at the summit at two locations where the observatories are willing to accommodate limited public access. Currently the Keck observatory sites allow such use, with the Keck Observatory providing a Visitor's Gallery including restrooms. Very limited parking areas are present to serve the visitor areas, and visitors will generally be directed to use the restroom facilities planned for the Poi Bowl area.

Trails. In the rugged terrain in the upper slopes of Mauna Kea, trails to Wai'au and the summit are evident on historic maps and on the ground today. Past ranching activities were responsible for creating the more defined trails. Interviews of informants with historical knowledge of Mauna Kea identified the routes of historical trails (Figure 4-4).

The plan is to preserve the existing historical trails to Wai'au and the summit. To protect the resources of the Science Reserve, formal public hiking routes within the Science Reserve will be mapped in the future, and trail improvements will be planned as needed for safety information. A recreational support facility, including a parking lot and restrooms, is planned for the Millimeter Valley area and will be available to hikers and other users.



Source: 1983 Mauna Kea Science Reserve Complex Development Plan, Dr. Jerry Johnson, 1998

Ski Areas

25' Contour Intervals

Natural Area Reserve

0' 750' 1500' 3000'

NORTH

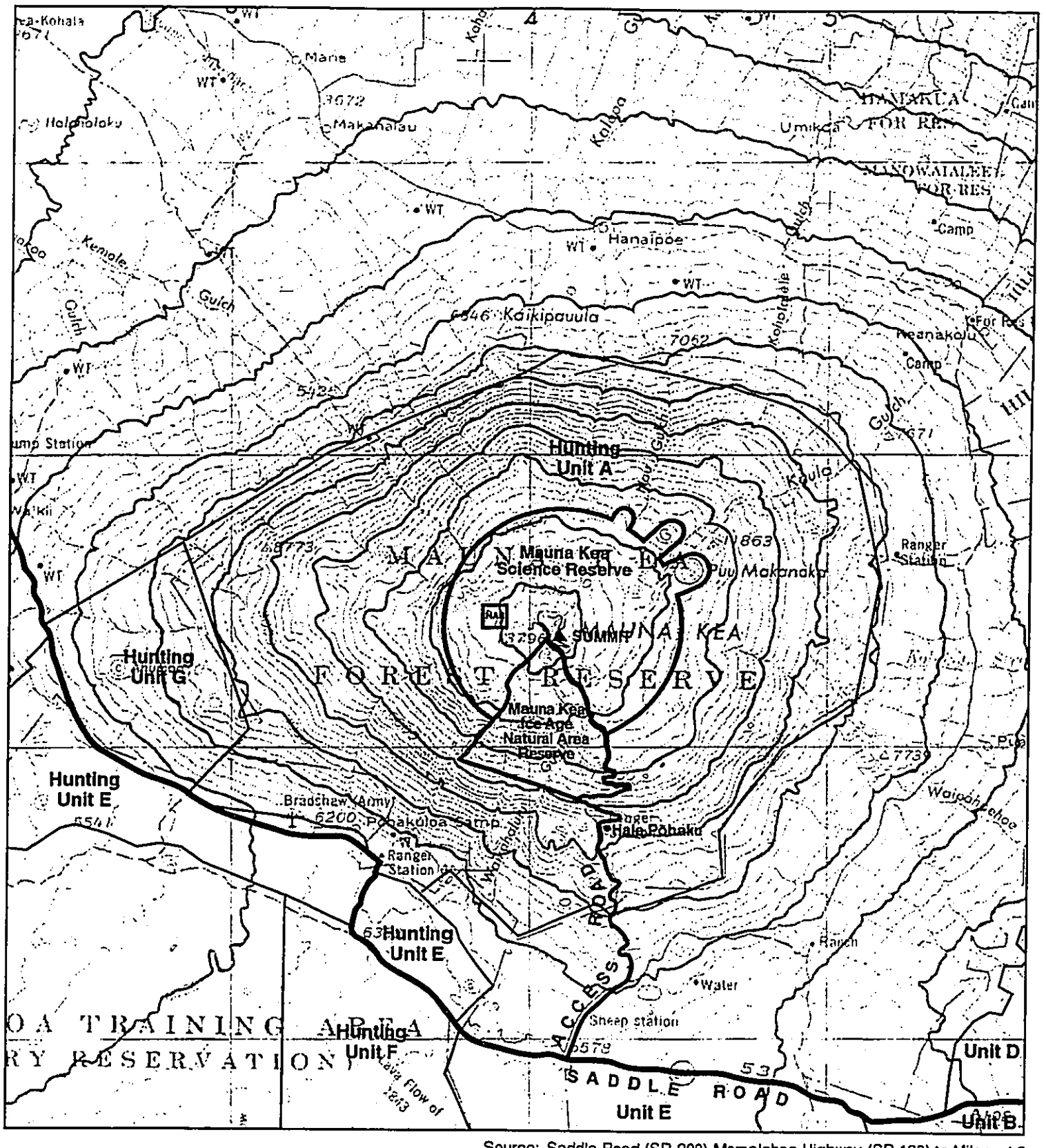
Existing Ski Areas

Another support facility is a parking area that is primarily planned to serve cultural resource interests, located along the access road at the 13,000 ft. elevation. This location will provide access to existing trails leading to Wai'au and the adze quarry. These uses are directed to defined areas of the Science Reserve to protect the sensitive natural and cultural resource components. Development of this support facility will be subject to approval by the DLNR.

Camping. The public will also benefit from the planned conversion of the construction cabins built by the Subaru observatory at Hale Pōhaku. These will be turned over after construction operations cease (2001) and become available for public group stays.

Hunting. Hunting activity in the Science Reserve generally only occurs in the lower and mid-elevations of Mauna Kea. Hunting areas are shown in Figure 3-16. Access for hunters is available through Hale Pōhaku and Pu'u La'au. The Master Plan places no new restrictions on the future use of the Science Reserve for hunting or access for hunting areas.

Recreational Physical Plan. The recreational use elements of the Science Reserve are depicted as broad use areas for skiing, snow play, hiking and hunting. Specific landforms, such as Pu'u Poli'ahu have been designated as off-limits for future recreational use to respect the cultural significance of this *pu'u*. The plan includes informational signage for visitors such that a well-planned tour can be conducted without random stopping points that can result in adverse effects to important natural and cultural resources.



Source: Saddle Road (SR 200) Mamalahoa Highway (SR 190) to Milepost 6
DEIS, Techinical Appendices, Volume V, 1997

DLNR Hunting Units

0' 7500' 15000' 30000'

NORTH

3.2.4 Overall Physical Plan for Summit

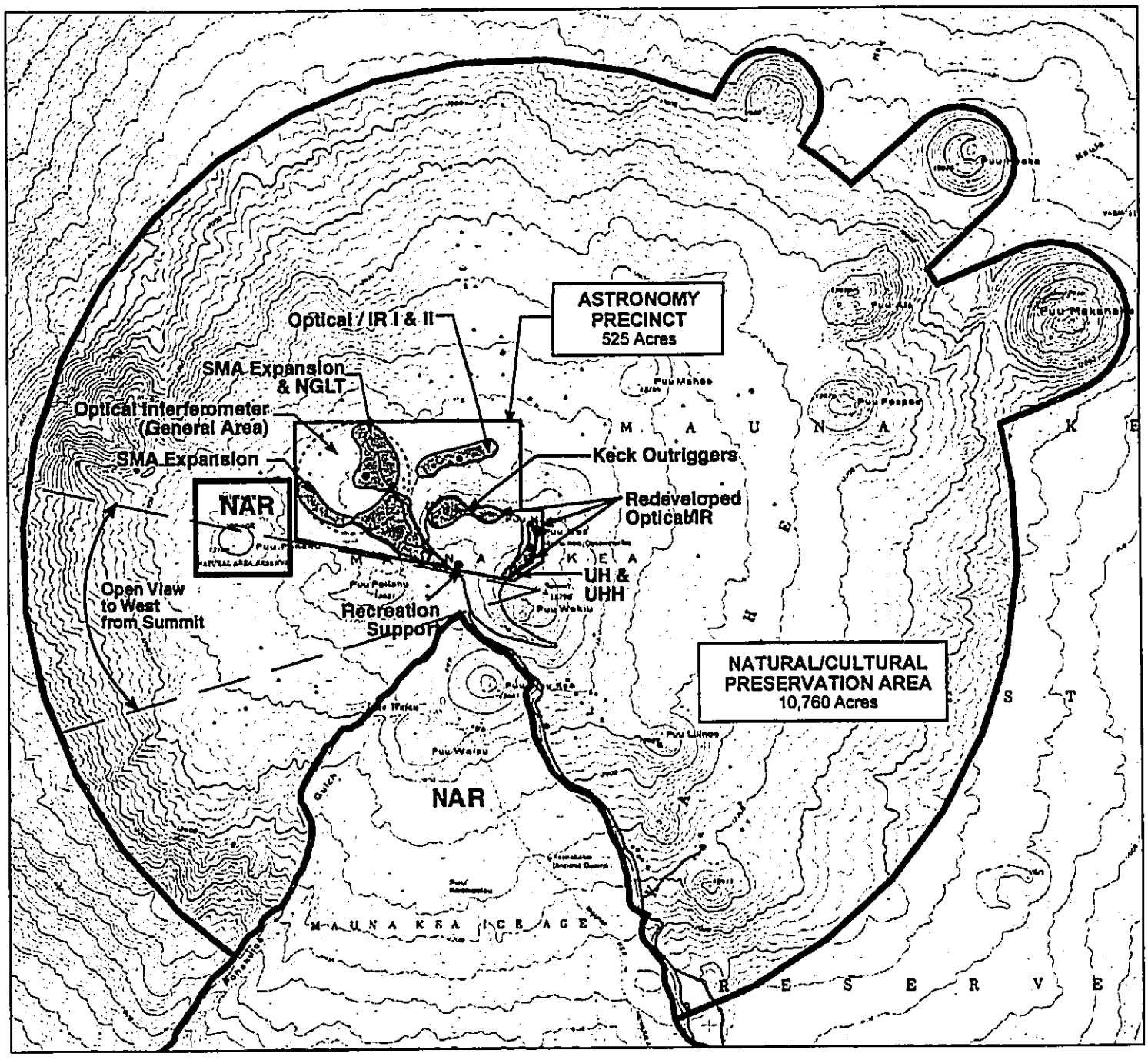
An overall plan of the summit region is shown in Figure 3-17. The physical plan identifies all of the locations for existing and proposed astronomy facilities in the Astronomy Precinct. Also shown in the plan is the location of the recreational support building within the Precinct. This plan depicts a composite of all resource components into one integrated plan. Natural and cultural resources elements are preserved throughout the Science Reserve, with particular focus on the 10,760-acre Natural and Cultural Preservation Area surrounding the proposed Astronomy Precinct. Proposed facilities to support education/research and recreational elements are limited within the approximately 525-acre Astronomy Precinct. The Astronomy Precinct, proposed facilities, and natural and cultural features are shown in Figure 3-18.

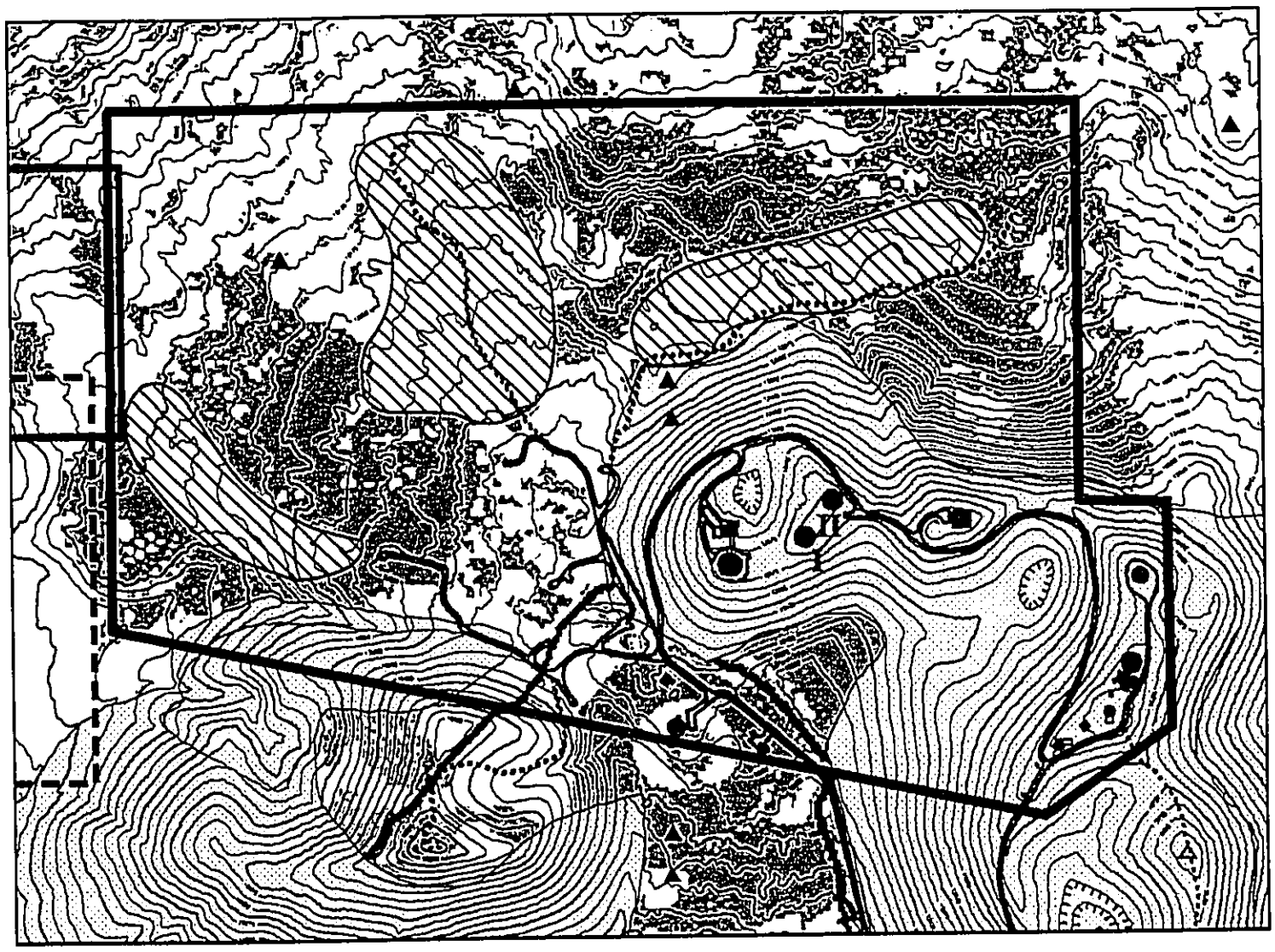
3.2.5 Plan for Hale Pōhaku Mid-Elevation Facilities

The mid-elevation facilities at Hale Pōhaku have typically been associated with support of astronomers, dating back to times when all facilities were operated by on-mountain astronomers and technicians. With today's technology and the fiber optic communications system, many of the studies occurring at these observatories can be operated remotely either from Hale Pōhaku, off-mountain Hawai'i locations (Waimea, Hilo), or via the Internet.

Hale Pōhaku's role in providing public information and education about astronomy on Mauna Kea will be augmented by these base facilities and a planned planetarium in Hilo. Refer to the following section for additional detail regarding the off-mountain base facilities.

Even with the change in operating procedures, portions of the Hale Pōhaku facilities are being planned to accommodate increased non-astronomy use in the next 20 years. There are three components to the Hale Pōhaku facilities that are addressed in the plan, including: 1) Astronomy mid-elevation facilities, 2) Construction camp facilities, and 3) the Visitor Information Station facilities. Existing facilities at Hale Pōhaku, and uses planned at these locations, are described below and shown in Figure 3-19.


ASTRONOMY PRECINCT
525 Acres
Optical / IR I & II
SMA Expansion & NGLT
Optical Interferometer (General Area)
SMA Expansion
NAR
Keck Outriggers
Redeveloped Optical/IR
UH & UHH
Open View to West from Summit
Recreation Support
NATURAL/CULTURAL PRESERVATION AREA
10,760 Acres
NAR
M A U N A K E A
M A U N A K E A R E S E R V E
40' Contour Intervals
0'
2000'
4000'
8000'
NORTH



40' Contour Intervals

Natural Area Reserve

Slope > 20%

Proposed Siting Areas

Existing Proposed Facilities

Astronomy Precinct

Potential Wēkiu Habitat

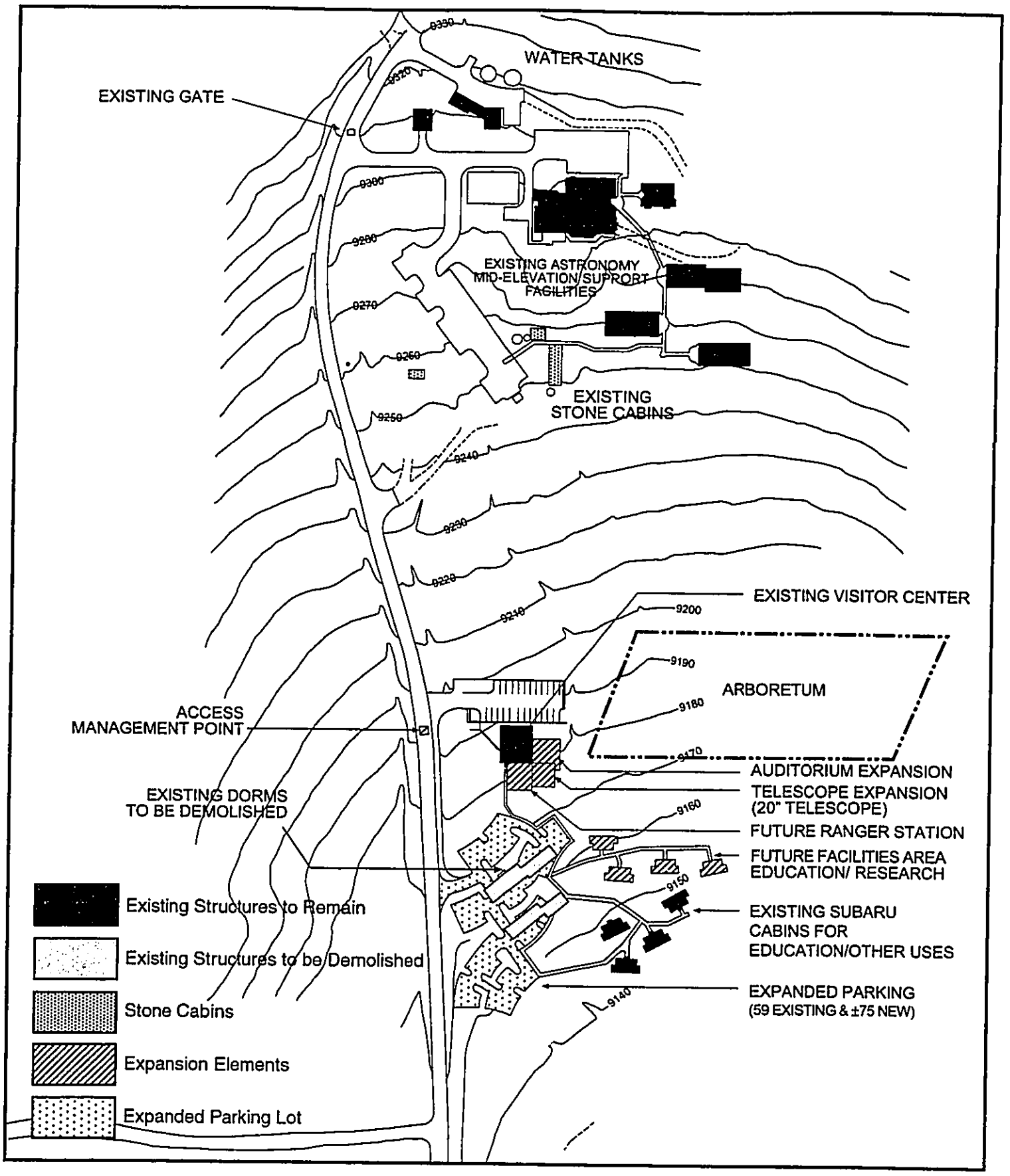
Archaeological Sites

0' 500' 1000' 2000'

NORTH

Astronomy Precinct, Natural and Cultural Features

Figure 3-18


WATER TANKS
EXISTING GATE
EXISTING ASTRONOMY MID-ELEVATION SUPPORT FACILITIES
EXISTING STONE CABINS
EXISTING VISITOR CENTER
ARBORETUM
ACCESS MANAGEMENT POINT
EXISTING DORMS TO BE DEMOLISHED
AUDITORIUM EXPANSION
TELESCOPE EXPANSION (20" TELESCOPE)
FUTURE RANGER STATION
FUTURE FACILITIES AREA EDUCATION/ RESEARCH
EXISTING SUBARU CABINS FOR EDUCATION/OTHER USES
EXPANDED PARKING (59 EXISTING & ±75 NEW)
Existing Structures to Remain
Existing Structures to be Demolished
Stone Cabins
Expansion Elements
Expanded Parking Lot

1. Astronomy Mid-Elevation Facilities. Due to the increased capability for off-mountain viewing, use of the existing astronomy mid-elevation facilities has been declining, and this trend is generally anticipated to continue or stabilize near current levels. As the total number of observatories on the summit will be increasing, overnight stays at the mid-elevation facility will generally decline on a per facility basis. This will result in a total number of overnight stays that is anticipated to be comparable to the present levels, therefore there will be no need for expansion.

2. Construction Camp Facilities. The older camp facilities are to be removed. The Subaru construction cabins will become fully available to the State in 2002. These cabins are proposed to be used for additional purposes including education, research and recreation, including:

   - Increased use by University of Hawai'i at Hilo, other college/university-level academic programs relating to geology, alpine and mountain forest ecology, astronomy and Hawaiian culture, as well as groups from schools and organizations.
   - Periodic temporary lodging for observatory construction crews for future projects.

3. Visitor Information Station Facilities. The Visitor Information Station facilities will require further expansion, which will complement the planned programs at UH Hilo. A Visitor Information Station will be included in the facility. Other possible uses could include natural and cultural resources interpretive center, and the ranger station offices and communications center. The new controlled access point on the summit road will occur at the Visitor Information Station, replacing the present (open) gate located at the astronomy mid-elevation facility. Current plans for the Visitor Information Station expansion include an auditorium addition and new observatory. The anticipated users of the Visitor Information Station are described below in several categories.

   - Visitors attracted or directed by the planetarium program at UH Hilo's University Park. People visiting the planetarium will learn about the Hale Pōhaku facilities, and some will visit the Mid-Elevation facilities for a first-hand experience of the mountain's cultural and educational resources.
   - Private tour groups and individual travelers are also expected to travel to Hale Pōhaku in greater numbers. With the improvement of the Visitor Information Station, its reputation will grow and people's interest in witnessing the facility and experiencing its programs about the mountain will expand. A 20-inch telescope will be installed at the VIS so the visitors and amateur astronomers can observe the sky in Mauna Kea's superior conditions. In addition to the 20-inch telescope there are plans to erect the 4 foot high Smithsonian Micro Observatory, a facility which the public will access remotely via the Internet to request specific images. Other public astronomy facilities may also be developed in the future. All improvements at Hale Pōhaku are subject to design review.
   - Non-astronomy research groups (e.g. geology, botanical, faunal, cultural, etc.) will also increase over time. These types of groups will travel to the Visitor Information Station to experience exhibits and programs highlighting the unique natural and cultural resources of the mountain.

- Recreational use by naturalists and cultural groups will expand. Individuals and organizations are anticipated to utilize the Visitor Information Station for their own recreational enjoyment or for organized functions.
- Primary-level educators will utilize the Visitor Station for school field visits and educational programs (e.g. geology, botanical, faunal, cultural, etc.)

The anticipated increases in use will create the need for additional parking area at the Hale Pōhaku Visitor Information Station. The number of parking spaces is currently planned to increase by 75 spaces to a total of approximately 150 spaces. More parking may be needed at the Visitor Information Station in the future.

The number of travelers to Hale Pōhaku utilizing Saddle Road and the Mauna Kea Access Road is expected to increase in the future. Future improvements planned for Saddle Road by Hawai'i County will also allow for better access to Hale Pōhaku. Mauna Kea Access Road is not currently planned for improvements. However, future use levels at the Visitor Information Station may warrant additional work such as increased signage, new pavement and striping, and minor widening of pavement for paved shoulders.

3.2.6 Off-Mountain Base Facilities

It is difficult to conduct research investigations for prolonged periods at the high altitude locations of the Mauna Kea summit or Hale Pōhaku. In addition, it is difficult to access the observatories in harsh winter weather periods. Several observatories have found it more effective to conduct their studies from off-mountain base facilities. With the installation of fiber optic communications to the observatories on Mauna Kea, they now have the capability to be operated remotely. Off-mountain base facilities for these observatories have been established in Waimea (CFHT and W.M. Keck Observatory) and University Park in Hilo (UKIRT, JCMT, CSO, Subaru, Gemini, and the Institute for Astronomy). The trend toward providing off-mountain base facilities is expected to continue.

Some facilities can be operated remotely via the Internet. The Submillimeter Array (SMA), for example, can be operated remotely from its home base in Cambridge, Massachusetts. SMA also has offices in Hilo from which it conducts current operations in Hawai'i. Future telescopes constructed at Mauna Kea will be encouraged to develop their base facilities in Hawai'i to the greatest extent practical.

Future observatory construction at Mauna Kea may require additional base facilities to be constructed in either Waimea or Hilo. The most recent base support facilities have been developed at University Park on the campus of UH Hilo.

3.2.7 Infrastructure Requirements

Infrastructure elements serving the Science Reserve will require periodic updating and expansion to serve the various users of the mountain in the next 20 years. Education and research facilities within the Astronomy Precinct will have facility requirements for updating and expansion of roadways, communications system, and electrical power supply. Infrastructure maintenance will be an ongoing requirement, which is addressed in the management plan.

Roadways. Roadway expansion will be minimized through the development siting criteria, which guides future facilities to be developed near the existing roadways. The existing unimproved roadways serving the expansion sites within the Astronomy Precinct will require additional improvement. Although there are narrow road alignments present, these roads will require modest widening and grading to make them passable for new facilities operations located beyond the existing astronomy areas at Millimeter Valley and the summit ridge. The Master Plan recommends paving of the remainder of the access road from Hale Pōhaku and the remainder of the summit spur road which runs from the SMA building past the Subaru telescope to the W.M. Keck Observatory. Paving will reduce the amount of dust generated by traveling vehicles, thus improving conditions for astronomy observations and for Wēkiu habitat.

Communications and Power Supply. The fiber optic communications system and the electrical power system will be expanded to serve new facilities sites to the north and northwest. The main power supply to the mountain is adequate to serve the additional facilities anticipated under this plan. To minimize the visual impact of new utility pull boxes to be located along the new underground conduit routes, colored concrete will be used to match the surrounding ground surface.

Water Supply. There is no water supply extending to the summit of Mauna Kea, and future water supply to the summit will continue to follow current procedures. Water will continue to be provided from two 40,000-gallon water tanks located at Hale Pōhaku. Currently, 25,000 gallons of water are trucked to the mid-level facility from Hilo each week. Each of the observatories will continue to be supplied with potable water that is transported to the summit by tanker trucks from Hilo. About 15,000 gallons of water is presently trucked to the summit each week, and each facility has its own water storage tank. The supply rate will increase to serve new facilities that are planned for the summit. Changes to technology allowing remote (off-mountain) viewing access could reduce the number of workers and scientist actually present at new facilities, and a corresponding lower water use rate as compared to existing facilities.

Wastewater Management. There is no plan for construction of a sewer collection system to serve the summit area. Wastewater generated at the observatories will continue to be managed by each facility through individual wastewater disposal systems (cesspools and septic tank/leaching field systems). Due to the small number of workers and visitors utilizing these facilities on a daily basis, the volume of water use and wastewater generation is small, approximating domestic rates. Changes to technology allowing remote (off-mountain) viewing access could reduce the number of workers and scientist actually present at new facilities, and a corresponding lower water use and wastewater generation rates.

Drainage. Erosion due to storm water runoff will be controlled on all new roadways, such that there will be no adverse affects to the surrounding landscape. There are six culverts within the 4.5 miles of roadway from Hale Pōhaku to the summit. Culverts will be installed as needed along the extension of the access roadway system to the north to minimize erosion

3.2.8 Summary of Physical Plan for the Science Reserve and Hale Pōhaku

The overall physical plan for the Science Reserve depicts a composite of all resource components into one integrated plan. Natural and cultural resources elements are preserved throughout the Science Reserve, with particular focus on the 10,760-acre Natural and Cultural Preservation Area surrounding the proposed Astronomy Precinct. Proposed facilities to support education/research and recreational elements are limited within the approximately -acre Astronomy Precinct, except for improvements to facilities at the Hale Pōhaku Visitor Information Station.

This updated physical plan, in conjunction with the updated Management Plan (discussed in the following section), creates a living planning and management document that has been developed in collaboration with the University, Mauna Kea Advisory Committee, native Hawaiian interests, and other stakeholders and interested community members.

3.3 MANAGEMENT PLAN

This section presents the Management Plan Objectives, the proposed Organization Procedures, and the current draft of the Management Plan.

3.3.1 Management Plan Objectives

The experience of the last three decades has shown the need for re-examination of the existing management procedures. The lessons from this experience are summarized in the following clusters of management objectives:

A. ***To create a structure for sustainable, focused management of the resources and operations of the Mauna Kea Science Reserve in order to:***

- **Protect historic/cultural resources: e.g. archaeology sites, traditional cultural practices.** While actual damage to known archaeological sites has been minimal, there has evolved a greater sensitivity to cultural values and the importance of geophysical forms in the cultural landscape. The proposed management plan incorporates these values and sets up a supportive framework for current, traditional Hawaiian cultural practices. It proposes a framework for assessing the impact of current practices on historic sites, natural resources and other uses on the mountain. If there are conflicts, the management plan would establish a

procedure for resolving disputes. The plan also promotes education and further research in ethnography and related disciplines.

- **Protect natural resources: e.g. Wēkiu habitat, alpine ecosystem.** The natural resources that should be protected begin with the mountain's geology and atmospheric qualities. These form the base for the unique ecosystems that make up the Science Reserve, Summit Road corridor and Hale Pōhaku. Tropical island alpine environments are extremely rare on the planet. The value of the *māmane* forest has been recognized in all plans. The passage of years has only reinforced the importance of this ecosystem. The impetus from the planning for astronomy and other activities has provided us with studies that have given us greater understanding of the uniqueness of the Wēkiu and other endemic species. This increased understanding has provided more information on potential protective and mitigative measures.

- **Protect and enhance education and research: e.g. astronomy, Hawaiian language and culture, archaeology, ecology, geology.** The continued recognition of the importance of astronomy in the Mauna Kea Science Reserve remains critical. Its economic impact to the island is significant. Mauna Kea's global importance has grown over the last twenty years until it is now recognized as one of the premier viewing places in the world. The qualities that make Mauna Kea such a desirable site need to be preserved. Facility and infrastructure improvements must continue for the complex to retain its continued prominence in the field.

  Knowledge about the potential for other research disciplines has grown. Mauna Kea has many qualities and resources that make it a great outdoor laboratory and classroom for Hawaiian language and culture, archaeology, ecology, biology, geology and a host of other disciplines. This is recognized in the plan by the encouragement of joint use of support facilities and the identification of these other disciplines as important overall goals. Education is a major function of the State of Hawai'i and the University. The value of the mountain for educational purposes is recognized and incorporated in the use concepts for the mountain. The proposed management plan recognizes this greater diversity of interests.

- **Protect and enhance recreational opportunities: e.g. hiking, snow play and skiing.** Recreational opportunities are an adjunct to the existence of the natural resources of the mountain. The proposed plan recognizes the importance of recreational values by identifying it as a separate resource cluster. Proposed management plans hope to address the anticipated growth in recreational uses while protecting the resources.

- **Promote public safety.** Improving access and growing numbers of visitors and vehicles raise concerns about public safety. This is already a problem with accidents and injuries; especially on the Summit Road. The plan proposes various measures to increase public safety.

B. To create a structure which meets the following objectives:

- **Promote community input.** The inadequacy of a forum for public input has been a long standing issue. The proposed plan addresses the issue with the creation of a new management structure and review procedures for amendments and proposals that include public participation.

- **Establish local management.** The need and sentiment for local management has been clear. The plan addresses this question with the creation of a management body located on the Big Island.

- **Establish a focal point for management responsibility.** For the general public, multiple jurisdiction has created vagueness and confusion in responsibility, authority, communication and policy. The need for a focal point of management responsibility and contact has became clear. The plan addresses this goal by creating a single entity as a hub for activity and management on the mountain.

- **Establish clear lines of decision making and accountability.** Within responsible agencies, lines of authority and communication must be clear. The proposed management structure must increase the accountability of all parties on the mountain and make sure each agency is aware of its responsibilities.

- **Economic and structural feasibility.** Funding for management has been inadequate. The proposed plan focuses on changes that can be achieved without statutory changes to existing regulations and responsibilities. Management functions would become a part of a funded function of the University supported by the Board of Regents.

- **Provide a base for future expansion of the scope of activities in the Science Reserve.** It is anticipated that activities supported in the Science Reserve will expand beyond astronomy to include a variety of other areas such as cultural practices, sports/recreation, education, other academic areas and environmental programs. The proposed plan provides a structure designed to manage these varied activities under a single management entity.

The management objectives and the proposed management plan evolved after many Mauna Kea Advisory Committee meetings and discussions with key individuals from the University of Hawai'i, Department of Land and Natural Resources and the community. Many alternative management structures were proposed, discussed, revised and/or discarded. The management plan delineated here addresses the issues described in Section 2, and meets the objectives listed above. It can be implemented quickly with a minimum of consent or approval outside of the current University of Hawai'i system. The plan calls for the creation of a management organization capable of providing the necessary stewardship for the sustainable use of Mauna Kea. The structure can also evolve to take on more responsibility and authority as needed. The plan also considers the integrated nature of the resources and establishes clear relationships with the adjacent NAR and other DLNR lands.

3.3.2 Management Organization and Procedures

Three levels or tiers of responsibility comprise the structure at Mauna Kea: land ownership, policy setting/regulatory compliance, and management. The following is proposed:

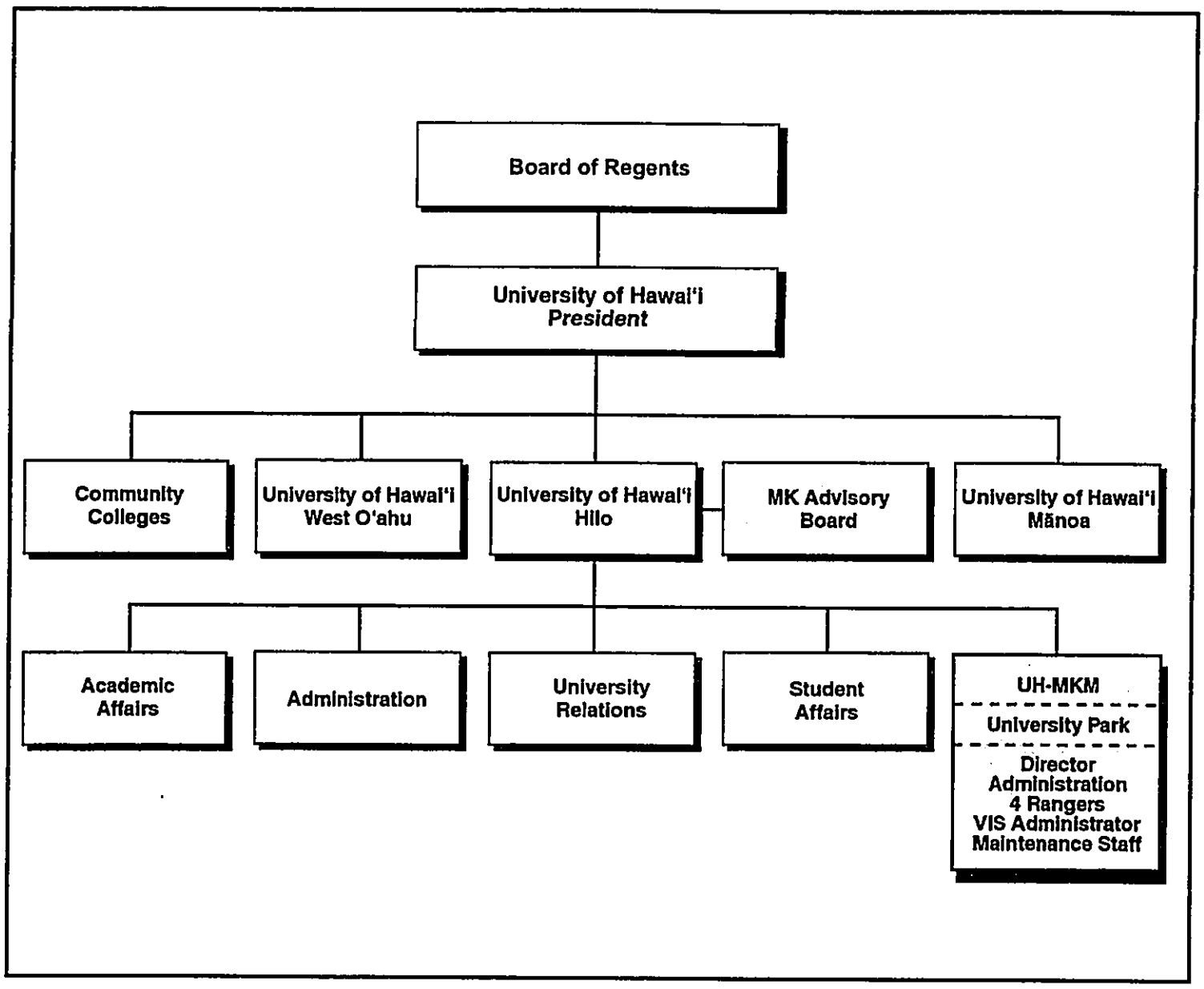
Management Organization Proposal: There is a need for a single entity to manage a comprehensive integrated plan for the Mauna Kea Science Reserve. This management organization should be based on the Big Island and recognized by the general public as the point of contact for the summit region. It could be housed within the University of Hawai'i system and funded as a separate, ongoing program unit out of the University of Hawai'i at Hilo. (Figure 3-20) Housing it within a permanent unit of the UH system makes a clear statement that the University accepts the responsibility for this function, including its funding.

A suggested name for the organization is the University of Hawai'i Office of Mauna Kea Management (UH MKM or Office). It is also proposed that a Mauna Kea Advisory Board (Board) be recommended by the UH Hilo Chancellor and approved by the President to guide the operations of the UH MKM. This Board will be advisory to the Chancellor. It is further proposed that the Office be housed within the unit for UH Hilo which is projected to manage the University Park. The Office should be responsible for the management of the Science Reserve, Summit Road and Hale Pōhaku. It would be responsible for establishing and enforcing management policies within the parameters of General Lease S-4191. The Office would be the focus of contact for the general public and would function as a referral and facilitative agency for issues that are outside its authority but related to the mountain.

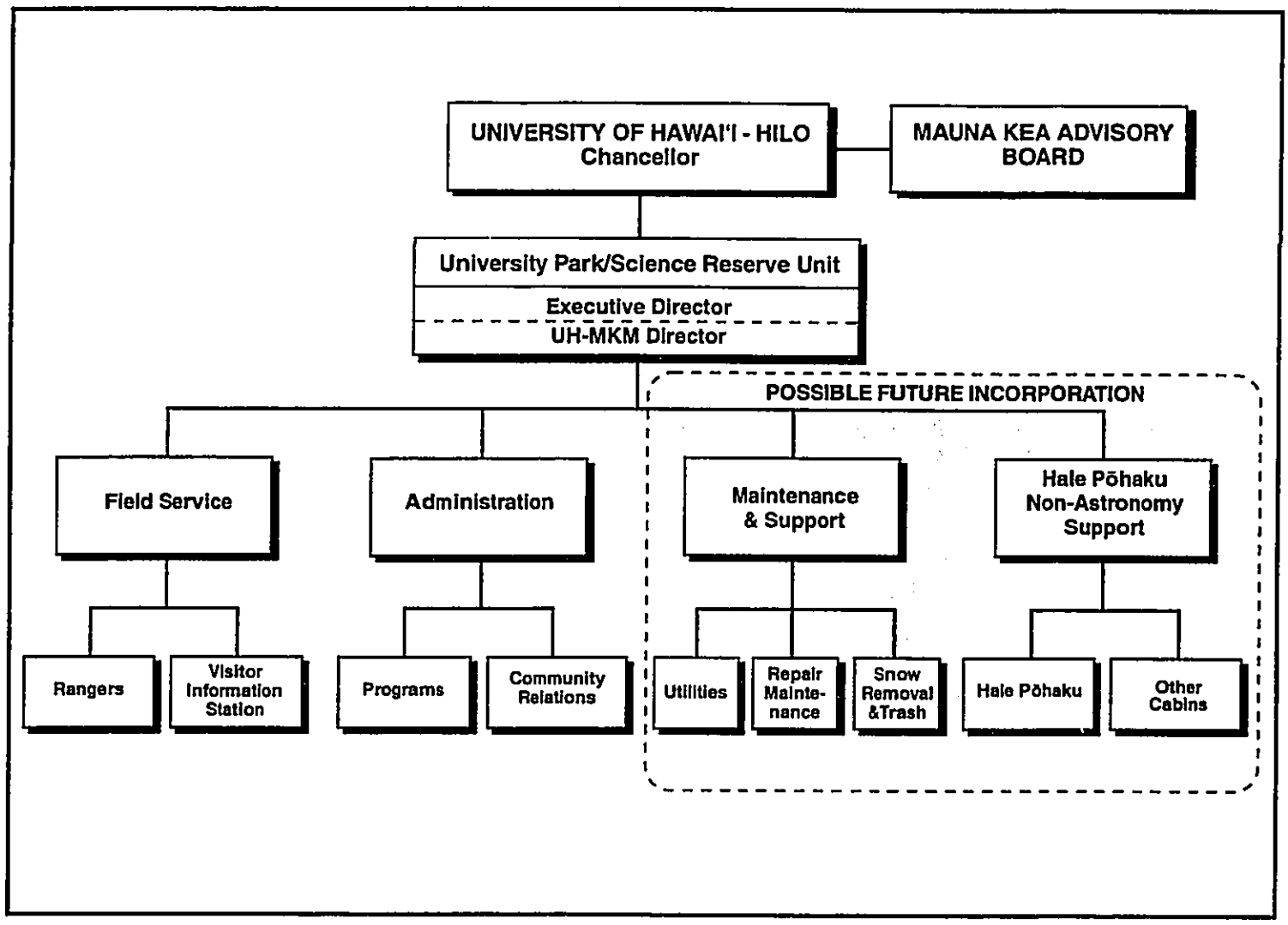
It is projected that the UH MKM would have an initial staff which includes a director, administrative assistant, mountain rangers and general maintenance and support staff (Figure 3-21). For general maintenance and support services, except for functions retained by IfA for existing leases and agreements, most of the current Mauna Kea Support Services could be transferred to the UH MKM. This transfer would be projected to occur over time after the updated Master Plan is adopted by the Board of Regents and the new structure is implemented.

Within the UH system, the director would have overall management responsibility for the Office. The director would be the key representative of the Office and the daily point of contact for the general public and tenant organizations on the mountain and at University Park. Any permitting and rental arrangements that may be established could be processed through UH MKM. Except for facilities managed by IfA at Hale Pōhaku for astronomy support, scheduling and requests for use of facilities or support services should be processed through the director. The Office would also address other requests, grievances and requests for information. Monitoring programs and databases would be coordinated through UH MKM to provide integrated management of the mountain.

Rangers, located at Hale Pōhaku, should be trained as cultural and natural resource specialists and it is recommended that some of the ranger staff be bilingual Hawaiian and English speakers. Their primary role would be education, coordination, monitoring and resource management.



Office of Mauna Kea Management Position in UH System



Organization Chart

They would have a secondary enforcement role with possible assistance from DLNR DOCARE officers and County of Hawai'i police. It is envisioned that there would be a minimum of two rangers on the mountain at any time; one at Hale Pōhaku managing the entrance and one roaming in the Science Reserve. The ranger at Hale Pōhaku should register and orient visitors and coordinate programs that may be occurring at the Visitor Information Station (VIS) or other parts of the mid-elevation facilities. The ranger that is roaming would monitor people activity and make periodic field checks in resource areas. They would assist with safety and emergency procedures. Rangers would assist and educate visitors at all times. Rangers should monitor all field activities in the summit area from sports activities to volunteer rubbish sweeps and outdoor educational programs.

General maintenance and research support services are currently provided by Mauna Kea Support Services (MKSS). At present these functions include:

- Food and lodging at Hale Pōhaku;
- Gas, diesel and water to existing astronomy facilities and their staff;
- Provision of utility support services, including trash removal;
- Safety and emergency services;
- Road maintenance and snow removal;
- Visitor Information Station services and manpower;
- Library and office services at Hale Pōhaku;
- Maintenance of the communications network;
- Servicing the construction camp.

After negotiations with IfA and current tenants, portions of MKSS functions, budget and personnel would be transferred to the MKM and become a permanent part of the new management organization. Existing leases specify IfA involvement in the provision of specific utility services and support functions and any transfer of responsibilities would be contingent on agreement from existing sublease holders.

Hale Pōhaku: The mid elevation facilities at Hale Pōhaku are projected to accommodate much of the anticipated growth in facilities and programs for astronomy education and non-astronomy purposes. As the facility expands with new equipment and spaces, program specialists in education, culture and natural resources may be added to the staff as funding increases. These specialists would assist in program development and coordination and may be accommodated at either Hilo or Hale Pōhaku. New programs in culture, Hawaiian language, geology, biology, ecology, habitat restoration and others are potential areas of growth. These programs may have field, classroom and distance learning components. Facility and infrastructure support may be provided in the Science Reserve, at Hale Pōhaku or elsewhere. The mid-elevation facilities are within the area desginated by the US Fish and Wildlife Service as Palila Critical Habitat. Future expansion of the facilities will take measures to minimize effects to the bird's habitat.

Community Involvement: Mauna Kea is a community resource. Community involvement in the management of the mountain begins with the membership of the Mauna Kea Advisory

Board. The Board should be composed of members representing the major stakeholders of Mauna Kea. These include: DLNR, BOR, UH Hilo, IFA, the County of Hawai'i, native Hawaiians, environmental organizations, recreational interests and other community groups. The MKAC recommended consideration of the following members as a preliminary roster:

- Director of the Department of Land and Natural Resources, or designee
- Director of the Department of Hawaiian Home Lands, or designee
- Chairperson of the Office of Hawaiian Affairs, or designee
- Mayor of the County of Hawai'i, or designee
- Hawai'i County Council
- Edith M. Kanakaole Foundation
- Coalition of Hawaiian Organizations
- Mauna Kea Observatories
- University of Hawai'i at Hilo
- Institute for Astronomy
- DLNR Historic Preservation Division
- Natural Area Reserve System (NARS)
- Hawai'i Island Alliance for the Future
- Mauna Kea Tour Operators
- Big Island Visitors' Bureau
- Wildlife Conservation Association of Hawai'i
- Hawai'i Conservation Council
- Mauna Kea Skiing and Snowboarding Community
- Mauna Kea Management Office Executive Director

The Board of Regents held further discussions on this topic subsequent to the MKAC process, where it was suggesting that the Mauna Kea Advisory Board be composed of key stakeholders representing the astronomical observatories, native Hawaiian community, environmental interests, the DLNR, and the business community.

The Board's primary role is to advise the Office of the Chancellor at UH Hilo on management of the Mauna Kea Science Reserve. The Board should be the main community voice for activities and development planned for the Science Reserve. The Board would be a public forum for future uses, activities and development on the mountain. Finally, the Advisory Board could act as a facilitator during grievance procedures and assist in the resolution of conflicts.

The Board is encouraged to establish special committees on culture, environment and education, as needed, to assist it in its functioning. For cultural issues the Burial Council model is suggested. The Burial Council is a group of appointed citizens which provides guidance on the disposition of human remains. A special *Kahu/Kūpuna* Advisory Committee made up of representatives of native Hawaiian organizations as well as individuals recognized for their specialized knowledge could function like the Council. Other special advisory committees may

be formed for environmental and education issues. These committees could focus on docent and other programs for Mauna Kea.

Docent programs are suggested to expand knowledge of the mountain and to encourage greater community participation. Docents could teach visitors about the rich and complex resources of the mountain. Volunteer organizations and alliances are also encouraged in order to broaden the pool of people who value and support the stewardship of the mountain. These groups could be called upon for various functions such as the periodic maintenance sweeps, special programs or fund raising events. Groups should be encouraged to "adopt the mountain". The UH MKM should encourage and coordinate community participation.

Grievance Procedures: The MKM should establish grievance procedures to address issues as they arise. All grievances should be presented to the director of the Office who will make an assessment about the appropriate resolution of the issue. If the issues represent broad plan or policy questions beyond the management authority of the MKM, the director should refer the questions and/or questioner to specific contacts at the appropriate agencies; usually the DLNR or the UH Board of Regents. The Office should follow the progress of the grievance and assist where it is able. Where the grievance is about management issues or items within the jurisdiction of the Office, the director will receive and respond to the questions. If the issue requires management or rule changes by the Office, the director will research the question and bring it before the Advisory Board for review. All grievances should be handled in a sensitive and timely manner.

3.3.3 Policies and Strategies

The Management Plan proposes policies and strategies to integrate and balance the natural, cultural, educational/research and recreational values of Mauna Kea within a framework that should provide responsible stewardship of the resources. It seeks to allocate resources and priorities toward sustainable use and enhancement of the Mauna Kea Science reserve as Hawaiian place with a unique and significant meaning, both locally and globally.

3.3.3.1 General Policies

A synopsis of the General Policies of the Management Plan is presented below.

Access Management: Vehicular access to the summit area should be managed but not curtailed. Hiking will remain unrestricted. Pack animal access should be managed. Detailed policies and guidelines for access should be adopted and implemented by the University of Hawai'i. Access through the summit region should be managed through a control point at Hale Pōhaku. The management plan seeks to integrate the developments at Hilo, Hale Pōhaku and the Summit Region. Access guidelines are established for: Permits, Registration and Orientation; Hours of Operation; Control Point; Shuttle; Helicopters; Private Vehicles; other access.

Facilities and Physical Management: The UH MKM will be responsible for the physical maintenance of the Science Reserve, Summit Road and Hale Pōhaku. These include the Visitor Information Station, Hale Pōhaku, Subaru cabins/construction camp, stone cabins, roads and parking areas, trails, utilities and infrastructure, and trash and solid waste.

Safety, Security and Liability: The UH MKM should develop and maintain safety and security plans which include the following: weather, altitude, medical emergencies, security and vandalism, other hazardous site conditions, fire protection, and alcohol and drugs.

Jurisdiction: The Management Plan applies to the Mauna Kea Science Reserve, the summit access road and Hale Pōhaku. It does not include other State lands in the upper mountain region managed by the DLNR or DHHL.

Compliance with Regulatory Requirements: The Office will oversee permitting and compliance activity for uses on the mountain in areas of the University's jurisdiction. MKM will work with DLNR in areas of DLNR's jurisdiction. MKM could prepare annual reports on the status of activities and include regulatory compliance as a part of this annual report. The Office will monitor sub-lease holders and permit holders to check on the status of CDUA conditions, EIS mitigation measures, historic sites treatment, endangered species monitoring and other similar conditions and requirements.

Language: As a general policy, Hawaiian and English languages should both be used for signs, pamphlets, videos and other material developed for the general public. Where practical, the Hawaiian language should be given the position of prominence in the communication format.

3.3.3.2 Natural and Environmental Resources

Special plans to protect and enhance the natural and environmental resources of Mauna Kea for their perpetual enjoyment and use into the foreseeable future are suggested. Baseline studies of geology and biology have been completed and can be used to protect the resource. Some of these studies have data over time that may be used to discover trends. More detailed mitigation response plans may be developed as knowledge of the resource increases. The information is contained in a GIS database and it seems desirable for the office to maintain the database.

3.3.3.3 Historic and Cultural Resources

This plan protects archaeological sites and provides guidance for traditional Hawaiian cultural practices. A synopsis of the policies and activities recommended include:

- Orientation: An educational program should be developed to inform all visitors of the cultural, spiritual, historic and archaeological values of Mauna Kea.

- Archaeological and Historic Sites: Known sites on the summit area should be preserved and monitored

- Geo-physical Features: Educational programs should be developed to heighten the sensitivity of visitors to the natural landscape and its role in Hawaiian culture. The concept of *wāhi pana* is of special importance here.

- Current Practices: Hawaiian cultural and religious practices should be generally unregulated. However, practices that have potential to significantly impact the physical landscape or traditional Hawaiian spiritual values of sites should be managed or coordinated. Where conflicts are unresolved, native Hawaiian practices and values should take priority.

- Advisory Committee: A *kahu/kūpuna* Committee of individuals knowledgeable about native Hawaiian cultural practices should be formed to advise the Mauna Kea Advisory Board.

3.3.3.4 Education and Research

Astronomy Research. A goal of the plan update is the maintenance of Mauna Kea as one of the premier astronomical viewing places in the world. Most of the factors necessary for its continued desirability as an astronomical site are addressed in the physical plan for the mountain. IfA will remain the lead UH entity responsible for astronomy development in the Science Reserve. However, since development and upgrades occur in the context of the Master Plan the MKM would be responsible for other activities and overall property management. Issues that need to be addressed from a management standpoint include:

- Upgrades of equipment and support facilities are needed to retain its global position.
- Dust and light conditions near the summit must be controlled to ensure a continued high quality environment for ground based astronomy.
- Interference from other radio transmitters.

Non-astronomy related academic and research areas: The sentiment supporting the growth of other research disciplines on the mountain is growing. Further definition is needed in the program areas and resource needs before this support can be realized.

Education: Mauna Kea is a great outdoor classroom. Policies should encourage the use of the mountain for educational purposes.

3.3.3.5 Recreational Activities

The existence of natural resources draws recreational users to the mountain. Recreational uses need to be managed to avoid conflicts of use and degradation of resources. Education is the best tool for reducing the impact of man on natural resources. All visitors should be given a brochure and/or briefing on the proper treatment of resources; both natural and cultural. Signage should be developed in areas of sensitivity and high traffic. The presence of rangers will also enhance resource protection while accommodating recreational activities.

Hiking will be unrestricted but hikers should be encouraged to stay on known trails for safety and minimization of impact to natural and cultural resources. Sightseers and tourists coming by

vehicle must stay on paved roads and stay near developed facilities. Hunting is unrestricted in the Science Reserve, however, hunters should be cautioned about safety regarding other people on the mountain. While extreme sports activities are not categorically prohibited, they must be evaluated on a case by case basis and require a permit. Some activities may be prohibited.

3.3.3.6 Commercial Activities

Limited commercial activities would be allowed in the Science Reserve. These activities and operations should be small and low impact in nature. Commercial operations should remain small to avoid negatively impacting the primary missions of protecting natural and cultural resources and the promoting educational and research activities. It is suggested that the MKM manage the permitting responsibilities for these functions. Commercial Sightseeing Tours; Movies, Commercials and similar productions; Concessions; Special Events; Eco-education Tours; and Cabin/room rentals are possible under the Management Plan.

3.3.4 Management Funding

As part of a permanent program unit within UH - Hilo funding is anticipated through normal University procedures. In addition to basic program funds from the University of Hawai'i, the following potential funding sources may be pursued to improve management and program implementation. Possible future funding sources may include: Existing observatories; New astronomy development license agreements; User fees and licenses for Commercial and quasi-commercial uses; Hale Pōhaku uses; Mid-Elevation Construction Cabins; Stone Cabins, Visitor Information Station; Research and other grants; Private and non-profit donations; and Department of Land and Natural Resources. In summary, management functions must be funded. Funding would be from the UH system in cooperation with astronomy interests and supplemented by other sources.

3.4 IMPLEMENTATION PLAN

This update to the Mauna Kea Science Reserve Master Plan is intended to address a 20-year planning horizon covering the period of 2000 to 2020.

Implementation of the updated Mauna Kea Master Plan will begin with the adoption of the Plan by the University of Hawai'i Board of Regents, anticipated in early 2000. The major steps in implementation include:

- Adoption of the updated 2000 Master Plan,
- Establishment of organizational structure,
- Funding,
- Appointment of Advisory Board,
- Hiring staff and establishing offices and support facilities,
- Adoption of administrative rules,

- Development of programs.
- Development of facilities

The proposed overall implementation schedule is shown in Figure 3-22. Program and facility development will follow their individual schedules as they receive funding.

3.4.1 Organizational Structure Implementation

There are three new major components to the organizational structure surrounding the Mauna Kea Science Reserve. They are the University of Hawai'i Office of Mauna Kea.Management, the Mauna Kea Advisory Board and the Design Review Committee. These components should be formed within 6 months of the approval of the updated Master Plan.

Office of Mauna Kea Management (UH MKM). Steps in the development of this office will include the following:

1. ***Finalize Organizational Structure:*** Establish position descriptions and pay scales. Clarify the relationship of the Office of Mauna Kea Management to the Office of the Chancellor at UH Hilo. This will be done concurrently with the finalization of the Master Plan.

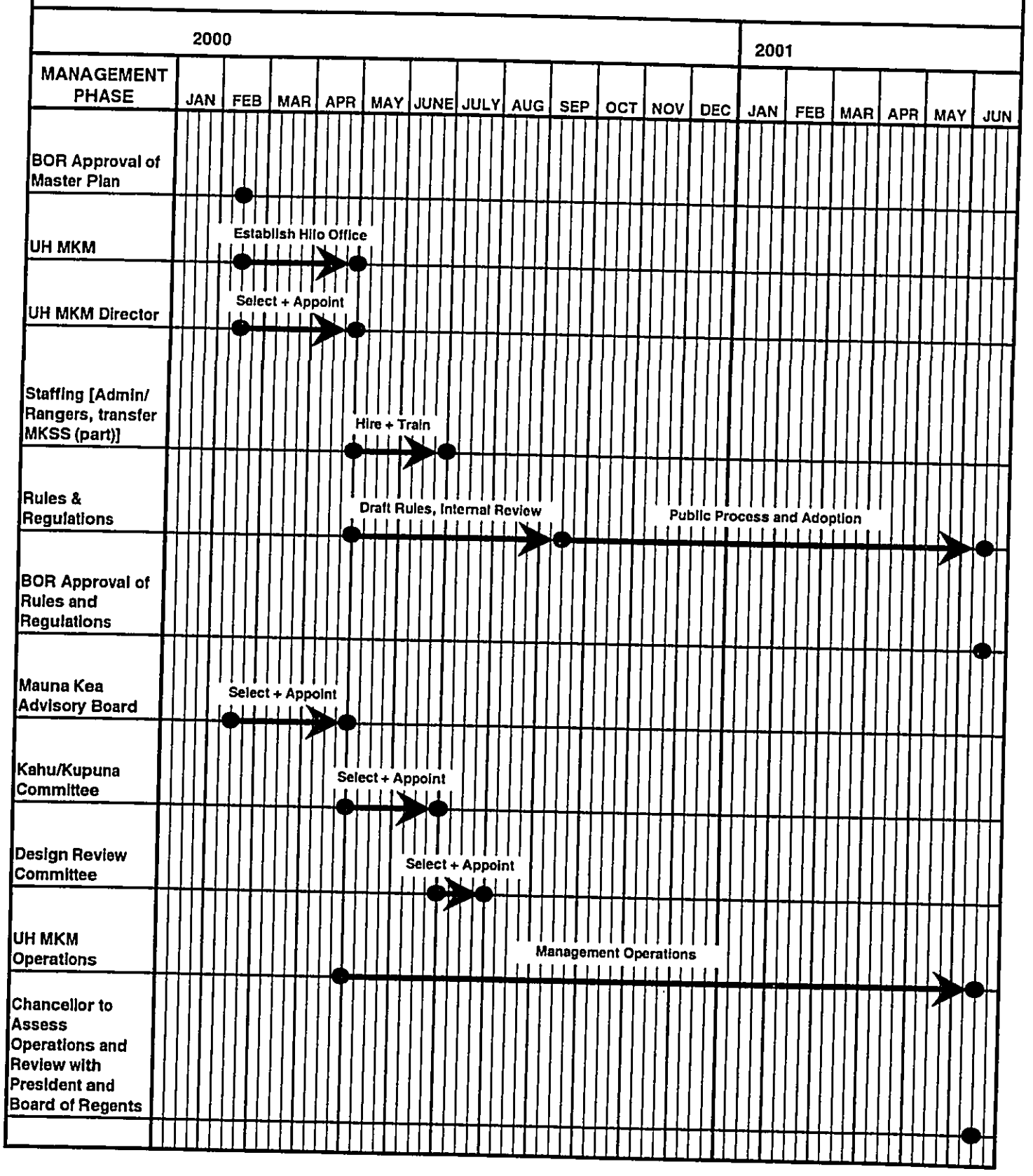
2. ***Establish Funding***: The President of the University of Hawai'i has committed to providing $400,000 of funding per annum for this new office. Additional funds may be added as conditions dictate.

3. ***Select Director***: The director will be the key "face of the University" to the public and people who work on the mountain. This person needs to have the respect of and be able to communicate with scientists, the community and the UH Hilo community. Strong organizational and interpersonal skills are needed to cover the wide range of responsibilities and tasks involved in this position. Sensitivity and knowledge of Hawaiian cultural issues and natural resource management issues is required.

4. ***Hire and Train Staff:*** The director should be involved in the hiring of the rest of the staff to have ownership of the Office team. The staff should be knowledgeable about the resources of the mountain and sensitive to community needs. Some of the staff should be bi-lingual; especially in Hawaiian. A training program for the staff is needed to inform them of the values, resources and protocols on the Mountain. The hiring and training of the staff should occur within 2 months after the director has been selected.

5. ***Develop Administrative Rules:*** Rules should be adopted pursuant to Chapter 91. These rules would guide the daily operations of the UH MKM and the management of the Science Reserve. Draft rules should be prepared within approximately 6 months of the hiring of the director. Final rules should be adopted within approximately 18 months of the formation of the UH MKM. These rules should be based on the Master Plan policy guidelines.

Figure 3-22
Management Plan Implementation Milestones



6. *Establish Hilo Office:* The main office of the MKM should be established at UH Hilo in the Astronomy building to keep it close to the community, UH Hilo and the Research Park and its tenants. The Office should be established as soon as the Master Plan is adopted.

7. *Reorganize Hale Pōhaku Operations:* The Visitor Information Station should be renovated to headquarter the rangers and accommodate the expanded VIS operations. Renovations should be completed within approximately a year of operations under the UH MKM. Registration protocol and educational materials and programs should be established as soon as the positions are filled. A control point kiosk should be developed within the first year of operations. VIS Expansion should be completed within three years.

8. *Mauna Kea Support Services (MKSS) functions (partial) transfer*: Maintenance and management functions currently provided by MKSS would be reviewed and with the agreement of affected parties shifted to the UH MKM on a timely basis. Services that are related to existing leases and efficiently managed by IfA will remain as is. Initial transfers of personnel and functions should occur within the first year of the establishment of the UH MKM.

Mauna Kea Advisory Board

1. *Appoint Advisory Board:* Members will be selected by the UH Hilo Chancellor and approved by the Board of Regents. Terms and responsibilities will be detailed in administrative rules. The Board should be appointed and organized concurrently with the establishment of the UH MKM.

2. *Establish Administrative Rules:* The Board should adopt formal rules within one year of its formation. Procedures for public participation should be included in the adopted rules.

3. *Kahu/Kūpuna Committee*: The Board should organize the *Kahu/Kūpuna* Committee to assist in deliberations of cultural and community values. This committee should be formed by April 2000

Design Review Committee

This Committee should be appointed with the adoption of the Master Plan. It should include design professionals such as architects, landscape architects, and civil engineers.

3.4.2 Design Guidelines

The purpose of the design guidelines is to direct development in a manner which integrates it into the summit environment. The design guidelines would apply to both renovations of existing facilities as well as new construction. The following is a summary of the design guideline categories.

3.4.3 Project Review Procedures

A project approval and design review process is to be established to ensure that projects conform to and implement the concepts, themes, and development standards and guidelines set forth in this plan. Plans should support the Master Plan goals and objectives and contribute to the mountain's overall character and environmental quality.

The University of Hawai'i Board of Regents and the President of the University of Hawai'i retain project approval and design review authority over all developments in the areas covered under General Lease S-1491. In order to assist the President and the Board of Regents in interpreting the design guidelines and intent of the Master Plan the establishment of a Design Review Committee (DRC) comprised but not limited to professionals in the fields of architecture, landscape architecture, and engineering is recommended. UH MKM and the Mauna Kea Advisory Board will also review projects for overall conformance to the Master Plan while the DRC conducts design reviews (Figure 3-23).

The Project Review Procedures elements are briefly summarized below.

- ***General Review Standards:*** Conforms to the goals and objectives of the Mauna Kea Master Plan.

- ***Minor and Major Projects***: Separate processes are established for the review of "Minor Projects" and "Major Projects." Major projects must be processed through a rigorous design review.

- ***Construction Review and Approval:*** Procedures specify a 12-month period for initiation of construction, with provisions for new review of construction plans for projects starting later

- ***Variances:*** Requests for variances from development standards and guidelines may be approved if they are minor in nature and otherwise consistent with the overall goals and objectives of the Master Plan.

- ***Temporary Facilities:*** The Master Plan provides review procedures for temporary facilities such as test optics, facilities for short term experiments, constructions support structures, temporary cultural, educational or recreational activity shelters and structures and small test facilities.

3.4.4 Master Plan Amendment Procedures

The Mauna Kea Master Plan is adopted by the University of Hawai'i Board of Regents and will guide the use and development of the Science Reserve. It is anticipated that there would not be many amendments to the plan during its life. Amendments would be required for large new facilities and major renovations only if they are not anticipated in the Master Plan. Projects identified in the Master Plan would not require additional plan review or amendments unless

there are significant changes in design or location that have major impacts on the plan itself or the environment. It is proposed that plan amendments be separated into two categories: Class A and Class B amendments.

Class A amendments would be major amendments for proposals that require approval by the Board of Regents. Examples of these include:

- New projects not identified in the Master Plan with either a site coverage over 2,000 square feet or a building envelop over 24,000 cubic feet (40' x 50' x 12').
- Major expansions of existing facility sites not anticipated in the Master Plan. (more than 50% of existing floor area or 2,000 square feet, whichever is greater)
- New utility alignments and corridors.
- Improvements identified in the Master Plan which require significant changes in size or location;

Class B amendments would be administrative. Final approval for Class B amendments would rest with the President of the University of Hawai'i. Class B amendment requirements alsoapply only to projects that are not anticipated on the Mauna Kea Master Plan. The following are examples of Class B amendments:

- Significant land altering proposals unanticipated in the Master Plan with a ground coverage of less than 2,000 square feet and a volume of less than 24,000 cubic feet;
- Unanticipated additions (less than 50% of existing floor area or 2,000 square feet, whichever is greater);
- Accessory support facilities; Comfort stations; Temporary structures;
- Roadway and utility improvements within existing alignments and corridors;
- Other unanticipated proposals such as significant equipment platforms, parking areas or cultural facilities such as *heiau* over 2,000 square feet.

Exempt Activities: Many improvements would not require plan amendments even though not explicitly anticipated in the plan. Exempt actions would be reviewed by the UH MKM, Office of the Chancellor. Questions of qualification for exemption would be decided by the President of the University of Hawai'i. Exempt activities include but are not limited to the following examples: Small *ahu* and shrines used for traditional cultural practices; Renovations within existing structures; Repairs to existing facilities; and other minor activities.

Classification of a proposal as either Class A, Class B or Exempt does not obviate the need for any other pertinent federal, state or county requirements set by statutes or ordinances. Many plan

amendments are likely to require Chapter 343 Environmental Assessment or Environmental Impact Statement documentation. If the UH MKM is not the proposing agency, it should begin its review of these documents at the pre-consultation stage. Other frequently needed reviews are historic sites review and Section 7 endangered species consultation. Proposals that may impact significant historic sites or traditional cultural properties would require DLNR review and approval even in the Science Reserve. Consultation with SHPO is recommended at an early stage in project development.

3.4.5 Administrative Rules

Administrative Rules should be adopted within one year of the formation of the UH MKM and the appointment of the Mauna Kea Advisory Board. Rules should be adopted for both the MKM and the Advisory Board.

3.4.6 Recommendations of Legislative Auditor's Report

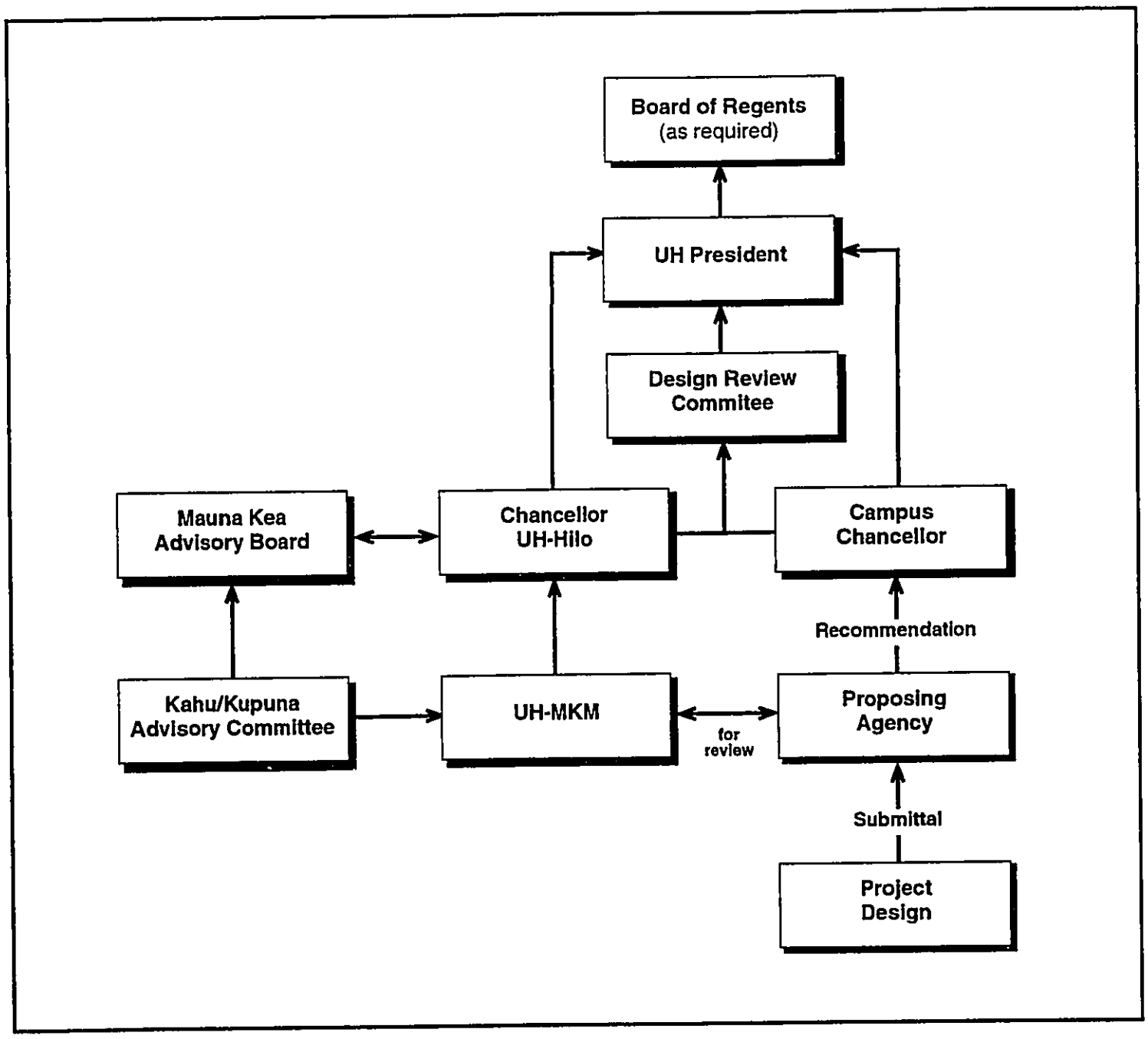
The 1998 Legislative Auditor's Report concluded with a number of comments and recommendations. One important aspect of the Master Plan implementation is the response to the Auditor's Report. The bold italic sentences and phrases are the auditor's comments and recommendations, followed by the proposed action of the Master Plan and Management Plan. Table 3-2 summarizes the recommendations and actions.

Management:

- ***Develop rules and regulations for development and public access in the summit area and Hale Pōhaku.***
  Rules for the Science Reserve and Hale Pōhaku are to be developed and processed by the UH MKM. Rules and regulations will be adopted pursuant to Chapter 91. Tentative schedule for adoption is December 2000. Rules will include management of development and public access. Public access will not be restricted but it will be managed. Lands at Hale Pōhaku are subject to DLNR's rules regulating game mammal and game bird hunting.

- ***Hire ranger/guides at Hale Pōhaku who will be there on a daily basis.***
  Rangers will be an integral part of the UH MKM. There will be a minimum of two rangers on the mountain every day. They will operate out of Hale Pōhaku. These rangers will be trained in cultural and natural resource management.

- ***Require registration of visitors for education and safety reasons.***
  This is the primary reason for managed access. Visitor registration procedures will be part of the proposed rules being developed. It is anticipated that registration will occur at the VIS at Hale Pōhaku and managed by the ranger. Registration will include orientation on safety, environmental and cultural aspects of Mauna Kea.



Project Approval and Design Review Procedures

Table 3-2
Response to Auditor's Recommendations

Recommendation	Addressed in MP	Implementation Milestone
Management		
Development rules and regulations for summit area and Hale Pōhaku	✓	7/2000
Hire ranger/guides at Hale Pōhaku who will be there on a daily basis	✓	3/2000
Require registration of visitors for education and safety reasons	✓	
Develop milestones, specific timeframes & other controls to ensure implementation	✓	11/1999
Develop a forum for continuous community input	✓	1/2000
New method for measuring impact	✓	11/1999
Measure impacts individually and cumulatively	✓	8/1999
State specific carrying capacity	✓	
Require management plans that have time frames	✓	11/1999
Make sure all responsibilities are assigned; UH or DLNR	✓	11/1999
Historic/Cultural Resources		
Address cultural and historic issues	✓	11/1999
Compile the Historic Preservation Plan	DLNR	9/1999
Adopt rules for Chapter 6E, Historic Preservation Program	DLNR	Draft rules are in public review
Maintenance		
Periodic inspection and documentation of trash control	✓	4/1999
Remove remnants of old equipment	✓	Completed
Physical Planning Guidelines		
Identify areas suitable for astronomical development	✓	11/1999
Identify critical habitats for plants, invertebrates and other endangered species	✓	11/1999
Identify no build zones	✓	11/1999
Include facilities besides telescopes	✓	11/1999
Statutory Recommendations/Lease Agreements		
Incorporate EIS mitigation measures as CDUA conditions	DNLR	Completed
Relate permit conditions to lease	DLNR	Ongoing
Ensure internal deadlines prior to release of land or leases	DLNR	12/15/1999

- ***Develop milestones, specific timeframes & other controls to ensure implementation.***
  The implementation schedule presented in this chapter identifies milestones and time frames (Figure 3-22). Other controls and assurances of implementation are identified in Section 10 under Management Plan. Incorporating the UH MKM as an integral part of UH Hilo makes the management of Mauna Kea a clear responsibility accepted by the University of Hawai'i. It also establishes a sustainable funding platform for the office.

- ***Develop a forum for continuous community input.***
  The appointment of the proposed Mauna Kea Advisory Board provides a forum for continuous community input. Additionally, the creation of a *kahu/kūpuna* advisory committee creates an added dimension and authority to the community's voice. Finally, as programs are developed it is anticipated that docent programs on many subject areas will be created providing ongoing partnership with volunteer organizations and community members. Volunteer groups will be encouraged to assist in the stewardship of the mountain during events such as clean-up days or possible future programs such as silversword re-vegetation or habitat restoration in the *māmane-naio* forest around Hale Pōhaku.

- ***New method for measuring impact.***
  Telescope counting was criticized in the Auditor's report as an inadequate method for measuring impact which did not take into account changes in technology. Interferometers were specifically identified as needing special treatment. The updated Master Plan measures impact more specifically by observatory type, external impact as measured by design guidelines and improvements evaluated by site location and type. Maximum sizes and color are included in the evaluation criteria. Proposed projects are grouped into recycled sites, expansions of existing facilities and new locations. Adoption of this Master Plan and its project review process provides a new and specific methodology for assessing the Master Plan impact of each facility. The Plan also requires that projects which deviate from the Master Plan's descriptions or are not described in the Master Plan must under go full environmental review (EIS) as major amendments to the Plan.

- ***Measure impacts individually and cumulatively.***
  Individual and cumulative impacts are addressed in the Master Plan EIS process. State and Federal EIS laws both require analysis of individual and cumulative impacts. While there has been criticism in the past that this was not done even though it is required by law, this criticism is addressed by the formation of UH MKM and the Mauna Kea Advisory Committee. These two entities will now be a part of every EIS review process and ensure broad and comprehensive reviews which will include individual and cumulative impacts. In addition, all individual projects must be individually and cumulatively addressed in project specific Environmental Assessments and/or Environmental Impact Statements.

- ***State specific carrying capacity.***
  The issue of carrying capacity was discussed with the Office of the Legislative Auditor. It was clarified that the comment was generic and not a specific reference to a methodology or specific study product. It is understood that the technical carrying capacity of the Science Reserve is huge; limited only by available sites, infrastructure, critical habitat, historic sites

and the interference of one facility by another. The Science Reserve is large and capable of housing many more instruments or observatories. The concept of social carrying capacity used in recreation and wilderness planning does not result in clear limits to capacity because of differences in opinion and tolerance. The concern implied behind the comment was addressed by limiting physical development to an Astronomy Precinct of approximately 525 acres and re-designating the rest of the Science Reserve as a Natural Cultural Preservation Area.

Several factors relating to carrying capacity were instrumental in the defining the boundaries of the precinct. First, all undeveloped summit *pu'u* were removed as future development sites. Additional Wēkiu bug habitat was avoided. Specifically, the precinct was defined on the west by eastern edge of the Pu'u Pōhaku NAR boundary. To the north, consideration of the concentrations of archaeological sites at the outer edge of the summit plateau defined the limit. On the eastern side, view protection and the retention of the pristine character of the eastern flank limited development to the developed areas of the summit ridge. The southern boundary was based on the protection of a westward view corridor from the true summit (Kūkahau'ula), and an analysis of views and relationships between Pu'u Poli'ahu, Wai'au, Kūkahau'ula, Līlīnoe and the adze quarry (Keanakāko'i). Attempts were made to minimize future disturbance of the southern edge with the idea of protecting a relatively intact cultural landscape. These factors relate to the concept of carrying capacity implied by the Auditor's report and the companion recommendation to identify no-build areas.

- ***Require management plans that have time frames.***
  The management plans described in this Plan include the time frames identified in this chapter (Figure 3-22). While some deviations may occur due to unforeseen circumstances, the inclusion of major stakeholders and the community as partners with the University of Hawai'i in the decision process ensures its timely implementation.

- ***Ensure internal deadlines prior to release of land or leases.***
  The Auditor's report states that leases and other land management issues are not completed in a timely manner. This criticism was largely aimed at the Department of Land and Natural Resources. In its report to the Legislature, the DLNR mentioned the following:

1. It will work with the UH Institute for Astronomy to ensure the completion of leases prior to the start of construction.

2. Land Division has begun a computerization plan to track and administer permits and lease issuance in a timely manner.

3. Ongoing discussions with the University regarding lines of authority and management responsibilities on the mountain.

Development of UH MKM will facilitate the performance of these responsibilities.

- ***Make sure all responsibilities are assigned; either UH or DLNR.***
  It is noted that all responsibilities are currently assigned by legal requirements. The problem in the past has not been in the assignment of responsibilities but in the resources and personnel needed to address them adequately. Additionally, overlapping responsibilities, the complexity and generality rules and policies has led to a public perception of mismanagement, unfulfilled responsibilities and ignored promises. The creation of the UH MKM at UH Hilo addresses this issue by creating a lead agency based on the Big Island that can receive concerns and make sure they are addressed or brought to the attention of the responsible agency. UH MKM will function as the public point of contact with the University and its responsibilities. For other responsibilities UH MKM will act as liaison and bridge to the appropriate agency and assist in the follow through of community concerns.

Historic/Cultural Resources:

The Auditor's report was critical of the neglect of cultural issues and resources. The criticism is one of not valuing and protecting both cultural sites as well as traditional cultural practices. Specifically, the report calls the University to do the following:

- ***Address cultural and historic issues.***
  Cultural and historic issues have been addressed in a number of ways. First, the planning process has resulted in new knowledge about the cultural and historical resources of Mauna Kea. In the development of the updated plan a detailed archaeological study was conducted by Dr. Patrick McCoy of the State Historic Preservation Office (Appendix E). His final report is currently being completed. Additionally, ethnographic studies have been conducted by Kepā Maly including archival searches into Hawaiian language documents dating back to the 19th century and oral history interviews with cultural practitioners, *kūpuna* and *kama'aina* (Appendix C). The information gathered in the ethnographic studies was assessed by Paul Rosendahl, Inc. (Appendix H). Input was also received through the Mauna Kea Advisory Committee appointed by the President of the University of Hawai'i. Committee members solicited additional input from other community sources. The State Historic Preservation Office is in the process of preparing a Historic Preservation Plan for the Science Reserve.

  The information from the archaeological survey, ethnographic study and the President's Mauna Kea Advisory Committee were incorporated in a GIS database. The components and configuration of the Physical Plan within the Master Plan incorporates both physical, spiritual and symbolic cultural issues in a balanced way. The importance of the cultural values in the Science Reserve are emphasized and formalized by the designation of 10,763 acres as a Natural/Cultural Preservation Area. Astronomy development areas were reduced to a 525 acre precinct.

  The Cultural Resource Management Plan, siting criteria and design guidelines all consider potential impacts to cultural and archaeological site and resources. Site specific inventory level surveys are requirements prior to facility siting. Cultural sensitivity to view impacts are considered and minimized where practical. All undeveloped summit *pu'u* are removed from future development.

A permanent *kahu/kūpuna* advisory committee is recommended to help guide the University's management of the Mauna Kea's cultural resources and cultural practices. The committee would also assist in the resolution of questions and potential conflicts.

New protocols during visitor registration will improve sensitivity to cultural resources and values. Signage plans and the cultural resources management plan are geared to the protection of these resources by directing visitors to less sensitive areas and educating them about the value of these resources. Rangers will be especially trained in this area to educate the public and protect resources.

New protocols for construction are also proposed to protect cultural resources. The details of the protocols will be delineated in the Preservation Plan being prepared by the State Historic Preservation Office. Some features of this plan will include monitoring programs and the presence of qualified archaeologists during excavations and related construction activities that may have the potential to impact cultural properties.

- ***Complete the Historic Preservation Plan.***
  A memorandum of agreement was signed between the University of Hawai'i and the DLNR for the State Historic Preservation Office to prepare the Historic Preservation Plan at the University's expense. A detailed outline has been developed to date. As noted earlier, a proposal in the Historic Preservation Plan to designate the summit region as a historic, cultural property is being considered. A full draft of the Plan is scheduled for completion this year by the State Historic Preservation Office with adoption following public review.

Maintenance:

- ***Periodic inspection and documentation of trash control.***
  This is occurring. In the future, this responsibility will be handled through the UH MKM.

- ***Remove remnants of old equipment.***
  The two instances that led to this comment have been removed. New lease agreements will include this requirement as a routine condition and UH MKM will monitor compliance.

Physical Planning Guidance:

- ***Identify areas suitable for astronomical development.***
  Areas suitable for astronomy development have contained in an "Astronomy Precinct" of approximately 525 acres.

- ***Identify critical habitats for plants, invertebrates and other endangered species.***
  There is no officially designated endangered species in the Mauna Kea Science Reserve. The Wēkiu bug (*Nysius wēkiucola*) is being considered for endangered status but this has not yet occurred. The notion of critical habitat is an unclear parameter in the absence of knowledge about the life cycle of the species, critical population size or area distribution. However, new

biological studies identified and GIS mapped habitat areas for ferns, lichen, moths, spiders, and Wēkiu. Areas considered sensitive habitat were avoided as much as possible. The importance of the *māmane-naio* forest as a critical habitat of the palila has always been considered a given. Development at Hale Pōhaku recognizes the importance of this habitat and follows guidelines which avoid or minimize disturbance to this ecosystem.

- ***Identify no build zones.***
  The area outside the Astronomy Precinct is a "no build" area. Theoretically, without such a restriction, development could occur anywhere in the 11,288 acre Science Reserve. The VLBA is a case in point.

- ***Include facilities besides telescopes.***
  A recreation support pavilion is identified in the summit area. Other non-telescope facilities were not included because there were no specific requests from other users. It was decided that facilities would not be proposed unless there were users groups requesting them since it was not the intent of the Master Plan to encourage unsupported development in the summit area.

  At Hale Pōhaku the Plan proposes sharing some facilities and encouraging the use of former construction cabins for other non-astronomy purposes. The Subaru Cabins are specifically targeted for this function. The VIS is also planned for expansion to accommodate other uses. The stone cabins at Hale Pōhaku might also be renovated for other uses.

Statutory Recommendations/Lease Agreements:

- ***Incorporate EIS mitigation measures as CDUA conditions.***
  This is a recommendation to the Board of Land and Natural Resources since the BLNR issues conservation district permits. The Department of Land and Natural Resources has stated in its December 1998 response to the State Legislature that it agrees with the purpose of this recommendation and will pursue its implementation more diligently in the future.

- ***Relate permit conditions to leases.***
  DLNR and the University of Hawai'i will review this recommendation and where applicable include permit conditions in the subleases to any future tenants. This will also be considered in the renewal of existing leases.

- ***Adopt rules for Chapter 6E, Historic Preservation Program.***
  Draft rules for Chapter 6E were published and circulated for review in May 1999. After a period of public review and revision, it is anticipated that these rules will be adopted in late1999 or early 2000.

All items in the Legislative Auditor's report have been addressed. Several items have already been completed and the remainder is projected for implementation with the adoption and commencement of this Master Plan.

Section 4.0

Environmental Setting

4.0 ENVIRONMENTAL SETTING

4.1 REGIONAL OVERVIEW

The ancient saying "Mauna Kea kuahiwi ku ha'o i ka mālie" (Mauna Kea is the astonishing mountain that stands in the calm) (Pukui 1983: No. 2147), expresses the feeling that Hawaiians and non-Hawaiians alike have for this special place. Standing tall over the Island of Hawai'i, Mauna Kea is home to vast physical, natural and cultural resources. From early adze makers to modern day astronomers, Mauna Kea has long been a special place for work, worship, and reflection.

For many years hikers, hunters, scientists, worshippers, and skiers have come to the highest mountain in the Pacific Basin. In the past three decades the Mauna Kea Science Reserve has evolved into the world's premier astronomy complex. Mauna Kea's observatories are known worldwide for their advanced technologies, excellent viewing environment, and the discoveries that have been made with these facilities. The development of this complex has not come without its costs. The roadway that was installed for the testing and construction of the first telescopes has opened the mountain to all. Physical development, foot and vehicular traffic, and the byproducts of man's use of the mountain have all left temporary and permanent impacts on the mountain. More positively, the access has provided a wealth of information and enjoyment for those who have taken interest in this great mountain.

The Science Reserve is a 11,228 acre area of land that is leased by the University of Hawai'i from the State of Hawai'i for use as a scientific complex. The astronomy complex is centered near the middle of the summit plateau while the remainder of the Science Reserve serves as a buffer area. The Science Reserve is composed of those lands above approximately the 12,000 foot elevation; excluding the parcels that make up the Mauna Kea Ice Age Natural Area Reserve.

Support facilities for science activities are provided at Hale Pōhaku. Hale Pōhaku, "House of Stone", was named after the stone cabins located at the 9,200-foot elevation of Mauna Kea. These cabins were built in the 1930s after the road to Hale Pōhaku was completed and were originally built for the convenience of those going to the top of mountain and also for acclimatizing hunters, hiker and snow visitors before they proceeded to the upper elevations.

4.2 CULTURE AND ARCHAEOLOGY

What we know today of Mauna Kea's ancient use and meaning has been learned from physical clues left behind on the mountain. Ethnographic research has explored more recent human activity and the traditions, chants and stories that were handed down within families over time.

For the past two decades archaeologists have conducted extensive field work on the slopes of Mauna Kea, with access made much easier with the construction of a road to summit area.

Approximately 3,000 acres, or 27 percent, of the Science Reserve has been surveyed to date (McCoy, 1999). Much of this archaeological work has been undertaken by Dr. Patrick McCoy. Currently with the State Historic Preservation Division. McCoy and colleague Dr. Holly McEldowney are in the process of preparing a Historic Preservation Management Plan for Mauna Kea. As part of this plan, McCoy has inventoried and summarized the known archaeological sites that provide a wealth of knowledge of past use of the mountain (McCoy, 1999) (Figures 4-1 and 4-2).

In addition to the archaeological field work, several individuals have recently conducted ethnographic studies concerning Mauna Kea.

Dr. Charles Langlas of the University of Hawai'i-Hilo worked with Paul H. Rosendahl, Ph.D., Inc. to prepare an Archaeological Inventory Survey and Historic and Traditional Cultural Assessment for the Hawai'i Defense Access Road A-AD-6(1) and Saddle Road (SR 200) Project (1997). Pualani and Edward Kanahele prepared a Social Impact Assessment of Indigenous Hawaiian Cultural Values for this same project (1997).

In association with the preparation of this Master Plan, cultural specialist Kepā Maly conducted an oral history interview and archival research effort in the later part of the 1998 to compile the thoughts and memories that those living today have of Mauna Kea (Maly, 1999) (See Appendix C). Maly interviewed 22 individuals and structured his research into broad groupings that are helpful in organizing the often generalized feelings that individuals have toward Mauna Kea. Previously Maly had prepared an archival and historical documentary research report for the *ahupua'a* of Humu'ula and Ka'ohe (Maly, 1996). The information gathered in Maly's ethnographic studies was assessed by Paul Rosendahl, Inc. (Appendix H).

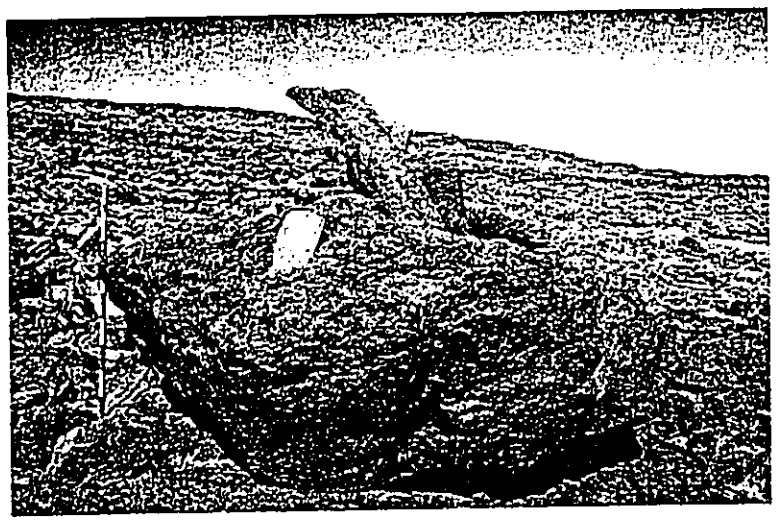
4.2.1 Cultural Background

Summit Region

In Hawaiian culture, natural and cultural resources are one and the same. Native traditions describe the formation of the Hawaiian Islands and the presence of life on and around them. All forms of the natural environment, from the skies and mountain peaks, to the valleys and plains, and to the shoreline and ocean depth are the embodiments of Hawaiian gods and deities. One Hawaiian genealogical account records that Wākea (the expanse of the sky) and Papa-hāna-moku (Papa – Earth mother who gave birth to the islands) and various gods and creative forces of nature gave birth to the islands. Hawai'i, the largest of the islands, was the first-born of these island children. The account continues that the same god-beings were also the parents of the first man (Hāloa), and from this ancestor, all Hawaiian people are descended. In some genealogical chants, Mauna Kea is referred to as "Ka Mauna a Kea" (Wākea's Mountain), and it is likened to the first-born of the Island of Hawai'i. (Maly, 1999)

The First Arrivals: Native Hawaiian Uses

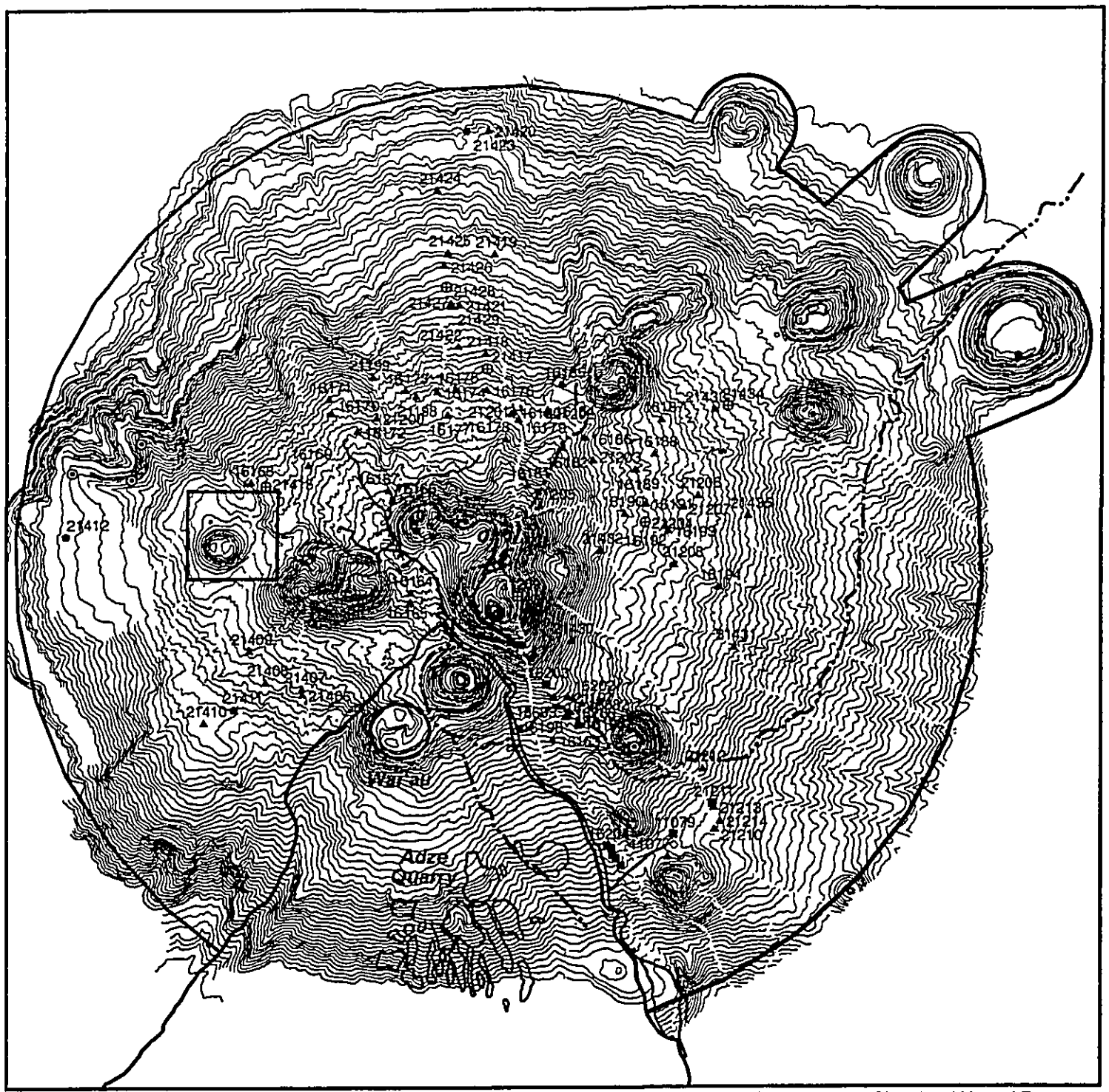
According to Kanahele and Kanahele (1997), the first Hawaiians landed on the island's shores between 25 BCE and 125 CE. Many more Polynesians voyaged to Hawai'i and settled over the



Archaeological Site Examples

Photos: Pat McCoy

Figure 4-1



Source: Hawaii Department of Land and Natural Resources
Historic Preservation Division, February 1999

Shrines
Marker
Unknown
Workshop
25' Contour Intervals
Historic Trails

0' 2000' 4000' 8000'
NORTH

Archaeology Sites Map

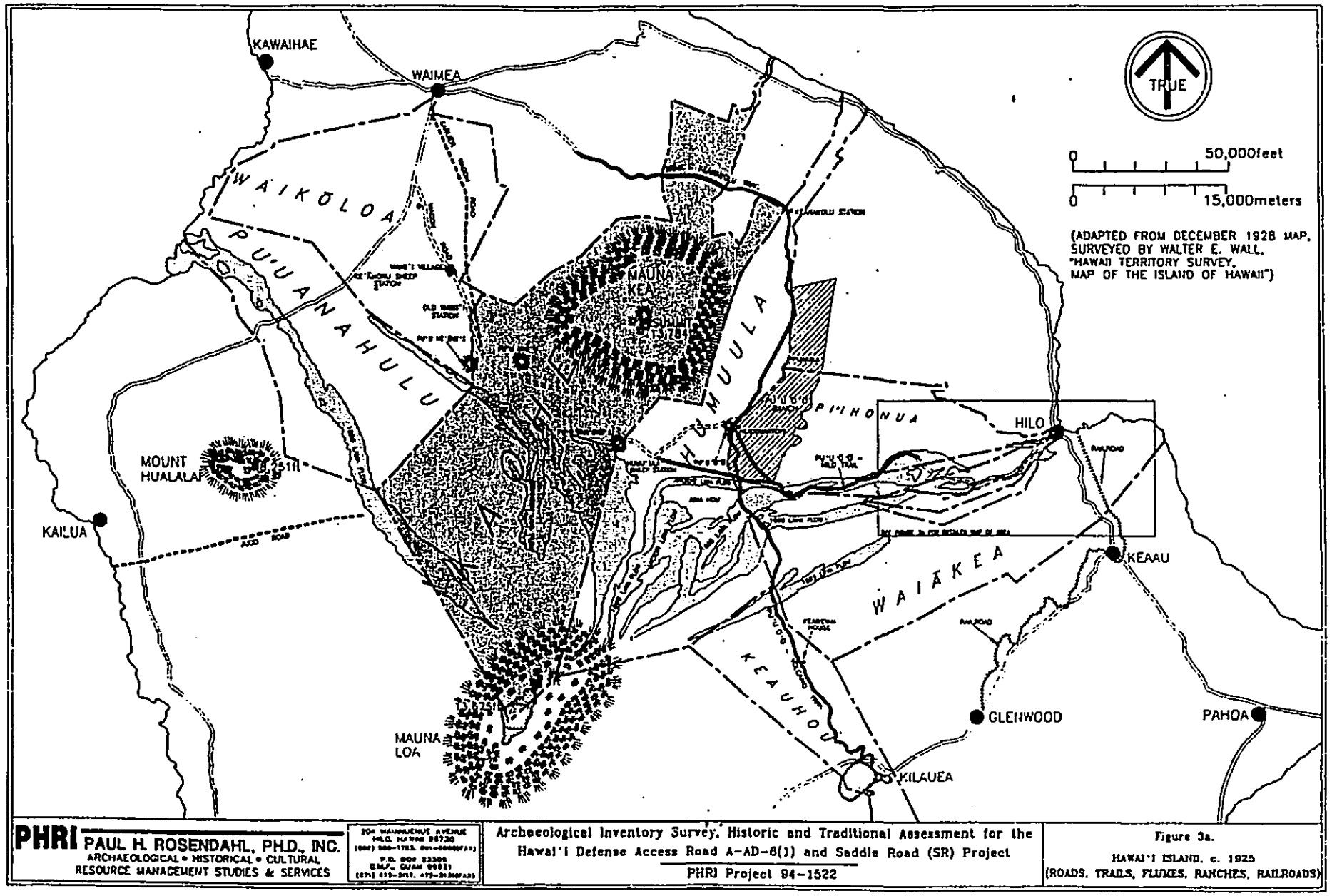
next thousand years. During this settlement period, the early Hawaiians developed stable water and food sources and adapted to their new environment. (Kanahele and Kanahele, 1997) Hawaiians first settled near the shore where there was ready access to the ocean's plentiful resources. The forests provided plants and animals for food, tools, and shelter. Flightless birds, knowing no predators before, became easy prey for Hawaiian hunters. The mountain tops, the highest points of the land, were considered sacred. Mauna Kea is among the most sacred of these high points.

As early as AD 1100, adze makers came in reverence to the Mauna Kea adze quarry, Keanakāko'i (most of which is located in the Mauna Kea Ice Age Natural Area Reserve), to craft tools from the unique dense basalt found here. As part of the ritual associated with quarrying, craftsman erected shrines to their gods. Adze makers came to the mountain for short periods of time to work on the basalt that formed from molten lava which erupted under the glacial ice cap. They chipped out chunks of basalt and then worked the stone to form refined tools in shelters and workshops they had built. Different areas were designated for chipping, rough-finishing, and fine-finishing. *Māmane* wood was preferred for adze handles. In addition to the quarrying of adze basalt, craftsmen also collected volcanic glass and dunnite/gabbro for cutting tools and octopus fishing gear sinkers (McCoy, 1987 and Maly, 1999). Further down the mountain, near a spring, the adze makers erected shelters from which they would gather water, wood, and food to sustain them as they worked in the quarry. (PHRI, 1997) Remnants of shelters, shrines, adze manufacturing, food and offerings remain today to tell of these early craftsmen. The adze makers are thought to have come from neighboring areas and the adzes they crafted were widely used. Keanakāko'i was an active place for hundreds of years, with intensive use after AD 1400 and eventual decline prior to Western contact.

Following the long period of initial settlement, an era of high culture ensued and the Hawaiian society advanced in all areas from the 1200s until the late 1700s. During this time political powers exerted their might and the structure of communities was refined. (Kanahele and Kanahele, 1997)

In the beginning of the 1600s, during the time of Umi, the Hawaiian Islands were divided into political regions. The larger islands (*mokupuni*) were divided into districts (*moku*). The *moku* were divided into *ahupua'a* and large *ahupua'a* were divided into *'ili*. *Ahupua'a* were often entire valleys spanning from the top of the mountain ridge to the ocean. The *konohiki* managed the day-to-day operations of the *ahupua'a* with the aid of *luna* who were experts in various skills such as planting and fishing. Each *ahupua'a* contained nearly all of the resources Hawaiians required for survival from fresh water, plants, and a variety of animals, and was managed so that these resources could be sustained over time. (The Ahupua'a, 1994)

The *ahupua'a* of Ka'ohe spans the summit of Mauna Kea and includes the Mauna Kea Science Reserve (Figure 4-3). The lower slopes of Mauna Kea reach into the *ahupua'a* of Humu'ula and Ka'ohe. Hawaiians hunted and gathered in Mauna Kea's *māmane* forests which were rich with vegetation and native birds including the *'ua'u* (dark-rumped petrel), *nēnē*, and *palila*. So prized were the plump young *'ua'u* that they could be eaten only by the *ali'i*. Hawaiians came to the *koa* and *'ōhi'a* forest on the mountain's lower slopes to gather wood for canoe-making and to



Source : PHRI, 1997, Archaeological Inventory Survey and Historic Traditional Cultural Assessment for the Hawai'i Defense Access Road A-AD-6(1) and Saddle Road (SR 200) project

collect bird feathers. Above the *koa* forests was the open *māmane* forest where they may have hunted *'ua'u* and *nēnē*.

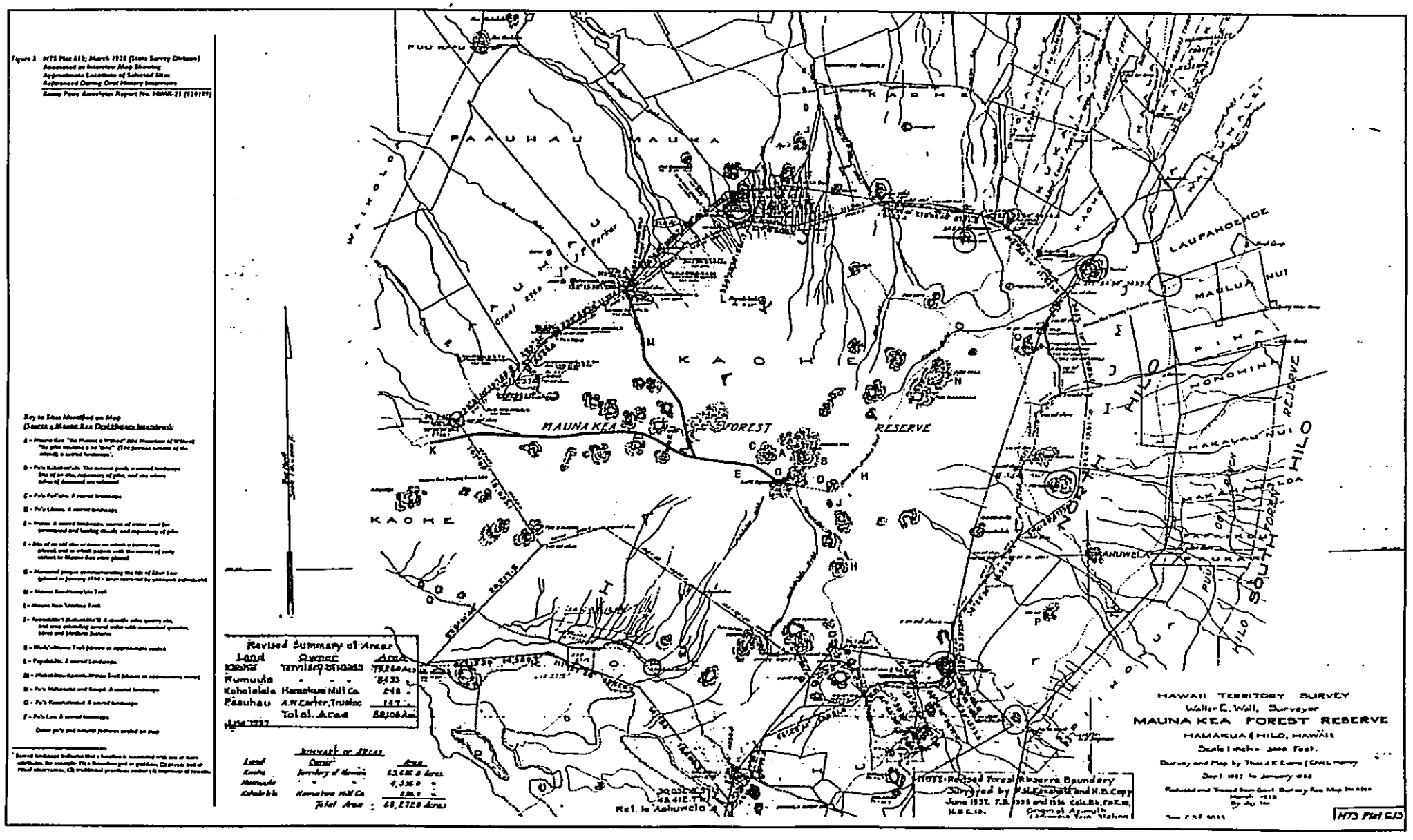
All aspects of Hawaiian life were steeped in ritual. For the Hawaiian people, spiritual beliefs, cultural practices and all facets of daily life were intricately bound to the natural landscape of the islands. The lake, Wai'au, was believed to contain pure water associated with the god Kāne and was used in healing and worship practices. Archaeologist Pat McCoy suggests that shrines located at the edge of the summit plateau may mark the transition to a spiritual zone associated with the summit of Mauna Kea (McCoy and McEldowney, 1982). The shrines may be associated with the snow line and thus represent shrines to Poli'ahu and/or other deities. Some of the archival and oral history research, including spiritual associations, is summarized below.

Adze Quarrying and Manufacturing
Several of those interviewed by Maly have heard of or visited the adze quarry areas on Mauna Kea.

> Coco Hind recalls, "I went up once [to Mauna Kea], a long time ago, we went up to Lake Waiau. I remember feeling kind of weak when we got up there, and it was the thin air. I wasn't that old. We went up to Humu'ula and then we took horses. We rode horses up to Wai'au. I was with my father, my mother didn't go. My mother was afraid of horses, she wouldn't go near a horse."... "... we went up and dad showed us this...there were other people with us too, my uncle Allan and his son, and others. He showed us this place where there were *'ōpihi* shells all over and it was where daddy said that they used to rough cut the adzes and then bring them down and finish them up, down below..." (Florence La'i-ke-aloha-o-Kamālu "Coco" Vrendenburg-Hind, p. A-118 in Maly, 1999)

Trails and Access
Maly reports that by the later nineteenth and early twentieth centuries, trails were created and often traveled on horseback. The trails of Mauna Kea linked communities and cultural and natural resources together. To reach the summit, people left the near-shore and plains lands and traveled the mountain slopes to the summit. The trails ascend the slopes of Mauna Kea from nearly all of the major, and many of the smaller *ahupua'a* which lie upon Mauna Kea's slopes. Traditions pertaining to journeys on the mountain trails, and knowledge of Mauna Kea are still retained as important family history today. Mauna Kea's trails, as told of in the oral and written histories, are depicted on the annotated interview map (Figure 4-4). Significantly, many of these trails converge at Wai'au, in the Natural Area Reserve.

Interviewees told Maly of their elders travelling to Mauna Kea to worship in the summit region, gather water from Wai'au for healing practices, procure stone for adze making, and take individuals' ash remains to the summit area or to Wai'au for their return to the Earth. Teddy Bell describes one of the mountain trails to Wai'au.



Annotated Interview Map (Kepā Maly)

> "And then we also went from Waiki'i" . . ."You go so far from Pu'u Lā'au . . . There used to be one pine tree forest. And from that reserve, there's a clump of pine trees. That's where they've got a lot of cones. From that pine trees, you look at Mauna Kea, the two sides, it's almost like a *pali* but wide. And then you right up through that hollow there, and you come up to Lake Waiau. Almost to the end of the *pali* on Mauna Kea." (Theodore "Teddy" Bell, Sr., p. A-128 in Maly, 1999) (This trail is indicated in Figure 4-4 as K Waiki'i-Waiau trail.)

During the historic period, people have traveled the mountain for Territorial Forestry operations, ranching, hunting, and recreational activities. Lloyd Case describes game trails on the mountain.

> "You know one of the most amazing things, and I don't know if some of the old timers told you this. But a lot of these Hawaiian trails, a lot of them were used by the sheep, they became game trails after a while. The sheep would use some of these trails. Some of these trails we walked 'em, on the Kemole side, Pu'u Mali side. But a lot of them, they are still there, but you have to have a good trained eye to find 'em." (p. A-348 in Maly, 1999)

Burials

While none of the individuals interviewed by Maly reported knowing of specific locations of burials in the immediate area of the Mauna Kea summit, many spoke of *ilina* (burial sites) in cinder cones, and other natural features in the region extending from about the 12,000 down to the 7,000 foot elevation. In modern times several family members or close friends of interviewees have had their cremated remains taken to Mauna Kea for release.

Summit Area

All of those interviewed by Maly attributed spirituality and healing qualities to being on Mauna Kea; and several recorded that they still go to Mauna Kea for prayer and restoration. One described Mauna Kea as a sanctuary in ancient times. The area above the forest line was so sacred that once in the upper region, your enemies could not pursue you. (Maly, 1999)

Cultural Landscape

The summit of Mauna Kea has been referred to as *wao akua* (region of the gods). The most common understanding of *wao akua* is that it was a remote desolate location where spirits, benevolent or malevolent, lived and people did not live. Usually these places were deep interior regions, inhospitable places such as high mountains, deserts and deep jungles. These areas were not necessarily *kapu* but were places generally avoided out of fear or respect. Different people and family had different protocols when they traveled through these remote regions. (George Atta personal communication with Holly McEldowney and Patrick McCoy, 1999)

> "Perhaps as a result of its prominence, isolation, and extreme environmental conditions, Mauna Kea's place in the culture and history of the Hawaiian people is significant. This 'cultural significance' extends beyond a physical siting, sites or particular features which have been previously identified in archaeological site studies. Mauna Kea is a prominent feature on the cultural landscape of Hawai'i

which has been and continues to be, viewed from afar, and to which spiritual and cultural significance is attributed." (Maly, 1999)

"A number of place names recorded for this mountain landscape are associated with Hawaiian gods. Other place names are descriptive of natural features and resources, or document events that occurred on the mountain." (Maly, 1999) "Native families also retain names such as Maunakea, Poli'ahu, Lilinoe, and Waiau, which in some cases are directly tied to the mountain landscape." (Maly, 1999)

Pualani and Edward Kanahele (1997) tell of Mauna Kea as the *piko* or origin point for the island of Hawai'i, and specifically for the northern half of the island. Mauna Kea is, therefore, a place of great *mana*. Kanahele has also said that the three *pu'u*, Poli'ahu, Līlīnoe, and Wai'au are named for three sister goddesses who are female forms of water. Poli'ahu is embodied in the snow, Līlīnoe in mist, and Wai'au in the lake. These *pu'u* are where the goddesses manifest themselves (Kanahele and Kanahele, 1997). Of these three landforms two, Poli'ahu and Līlīnoe, are located in the Science Reserve. Wai'au is located in the Natural Area Reserve (Figure 4-5).

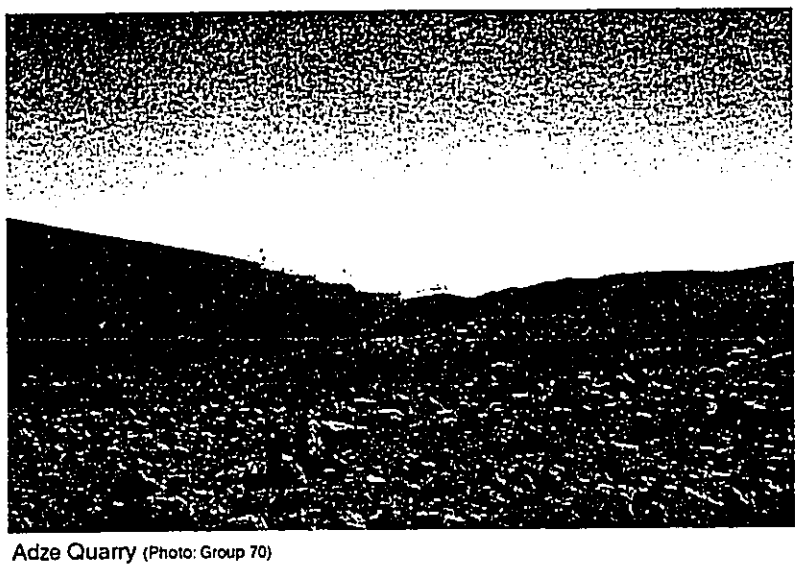
Many of those interviewed by Kepā Maly expressed the significance Mauna Kea holds for them as Hawaiians and as individuals.

John Speilman and Pualani Kanahele describe Mauna Kea in the context of the entire island of Hawai'i and in Hawaiian ancestral history.

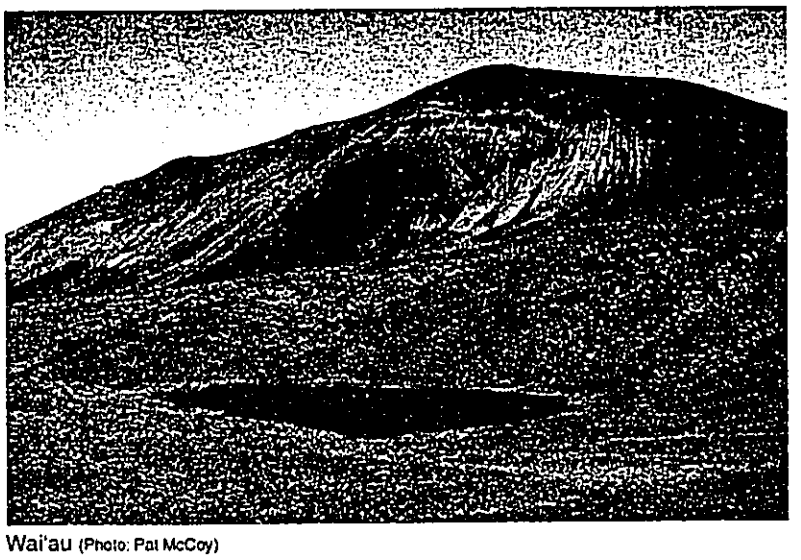
"And I think too, what is important to understand and for people to realize is that it is all connected. Although we are talking about Mauna Kea, Mauna Kea and Paniau are connected. When you go fishing from Paniau, you look up to Mauna Kea and you check out the weather. You look to the mountain and see what the weather patterns are doing. The Kohala mountains. So the fishermen use the mountains as visual aids to help them in their fishing. And perhaps, I don't this as much, but from the mountain side down, but I would imagine that the farmers and the people that lived higher, would look down to the ocean to see if the weather was changing, the cloud patterns on the ocean. It's all connected. It is not separate. But Mauna Kea, I think, is the focal point of this island. It is the *piko*, the breath . . ." (John K. Spielman, p. A-282 in Maly, 1999)

"Mauna Kea was always *kupuna* [an elder, ancestor] to us. Mauna Kea and Mauna Loa, the tips, they were always *kūpuna* [elders, ancestors]. and there was no wanting to go on top. You know, just to know that they were there was just satisfying to us. And so it was kind of a hallowed place that you know is there, and you don't need to go there. You don't need to bother it. But it is there, and it exists. And it was always reassuring because it was the foundation for our island." (Pualani Kanaka'ole Kanahele, p. A-366 in Maly, 1999)

Adze Quarry (Photo: Group 70)



Adze Quarry (Photo: Group 70)



Wai'au (Photo: Pat McCoy)

Natural Area Reserve (Adze Quarry, Wai'au)

Alexander Lancaster and Tita Spielman relay the significance of Mauna Kea to each of their families.

> "Yes, my grandmother Alice. Her Hawaiian name is Kamahalo – she was named after her grandmother, my great, great, great grandmother. She said " When you go up there, you going feel the spirit." And you do feel the spirit." (Alexander Kanani'alika Lancaster, p. A-234 in Maly, 1999)
>
> Regarding her family's relationship to Mauna Kea, Spielman explains, "Well, it was through my mother, because of course, she grew up in Kohala and spent a lot of time there. And at Pu'u Wa'awa'a and Kiholo, and always loved Mauna Kea. She used to say 'That's my mountain.' And so we got to know it and love it as we do." ("Tita" Elizabeth Kauikeōlani Ruddle-Spielman, p. A-265 in Maly, 1999)

Teddy Bell and Lloyd Case share their own personal feelings about Mauna Kea.

> "On the slopes of Mauna Kea, there is a ridge there called Pu'u Nānā. Pu'u Nānā, if it's a clear day, you can see all of this Waimea. So that's where I want my ashes to be scattered." Theodore "Teddy" Bell Sr., p. A-139 in Maly, 1999)
>
> "Because the one thing I loved about it was just going up there and sitting down under the tree and looking out at space. Looking at everything. That is the most rewarding thing that I ever can say happens to me. When I go up there, it just heals me. That is a place for healing . I come back a different person." (Lloyd Case, p. A-353 in Maly, 1999)

Wai'au is a place of tradition and a source of inspiration. Located outside the Science Reserve in the Natural Area Reserve, Wai'au is a focal point for many visitors to the mountain. Many of the individuals interviewed by Maly discussed their own visits or visits by family members to Wai'au.

> "It [Mauna Kea] brings back memories, you know. But way back, people never used to go up there. They never did go to Mauna Kea except on horse back, and that was very few. And right at Lake Waiau, had a bottle there. whoever went up, would write their name and the date, and put it in the bottle." . . ." Yeah. So, I don't know what happened to that bottle. My first trip to Mauna Kea was in 1934. And there were a few peoples names in that bottle already." (Theodore "Teddy" Bell Sr., p. A-123 in Maly, 1999)
>
> Kepa Maly, "And you mentioned that Waiau was a favorite place [of your grandfather Eben Low]." Tita Spielman, "A very favorite place. Yes, and that's why his plaque was put there. Because that was one of his favorite places. Although, his ashes were scattered at the top, the plaque was put at Waiau." ("Tita" Elizabeth Kauikeōlani Ruddle-Spielman p. A-270 in Maly, 1999)

In addition to feelings of *aloha* expressed for the place, numerous oral traditions of the importance of Wai'au have been handed down through families.

> Kepā Maly, "So he [your father] would go *mauka* to Waiau and gather water there?" Anita Landcaster, "And he would bring it, and he had my mom and I drink that water. And if we had it for a week, it never went into the refrigerator, it stayed on the counter, but it was always cold. And that was the sweetest water. It was so pure. I thought nothing of it because I was so young. But as I grew older, I would always remember it because my dad always had this gallon hanging, you know when he didn't go hunt, the gallon was always hanging in the house. In fact, the last time I saw it was just before he died, and then I don't know what happened to the gallon..." (Anita Leilani (Kamaka'ala) Landcaster, p. 245 in Maly, 1999)
>
> "The water they used...the *lā'au lapa'au*, the healers went to this particular place, and another place in the Kohala mountains, there is another spring up there which Papa Auwae uses." . . . "So, I've heard of the old ones getting water from Waiau to use for healing. (Lloyd Case, p. A-353 in Maly, 1999)
>
> "And so here, within the Mauna a Wākea, sits this *'apu wai* [water container] which is Waiau. What they are calling Lake Waiau. And as it hasn't had a chance to come down to the rest of us, then it is sacred water, like the water that is in the piko of *lau kalo* [taro leaf], and the water that is found in the *'oha* [bamboo – interpreted as the meaning of the *ahupua'a* name Ka'ohe, within which the summit of Mauna Kea and Waiau are situated]. And the water that is found also in the *niu* [coconut]. So you have all of these different, sacred waters, but to me, that water, Waiau, is the most sacred because it isn't the water that has been spilled, it is still up there in the realm of Wākea.". . . "The most sacred of all the waters." (Pualani Kanaka'ole Kanahele p. A-368 in Maly, 1999)

In ca. 1881, Dowager Queen Emma ascended Mauna Kea on a journey of spiritual and physical well-being. At the time, Queen Emma was in competition with David Kalākaua for the position of ruling chief for the Kingdom of Hawai'i. Each of the two embarked on journeys to prove their connection to the senior line and connect back to a *wahi pana* (a sacred physical place). Emma went to the top of Mauna Kea to bathe in the waters of Wai'au, and cleanse herself in the *piko* of the island. (Kanahele and Kanahele, 1997)

For some, Wai'au has a special family tie. "...Hawaiian members of the Lindsey family have a tradition of taking the *piko* of their children to Wai'au and the summit of Mauna Kea.". "Other interviewees who had not heard of the practice of taking *piko* to Mauna Kea all felt that it was likely to have occurred, and they shared similar stories from their own families of the custom at various localities." (Maly, 1999)

Pualani Kanahele explains the importance of this tradition of taking the *piko* to a particular place.

> "I don't personally know any families [who took the *piko* to Waiau]. I know that people took *piko* there, I just don't know who." . . . Well, the *piko* is that part of the child that connected the child back to the past. Connected the child back to the mama. And the mama's *piko* is connected to her mama, and so on. So it takes it back, not only to the *wā kahiko* [ancient times], but all the way to *Kumu Lipo*." . . . "So, it's not only the *piko*, but it is the extension of the whole family that is taken and put up in a particular place, that again connects to the whole family line. And it not only gives *mana* or life to the *piko* and that child, but life again to the whole family." Pualani Kanaka'ole Kanahele p. A-368 in Maly, 1999)

The First European Contact to the Islands

In 1778, the first foreigner arrived in Hawai'i. In the decades that followed, life in Hawai'i changed dramatically with the introduction of new technologies, religion, diseases, animals, and industry. The population of Hawaiians was decimated by the effects of diseases that had never been seen before in the islands. Port towns such as Kailua, Kealakekua and Hilo developed into commercial centers accommodating Western ships. Adze quarrying on Mauna Kea ceased to exist as stone adzes were replaced by metal tools.

In the late 1700s and through the 1800s several Europeans led expeditions to Mauna Kea. The names Goodrich, Baldwin and Alexander are well-known to students of the mountain. Their maps and documents are the earliest written descriptions of Mauna Kea.

In 1793 the first cattle were brought to Hawai'i and offered by Captain George Vancouver to King Kamehameha. By the early 1800s more cattle had arrived and escaped to forested areas where, in the absence of natural predators, their populations multiplied (Juvik and Juvik, 1984). In addition to wild cattle, sheep and goats thrived on the mountain. In 1809, John Palmer Parker settled in Hawai'i and became friends with King Kamehameha I. The king placed Parker in charge of the wild cattle. With a land grant from King Kamehameha III in 1845, Parker established a ranch, Parker Ranch, which has been in continuous operation until the present. Other ranches also operated in the mid-1800s, however, much of the cattle and sheep continued to run free on the mountain's slopes, destroying the native vegetation. By this time, hunting had become a vital lifestyle for many island residents. Hunters continued to pursue the animals for their hides and meat which were consumed locally or bartered for goods from visiting ships.

After the decline in adze making on Mauna Kea, there was limited human activity on the mountain. On the lower portions of the mountain animals grazed while hunters pursued them. On the higher slopes a few Western explorers conducted expeditions up to the summit region. The next major phase of activity began in the early 1960s with the exploration of Mauna Kea as a potential site for astronomy observations.

The travel journals of the first Westerners to explore the mountain's summit region highlight some of the physical evidence of past activity. McCoy (1999) shares some of these earliest observations. The first documented trip to the summit of Mauna Kea was that of Reverend

Joseph Goodrich in 1823. Later writings of this trip record some of the observations and thoughts about the summit region:

> "Rev. Joseph Goodrich, who, on this occasion, was unfortunately laid up with mountain sickness, had on 26th August, 1823, reached the summit of Mauna Kea. This is the first recorded instance of the ascent of this mountain, although Mr. Goodrich mentions that on reaching the top of one of the terminal cones that encircle the main plateau of Mauna Kea, he discovered a heap of stones, probably erected by some former visitor. Who this former visitor was is unknown, but he was probably one of the white men that in the early years of the nineteenth century got a living by shooting wild bullocks that roved on the side of Mauna Kea. It is very unlikely that any native had reached the top of the terminal cones on the summit, owing to being unprovided with warm clothing to resist the great cold and also to the fact that the natives had a superstitious dread of the mountain spirits or gods." (Macrae, 1922)

An account of Alexander's journey in 1892 mentions the presence of a cairn at the top of a cinder cone:

> "Messrs. Muir and Alexander ascended the second highest peak on the northwest, overlooking Waimea, 13,645 height to continue their survey. In the cairn on the summit a tin can was found, which contains brief records of the visits of five different parties from 1870 to the present time, to which we added our own." (Alexander, 1892)

Reflecting this notion, Ellis (1979) looked back to the travels of Goodrich and Blatchely, who ascended the peak about six months after Goodrich, and provided this description of Hawaiians' view of Mauna Kea.

> "The snow on the summit of the mountain, in all probability, induced the natives to call it Mouna-Kea (mountain white), or, as we should say, white mountain. They have numerous fabulous tales relative to its being the abode of the gods, and none ever approach the summit – as, they say, some who have gone there have been turned to stone. We do not know that any have been frozen to death; but neither Mr. Goodrich, nor Dr. Blatchely and his companion, could persuade the natives, whom they engaged as guides up the side of the mountain, to go near its summit." (Ellis, 1979)

The early exploration of the summit region and the subsequent development of the astronomy industry on the mountain is detailed further in the Education and Research section of this report.

Cultural Practice Today

In their ethnographic work Maly, Langlas, and Kanahele and Kanahele describe some of the practices that individuals and families conduct on Mauna Kea today. Several of the individuals

interviewed by Maly stated that "they still go to Mauna Kea for prayer and restoration". All interviewees attributed spirituality and healing qualities to being on Mauna Kea. (Maly, 1999)

Dr. Langlas interviewed a woman of the Poli'ahu line, meaning that Poli'ahu is one of her family's *'aumakua*. This family has designated an individual as their *kahu* for worship of Poli'ahu. This individual has constructed a shrine on Mauna Kea to worship Poli'ahu and has incorporated a stone given to her by the family. This individual considers the whole mountain to be sacred and feels that it is appropriate to worship anyplace on the mountain if one is spiritually guided there. Thus, worship should not be limited to traditional sites. The shrine placed by this *kahu* is not located in a traditional site but rather in a place that she was guided to.

Maly's interviewees also report of the practice of taking ash remains to the summit of Mauna Kea for release. Two of the individuals interviewed by Maly have instructed that upon their deaths, their ashes are to be taken to specific places on the slopes of Mauna Kea.

While the ethnographic research provides few accounts of actual cultural practices on the mountain, other individuals and groups may visit the mountain for worship on special occasions or on a regular basis. Many more carry with them an esteem and respect for Mauna Kea.

"In both its genealogical associations and its physical presence on the island landscape, Mauna Kea is a source of awe and inspiration for the Hawaiian people. In Hawaiian practice elders are revered – they are the connection to one's past – and they are looked to for spiritual guidance. Because of its place in the Hawaiian genealogies, Mauna Kea, the landscape itself is a sacred ancestor." (Maly, 1999) This is the spirit with which many view the mountain today.

Hale Pōhaku
Ethnographic information specifically relating to the Hale Pōhaku area is lacking. Of the several known place names in the vicinity of Hale Pōhaku, Pu'u Kalepeamoa (lit. "the comb [acquired] by [a] chicken" – Pukui and Elbert, 1986) is the only one to appear on early government survey maps and in the literature on late nineteenth century expeditions to the summit. (McCoy, 1987)

4.2.2 Archaeology

What we know today of Mauna Kea's ancient use and meaning we have learned from the physical clues left behind on the mountain.

Summit Region
McCoy summarizes the most recent archaeological work within the Mauna Kea Science Reserve. Based on field work undertaken between 1975 and 1997, a total of 93 archaeological sites have been identified in surveys covering approximately 3,000 acres within the larger Science Reserve, including the immediate summit ridge areas. These sites tell us much about the history of man's association with Mauna Kea. Of the 93 sites, 76 are shrines, four are adze manufacturing workshops, and three are markers. One burial has been positively identified and four other possible burial sites have been documented. The function of five of the 93 sites is unknown. (McCoy 1999)

In addition to the sites identified within the Science Reserve, a wealth of physical evidence can be found in the Mauna Kea Ice Age Natural Area Reserve, outside of the Science Reserve. Within the Natural Area Reserve, the main adze quarry and numerous sites at Wai'au tell of the activity in this geologically and culturally unique area. Many of these sites have been inventoried but have yet to be fully analyzed and related to the other sites found on the mountain.

Shrines

The term 'shrine' is used by McCoy to describe all of the religious structures that exist in the summit region of Mauna Kea. The most common of the archaeological features on Mauna Kea, shrines are characterized by the presence of one or more upright stones. The shrines at Mauna Kea range from single uprights to more sophisticated complexes with pavements and prepared courts.

The majority of shrines on Mauna Kea are located conspicuously on ridgetops or at breaks in the slope. It is not surprising that shrines were placed in prominent locations with commanding views of the landscape. Shrines have not been found on the tops of cinder cones.

McCoy suggests that each upright on a shrine may have stood for a separate god. The majority of uprights were made of angular slabs found in the glaciated area of Mauna Kea. These select stones were unmodified by their human gatherers and provided a place for the gods to inhabit when they were needed. Based on ethnographic information McCoy suggests that the pointed uprights might represent male gods and the flat-topped uprights, female gods.

Stone uprights were typically set in a crack in the bedrock and braced with a few stones. In other shrines, most notably those in the north and east slopes, uprights were set on the top of a boulder. In shrines dispersed throughout the summit area, stone uprights were set into low rubble heaps or piles of stones. In only a few cases, cairns were built to support the stone upright. Platforms were also built to support one or more uprights.

McCoy suggests that the shrines on Mauna Kea were erected for one of two, and possibly more, functions. Though they are not distinguished from each other by physical characteristics, the shrines can be classified as occupational or non-occupational in function. The eight occupational shrines are identified by the remains of specialized workshops and adze manufacturing byproducts.

The non-occupational shrines range in complexity from simple features with a small number of uprights to more complex structures with courts and larger numbers of uprights. Most of the shrines found on Mauna Kea have just 1 to 3 uprights, however, some have as many as 24 or 25 stone uprights. McCoy speculates that the simple shrines were built and used by small family groups and the larger, more complex structures were built and maintained by a priesthood. McCoy reasons that the larger number of uprights indicate a larger number of gods than most Hawaiians would probably not have known. In addition, many of these more complex sites are isolated from the main areas of worship.

McCoy has interpreted the shrine complex in the summit region as evidence of an historically undocumented pattern of pilgrimage to worship the snow goddess, Poli'ahu, and other mountain gods and goddesses.

Adze Quarrying and Manufacturing
The main adze quarry, Keanakāko'i, is located within the Mauna Kea Ice Age Natural Area Reserve. The majority of the workshops and shrines associated with adze manufacturing are located near the main quarry. Four additional adze manufacturing workshops have been found in the Science Reserve across the Summit Access Road from the adze quarry. However, these workshops are of a different kind than those found in the adze quarry. Manufacturing byproducts such as flakes, cores, adze rejects, and hammerstones have been found at these workshops, however, no stone-tool quality raw material is found. Thus it is likely that adzes were flaked elsewhere and transported to these localities at a later stage of the manufacturing process. Each workshop has one or more shrines upon which adze byproducts were offered to the tutelary gods of adze making. McCoy has identified one of these workshops as the location of initiation rites for apprentice adze makers. (McCoy 1999)

Trails and Access
In pre-contact times, it is suspected that travel to Mauna Kea was guided by individual knowledge of the landscape rather than by any distinct trails. It is possible that ridges were followed or that sources of water were known and visited along the way. Individuals going up the mountain likely visited the shrines erected by their family members to their gods. No evidence of pre-contact trails has been documented. (McEldowney, 1999)

Burials
As was mentioned earlier, no shrines have been identified on top of cinder cones in the Mauna Kea Science Reserve. McCoy believes that these high and remote places were reserved for burying the dead. Although there are references to human burials on Mauna Kea in oral histories, only one burial site has been positively identified in the mountain summit area.

> "To date the only positively identified human remains found in the Science Reserve are located at Site 16248 on the summit of Pu'u Makanaka. Jerome Kilmartin, a surveyor with the United States Geological Survey, noted the presence of human remains on this prominent cinder cone in 1925." (McCoy 1999)

Four other sites within the Science Reserve have been identified as possible burials by McCoy.

> "There are four other sites in the surveyed areas of the Science Reserve that have been identified as possible burials (Sites 16195, 21413, 21414, and 21416). In each case there are compelling reasons to believe that the site is indeed a burial, but because human remains were not seen at the time the site was recorded it has been called a possible burial."

Of these four possible burial sites one consists of two adjacent cairns located on the eastern rim of Pu'u Lilīnoe. The other three are located on the southern and eastern rim of a large unnamed cinder cone on the northwestern edge of the Science Reserve. (McCoy 1999)

McCoy notes that archaeological sites have been found in all areas that have been surveyed to date but the distribution and density of the various types of sites follows certain patterns. The one burial and four possible burials have been found only on the tops of cinder cones and never with shrines.

Summit Plateau
A significant pattern is the virtual absence of archaeological sites at the very top of the mountain. McCoy states that the "top of the mountain was clearly a sacred precinct that must, moreover, have been under a *kapu* and accessible to only the highest chiefs or priests."

Most of the shrines in the Science Reserve are found on the northern and eastern slopes just above and below the 13,000 foot elevation. This pattern suggest that most of those who journeyed to the summit area came from the Hāmākua and Hilo sides of the mountain. Discussing the scarcity of sites on the western and southwestern slopes, McCoy makes the following observations:

> "While the small number of shrines on this side of the mountain suggest the possibility of people coming from the Kona and South Kohala districts, the number would appear to have never been high. The implications are quite interesting. It suggests that while the mountain may have been viewed from a distance by people from everywhere on the island as a sacred mountain, in practice those who made the journey and worshipped there did not represent an even cross-section of the island populace. The implication is that access to the summit region was under the political control of the east Hawaii chiefdoms, a conclusion that is consistent with all of the other data." (McCoy, 1999)

Hale Pōhaku
Patrick McCoy has also been responsible for much of the field work that has taken place at Hale Pōhaku. As described below, the archaeological sites identified in the Hale Pōhaku area are associated with the adze quarry.

The first archaeological survey at Hale Pōhaku was conducted in 1979 with the preparation of the Hale Pōhaku Mid-Level Facilities Complex Development Plan. No archaeological remains were found at that time (McCoy, 1979). The next phase of work was undertaken in 1984-85 as part of the preparation of a supplemental EIS for a permit to build a new construction laborer camp. Five lithic scatters and two shrines were recorded in the course of three surveys carried out between July 1984 and June 1985 (McCoy, 1985). These remains were formally designated the Pu'u Kalepeamoa Site. (McCoy, 1987)

The Pu'u Kalepeamoa Site has no definite boundaries and is bisected by the Mauna Kea Observatories Access Road. On present evidence, most of the remains that comprise the site are

located on the west side of the road on the slopes of Pu'u Kalepeamoa and an unnamed cinder cone. The majority are situated at the vegetation line on these slopes. (McCoy, 1987)

The Pu'u Kalepeamoa site is located "outside" the quarry proper in the sense that it lies well beyond the boundaries of the raw material source, yet it is clearly part of the quarry "system" because it contains products from the quarry. The pace of this site in the quarry industry is an important research question. The use of the Pu'u Kalepeamoa site is associated with the late history of the quarry industry.

> "Archaeological investigations were undertaken in September, 1987 to mitigate the adverse effects of a construction project on a portion of the Pu'u Kalepeamoa site, located at the 9,200 foot elevation on the south flank of Mauna Kea at Hale Pōhaku. Data recovery involved survey and surface collections at 11 localities and limited test excavations at two of these. A total of 2,364 artifacts and some 129 faunal remains was collected. An analysis of the artifact collection, comprised of mostly adze manufacturing by-products derived from the Mauna Kea Adze Quarry and octopus sinker manufacturing by products, provided new information on these two production systems. Also included in this large artifact assemblage are some 20 bird cooking stones called *pōhaku 'eho* which may have had a primarily ritual use. The site, which on the basis of three radiocarbon age-determinations appears to date to after AD 1600-1700, is interpreted as a camp site occupied on both the ascent to and descent from the adze quarry for a combination of purely pragmatic and social reasons. The site is hypothesized to have been the locus of rites of passage involving a change in social state from *noa* to *kapu*." (McCoy, 1987)

4.3 NATURAL HAZARDS

The island of Hawai'i is located in Seismic Zone 4 (on a scale of 0 to 4 in the zone of highest seismic occurrence and danger) for building design under the Uniform Building Code. Much of the seismic activity is associated with the active volcanism at Mauna Loa and Kilauea Volcanoes. Large earthquakes have occurred elsewhere around the island, however, and are considered possible at any location (MCM Planning, 1991).

The summit and upper flanks of Mauna Kea have been classified as Zone 7 for lava flow hazards; with Zone 9 being the least hazardous (MCM Planning, 1991).

Mauna Kea has progressed to a later stage in its volcanic life cycle, a stage characterized by short and stubby flows, larger and more numerous cinder cones and less frequent eruptions. Based on the infrequency of its eruptions in the recent past, the probability of Mauna Kea erupting in the next several decades is very low (Group 70, 1983).

4.4 CLIMATE

Summit Region

Average monthly temperatures at the summit range from 23° to 56° Fahrenheit. Winds are predominately from the west/northwest during the day and from the east/northeast at night at about 10 to 15 miles per hour. During severe winter storms, winds can exceed 100 miles per hour on exposed summit areas, such as the top of cinder cones. (MCM Planning, 1991)

Hale Pōhaku

The climate at Hale Pōhaku is relatively dry and cool with an annual mean rainfall of about 25 inches and a temperature range of 30° to 70° Fahrenheit. The wettest time of the year is the period between November and March. Mist and fog derived from moisture laden convection clouds frequently cover the area in the afternoon. Snow is a rare occurrence at the mid-elevation. Prevailing winds are from the northeast and are characterized by occasional strong gusts. (McCoy, 1987)

4.5 TOPOGRAPHY

Summit Region

Mauna Kea is a shield volcano that rises 30,000 feet from the ocean floor. The highest point of the mountain, the summit Kūkahau'ula, is 13,796 feet in elevation. The sloping shield volcano is punctuated with cinder cones of varying sizes and shapes along the rift zones that descend from the summit. Slopes in the area vary from flat plateaus to close to vertical slopes on the cinder cones. Kūkahau'ula, the summit cinder cone, rises several hundred feet above the surrounding lava plateau. Both the inner and outer slopes of this cone average about 28 degrees. (Group 70, 1983) A slope analysis is presented in Figure 4-6.

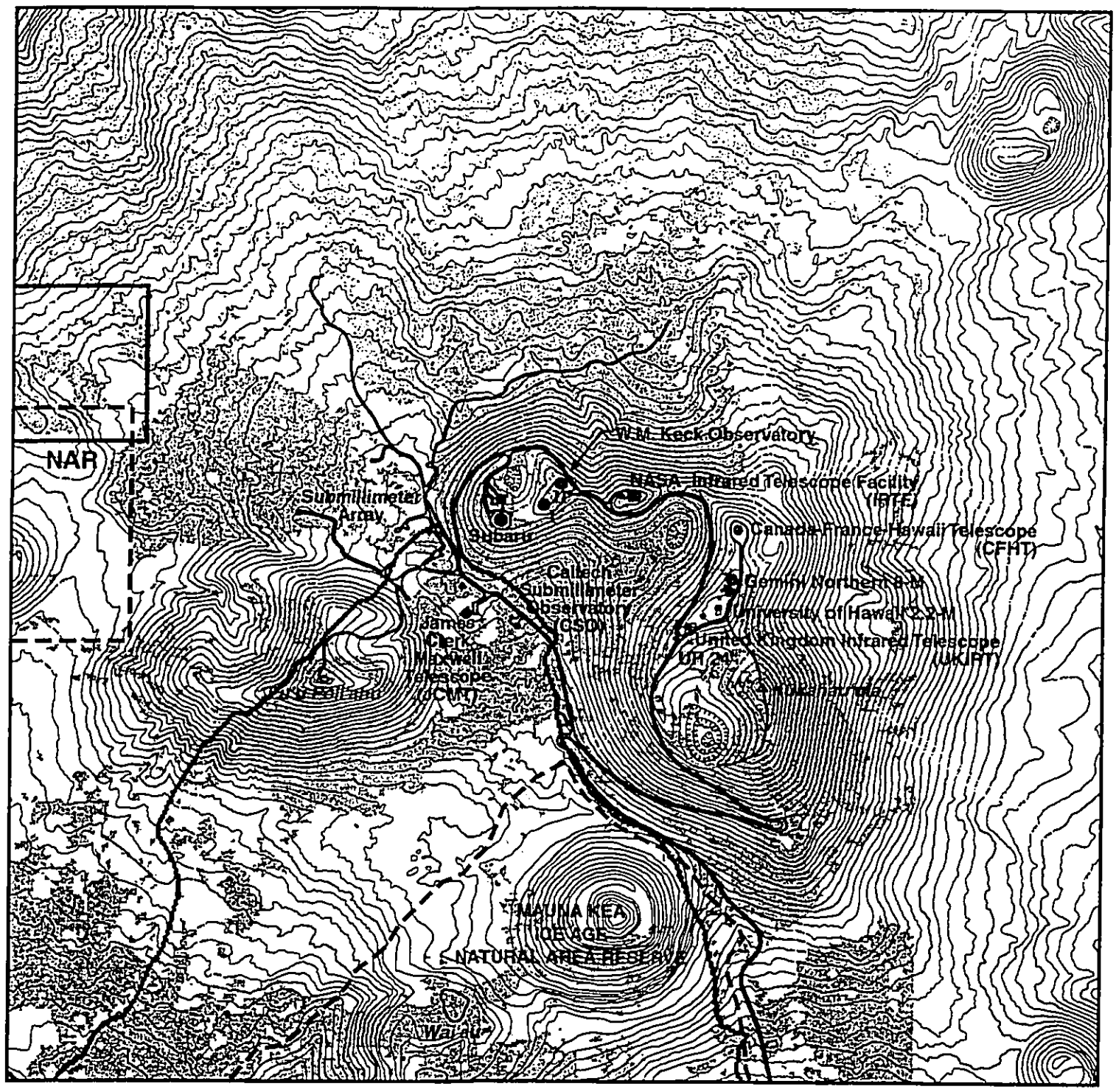
Hale Pōhaku

The average slope of the mid-elevation astronomy support facilities area is 12 percent. Ground slopes in the construction camp area vary from about 5 to 12 percent. (MCM Planning, 1985)

4.6 VIEWS

Summit Region

The topography of the mountain blocks the view of the telescopes from the access road approaching summit, however, the Mauna Kea astronomy facilities are visible from within the immediate summit area. Existing facilities are also visually prominent to varying extents from Hilo, Honoka'a, and Waimea. Views from the summit area are presented in Figure 4-7. Existing summit astronomy facilities are shown in Figure 4-8.



Source: R. M. Towill Topographic Survey, 1997
Group 70, Slope Analysis, 1998

Slope 20% or Greater

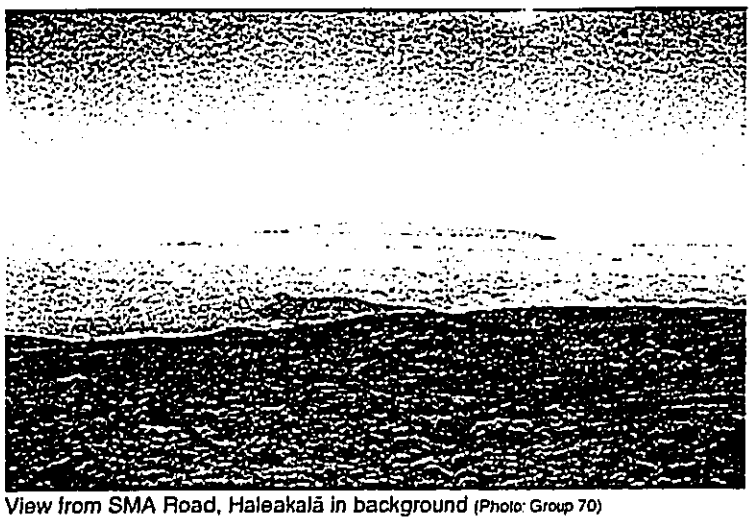
25' Contour Intervals

Natural Area Reserve

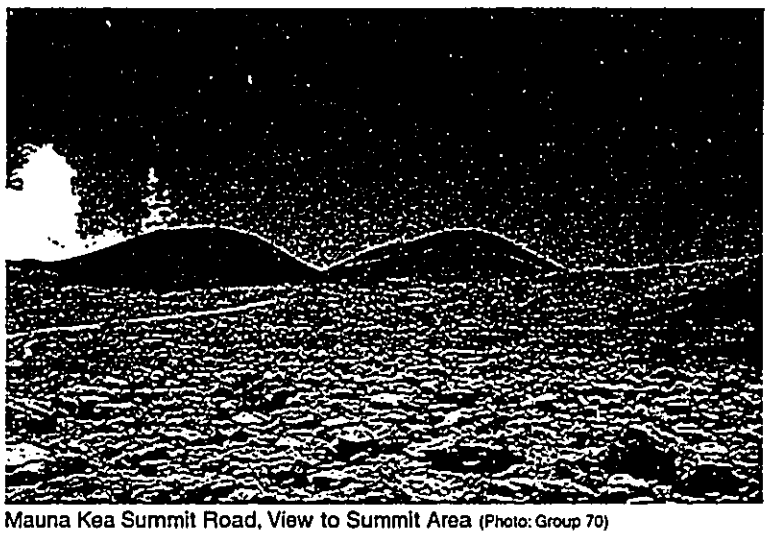
0' 750' 1500' 3000'

NORTH

Slope Analysis

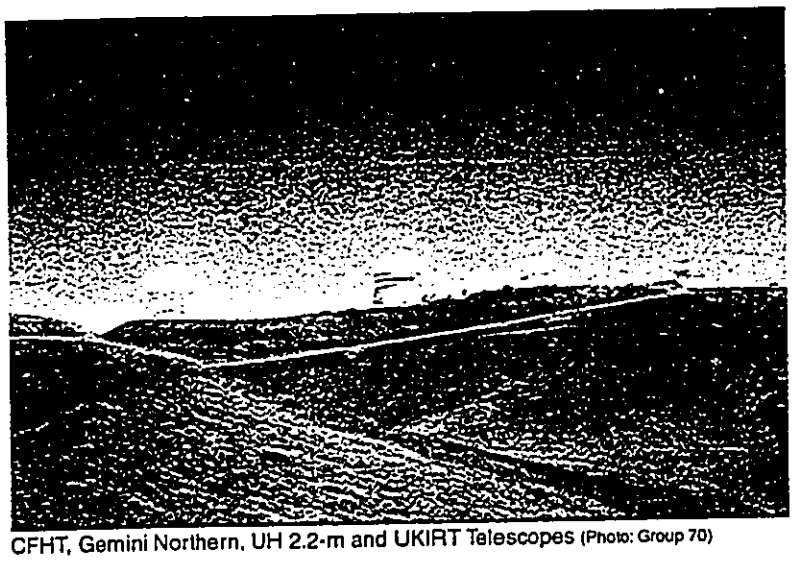


View from SMA Road, Haleakalā in background (Photo: Group 70)

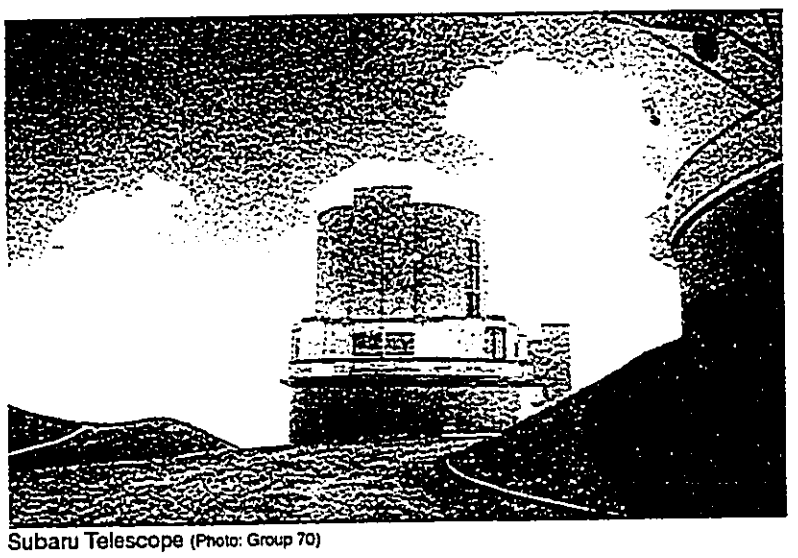


Mauna Kea Summit Road, View to Summit Area (Photo: Group 70)

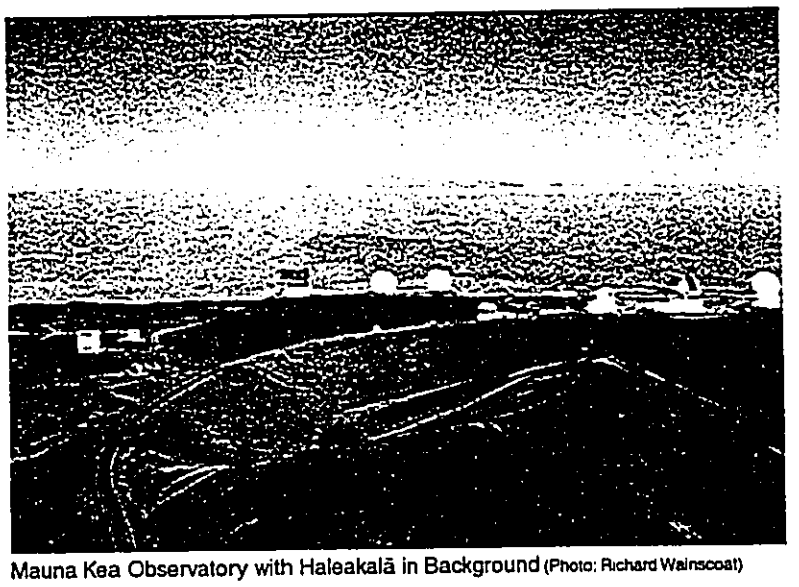
Summit Plateau Cinder Cones (Photo: Pat McCoy)



CFHT, Gemini Northern, UH 2.2-m and UKIRT Telescopes (Photo: Group 70)



Subaru Telescope (Photo: Group 70)



Mauna Kea Observatory with Haleakalā in Background (Photo: Richard Wainscoat)

Hale Pōhaku
The mid-elevation and construction camp facilities are visible from the Mauna Kea Observatory Access Road. Mid-elevation facilities have been built to follow the slope of the mountain and are colored in earth tones to blend with the surrounding landscape. Construction camp facilities are one story in height and nestled among trees to the extent possible. Building and roof colors and materials for the newer construction camp facilities are chosen to blend in with the surrounding landscape.

4.7 GEOLOGY AND SOILS

Summit Region
Mauna Kea formed as a shield volcano that was later punctuated with neatly formed cinder cones. It is a dormant volcano in its postshield stage. Mauna Kea last erupted about 4,500 years ago, and hence the mountain cannot yet be labeled as extinct. The oldest exposed lava flows on Mauna Kea are approximately 250,000 years old. The mountain's volcanic activity was characterized by explosive eruptions that produced widespread ash deposits. (Clague in Atlas of Hawai'i, 1998)

The dome of Mauna Kea measures 30 miles across and is studded with cinder cones in a pattern indicating that the volcano was built over rifts extending eastward, southward, and westward. The volcanics of Mauna Kea are divided into two series. The older Hāmākua series is made up chiefly of primitive olivine basalts and forms the major part of the mountain. The overlying Laupāhoehoe volcanic series is predominantly andesine andesites and forms a thin veneer over the upper part of the mountain. The Laupāhoehoe series is the thickest at the Mauna Kea summit where it has filled in the summit caldera. This volcanic series is characterized by many short flows and bulky cinder cones. (Stearns, 1966)

During the Pleistocene epoch, an ice cap covered approximately 28 square miles over the summit area of Mauna Kea. Several of the mountain's cinder cones peaked through the ice cap which had an average thickness of 200 feet and a maximum thickness of 350 feet in places. Within the limits of the glacier, which reached down to the 11,000 and even the 10,500-foot elevation, many areas were scraped bare of ash and cinder. (Macdonald and Abbott, 1970) During this period, volcanic eruptions continued to take place beneath the ice cap, forming a large lake of lava. This lava cooled without crystallizing, creating a uniquely dense rock that was moved and crushed under the weight of the glacier. Many years later, this rock was sought after by Hawaiians who used it to craft adzes.

The scouring action of the glacier is witnessed today in the terminal moraine and gorge at Pōhakuloa. In other parts of the summit plateau, scars on the sides of *pu'u* and large areas of glacial till stand in contrast to the smooth cinder cones. Areas of buried fossil ice remain in the Mauna Kea Ice Age Natural Area Reserve. Cycles of freezing and thawing continue today, creating ever-changing patterns of rock fragments. These fragments of various coarseness are constantly moving, sorted into stripes and polygons by the forces of nature.

The area that today makes up the Mauna Kea Science Reserve today is characterized by its severe climate with extremes of moisture and temperature and by its rugged landscape, alternating between massive andesite lava flows and large cinder cones of volcanic ash, loose cinder, and other interbedded volcanic material. Cinder cones are generally loose, unstable and highly porous. The andesite lava flows consist of dense rock with numerous pits, fissures, small caves, overhangs, and deeply shaded pockets and crevices. A geology map is presented in Figure 4-9.

Among the many natural features found on Mauna Kea, the small alpine lake, Wai'au , is unique and revered. Wai'au is a nearly circular pond, 300 feet in diameter, situated on the summit platform of Mauna Kea at an altitude of approximately 13,020 feet. It is the highest lake within the boundaries of the Pacific Ocean basin and one of the highest lakes in the United States. The southern rim of the depression containing the lake is a low segment of a cinder cone, Pu'u Wai'au, on which rests a moraine of the latest period of glaciation. The water of the lake, a maximum of 10 feet deep, is derived entirely from precipitation and runoff from the edges of the basin. (Stearns and Macdonald, 1946)

Hale Pōhaku

The landscape around Hale Pōhaku is entirely of volcanic origin, lying below the lower limits of the Pleistocene glaciation. The cinder cones, lava flows and airfall deposits in the Hale Pōhaku area are of uncertain age but are probably less than 40,000 years old. According to Wolfe the landscape in the immediate environs of Hale Pōhaku belongs to the Laupahoehoe Volcanics. (McCoy, 1987)

The Hale Pōhaku area is characterized by Huikau extremely stony, loamy sand soil which 30 to 40 inches thick resting on *'a'ā* lava. The surface layer is very dark, loamy sand about 5 inches thick while the substratum consists of alternating layers of ash, cinders and pumice. (MCM Planning, 1985)

4.8 DRAINAGE

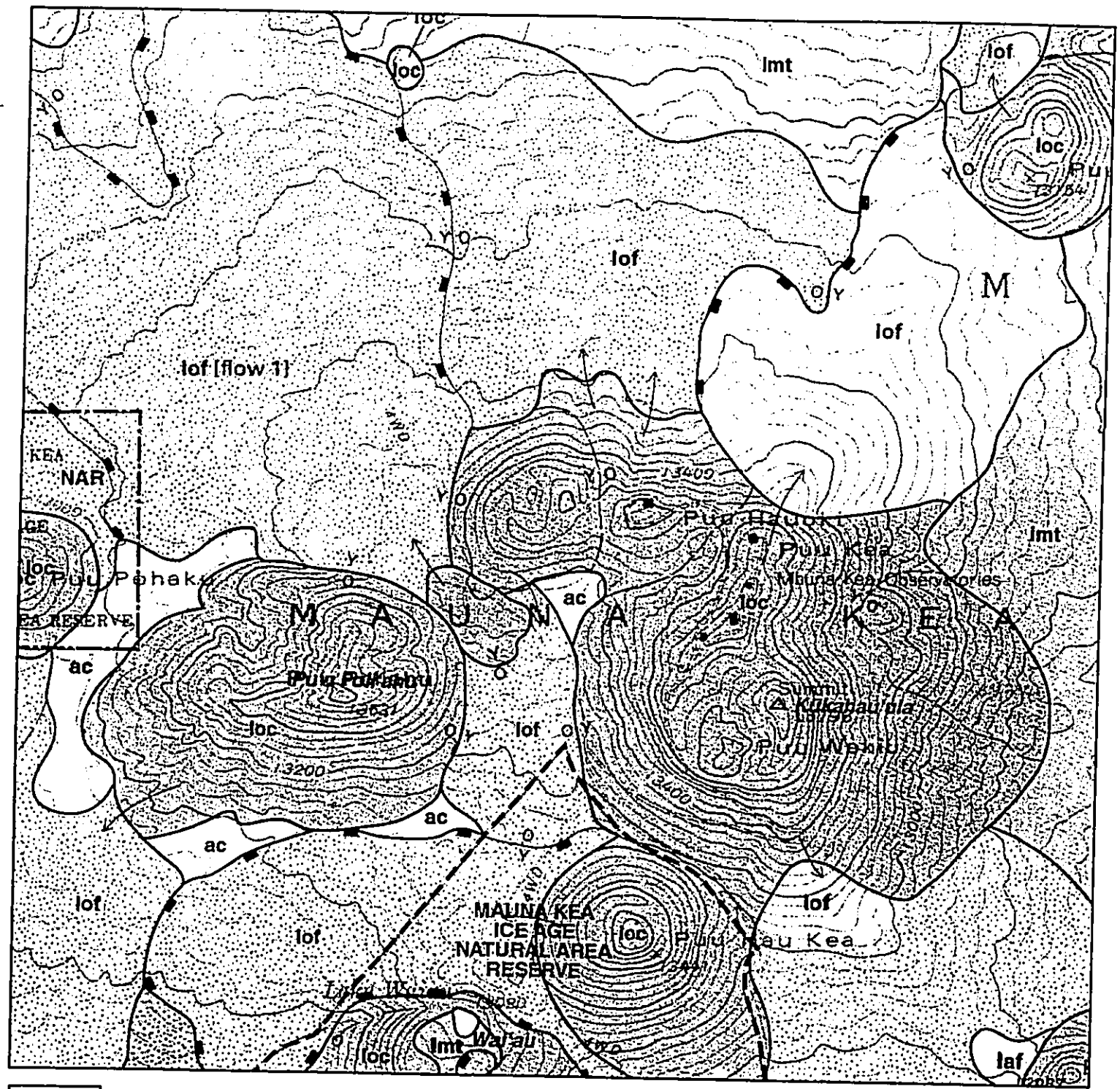
Summit Region

Runoff from paved surfaces is directed to lined channels which conduct the water to collection basins and/or dry wells. This allows runoff to percolate into the subsurface and thereby prevent surface erosion. (MCM Planning, 1991)

Because of the very limited precipitation and high permeability of the soils at the summit "the only groundwater known to exist consists of perched water in the center of some of the cones, including the area immediately east of Lake Waiau" (Woodcock, 1974, 1980).

Hale Pōhaku

Because of the very limited precipitation and high permeability of the soils, groundwater resources in the Hale Pōhaku area are presumed to be non-existent No water table is known to exist anywhere in the vicinity of Hale Pōhaku, nor are any groundwater sources developed in



loc	Cindercones	laf	Air Fall Deposits
ac	Alluvium and Colluvium		Surface Erosion from Ice Cap
lof	Lava Flows		

Source: The Geology and Petrology of Mauna Kea Volcano, Hawai'i USGS Professional Paper 1557

Geology

0' 7500' 15000' 30000'

NORTH

the area (Dames & Moore, 1982). Although there probably is dike-impounded water near the project area, it is assumed to be too deep beneath the surface for development (U.S. Geological Survey, 1973). (MCM Planning, 1985)

Various factors affect the rate of erosion in the area. The erosion hazard is high for soil in the area because there is little ground cover to hold the soil. This is mitigated, however, by the high soil permeability which is very rapid at 20+ includes per hour, and the soil's low moisture-holding capacity. These conditions limit concentration of storm runoff, thus reducing the potential for soil erosion, except during periods of exceptionally intense rainfall. (MCM Planning, 1985)

4.9 VEGETATION

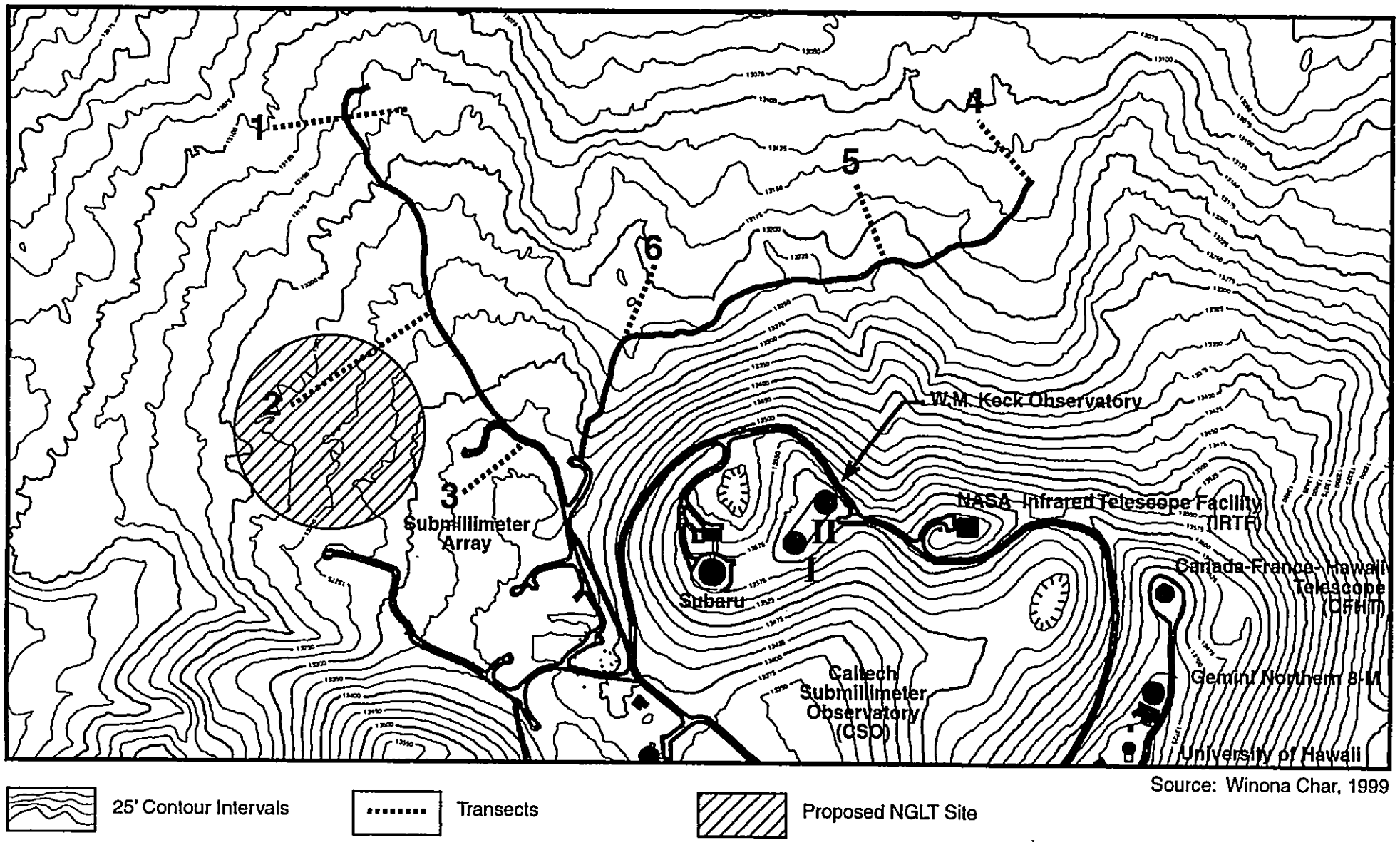
Summit Region

Looking at Mauna Kea from afar, one can clearly see the pattern of vegetation growth on the mountain. Above approximately 10,000 feet elevation, the open woodland gives way to bare lava and cinder cones with occasional shrubs. Above 11,500 feet there are a few scattered silverswords and numerous lichen, mosses and some vascular plants. The character of the mountain summit is shaped by the barren volcanic landscape.

Winona Char (1999) prepared a summary of the botanical resources found on the Mauna Kea summit above 13,000 feet. The information was drawn from a 1982 earlier survey by Smith et al. for the Mauna Kea Science Reserve Complex Development Plan and EIS and from a 1992 study prepared by Char for the Smithsonian Submillimeter Array site. In June, 1999, Char performed a reconnaissance-level field survey of the slope beyond the summit ridge and to the northwest of the summit ridge, areas that are proposed for future astronomy facilities. The locations of these survey transects are presented in Figure 4-10.

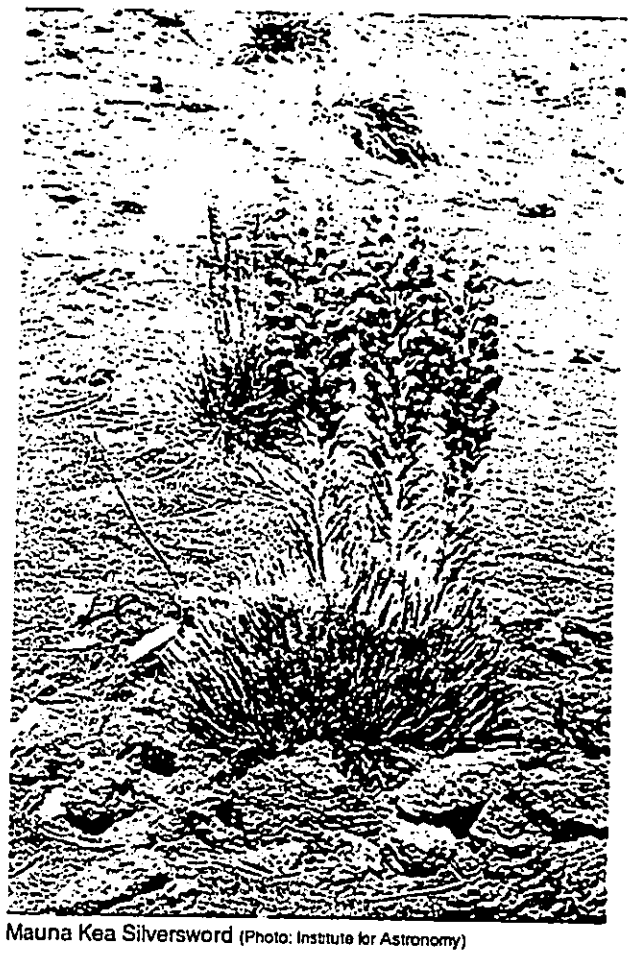
The distribution of plant communities at the summit is driven primarily by substrate type. The cinder cones do not provide suitable habitat for most plants because of their loose, unstable nature and high porosity. The andesite (Hawaiite-mugearite) lava flows consist of dense rock with numerous pits, fissures, small caves, overhangs, and deeply shaded pockets and crevices. These less exposed areas of the flow provide habitat for the lichens and mosses found at the summit. The vascular plants tend to occupy the areas at the base of the rock outcrops where there is an accumulation of soil and somewhat moister conditions. These are numerous deposits of aeolian or colluvial material scattered throughout the lava flows in low lying, swale areas. Like the cinder cones, these deposits of loose material provide only a poor to marginal habitat for the plants.

Select summit flora photographs and potential flora habitats areas are presented in Figures 4-11 and 4-12. Char's report is included as Appendix B. A list of species identified on the Mauna Kea summit is presented in the botanical resources report.



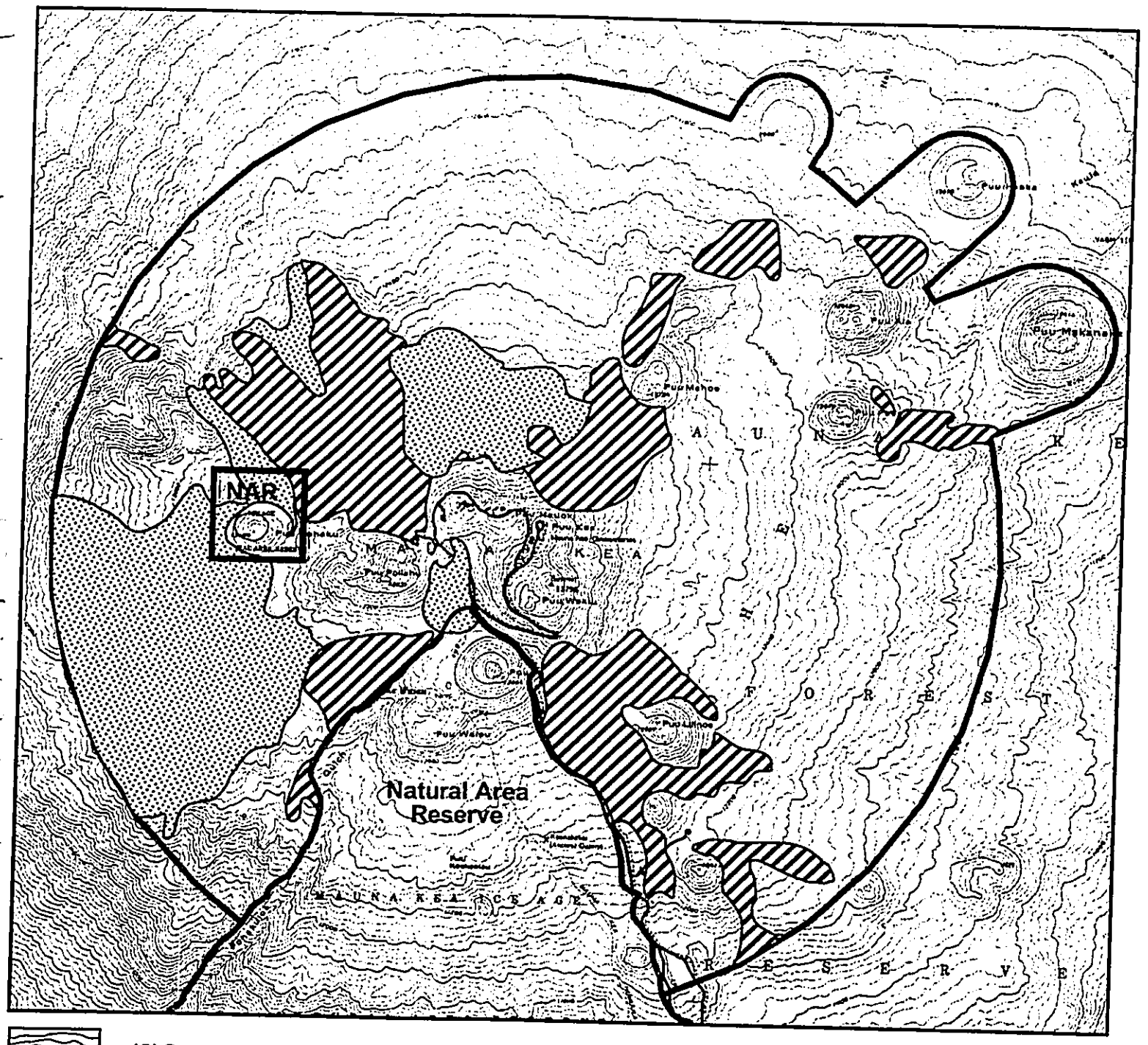
Approximate Locations of Sampling Transects (1 to 6) to Characterize Flora Habitat

Ferns in Crevice (Photo: Dr. Frank Howarth)


Mauna Kea Silversword (Photo: Institute for Astronomy)

Lichens & Moss (Photo: Dr. Frank Howarth)

Summit Flora Examples



40' Contour Intervals

Potential *Cystopteris* fern habitat

Potential lichen habitat

Source: Winona Char, 1999
Note: Mosses are found throughout the summit area, primarily on rock outcroppings with crevices and fissures.

Summit Flora Habitat

0' 2000' 4000' 8000'

NORTH

Mauna Kea Science Reserve
Environmental Impact Statement

Figure 4-12

A discussion of the lichen, moss, and vascular plants found at the summit follows. One algae species, Haematococcus sp., was observed on almost all the snow banks investigated during the 1982 survey.

Lichens. Dr. Clifford Smith studied approximately 25 different lichen communities on Mauna Kea in 1982. Approximately half of the species are endemic to the Hawaiian Islands, with two occurring only on Mauna Kea. Lichens can be found throughout the summit area, but reach their highest density and greatest diversity on the north and west facing andesite rocks where they are not exposed to the sun for long periods of time. Some south facing rock faces can also support lichen communities if protected from exposure to the sun. The cinder cones and the deposits of aeolian or colluvial material on lava flows are species poor and support only the most ubiquitous lichen species. (Char, 1999)

Char's report details the specific lichen species suitable to each substrate type.

Mosses. About 12 species of mosses were inventoried during the 1982 survey. Less than a quarter of the mosses are endemic. All of the mosses are related to members which are temperate in origin.

The mosses are found in the more protected areas such as under rock overhangs and in deeply shaded pockets and crevices on north-northeast facing sides of rocky mounds, as well as south-southwest facing sides of these mounds. The mosses are nearly always associated with small run-off channels where greater moisture is available from snow melt. Small caves and rocky overhangs can harbor pockets of compacted snow for some time, providing much needed moisture. (Char, 1999)

Mosses occur only on rock mounds and in ash-filled crevices. mosses wee not observed on loose cinders or on the aeolian or colluvial fields.

Vascular Plants. Six species of vascular plants are found within the Mauna Kea Science Reserve. The plants tend to be associated with the rocky outcrops, usually at the base of the large outcroppings or among large boulders, where there is an accumulation of soil or ash and moisture. The plants rarely are found on the loose, less stable cinder cone areas.

Two species of fern are known from the summit area. The Cystopteris douglasii is considered a species of concern by the US Fish and Wildlife Service. It is unusual in that it prefers to grow in open, exposed areas on weathered rock facing the tradewinds.

Two members of the grass family (Poaceae) are found at the summit. The other two species found at the summit area are introduced, common, weedy, temperate species.

Hale Pōhaku

Winona Char compiled a botanical resources study for the Hale Pōhaku area (1999). Her report is based on three previous studies an personal observations: a 1979 study by Gerrish of the permanent facility site as well as the Hale Pōhaku State Park; a 1985 study by Char of the

construction camp area; and a 1990 survey by Char of the Japan National Large Telescope dormitory site. Char's report, including a list of plant species found in the area, is included as Appendix B.

The vegetation on the mid-level facilities consists of open-canopied māmane forest (Figure 4-13). Māmane (Sophora chrysophylla), a member of the pea family, has bright yellow clusters of flowers and somewhat woody, knobby seed pods, brown to tan when mature; leaves and young shoots are covered by fine, golden brown hairs. The māmane trees occur in scattered clumps, from 6 to 18 feet tall. Smaller saplings less than three feet tall are also common.

Ground cover consists of a mixture of bunch grasses. The various types of grass species, including both native and introduced species, are listed in Char's report (Appendix B). These form upright tussocks or clumps rather than low, running mats. The plants tend to be denser under and around the māmane trees where there is more moisture available because of fog drip.

Shrubs of 'aweoweo or 'aheahea are occasional. A few shrubs of pukiawe and nohoanu, a native woody geranium with attractive white flowers and silvery leaves, are also found on the site. These plants are usually associated with the more rocky areas. Two native members of the mint family are fairly common and can be observed growing at the base of the māmane trees.

In the open areas between the clumps of māmane trees, ground cover is less dense with bare areas of fine soil or rocky outcroppings prominent. Scattered patches of the introduced California poppy are locally common on some open areas, especially near the stone cabins. A small grove of Eucalyptus trees and saplings is found just above the Visitor Information Station parking lot. A few shrubs of tagasaste also occur here.

A sub-species of the silversword is also found on Mauna Kea. While some examples of the plant can still be found, its population has declined greatly from the years when sheep and goats grazed the mountainside.

4.10 BIRDS, FAUNA AND INSECTS

Summit Region

The harsh climate of the Mauna Kea summit is a difficult environment for the survival of many species. The summit region is an aeolian ecosystem where strong winds distribute dust, cinder, and food sources such as insects blown from lower elevations. The major component of the fauna on the Mauna Kea summit are arthropods. In addition to the arthropods, feral pigs will occasionally travel to the higher elevations. Previously, feral ungulates traveled higher on the mountain where they destroyed the vegetation and altered the landscape. Recent eradication efforts have stemmed the ungulate population on Mauna Kea.

The existence of a resident community of native Hawaiian arthropods living near the summit of Mauna Kea was confirmed in 1980 (Howarth and Montgomery, 1980). The resident species seemed to be able to cope with the stressful environments above 4,000 meters. In 1982, the Institute for Astronomy funded a team of scientists to conduct an assessment of the arthropod

Naio (Photo: Winona Char)

Māmane (Photo: Winona Char)

Māmane Forest (Photo: Winona Char)

Palila and Māmane (Photo: Audubon Society "Birds of Hawaii")

Mid-Elevation Flora and Fauna Examples

fauna and aeolian near the summit of Mauna Kea. The team collected a large number of arthropod species which includes spiders, moths, mites, springtails, centipedes, booklice, barklice, and true bugs. At least eleven of these species were native to Hawai'i and do not occur outside of the Hawaiian island chain (Howarth and Stone, 1982). A large number of the species captured were considered transient, aeolian waifs, blown upslope by the daily mountain winds. These latter species were thought to be a food source for the resident species.

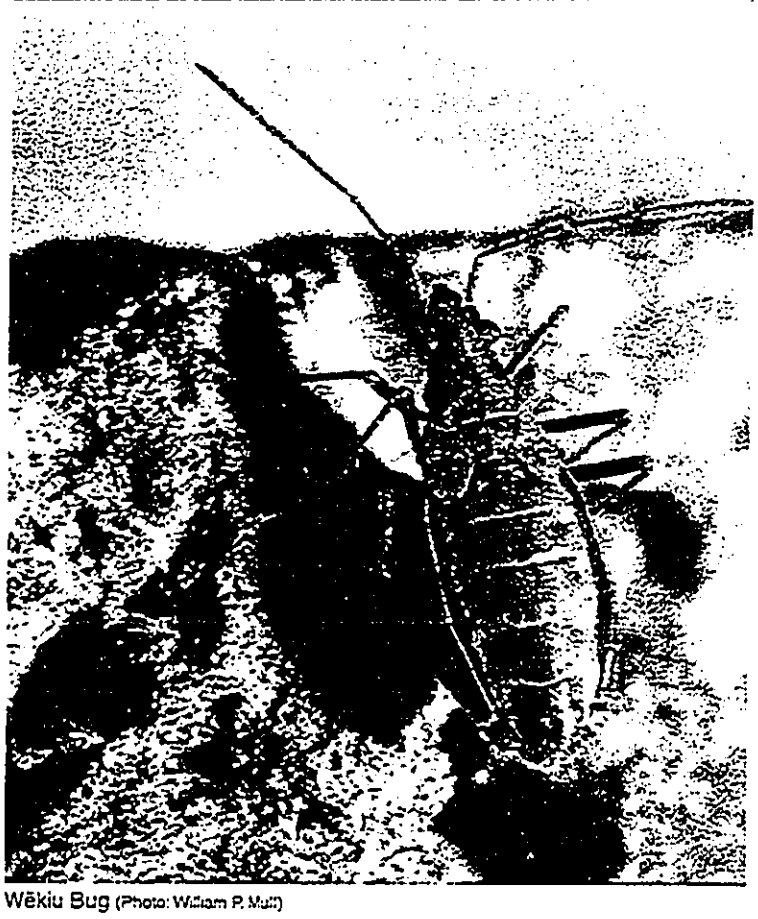
In order to determine the current status of resident arthropod species within the Science Reserve, the IfA contracted for a new study of the summit area. In 1997-1998, the team of Francis Howarth, Gregory Brenner and David Preston (1999) conducted field work and analysis of the arthropod community located near the summit of Mauna Kea. Sampling began in August, 1997 at the summit areas of Kūkahau'ula, Pu'u Hau'Oki and ended in September, 1998 with a final reconnaissance and sampling of buffer areas. A total of 44 days (179 person days) were spent in the field for sampling and reconnaissance. A list of arthropod species identified in the 1997-1998 field work is included in the arthropod study in Appendix D. (Howarth et al., 1999)

The one true bug found on the summit is the Wēkiu bug (*Nysius wekiuicola*). The bug has been found only in the summit area of Mauna Kea above about 12,800 foot elevation, however, recent fieldwork has identified suitable habitat down to approximately 11,800 feet (Howarth, 1997). The Wēkiu is found only on Mauna Kea, under large boulders and among loose cinders. A relative of this bug is found on Mauna Loa. Researchers speculate that undisturbed cinder cones allow the bug to migrate vertically within the substrate to escape cold and drought and to seek moisture. Larger pore spaces in the cinder allow movement and provide resting and hiding spaces. The Wēkiu survives on the water and food carried by the wind and deposited to the substrate in melting snow. The presence of organic aeolian debris and moisture are necessary to support life in this stone desert. Generally, in spite of the dry weather, moist substrates were found at most sites, especially within the sandy ash layer below the surface scoria. Photographs of select arthropods and areas that have been identified as suitable Wēkiu habitat are shown in Figure 4-14 and 4-15.

Significantly fewer Wēkiu bugs were captured in the 1997-1998 fieldwork than during the 1982 study. However, the cause of the difference has not been determined and could be due to any of several factors including sampling methods, changing weather patterns, habitat disturbances, presence of harmful alien species, and long-term population cycles. An example of the affect of sampling on results is explained here. Live traps were in place for only three days in 1997-1998 compared to death traps set for more than three weeks in 1982. Because of the shorter period they are in place, live traps are less likely to reflect arthropod response to variations in weather. In addition, the 1982 study was conducted during a period of exceptional snowfall that may have favored Wēkiu bug activity. A change in the Wēkiu bug population due to climate, introduced species, or habitat disturbance is difficult to determine without more frequent monitoring. Life history is also difficult to establish in the absence of a long-term monitoring program. (Howarth et al., 1999)

In his 1998 study, Howarth identified the areas of the Mauna Kea summit region that would be expected to provide suitable habitat for the Wēkiu bug. He and his team then sampled these

Average Size of Wēkiu Bug

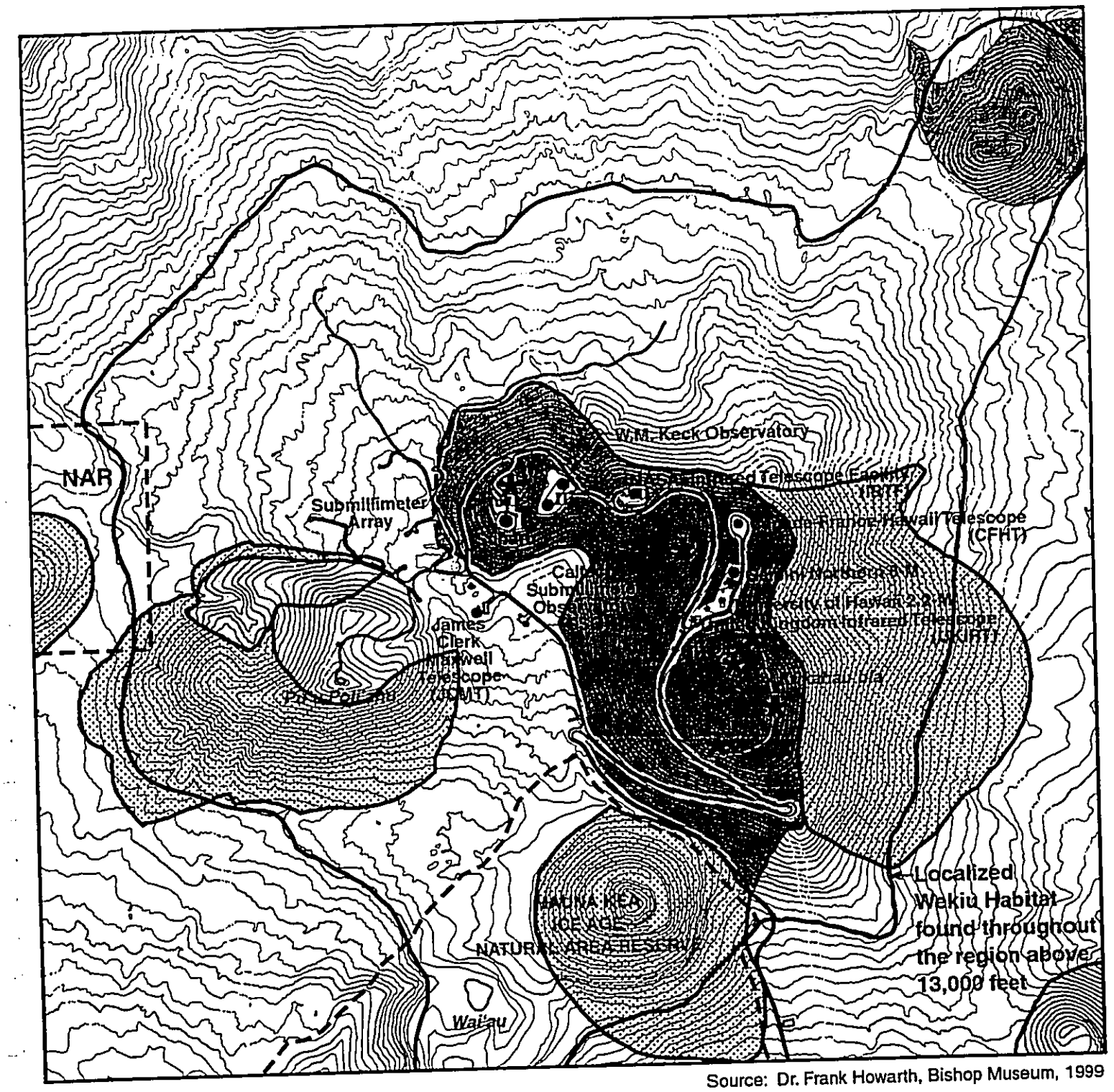


Wēkiu Bug (Photo: William P. Mull)

Agrotis, moth (Photo: Stephen L. Montgomery)

Lycosa, wolf spider (Photo: William P. Mull)

Summit Fauna Examples



Source: Dr. Frank Howarth, Bishop Museum, 1999

Likely Habitat/Specimens Found

Likely Habitat

Likely Habitat/Presence Unknown

25' Contour Intervals

Natural Area Reserve

Specimens Found 1997-1998

0' 750' 1500' 3000' NORTH

Potential Wēkiu Habitat

Mauna Kea Science Reserve
Environmental Impact Statement

Figure 4-15

areas and determined that the bug is almost completely confined to the immediate summit area. Except for one collection at 12,075 feet in Pu'u Mākanaka Crater, the Wēkiu bug has been found only at summit areas above about 12,800 feet. Further study is needed to determine the factors that limit Wēkiu bugs to the summit area and to determine the lower limits of the Wēkiu bug population.

> In all but one case, arthropod activity on Pu'u Hau'Oki was greater than or equal to that found on Kūkahau'ula. Kūkahau'ula is supposedly less disturbed, although substrate disturbance was evident, apparently caused by the greatly increased foot traffic along the ridge and within the crater since the 1982 study. Trap capture rates for Wēkiu bugs were significantly higher in disturbed areas than in undisturbed areas. These results raise the possibility that observatory construction and other human activities have not impacted Wēkiu bug or lycosid spider distributions at the summit, outside of the immediate vicinity of the paved and covered areas. The difference in capture rates may be attributable to other factors. For example, capturing Wēkiu bugs in the ash-like and compacted substrate common to disturbed areas is inherently more effective that the same trapping methods used in undisturbed substrate areas characteristically comprised of larger cinder material. Secondly, it is known that Wēkiu bugs used disturbed areas only for foraging territory rather than as shelter habitat, and disturbed areas may not be suitable habitat for the Wēkiu bug (USFWS, October 1999).

In both 1982 and 1997 the Lycosid wolf spiders and noctuid moths were found to be widespread at low to moderate population densities within the Science Reserve. Both species are good at dispersing and appear to take advantage of temporarily available resources to survive.

Two new, presumably resident spider species were collected in 1997-1998 study, and both appear to be recently introduced alien species. The first, and most common, is an alien linyphiid sheet-web spider, *Lepthyphantes tenuis* (Blackwall), native to Europe. The other alien spider species found may have more impact on Wēkiu bugs. It is *Meriola arcifera* (Simon), a ground hunting spider, native to Chile, Bolivia, and Argentina. Like the lycosid spiders, it does not build a web, but actively hunts on the ground surface. *Meriola arcifera* was first collected in Hawai'i in 1995. It has been found only from upper elevations on the Saddle Road to the summit of Mauna Kea. Within the Science Reserve, it may be common enough to be preying upon and reducing populations of the smaller native arthropod species, including the Wēkiu bug.

Hale Pōhaku

Two endangered bird species are known to occur on the upper slopes of Mauna Kea. The *palila* (Loxioides bailleui) is a small bird of the Hawaiian honey-creeper subfamily that has been listed as an endangered species since 1966 (See Figure 4-13). In the 1890s, and early part of the 20th century, the *palila* was found over a large portion of the Island of Hawai'i including the North and South Kona districts, the Hāmākua district on the windward slope of Mauna Kea, and the southern and western slopes of Mauna Kea. The *palila* was recognized as endangered in 1996 because it no longer occupied a significant portion of its historical range, its habitat was being adversely modified by feral sheep, and the total population at the time was estimated to be in the

low hundreds. The *palila* is significant in that it is not found anywhere else in the world. Green *māmane* seeds and the fruit of the *naio* are the chief food of this small native bird. The *māmane* trees also provide shelter and nesting sites for the bird.

The Dark-rumped Petrel is an endangered pelagic seabird that breeds on many of the Hawaiian Islands between the months of May and October. It is the second endangered bird species known to occur on Mauna Kea. During field work in 1985, Maile Kjargaard also observed other bird species to include the Eurasian Skylark, Japanese White-eye, *'Amakihi*, *'Apapane*, House Finch, and the House Sparrow. Game birds found near Hale Pōhaku include the Chukar Partridge, California Quail and Erckel's Francolin. Other bird species are known to exist in the mid-elevation area.

In addition to the various bird species found on the mountain, a number of mammals roam the mountain. Following European contact in the late eighteenth century a range of domestic livestock was brought to the Hawaiian Islands. By the early nineteenth century many of the cattle, sheep, and goats had escaped to forested areas where their populations expanded. In 1937, an estimated 40,000 sheep roamed the slopes of Mauna Kea (Palila Recovery Team, 1977). Feral sheep and goats destroyed large portions of the *māmane* ecosystem by eating the leaves, stems, seedlings, and sprouts of the plants. In 1987, a federal court ordered the complete and permanent removal of all mouflon and hybrid sheep from the mountain to the protect the endangered *palila* forest bird. Though not always popular, sheep and goat eradication programs have keep the numbers of feral ungulates in check and have assisted the revegetation of certain areas of the mountain. Over 30,000 acres of the *māmane-naio* forest have been designated as the critical habitat of the *palila*. *Māmane* revegetation programs have been undertaken to replenish the *palila* habitat. Revegetation efforts near the Hale Pōhaku facilities have favorable chances of success as the human activity tend to keep destructive animals out of the area.

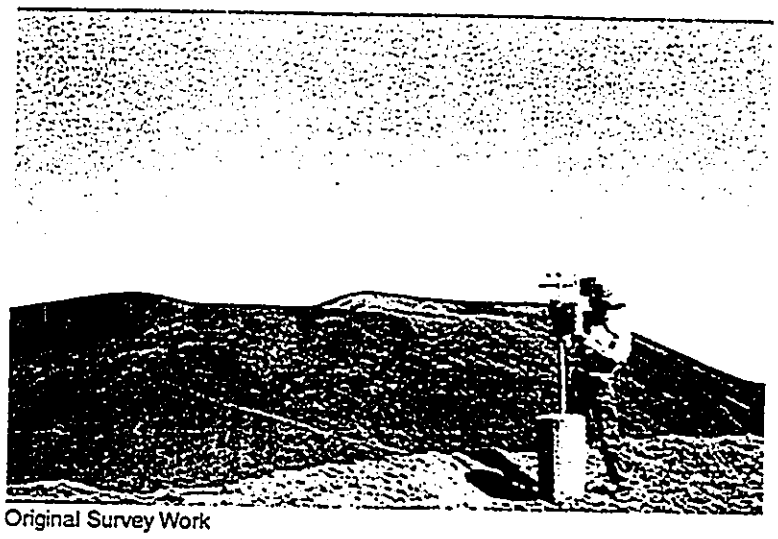
Few mammals are found in the mid-level facility area today. Feral sheep, mouflon, wild pigs and wild goats have been sighted though in much smaller numbers than previously found. Mice have been seen and the presence of rats and/or mongooses is suspected.

4.11 EXISTING USES AND ACTIVITIES

4.11.1 Mauna Kea Astronomy

Mauna Kea is one of the finest locations in the world for ground-based astronomical observations. Because of its location high on an island in the Pacific, the sky above of the mountain is general cloud-free. This gives Mauna Kea one of the highest proportion of clear nights in the world, an important factor given the number of researchers requesting viewing time. The stability of the atmosphere at Mauna Kea, free from disturbance of neighboring land forms, allows more detailed observations than available elsewhere. An island-wide lighting ordinance minimizes ground light interference, allowing observation of very faint objects. Finally, the summit's height above the tropical inversion cloud layer provides summit skies that are pure, dry and free from atmospheric pollutants. The evolution of this mountaintop for astronomy has occurred over three decades and many of the latest findings in astronomy have been made from

Governor Burns at Mauna Kea Observatory Dedication (1970)



Original Survey Work

Road Work (1988)

Evolution of Facility Development

Photos: Institute for Astronomy

observations at Mauna Kea. Table 3-5 lists the astronomy facilities that have been developed on Mauna Kea. Figures 4-16 and 4-8 show the evolution of the astronomy complex and some of today's observatories.

4.11.2 Hale Pōhaku Mid-Elevation Facilities

Permanent UH Institute for Astronomy Mid-Level Facilities were dedicated in October, 1983. The facilities consist of five buildings containing sleeping accommodations for astronomers, technicians and support staff; a common building which contains offices, kitchen/dining facilities and lounge areas; and a maintenance area which provides space for minor equipment repairs and other repair and maintenance functions. (MCM Planning, 1985)

There are two stone cabins and one stone restroom located at Hale Pōhaku. The larger facilities are used for storage and the restroom is currently not functioning.

A 950-square foot Visitor Information Station and supporting parking area was constructed as part of the permanent Mid-Level Facilities. These facilities serve as public use areas for acclimatization, information distribution, and evening events.

Existing construction camp facilities include four 8-person cabins developed to support crews constructing the Subaru telescope. There are also two longer structures that had originally been developed at a higher elevation to support construction in the 1970s.

4.11.3 Other Activities

In addition to being a superior site for ground-based astronomy, Mauna Kea is also a special place for other activities. Recreational uses in the Science Reserve include skiing, snowplay, sightseeing, hiking and hunting. Hunting is also an important subsistence activity that occurs mostly at lower elevations. The extreme weather conditions on the mountain make all recreational activities potentially dangerous.

Sightseeing

Residents and visitors alike come to Mauna Kea simply to experience this place that is unlike any other in Hawai'i. Many are drawn to the mountain to witness the world class telescopes, feel the chill of the air, and appreciate the desolate beauty and natural land forms of Mauna Kea.

Before proceeding up the mountain visitors are asked to spend time at the Visitor Information Station (VIS) to view the exhibits and acclimate to the altitude. Visitors will drive up to the summit possibly stopping along the way to walk around a bit and take photographs. At the summit, the public can visit the Keck Visitor Gallery to view exhibits and see the inside of one of the Keck domes.

The VIS also offers guided tours to the summit. Visitors acclimate at the VIS and proceed up the mountain in private 4WD vehicles. The tour includes stops at both the Keck Observatory and the UH 2.2-meter Telescope.

In the Fall of 1998, an estimated 125 vehicles per week visited the summit area of Mauna Kea (Koehler, 1998).

Taking sightseeing to a higher level, the Visitor Information Station offers evening stargazing programs four days a week. These stargazing programs drew an average of 80 participants per evening (320/week) (Koehler, 1998).

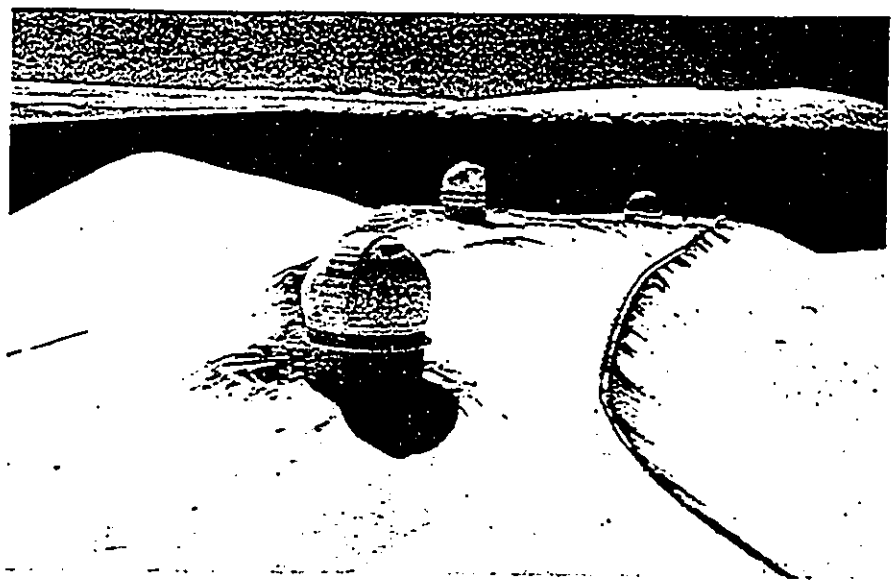
Skiing and Snowplay
Big Island residents and visitors look forward to those winter periods when snow falls at the higher elevations of Mauna Kea. Families and individuals visit the mountain to ski, snowboard, hike, and play in the snow. Often, people will load their pickup trucks with snow to take down to Hilo and build snowmen and play. A ski shop in Waimea runs commercial tours to the summit area during snow season.

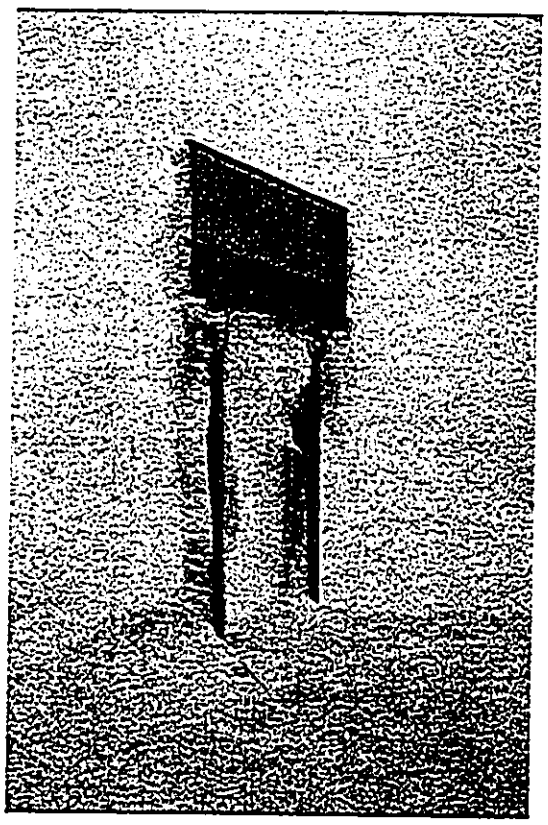
The summit road is kept clear of snow by Mauna Kea Support Services staff. Vehicles typically park along the roadways and visitors play nearby. The most popular ski and snowplay areas are those easily accessed by roadway. The ski run known as Poi Bowl is the most popular because it is accessible by roads at both the top and bottom of the run. Skiers typically establish an informal shuttle system where the skier is dropped off at the top of the run and then met at the bottom. If the snowfall is heavy enough, the area to the east of the summit, known as King Kamehameha run, is used for longer ski runs although the bottom of the run is not accessible by vehicle and the skier must hike back to a roadway. At times it is possible to ski from the summit to the edge of the Science Reserve. Once or twice a year, depending on the snow conditions, there is a skiing or snowboarding competition held on the mountain.

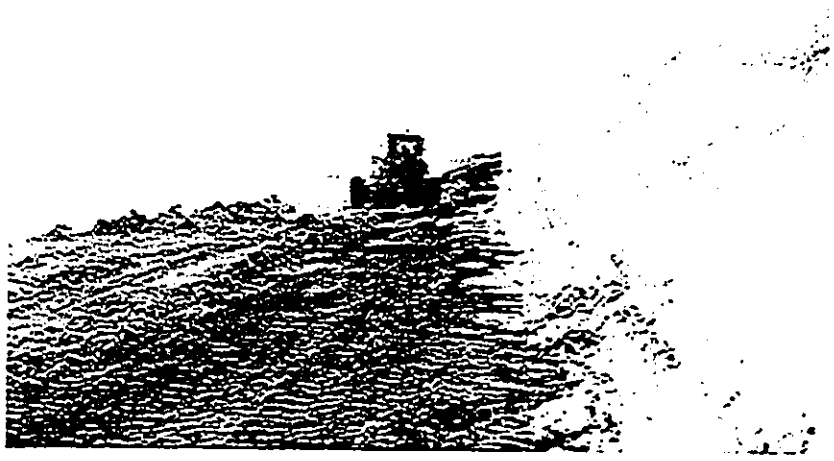
The weather patterns for any particular year will determine how much and where snow falls. Snow typically falls first and melts last from the northern slope of Pu'u Hau Kea (also known as Goodrich). At times it is the only place on the mountain with snow. When snowfall is light, people tend to hike between snowy areas. Snow condition examples are presented in Figure 4-17.

Commercial Use
While many residents and visitors drive to the summit area themselves, others join commercial tours. DLNR issues a limited number of Commercial Activity Permits to tour operators who pay annual and per customer fees. Commercial tours register at Hale Pōhaku each time they ascend the mountain. In 1999, eleven Commercial Activity Permits were active. Of these, ten allowed tours to the summit and one provided commercial access to Hale Pōhaku only. Tour operators take visitors for six to eight hour trips which can include an observatory tour, lunch, hikes to Wai'au, and narratives on the area vegetation and natural history. In the Fall of 19998, an estimated 30 tours per week went to the summit (Koehler, 1998).

Hiking
Hikers visit Mauna Kea for an experience that is unmatched in the Hawaiian Islands. The clear skies, cool air, and awe-inspiring landscape draw experienced and novice hikers alike. The







Snow & Snow Removal

Photos: Institute for Astronomy

factors that make Mauna Kea such a uniquely appealing place to hike are also cause for health and safety concerns. Hikers must be prepared for the affects of high altitude on their bodies and the possibility of a sudden and severe change in weather.

Hiking is most popular in the Mauna Kea Natural Area Reserve and along existing roads. Individuals typically drive up the mountain for a distance before parking and hiking. The Humu'ula-Mauna Kea trail runs from the Humu'ula sheep station to Wai'au. A few individuals brave the low temperatures and swim in Wai'au.

Hunting
Hunting is a traditional recreation and subsistence activity in Hawai'i. Pigs, sheep, goats, and a variety of gamebirds are hunted by rifle or archery in three dozen hunting units concentrated in the central portion of the Island of Hawai'i. Gamebirds include turkey, pheasants, quails, chukars, and francolins are also present. There are over 3,000 licensed hunters living on the island. The Mauna Kea Forest Reserve (elevations over 7,000 feet) is a hunting unit where pigs, goats, sheep and birds can be hunted with archery and firearms. DLNR hunting units are presented in Figure 3-12.

4.12 ROADS AND UTILITIES

Walking trails and cart paths were the precursors to the first jeep trail and today's infrastructure linking the Mauna Kea summit to the mid-level facilities, sea level communities and the world beyond. The infrastructure serving the mid-elevation and summit areas has been developed and upgraded over time as new telescope facilities have come on-line. Because of extreme weather conditions and for aesthetic reasons, all power and telecommunication lines from the mid-elevation to the summit have been built underground.

4.12.1 Roads and Traffic

The original trail to the summit was a steep trail developed to assist initial analysis of the summit for astronomy purposes. The jeep trail to the summit was realigned in 1975 to alleviate some of the steep grades and sharp turns in the original trail. In 1985, the State Department of Transportation began the design process for a 20-foot wide roadway beginning at Hale Pōhaku and looping around summit facilities. To date, two of the six phases of construction have been completed, including pavement of the roadway from 11,800 to the summit facilities. Future phases will include the paving of the road from Hale Pōhaku to 11,800 feet, construction of additional parking areas, and two runaway truck ramps.

The Mauna Kea Access Road and Summit Road are increasingly busy roads used by observatory crews, construction workers, cultural practitioners, recreational users, and Mauna Kea Support Services staff. Because of the steep grade and sharp turns on the Summit Road, only four-wheel-drive (4WD) vehicles are recommended above Hale Pōhaku. The IfA-led summit tours require that participants drive 4WD vehicles. In the Fall of 1998, an average of 560 vehicles per week drove to the summit area (Koehler, 1998). The following user breakdown is estimated.

Construction Projects (Gemini/Subaru/SMA)	150 per week
Observatory Day Crews	150 per week
Observatory Evening Crews	85 per week
Commercial Tours	30 per week
MKSS vehicles	20 per week
Tourists and Local Traffic	125 per week

Another 100 to 150 vehicles per week visited the Visitor Information Station only during the day and for evening stargazing programs. During the 1999 periods of snowfall, it was estimated that over 200 vehicles drove beyond Hale Pōhaku during the busiest days. While it is recommended that only four-wheel-drive vehicles go above Hale Pōhaku, nothing prevents two-wheel drive vehicles from using the summit road.

Beyond permitted vehicular access, individuals occasionally take their vehicles off of the paved roads. In seeking their own thrills, these people risk damage to archaeological sites, arthropod and flora habitats, and to the serenity of the natural landscape. While this activity is discouraged, there are no permanent barriers preventing any vehicle from leaving the summit access road.

4.12.2 Water Supply

Summit Region

Water supply for Hale Pōhaku and the summit is regularly trucked from Hilo. An additional 15,000 gallons per week are trucked to the summit to supply the various facilities. These quantities have remained fairly consistent throughout the development of the telescope facilities. However, during heavy construction periods additional water is consumed by the construction crews. A report on the existing infrastructure on Mauna Kea was prepared by Sam O. Hirota, Inc. (1999). This report is included as Appendix F.

Hale Pōhaku

Two-40,000 gallon water tanks are located at Hale Pōhaku. Currently, 25,000 gallons per week are trucked to the mid-level facility. (Sam O. Hirota, 1999)

4.12.3 Wastewater Collection, Treatment and Disposal

At this time all sewer disposal and treatment is handled by individual cesspools and septic tank/leaching field systems that serve each facility. Wastewater facilities are approved by the State Department of Health. There is no plan for construction of a sewer system to collect and treat wastewater from each facility.

4.12.4 Power and Communications

Power
During the early years of telescope development, power was provided to individual facilities by on-site generators. The first phase of bringing power lines to the summit began in 1985 with the construction of a 69KV overhead system from the Humu'ula Radio Site to the mid-level facilities.

Once power reaches a substation located just below the mid-level facilities, the voltage is reduced to 12.47KV, and the power distributed via underground distribution system to the summit. The initial construction of the distribution system was completed in 1988. In 1995, an upgrade of the electrical system was started to complete the loop at the summit and provide service to the Submillimeter Array.

Communications
Development of the communications system required many phases of construction to complete. The first phase began during the construction of the underground power distribution system in 1985. The addition of summit communications system continued into the 1990's, with the installation of fiber optic lines.

A project to add fiber optic lines to the existing 69KV overhead power system began in 1995. The lines were added to the existing system of poles from the Humu'ula Radio Site to the substation near Hale Pōhaku. In 1996, the construction began to complete the final phase of the fiber optics communication system.

4.13 POPULATION AND ECONOMY

Astronomy has blossomed on the Island of Hawai'i because Mauna Kea offers exceptionally clear viewing conditions. The State and County have protected those conditions through management of the summit of Mauna Kea and concern over changes in land use (e.g. urban lighting) that could affect viewing.

Astronomers and scientific organizations throughout the world have responded by investing in observatories on the summit. In addition, the University of Hawai'i has developed a strong graduate program at Mānoa and the ability to create scientific instruments for viewing.

SMS Research and Marketing Services, Inc. (1999) analyzed the existing and future economic impact of astronomy conducted on Mauna Kea for the Master Plan. SMS defines the current situation to include the operation of the three newest telescopes - the Subaru telescope, Gemini Northern telescope, and the Smithsonian Astronomical Observatory. SMS's economic study is included as Appendix G.

4.13.1 Population

Hawai'i County currently makes up approximately 12 percent of the State's residents. Over the 1971 – 1997 period, the average annual rate of increase for the Hawai'i County population has been approximately 2.9 percent.

Comparison of 1980 and 1990 Census figures reveals significantly different population trends in Hilo and Waimea. Waimea's population grew by more than 400 percent, while Hilo's population grew by 7 percent. Since Waimea is a small town (approximately 6,000 residents in 1990), astronomy's role in economic and demographic growth has been very visible.

Mauna Kea itself has a small transient population with no permanent residents. In addition to observatory staff, tourists visit the summit and Hale Pōhaku area. Tourism is increasing, and hikers and skiers also visit when conditions make their recreation possible. The transient housing at Hale Pōhaku typically accommodates 30 visiting scientists and technicians.

The average visitor census numbers for Hawai'i County have climbed during the 1980s and remained steady in the 1990s. Hawai'i County has also attracted an increasing share of the State's visitors. On average, nearly 20,000 tourists are on island at a time.

Hale Pōhaku is visited by 100 or more visitors daily. Summit tours are increasing in number. Growth in tourism on Mauna Kea is part of a larger trend towards active tourism on Hawai'i Island.

4.13.2 Economy

As of May 1999, the employed Hawai'i County workforce numbered 49,050 - 300 fewer than the year before. The unemployment rate, 8.6%, was much higher than the State average (5.5%) and has been especially severe in areas where sugar plantations have closed (Hāmākua, North Hilo, Ka'u). Average family household incomes in Hawai'i County are appreciably less than for the State as a whole.

From the construction of new astronomy facilities, to the employment of trained technicians, to the purchases made by visiting scientists, the astronomy industry contributes widely to the Big Island economy. Mauna Kea astronomy supports nearly 400 direct operations jobs in Hawai'i, the great majority of which are located at base facilities in Hilo and Waimea. These jobs include astronomers, engineers and engineering technicians, software programmers, equipment technicians, and administrative personnel.

Total economic impact (direct, indirect and induced impact) of astronomy, assuming operation of Subaru, Gemini, and SMA facilities, is estimated at $130.9 million annually for the County and $141.7 million annually for the State. Direct impacts include employment and expenditures directly associated with the operation of the astronomy industry and represent $61.1 million for the County and $63.0 million for the State annually. Indirect impacts occur when astronomy-related firms purchase goods and services from other firms. Induced impacts are due to spending

by the astronomy workforce in the local community. Construction costs for all facilities built or to be built prior to the year 2000 total approximately $826 million (converted to 1998 dollars. Roughly one fourth of this sum is spent in Hawai'i County.

Counting all the jobs generated by observatory purchases from other firms and spending by the direct and indirect workforces, the total impact of Mauna Kea astronomy comes to about 750 jobs on the island, with a total payroll of $44.5 million, and the statewide total impact is estimated at 820 jobs, with a payroll of $49.3 million.

SMS Research (1999) estimates the direct impacts of Mauna Kea astronomy in the State to include:

Operating Budget	$51.9 million/year
Workforce	397
Visiting Researchers	3,755 trips/year
Visitor Spending	$0.7 million/year

Section 5.0

Relationship to Federal, State, and County Land Use Plans

5.0 RELATIONSHIP TO FEDERAL, STATE, AND COUNTY LAND USE PLANS, POLICIES AND CONTROLS

5.1 U.S. GOVERNMENT PLANS AND CONTROLS

The federal government has no direct jurisdiction over property within the boundaries of Mauna Kea Science Reserve. However, the U.S. Army operates the Pōhakuloa Training Area in the lower slopes bordering the Science Reserve to the south west.

Relationship of the Proposed Actions - None of the planned actions of the Master Plan are expected to effect the lands under control of the federal government.

5.2 STATE OF HAWAI'I PLANS AND CONTROLS

5.2.1 Hawai'i State Plan and Functional Plans

5.2.1.1 Hawai'i State Plan (Chapter 226 Hawai'i Revised Statutes, 1996)

It is the goal of the Hawai'i State Plan to achieve:

(1) A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawai'i's present and future generations.

(2) A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people.

(3) Physical, social, and economic well-being, for individuals and families in Hawai'i, that nourishes a sense of community responsibility, of caring, and of participation in community life.

Objectives and policies of the State Plan which are relevant to the Mauna Kea Science Reserve include the following:

Section 226-6 Objectives and Policies for the economy – in general.

(a) Planning for the State's economy in general shall be directed toward achievement of the following objectives:

(1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawai'i's people.

(2) A steadily growing and diversified economic base that is not overly dependent on a few industries, and includes the development and expansion of industries on the neighbor islands.

(b) To achieve the general economic objectives, it shall be the policy of this State to:

(2) Expand Hawai'i's national and international marketing, communications, and organizational ties, to increase the state's capacity to adjust to and capitalize upon economic changes and opportunities occurring outside the State.

(3) Promote Hawai'i as an attractive market for environmentally and socially sound investment activities that benefit Hawai'i's people.

(15) Increase effective communication between the educational community and the private sector to develop relevant curricula and training programs to meet future employment needs in general, and requirements of new, potential growth industries in particular.

Section 226-8 Objective and policies for the Economy – Visitor Industry.

(4) Planning for the State's visitor industry shall be directed towards the achievement of the objective of a visitor industry that constitutes a major component of steady growth for Hawai'i's economy.

(b) To achieve the visitor industry objective, it shall be the policy of this State to:

(8) Foster an understanding by visitors of the aloha spirit and of the unique and sensitive character of Hawai'i's cultures and values.

Section 226-10 Objective and policies for the Economy – Potential Growth Activities.

(a) *Planning for the State's economy with regard to potential growth activities shall be directed towards achievement of the objective of development and expansion of potential growth activities that serve to increase and diversify Hawai'i's economic base.*

(b) To achieve the potential growth activity objective, it shall be the policy of this State to:

(5) Expand Hawai'i's capacity to attract and service international programs and activities that generate employment for Hawai'i's people.

(6) Enhance and promote Hawai'i's role as a center for international relations, trade, finance, services, technology, education, culture, and the arts.

Section 226-12 Physical Environment – Scenic, Natural Beauty, and Historic Resources

(a) *Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawai'i's scenic assets, natural beauty, and multicultural/historical resources.*

(b) *To achieve the scenic, natural beauty, and historic resources objective, it shall be the policy of this State to:*

(1) Promote the preservation and restoration of significant natural and historic resources.

(4) Protect those special areas, structures, and elements that are an integral and functional part of Hawai'i's ethnic and cultural heritage.

226-21 Objective and policies for socio-cultural advancement - education.

(a) Planning for the State's socio-cultural advancement with regard to education shall be directed towards achievement of the objective of the provision of a variety of educational opportunities to enable individuals to fulfill their needs, responsibilities, and aspirations.

(b) To achieve the education objective, it shall be the policy of this State to:

(2) Ensure the provision of adequate and accessible educational services and facilities that are designed to meet individual and community needs.

(9) *Support research programs and activities that enhance the education programs of the State.*

Relationship of the Proposed Actions – The development of the Mauna Kea Observatory since the late 1960s has diversified the State's economic base, by providing a stable, clean, high-tech industry. Mauna Kea is internationally known as the premier location for astronomy in the Northern hemisphere. Construction and operation of the facilities produce economic benefits that are detailed in Section 6.0 of the DEIS.

The Master Plan guides continued development of the Mauna Kea astronomy complex, proposing only world class facilities for the mountain. It is likely that future proposals for telescope facilities will continue to involve international partnerships as they have for facilities such as the Gemini Northern Telescope.

The Mauna Kea Master Plan also provides for the preservation of significant natural and historic resources. The State Historic Preservation Division has compiled the results of the several archaeology studies conducted to date. These features have been mapped in the State's Geographic Information System (GIS) and are described in Appendix E of this report. Based on significant natural and cultural features, the Plan designates a 525-acre Astronomy Precinct and a 10,760-acre Natural and Cultural Preservation Area within the 11,288-acre Science Reserve.

The Visitor Information Station at Hale Pōhaku and the astronomy complex at the mountain's summit are frequently visited by residents and visitor's alike. Nighttime stargazing programs are also popular. The Master Plan proposes the establishment of the Office of Mauna Kea Management to include the hiring of rangers who will guide and educate visitors and residents about the mountain's significant natural and cultural resources.

5.2.1.2 Hawai'i State Plan: Functional Plans

The State Functional Plans are plans which set forth the policies, statewide guidelines, and priorities within a specific field of activity. Functional plans have been developed for agriculture, conservation lands, education, employment, energy, health, higher education, historic preservation, housing, human services, recreation, tourism, transportation and water resources development.

The State Functional Plans have been reviewed and those that have direct relevance to the proposed plan for the Mauna Kea Science Reserve are presented here.

Recreational Functional Plan (1991)

ISSUES AREA II. MAUKA, URBAN, AND OTHER RECREATION OPPORTUNITIES
Objective II-A: Plan, develop, and promote recreational activities and facilities in mauka and other areas to provide a wide range of alternatives.
Policy II-A(1): Plan and develop facilities and areas that feature the natural and historic/cultural resources of Hawai'i. Develop interpretive programs for these areas.

ISSUES AREA IV. RESOURCE CONSERVATION AND MANAGEMENT
Objective IV-A: Promote a conservation ethic in the use of Hawai'i's recreational resources.
Policy IV-A(1): Emphasize an educational approach, in coordination with enforcement efforts, to promote environmental awareness.

Relationship of the Proposed Actions – Just a short drive from the island's coasts, Mauna Kea's upper slopes provide the opportunity to ski, snowboard and play. The mountain is also popular

for hiking and sightseeing. The mountain's lower slopes are used for hunting. The Master Plan proposes to continue all existing recreational activities on the mountain. A recreational support facility with additional parking is proposed in the summit area. The support facility will provide protective shelter for skiers, hikers, and other recreationalists. The additional parking will provide an alternative to the current practice of parking on the side of the road. Signage and the presence of rangers on the mountain will provide education and guidance concerning treatment of the mountain's unique natural and cultural resources.

Tourism Functional Plan (1991)
The State's tourism planning efforts "attempt to balance economic objectives with social and environmental objectives to achieve the balanced growth and quality of life that are desired by residents".

Objective IIIA: Enhancement of respect and regard for the fragile resources which comprise Hawai'i's natural and cultural environment. Increased preservation and maintenance efforts.

Relationship of the Proposed Actions – The Mauna Kea Visitor Information Station (VIS) is the main source of visitor information on the mountain. The Master Plan calls for the expansion of this facility and the associated parking to accommodate current and future visitor levels. Rangers stationed at the mid-elevation facilities and in the summit area will further enhance the safety and education of visitors to the mountain.

In a separate project, the Mauna Kea Education Center is currently being planned for University Park in Hilo. This facility will be an interpretive and educational adjunct to the Mauna Kea observatories. The Center will house observatory interpretative exhibits and displays, a planetarium/multi-media theater facility, Hawaiian/Polynesian cultural and natural history displays and exhibits, and support facilities for formal astronomy education spanning all levels from K-12 through baccalaureate.

Conservation Lands Functional Plan (1991)
The objective of the State Conservation Lands Functional Plan is to provide for a management program allowing for judicious use of the State's natural resources balanced with the need to protect these resources to varying degrees.

Objective IA: Establishment of data bases for inventories of existing lands and resources.
Objective IB: Establishment of criteria for management of land and natural resources.
Objective IIA: Establishment of plans for natural resources and land management.
Objective IIB: Protection of fragile or rare natural resources.
Objective IIC: Enhancement of natural resources.
Objective IID: Appropriate development of natural resources.
Objective IIF: Increase enforcement of land and natural resource use laws and regulations.
Objective IIIA: Expansion and promotion of a public conservation ethic through education.

Relationship of the Proposed Actions – The Master Plan proposes the designation of a Natural and Cultural Preservation Area. No development is proposed for this area which includes 10,760 of the Science Reserve's 11,288 acres. In designating this area, the Master Plan calls for the protection of all undeveloped *pu'u* on Mauna Kea. In the Astronomy Precinct, proposed facilities have been sited to avoid archaeological features and critical Wēkiu habitat.

From a daily operations standpoint, the Master Plan proposes that rangers be present on the mountain to ensure the appropriate level of human interaction with the natural environment and to share their knowledge about the natural environment of Mauna Kea. These rangers will work with DLNR officers when regulatory enforcement is required.

Higher Education Functional Plan (1987 Draft)
The State Higher Education Functional Plan is "intended to serve as a guide to the objectives and policies pursued by the post-secondary education community in meeting its many responsibilities."

Objective A: *Maintain a number and variety of postsecondary education institutions sufficient to provide the diverse range of programs required to satisfy individual and societal needs and interests.*

Policy A(2): *Focus increased attention on the role higher education plays in supporting the economic development of the State.*

Objective B: *Attain the highest level of quality, commensurate with its mission and objectives, of each education, research, and public service program offered in Hawai'i by an institution of higher education.*

Policy B(2): *Maintain and strengthen the position of the University of Hawai'i as a leading national and international research center.*

Policy B(3): *Identify for program enrichment and emphasis those programs considered important in terms of State needs and emphases, those programs for which special advantages in Hawai'i provide an opportunity for national or international prominence, and those programs which have already achieved such prominence.*

Relationship of the Proposed Actions – The University of Hawai'i's Institute for Astronomy is internationally known for its astronomical research. The IfA is able to recruit world-class talent and conduct superior research because the University, through its agreements with the individual telescopes located on Mauna Kea, has access to some of the world's finest viewing instruments. The Master Plan proposes the future development of world class telescopes within the area of the existing astronomy complex. One of the proposed telescopes is a one-meter class telescope proposed for development and use by UH Hilo as a instructional telescope.

5.2.2 State Conservation District Regulations

Pursuant of Chapter 203, Hawai'i Revised Statutes, the State Land Use Commission has established the boundaries for four State Land Use Districts throughout the State: Urban, Rural, Agriculture and Conservation. The Mauna Kea Science Reserve is contained within the State Conservation District.

The State Board of Land and Natural Resources is responsible for the regulation of land uses within the Conservation District. It has established four types of resource subzones (general, resource, limited, and protective), within the various Conservation Districts based on their resource characteristics, and adopted regulations identifying permitted uses and permitting requirements. The Mauna Kea Science Reserve is contained entirely within the Resource (R) subzone. Permitted uses for each subzone included in the Mauna Kea Science Reserve are listed in Table 6-1.

Resource Subzone (R): The objective of this subzone is to develop, with proper management, areas to ensure sustained use of the natural resources of those areas.

Areas Included:

- Lands necessary for providing future parkland and lands presently used for national, state, county, or private parks.
- Lands suitable for growing and harvesting of commercial timber or other forest products.
- Lands suitable for outdoor recreational uses such as hunting, fishing, hiking, camping, and picnicking.
- Offshore islands of the Sate of Hawai'i, unless placed in a (P) or (L) subzone.
- Lands and state marine waters seaward of the upper reaches of the wash of waves, usually evidenced by the edge of vegetation or by the debris left by the wash of waves on shore to the extent of the State's jurisdiction, unless placed in a (P) or (L) subzone.

In evaluating the merits of a proposed land use, the Department of Land and Natural Resources or Board of Land and Natural Resources shall apply the specified criteria. Those criteria directly related to the Mauna Kea Science Reserve are included here.

(1) The proposed land use is consistent with the purpose of the conservation district;
(2) The proposed land use is consistent with the objectives of the subzone of the land on which the use will occur;
(3) The proposed land use complies with provisions and guidelines contained in Chapter 205A, HRS, entitled "Coastal Zone management," where applicable;

TABLE 5-1
Permitted Uses Within State Conservation District Subzones

Protective (P) Subzone	Data Collection Fishponds Kuleana Land Use Landscaping, Removal of Noxious Plants Moorings and Aids to Navigation Public Purpose Uses Sanctuaries Signs Structures, Existing Structures, Accessory Subdivision of Consolidation of Property Tree Removal
Limited (L) Subzone	Uses in Protective Subzone Agricultural Botanical Gardens and Private Parks Erosion Control Landscaping and Removal of Noxious Plants Seawalls and Shoreline Protection Single Family Residence Structures, Accessory
Resources (R) Subzone	Uses in Protective and Limited Subzones Aquaculture Artificial Reefs **Astronomy Facilities** Commercial Forestry Landscaping Marine Construction Mining and Extraction
General (G) Subzone	Uses in Protective, Limited & Resource Subzones Open Space Land Use Not Previously Identified

(4) The proposed land use will not cause substantial adverse impact to existing natural resources within the surrounding area, community or region;
(5) The proposed land use, including buildings, structures and facilities, shall be compatible with the locality and surrounding areas, appropriate to the physical conditions and capabilities of the specific parcel or parcels;
(6) The existing physical and environmental aspects of the land, such as natural beauty and open space characteristics, which will be preserved or improved upon, whichever is applicable.
(8) The proposed land use will not be materially detrimental to the public health, safety and welfare.

Relationship of the Proposed Actions – Astronomy facilities, identified in an approved master plan, are permitted in the Resource (R) subzone. The Master Plan includes design guidelines concerning the siting, heights, coloration, and character of new facilities in a manner that is appropriate to the unique physical environment of Mauna Kea. Outside of the Astronomy Precinct, the proposed Natural and Cultural Preservation Area is proposed to protect a large expanse of undisturbed natural area.

5.2.3 Coastal Zone Management Area Program

The State Coastal Zone Management (CZM) Law (Chapter 205A, Hawai'i Revised Statutes) applies state-wide.

Relevant objectives, policies and guidelines, and the relationship of the proposed improvements to them, are presented below.

Historic Resources Objective – Protect, preserve, and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Historic Resources Policies:
(A) Identify and analyze significant archaeological resources.
(B) Maximize information retention through preservation of remains and artifacts or salvage operations.

Relationship of the Proposed Actions – The State Historic Preservation Division has surveyed all known archaeological features in the Mauna Kea Science Reserve. Using Global Positioning System (GPS) technology, the State has been able to accurately locate these features and has incorporated them into a Geographic Information System (GIS). This database is maintained by the State Historic Preservation Division and has been utilized along with other data to determine the boundaries of the proposed Natural and Cultural Preservation Area and to determine appropriate locations for proposed new facilities.

As specific projects are proposed, more extensive archaeological fieldwork will be conducted.

5.3 COUNTY OF HAWAI'I PLANS

5.3.1 County of Hawai'i General Plan

The Hawaii County General Plan establishes the long-range goals and policies which guide comprehensive development and appropriate uses of land resources. The General Plan contains goals, policies, and standards under in several categories that are relevant to Mauna Kea. Categories include economic, environmental quality, historic sites, natural beauty, natural resources and shoreline, recreation, and land use. This Section addresses the consistency of the Master Plan for the Mauna Kea Science Reserve with relevant policies of the County General Plan.

Economic

Goals:
Economic development and improvement shall be in balance with the physical and social environments of the island of Hawai'i.

Policies:
The County of Hawai'i shall continue to encourage the expansion of the research and development industry by working with and supporting the university, private sector, and other agencies' programs developed to aid the County of Hawai'i.

The County shall promote a distinctive identity for the island of Hawai'i to enable government, business and travel industries to promote the County of Hawai'i as an entity separate and unique within the State of Hawai'i.

Relationship of the Proposed Actions – The State's astronomy industry, and specifically the complex on Mauna Kea, is one of Hawai'i's best known industries in the international community. Current and proposed astronomy facilities will continue to be operated by educational, non-profit, and international partnerships.

Historic Sites

Goals:
Protect and enhance the sites, buildings and objects of significant historical and cultural importance to Hawai'i.

Access to significant historic sites, buildings and objects of public interest should be made available.

Policies:
Signs explaining historic sites, buildings and objects shall be in keeping with the character of the area or the cultural aspects of the feature.

Relationship of the Proposed Actions – The known archaeological sites within the Mauna Kea Science Reserve have been mapped and described by the State Historic Preservation Division. No new facilities are proposed near existing archaeological features. The Master Plan calls for the presence of rangers and interpretive signs on the mountain. Both will serve to educate visitors and residents about the proper treatment of significant cultural features.

Natural Beauty

Goals:
Protect scenic vistas and view planes from becoming obstructed.

Maximize opportunities for present and future generations to appreciate and enjoy natural and scenic beauty.

Policies:
Increase public pedestrian access opportunities to scenic places and vistas.

Relationship of the Proposed Actions – The proposed Natural and Cultural Preservation Area is designated to maintain a large undeveloped area. Proposed facilities within the Astronomy Precinct will be visible from the surrounding towns of Honoka'a, Hilo and Waimea.

Pedestrian access on the mountain will not be restricted in any way. Informational signs already exist to warn visitors of the potential dangers of the severe climate on Mauna Kea.

5.3.2 Land Use Policy Allocation Guide (LUPAG)

The lands of Mauna Kea Science Reserve and Hale Pōhaku are all outside the jurisdiction of the County of Hawai'i. The County's Land Use Policy Allocation Guide (LUPAG) map designates the entire area of Mauna Kea as conservation. The County's Facilities Map does not designate any County public facilities in the area of Mauna Kea.

5.4 PREVIOUS MAUNA KEA PLANS

Previous plans for Mauna Kea are discussed in Section 2.0 of the EIS. These include the 1977 Mauna Kea Plan prepared by DLNR and the 1983 Mauna Kea Science Reserve Complex Development Plan. In 1998 the State Auditor also prepared a report on the management of the mountain. These documents, as well as others prepared in the past three decades were used as references in prepared the Mauna Kea Science Reserve Master Plan.

Section 6.0

Potential Impacts and Mitigative Measures

6.0 POTENTIAL IMPACTS AND MITIGATIVE MEASURES

Two types of potential impacts to the environment resulting from the Master Plan actions are discussed in this section including short-term or construction-related impacts, and long-term or operational-related impacts. Also described are mitigative measures that are proposed for implementation, where appropriate and feasible, to minimize any adverse impacts. In addition, areas where there could potentially be adverse impacts, but where none are actually expected, are discussed.

There are some short-term impacts that will result from constructing a new facility, or improving an existing facility. These will be different or distinct from the long-term impacts that would be due to changes resulting from the existence of that new facility or improvement. In other cases, impact concerns will be related more to the permanent change that is being made, rather than to any distinction that could be made between impacts of the temporary or short-term construction process and the long-term impacts of the completed improvement.

Aside from the Keck Outriggers project, there are no specific projects proposed for either redevelopment of existing observatories or development of new observatories. Each of these future projects will be required to prepare individual environmental documents that will present a detailed evaluation of its potential impacts and proposed mitigative measures.

6.1 SHORT-TERM IMPACTS

Construction of the facilities planned for the Mauna Kea Science Reserve and Hale Pōhaku Mid-Elevation Facilities and Visitor Information Station will create some local short-term construction-related impacts on the environment. These will include temporary changes to drainage and runoff patterns, soil disturbance, dust and erosion due to clearing and grading; traffic in the project's vicinity due to construction equipment and trucks; views of construction activity, and increased noise due to construction-related operations.

Short-term beneficial impacts related to construction will include employment-related expenditures and the purchase of services and materials related to the design and construction of the various projects. Local retail businesses may also indirectly benefit through direct and multiplier effects associated with construction activities.

Actions proposed in the Master Plan will result in short-term impacts associated with the facility redevelopment sites and new facility development sites. The potential short-term impacts related to constructing the planned improvements and, where applicable, proposed mitigative measures are described in the following sections.

6.1.1 Topography, Soils, Drainage and Erosion

Potential Short-Term Impacts - The potential impacts of actions proposed under the Master Plan include alteration of the landform, grading, and excavation. The topography of individual facility development sites will be affected by the earthwork preparation for construction. The planned improvements at redevelopment sites will be located in areas that have been previously graded and improved with buildings, roadways and utilities. In these instances, the potential impacts to topography and soils, drainage and erosion are not expected to be significantly different than existing conditions.

Cut and fill activities will be required to construct the new facilities proposed within the Science Reserve and Hale Pōhaku. Excavation will be required for sections of the roadways and building foundations, as well as utility trenches and drainage features. Grading and filling will be required to provide level areas for construction of the roadways and buildings. In some locations, drilling may be required to install foundation piers for the new observatories. Roadway surfaces will be paved with asphalt concrete to provide an all-weather travel surface in steep slope areas.

Mitigative Measures – Several mitigative measures are proposed to minimize the potential short-term impacts due to earth disturbance, including:

1) Erosion Control Plan. Strict erosion control measures will be followed in order to ensure that any significant adverse impacts are avoided. An Erosion Control Plan will be implemented prior to initiating construction.

2) Containment of Excavated Material. Excavated material from new and redeveloped facilities will be placed along the edges of the observatory pads and along the access roadways. Excavation of conduit trenches will be backfilled to match the surrounding grade.

3) Runoff Control. There will be no substantive alterations made to the existing drainage patterns. Runoff from paved surfaces will be directed to lined channels leading to collection basins or dry wells. Runoff water will percolate into the subsurface strata, which will prevent surface erosion.

4) Dust Control. Erosion and dust control measures specified in U. S. Soil Conservation Service's "Erosion and Sediment Control Guide for Hawai'i" will be adhered to during construction of the planned improvements. The disturbed areas at individual project sites will all be less than five acres and only the smallest possible area should be exposed at any given time. Dust controls will include the watering of exposed areas and good housekeeping at the job sites. Open-bodied trucks will be covered during materials transport. In addition, contractors will be required to suspend dust-generating activities and secure equipment and materials during high winds and storms. The stormwater runoff from the construction sites will not be discharged into the waters of the United States, therefore, an NPDES permit will not be required.

6.1.2 Flora

Potential Short-Term Impacts – Redevelopment activities involving sites located on the summit ridge cinder cone complex will not have an impact on flora. Potential short-term impacts to vegetation may result in the areas designated for new observatory development and supporting infrastructure. Field surveys by Char (1993; 1999) and others, along with the existing documentary literature on flora within the Mauna Kea summit region, indicate that lichens occur widely throughout the non-cinder substrate areas of the summit. Ferns are found to the north of the summit cinder cone complex. Lichens and ferns are found mostly on the rocky outcroppings, rather than cinders, ash and alluvium substrates.

Given the known distribution patterns, it is likely that development at the sites for the SMA expansion, the NGLT and the conventional optical/IR telescopes which avoid rock outcroppings will create short-term impacts to vegetation. Minor short-term impacts on vegetation can be anticipated wherever site clearing and grading or excavation is necessary. Of particular concern would be any disturbance that would occur to the habitats for endangered or rare species of vegetation. However, as described in Section 4.4.5, there are no endangered or rare species of vegetation located in the areas to be occupied by the planned improvements. Potential short-term impacts to flora resources will be minimal for individual facilities, as areas of concentration will be avoided. Dust generated along the access road during construction periods may have a temporary short-term impact on roadside flora.

One fern species that was identified in the recent field study by Char (1999) and a previous study by Palmer may be considered to be a species of concern. Although the plant is not found at a potential facility site, special consideration will be required in the siting and development of the two new conventional optical/IR telescopes planned for sites to the north of the summit ridge. Detailed field investigations of these sites will be conducted when a future individual project proposal is made, and these new observatories will avoid impacts to this particular fern species. Mamane trees at Hale Pohaku will be avoided in the construction of improvements to the Visitor Information Center. Removal of any Mamane would cause modification of the Palila habitat and require mitigation.

Mitigative Measures – Measures have been proposed to minimize the potential short-term impact of construction activities in areas with lichens and ferns, as listed below.

1) Follow-Up Surveys at Observatory Sites. Detailed field studies will be conducted for all new facilities to identify areas of high lichen concentration and ferns to be avoided in the facility siting and development process, and Mamane trees near the mid-elevation facilities.

2) Avoidance of Concentration Areas. Areas with concentrations of lichens and ferns will be avoided during development activities by flagging areas to be preserved from disturbance during construction. Mamane trees will be avoided in the improvements at Hale Pohaku.

3) Avoidance of Dust Generation at Construction Sites. Dust generated along roadways and at development sites will be minimized to avoid impacts to vegetation in the surrounding area.

6.1.3 Fauna

Potential Short-Term Impacts – At Hale Pōhaku, the proposed actions of the Master Plan are not expected to affect the populations of feral ungulates (sheep, goats, etc.), birds and other fauna inhabiting the lower and middle elevations of the mountain. Clearing of vegetation, grading and construction noise are all potential short-term impacts to fauna at the mid-elevation area. Development of expanded facilities at Hale Pōhaku will require removal of several māmane trees for the planned expansion of the Visitor Information Station and parking facilities. Removal of these trees could slightly diminish the habitat area for the endangered palila bird. Noise from construction activities may also have a temporary adverse effect to fauna in areas near the Visitor Information Station area.

In the Science Reserve, wildlife species that may potentially be affected by short-term impacts due to implementation of Master Plan include the endemic arthropods such as the moths, lycosid spider and Wēkiu bug (*Nysius* sp.). Short-term construction-related impacts could occur at observatory redevelopment sites and new development sites as a result of site grading and excavation.

Of the known arthropod species on the summit, *Nysius sp.* is the most critical species of concern, residing only in the cinder cone areas. At the present time, the USFWS is considering this arthropod for listing as a candidate endangered species. This status elevates the concern reflected in the planning for the Science Reserve. Areas within the Astronomy Precinct which contain cinder cone substrate are all considered to be potential *Nysius* habitat areas, according to previous and recent studies completed by Howarth (1999). The Master Plan avoids facilities expansion into *Nysius* habitat wherever possible to avoid potential habitat disruption. In particular, observatory redevelopment will be limited within the existing sites along the summit ridge to avoid expansion onto the surrounding cinder cone substrate.

Introduction of non-native arthropod species, such as the high-altitude linyphiid spider, has been suggested as a potential predator that may adversely affect the *Nysius* population at Mauna Kea. There is the potential for the introduction of additional arthropod species to the summit or Hale Pōhaku as a result of new observatory equipment imported from other high altitude locations.

Mitigative Measures – The following measures will be implemented to minimize the potential short-term impacts of construction at Hale Pōhaku and the Astronomy Precinct.

1) Minimize earthwork beyond existing disturbed sites. Facility redevelopment along the summit ridge will be carried out so as to keep any disturbance of the surrounding cinder cone substrate to a minimum. New facility development will also be contained to the smallest possible disturbance area to minimize impacts to endemic arthropods.

2) No new facilities on undisturbed cinder cone habitat.

3) Fumigation of Transferred High-Altitude Equipment. To avoid the short-term potential for introduction of new arthropod species at Mauna Kea, containers including equipment or

materials transported from another high-altitude location will be inspected and fumigated as necessary prior to transport to the mountain.

6.1.4 Cultural, Historic and Archaeological Resources

Potential Short-Term Impacts: Implementation of the Master Plan should have no adverse short-term direct effects to the rich historic properties and cultural practices, features and beliefs of the summit region of Mauna Kea (refer to PHRI's Cultural Impact Assessment in Appendix H). The Keanakāko'i Adze Quarry is located over 4,000 feet from the boundary of the proposed Astronomy Precinct. Lake Wai'au is more than 3,000 feet from the Astronomy Precinct.

As discussed in Section 4.2.2, archaeological sites located in the Science Reserve, mostly shrines, have been identified through several comprehensive surveys of the summit region (McCoy 1982, 1995, 1999). There are three archaeological sites located within the Astronomy Precinct, and they are avoided in the siting of new facilities. The minimum setback from existing archaeological sites will be 200 ft., which will avoid any adverse effect to these features.

No cultural resources were identified in the summit cinder cone area, and none were uncovered in the construction of telescopes at the summit, such as the Keck and Gemini telescopes.

Short-term effects to cultural resources as a result of the Master Plan will also be avoided by preserving the significant natural landforms and visual integrity between these landforms and the shrines of the summit region. Cultural practitioners will have unimpeded access to the summit except in construction areas during active construction periods where personal safety would be jeopardized.

At Hale Pōhaku, there are several archaeological and cultural features of significance which are outside of the area planned for improvements at the Visitor Information Station. No adverse short-term impacts to archaeological and cultural resources are anticipated.

Mitigative Measures: The following measures have been or will be implemented to minimize or eliminate the potential impacts to archaeological and cultural resources:

1) Historic Preservation Plan. The State Department of Land and Natural Resources' Historic Preservation Division is in the process of preparing a Historic Preservation Plan for Mauna Kea. A preliminary draft of this plan is included as Appendix I. The Plan will compile and assess archaeological and cultural resource information and provide recommendations for appropriate management of the lands of Mauna Kea. There will be a programmatic agreement with DLNR to provide a guidance vehicle to implement the management component of the Historic Preservation Plan.

2) Protection of Resources through Monitoring and Enforcement. The new Management Plan will implement the local-based Office of Mauna Kea Management (MKM) which will be tasked with the responsibility of protecting the archaeological and cultural resources of the

summit. Rangers will be present on the summit. This will provide day-to-day monitoring and enforcement, mitigating potential short-term and long-term effects.

3) Mapped Locations for Archaeological Sites. To protect existing shrines from potential impacts, all existing shrines have been identified and mapped using GPS coordinates and integrated into the GIS database from the summit. Archaeological site locations are mapped accurately via Global Positioning System (GPS) such that all known sites can be avoided in any future redevelopment or new development projects. Mapping of sites is integrated into the Geographic Information System (GIS) for the Mauna Kea Science Reserve, which is a product of the current Master Plan.

4) Setbacks from Archaeological Sites. Existing sites will be protected from disturbance by applying a very conservative setback standard of 200 ft from new facilities. This setback is 10 times the minimum setback recommended by the Hawai'i Island Burial Council for protection of known burials.

5) Retention of Visual Integrity. The visual connection between existing archaeological sites and the significant natural landforms of the summit region will be retained. Facilities will not be sited between the major landforms to allow for an unimpeded view between the major cinder cones of the summit region.

Excavation Monitoring By Qualified Archaeologist. If during the course of construction any cultural or archaeological remnants are unearthed, all work in the area will be halted and the State Historic Preservation Division will be notified. New protocols for construction are also proposed to protect cultural resources. The details of the protocols will be delineated in the Preservation Plan being prepared by the State Historic Preservation Office. Some features of this plan will include monitoring programs and the presence of qualified archaeologists during excavations and related construction activities that may have the potential to impact cultural properties.

6) Designated Areas and Allowances for Construction of Features for Contemporary Worship. Access to the Science Reserve, including the Astronomy Precinct, for purposes of traditional and customary practices will be permitted. To avoid the placement of inappropriate types of structures and use of inappropriate locations, the MKM Cultural Advisory Committee will advise MKM on the designation of specific areas and types of structures that would be allowed to be constructed in the Astronomy Precinct and the Science Reserve.

6.1.5 Air Quality

Potential Short-Term Impacts – Sources of air pollution will likely occur during the construction of individual projects in the Science Reserve and at Hale Pōhaku. A recent analysis of construction impacts to air quality was completed by Dames & Moore (1999) for the Keck Outrigger project. Construction projects at Mauna Kea are anticipated to generate two sources of short-term air quality impacts resulting from dust generation and construction vehicle emissions.

Winds in the area aid in the dispersion of air pollutants, however, with typical wind velocities ranging from 10 to 30 mph. Factors favoring good air quality in the vicinity of the project site include good exposure to winds and ample open space. Moreover, except for vehicles traveling along the Summit Road and Saddle Road, there are no other sources of air pollution in the immediate vicinity.

The emissions associated with construction activities are generally of short-term duration and will conclude once the individual project is built. Receptors of air emissions could include human receptors, ecological receptors and equipment that are sensitive to dust concentrations. Potential human receptors may include construction workers, scientists, staff and visitors to the area.

Fugitive dust will be generated from excavation and vehicle movement on unsurfaced roadways within the Science Reserve. Earthmoving activities at individual construction projects will generate dust amounts that can be quantified based on the area disturbed and the period of construction. A standard used to estimate this potential is the federal Environmental Protection Agency's construction emission factor of 1.2 tons/acre of total suspended particulate matter (TSP) per month of construction. This standard does not account for mitigative measures that can substantially reduce the dust generation potential at construction sites.

Carbon monoxide and nitrogen oxide emissions are expected from on-site construction equipment and from vehicles of construction workers and motorized construction equipment traveling to and from the work site. Much of the vehicular emissions of carbon monoxide (CO) and volatile organic compounds (VOC) would be exhausted over 75 miles of roadways, much of this occurring below the typical inversion layer. The impact of these construction emissions would be a regional effect as opposed to a site-specific impact.

The estimated emissions of all pollutants, including localized fugitive dust emissions are anticipated to be well below the significance levels for suspended particulate and combustion emissions.

Mitigative Measures – The short-term effects on air quality during construction will be mitigated by compliance with State Department of Health Administrative Rules and the following

1) Dust Controls. Potential control measures to reduce fugitive dust include wetting down of work areas with water, covering of open-bodied trucks during materials transport. It is recognized that water is in short supply on the summit, being trucked in from Hilo, and can only be used sparingly during construction.

2) Limiting Exposed Areas. Dust generation can be minimized during construction by allowing only the smallest possible area to be exposed at any given time.

3) Application of Dust Suppressant/Soil Stabilizer. Natural vegetation cannot be used to stabilize soil surfaces at Mauna Kea due to the extreme environmental conditions on the summit. Mitigation proposed for the Keck Outrigger project includes a polymer emulsion

that penetrates, saturates and bonds the surface dust ad aggregate together to create a hard, colorless, dust-free, water-resistant and resilient surface (MCM 1999). This product is environmentally benign.

4) Rules and Permit Conditions. Compliance with Hawai'i DOH Rules and the County of Hawai'i Grading Permit.

5) Job Site Management. Contractors will be required to suspend dust-generating activities and secure equipment and materials during high winds and storms. During these periods, cinder or dirt would be moved to an off-site storage area.

6) Equipment Maintenance. Construction vehicles and equipment must be properly maintained to minimize combustion emissions. Equipment idling should be kept to a minimum when not in use.

6.1.6 Noise

Potential Short-Term Impacts. Due to the distance of the individual projects contemplated under the Master Plan from potentially noise-sensitive uses, no significant adverse impacts from construction noise are anticipated. The only people affected during construction periods may be the scientists, staff and visitors to the summit area and Hale Pōhaku. Construction vehicle traffic along the Summit Road is anticipated to create higher noise levels, however, there are no sensitive receptors along this route.

Mitigative Measures: The following measures have been or will be implemented to minimize or eliminate the potential effects of construction noise:

1) Sound Suppression and Limited Construction Hours. Measures to minimize construction noise include the use of mufflers to suppress loud equipment and limitations on the hours of heavy equipment operation.

2) Blasting Controls. Blasting noise will be mitigated by limiting the blast area and size of charges and by covering the blast site before the charges are detonated.

6.1.7 Recreational Resources

Potential Short-Term Impacts. Operations and visitor use at Mauna Kea and Hale Pōhaku will be affected in that users may be occasionally inconvenienced, and the beauty and tranquillity of the natural setting may be disrupted, by construction activities. However, with proper scheduling and phasing it will be possible to minimize the inconvenience and allow for the continued use of the Science Reserve and Hale Pōhaku Visitor Information Station at current levels during facility construction periods. Winter snow play activities will not be affected by construction activities. Future redevelopment of the UKIRT observatory on the summit ridge may disrupt the current

pattern for skiers that have grown accustomed to using their parking area for vehicle drop-off of skiers.

Mitigative Measures - Construction at the Science Reserve and Hale Pōhaku will be conducted in a manner that will allow these areas to generally remain open to recreational visitors.

6.1.8 Economy and Population

Potential Short-Term Impacts. SMS Marketing and Research conducted an economic analysis of the existing and proposed facilities on Mauna Kea (1999). Their report is included as Appendix G.

For their analysis, SMS used a low estimate and a high estimate of the implementation of projects included in the Master Plan. The Low Estimate includes new management and visitor facilities, the UH Hilo instructional telescope, replacement of three optical/IR telescopes, partial Keck and SMA expansion, one new optical/IR telescope, and the Next Generation Large Telescope. The High Estimate includes new management and visitor facilities, the UH Hilo instructional telescope, replacement of four optical/IR telescopes, complete Keck and SMA expansion, two new optical/IR telescopes, and the Next Generation Large Telescope.

The estimated cost for the design and construction of the observatories planned over the 20-year Master Plan timetable ranges from $1 billion to over $1.5 billion. Of that total, some $200 million to $300 million would be spend in Hawai'i. This will generate significant short-term direct employment, both on- and off-site, during the individual project construction periods.

The pace of construction of new and redeveloped observatories at Mauna Kea over the next 20 years will be intermittent. Individual projects will come on line during this period as proposed in the Master Plan, following advances in astronomy technology and increases in the demand for new facilities. The number of short-term construction-related jobs at any given time will vary considerably, depending on the level of construction activity. On average, astronomy projects are expected to generate an average of 80 to 120 direct full-time equivalent construction and construction-related jobs on an annual basis.

Construction activity will also generate indirect and induced employment opportunities and multiplier effects. Those impacted will local material suppliers and retail businesses. Total employment impact (direct, indirect, and induced) from construction would amount to about 190 to 290 jobs statewide annually, on average. Of those jobs, some 175 to 265 would be located in Hawai'i County.

Mitigative Measures – The short-term employment impacts will be beneficial to both the overall State of Hawai'i and the local Hawai'i island economy. The magnitude of the short-term impacts on the local economy would not result in significant expansion or structural changes that could lead to negative impacts when construction is completed. No mitigative measures are considered necessary.

6.1.9 Roads and Traffic

It is recommended that paving be completed, as recommended in the 1983 Complex Development Plan, for the existing access roadway serving Hale Pōhaku and the Science Reserve – Summit Road. In addition, the Master Plan recommends paving of the remainder of the summit spur road which runs from the SMA building past the Subaru telescope to the W.M. Keck Observatory. Existing jeep service roads will be widened and leveled for access to the new proposed observatory facilities developed to the north and northwest of the summit.

There will be some short-term impacts from trucks, heavy equipment and other vehicles that will use existing roads to access construction areas, especially for the purpose of delivering construction materials and hauling away demolition debris. While construction vehicles are relatively slow and difficult to maneuver, it is anticipated that they will only marginally affect overall traffic flow. The relative impacts on traffic should be slight.

Transport of major observatory elements can cause short-term disruptions to traffic along the route from Kawaihae. This was experienced for the transport of the mirrors to the summit for the Gemini and Subaru observatories in 1999. Individual events, such as these major transports of equipment, will be very occasional and carefully planned to minimize adverse effects on a case-by-case basis.

Mitigative Measures – Appropriate traffic control measures and scheduling of construction activities will be applied during the individual construction projects as necessary to ensure public safety and minimize the disruption of traffic. In addition, if necessary to avoid causing or substantively affecting existing congested traffic areas, the movement of construction equipment and slower vehicles will be coordinated to avoid disruption of traffic during peak periods.

6.2 POTENTIAL LONG-TERM IMPACTS

Changes to the Science Reserve resulting from completion of the planned observatory development and the implementation of the new management program will generate some long-term impacts on the natural and human environment. In addition to the subject areas discussed above with respect to short-term impacts, areas where long-term impacts are probable include natural hazards, visual resources, population, and roads and utilities. Probable long-term impacts related to completion and operation of the planned improvements and, where applicable, proposed mitigative measures are described in the following sub-sections.

6.2.1 Natural Hazards

Potential Long-Term Impacts. Foundation and building design for structures built at the Science Reserve and Hale Pōhaku, in accordance with the Uniform Building Code, is anticipated to be adequate for this location. Large earthquakes are considered possible at this location rated as

Seismic Zone 4. Based on the knowledge of volcanic activity on the island of Hawai'i, the risk of volcanic eruptions affecting the proposed telescope sites is anticipated to be low.

Mitigative Measures. New or redeveloped structures at the Science Reserve and Hale Pōhaku will be designed and built in accordance with the Uniform Building Code.

6.2.2 Topography, Soils, Drainage and Erosion

Potential Long-Term Impacts. As noted above in Section 6.1.2, the redevelopment of existing facilities will be located in previously graded and improved areas. New facility locations will follow the existing topography to the greatest extent possible, with some limited land alteration required to build the new observatories. In general, the existing landforms and drainage patterns will not be altered. Surface runoff in the area of the summit ridge will only minimally increase due to a slight increase in the amount of impervious surface.

Overall, there will be no major change in the existing drainage conditions along the summit ridge. Runoff patterns will generally stay the same, and be controlled by the existing drainage control features. There will be no significant erosion caused by runoff generated at these facilities.

For new facilities, there will be an increase in runoff anticipated due to the increase in impervious surface area for the new observatory buildings and any surrounding pavement. The anticipated increase in runoff will be controlled by the installation of new drainage features as part of the roadway expansion and new observatory facilities.

Mitigative Measures – The potential long-term effects to topography, soils, drainage and erosion will be mitigated by implementing drainage design and erosion controls. All new facilities will be designed and constructed in a manner that avoids creating new erosion problems and meets design standards and requirements for preventing erosion and handling anticipated peak surface runoff loads. Newly disturbed areas, as well as some existing relatively barren areas, will be graded in a manner that will preclude serious erosion in all but the most extreme circumstances.

6.2.3 Flora

Potential Long-Term Impacts – It is likely that development at the sites for the SMA expansion, NGLT and conventional optical/IR telescopes will create some minor long-term impacts to vegetation. Partial site clearing, grading and excavation is necessary to develop these new facilities. These areas contain lichens and mosses that are commonly found throughout the lava landscape areas of the summit. Overall, the impacts to flora resources will be minimal for individual facilities, as areas of lichen concentration will be avoided in siting and development.

As described in Section 4.4.5, there are no endangered or rare species of vegetation located in the areas to be occupied by the planned improvements. In the area of the SMA expansion, service

roadways and utility trenches will be extended to the new pad locations. The pads are small and can be sited in small swales or bowl areas with loose cinder material or small rocks, thereby avoiding higher concentrations or lichens. For the proposed location of the NGLT, a circular area of 250 to 300 feet in diameter would be affected by facility development. The proposed NGLT siting area to the northwest of the summit which contains some areas with lichen concentrations, and the exact future location of this telescope will consider its potential impact to lichens.

The proposed location for the conventional optical/IR telescope to the north of the summit ridge is not expected to affect the habitat of the fern species found during the field studies. Measures will be taken to avoid potential long-term impacts to the habitat of the fern species, as discussed below.

Mitigative Measures – Measures have been proposed to minimize the potential long-term impact of development in areas with lichens and ferns, as listed below.

1) Follow-Up Surveys at Observatory Sites. Detailed field studies will be conducted for all new facilities to identify areas of high lichen concentration and ferns to be avoided in the facility siting and development process, as part of the project-specific Chapter 343 documentation.

2) Avoidance of Concentration Areas. Areas with higher concentrations of lichens and ferns will be avoided during development activities by flagging areas to be preserved from disturbance during construction.

6.2.4 Fauna

Potential Long-Term Impacts. The redevelopment of facilities in and around the summit cinder cones present the greatest potential for impacts to the Wēkiu bug habitat. The measures proposed in the plan will limit redevelopment to within existing disturbed areas, and new facilities to non-cinder cone areas. Given the current knowledge of the extent of the Wēkiu bug habitat, there is little potential for long-term impacts to the habitat.

No significant long-term effects are anticipated for the other arthropod species occupying the summit region, such as the moth and lycosid spider. These species are wide ranging across the Science Reserve, and habitat areas will not be diminished by the redevelopment of exisiting facilities, or the limited construction of new facilities.

Introduction of non-native arthropod species, such as the high-altitude linyphiid spider, has been suggested as a potential predator that may adversely affect the *Nysius* population at Mauna Kea. There is the potential for the introduction of additional arthropod species to the summit or Hale Pōhaku as a result of new observatory equipment imported from other high altitude locations. Mitigative measures proposed will minimize to potential introduction of non-native arthropods to the Science Reserve, including inspection and fumigation of containers shipped from high altitude locations.

Mitigative Measures – Measures have been proposed to minimize the potential long-term impact of development in Wēkiu bug habitat areas, as listed below.

1) Follow-Up Surveys at Observatory Sites. Detailed field studies will be conducted for all new facilities to examine the arthropod community in the facility siting and development process, as part of the project-specific Chapter 343 documentation.

2) Avoidance of Cinder Cone Wēkiu Bug Habitat Areas. Areas with cinder cone substrate will be avoided in long-term facility siting, and preserved from disturbance due to construction. Redevelopment projects located on existing observatory sites and roadway areas will be designed to avoid Wēkiu habitat to the maximum extent possible. New facility development will be contained to the smallest possible disturbance area to minimize impacts to endemic arthropods. Sign placement is recommended in the most sensitive habitat areas making it off-limits to visitors.

3) Fumigation of Transferred High-Altitude Equipment. To avoid the short-term potential for introduction of new arthropod species at Mauna Kea, containers including equipment or materials transported from another high-altitude location will be inspected, and fumigated as needed, prior to transport to the mountain.

4) Long-Term Monitoring. A long-term monitoring program is recommended to gather information to learn about environmental changes and to increase understanding of the impacts of the impacts of management activities on natural resources. This information can be used to guide good stewardship and conservation practices.

5) Winter Recreation Management. The US FWS recommends that winter recreation be guided away from sensitive Wēkiu bug habitat areas. This recommendation should be studied further by the new management office, in conjunction with community involvement.

6.2.5 Cultural, Historic and Archaeological Resources

Potential Long-Term Impacts: There are both positive and adverse potential long-term effects anticipated from implementation of the Master Plan. These are discussed in the Cultural Impact Assessment prepared by Paul Rosendahl, Inc. (Appendix H). Potential long-term impacts include the potential visual impact of new astronomy facilities from existing shrines and the impact on the summit historic district. Although no know sites will be directly disturbed as a result of the Master Plan actions, long-term direct impacts could potentially result from recurrent operations and maintenance activities. Long-term indirect impacts could potentially result from increased access to and use of the Science Reserve.

There is the potential for long-term indirect effects to these resources even with the planned preservation of the cultural landscape and all undeveloped *pu'u*. The new management structure will implement an on-mountain resource monitoring and enforcement program which will

mitigate potential impacts to archaeological and cultural resources. The new Management Plan will implement the local-based Office of Mauna Kea Management (MKM) which will be tasked with the responsibility of protecting the archaeological and cultural resources of the summit. Further, MKM will employ rangers to monitor day-to-day activities on the mountain and enforce the rules regarding protection of archaeological and cultural sites.

Implementation of the Master Plan will not generate significant adverse long-term effects to the archaeological and resources of the summit region of Mauna Kea. The most well-known archaeological and cultural features of the summit region are preserved within the Natural Area Reserve (NAR). These include the Keanakāko'i Adze Quarry and Lake Wai'au, located over 3,000 from the boundary of the proposed Astronomy Precinct.

The three existing archaeological sites located within the Astronomy Precinct will not be physically affected by the proposed redevelopment or new development projects. These sites will be protected by 200 ft. setbacks from new development activity. MKM rangers will monitor day-to-day activities on the mountain and enforce the rules regarding protection of archaeological and cultural sites. Contemporary worship sites that are erected by cultural practitioners within areas of the Science Reserve as defined by the Cultural Advisory Committee will also be respected.

As discussed in Section 4.4, the State Historic Preservation Officer determined that the proposed Keck Outriggers project would have a significant effect on historic sites (Hibbard, May 3, 1999). The SHPO determined that the summit cinder cone complex is considered to be an historic district, and the presence of the new facilities would affect the visual integrity of the summit ridge. Based on the findings of informants interviewed in recent ethnographic studies (Maly, 1999), the visual presence of new astronomy facilities would be considered to be a negative impact to the perceived cultural value of the summit. To address the potential cultural impact, the current Master Plan takes specific measures to minimize the potential visual impact of redeveloped facilities along the summit ridge.

Views of the archaeological sites and culturally-significant landforms of the Science Reserve will be affected by the redevelopment of existing observatories and new astronomy facilities. Existing and future views of the summit cinder cone complex are shown in Figure 3-5. These views show the extent of existing facilities along the summit ridge, as compared to the redeveloped facilities whose size and color will comply with the Master Plan design guidelines. Redeveloped observatories along the ridge will become larger on average, but limited to the height and width of the existing Gemini observatory. Enclosures for the redeveloped ridge facilities will be designed and built to blend with the background sky color. The base portion of the redeveloped facilities will be colored darker to match the surrounding cinder landscape, thereby reducing the apparent height of each facility. With these measures in place, the visual integrity of the summit cinder cone complex will not be diminished by the redeveloped observatories, and therefore is anticipated to cause a minor adverse effect upon this cultural resource.

Mitigative Measures: Potential long-term impacts to archaeological and cultural resources related to the implementation of the Master Plan will be minimized or eliminated by the implementation of proposed mitigative measures, as described below.

1) Resource-Based Boundaries for the Astronomy Precinct. The northern boundary of the proposed astronomy precinct has been established to respect a cluster or band of archaeological sites (shrines) located at the 13,000 ft. elevation. The southern boundary of the precinct has been established to respect the visual integrity between the major landforms of cultural significance including Kūkahau'ula, Poli'ahu and Wai'au.

2) Historic Preservation Plan and Programmatic Agreement. The State Department of Land and Natural Resources' Historic Preservation Division is in the process of preparing a Historic Preservation Plan for Mauna Kea. The Plan will compile and assess archaeological and cultural resource information and provide recommendations for appropriate management of the lands of Mauna Kea. There will be a programmatic agreement with DLNR to provide a guidance vehicle to implement the management component of the Historic Preservation Plan.

3) Protection of Resources through Monitoring and Enforcement. The new Management Plan will implement the local-based Office of Mauna Kea Management (MKM) which will be tasked with the responsibility of protecting the archaeological and cultural resources of the summit. Rangers will be present on the summit.

4) Mapped Locations for Archaeological Sites. To protect existing shrines from potential impacts, all existing shrines have been identified and mapped using GPS coordinates and integrated into the GIS database from the summit. Archaeological site locations are mapped accurately via Global Positioning System (GPS) such that all known sites can be avoided in any future redevelopment or new development projects. Mapping of sites is integrated into the Geographic Information System (GIS) for the Mauna Kea Science Reserve, which is a product of the current Master Plan.

5) Setbacks from Archaeological Sites. Existing sites will be protected from disturbance by applying a very conservative setback standard of 200 ft from new facilities. This setback is 10 times the minimum setback required by the Hawai'i Island Burial Council for protection of known burials.

6) Retention of Visual Integrity. The visual connection between existing archaeological sites and the significant natural landforms of the summit region will be retained. Facilities will not be sited between the major landforms to allow for an unimpeded view between the major cinder cones of the summit region.

7) Construction Monitoring. If during the course of construction any cultural or archaeological remnants are unearthed, all work in the area will be halted and the State Historic Preservation Office will be notified.

8) Designated Areas for Construction of Features for Contemporary Worship. Access to the Science Reserve, including the Astronomy Precinct, for purposes of traditional and customary practices will be permitted. To avoid the placement of inappropriate types of structures and use of inappropriate locations, the MKM Cultural Advisory Committee will advise MKM on the designation of specific areas and types of structures that would be allowed to be constructed in the Natural and Cultural Preservation Area and the Astronomy Precinct.

9) Chapter 6E, HRS Historic Preservation Review and Section 106 Consultation. New and redeveloped facilities will be reviewed under these procedures according to the appropriate State and/or Federal regulatory procedures.

6.2.6 Air Quality

Potential Long-Term Impacts. Air quality at the Science Reserve and Hale Pōhaku will substantially return to existing conditions once construction of the planned improvements is completed. There will likely be a slight increase in vehicular traffic and emissions due to an expected increase in the number of visitors to the Hale Pōhaku Visitor Information Station. There are no new facilities planned that will result in on-going emissions of air pollutants. None of the Master Plan improvements will have substantive long-term impacts on overall air quality.

Mitigative Measures. Overall air quality at Mauna Kea area is very good, due both to the low intensity of use and the substantial winds that blow most of the time. The planned improvements will not change these conditions. No mitigative measures beyond existing vehicle emission controls are considered necessary.

6.2.7 Noise

Potential Long-Term Impacts. Noise at the Science Reserve and Hale Pōhaku should remain at very low levels since none of the planned improvements will generate significant amounts of noise beyond the construction phase. There are no residences or other noise sensitive uses near the new facilities. The anticipated increase in use of the Hale Pōhaku Visitor Information Station will cause slightly greater noise levels along the Summit Road, however, there are no sensitive receptors that will be affected along this route.

Mitigative Measures – No mitigative measures are considered necessary to offset potential long-term impacts.

6.2.8 Visual Resources

Potential Long-Term Impacts. Views of the summit of Mauna Kea will be affected by the construction of new and redeveloped observatory facilities. Views may be affected from

locations within the Astronomy Precinct, as well as from off-mountain, downslope locations such as Hilo, Honokaa and Waimea. The changes to existing views will result from the redevelopment of facilities on the summit ridge, as well as views of facilities planned at locations to the north and northwest of the summit.

As discussed in Section 3, the proposed redevelopment of facilities at the summit ridge will involve up to five sites, including the NASA/IRTF, CFHT, UH 2.2 m, UKIRT, and UH 0.6 m. Redevelopment of these sites will follow design guidelines, such that the observatories will be limited in size and colors. Figure 3-5 shows the existing view of the summit ridge in comparison to the simulated view of the summit ridge with the redeveloped facilities. The proposed design limitations to size and color help to blend the base of these facilities with the surrounding landscape, and the upper portion of the enclosures are designed to blend with the sky background.

The redeveloped ridge facilities will be noticeable from sites within the Astronomy Precinct, however, the visual impact is not expected to be significant. The future view simulation shows the effect of the guidelines in limiting the size of the observatory enclosures and the selection of colors that blend the facilities with the sky background. As viewed from distant off-mountain locations (Figures 3-8, 3-9 and 3-10), the redeveloped summit ridge facilities will be slightly noticeable from Hilo, Honokaa and Waimea. However, the measures proposed to minimize visual impacts are shown to be effective in softening the view of facilities from the down-slope communities. In general, the redeveloped ridge facilities are not anticipated to cause significant adverse effects to views from both on-mountain and off-mountain locations.

The proposed new observatory facilities for the SMA Expansion and NGLT are located at sites to the northwest of the summit, and the two conventional optical/IR telescope sites are planned to the north of the summit. These new facilities would be visible from locations within the Astronomy Precinct and from Honokaa and Waimea. As shown in Figures 3-8, 3-9 and 3-10, the facilities constructed for the SMA Expansion are slightly visible from off-mountain locations. As discussed in Section 3, the proposed design for the NGLT minimizes its visibility from all locations due to its sub-grade foundation portion, earthen-colored enclosure and rounded "*pu'u*" shape.

The boundaries of the proposed Astronomy Precinct were established to minimize views of the existing observatories and future redeveloped or new observatories. From locations outside the Precinct to the south, such as Wai'au, the astronomy facilities are not visible. The visual connection and inter-relationship of major landforms and culturally-significant places within the Science Reserve will not be affected by the planned improvements within the Astronomy Precinct. Further, the proposed improvements will have no adverse effect upon a potentially significant cultural resource of the open view channel to the west from the summit at Kūkahau'ula.

Views at Hale Pōhaku will not be adversely affected by the modest planned expansion of the Visitor Information Station. The existing facilities will be expanded with comparable

architectural design, and the parking areas and cabin area will retain existing vegetation and enhanced landscaping consistent with the surrounding ecotype.

Mitigative Measures – Potential long-term impacts to visual resources related to the implementation of the Master Plan will be minimized or eliminated by the implementation of proposed mitigative measures, as described below.

1) Design Guidelines – Size and Color of Facilities. The potential views of facilities built in the Science Reserve will be mitigated by the proposed Design Guidelines for redeveloped and new observatories. The guidelines call for specific limitations for the size of redeveloped facilities on the summit ridge, limiting them to no larger than the existing Gemini observatory. Coloring and design of redeveloped and new facilities will minimize their potential visual impact by designing structures that blend with the background. Surfaces, textures and material used for construction should seek to blend into the landscape. The ridge facility enclosure design will utilize a combination of detailed geometrical design, surface treatment (i.e. reflecting vs. non-reflecting) and color (blues and grays) to minimize visibility against the daytime sky.

2) Astronomy Precinct. The boundaries established for the Astronomy Precinct set the limits for potential development in the Science Reserve, and limits the potential visual impact of new facilities. Within these constraints, the culturally-significant views of the major landforms within the Science Reserve will be retained.

1) Design Review Committee. Future projects will be reviewed by the Design Review Committee which will advise the MKM and the Chancellor of UH Hilo to ensure compliance with the Master Plan Design Guidelines.

6.2.9 Economy and Population

Potential Long-Term Impacts. The SMS Marketing and Research economic study (July 1999) included analysis of the potential long-term impacts of astronomy development to the State and County population and employment (Refer to Appendix G). The continuing growth in the number of telescopes on Mauna Kea is expected to result in the continuing growth in spending on astronomy on Hawai'i Island. The planned improvements are not expected to generate significant population impacts. The number of new long-term jobs that bring new residents to the island will be modest, and spread over the 20-year period of the Master Plan. The increase is not expected to cause a shift in resident population growth from other areas of the Big Island. The anticipated growth in jobs and population resulting from the actions of the Master Plan will have no significant impact on Hawai'i's overall population growth rate.

For their analysis, SMS used a Low Estimate and a High Estimate of the implementation of projects included in the Master Plan. These estimates are described in Section 6.1.8.

It is estimated that roughly 120 to 170 new research and technical positions will be created to staff the observatories in the Astronomy Precinct. The Office of Mauna Kea Management will also create approximately six positions, including an Executive Director, an Administrative Assistant, and four Ranger positions. Other employment will result from the development and operation of base facilities for observatories at locations in Waimea or Hilo. The Hale Pōhaku Visitor Information Station will also have increased staff requirements over time as tourism is expected to increase. Total (direct, indirect and induced) employment associated with Mauna Kea operations in the year 2020 is expected to total 850 to over 1,000 positions statewide – an increase of 33% to 57% over the current level.

There is a positive economic impact anticipated from the planned actions under the Master Plan. Presently, the value of astronomy to the State's economy in total direct, indirect, and induced expenditures is estimated at $142 million on annualized basis. Expenditures will increase to over $200 million per year with implementation of the new Master Plan.

Over time, two trends may have much larger effects than seen to date:

1) With continuing support of science education and internships, and continuing need for staff, the observatories will encourage a local pool of skilled technical personnel. The results could well include not only jobs with good pay for some residents, but also experience leading to similar jobs elsewhere for some, or the creation of start-up businesses by a few others.

2) Tourism on the island may draw more extensively on astronomy as a resource. East Hawai'i marketers are very much aware of the need for more and varied attractions. Astronomy is a potential attraction could occur at a variety of Big Island locations, such as Hilo's University Park, the Waimea Observatories centers, and Hale Pōhaku. It is possible that these sites may be integrated into the trips of visitors to the island. The tourist industry will explore ways to include astronomy, as a separate attraction or simply as a part of the association between Hawai'i Island and spectacular natural events.

Mitigative Measures – Most if not all of the employment impacts will be beneficial. No mitigative measures are expected to be necessary for employment and population effects.

6.2.10 Roads and Traffic

Potential Long-Term Impacts. The paving of the remaining unpaved sections of the Summit Road between Hale Pōhaku and the summit region will be accomplished during the 20 year period of the Master Plan. Improvements proposed under the Master Plan are anticipated to result in a minor increase in long-term traffic volumes to and from Mauna Kea. The astronomy improvements at the Science Reserve and the improvements to Hale Pōhaku Visitor Information Station will generate some additional vehicle trips. There will also be an increase in the number of visitors travelling beyond the Visitor Information Station to the summit. The anticipated effect of each future traffic component is presented below.

Summit Road Traffic Above Hale Pōhaku. Travel to the summit is composed primarily of traffic from astronomy operations, other research activities and visitors. Completion of all of the proposed astronomy redevelopment and new facilities will bring four new observatory entities being added to the summit (UH Hilo Instructional, NGLT, and two Optical/IR). The operational function of each of these facilities will have specific requirements for on-mountain staff support. The trend has been to minimize the number of staff and scientists working at the summit. Long hours spent at the high altitude of Mauna Kea make for difficult working conditions. Improvements in communications now allow for remote operation at the base facilities in Waimea and Hilo. It is anticipated that this trend will continue, which will minimize the number of additional trips made to the summit in the future by staff and researchers associated with the new observatories.

Future traffic projections are based on the existing traffic volumes (data provided by Mauna Kea Support Services) and the anticipated traffic associated with the existing and expanded facilities at the summit. It is estimated that approximately 80 vehicles travel from the Hale Pōhaku Mid-Elevation facilities to the summit each day, primarily composed of astronomy operational support and visitors. Of these vehicles, about 75 per cent travel to the summit for astronomy support or research functions, with 25 percent being tour groups, individual tourists and local traffic. With the new astronomy facilities in place, the number of astronomy-related vehicles will increase by about 10 to 20 percent (6 to 12 vehicles per day). It is also projected that the relatively small number of non-astronomy visitor traffic (20 vehicles/day) will increase over the next 20 years to an additional 20 vehicles/day. The anticipated increase in traffic to the summit of an additional 30 to 40 vehicles per day is not expected to cause a significant reduction in the operating capacity of the roadways serving the summit.

There will be a positive effect on traffic safety on the Summit Road above Hale Pōhaku as a result of the Master Plan. In addition to the paving of unpaved sections, the planned improvements to the roadway include the installation of guide rails at roadway turns and improved signage to alert drivers to steep grades and turns in the road.

The new management entity will be addressing the plan to manage visitor travel to the summit. There is a current proposal under the new Management Plan to limit the road to four-wheel drive vehicles only, to ensure greater safety for visitors. Vehicles will be required to check-in at the Ranger Station.

Traffic to the Mid-Elevation Facilities and Hale Pōhaku Visitor Information Station. Travel to the Mid-Elevation Facilities and Hale Pōhaku Visitor Information Station is anticipated to increase over the next 20 years. The current number of vehicles travelling to the Mid-Elevation Facilities or the Hale Pōhaku Visitor Information Station is approximately 100 to 150 per week (15 to 20 daily). The number of visitors is highly variable, depending upon the time of year, weather conditions, day of the week, and activity schedule for the Visitor Information Station. In addition, there are tour groups that come by bus or car to the Visitor Information Station four nights per week for an organized Stargazing program. These groups average about 80 people per night, including about 30 to 40 vehicles per night.

A modest expansion of the Visitor Information Station is planned over the next 20 years, which is primarily intended to provide improved services to the present level of visitors. The improvements include addition of a small telescope, auditorium, ranger station, and conversion of the Subaru construction cabins for public (group) use. The number of individual daytime visitors is projected to increase. As well, organized evening programs that draw groups and individual vehicles to the Visitor Information Station, are expected to continue and likely to expand in scope over the next 20 years. The actual scope and frequency of these programs will be more fully defined by the new management entity (MKM).

The number of vehicles travelling to Hale Pōhaku is anticipated to increase for both daytime activities and night stargazing. Daytime visitors to Hale Pōhaku will be 30 to 40 per day, or with about 200 to 300 vehicles per week (daytime). About 60 to 80 vehicles per night are anticipated for the stargazing program. The effect of this increased traffic will be the addition of vehicles to the Summit Road and its intersection with Saddle Road. This additional traffic can be accommodated on the existing roadway facility with modest improvements to pavement width and signage along portions of the road.

Traffic on Saddle Road Due to Mauna Kea Activities. Saddle Road is projected to undergo major improvements over the next 20 years, which will increase the accessibility of Mauna Kea from the rest of the island. The number of local residents visiting Mauna Kea will increase, as will the number of tourists attracted to the activities on the mountain, primarily at the Visitor Information Station.

The number of vehicles using Saddle Road that will be associated with the observatories and the Hale Pōhaku facilities will increase. The total number of vehicles associated with Mauna Kea Science Reserve and Hale Pōhaku activities that will travel on Saddle Road is expected to be between 210 to 280 per day by 2020. These trips will be generated from both the Hilo and West Hawai'i directions.

In addition to the Science Reserve traffic, the Humu'ula/Pi'ihonua Master Plan for the Department of Hawaiian Homelands (DHHL) also contemplates the development of homestead lots and limited commercial uses along the Mauna Kea Access Road at its intersection with Saddle Road. Based on the development proposed, in excess of 100 vehicle trips could result from these activities during peak hour at the Saddle Road intersection.

With the improvements planned to Saddle Road, the increased vehicle traffic associated with Mauna Kea is not expected to cause a significant impact to traffic flow. The intersection of Summit Road with Saddle Road is expected to require modest improvements, such as a left turn lane in the Hilo-bound approach and right turn deceleration lane on approach from the Kona-bound approach.

Mitigation Measures. The following measures have been proposed to minimize the potential impacts of traffic generated by the proposed actions of the Master Plan.

1) Increased Remote Operations with Communications Improvements. The number of researchers and support staff required to travel to Mauna Kea for astronomy research has diminished due to the improvements in communications. Most of the observatories will have remote operating capabilities in the future, which will minimize the number of astronomy researchers and support staff that are required to access the mountain on a regular basis.

2) Saddle Road Intersection Improvements. The intersection of Summit Road with Saddle Road will be improved to account for the future traffic flows on both of these facilities.

3) Traffic Safety Improvements on Summit Road above Hale Pōhaku. The planned improvements to the roadway include the addition of paved surface between the upper section of the road and Hale Pōhaku, installation of guide rails at roadway turns, and improved signage to alert drivers to steep grades and turns in the road.

4) Saddle Road Improvements. Vehicles using Saddle Road to access Mauna Kea will have a safer travel route upon the completion of the planned improvements to widen and realign Saddle Road.

5) Elimination of Water Tanker Travel on Saddle Road. Water for users on Mauna Kea could become available from sources to be developed for the Humu'ula community on DHHL lands. The water tanker trucks serving the mountain's users could fill at Humu'ula, which would eliminate the need to travel to and from Hilo for water delivery along Saddle Road.

6.2.11 Utilities

The potential long-term impacts to utilities, and the proposed mitigation measures, are discussed in this section. Water supply, wastewater management, electrical and communications systems are evaluated in this section.

6.2.11.1 Water Supply

Potential Long-Term Impacts. Water is imported by tanker truck to the mountain from the lower elevations, and this mode of water supply will continue into the future. It is impractical to consider the development of a water supply system to the mid-Elevation facilities or the summit.

Water supply will be developed to serve the Humu'ula community on DHHL lands below Hale Pōhaku. This is a logical future source for water to be trucked to Hale Pōhaku and the summit, instead of the long trip from Hilo along the Saddle Road. These facilities have yet to be developed, and could be designed to accommodate future demand from Hale Pōhaku and observatories at the summit.

The existing water storage facilities at Hale Pōhaku are adequate to provide domestic supply and fire protection for the expanded Visitor Information Station.

Mitigation Measures. Water for the mountain's users could potentially be derived from Humu'ula sources to eliminate the need to truck water from Hilo. The potential sources for this water will be explored with DHHL as the Humu'ula plans are advanced in the future.

6.2.11.2 Wastewater Management

Potential Long-term Impacts. Wastewater is managed by individual treatment and disposal systems serving each of the observatories and the Mid-Elevation Facilities. The current method for wastewater management involves either cesspools or septic tank systems with leaching fields. In the future, redeveloped or new observatories will be required to install septic tank and leaching fields which comply with State Department of Health regulations for individual wastewater systems. The impact of wastewater effluent on groundwater quality is expected to be negligible due to small effluent volumes and the great distance from drinking water aquifer sources.

Mitigation Measures. Redeveloped or new observatories will be required to install septic tank and leaching fields which comply with State Department of Health regulations for individual wastewater systems.

6.2.11.3 Power and Communications

Potential Long-Term Impacts. The electrical supply and communications systems that serve the Science Reserve and Hale Pōhaku are expected to have adequate capacity to serve the future facilities development anticipated under the Master Plan. Extension of the power and communications system will be required to serve new observatories being developed within the Science Reserve.

Electrical power lines will be extended underground to the new facility sites following the service road extensions. An electrical system capacity analysis was completed for the existing system serving the Mauna Kea Science Reserve (Bennett, June 1999). The analysis found that the existing system has more than adequate electrical supply capacity to serve approximately three times the current demand level. The facilities proposed in the Master Plan will not have an adverse effect on electrical supply to the area.

In recent years, the communications system serving the observatories at the summit has been upgraded, including the installation of a fiber optic communications system (1996-98). This system provides adequate communications links to provide real-time data flow between the summit and base facilities in Waimea and Hilo. Remote operation from outside Hawai'i via the Internet is also possible with the improved communications link. The fiber optic communications lines will be extended along the underground utility lines that will be installed for new facility sites. The extension of this system will not have an adverse effect on communication service to the area.

Mitigation Measures. The electrical supply system and communications system for Mauna Kea has adequate capacity to serve the proposed facilities. No mitigation measures are considered to be necessary.

6.3 SUMMARY OF POTENTIAL IMPACTS

This section summarizes the potential environmental impacts of the actions proposed in the Mauna Kea Master Plan.

6.3.1 Inter-relationships and Cumulative Environmental Impacts

The potential inter-relationships between planned future uses and their combined effects is addressed, including the potential long-term cumulative impacts of such actions. Cumulative and interrelated impacts are those associated with existing, approved and foreseeable future projects that may produce related or additive impacts. This cumulative impact analysis addresses the existing observatories and mid-elevation facilities, and the addition of new observatories and recycling of existing observatories within the Astronomy Precinct. The only other potential plans for Mauna Kea include the DHHL plan for the Humu'ula lands, which relate to each other only in future traffic conditions.

The new facilities, as described in Section 3, will include the UH Hilo Instructional Telescope, Keck Auxiliary Telescopes, Submillimeter Array Expansion, Next Generation Large Telescope and two Conventional Optical/IR Telescopes. Also planned are a recreational support facility in the Astronomy Precinct, and expansion of the Hale Pōhaku Visitor Information Station. The majority of the Science Reserve, 10,760 acres is planned to be designated as a Natural and Cultural Resource Preservation Area. This section addresses the potential cumulative impacts of these proposed actions of the Master Plan over the 20-year planning period.

Cumulative Impacts to Flora Habitat.

Flora habitat that contains plants as lichens and ferns will be affected by the development of new astronomy facilities within the Science Reserve. There will be removal of approximately 10 acres of habitat area as a result of the limited amount of grading and disturbance for the new observatories, support facilities and roadways in the Master Plan. Each observatory facility will be sited carefully to avoid impacts to concentrations of lichens or ferns. These plants are widespread over the summit area, and the total cumulative disturbance of these habitat areas will constitute less that 0.1 percent of the total habitat area.

Removal of Mamane trees at Hale Pohaku will be avoided in the construction of improvements to the Visitor Information Center.

Cumulative Impacts to Fauna Habitat.

Arthropod species habitat areas will be affected by the development of new astronomy facilities within the Science Reserve. There will be disturbance of approximately 10 acres of non-cinder habitat area as a result of grading and disturbance for the new observatories in the Master Plan. The new facility areas are habitat for lycosid spiders and the moth, both of which are widespread across the summit area. The cumulative impact of this habitat loss is negligible, and does not affect critical habitat areas.

There may also be a slight adverse effect to the cinder cone habitat of the most sensitive arthropod species Wēkiu bug (Nysius sp.). For the most part, cinder cone substrate areas will be preserved from modification by new facilities. Construction of redeveloped facilities will have only a slight effect on the cinder cone areas – expansion of the disturbed areas allowed at the "recycled" facility sites will be kept to a minimum. With construction equipment activity and excavation occurring at each of the five redevelopment sites on the summit ridge, some slight adverse effect to the Wēkiu bug cinder cone habitat may result.

Cumulative Impacts to Archaeological and Cultural Resources.

No archaeological resources will be directly affected by the actions proposed under the Master Plan. Large setbacks will be established between the three archaeological sites within the Astronomy Precinct and new observatory facilities, and no adverse effect is anticipated. There is the potential for an increase of the number of visitors using foot trails within the Science Reserve. With greater access to archaeological sites, this could result in some secondary impacts resulting from possible disturbance to shrines and other site types. Monitoring by rangers and educational programs at the Visitor Information Station are expected to help offset this potential cumulative impact to archaeological resources.

Cultural resources will be preserved on Mauna Kea through the multiple measures proposed in the Master Plan, including preservation of culturally important land forms and inter-relationships between shrines and between the land forms. The Master Plan takes several measures to preserve and enhance the cultural setting of the summit region. Siting of new facilities avoids impacts to culturally significant landforms and design of new and recycled facilities that blend with the surroundings. In the case of the summit ridge, the visual impact of the recycled facilities could be less intrusive than the view of existing facilities on the ridge.

Many believe that the presence of new observatory facilities in the summit area will cumulatively diminish the overall cultural significance of the mountain. This area is considered "sacred" in that it is the highest zone of the mountain. Its lack of archaeological sites is interpreted by some to indicate that few ancient Hawaiians ventured into this area.

The Astronomy Precinct area is the area most affected by previous development, however, it contains the fewest archaeological sites, and there are no undeveloped *pu'u* in this part of the summit. The cumulative effect of restricting the zone of development is a significant benefit to cultural resources through the designation of over 95 percent of the Science Reserve into a

Natural and Cultural Preserve Area, consisting of over 10,760 acres. All of the undeveloped *pu'u* in the Science Reserve will be protected from future disturbance. An unimpeded view channel from the summit to western slope of the mountain will be retained. The Master Plan reinforces the existing resources of the Natural Area Preserve, with its culturally important places of Wai'au and Keanakāko'i adze quarry and the band of shrines occurring at the 13,000 ft. elevation.

In terms of the management impact to cultural resources, the new management plan brings Hawaiian cultural interests to the forefront of an on-going management effort for the resources of the mountain. The mountain's cultural resources will be protected, along with access rights for cultural practitioners. The plan protects and enhances these resources for the betterment of generations to follow.

Cumulative Impacts to Visual Resources.

Views of the summit of Mauna Kea from locations at the summit and off-mountain locations will be affected by the proposed actions of the Master Plan. The plan for physical development limits redevelopment and new facilities to the Astronomy Precinct, which is the area of least potential visual impact. The most desirable locations for new observatories — the tops of undeveloped *pu'u* such as Poli'ahu and Līlīnoe — will not be affected by astronomy development. The view of the summit from Hilo will be preserved, with no new facilities extending down the slope to the east of the summit ridge.

In the case of recycled facilities to be built on the summit ridge, the visual impact could actually be less intrusive than the existing facilities on the ridge. As shown in Figure 3-5, the future view of the summit shows the effectiveness of coloring the enclosures to blend with the sky background.

Views from Honokaa and Waimea will include the new facilities in the Astronomy Precinct to the north of the summit ridge. However, the new telescopes should be colored in earth tones to blend with their surroundings. There will be a long-term cumulative effect resulting from the view of new facilities on the northern slope of the mountain from the down-slope communities. Design measures and careful siting must be applied to minimize the potential visual impact of these facilities.

Cumulative Impacts to Economy.

The Master Plan actions will have a positive long-term cumulative effect to the economy of the State of Hawai'i and County of Hawai'i. Astronomy-related employment currently totals nearly 400 direct positions. Direct, indirect and induced employment associated with Mauna Kea operations in the year 2020 is expected to total 850 to over 1,000 positions statewide. Direct and indirect revenues to the State and County will be increased by $12 million to $16 million per year.

Aside from direct and indirect economic benefits, the observatories are becoming more involved in community building activities, with high school student internships offered by Keck and

Gemini observatories. The trend toward observatory involvement in community-building enterprises is anticipated to expand with time.

Cumulative Impacts to Infrastructure.

The actions proposed under the Master Plan will create some cumulative effects to infrastructure. Water supply will continue to be trucked to the summit, therefore, the slight increase in demand from the new facilities on the mountain will add to the frequency of truck trips. Wastewater will continue to be managed through DOH-approved individual treatment and disposal systems, and the volume of wastewater will increase with the addition of new observatories. Traffic on the Saddle Road and Summit Road serving Mauna Kea will continue to grow slightly due to increased number of trips by staff, researchers and visitors to the mountain.

6.3.2 Potential Secondary Effects

Examples of potential secondary types of effects include the stimulation of additional development in an area, or of higher density development, as a result of the construction of public facilities such as a new highway or sewerage system. However, it is not expected that the planned improvements at Mauna Kea Science Reserve or the Hale Pōhaku Visitor Information Station will have substantive secondary effects. Uses of Mauna Kea will be managed in order to ensure that activities are kept at a level that can be accommodated without damaging the mountain's natural environment and ecosystems.

6.3.3 Relationship Between Local Short-term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity

These relationships are described below in the context of the following four specific areas of potential concern:

1. Narrowing of the range of beneficial uses of the environment;
2. Long-term risks to health and safety;
3. Foreclosure of future options; and
4. Trade-offs among short-term and long-term gains and losses.

The Master Plan actions and planned improvements are considered to be beneficial uses of the environment. The recycling of observatory sites will utilize areas that have been previously disturbed by development. The establishment of the 10,760-acre Natural and Cultural Preserve Area will provide for several beneficial purposes, including:

- Preserving and protecting important natural, historic and cultural ecosystems and resources;
- Increasing the opportunity for people to experience and enjoy Hawai'i's special natural beauty and environment; and

- Creating greater public awareness of and appreciation for the value, uniqueness and, in many respects, the fragility of many of Hawai'i's significant natural resources.

Thus, the planned improvements will increase and enhance, rather than narrow, the range of beneficial uses of the environment.

By enhancing both people's opportunity for contact with Mauna Kea's natural environment, and the quality of that contact with the environment, the planned improvements should contribute to the long-term health and general welfare of the people of Hawai'i. In the case of the new Rangers for the mountain and the planned roadway safety improvements, these will also improve the safety associated with the ways in which the contact is made.

The option of using part or all of the larger Science Reserve for future observatory improvements will be foreclosed by containing these within a designated Astronomy Precinct of approximately 525 acres. The surrounding 10,760 acre Natural and Cultural Resource Preservation Area will remain unaffected by observatory development. The future consideration of other possible astronomy use options for this larger part of the mountain will be permanently foreclosed.

This option foreclosure also constitutes the most significant "trade-off" involved in implementing the Master Plan. As noted, the proposed "gain" is regarded as significantly outweighing the resultant "loss".

In summary, the planned actions of the Master Plan are expected to help maintain and enhance the long-term productivity of the environment, rather than adversely affect it, for the following reasons:

People's awareness of and appreciation for the natural environment and cultural resources will be increased by the interpretive exhibits and educational programs and tours that will be offered through the Visitor Information Station. This is considered a productive use of part of the natural environment. A likely added benefit should be greater public support for the mountain's overall maintenance and enhancement.

The planned improvements will be located in previously disturbed or limited amounts of limited resource areas, with minimal or no disturbance to the significant natural and cultural areas. The overall intensity of the planned uses will be confined and strictly controlled to manage the types and intensities of any activities in environmentally sensitive areas.

6.3.4 Irreversible and Irretrievable Commitments of Resources

Resources that will be expended by implementing the actions of the Master Plan are addressed in this section. The construction and operation of the planned new and recycled observatories and recreational support facilities will involve the irretrievable commitment of certain natural and fiscal resources. However, this will include only a modest commitment of previously

undisturbed natural areas. This is because, as already noted, the improvements involve the redevelopment of currently used or previously developed areas and small areas of undisturbed land.

There will be a permanent commitment of funds and resources to plan, design, construct and operate the observatories and facilities. Planning, design and construction of the planned improvements over the 20-year planning period will require the expenditure of approximately $1.0 to 1.5 billion, of which $200 to $300 million will be spent in Hawai'i. Construction will also involve the use of labor and materials, most of which is non-renewable and irretrievable.

Roughly 175 to 275 new jobs will be created in the County and statewide to operate the new facilities. Approximately $400,000 per year will be committed by the University of Hawai'i on an on-going basis to cover the costs of the operating a new management entity.

Operations are anticipated to increase the consumption of gasoline and diesel fuels, primarily for the support vehicle transportation, and coal and oil-powered electricity for facility operations. Both represent an irretrievable commitment of resources.

6.3.5 Adverse Environmental Effects That Cannot Be Avoided

Adverse impacts can be divided into short- and long-term effects. Short-term effects are generally associated with construction, and prevail only for the duration of the construction period. Long-term effects generally follow completion of the improvements, relate either simply to their existence or to the operation of the new facilities, and are permanent. Effects that can be considered both adverse and unavoidable are described below for both short-term and long-term effects:

6.3.5.1 Unavoidable Adverse Short-term Effects

- Soils and rock material will be temporarily disturbed by grading, excavation and mounding activities at the project sites during construction.
- Temporary increases in soil erosion will also result from construction operations, and minor amounts of soil may be carried beyond construction sites.
- Possibly, small amounts of natural vegetation, will be removed to allow construction of the planned new observatory sites.
- Arthropods occupying the soils and rock material at the recycle facilities and new observatory project sites will be affected by construction activities.
- Operation of construction equipment, trucks and worker vehicles may temporarily impede traffic along the public roads serving Mauna Kea during the construction period.

- Negligible releases of air contaminants will occur from construction equipment emissions. Small amounts of dust may be generated during dry periods as a result of construction operations.

- Minor increases in noise levels may result from construction activities.

- Views of construction equipment operations and construction sites will be noticeable during the construction periods.

6.3.5.2 Unavoidable Adverse Long-term Effects

- Minor modifications to the current topography at each project site will be made to accommodate the planned improvements and facilities.

- There will be unavoidable effects to the visual setting of the summit cinder cones due to the presence of the redeveloped and new observatories.

- The will be unavoidable affects to the cultural setting of the summit due to the presence of the redeveloped and new observatories.

- Utilization of potable groundwater from the Hilo water system will increase from the current use level of approximately 10 to 20 per cent.

- Wastewater requiring treatment and disposal will be managed via the existing and future individual wastewater systems. The total wastewater flow is estimated to increase by approximately 10 to 20 per cent with the new facilities.

- The added emissions from an increase in vehicles associated with the new facilities – primarily the added employee and visitor vehicles – will have a negligible effect on air quality in the area.

- Noise levels will increase slightly due to the small increase in traffic to the summit and the Visitor Information Station.

- There will be a slight loss of flora and fauna habitat.

- The traffic on the Summit Road and Saddle Road associated with new facilities on Mauna Kea will likely cause a minor reduction in traffic flow, and may cause some minor delays, as compared to existing conditions.

- There will be a very minor increase in demand on police and fire protection services.

Section 7.0

Alternatives to the Proposed Master Plan

7.0 ALTERNATIVES TO THE PROPOSED MASTER PLAN

Alternatives to the proposed Master Plan and Management Plan that were considered include the following options: (1) No Action Alternative, (2) Postponing Actions of the Master Plan Pending Further Study, (3) Alternative Locations for Proposed Actions of the Master Plan, (4) Limiting Development While Improving Existing Facilities, (5) More Intensive Development than the Proposed Master Plan, and (6) Management Organization Alternatives.

7.1 No Action

This alternative would have significantly less beneficial and relatively more adverse impacts than will the implementation of the proposed Master Plan and Management Plan. In this scenario, there would be no improvement to the existing issues with astronomy development activities or management of the natural, cultural, educational and recreational resources.

The entire 11,288-acre Science Reserve could remain open for possible future development of astronomy facilities, or other buildings associated with research or recreation. There would be no establishment of an Astronomy Precinct to limit the future development of astronomy facilities to a defined area with the least potential impact to resources. As compared to the proposed action, the potential impacts to wildlife, shrines and cultural resources could be greater under this option due to the lack of the "no-build" Precinct boundary, and no change to the management of the mountain.

The no action option would not improve the current management status, and there would be no move to place management responsibilities with a local Hawai'i Island entity. Efforts to involve the Hawai'i Island community in an ongoing advisory role would not be instituted in this alternative. Altogether, the No Action Alternative would result in detrimental impacts to the resources of the mountain and the Hawai'i Island community.

The 1983 Plan was projected out to 2000, therefore, with no action there would be no revision or update to the current plan for the Science Reserve. The failure to complete an update to the Master Plan at this time would not provide a planning response as recommended by the State Auditor in 1998.

7.2 Postponing Actions of the Master Plan Pending Further Study

To postpone the actions of the Master Plan and Management Plan would result in many of the same negative effects anticipated to occur under the No Action Alternative. There are few technical issues which are pending further study that could resolve outstanding questions about the Science Reserve resources and potential impacts. Previously completed and newly commissioned studies of flora, fauna, geology, archaeology, cultural resources, infrastructure have been consulted for during this master planning process.

The specific project designs and anticipated schedules for the new and redeveloped observatories have not been completed at the time of this document. An advantage of postponing action may be to clarify projections of future observatories. This presents a dilemma in that the Plan could be delayed indefinitely for clarification. At no point would a projection of a future observatory be certain. Individual project proposals will have their own environmental studies and CDUA permit review, therefore, the details of each project will be evaluated and refined prior to the actual development proceeding. There are several technical issues that remain unanswered with some of the proposed observatories.

As compared to the proposed action, the potential impacts to wildlife, shrines and cultural resources could be greater under this option due to the lack of the "no-build" Precinct boundary and no change to the management of the mountain. There would be additional studies completed of these resources under this alternative approach. The Office of Mauna Kea Management may also choose to conduct these types of updated studies under the proposed updated plan.

7.3 Alternative Locations for Proposed Actions of the Master Plan

There are several possible alternative locations for the planned new observatories and recreational support facilities in the Master Plan. Alternative locations for these facilities could be considered using the following parameters: (a) Land–based locations for new observatories other than Mauna Kea, (b) Alternative locations for new observatories in the Science Reserve, and (c) Space-based facilities.

(a) Alternative Locations for Observatories Besides Mauna Kea – There are several possible locations that may be suitable for developing new observatories in the Northern Hemisphere. These include locations in Arizona, New Mexico, Canary Islands, California, and Mexico. Mauna Kea presents a number of unique qualities that make it the best location in the Northern hemisphere, and possibly the world, for land-based astronomy. These factors include altitude, favorable atmospheric qualities, frequency of clear weather, latitudinal position, and mid-ocean position (lack of other visible land-based light sources). In addition, Mauna Kea has a quality fiber optic communications system, is easily accessible from quality airports and relatively short roadway transit distances, and nearby population support centers (Hilo, Waimea) with an educated workforce and friendly people. These technical criteria and desirable features cannot be matched anywhere in the world.

For the types of new observatory facilities being proposed in the next 20 years, only the top astronomy research ideas, in terms of new facilities will be considered for development on Mauna Kea. With the proposed new facility budgets potentially ranging from $200 million to over $1.0 billion, the proposing consortiums will seek to place their facility at the best possible location to provide the best chances for a successful research effort. Given these factors, Mauna Kea is generally the preferred location for the newest major observatory facilities in the Northern Hemisphere. As has been the trend in the past, new facility proposals will be evaluated on a case-by-case basis for their compliance with the Master Plan, and the less significant projects will continue to be guided to other quality astronomy locations. For the residents of Hawai'i, development and operation of astronomy facilities on Mauna Kea provides significant economic

benefit. As compared to the proposed action, the potential impacts to wildlife, shrines and cultural resources would be less under this option.

(b) Alternative Locations within the Science Reserve – The proposed establishment of the Astronomy Precinct would create a 525-acre area within which future observatories could be proposed, and developed if found to be consistent with the provisions of the new Master Plan. A fundamental reason for proposing the Astronomy Precinct is to protect the rich archaeological and cultural resources of the upper slopes and summit region. Locations outside of the Astronomy Precinct pose the potential for significant adverse effects to both archaeological sites and culturally-significant landforms. Under this alternative, other locations within the Science Reserve could be considered for development of observatories.

The undeveloped *pu'u* of the Science Reserve would present high quality locations for future observatory development. One of the finest possible observatory locations on Mauna Kea is Pu'u Poli'ahu. This site was tested in the 1970's for its potential qualities for astronomy observations, and found to be a high quality location. Several of the proposed new observatories could consider locating at the summit of Poli'ahu, however, this would violate an overriding principal of cultural sensitivity that underlies the Master Plan. Oral histories and community testimonies have shown that Poli'ahu and the other undeveloped *pu'u* on Mauna Kea are sacred and should not be altered with new observatories or other development. Further uses besides the undeveloped *pu'u* are possible, such as the large array projects which would extend across the slopes and be highly visible. It is expected that facilities developed at locations outside the Astronomy Precinct would create greater impacts than those planned appropriately within the lower-impact siting areas identified within the Astronomy Precinct. As compared to the proposed action, the potential impacts to wildlife, shrines and cultural resources could be greater under this option.

(c) Space-based observatory facilities. The possible deployment of space-based telescopes to replace ground-based telescopes at Mauna Kea (or elsewhere on Earth) has been suggested as as an alternative to future expansion. The existing Hubble Space Telescope has been successful in producing high quality images but is limited by the area of its 2.5-m light collecting surface. There are plans to build a larger 8 m. or 10 m instrument to be called the Next Generation Space Telescope (NGST), however, the timing for this instrument is beyond 10 years.

Further, there are limitations to a space-based instrument that ground-based telescopes are superior. Large mirrors and their associated equipment cannot be practically transported, constructed and operated in space.

Ground-based telescopes are also needed to support space-based instruments to aid in the resolution of images. For example, the 10 m. instrument at Keck Observatory on Mauna Kea serves as a ground-based support for the Hubble, since it provides a 4:1 ratio of light collecting area. Given the plans for the 8 to 10 m. space telescope, there will be a need to provide a ground-based instrument in the range of 32 to 40 m mirror size. Current plans are for such a facility (Next Generation Large Telescope or NGLT) to be located at Mauna Kea within the 20-year timing of this Master Plan.

In comparison to a ground-based telescope, there are also tremendous differences in the cost of constructing, deploying, operating and maintaining just one space-based instrument. The large number of astronomy research projects that are on-going would could not be satisfied by one or two space-based instruments. Given the cost limitations, the types of research limitations, and the need for ground-based telescope support, there is no likelihood in the foreseeable future that space telescopes will replace ground-based telescopes on Mauna Kea.

The development of space-based telescopes would have no direct impact on the resources of Mauna Kea. The new observatories on Mauna Kea that could provide ground-based support for the future Next Generation Space Telescope would have the same impacts as discussed with the proposed actions of the Master Plan. As compared to the proposed action, the potential impacts to wildlife, shrines and cultural resources would be less under this option.

7.4 Limiting New Development While Improving Existing Facilities

This alternative considers the possible limited redevelopment of astronomy facilities to areas which are presently occupied with observatories. This would include the development of expanded recreational and visitor support facilities at Hale Pohaku.

This scenario would include the redevelopment of the older observatories at the summit ridge (UH 0.6m, UH 2.2, UKIRT, CFHT and NASA/IRTF) and the older facilities in millimeter valley (CSO and JCMT). There would be no new observatory sites developed in this alternative.

Major redevelopment programs would allow for new facilities to replace the existing older telescopes along the summit ridge. However, the larger facilities being considered for the future, such as the NGLT, would not be possible to construct on the ridge due to the site configuration and topography. Further, the radio and optical/IR interferometer types of facilities being proposed in the future could not be developed.

Given these constraints on the future use of Mauna Kea for locating new astronomy instruments, the world astronomy community would eventually need to look elsewhere to develop these "next generation" instruments. In this scenario, Mauna Kea would eventually diminish in its importance scientifically, and may no longer be considered as the world's premier observatory complex several decades from now. As compared to the proposed action, the potential impacts to wildlife, shrines and cultural resources would be less under this option. There would ultimately be a tangible impact upon the State and County economy due to the eventual diminished construction, employment, direct and indirect spending, and government revenues.

7.5 More Intensive Astronomy and Recreational Facilities Development

This alternative considers the possible expansion of astronomy facilities to areas outside the planned Astronomy Precinct. Another aspect of this alternative could be the development of larger and more expansive observatories within the Astronomy Precinct. Options such as the development of substantial recreational/visitor support facilities could expand development to locations such as the summit ridge, undeveloped *pu'u* such as Poli'ahu, or areas adjacent to the Natural Area Reserve.

In the past, proposals for very intensive development have been presented to the University from international consortiums. One recent proposal for a large radio astronomy array involved 40 towers extending up to three kilometers along the Hilo side of the summit. The project would have been fully visible from Hilo and not aesthetically pleasing. These types of projects would not be allowed under the proposed Master Plan, however, it could proceed under an alternative intensive development plan for the summit.

All of these scenarios would be in basic conflict with the goals of the Master Plan. The Master Plan proposes for limited astronomy development is within a confined area of least potential impact to natural and cultural resources. Expanded observatory development could have significant impacts to the natural and cultural resources of the Mauna Kea Science Reserve. Astronomy development of the major undeveloped *pu'u* within the Science Reserve, such as Poli'ahu or Līlīnoe, would create significant impacts to the visual and cultural setting. New roadways would also be required to service new facility sites located beyond the existing infrastructure network. As compared to the proposed action, the potential impacts to wildlife, shrines and cultural resources could be greater under this option.

7.6 Management Organization Alternatives

There are numerous options that could be considered in terms of the management organization for the Mauna Kea Science Reserve. Ongoing responsibilities of the Mauna Kea Support Services (MKSS) are assumed to maintain the roads and the lodging and meal functions at Hale Pōhaku. Several management organization options that were discussed with the Mauna Kea Advisory Committee during 1998/99 included alternative structures possible for a local Hawai'i island management. The options for alternative management structures range from improving DLNR's existing staffing, to creating a new third-party management organization. The MKAC strongly supports the creation of a Hawai'i island-based management entity to take local responsibility for decisions and actions affecting the use of the mountain. These management organization options are discussed further below.

- Expanded DLNR/UH Management. The idea of expanding DLNR's role on the mountain would involve adding ranger staff to the Division of Forestry and Wildlife, and providing direct attention to the resources of both the NAR and the Science Reserve. This approach was felt to be difficult to implement, since the DLNR has taken this responsibility since the creation of the 1995 Management Plan, yet has not been able to follow-through due to budgetary constraints. Adding staff to DLNR might improve some of the current resource impact problems, however, it would not be community-based in its management focus, nor would it be limited only to management issues specifically involving just the Science Reserve. Ongoing coordination with the University would be necessary to share certain responsibilities. This option would result in a continuation of the existing gaps in the management function.

- New Third-Party Management. The creation of a third-party manager or authority was also considered. This involves the creation of a new management entity or the hiring of an existing organization to manage the mountain resources. An existing organization with land management experience, such as the Nature Conservancy, is a possible suggestion for this role. The gap in this management scenario was felt to be the lack of direct involvement of the University in the control of astronomy requirements in the Science Reserve.

Section 8.0

Summary of Unresolved Issues

8.0 SUMMARY OF UNRESOLVED ISSUES

Several unresolved issues have been identified in the planning process for the Mauna Kea Science Reserve and Hale Pōhaku. There are both physical planning issues and management issues which remain unresolved at the time of this document.

In addition to identifying these issues, the discussion focuses on how these issues may be resolved prior to commencement of the planned Physical Plan improvements and the implementation of Management Plan proposals, or the overriding reasons for proceeding without resolving the issues.

8.1 Carrying Capacity of Mauna Kea Science Reserve

The so-called carrying capacity of the Science Reserve to accommodate new observatories and other research or recreational facilities is quite large. The capacity for development essentially limited by the availability of usable sites (not steep slopes) and infrastructure service, such as roadways and electrical power. The current infrastructure serving the summit is adequate to support several times the existing number of observatories. With over 11,000 acres available, the Science Reserve would offer numerous locations that could be suitable for locating new astronomy facilities. With this as a measure, there is the potential "capacity" to build several hundred observatories on the summit of Mauna Kea.

From a technical standpoint only, each of the major pu'u and the broad upper slopes would represent logical locations for major new telescopes, although roadways and utilities would need to be extended to serve these locations. Large-scale expansion of astronomy across the Science Reserve could be accomplished without direct effects to the known archaeological sites. This estimate of capacity largely disregards potential impacts to views and cultural landforms, yet this scale of development would be within the "capacity" of the support facilities of roads and utilities currently serving the summit.

The development scope outlined in the Master Plan clearly shows no future expansion of observatories beyond the Astronomy Precinct. The carrying capacity will be strictly limited to those sites within low potential impact areas as defined within the Astronomy Precinct.

8.2 Scope of Future Astronomy Facilities Expansion

The limited expansion of astronomy facilities within the 525-acre Astronomy Precinct is unacceptable to those who believe that no further astronomy expansion should occur. The astronomy research community continues to support the limited future expansion of the observatory complex on Mauna Kea to accommodate new technologies and demand for astronomy research at the leading edge.

There is another position that opposes the expansion of astronomy facilities beyond its existing developed sites. This position would allow existing observatories to redevelop, within strict guidelines that limit their size and color, and no new observatories should be built. The redevelopment of existing observatories would be required to limit the extent of work to the existing disturbed areas on these sites.

The question of limited astronomy expansion versus allowing only redevelopment was raised in the Mauna Kea Advisory Committee meetings. The MKAC voted to support a draft of the Master Plan which limits the expansion of astronomy facilities to specific locations identified within the proposed Astronomy Precinct. The new Mauna Kea Advisory Board will have an advisory function which will examine the compliance of new facility proposals with the Master Plan and its Design Guidelines.

8.3 Access Management

The proposed management of vehicular access for visitors to Mauna Kea is not resolved. Some interests would prefer that vehicle access remain unrestricted, while others would prefer that this access is managed in the future. The Master Plan calls for no restrictions on traditional (foot) access for Hawaiian cultural practitioners, naturalists and hunters.

Those is support of managed vehicular access believe that public safety and resource protection are best achieved through the creation of a check-in station, limited hours of public access, and vehicle standards. The check-in station and visitor center would help educate visitors about altitude health issues and monitor in/out travel, along with limiting only four-wheel drive vehicles only between Hale Pōhaku and the summit. Some feel that a new management scheme should not place these types of constraints on visitors to the Science Reserve, and allow open access at all times to the summit.

Specific management proposals, such as vehicular access control, will be addressed by the Office of Mauna Kea Management and the Mauna Kea Advisory Board. These groups will establish rules for operation of the Hale Pōhaku Visitor Center and the Summit Road, including hours for public access to the Science Reserve, and other policies for vehicle standards, weather advisories, and road closure conditions.

8.4 Decision Authority Over New Observatory Proposals

The policy authority of the proposed Mauna Kea Advisory Board and Office of Mauna Kea Management is directed toward protecting the resources of the Science Reserve. These new management entities would be responsible for managing the uses of the land in keeping with the new Master Plan and Management Plan. New observatory construction proposals would be reviewed by these groups, and advisory recommendations would be passed on to the Chancellor of UH Hilo.

Some would prefer that the new management entity would have decision-making powers for new astronomy development proposals. Decision-making on these matters is currently the authority

of the UH Board of Regents, and are not expected to delegate these powers to the new management group. This position is also shared by the Board of Land and Natural Resources, which has discretionary authority over the Conservation District Use Permit process.

8.5 Native Hawaiian Cultural Issues

Many Native Hawaiians have participated in the public information process, including the Mauna Kea Advisory Committee, over 12 public meetings, and the EIS review process. There exists a wide range of opinion regarding the proposed Master Plan and the appropriate direction for the future of Mauna Kea and the Science Reserve from a Hawaiian cultural perspective. The subject is unresolved and will continue to be a subject of discussion on an ongoing basis in the management of the Science Reserve.

There are many that voiced their concern about the development of additional observatories at Mauna Kea. The oral history portion of the cultural assessment identified approximately 20 people who held this position. During the public meetings and small group meetings, other Hawaiians have voiced support for a respectful plan to preserve the cultural integrity of the summit while permitting carefully sited new observatories where they pose the least potential impact to the summit resources.

The improvement to the management of the Science Reserve is generally appreciated by Native Hawaiians. However, it is deemed essential that access rights be retained for Native Hawaiian religious worship and traditional activities. Finally, ongoing involvement in the Kahu/Kupuna Advisory Committee will guide the future Science Reserve management activities to be more sensitive to and inclusive of the concerns of the Native Hawaiian people.

Section 9.0

Required Approvals and Permits

9.0 REQUIRED APPROVALS AND PERMITS

The proposed planned improvements under the Master Plan are consistent with and support the intent of the State Conservation District, the County of Hawaii General Plan.

The following is an approximate list of major approvals and permits and their status required for implementation of the planned improvements.

Ministerial permits will be obtained as required such as building, grading, etc.

TABLE 9-1

Required Approvals and Permits

Permit or Approval	Authority	Status
Programmatic Master Plan Environmental Impact Statement	Chapter 343, HRS, Governor, State of Hawaii	In Progress
Individual Projects: Environmental Assessment or EIS Conservation District Use Permit	Board of Land & Natural Resources	In Progress

Section 10.0

Master Plan References

10.0 MASTER PLAN REFERENCES

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Section 11.0

Preparers of the Final EIS

11.0 PREPARERS OF THE FINAL ENVIRONMENTAL IMPACT STATEMENT

This environmental impact statement has been prepared for the University of Hawai'i by Group 70 International, Inc. The following list identifies the individuals and organizations involved in the preparation of this EIS and their respective roles in the preparation of this document.

Group 70 International, Inc.

Francis S. Oda, AIA, AICP	Principal-in-Charge
Jeffrey H. Overton, AICP	Project Manager and Principal Author
George I. Atta, AICP	Management Plan
Christine M. Ruotola, AICP	Senior Planner
Kimberly Evans	Planner
Kathryn Nam	Graphics Manager
Joy Rabara	Graphics

Technical Consultants

Kumu Pono Associates/Kepa Maly	Oral Histories
Paul H. Rosendahl, Ph.D., Inc.	Cultural Impact Assessment
DLNR/Patrick McCoy, Ph.D.	Archaeology
DLNR/Holly McEldowney, Ph.D.	Historic Preservation Plan
Sam O. Hirota, Inc.	Civil Engineering
SMS Research and Marketing, Inc.	Economic Impacts
Char & Associates	Botanical Resources
Howarth, Brenner and Preston	Arthropod Assessment

Section 12.0

Comments and Responses

Consulted Parties and/or Commenting Parties	N.O.P. (May 99)	DEIS (Aug 99)
A. Federal Agencies		
U.S. Army Corps of Engineers - Pacific Ocean Division	--	
U.S. Army Corps of Engineers - Civil Works Technical Branch		X
U.S. Department of the Interior - Fish and Wildlife Service	X	X
U.S. Department of the Interior - National Park Service	--	
U.S. Department of Agriculture - Natural Resource Conservation Service	--	
B. State Agencies		
Department of Accounting and General Services		X
Department of Business, Economic Development and Tourism		
Office of State Planning	X	
Department of Defense	X	
Department of Education		
Department of Health		
Commission on Persons with Disabilities		
Environmental Management Division	X	X
Office of Environmental Quality Control	X	X
Department of Land and Natural Resources	X	X
Historic Preservation Division		X
Land Management Division		X
Division of Forestry & Wildlife		X
Department of Transportation	X	X
Hawaii State Library - Hawaii Document Center		
Office of Hawaiian Affairs	X	X
University of Hawaii - Environmental Center	X	X
Water Resources Research Center		
C. County of Hawaii		
Mayor Steven Yamashiro	X	X
County Council Chair James Arakaki		X
Department of Civil Defense		
Department of Research and Development	X	X
Department of Public Works	X	X
Planning Department		X
Department of Water Supply		X
Police Department		X

Consulted Parties and/or Commenting Parties	N.O.P. (May 1999)	DEIS (Aug 99)
D. Other Parties		
Mauna Kea Advisory Committee (23 members)		
Larry Kimura	--	
William Wilson, Ph.D.	--	
Gerald DeMello	--	
Virginia Goldstein	--	
William Heacox, Ph.D.	--	
Richard Henderson	--	
Rex Johnson	--	
Jerry Johnson, Ph.D.	--	
James Juvik, Ph.D.	--	
Bill Kikuchi	--	
Herring Kalua	--	
Robert McLaren, Ph.D.	--	
Patrick McCoy, Ph.D.	--	
Alika Maikui	--	
Nelson Ho (author for Sierra Club - Hawaii Chapter)	X	X
Imaikalani Namahoe	--	
Monty Richards	--	
Betty Snowden	--	
Hannah Kihalani Springer	--	
Leinaala Teves	--	
Mililani Trask	--	
Charlene Unoki	--	
James Arakaki (also listed under County Council)		X
D. Other Parties Providing Comments		
Life of the Land	X	X
Sierra Club - Hawaii Chapter	X	X
Anthony Ako Anjo & Valerie Luhiau Anjo	X	X
James Roberts, Ph.D.	X	
Universe Trail & Bikeway Outdoor Learning Center	X	
Deborah Ward	X	
Kepa Maly and Kamakoanaona Pomroy-Maly		X
Anakura Melemai		X
John F. Villesvik		X
Alexa Russell		X
George Russell		X
Rev. Tuck Wah K. Lee		X

Consulted Parties and/or Commenting Parties	N.O.P. (May 99)	DEIS (Aug 99)
Genesis Lee Loy		X
Elizabeth G. L. Loy		X
Hannah Wahinemaikai o Ka'ahumanu Keli'iulanui Nani'ole o Kalama Kane Reeves		X
Ululani Evangelista		X
Eleanor K. Ahuna		X
Carole Nervig		X
Connie Y. K. Erger		X
Edward G. Stevens		X
Beings in Touch (Mare Grace)		X

NOTE: "X" indicates that a written response was received.
"--" indicates no written communication was received.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Ecoregion
300 Ala Moana Boulevard, Room 3122
Box 50088
Honolulu, Hawaii 96850

In reply refer to: MSR

RECEIVED
JUN 24 1999.
GROUP 70

JUN 23 1999

Jeff Overton
Group 70 International, Inc.
925 Bethel St., 5th Floor
Honolulu, HI 96813-4307

Re: Environmental Impact Statement Preparation Notice for the Mauna Kea Science Reserve Master Plan, Hamakua District, Island of Hawaii

Dear Mr. Overton:

The U.S. Fish and Wildlife Service (Service) has reviewed the Environmental Impact Statement Preparation Notice (EISPN) for the Mauna Kea Science Reserve Master Plan, Hawaii. The project sponsor is the University of Hawaii. The proposed Mauna Kea Science Reserve Master Plan (MKSRMP) includes a physical plan and a resources management plan, the stated purpose of which is to preserve natural and cultural resources in the reserve while specifying the scope of astronomy facilities development at the summit and support facilities development at Hale Pohaku for the years 2000 to 2020. The proposed project site is entirely located on land owned by the State of Hawaii and managed by the Institute for Astronomy, an affiliate of the University of Hawaii. The Service offers the following information for your consideration.

As the EISPN acknowledges, the summit area of Mauna Kea is home to a unique Hawaiian ecosystem. Several endemic arthropods including a lycosid spider (*Lycosa* sp.), a moth species belonging to the genus *Agrotis*, and the Wekiu bug (*Nysius wekiuicola*) are found on Mauna Kea and nowhere else in the world. Currently, the Wekiu bug is a candidate for Federal listing under the Endangered Species Act. To the best of our knowledge, no other federally endangered, threatened, or candidate species, significant wetlands, or other federal trust resources occur in the immediate area of the proposed project site.

The Service recommends that the Draft EIS adequately describe the scope of the proposed project, fully analyze reasonable alternatives to the preferred action, and assess the impacts to wildlife resources anticipated to result from each alternative under consideration. Specifically, the Service

recommends that the Draft EIS thoroughly address potential impacts from the proposed project on the Wekiu bug and the other endemic Mauna Kea arthropods and their habitats. We recommend that the Draft EIS describe how unnecessary impacts will be avoided and how unavoidable impacts will be minimized through the implementation of specific Best Management Practices and other measures. Adequate compensation for any anticipated significant unavoidable impacts should be proposed in the Draft EIS.

The EISPN states that the MKSRMP reduces the area for potential astronomy development from 11,228 acres to approximately 600 acres and simultaneously proposes preservation of the balance of 10,628 acres. The Service supports the proposed preservation, but we have concerns based on a February 1998 Hawaii State Auditor report (no. 98-6) entitled: "Audit of the Management of Mauna Kea and the Mauna Kea Science Reserve." This report states that the "... focus on telescope construction on Mauna Kea's summit...was at the expense of neglecting the site's natural resources" and indicated that in the past, the project sponsor has been remiss in implementing adequate resource protection measures while disregarding self-imposed limits to astronomy development on the summit. Thus, we recommend that the Draft EIS identify whether and how the proposed preservation area is to remain permanently off-limits to development in the future; address what general resource protection measures are proposed for the area; and discuss the funding necessary for management and preservation of the area.

The EISPN states that the MKSRMP includes plans for protection and preservation of areas around the recorded habitat of the Wekiu bug. Scientific research and observations to date indicate that approximately the same 600-acre area defined in the EISPN as the Astronomy Precinct and proposed for further intensified development coincides with the preferred and optimal habitat for the Wekiu bug. The Draft EIS should fully discuss and consider this factor and present a fair range of alternatives for a summit management plan. The EISPN also mentions plans for future redevelopment or expansion of five of the existing observatory sites and construction plans for four new observatory sites within the proposed Astronomy Precinct. Based on this, the Service recommends that the Draft EIS discuss the cumulative impacts from summit development on the significant resources at the site.

In addition, the Draft EIS should address the following issues:

Future Construction

a) Introductions of Alien Species

Many alien species are introduced to Hawaii every year, including a linyphiid spider that has recently been recorded on the Mauna Kea summit. This alien species is known to be a high-altitude dweller, which is suspected to have been inadvertently brought in with materials from another high-altitude astronomy site. The accidental introduction of certain alien arthropods may decimate populations of one or more of the sensitive, endemic summit-dwelling species. Boxes, crates, vehicles, and other container items should be inspected before entry into the summit area. The Service recommends the Draft EIS discuss standard inspection techniques that can be established in staging areas (or at the port of origin) before materials are transported to the summit.

b) Disturbance to Wekiu Bug Habitat

The Draft EIS should identify proposed measures to minimize impacts to the Wekiu bug, including adequate erosion control to ensure that project-related sediments and dust are not blown or washed into the interstitial spaces between rocks that provide habitat for the Wekiu bug and other native arthropods. The Service recommends that construction be prohibited on all currently undeveloped Wekiu bug habitat areas within the reserve. Redevelopment of previously developed sites should include limiting clearing and grading activities to the minimum necessary at specified project sites.

c) Garbage Collection and Containment

There have been numerous past observations of widely strewn construction-related debris on the summit. The Service recommends that the Draft EIS address this issue and propose on-site garbage control measures, including the requirement that all trash and garbage containers always be covered while they are within the summit area. We believe that it is necessary to control trash and garbage at the source since later retrieval of this material from surrounding areas can cause damage to important Wekiu bug habitat.

Minimize Visitor Impact

When discussing recreational activities, the EISPN states that all existing forms of recreation currently allowed will continue to be permitted. This contradicts a management recommendation in an April 1999 report entitled: "An Arthropod Assessment within Selected Areas of the Mauna Kea Science Reserve," which was prepared for and funded by the project sponsor. The report recommends that skiing and snow play on Mauna Kea be discouraged and/or restricted to specific sites and times when the snow is deep and impacts to Wekiu bug habitat would be minimal. The Service supports this recommendation since it is widely believed that disturbance of snow-patch habitats during periods of high Wekiu bug activity may be detrimental to its survival. The Draft EIS should outline a management plan for winter activities on Mauna Kea.

The Service recommends that areas where Wekiu bug populations are the greatest, or where they occur during periods of extremely low population levels, be clearly identified and marked with appropriate signage and be placed off-limits to visitors. Areas that are worthy of being off-limits include portions of the outer scoria (loose, mid-sized rocks) slopes of Pu'u Hauoki and Pu'u Wekiu in the summit region and Pu'u Mahoe and Pu'u Makanaka in the lower areas.

Comprehensive Monitoring Program

The Service believes an integrated natural resources management plan should include a comprehensive monitoring program. Since astronomy development began on the summit in 1963, only two formal on-site arthropod studies have been conducted. Since 1963, an estimated 25% of the potential Wekiu bug habitat has been lost due to astronomy development. Recent studies have corroborated incidental observations that Wekiu bug populations have declined. Therefore, the Service recommends the Draft EIS discuss implementation of a long-term environmental monitoring program designed to provide the project sponsor with inferences about ecological changes and the impacts of its management strategies on natural resources within the reserve.

The Service appreciates the opportunity to comment on the EISPN for the proposed project. We look forward to reviewing the Draft EIS when it is available. If you have any questions regarding these comments, please contact Fish and Wildlife Biologist Mike Richardson b telephone at (808) 541-3441 or facsimile transmission at (808) 541-3470.

Sincerely,

Robert P. Smith

Robert P. Smith
Pacific Islands Manager

August 26, 1999

U.S. Department of the Interior
Fish and Wildlife Service
300 Ala Moana Boulevard, Room 3122
Honolulu, HI 96850

Attention: Robert P. Smith, Pacific Islands Manager

GROUP 70
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Chad M. Asuncion, AIGA
Christine M. Ruotola, AICP
Stuart M. Jow, AIA

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft EIS Notice of Preparation

Dear Mr. Smith:

Thank you for providing comments on the Draft EIS Notice of Preparation for the Mauna Kea Science Reserve Master Plan in your letter of June 23, 1999. The following responses address the scope of issues you have raised for consideration in preparing the Draft EIS.

Endemic Arthropods

The Draft EIS addresses the potential impacts to endemic arthropods, and proposes mitigation measures to minimize effects to sensitive habitat areas. Essentially, the cinder cone habitat areas of the Wēkiu bug will be preserved through the actions of the Master Plan. Development activities are limited to non-cinder areas which are not habitat areas for the Wēkiu bug.

Please provide us with the information documenting the current federal listing status of the Wēkiu bug.

Alien Species

We appreciate the information you provide regarding high-altitude arthropod species that could be inadvertently introduced to Mauna Kea. Measures such as inspection and fumigation are being considered for boxes and crates, especially those originating from other high-altitude locations.

Garbage Collection

The Management Plan proposes several measures to minimize trash and garbage at the summit, including the measures you propose for managing construction trash and garbage containers.

Visitor Impact

Recreational activities at Mauna Kea will be managed under the new management office. The Mauna Kea Advisory Board will make recommendations on the management of recreational activities at the summit. Protection of sensitive habitat areas at the summit should be considered by these management entities.

Monitoring

UH has conducted recent surveys to update earlier investigations of the Wēkiu bug population. On-going monitoring of the Wēkiu bug is a recommendation of the Master Plan, however, a specific program for monitoring has yet to be defined. Monitoring programs for other aspects of the overall environment at Mauna Kea could be considered by the management office, with the potential for a link with the environmental educational programs at UH Hilo.

Thank you again for providing your comments on the Draft EIS Notice of Preparation. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

BENJAMIN J. CAYETANO
GOVERNOR
SEIJI F. NAYA
DIRECTOR
BRADLEY J. MOSSMAN
DEPUTY DIRECTOR
David W. Blane
DIRECTOR, OFFICE OF PLANNING

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

OFFICE OF PLANNING
235 South Beretania Street, 6th Flr., Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Tel.: (808) 587-2846
Fax: (808) 587-2824

Ref. No. P-8095

May 24, 1999

RECEIVED
MAY 27 1999
GROUP 70

Mr. Jeffrey Overton, AICP
Group 70 International, Inc.
925 Bethel Street, 5th Floor
Honolulu, Hawaii 96813-4307

Dear Mr. Overton:

Subject: Notice of Preparation of Draft Environmental Impact Statement, Mauna Kea Science Reserve Master Plan

We agree with the actions proposed for the preparation of the environmental impact statement provided that they consider the Coastal Zone Management (CZM) objectives and policies of Chapter 205A, Hawaii Revised Statutes. Since the CZM area encompasses all lands and waters of the State, it is important to demonstrate the project's compliance with CZM. This assessment should be included in the environmental impact statement as required by the administrative rules of the Office of Environmental Quality Control.

With regard to water quality problems, issues, or concerns, we recommend that the Hawaii Coastal Nonpoint Pollution Control Program Management Plan be consulted. This document contains management measures provided by the Environmental Protection Agency and the National Oceanic and Atmospheric Administration, of which we must assure implementation.

If there are any questions, please contact Steve Olive of our CZM Program at 587-2877.

Sincerely,

David W. Blane
Director
Office of Planning

c: Mr. Allan Ah San, UH

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Stuart M. Jow, AIA

August 26, 1999

Office of Planning, DBEDT
State of Hawai'i
235 South Beretania Street, 6th Floor
Honolulu, HI 96804

Attention: David W. Blane, Director

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft EIS Notice of Preparation

Dear Mr. Blane:

Thank you for providing comments on the Draft EIS Notice of Preparation for the Mauna Kea Science Reserve Master Plan in your letter of May 24, 1999. The following responses address the scope of issues you have raised for consideration in preparing the Draft EIS.

The Draft EIS will address Coastal Zone Management (CZM) objectives and policies of Chapter 205A, HRS. There appears to be minimal potential for non-point pollution of coastal waters due to future construction activities on Mauna Kea. Management measures will also be considered to minimize erosion of soils from construction areas.

Thank you again for providing your comments on the Draft EIS Notice of Preparation. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

BENJAMIN J. CAYETANO
GOVERNOR

MAJOR GENERAL EDWARD V. RICHARDSON
DIRECTOR OF CIVIL DEFENSE

ROY C. PRICE, SR.
VICE DIRECTOR OF CIVIL DEFENSE

PHONE (808) 733-4300
FAX (808) 733-4287

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE DIRECTOR OF CIVIL DEFENSE
3949 DIAMOND HEAD ROAD
HONOLULU, HAWAII 96816-4495

June 8, 1999

RECEIVED
JUN 16 1999
GROUP 70

TO: Group 70 International
924 Bethel Street
Honolulu, Hawaii 96813-4398

FROM: Roy C. Price, Sr.
Vice Director of Civil Defense

SUBJECT: MAUNA KEA SCIENCE RESERVE MASTER PLAN ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION

We appreciate this opportunity to comment on the Environmental Impact Statement Notice of Preparation, Mauna Kea Science Reserve Master Plan, Maui, Hawaii.

Although State Civil Defense (SCD) does not have a present need for a radio site at or near the summit of Mauna Kea and/or Hale Pohaku, we support the prospect that access for Federal, State or county public safety agencies could be required in the future. Any plan to limit transmitters on Mauna Kea must be balanced with the needs of all public safety agencies.

Our SCD planners and technicians are available to discuss this further if there is a requirement. Please have your staff call Mr. Norman Ogasawara of my staff at 733-4300.

August 26, 1999

Department of Defense
State of Hawai'i
3949 Diamond Head Road
Honolulu, HI 96816-4495

Attention: Roy C. Price, Sr.; Vice Director of Civil Defense

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft EIS Notice of Preparation

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Chad M. Asuncion, AIGA
Christine M. Ruotola, AICP
Stuart M. Jow, AIA

Dear Mr. Price:

Thank you for providing comments on the Draft EIS Notice of Preparation for the Mauna Kea Science Reserve Master Plan in your letter of June 8, 1999. The following responses address the issues you have raised for consideration in the Draft EIS.

The need to install a radio relay/transmitter site on the Mauna Kea summit for Federal, State or County civil defense agencies could possibly be accommodated for use during emergency events only. However, there is no provision for such a facility in the Master Plan, and further discussion of this is required. The primary concern is the possibility of interference with the radio astronomy instruments and other observatory equipment that may be sensitive to radio waves. Any new structure that could create adverse visual impacts would also be a concern.

We would like to speak with your staff to better understand these suggestions. Thank you again for providing your comments on the Draft EIS Notice of Preparation. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801

BRUCE S. ANDERSON, Ph.D., M.P.H.
DIRECTOR OF HEALTH

RECEIVED
JUN - 1
GROUP 70

In reply, please refer to:
File:

May 26, 1999

99-104/epo

Mr. Jeffrey H. Overton
Chief Environmental Planner
Group 70 International, Inc.
925 Bethel Street, Fifth Floor
Honolulu, Hawaii 96813-4307

Dear Mr. Overton:

Subject: Environmental Impact Statement Preparation Notice (EISPN)
Mauna Kea Science Reserve Master Plan

Thank you for allowing us to review and comment on the subject document. We would like to see the Draft EIS address wastewater disposal, and we would appreciate receiving a copy of the Draft EIS.

Sincerely,

GARY GILL
Deputy Director for
Environmental Health

GROUP 70
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August 26, 1999

Department of Health
State of Hawai'i
P.O. Box 3378
Honolulu, HI 96801

Attention: Gary Gill, Deputy Director for Environmental Health

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft EIS Notice of Preparation

Dear Mr. Gill:

Thank you for providing comments on the Draft EIS Notice of Preparation for the Mauna Kea Science Reserve Master Plan in your letter of May 26, 1999. The following responses address the scope of issues you have raised for consideration in preparing the Draft EIS.

The Draft EIS will address wastewater management at the Mauna Kea Science Reserve. We will provide you a copy of the Draft EIS.

Thank you again for providing your comments on the Draft EIS Notice of Preparation. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

BENJAMIN J. CAYETANO
GOVERNOR

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

RECEIVED
JUN 24 1999
GROUP 70

June 21, 1999

Mr. Eugene Imai
Senior Vice President for Administration
University of Hawaii
2444 Dole Street, Bachman Hall
Honolulu, Hawaii 96822

Dear Mr. Imai:

1. Mauna Kea is one of the scenic wonders of Hawaii. Preservation of the visual characteristic of the summit is very important. Please illustrate the visual impacts of the proposed structures from public places such as roads and lookouts. Photos of existing conditions taken from public view points are helpful in evaluating visual impacts. Renderings of future structures superimposed on photos of existing views should be provided.

2. Mauna Kea is of great significance to the traditions and beliefs of the Hawaiian people. Mauna Kea's cultural value must be recognized. Please evaluate whether traditional customs, practices, beliefs and/or sites of importance to native Hawaiians will be impacted by the project. For direction, please refer to the enclosed "Guidelines for Assessing Cultural Impacts."

3. The summit of Mauna Kea contains many significant biological resources. Please study the impacts of the project on the flora and fauna based on the enclosed "Content Guidelines for Biological Surveys, Ecosystem Impact Analysis and Mitigation Measures."

4. The EISPN describes "ecological sustainability" as a theme for the Mauna Kea summit. What is the carrying capacity of the summit? How would the master plan manage and control activity within the summit area?

5. The project area is on ceded lands. Please consult with the Office of Hawaiian Affairs regarding this matter. Document your consultation in the Draft EIS.

6. The recent legislative audit on the management of Mauna Kea cited several shortcomings on the part of the University of Hawaii in managing the summit area. We would like to explore the possibility of requiring the UH Institute of Astronomy or individual observatory developers to secure a bond to ensure that commitments to protect the environment in summit area are honored. Please discuss the pros and cons of requiring the Univeristy or individual develops to obtain such a bond.

Should you have any questions, please call Jeyan Thirugnanam at 586-4185. Thank you.

Sincerely,

Genevieve Salmonson
Director

Enclosures

c: Jeff Overton

GUIDELINES FOR ASSESSING CULTURAL IMPACTS

Adopted by the Environmental Council, State of Hawaii
November 19, 1997

I. INTRODUCTION

It is the policy of the State of Hawaii under Chapter 343, HRS, to alert decision makers, through the environmental assessment process, about significant environmental effects which may result from the implementation of certain actions. An environmental assessment of cultural impacts gathers information about cultural practices and cultural features that may be affected by actions subject to Chapter 343, and promotes responsible decision making. Articles IX and XII of the State Constitution, other state laws, and the courts of the state require government agencies to promote and preserve cultural beliefs, practices, and resources of native Hawaiians and other ethnic groups. Chapter 343 also requires environmental assessment of cultural resources, in determining the significance of a proposed project.

The Environmental Council encourages preparers of environmental assessments and environmental impact statements to analyze the impact of a proposed action on cultural practices and features associated with the project area. The Council provides the following methodology and content protocol as guidance for any assessment of a project that may significantly affect cultural resources.

II. CULTURAL IMPACT ASSESSMENT METHODOLOGY

Cultural impacts differ from other types of impacts assessed in environmental assessments or environmental impact statements. A cultural impact assessment includes information relating to the practices and beliefs of a particular cultural or ethnic group or groups.

Such information may be obtained through scoping, community meetings, ethnographic interviews and oral histories. Information provided by knowledgeable informants, including traditional cultural practitioners, can be applied to the analysis of cultural impacts in conjunction with information concerning cultural practices and features obtained through consultation and from documentary research.

In scoping the cultural portion of an environmental assessment, the geographical extent of the inquiry should, in most instances, be greater than the area over which the proposed action will take place. This is to ensure that cultural practices which may not occur within the boundaries of the project area, but which may nonetheless be affected, are included in the assessment. Thus, for example, a proposed action that may not physically alter gathering practices, but may affect access to gathering areas would be included in the assessment. An ahupua'a is usually the appropriate geographical unit to begin an assessment of cultural impacts of a proposed action, particularly if it includes all of the types of cultural practices associated with the project area. In some cases, cultural practices are likely to extend beyond the ahupua'a and the geographical extent of the study area should take into account those cultural practices.

The historical period studied in a cultural impact assessment should commence with the initial presence in the area of the particular group whose cultural practices and features are being assessed. The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs.

The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both man made and natural, including submerged cultural resources, which support such cultural practices and beliefs.

The Environmental Council recommends that preparers of assessments analyzing cultural impacts adopt the following protocol:

(1) identify and consult with individuals and organizations with expertise concerning the types of cultural resources, practices and beliefs found within the broad geographical area, e.g., district or ahupua'a;

(2) identify and consult with individuals and organizations with knowledge of the area potentially affected by the proposed action;

(3) receive information from or conduct ethnographic interviews and oral histories with persons having knowledge of the potentially affected area;

(4) conduct ethnographic, historical, anthropological, sociological, and other culturally related documentary research;

(5) identify and describe the cultural resources, practices and beliefs located within the potentially affected area; and

(6) assess the impact of the proposed action, alternatives to the proposed action, and mitigation measures, on the cultural resources, practices and beliefs identified.

Interviews and oral histories with knowledgeable individuals may be recorded, if consent is given, and field visits by preparers accompanied by informants are encouraged. Persons interviewed should be afforded an opportunity to review the record of the interview, and consent to publish the record should be obtained whenever possible. For example, the precise location of human burials are likely to be withheld from a cultural impact assessment, but it is important that the document identify the impact a project would have on the burials. At times an informant may provide information only on the condition that it remain in confidence. The wishes of the informant should be respected.

RECEIVED AS FOLLOWS

Primary source materials reviewed and analyzed may include, as appropriate: Mahele, land court, census and tax records, including testimonies; vital statistics records; family histories and genealogies; previously published or recorded ethnographic interviews and oral histories; community studies, old maps and photographs; and other archival documents, including correspondence, newspaper or almanac articles, and visitor journals. Secondary source materials such as historical, sociological, and anthropological texts, manuscripts, and similar materials, published and unpublished, should also be consulted. Other materials which should be examined include prior land use proposals, decisions, and rulings which pertain to the study area.

III. CULTURAL IMPACT ASSESSMENT CONTENTS

In addition to the content requirements for environmental assessments and environmental impact statements, which are set out in HAR §§ 11-200-10 and 16 through 18, the portion of the assessment concerning cultural impacts should address, but not necessarily be limited to, the following matters:

1. A discussion of the methods applied and results of consultation with individuals and organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints or limitations which might have affected the quality of the information obtained.

2. A description of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken.

3. Ethnographic and oral history interview procedures, including the circumstances under which the interviews were conducted, and any constraints or limitations which might have affected the quality of the information obtained.

4. Biographical information concerning the individuals and organizations consulted, their particular expertise, and their historical and genealogical relationship to the project area, as well as information concerning the persons submitting information or interviewed, their particular knowledge and cultural expertise, if any, and their historical and genealogical relationship to the project area.

5. A discussion concerning historical and cultural source materials consulted, the institutions and repositories searched, and the level of effort undertaken. This discussion should include, if appropriate, the particular perspective of the authors, any opposing views, and any other relevant constraints, limitations or biases.

6. A discussion concerning the cultural resources, practices and beliefs identified, and, for resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site.

7. A discussion concerning the nature of the cultural practices and beliefs, and the significance of the cultural resources within the project area, affected directly or indirectly by the proposed project.

8. An explanation of confidential information that has been withheld from public disclosure in the assessment.

9. A discussion concerning any conflicting information in regard to identified cultural resources, practices and beliefs.

10. An analysis of the potential effect of any proposed physical alteration on cultural resources, practices or beliefs; the potential of the proposed action to isolate cultural resources, practices or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place.

11. A bibliography of references, and attached records of interviews which were allowed to be disclosed.

The inclusion of this information will help make environmental assessments and environmental impact statements complete and meet the requirements of Chapter 343, HRS. If you have any questions, please call us at 586-4185.

CONTENT GUIDELINES FOR BIOLOGICAL SURVEYS, ECOSYSTEM IMPACT ANALYSIS AND MITIGATION MEASURES

Introduction:

Hawaii State law calls for efforts to prevent or eliminate damage to the environment and biosphere and the protection of endangered species and indigenous plants and animals. To meet this goal, special care must be taken to assess a proposed project's impact on biological resources.

The purpose of the state's environmental review law is to encourage full, accurate and complete analysis of proposed actions, promote public participation and support enlightened decision making by public officials. To assist agencies and applicants in meeting this legal purpose, the Office of Environmental Quality Control offers the following guidelines for preparers of environmental reviews under the authority of HRS 343.

These guidelines do not constitute rules or law. They have been refined by staff, student interns and peer review to provide a helpful checklist of items that will assist planners in preparing an adequate biological survey.

An Environmental Assessment or Impact Statement for a project that may affect biological resources should contain a biological survey that considers the items and issues described below.

Part I. Biological Surveys: Methods and Content

1. Survey Method

Timing

Surveyors should take into account the activities of nocturnal, migratory and seasonal species and conduct surveys accordingly. (e.g. a survey of wetland flora should take place during the rainy season to observe otherwise dormant species.)

Route and Coverage

A thorough flora/fauna survey, should provide the following:

* a map containing the survey routes
* a minimum of 50% coverage of the study area (although smaller areas may merit a larger percentage of study coverage)
* the areas covered must include a composite of all terrain present (i.e., ridge tops, wetland, slope, riparian habitat etc.)
* accounting for native invertebrate populations may be accomplished by estimating the coverage of host flora.

Adjacent Streams

Stream conditions both up and down-stream from a survey site should be assessed. The Hawaiian Stream Bio-assessment Protocol (HSBP) developed by the Environmental Planning Office of the Department of Health may be utilized in studying habitat and biotic quality of streams.
The Hawaii Stream Assessment produced by the Commission on Water Resource Management (CWRM) should also be consulted to identify waterways that qualify as a "heritage" streams. Investigators should also consider CWRM's Stream Protection and Management (SPAM) system administrative rules and consult with DLNR's Division of Aquatic Resources.

Literature Search

Literature and database sources should be searched for historical sightings of significant biological resources. Consult sources such as the **Manual of the Flowering Plants of Hawaii**, the Bishop Museum, The Nature Conservancy's Hawaii Heritage Program Database listings, the U.S. Fish and Wildlife Service, the National Biological Service, the State Department of Land and Natural Resources Division of Forestry and Wildlife and Natural Area Reserve Commission, the University of Hawaii botany, zoology and geography departments and the Audubon Society.

On-island experts should be contacted for information on historical sightings of significant species which may not be present during the survey (e.g., migratory water birds, ephemeral plants).

2. Ecosystem Characterization

Description
A description of the ecosystem should include the following:

* an analysis of principal community types including both native and non-native organisms and the biological values of these community types
* note the presence and condition of plant and animal communities based on elevation, moisture, substrate, topography and physiography (examples include: coastal dry shrublands; montane wet forests; seasonal or perennial wetlands and streams; anchialine pools; aeolian lava flow systems; and subterranean cave ecosystems)
* a description of any obligate species (those requiring specific niches)
* a list any applicable global ranks (established by the Nature Conservancy), describe species density (frequency of sightings or rate of occurrences), historical and current ranges and the location of notable species

Native Intactness

Analyze habitat intactness based on species composition. Assess the native bio-diversity of the project site based on alien-to-native species proportions and distributions and the presence of indicator species for a given ecosystem. Indicator species should be considered to identify potentially high quality ecosystems. For example, the presence of 'o'opu, or native goby species, (Lentipes concolor, Awaous stamineus, Sicyopterus stimpsoni), as well as hihiwai (Neritina granosa) in streams indicate unaltered stream conditions necessary for their survival.

Listed Species

Any rare, threatened and endangered species and their habitats should be listed and described. Indicate the presence and distribution of the following taxonomic groups:

* species listed as either endangered or threatened by the state or federal government or both
* species that are proposed or candidates to be listed as either endangered or threatened by the state or federal government or both
* species of concern as determined by the U.S. Fish and Wildlife Service (those which appear or are suspected to be declining and may eventually fall under one of the categories listed above)
* those species noted as rare or vulnerable by authorities on the specific taxa and not necessarily recognized by the State or Federal Endangered Species Act (such as insects)

In addition, note whether the habitat type is part of critical or essential habitat for the taxa listed above and restricted to the project area.

Resource Values

Note any historical and/or cultural importance related to the species or habitat. Also describe any economic, scientific, medicinal or recreational value related to the species or habitat. Non-governmental organizations, local community associations, oral histories, Hawaiian language texts, kupuna and recreational users can be consulted to obtain this information. The book, **Valued Economic Ecosystem Components** by Gorden Orian, identifies various resource economic indices that may be of assistance in this analysis.

3. Shelf life of biological surveys

If the biological survey for a given site is older than 5 years it should be updated. A new "walk through" of the site should be performed at a minimum. Project proponents should also consult with area experts to determine if any changes have occurred since the area was last surveyed.

Part II. Ecosystem Impact Analysis

1. Consistency with existing land use policy

The EA should include a full discussion of how the proposed action corresponds to existing county and state land use requirements, goals and objectives related to conservation. The analysis should relate to the following:

* State and county zoning
* County General Plans
* State Plan
* State Environmental Policy (HRS 344)

2. Habitat fragmentation and encroachment assessment

Determine whether the proposed action reduces the principal community types which are located on the given site and are part of the larger ecological community outside the project area.

For example, if the project alters native forest that occupies 10% of the project area, but represents 50% of that forest type remaining in the district, then the impact analysis should cover both the reduction of vegetation in the immediate project area and in the district as a whole.

Identify and assess areas that are generally intolerant to change such as wetland habitat, dryland forests and coral reefs. Analyze potential impacts resulting from catastrophic events (e.g. hurricanes, fires and landslides) in addition to the project impacts. Consider this cumulative impact on the survival of any species.

Noise impacts on the area should also be considered.

3. Alien species importation

Indicate whether and how the proposed action increases the potential for alien species dispersal that may affect native species. For example, if temporary access roads/corridors are to be built through pristine forest for construction in a disturbed area, discuss how the construction of access roads could increase

alien plant dispersal. Encroachment of exotic grasses that increase the area's fire hazard can also be a concern.

4. Cultural impact analysis

Discuss potential impacts to the cultural use of biological resources. The analysis should relate to native gathering and other traditional subsistence practices (e.g., fishing, aquaculture) as well as current cultural activities (e.g., commercial, scientific, recreational, educational).

5. Impacts on Streams and Coastal Waters

A project's impact on streams, rivers and coastal waters should be assessed. A project that alters streams could impact upon the following:

* wetlands, estuaries and fisheries
* native species, food sources, water quality, temperature and nutrient load
* reduction in flow leading to increased predation or competition from alien species
* siltation or contamination of habitat from run-off
* ground water resources or agricultural uses

Part III. Proposed mitigation measures

1. Vegetation alteration

If the proposed action reduces and/or alters existing vegetation, mitigation measures may include the following:

* incremental clearing of project site to reduce erosion and siltation
* concurrent application of geotextiles or other proven techniques in erosion-prone areas
* revegetation with native species

2. Alien species introduction and establishment

If the project is shown to increase the potential for alien species importation, then mitigation should include the cleaning of gear, equipment and clothing before, during and after the project is completed.

3. Ecosystem-wide and species-specific management of significant biological resources

If the project potentially impacts significant biological resources, mitigation of impacts should go beyond mere avoidance of the resources. The EA should consider direct management

and/or protection of sensitive species and their supporting ecosystems, to include the following:

* ecosystem protection planning: designation of heavy impact activities to areas within the project that can sustain them (e.g., previously degraded areas)
* habitat enhancement: selective weeding, native species outplanting
* subsequent monitoring: engage foresters and/or biologists to monitor effects of actions over time and direct additional management actions as needed

4. Project design

To reduce or mitigate a project's impacts, it may be appropriate to integrate the following components into its design:

* buffer zones to protect fragile areas
* walkways or boardwalks to protect sensitive areas
* native landscaping appropriate to the area
* detention and retention basins to control run-off
* vegetated rather than channelized stream banks

5. Alternative analysis

To direct harmful development away from sensitive native ecosystems, the project proponent should consider employing conservation techniques such as land exchanges, conservation easements, and management agreements with non-profit organizations. The Trust for Public Land and the Nature Conservancy, among other organizations, may provide technical assistance with developing these options.

August 26, 1999

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Stuart M. Jow, AIA

Office of Environmental Quality Control
State of Hawai'i
235 South Beretania Street, Suite 702
Honolulu, HI 96813

Attention: Genevieve Salmonson, Director

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft EIS Notice of Preparation

Dear Mrs. Salmonson:

Thank you for providing comments on the Draft EIS Notice of Preparation for the Mauna Kea Science Reserve Master Plan in your letter of June 21, 1999. The following briefly addresses the scope of issues you have raised for consideration in preparing the Draft EIS. The Draft EIS will contain more detailed information on these issues.

Visual Resources

The Draft EIS will include a complete visual resources section to address the potential impacts to views from locations both on the mountain and from lower elevation communities. Design guidelines are established in the Master Plan to guide the future development of observatories and other facilities on Mauna Kea.

Cultural Values

The Draft EIS describes how the Master Plan is centered around the cultural resources and values for Mauna Kea. There will be no actions in the Master Plan that conflict with the right to traditional access for Hawaiian religious worship. The Guidelines for Assessing Cultural Impacts were followed in the preparation of a Cultural Impact Assessment.

Biological Resources

Updated technical studies in the areas of botany and arthropods have been completed for the EIS. Rare flora and fauna are evaluated in these studies. The studies are consistent with the "Content Guidelines for Assessing Cultural Impacts".

Ecological Sustainability and Carrying Capacity

The physical plan and management plan components of the Master Plan emphasize ecological sustainability. These measures include the physical planning actions (the Astronomy Precinct limits, avoidance of habitat areas, etc.) and the management plan measures (rangers, monitoring, etc.).

On one level, the "carrying capacity" of the Science Reserve to accommodate new observatories and other research or recreational facilities is essentially a function of the

infrastructure service capacity such as roadways and electrical power, and land availability. The current infrastructure serving the summit is adequate to support several times the existing number of observatories. Land is obviously abundant. With this as a measure, there is the "capacity" to build several hundred observatories on the summit of Mauna Kea. This disregards potential impacts to environmental and cultural issues, yet would be within physical "capacity". The Plan embodies a "capacity" approach which is strongly guided by cultural and aesthetic concerns. There is no intent for future expansion of observatories beyond the Astronomy Precinct and the development scope outlined in the Master Plan.

Protection of Public Trust Land Resources

We recognize that Mauna Kea Science Reserve is comprised on state ceded lands. Ceded land issues are a State-wide concern that the Governor is presently addressing trust obligations to both the Native Hawaiian community and the general public. The Draft EIS addresses the measures proposed in the Master Plan for increased protection of natural and cultural resources, and greater sensitivity toward cultural practices.

Commitments to Protect the Environment

The mitigation measures that are proposed in the Draft EIS address the actions proposed in the programmatic Master Plan. Individual projects will have their own environmental documentation and mitigation plans. Conditions imposed as part of the CDUA permitting mandate that certain mitigation must be implemented. The Board of Land and Natural Resources is responsible for the conditions to be imposed on new projects in the Conservation District.

Thank you again for providing your comments on the Draft EIS Notice of Preparation. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P.O. BOX 621
HONOLULU, HAWAII 96809

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND DIVISION
STATE PARKS
WATER RESOURCE MANAGEMENT

Ref:PS:EH

JUN 25 1999

RECEIVED
JUN 28 1999
GROUP 70

Mr. Jeffrey Overton, AICP
Group 70 International, Inc.
925 Bethel Street, 5th Floor
Honolulu, HI 96813-4307

Dear Mr. Overton:

Subject: Mauna Kea Science Reserve Master Plan
Environmental Impact Statement Preparation
Notice (EISPN)

We have reviewed the subject EISPN document and note that the Land Division and the State Historic Preservation Division are represented on the Mauna Kea Advisory Committee.

In order to circulate the Draft EIS to other divisions and Hawaii District Offices such as the Division of Forestry and Wildlife for their review and comment, we would like to request that you forward five copies of the document to us when it is available.

Thank you for your attention and cooperation regarding this matter.

Should you have any questions or require further assistance, please contact staff planner Ed Henry at 587-0380.

Very truly yours,

TIMOTHY E. JOHNS
Chairperson

c.c. University of Hawaii
Atten. Allan Ah San
HDLO
DOFAW
HPD

GROUP 70
INTERNATIONAL

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Christine M. Ruotola, AICP
Stuart M. Jow, AIA

August 26, 1999

Timothy E. Johns, Chairperson
State of Hawaii
Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96809

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft EIS Notice of Preparation

Dear Chairperson Johns:

Thank you for providing comments on the Draft EIS Notice of Preparation for the Mauna Kea Science Reserve Master Plan in your letter of June 25, 1999.

Our office will provide five copies of the Draft EIS to your department to facilitate your review and comment. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

BENJAMIN J. CAYETANO
GOVERNOR

RECEIVED
JUN 17 1999
GROUP 70

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
BRIAN K. MINAAI
GLENN M. OKIMOTO

IN REPLY REFER TO:
STP 8.9111

June 14, 1999

Mr. Jeffrey H. Overton
Chief Environmental Planner
Group 70 International, Inc.
925 Bethel Street, 5th Floor
Honolulu, Hawaii 96813-4307

Dear Mr. Overton:

Subject: Mauna Kea Science Reserve Master Plan & Management Plan
Environmental Impact Statement Notice of Preparation

Thank you for your transmittal requesting our comments on the subject plans.

The proposed plans will not have a significant impact on our State transportation facilities.

We appreciate the opportunity to provide comments.

Very truly yours,

KAZU HAYASHIDA
Director of Transportation

c: Mr. Allan Ah San, University of Hawaii

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August 26, 1999

Department of Transportation
State of Hawai'i
869 Punchbowl Street
Honolulu, HI 96813-5097

Attention: Kazu Hayashida, Director of Transportation

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft EIS Notice of Preparation

Dear Mr. Hayashida:

Thank you for providing comments on the Draft EIS Notice of Preparation for the Mauna Kea Science Reserve Master Plan in your letter of June 14, 1999. The following responses address the scope of issues you have raised for consideration in preparing the Draft EIS.

The Draft EIS will address roadways which provide access to Mauna Kea. We acknowledge your conclusion that the Master Plan actions will not have a significant impact on State transportation facilities.

Thank you again for providing your comments on the Draft EIS Notice of Preparation. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

Group 70 International, Inc. • Architecture • Planning • Interior Design • Environmental Services • Building Diagnostics • Assets Management
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STATE OF HAWAI'I
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JUL - 7 1999
GROUP 70

TESTIMONY FROM THE
OFFICE OF HAWAIIAN AFFAIRS
HILO, HAWAII; MAY 27, 1999;6:30 P.M.

The Office of Hawaiian Affairs has reviewed the draft Environmental Assessment (DEA) for the Outrigger Telescope Project at the Keck Observatory on Mauna Kea, and has several comments and concerns with both the document and the project that can also apply to the University of Hawaii Draft Master Plan for the Mauna Kea Science Reserve.

Several of the sections in the DEA lack the level of detailed information necessary for a "Finding of No Significant Impact" (FONSI). For example, the section on fauna points to a 1982 study as the basis of information but later discloses that the study is "currently being update." Clearly the study should be updated since it is seventeen years old. However, it also indicates that the information contained in the DEA is inadequate. Most importantly, basing as FONSI on incomplete data is disingenuous.

Correspondingly, the section on Historical/Cultural Resources is insufficient. The summit of Mauna Kea is known for its cultural importance and its archaeological richness. It is surprising then, that no archaeological report is included in the DEA. Instead, the DEA references a 1982 archaeological study and concludes that as there are no "sites" within the project area there is no negative impact. On several levels this conclusion is inappropriate.

First, much new information and understanding of the Hawaiian people has been gained in the years between the 1982 study and today. New methods of research and new meaning have been developed. In an area which has the cultural important ascribed to Mauna Kea, reliance on outdated methods and information is not only inadequate it reflects incompetence.

Second, although section 8 is titled "Historical/Cultural Resources" there is no information on the cultural importance of Mauna Kea for Native Hawaiians. Important cultural reports prepared by Mrs. Pualani Kanakaole, Mr. Charles Langles and Mr. Kepa Maly for the University of Hawaii Advisory Committee on Mauna Kea clearly indicate the sacred nature of Mauna Kea. The exclusion of this information in the DEA is inexcusable. Furthermore, Group 70 has also ignored these cultural reports that bring true background and depth to the discussion on Historic and cultural resources.

Post-It™ brand fax transmittal memo 7671	# of pages ▸ 4
To Jeff Overton	From Jayan
Co.	Co.
Dept.	Phone #
Fax # 523-5874	Fax #

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Third, it appears that the Institute for Astronomy is avoiding a discussion of the cumulative impacts of the several projects both completed and anticipated for Mauna Kea by limiting the impact focus to the land area directly under this project. The attempt to segment or separate these impacts is unacceptable.

Also missing from the DEA is confirmation from the State Historic Sites Division that no negative impact to archaeological and cultural resources will result from this project. Absent a confirmation of no negative effect, a FONSI is not possible.

Finally, the document never discloses that the land leased by the University for this project is ceded land which implies trust obligations to both the Native Hawaiian community and the general public. Since the inception of the lease the University has ignored the multiple nature of this trust responsibility and has focused only on the objectives of the Institute for Astronomy. The disrespect for the sacred nature of Mauna Kea, as indicated by the lack of information contained in the DEA, combined with a failure to acknowledge the trust obligations inherent in the use of ceded land constitutes a major flaw in both the focus of the project and the disclosure requirements of the environmental process.

We urge the Institute for Astronomy to begin a consultation process, as required under Section 106 of the National Historic Preservation Act with the Office of Hawaiian Affairs as soon as possible.

Thank you for the opportunity to testify.

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FAX (808) 594-1865

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STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

TESTIMONY FROM THE
OFFICE OF HAWAIIAN AFFAIRS
KEALAKEHE, HAWAII; MAY 25, 1999;6:30 P.M.

The Office of Hawaiian Affairs has reviewed the draft Environmental Assessment (DEA) for the Outrigger Telescope Project at the Keck Observatory on Mauna Kea, and has several comments and concerns with both the document and the project that can also apply to the University of Hawaii Draft Master Plan for the Mauna Kea Science Reserve.

Several of the sections in the DEA lack the level of detailed information necessary for a "Finding of No Significant Impact" (FONSI). For example, the section on fauna points to a 1982 study as the basis of information but later discloses that the study is "currently being update." Clearly the study should be updated since it is seventeen years old. However, it also indicates that the information contained in the DEA is inadequate. Most importantly, basing as FONSI on incomplete data is disingenuous.

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First, much new information and understanding of the Hawaiian people has been gained in the years between the 1982 study and today. New methods of research and new meaning have been developed. In an area which has the cultural important ascribed to Mauna Kea, reliance on outdated methods and information is not only inadequate it reflects incompetence.

Second, although section 8 is titled "Historical/Cultural Resources" there is no information on the cultural importance of Mauna Kea for Native Hawaiians. Important cultural reports prepared by Mrs. Pualani Kanakaole, Mr. Charles Langles and Mr. Kepa Maly for the University of Hawaii Advisory Committee on Mauna Kea clearly indicate the sacred nature of Mauna Kea. The exclusion of this information in the DEA is inexcusable. Furthermore, Group 70 has also ignored these cultural reports that bring true background and depth to the discussion on Historic and cultural resources.

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Finally, the document never discloses that the land leased by the University for this project is ceded land which implies trust obligations to both the Native Hawaiian community and the general public. Since the inception of the lease the University has ignored the multiple nature of this trust responsibility and has focused only on the objectives of the Institute for Astronomy. The disrespect for the sacred nature of Mauna Kea, as indicated by the lack of information contained in the DEA, combined with a failure to acknowledge the trust obligations inherent in the use of ceded land constitutes a major flaw in both the focus of the project and the disclosure requirements of the environmental process.

We urge the Institute for Astronomy to begin a consultation process, as required under Section 106 of the National Historic Preservation Act with the Office of Hawaiian Affairs as soon as possible.

Thank you for the opportunity to testify.

August 26, 1999

Office of Hawaiian Affairs
State of Hawai'i
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Frank B. McCue, AIA
Chad M. Asuncion, AIGA
Christine M. Ruotola, AICP
Stuart M. Jow, AIA

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft EIS Notice of Preparation

Ladies and Gentlemen:

Thank you for providing a copy of your testimony on the Draft Environmental Assessment for the Outrigger Telescope Project for the Keck Observatories dated May 25 and 27, 1999.

Your testimony was delivered at public meetings of the Mauna Kea Advisory Committee, which was not a meeting addressing the Keck Outrigger project. Please note that your comments were not forwarded to the State Office of Environmental Quality Control by the Mauna Kea Advisory Committee. Let us also clarify that Group 70 is not involved with any of the documents prepared for the Keck Outrigger project and cannot respond to any of these specific comments.

We understand that you wish for your comments on the Keck Outriggers to be applied to the Mauna Kea Science Reserve Master Plan. The following responses address those issues you have raised which are relevant for consideration in preparing the Draft EIS.

Environmental Studies

Updated technical studies of environmental resources are being completed for the EIS in the areas of botany, arthropods, cultural resources/ethnography, and archaeological resources. Rare flora and fauna are evaluated in these studies. Each of the issues you raise regarding archaeological sites and mitigation are addressed in the EIS. DLNR is currently progressing with their completion of the Historic Preservation Plan, and the EIS will discuss the DLNR's current direction for the plan.

Cultural Resources

Updated archaeological and cultural resources studies have been completed for the new Master Plan. Further, the resources you have cited and others have all been consulted and integrated into the planning and analysis for the Master Plan. Group 70 has not ignored these studies, instead they form a crucial element of the foundation upon which the new Master Plan is based.

Cumulative Impacts

A principle focus of the Draft EIS is the discussion of potential cumulative impacts at the Mauna Kea Science Reserve. The Draft EIS will include a full discussion of potential cumulative impacts, including archaeological and cultural resources.

Ceded Land

Ceded land issues are a State-wide concern that the Governor is presently addressing trust obligations to both the native Hawaiian community and the general public.

Thank you again for providing your comments on the Draft EIS Notice of Preparation. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

BENJAMIN J. CAYETANO
GOVERNOR
STATE OF HAWAII

RAYNARD C. SOON
CHAIRMAN
HAWAIIAN HOMES COMMISSION

JOBIE M. K. M. YAMAGUCHI
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P.O. BOX 1879
HONOLULU, HAWAII 96805

RECEIVED
JUN 29 1999
GROUP 70

June 25, 1999

Mr. Jeffrey H. Overton
Chief Environmental Planner
Group 70 International, Inc.
925 Bethel Street, 5th Floor
Honolulu, Hawaii 96813-4307

Dear Mr. Overton:

Subject: Mauna Kea Science Reserve Master Plan

The Department of Hawaiian Home Lands has reviewed Draft #2 of the Master Plan (5/10/99) and Notice of Preparation of Draft Environmental Impact Statement (NPDEIS) (5/12/99) for the subject project. Following are our comments, concerns, and questions.

1. Protection of Public Trust Lands Resources: The Mauna Kea Science Reserve (MKSR) is comprised of state ceded lands identified in the State Constitution for specific purposes. It is described as the premier site for astronomy and now has the largest concentration of telescopes in the world. However, some of the existing and planned developments may be at the expense of natural and cultural resources that exist in the area. The report should discuss the recommendations in the State Auditor Report No. 98-6 issued in February 1998, especially with regard to the need for more protection of natural resources and greater sensitivity to cultural practices.

2. Public Trust Revenues: Due to the unique attributes of the MKSR site for astronomy, it should command a reasonable rent that can be used for other public trust purposes, including an allocation of a 20% portion of income to the Office of Hawaiian Affairs (OHA) to better conditions of native Hawaiians. Does the state charge rents for use of the lands, and are appropriate amounts being transferred to OHA?

3. Master Plan Areas and Management Organization: The NPDEIS on Page 2-6 states that the bulk of the Reserve (10,688 of 11,288 total acres) is to be designated as a natural/cultural preservation area. Several land use and management structural changes are proposed. The report should discuss the past management organization and how well it performed under the conditions of State General Lease S-4191. It should describe in more detail the new management organization, how it will be funded, its priorities, programs and policies. Consideration should be given to separating control and management of the Astronomy Precinct from that of the Natural/Cultural Preservation Area.

4. Impacts on Uses of Other Lands: As depicted in Figure VIII-1 of the Draft #2 report, the Department of Hawaiian Home Lands has jurisdiction over more than 50,000 acres on the southern and eastern slopes of Mauna Kea. We would like to know of Science Reserve operational requirements that may restrict the full use of Hawaiian home lands; e.g., limits on certain land uses, building materials, street lighting, household or agricultural activities, noise, exhaust systems, etc. Also, information on any MKSR activities that may have adverse impacts on homesteading or other uses of our downslope areas; e.g., exposure to dangerous radiation, migration of hazardous wastes, etc.

5. Mauna Kea Observatory Road Access: The existing access from the Saddle Road up to the 9,000 feet elevation was constructed over Hawaiian home lands without proper authorization or compensation to the DHHL, which has ownership jurisdiction. This matter needs to be resolved with entities that have authority, responsibility and ongoing interest in use of the access road.

6. Opportunities for Complementary Uses: The DHHL has a draft land use plan for its Humuula-Piihonua lands on the slopes of Mauna Kea. We would like to know if the uses being considered are complementary or in conflict with proposals in the subject MKSR Master Plan. For example, the DHHL's Humuula Sheep Station area near the Saddle/Observatory

access road intersection is designated for economic development. Can the University of Hawaii, Department of Land and Natural Resources and DHHL work out an agreement for coordinating land uses, economic development and commercial activities in the area?

7. Traditional Rights and Religious Freedom: The State Constitution provides for the protection of Native Hawaiian rights to enter onto public lands for subsistence, cultural and religious purposes. Amendments to the 1978 American Indian Religious Freedom Act provide for the free exercise of religion; and in order for sacred lands and landforms to be in a condition appropriate for religious use, the physical environment, water, plants and animals associated with the sites must be protected. We appreciate statements on Page 2-6 of the NPDEIS that "Future facilities will be designed and sited to avoid and minimize impacts to sensitive habitat and rare or fragile geological features" and "Modern cultural practitioners would have unrestricted access to the natural/cultural preservation area."

Thank you for allowing our input. Please include the department as a party for future consultations regarding this project. If you have any questions, please call Mr. Joe Chu of our Planning Office at 587-6421.

Aloha,

Raynard C. Soon, Chairman
Hawaiian Homes Commission

c: Allan Ah San, University of Hawaii at Manoa

GROUP 70
INTERNATIONAL

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Chad M. Asuncion, AIGA
Christine M. Ruotola, AICP
Stuart M. Jow, AIA

August 26, 1999

Department of Hawaiian Home Lands
State of Hawai'i
P.O. Box 1879
Honolulu, HI 96805

Attention: Raynard C. Soon, Chairman
Hawaiian Homes Commission

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft EIS Notice of Preparation

Dear Mr. Soon:

Thank you for providing comments on the Draft EIS Notice of Preparation for the Mauna Kea Science Reserve Master Plan in your letter of June 25, 1999. The following responses address the scope of issues you have raised for consideration in preparing the Draft EIS.

Protection of Public Trust Land Resources

We recognize that Mauna Kea Science Reserve is comprised on state ceded lands. Ceded land issues are a State-wide concern that the Governor is presently addressing trust obligations to both the Native Hawaiian community and the general public. The Draft EIS addresses the measures proposed in the Master Plan for increased protection of natural and cultural resources, and greater sensitivity toward cultural practices.

Public Trust Revenues

The observatories on Mauna Kea lie within the lease area held by the University of Hawai'i for educational and research purposes. There are no revenues to UH being generated from the existing observatories, rather these observatories provide viewing time on their instrument for UH researchers. The Draft EIS does not provide detailed examination of this issue because it is directly related to the on-going effort of the Governor to resolve the ceded land issues.

Master Plan Areas and Management Organization

The past management organization is described in the Draft EIS, as well as the future proposed management organization involving the Office of Mauna Kea Management and the Mauna Kea Advisory Board. The possibility of separating control and management of the Astronomy Precinct form that of the Natural/Cultural Preservation Area is being considered.

Inter-Relationship of the Science Reserve and DHHL Lands

Future activities proposed for the Humu'ula-Pi'ihonua lands will interact with the existing and future planned activities at the Science Reserve. Use of the roadway system is the most obvious interaction, where all researchers and visitors travelling to the Science Reserve will pass DHHL lands along the Mauna Kea Observatory Road. The future uses of the down slope lands are not anticipated to affect the operation of observatories in the Science Reserve, particularly if DHHL follows the County street lighting ordinance. The Draft EIS will address potential impacts to the DHHL lands resulting from the Master Plan and Management Plan.

Mauna Kea Observatory Road Access

Further discussion is necessary to address the authorization for development of the access roadway. Agreement for on-going access privileges across the roadway is specified in correspondence issued over 15 years ago.

Complementary Uses

We have examined the draft land use plan for the Humu'ula-Pi'ihonua DHHL lands. It is not clear what the exact form of land uses that are planned for economic development at the intersection of Saddle Road with the Observatory Access Road. We anticipate that these two uses will be complementary with the Master Plan uses, and wish to continue meeting with you and your staff to better understand the planning objectives.

Traditional Rights and Religious Freedom

The statements you have referenced in the Draft EIS Preparation Notice reflect the direction of the discussion to be presented in the Draft EIS on these issues. There will be no actions in the Master Plan that conflict with the right to traditional access for Hawaiian religious worship.

Thank you again for providing your comments on the Draft EIS Notice of Preparation. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

University of Hawai'i at Mānoa

Environmental Center
A Unit of Water Resources Research Center
2550 Campus Road • Crawford 317 • Honolulu, Hawai'i 96822
Telephone: (808) 956-7361 • Facsimile: (808) 956-3980

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JUL 21 1999
GROUP 70

July 8, 1999

PN:0090

Group 70 International, Inc.
925 Bethel Street, 5th Floor
Honolulu, Hi 96813-4307
Attn: Jeffrey Overton, AICP

Dear Mr. Overton:

Environmental Impact Statement Notice of Preparation
Mauna Kea Science Reserve Master Plan
District of Hamakua, Hawaii

Thank you for sending us the EIS Preparation Notice for the Mauna Kea Science Reserve Master Plan. We look forward to reviewing the Draft EIS when it is submitted for public review.

The Preparation Notice provided a brief overview of aspects of the project with some specific references to the Significance Criteria given in the EIS Rules (Chapter 200 section 12). Statements were made indicating that the project will not result in any significant loss or impacts, and minimal to no environmental degradation, cumulative impacts, or impacts to air or water quality etc., etc., etc. We would like to suggest that the draft EIS focus on a description of the specific actions that will be undertaken and how these actions may impact the environment, without necessarily ascribing either a positive or negative result to those impacts. The categorizing of impacts as positive or negative is a judgment call, based on the particular view or position of the viewer. A positive impact to one, may well be a major negative impact to another. For example, the construction of a dam creates a lake that provides fishing and water recreation activity as well as a water storage facility... positive impacts. For those people or biota living in the valley, now underwater, the impacts are obviously very negative.

The Mauna Kea Science Reserve DEIS should also describe possible mitigative measures to ameliorate or eliminate impacts that appear to be significant. The reader/agency can then evaluate the facts as to the relative significance of the impacts of the project, what mitigation measures are most reasonable and feasible, and what alternatives have been or should be considered. Certainly community/cultural sensitivity will be a key issue in this plan and must receive major attention along with the biological sensitivity of the mountain.

Again, thank you for including us on your mailing list and we will be pleased to offer our comments on the DEIS when it becomes available for reviewing.

Sincerely,

Jacquelin N. Miller

Jacquelin N. Miller Ph.D.
Assoc. Environmental Coordinator
Environmental Center, UH.

Cc: OEQC
John Harrison
Roger Fujioka
Allan Ah San

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August 26, 1999

University of Hawai'i at Mānoa
2550 Campus Road, Crawford 317
Honolulu, HI 96822

Attention: Jacquelin N. Miller, Ph.D.
Associate Environmental Coordinator

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft EIS Notice of Preparation

Dear Dr. Miller:

Thank you for providing comments on the Draft EIS Notice of Preparation for the Mauna Kea Science Reserve Master Plan in your letter of June 21, 1999. The following responses address the scope of issues you have raised for consideration in preparing the Draft EIS.

The Draft EIS will concentrate on the potential impacts and mitigation involving the natural and cultural resources of Mauna Kea. Specific actions proposed under the new Master Plan are addressed, however, there is limited detailed information available at this time on most projects. Each future action will complete its own environmental documentation. A focus of the Draft EIS is to address the alternatives and potential cumulative effects of the overall plans for the 20-year period covered in this Master Plan.

Thank you again for providing your comments on the Draft EIS Notice of Preparation. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

Stephen K. Yamashiro
Mayor

William G. Davis
Managing Director

Henry Cho
Deputy Managing Director

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MAY 0 3 1999
GROUP 70

County of Hawaii

25 Aupuni Street, Room 215 • Hilo, Hawaii 96720-4252 • (808) 961-8211 • Fax (808) 961-6553
KONA: 75-5706 Kuakini Highway, Suite 103 • Kailua-Kona, Hawaii 96740
(808) 329-5226 • Fax (808) 326-5663

May 4, 1999

Mr. Jeffrey H. Overton
Chief Environmental Planner
Group 70 International
925 Bethel Street, 5th Floor
Honolulu, HI 96813-4307

Dear Mr. Overton:

Thank you for the opportunity to comment on the Master Plan and Management Plan for the Mauna Kea Science Reserve.

I am in full support of the astronomy activities and the international community of scientists who work and live on the Big Island. Astronomy has contributed millions of dollars to our economy and has helped sustain us during our current recession. It has provided educational and employment opportunities for our people, and significantly contributed to our understanding of the universe.

The astronomy industry is now a key component of our University of Hawaii at Hilo Technology Park and is also an integral part of the Waimea community. In your review, I would ask that you keep in mind that astronomy is a cornerstone of our economy and our university.

Sincerely,

Stephen K. Yamashiro
MAYOR

Stephen K. Yamashiro
Mayor

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JUN 16 1999
GROUP 70

William G. Davis
Managing Director

Henry Cho
Deputy Managing Director

County of Hawaii

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June 10, 1999

Group 70 International, Inc.
925 Bethel Street, 5th Floor
Honolulu, HI 96813-4307
Attn: Jeffrey J. Overton, AICP

Dear Mr. Overton:

Thank you for the opportunity to submit comments on the Mauna Kea Master Plan - Environmental Impact Statement Notice of Preparation (EISPN).

I agree with many of the concepts proposed in the EISPN, including the proposed new management structure within the administrative purview of the Office of the Chancellor at UH Hilo and the appointment of a citizen's advisory board appointed by the University of Hawaii.

I also support the general concepts of multi-uses for scientific activities, recreation, hunting and religious and cultural practices and open access under certain restrictions for safety and resource protection.

While I support a variety of uses, my administration gives its full endorsement to the astronomy industry which has invested $600 million in our community in the development of one of best sites in the world to view the universe. The telescopes atop Mauna Kea employ over 350 people and contribute some $50 million annually to our economy. This industry has helped sustain us during difficult economic times.

The discoveries that have been made by the Mauna Kea scientists have been monumental and have advanced mankind's knowledge of the universe and our own planet. Mauna Kea as a site for astronomical observatories is one of the world's great resources that must be protected for this scientific endeavor.

Sincerely,

Stephen K. Yamashiro
MAYOR

GROUP 70
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Chad M. Asuncion, AIGA
Christine M. Ruotola, AICP
Stuart M. Jow, AIA

August 26, 1999

Mayor Steven K. Yamashiro
County of Hawai'i
25 Aupuni Street, Room 215
Hilo, HI 967220-4252

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft EIS Notice of Preparation

Dear Mayor Yamashiro:

Thank you for providing comments on the Draft EIS Notice of Preparation for the Mauna Kea Science Reserve Master Plan in your letters of May 4 and June 10, 1999. The following responses address the scope of issues you have raised for consideration in preparing the Draft EIS.

Your support of the Master Plan for the future of the Mauna Kea Science Reserve and the continued success of the observatories is noted. Your comments also recognized the improvements to the management of the Science Reserve, environmental and cultural resource protection, and economic development benefits. These issues are all addressed in the Draft EIS that will be forwarded to your office.

Thank you again for providing your comments on the Draft EIS Notice of Preparation. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

Stephen K. Yamashiro
Mayor

Diane S. Quitiquit
Director

County of Hawaii
DEPARTMENT OF RESEARCH AND DEVELOPMENT
25 Aupuni Street, Room 219 • Hilo, Hawaii 96720-4252
HILO: (808) 961-8366 • Fax (808) 935-1205 ~ KONA: (808) 329-5226 • Fax (808) 326-5663
E-mail: chresdev@interpac.net

June 23, 1999

RECEIVED
JUN 28 1999
GROUP 70

Mr. Jeffrey Overton AICP
925 Bethel Street, 5th Floor
Honolulu, HI 96813-4307

Dear Mr. Overton:

Re: Mauna Kea Science Reserve Master Plan
Environmental Impact Statement Notice of Preparation

We have reviewed the referenced Notice of Preparation and would like to express our support for many of the concepts proposed for management of the Mauna Kea Science Reserve including public access that is effectively managed so as to ensure safety and resource protection. We have the following comments for your consideration:

1. It is understood that, per Section 5.2, detailed descriptions of other management organization options will be provided in the EIS. In this context, we suggest that consideration be given to forming a Mauna Kea Authority that includes representatives of UHH, the astronomy facilities and relevant community interests. This authority would be the responsible body for management of the MK Science Reserve. This alternative would address the potential problem inherent in the proposed organizational structure where a Mauna Kea Advisory Board provides input to the Chancellor of UHH. Advisory boards often fail to work effectively on a long term basis - members become frustrated and alienated when they feel that their input and recommendations fail to be incorporated in management decisions.

2. While Table 2-1 provides a listing of existing and currently proposed observatories, it should be made clear that this list (presumably) does not represent a limit on potential new developments over the planning period.

3. Every observatory should have in place a plan (and funding source) for decommissioning in the event that the facility is closed and not replaced with a new one.

We thank you for the opportunity to comment.

Sincerely,

Raymond Carr
Economic Development Specialist

cc: Diane Quitiquit, Director

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Stuart M. Jow, AIA

August 26, 1999

Department of Research and Development
County of Hawai'i
25 Aupuni Street, Room 219
Hilo, HI 967220-4252

Attention: Mr. Raymond Carr,
Economic Development Specialist

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft EIS Notice of Preparation

Dear Mr. Carr:

Thank you for providing comments on the Draft EIS Notice of Preparation for the Mauna Kea Science Reserve Master Plan in your letter of June 23, 1999. The following responses address the scope of issues you have raised for consideration in preparing the Draft EIS.

Management Entities

The management section of the Draft EIS describes the proposed organization of the Office of Mauna Kea Management at UH Hilo, which would become the management authority for the Science Reserve and Hale Pōhaku. It is also proposed to create the Mauna Kea Advisory Board to provide the community with an on-going voice in the management of the Science reserve and Hale Pōhaku.

Existing and Proposed Observatories

The listing shown as Table 2-1 in the Draft EIS Preparation Notice reflects the current program for observatory redevelopment and new development. There will be refinements to the individual facility proposals as greater details emerge over time. No additional facilities are proposed under the Master Plan, and any additions would require major plan amendment.

Decommissioning Plan

The operating agreement and sublease requires each observatory organization (sublessee) to remove its property and restore the premises to even grade within one year after closure of observatory operations.

Thank you again for providing your comments on the Draft EIS Notice of Preparation. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

Stephen K. Yamashiro
Mayor

Jiro A. Sumada
Deputy Chief Engineer

County of Hawaii
DEPARTMENT OF PUBLIC WORKS
25 Aupuni Street, Room 202 • Hilo, Hawaii 96720-4252
(808) 961-8321 • Fax (808) 961-8630

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MAY 07 19[illegible]
GROUP 70

May 5, 1999

MR JEFFREY H OVERTON
GROUP 70 INTERNATIONAL INC
925 BETHEL STREET FIFTH FLOOR
HONOLULU HAWAII 96813-4307

SUBJECT : DRAFT ENVIRONMENTAL IMPACT STATEMENT
MAUNA KEA SCIENCE RESERVE MASTER PLAN
& MANAGEMENT PLAN
TMK: 3 / 4-4-15

We acknowledge receipt of your letter concerning the subject matter, and provide you with our comments as follows:

1. Any building construction shall conform to all requirements of code and statutes of the County of Hawaii.

2. All earthwork and grading shall be in conformance with Chapter 10, Erosion and Sediment Control, of the Hawaii County Code.

3. The Mauna Kea access road, just below Hale Pohaku, at the North Hilo-Hamakua boundary line, is maintained by the County of Hawaii, Department of Public Works. Any work within the County right-of-way shall be in conformance with Chapter 22, Streets and Sidewalks, of the Hawaii County Code.

Should there be any questions concerning this matter, please feel free to contact Mr. Casey Yanagihara in our Engineering Division at (808)961-8327.

Galen M. Kuba, Division Chief
Engineering Division

CKY

Stephen K. Yamashiro
Mayor

Jiro A. Sumada
Deputy Chief Engineer

County of Hawaii

DEPARTMENT OF PUBLIC WORKS
25 Aupuni Street, Room 202 • Hilo, Hawaii 96720-4252
(808) 961-8321 • Fax (808) 961-8630

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JUN - 5
GROUP 70

May 27, 1999

MR JEFFREY H OVERTON
GROUP 70 INTERNATIONAL INC
925 BETHEL STREET FIFTH FLOOR
HONOLULU HAWAII 96813-4307

SUBJECT : ENVIRONMENTAL IMPACT STATEMENT, NOP
MAUNA KEA SCIENCE RESERVE MASTER PLAN
TMK: 3 / 4-4-15: 9 & 12

We acknowledge receipt of your letter concerning the subject matter, and provide you with our comments as follows:

1. Any building construction shall conform to all requirements of code and statutes of the County of Hawaii.

2. All earthwork and grading shall be in conformance with Chapter 10, Erosion and Sediment Control, of the Hawaii County Code.

3. The Mauna Kea access road, just below Hale Pohaku, at the North Hilo-Hamakua boundary line, is maintained by the County of Hawaii, Department of Public Works. Any work within the County right-of-way shall be in conformance with Chapter 22, Streets and Sidewalks, of the Hawaii County Code.

4. We see no discussions on the existing or proposed roadway systems or their maintenance.

Should there be any questions concerning this matter, please feel free to contact Mr. Casey Yanagihara in our Engineering Division at (808)961-8327.

Galen M. Kuba, Division Chief
Engineering Division

CKY

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Chad M. Asuncion, AIGA
Christine M. Ruotola, AICP
Stuart M. Jow, AIA

August 26, 1999

Department of Public Works
County of Hawai'i
25 Aupuni Street, Room 202
Hilo, HI 967220-4252

Attention: Mr. Galen M. Kuba, Division Chief

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft EIS Notice of Preparation

Dear Mr. Kuba:

Thank you for providing comments on the Draft EIS Notice of Preparation for the Mauna Kea Science Reserve Master Plan in your letters of May 5 and May 27, 1999. The following responses address the scope of issues you have raised for consideration in preparing the Draft EIS.

Building Construction

Building construction at the Science Reserve and Hale Pōhaku will conform to the requirements of code and statues of the County of Hawai'i.

Earthwork and Grading

Earthwork and grading at the Science Reserve and Hale Pōhaku will conform with Chapter 10, Erosion and Sediment Control of the Hawai'i County Code.

Mauna Kea Access Road

Thank you for informing us of the County maintenance section for the Access Road. It is understood that work within the County right-of-way will conform with Chapter 22, Streets and Sidewalks, of the Hawai'i County Code.

Roadway Systems

The existing and proposed roadway system will be addressed in the Draft EIS.

Thank you again for providing your comments on the Draft EIS Notice of Preparation. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

LIFE OF THE LAND

Ua Mau Ke Ea O Ka 'Aina I Ka Pono
Hawai`i's own Community Action Group
Protecting our Fragile Environment through
Research, Education, Advocacy and Litigation

FO ✓
Team ✓

Ben Cayetano
Governor, State of Hawaii
c/o Office of Environmental Quality Control
235 South Beretania St. Suite 702
Honolulu 96813

Francis Oda
Group 70
925 Bethel, Fifth Floor
Honolulu, HI 9681

re: Mauna Kea Master Plan (MKMP) Environmental Impact Statement Preparation Notice (EISPN)

Aloha,

Life of the Land is Hawai`i's own environmental and community action group advocating for the people and the land since 1970. our mission is to preserve and protect the life of the land through sustainable land use and energy policies and to promote open government through research, education, advocacy and, when necessary, litigation.

It is difficult for us to look at any expansion of Mauna Kea Science Reserve when a 1998 Legislative Audit charged the University of Hawai`i ("UH") and the Department of Land and Natural Resources ("DLNR") with "having failed to implement adequate controls to balance environmental concerns with astronomical development." The Mauna Kea Advisory Committee, 23 members appointed by UH President Kenneth Mortimer, has many of the same people criticized by the audit. Why is this?

*** 76 North King Street * Suite 203 * Honolulu, Hawai`i 96817 * phone: 533-3454 * fax: 533-0993 ***
*** email: lifeoftheland@hotmail.com ***

We were at a briefing at the Board of Land and Natural Resources ("BLNR") several years ago when scientists from Mauna Kea were asking to create roads on the mountain so that they could bring equipment to remote areas. At that meeting, a staff person from the State Office of Historic Preservation showed slides and talked about the many sacred sites on Mauna Kea and then showed pictures of the garbage strewn across this sacred place. We remember feeling very sad that Mauna Kea was being treated with such disrespect.

Also attending that same meeting, were some people who worked at Haleakala who questioned why roads were needed at all. Why couldn't the equipment be backpacked in to the area to preserve this fragile environment as they do on Maui? We wondered the same thing. We left that briefing feeling that the scientific community just did not understand what Mauna Kea means to the people of Hawai`i and the Pacific.

Prior Agreements

Life of the Land asks that you include in the Draft Environmental Impact Statement ("DEIS") a discussion on how the application complied with prior agreements with respect to the number of telescopes allowed and their stewardship of this sacred mountain. We do not want some comment like: "some conditions were broken, but they are now being corrected." Please specify exactly who violated what conditions, and how the new conditions will be enforced to see that this does not happen in the future.

Telescope Definitions

In regard to the number of telescopes, we have a few questions: What is the definition of a telescope? Is a telescope "one lens" requiring "one pad"? Are there smaller units requiring the construction of "pads" around that one telescope? If so, how many smaller units? How many lenses are currently on Mauna Kea? At full build-out, how many lenses are being proposed? At full build-out, what is the maximum number of lenses that could be built? What is a telescope? How was a telescope defined in the First Master Plan? When was the first multiple-lens single-telescopes built anywhere in the world?

If two telescope lenses are located on different continents and are always tied together by a dedicated communication line and a computer, are they one telescope? Are these definitions peculiar (arcane) to astronomy? What is an array element? When was this term first used with regard to telescopes? Do astronomers have a different definition of telescopes that found in common usage dictionaries (please be specific)?

Stewardship

As to the applicant's stewardship of the mountain, the only thing the greater community can rely on is the astronomers performance to date. Has the caretaker been a good caretaker of the Summit? Have they treated Mauna Kea with respect? What actions have they taken to manage waste generated by the telescope community? How can the greater community be assured that Mauna Kea will be respected and cared for with almost three times the current development being planner for in the near future? Who is responsible for enforcement of any agreement made? Is there a clause for "citizen's suits" in any agreement planned or currently existing? What guarantee does the greater community have that our voices will be heard? Would your "citizen's advisory committee" have the clout to stop bad actions on Mauna Kea? When will your "citizen's advisory committee" hold its first meeting under the State's Sunshine Laws? How will meetings of the "citizen's advisory committee" be "noticed" to encourage public participation?

How will meetings of the "Management Authority" be "noticed" to encourage public participation? What will be the exact structure of the Management Authority? The Management Authority should have representatives of the public. The majority of the public representation should be Hawaiians.

Currently, the Astronomy Precinct is controlled by the Institute for Astronomy (IfA), which, in turn, falls under the management control of the University, which is headed by President Kenneth Mortimer. Thus the buck stops at President Kenneth Mortimer.

Under the new proposal, the Astronomy Precinct would be held accountable by the Chancellor of the University of Hawai`i's Hilo ("UHH"). UHH is held accountable through the chain of command to University of Hawai`i's President Kenneth Mortimer.

Thus, the front door approach - through IfA - and the back-door approach - through UHH - appear to be ultimately the same management.

Please comment in detail on the management approaches and give strengths and weaknesses for different options.

Recycling

When the applicant speaks of "recycling two to four of the existing observatory sites" what do they with the equipment that is being replaced? Do the "renovations of new optical/Infrared facilities" constitute a portion of the 52 new telescopes, or is the proposal actually for 52-56 more new telescopes? Whenever a building anywhere is torn down and a new building is built in its place, is the site being "recycled"? Does this imply that all redevelopers are environmentalists since they recycle sites? Where does this definition of recycling come from? Have you made up any other weird definitions?

Use

Who will use this "Astronomical Precinct"? What is the data used for? Please describe the current and proposed uses and users of the site. Do the various users pay rent (cash or in-kind) for use of the site? How does the greater community benefit from the development of this "Astronomical Precinct"?

Burials

The State Office of Historic Preservation has verified that there are burials and several other possible burial areas on the Summit. It is our understanding that the Hawai`i Island Burial Council was not notified of your actions in and around these burial sites. Why?

Archeological Data

Life of the Land has been informed that archeological data confirms that there are about 70 sacred shrines on the Summit, four of which are in the "Astronomical Precinct". How will the sites within the "Astronomical Precinct" be protected? We have been told that astronomical personnel and/or astronomical construction-employees have already destroyed contemporary places of worship on the Summit two times. How do you mitigate the destruction of someone's place of worship? How can you? What are your mitigation plans regarding sacred cultural sites? What are your policies for dealing with your employees who destroy such sites? Are they reprimanded? Are they fined? Are they given classes in cultural sensitivity? Are they encouraged to apologize? Or do you do nothing about them?

Ceded Land

Mauna Kea is ceded land. Why is it that the Hawaiians are always aced out of the discussion or are so seriously outnumbered that their concerns are minimized? Other interests always seem to override the cultural protocols. This is wrong. The people of Hawai`i need a full airing of **exactly** what is going on at the Summit. We need the broadest possible participation NOW before any more development occurs. We must assess how prior agreements with the applicant were adhered to before giving "carte blanche" for any expansion plans at the Summit.

Cultural Impact Guidelines

Are the Office of Environmental Quality Control (OEQC) Cultural Impact Guidelines being followed? How much of the land is ceded? What would a fair-market value for the land be, assuming one could buy and sell ceded land? How extreme would the offense have to be in order for the Management Authority to remove a scientist for willful desecration of Native Hawaiian religious sites? How many Hawaiian sites have been destroyed or damaged? How can the world's largest adze quarry (Keanakako`i) be protected when the access road goes through it? Could rent for the use of ceded be paid to the Hawaiians? Would paying rent for ceded lands increase or decrease trust between scientists and Hawaiians? How will issues of burials be dealt with?

How will violations of the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 and the Archeological Resources Protection Act of 1979 (ARPA) be dealt with? Will the Hawai`i Island Burial Council be consulted?

Public Participation

We have read the Mauna Kea Master Plan (MKMP) Environmental Impact Statement Preparation Notice (EISPN) and have been speaking with community members around Hawai`i, not just Hawai`i Island, who are very concerned about this plan. We have also been told that Mauna Kea has special spiritual significance to the Maori people. Hence, any plans for Mauna Kea are of concern to people all around Hawai`i and the Pacific. We ask that you broaden the discussion ... not limit it.

Staging Areas

As for the short-term impacts, it is a known construction practice to have a "staging area" for construction equipment and material storage. Will these "staging areas" be within the "Astronomical Precinct"?

Please include maps of any "staging areas" and their proximity to sacred sites. How long will the staging areas be in existence? Who will be responsible for their clean-up? Who will monitor toxic releases (such as oil spills) at the "staging areas"?

Flora and Fauna

How will you protect the habitat of the wekiu insect and the endemic biota of the area? How recent is the flora and fauna studies? How much of the data is simply a re-hash of earlier data? How much new research has been done? Are the works peer reviewed? Who revised them? Why has there been a drastic drop of Wekiu insects from the 1982 studied levels? What is the extent of microbial studies? Could alien species, such as insects inadvertently brought with astronomy related containers, or on the shoes of construction workers, have caused the decline? Is there an increase of alien species on or near the summit? Have spiders been introduced? What are they eating? Will they lead to a decrease of native fauna and flora? What quarantine system is in place? What type of quarantine system should be in place? How can the spiders be eliminated?

The 1983 Mauna Kea EIS was violated with regard to the Wekiu was violated according to the Legislative Auditor. How can the environmental process for the Keck 6 move forward under this violated plan simultaneously while the new plan is being reviewed?

Aesthetics

How can you mitigate the impacts to the viewplanes from Waimea and Honoka`a when there will be instrumentation industrializing the landscape? Camera pictures and the human eye analyze the same viewplane quite differently. How have pictures been computer-modified to make them more consistent to actual viewing conditions? How have scientists dealt with this problem?

Public Access

How will public access be protected if there is registration required at a "control point"? Will the road be open for night time visitors? Would the applicant be willing to sign an agreement for unfettered public access to the site? Who would enforce such an agreement? Will any restrictions be placed on public access by Hawaiian practitioners with regard to cars, entry, exit, movement, or land use? Are these policies consistent with the Hawaii Supreme Court's PASH/Kohanaiki decision? Will restrictions be imposed around sunrise or sunset?

When you color your buildings to blend into the sky, can you also place a paint layer to keep out unwanted car headlights? How does the Master Plan comply with the Hawaii Supreme Court's PASH/Kohanaiki decision on access? Would these restrictions be more or less restrictive for Hawaiians or scientists? What is the difference between "restricting" and "regulating" public access?

Maps

Please include U. S. Geological Survey topological maps in the Draft EIS along with visual simulations of a full build-out of the proposal so that the greater community can have a clear understanding of this proposal.

Disturbances

Please disclose full mitigation plans for any disturbance of ecological habitat and cultural sites.

Tiering

Tiering refers to the two-step process of creating a Master Plan and then writing sub-plans for individual projects encased within the Master Plan.

> "Tiering of environmental impact statements refers to the process of addressing a broad, general program, policy or proposal in an initial environmental impact statement (EIS), and analyzing a narrower site-specific proposal, related to the initial program, plan or policy in a subsequent EIS."
>
> Tiering section of the "Guidance Regarding NEPA Regulations. 40 CFR Part 1400. Memorandum". The document was published in the Federal Register and appears at 48 Fed. Reg. 34263 (1983) and is also located on the web at: http://ceq.eh.doe.gov/nepa/regs/1983/1983guid.htm. The document was written by A. Alan Hill, Chairman, Council on Environmental Quality.

While the statement is addressed to federal agencies, its implications apply equally to all NEPA documents. According to the Council on Environmental Quality (CEQ), the Master Plan must be a "broad, general program" document while the subsequent documents must "analyze a narrower site-specific proposal."

Thus by definition it is a falsehood that the General Plan should be limited to state review while some of the Specific Plans will require federal review. Such an application is obviously false since the Specific Plan would not be contained by the Master Plan.

Since some Specific Plans will be required to follow the NEPA process, it is obvious that the Master Plan must follow the NEPA process. But it isn't. Are you "recycling" the federal definition of a Master Plan to suit your restrictive concepts of public and agency review?

Timeliness

Group 70, the consultant for the Mauna Kea Master Plan (MKMP), is issuing at least three Mauna Kea Master Plan Draft Plans. The Environmental Impact Statement Preparation Notice (EISPN) is for the Second Draft (Draft #2). The public is being asked to comment on a Plan which is obsolete, and will be replaced in the near future.

This presents several thorny issues: (1) What exactly is the public commenting on? To which plan will the public comments be attached? Can the public testify on the actual plan? Who thought up this weird an illegal approach to following the Sunshine Law? Is it true that the Second Draft was passed by the Mauna Kea Advisory Committee in violation of the Sunshine Law? Are you going to "recycle" public comments to the Second Draft and attach them as an Appendix of Draft #3?

Scope

Maintaining and Upgrading the Access Road, the Utility Corridors and the Utility Substations are part of the creation of an "Astronomical Precinct". Will they be included in the Master Plan? Are access roads, utility corridors, staging areas, power substations, etc. located between the Saddle Road and the summit of Mauna Kea included in the Master Plan? Under whose jurisdiction do they fall? Will the University of Hawaii - Hilo (UHH) assume responsibility for there maintenance? What is the carrying capacity for the Science Reserve in terms of buildings, telescopes and scientists? How many scientists now use the facility? How many scientists now reside at Hale Pohaku? What will be the needed upgrades to the islands electrical and communication infrastructures?

> **Chapter 343: Environmental Impact Statements. §343-5 Applicability and requirements.** (a) Except as otherwise provided, an environmental assessment shall be required for actions which: (1) Propose the use of state or county lands or the use of state or county funds ... (2) Propose any use within any land classified as conservation district ... (4) Propose any use within any historic site

as designated in the National Register or Hawaii Register as provided for in the Historic Preservation Act of 1966, Public Law 89-665, or chapter 6E;

NEPA

The Master Plan covers all proposed development on Mauna Kea within the land set aside by Executive Order. Some, if not all, of the projects (both historical and in the future) need federal permits and thus trigger NEPA. How can a Master Plan, covering these facilities, fail to trigger NEPA? What happens if there is a discrepancy between the Master Plan and NEPA? What are the names of the projects on Mauna Kea which have required (a) a state Environmental Assessment, (b) a state Environmental Impact Statement, and (c) a federal National Environmental Protection Act Environmental Impact Statement? Did the Keck Environmental Assessment shed any light on the need for NEPA documentation?

How was the accepting agency chosen for the Master Plan? What is the nature of all federally-funded projects on Mauna Kea? Does the EISPN cover Draft 1, Draft 2, or Draft 3? How can the public comment on the EISPN when the next draft has yet to be published? How much federal money is involved at Mauna Kea? Will federally-funded facilities need to follow all state Master Plan guidelines? Under what conditions would NAGPRA need to be followed? What accounts for the difference in environmental permitting regarding the Gemini Telescope, the Subaru Japanese National Telescope and the Smithsonian Institution's submillimeter Array.

Visitor's Center

These improvements in the Visitor Information Station programs and hours of operation are long overdue. An expanded visitor program was promised way back in 1983 as part of the original Master Plan. A $300,000 dollar telescope purchased by Hawaii taxpayers for public stargazing has been sitting in a box for years. Please disclose its physical location and role in the public programs.

Toxics

What chemicals, solvents, cleaners are used at the facilities for? How are they used? How are the contaminated chemicals disposed of? Are any of them flushed down the wastewater lines? Which chemicals are regulated under TSCA and/or RCRA? What pesticides are used at the facilities?

Waste / Recycling / Reuse

Please list all facilities with cesspools, septic tanks, and wastewater facilities. What is the capacity of each system? What is the current usage of each system?

Footprints

What is the total square footage of all facilities on the mountain? What would be the maximum square-footage of facilities allowed under this new plan? Not the most likely, not with a reasonable amount of development, but what would be the maximum square-footage of facilities allowed under this new plan (including underground structures)? What is the land area of all access roads, utility corridors and substations?

Construction

During construction, how many cars and trucks will transverse the access road. What is the speed limit on the road? Will speeders stir up dust that will affect endangered fauna and flora? While visiting the summit just after the Hilo public meeting, we saw facility-based speeders on the access road. Will this be eliminated? How? Where will staging areas be? Can roads be widened without archeologists present?

Compliance

How many conditions were imposed on the facilities as a result of the 1983 plan? How many were violated? How many violations were issued? How many violations resulted in fines? What was the total amount of fines? Where did the fine money go?

Enforcement

Passing laws and/or regulations with no teeth and no enforcement mechanism is inappropriate. What should the enforcement mechanism be? Who should oversee it?

Public Input

According to Draft 2: "Developing a formula for continuous community input" should occur in January 2000. Do this imply that during the EISPN, Draft EIS and Final EIS stages will not have continuous public input? Why?

Accidents

Please disclose how many accidents a year are reported on the Mauna Kea summit road. How many of them involve construction vehicles or facilities related rental or staff vehicles. A tragic car crash occurred on Mauna Kea 10/20/98. A car lost its brakes and crashed into an embankment. The driver and passenger were airlifted via the country helicopter to Hilo hospital.

Revenues

How much money does Mauna Kea generate (cash, in-kind, etc.)?

Military

Is there military laser research being conducted on Mauna Kea? Is the military involved with Mauna Kea? Does the military contract with the telescope administrators/scientists? Do any of the facilities have contracts with military missions? Failing to disclose a contract which, if made public, would trigger NEPA, would be a huge mistake, would it not?

Noise

When was the last noise study conducted? What is the ambient noise level? What is the construction noise level? Will this impact endangered species? Were endangered species tested to determine how well they can handle noise? What is the nature of low-level noise, vibrations and harmonics due to (a) construction; and (b) operation of the facilities.

The World

For the following questions, please include analyses from important astrological facilities from around the world, including, but not limited to (a) Astrophysical Research Consortium (APO); (b) CSIRO; (c) BIMA Consortium.

Please include analysis from important sites including, but not limited to: (a) Sunspot, New Mexico; (b) Big Bear, California; (c) La Serena, Chile; (d) Palomar Mt., California; (e) Mt. Hopkins, Arizona; (f) Kitt Peak, Arizona; (g) Cerro Tololo, Chile; (h) Siding Spring Mt., Australia; (i) Cerro La Silla, Chile; (j) Mt. Locke, Fort Davis, Texas; (k) Mt. Fowlkes, Fort Davis, Texas.

Please include analysis on the use of telescopes located 1000+ km apart, but unified through communications and computers to act as one system.

How does Mauna Kea compare to other facilities around the world regarding (a) rent payments; (b) indigenous rights; (c) quality of the site for infrared telescopes; (d) quality of the site for Long Baseline Arrays; (e) quality of the site for radio telescopes; (f) (e) quality of the site for millimeter-wave radio interferometer?

Do telescope/astronomy facilities pay rent at other locations? Please name sites and rental fees with discussions on how the figures were decided and agreed upon.

The following statement can be downloaded from the Mauna Kea website: "More major telescopes are located on Mauna Kea than on any other single mountain peak, and Mauna Kea is widely recognized as offering better observations for optical, infrared and millimeter/ submillimeter measurements than any other developed site" Which undeveloped sites are superior to Mauna Kea?

History (1975)

DLNR Planning Study April, 1975. Science Reserve Management Area (page 5). B. Application for any proposed facility on Mauna Kea shall be accompanied by a comprehensive justification report showing: (1) Public benefit to the people of Hawaii, in terms of employment sources, educational pursuits, overall economic development, etc.; (2) Public necessity in terms of cooperative use of facilities and overall advance of science and research; (3) Evidence that Mauna Kea is the best site for such facility;

(4) Compatible with other uses of Mauna Kea and within the terms of the lease between the University of Hawaii and the Board of Land and Natural Resources. Is the current Master Plan following these guidelines?

Self-Serving Statements not Proper Under Chapter 343

Draft Environmental Assessment and Anticipated Finding of No Significant Impact (FONSI). WM Keck Observatory. Keck Telescope Interferometry. Outriggers Telescope Project. March 1999. (page S-2) "The 'No Project" alternative and several alternative sites were evaluated. If the Outrigger telescopes are not constructed at WMKO ... the money that would be spent in the State of Hawaii for construction and operations would go elsewhere. ... Six alternative sites were considered for the array; two in Chile and four on the mainland, U.S. All of the possible sites have environmental issues which must be addressed and mitigation before the Outriggers project could be developed. No significant environmental impact would result from construction and operation of the Outriggers at the WMKO site on Mauna Kea."

NEPA Revisited

Question: Early Application of NEPA. Section 1501.2(d) of the NEPA regulations requires agencies to provide for the early application of NEPA to cases where actions are planned by private applicants or non-Federal entities and are, at some stage, subject to federal approval of permits, loans, loan guarantees, insurance or other actions. What must and can agencies do to apply NEPA early in these cases?

Answer: Section 1501.2(d) requires federal agencies to take steps toward ensuring that private parties and state and local entities initiate environmental studies as soon as federal involvement in their proposals can be foreseen. This section is intended to ensure that environmental factors are considered at an early stage in the planning process and to avoid the situation where the applicant for a federal permit or approval has completed planning and eliminated all alternatives to the proposed action by the time the EIS process commences or before the EIS process has been completed. (CEQ Top 40 Questions Asked About NEPA. see CEQ's WEB site).

Documentation

In the Draft EIS, please enclose complete minutes of all Mauna Kea Advisory Committee meetings and ALL Hawaiian Cultural Documents that were commission by and/or paid for by either the Mauna Kea Advisory Committee or by Group 70. Please include a thorough biography (and a site in each county where the document may be obtained). Please include a thorough listing of definitions including especially those definitions that have been recycled (same word, new definition).

Scientific American

Scientific American: In Focus: Seeking Common Ground: Building a new generation of gargantuan telescopes gets mired in environmental and native cultural issues. July 1999. www.sciam.com/1999/0799issue/0799infocus.html

"In the mid-1950s a group of astronomers funded by the National Science Foundation showed an interest in a mountain in southwest Arizona called Kitts Peak. Its clear, dry air, removed from Tucson's city lights, made it among the most promising sites being considered for the first national observatory.

The Tohono O'Odham, however, refused a request to investigate the suitability of the site atop one of their most sacred mountains. An enterprising anthropologist at the University of Arizona suggested that the tribal council be invited to look through a telescope in the Steward Observatory on the university campus. Peering through the 36-inch-diameter (about one-meter-wide) telescope, the tribal elders had trouble containing their excitement. One after the other, each of the men would stare through the eyepiece and then move his head to view the bright moon glow through the top of the dome.

Shortly thereafter, the tribal council voted to reverse itself and let the astronomers proceed. The members 'were totally charmed by the people they called the men with long eyes,' says Frank K. Edmondson, professor emeritus of astronomy at Indiana University, who chronicled a history of the project in his book on the U.S. national observatories.

Gone are the days when astronomers were granted free run of an isolated mountaintop for a mere peek through an eyepiece. Now astronomers who hope to peer deeper into the universe find themselves running into legal headaches on earth--which threaten to delay or scuttle massive projects.

The University of Arizona, which so deftly helped to negotiate an accord with the Tohono O'Odham, has found itself mired for more than a decade in a public-relations nightmare involving new telescopes on Mount Graham in southeastern Arizona.

The debacle has set it against environmentalists trying to defend an endangered subspecies of red squirrel and against a group of Apaches trying to protect a holy site. The university blustered through only by weathering numerous lawsuits and by getting congressional exemptions that allowed it to circumvent the Endangered Species Act, the National Environmental Policy Act and a federal court order.

For the moment, the astronomers have won. Construction was completed in the early 1990s on the 1.8-meter Vatican Advanced Technology Telescope and the 10-meter Heinrich Hertz submillimeter telescope. And work is moving ahead on the twin 8.4-meter mirrored Large Binocular Telescope.
Balancing the needs of astronomy with environmental and cultural issues has moved to the forefront on perhaps the world's most coveted astronomical site, the 11,288-acre (4,571-hectare) science reserve atop Mauna Kea on Hawaii's Big Island.

The Board of Regents of the University of Hawaii is scheduled to vote by the end of this year on a plan that will establish a framework for development on the mountain for the next 20 years. Mauna Kea, whose summit area is leased by the university from the state, could become the location for some of the most ambitious projects of the new century, including a 25- to 50-meter Next Generation Large Telescope and an optical interferometer array that could consist of up to 30 telescopes.

The Mauna Kea advisory committee, a 23-member panel set up by the university to obtain public input, voted in May by a roughly two-to-one margin to endorse the plan. But the two loudest dissident voices on the committee--the Sierra Club and Ka Lahui, a Hawaiian sovereignty group--have blasted the plan as insufficient to protect the mountain from overdevelopment.

The master plan would create an astronomy precinct in which 600 acres, or some 5 percent, of the science reserve managed by the university could be used by astronomers. The 13 Mauna Kea observatories currently occupy about 60 acres. Nelson Ho, a regional vice president for the Sierra Club Hawaii, has called for a moratorium on new telescopes until a more acceptable approach can be devised that puts a halt to what he calls the 'industrialization' of the Mauna Kea summit.

Ho says the Sierra Club is considering filing a lawsuit to stop any new projects. The top of the mountain is home to rare insects, including the Wekiu bug, which survives by eating insects blown up from the lowlands.

Mauna Kea is also considered in oral Hawaiian traditions to be the first-born child of the gods of the sky and the earth, the most sacred place in all the islands.

The University of Hawaii hurriedly commissioned the new master plan after a state audit last year found that the university's management of the mountaintop was 'inadequate to ensure protection of natural resources.'

The audit's findings, many of which were contested by the university, made assertions about neglect of historical preservation and cultural sites, damage to the habitat of the Wekiu bug and failure to remove trash and equipment, some of which had lingered for decades.

The advisory committee voted to recommend that no new construction be started until the new plan is approved and funded by the university's Board of Regents, perhaps later this year.

Astronomers and observatory directors have welcomed the advisory committee, which has brought together Hawaiian cultural groups, university officials, and even skiers and hunters who use the mountain.

'Throwing every point of view on the committee may result in a catfight, but it's when people are left out of the process that you run into problems,' says Frederic Chaffee, director of the W. M. Keck Observatory. Privately, though, some members of the Hawaiian astronomy community fret about the effect a persistently tumultuous political environment may have on future projects.

'Astronomy on the Big Island could go the way of the sugarcane industry,' says one observatory director. The impact of Mauna Kea astronomy on the Hawaiian economy in both direct and indirect revenues is estimated to be $142 million annually.

The new master plan would place limits on the size, location and even color of new observatories, an attempt to help them blend into their surroundings and to preserve Wekiu habitat, archaeological sites and other culturally important areas of the mountaintop.

'This plan puts severe constraints on the future of astronomy, and some would say too much,' says Jeffrey Overton, project manager for Group 70 International, the Honolulu consulting firm that drafted the plan. (Group 70's work was paid for from money the Keck Observatory contributed to an infrastructure fund as part of its agreement with the university to build the Keck II telescopes.)

The plan also contains controversial provisions that might limit vehicle access to the summit and might require the observatories to pay a part of the cost of hiring rangers and implementing other measures to improve management of the reserve.

Negotiations about the future of Mauna Kea come at a time when management of the astronomy program finds itself in disarray. The university is trying to build one of the world's top astronomy departments to take advantage of the free telescope time it receives from the observatories.

> But no one seems to want the political headaches that come with the job. In April, Richard Ellis, a noted cosmologist from the University of Cambridge, turned down an offer to head the university's Institute for Astronomy.
>
> Although he would have welcomed the chance to mold its astronomy effort, he did not wish to deal with the job's myriad political and administrative responsibilities--which would include coping with land-use issues on Mauna Kea.
>
> But guiding astronomy programs--and the Big Science projects that come with them--may now require leaders to take on the mantle of the scientist-diplomat. Hawaii might study closely the Mount Graham experience.
>
> 'The University of Arizona came across as saying, 'We're the big guys, we can do what we feel like,' notes Chaffee, who was a spectator of the Mount Graham controversy while head of the University of Arizona's Multi-Mirror Telescope.
>
> But Chaffee points out that this attitude has the 'potential for poisoning the climate for science.' The bad blood generated over Mount Graham has meant that the issue will fester for years and could block any new telescope on the mountain. By necessity, leaders of astronomy may be forced to become Kissingers as well as Galileos."

The whole world is now watching what is being done at Mauna Kea.

In Closing

In closing, Life of the Land asks that you open your discussion of this proposal to all of Hawai`i, as Mauna Kea is important to all of us who love this `aina and have dedicated our lives to protecting our home.

Mahalo for this opportunity to testify.

Henry Curtis
Executive Director

Kat Brady
Assistant Executive Director

August 26, 1999

GROUP 70
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Life of the Land
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Attention: Henry Curtis and Kat Brady, Directors

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft EIS Notice of Preparation

Dear Ms. Brady and Mr. Curtis:

Thank you for providing comments on the Draft EIS Notice of Preparation for the Mauna Kea Science Reserve Master Plan in your letter of June 21, 1999. The following briefly addresses the scope of issues you have raised for consideration in preparing the Draft EIS. More detailed information will be included in the DEIS.

Prior Agreements

The 1983 Complex Development Plan identified several possible areas for telescope development, and specified the known projects that were anticipated in the foreseeable future by the Research Development Plan. Only two of the four development areas were actually utilized during the past 16 years.

Telescope Definitions

An interferometer is an observatory that collects radiated electromagnetic energy of certain spectra (radio, infrared light, optical light, xray) through multiple collectors. An interferometer depends upon multiple collecting elements to create a better image of the subject being studied. An interferometer does the job of a much bigger instrument that would be required to do the same job.

The SMA can be called a 12 antenna facility. This group of 12 antennas are used to create only one composite image -- they do just one job (much like the multiple mirrors of the Keck Telescope), not 12 different jobs at once. To do the same job as the SMA with a single antenna, it would require a 0.5 km-wide antenna that would be several hundred feet tall. In the case of the SMA, we compare this to 12 antennas that are 20 feet in diameter and 25 feet high.

The number and elements in all observatories is clearly specified in the Master Plan. This allows for full understanding and disclosure rather than the confusion related to numbering of lenses, mirrors, antennas, etc. The new plan includes conventional telescopes and interferometers, and the number of radiation collecting instruments for each facility is described with clarity.

Stewardship

The Mauna Kea Advisory Committee was established by the President to provide recommendations on the conditions under which development of astronomy could proceed. Individuals on the committee were selected because they represent interest groups, and they became the information conduit to the working committee. Public input to the process was felt to be essential, and recommendations from the working meetings were taken to the larger community at six meetings for comment. The public comments have significantly shaped the outcome of the planning process.

The new management structure is detailed in the Draft EIS. The specific functions of the Office of Mauna Kea Management and the Mauna Kea Advisory Board have yet to be determined. Members of these entities have not been selected, and there will surely be significant representation of the Hawaiian community.

Redevelopment of Existing Sites

There is no proposal to build 56 new telescopes on the mountain. Five sites have older observatory facilities that will eventually be redeveloped or "recycled" for updated instruments. In addition, two conventional optical/IR telescopes, a very small 1-meter class instructional UH-Hilo telescope, a "Next Generation Large Telescope" and twelve new antennas are projected over the next 20 years.

Greater Community Benefit from Astronomy

The greater community of the State and County of Hawai'i benefit from astronomy in many ways, with a few highlights listed below:

- Educational opportunities for Hawai'i students
- Job opportunities for Hawai'i residents
- Economic stimulus for a lagging local economy
- The pride of being home the best astronomy complex in the world
- Preservation of Hawaiian cultural sites, most unknown until astronomy arrived
- Preservation of natural habitat areas for sensitive flora and fauna species
- Enhanced recreational opportunities through increased access to the mountain

Burials

There are no known burials at the summit and very few confirmed burials in the Science Reserve. This is based on over 30 years of research on the summit and interviews with elders of the island. If there are records of such burials, we encourage these reports to come forward to be verified and added to the record. There have been no developments in and around burials, and there has been no findings or actions warranting notification of the Burial Council.

Archaeological Sites and Contemporary Worship Sites

There are three shrines in the proposed Astronomy Precinct and none are affected by future plans – these and all shrines and other archaeological sites will be preserved as is and protected by very large buffers. A contemporary worship site was disturbed many years ago, and this wrong has been addressed through direct apologies to the offended party and new employee procedures to avoid disturbance of contemporary worship sites.

Ceded Land

Ceded land issues are a State-wide concern that is presently being addressed in a holistic manner.

Cultural Impact Guidelines

The Draft EIS will include a cultural impact assessment which follows the OEQC guidelines. There absolutely have not been any violations to the NAGPRA and ARPA. The DLNR is the appropriate entity to determine the need for consultation with the Hawai'i Island Burial Council, and they have not indicated such an action is needed at present.

Public Participation

The public will be invited to comment on the Draft EIS. There will be State-wide notification the availability of the Draft EIS through the OEQC Environmental Notice. This information is also posted on the world wide web through the OEQC web site. Interested individuals and groups from Hawai'i and elsewhere are welcome to provide their comments during the 45-day public review process.

Staging Areas

The construction staging area is proposed to be at the same location as previously located in the valley between Poli'ahu and Kūkahau'ula. This location is within the Astronomy Precinct.

Flora and Fauna

Protection of the Wekiu bug will be strengthened by the Master Plan and Management Plan, with existing undisturbed habitat areas protected from new development. The Draft EIS includes updated studies of the flora and fauna of the Science Reserve.

Aesthetics

The Draft EIS will include a complete visual resources section to address the potential impacts to views from locations both on the mountain and from lower elevation communities. Design guidelines are established in the Master Plan to guide the future development of observatories and other facilities on Mauna Kea.

Public Access

Public access management issues will be a responsibility of the new management entity. The Management Plan recommends that public access be managed for public safety and protection of natural and cultural resources. One possible reason for controlled nighttime public access to the summit would be to offset the increase in off-road vehicle activities. The EIS addresses management plan issues including access management, however, the real decisions will be made by the future management group which surely will consider the wide range of public access needs.

Topography

The U.S. Geological Survey topographic map will be included in the Draft EIS, along with visual simulations of future conditions.

Mitigation

The impact and mitigation section of the Draft EIS will include mitigative measures for ecological habitat areas and cultural resources.

Tiering and NEPA

The process you describe is being followed for the Science Reserve. The current Draft EIS is a overall programmatic EIS addressing the new Master Plan. The implementation of projects specified in the Master Plan will have their own environmental documentation to comply with Chapter 343 HRS and, if required, applicable NEPA requirements.

There is no requirement for NEPA documentation for the subject Master Plan EIS. The Master Plan is being prepared under funding from the Research Corporation of the University of Hawai'i, and addresses uses on State lands. Specific individual projects, such as the Keck Outrigger project, have involved federal funding and are appropriately subject to NEPA compliance. Future observatories on Mauna Kea may or may not involve Federal funding, and NEPA will be complied with as applicable. The Office of Environmental Quality Control does not believe that NEPA compliance is required for this Master Plan.

Timeliness

The proposed action that will be described in the Draft EIS will reflect the current state of the Master Plan and Management Plan (Draft #3, July 13, 1999).

Scope

Utility and infrastructure requirements to support the future plans for the Science Reserve and Hale Pōhaku are addressed in the Draft EIS.

The capacity of the Science Reserve to accommodate new observatories and other research or recreational facilities is essentially limited by the infrastructure service, such as roadways and electrical power. The current infrastructure serving the summit is

adequate to support several times the existing number of observatories. With this as a measure, there is the "capacity" to build several hundred observatories on the summit of Mauna Kea. This disregards potential impacts to views and cultural landforms, yet would be within "capacity". There is no intent for future expansion of observatories beyond the Astronomy Precinct and the development scope outlined in the Master Plan.

Visitor Center

Improvements to the Hale Pōhaku Visitor Center are addressed in the Draft EIS, including the planned installation of the telescope you mention.

Toxic Materials

Chemicals, solvents, cleaners are managed in accordance with State and Federal requirements for hazardous materials, as discussed in the Draft EIS.

Wastewater Management

Each of the observatories has an individual wastewater system (IWS). The older facilities such as CFHT, CSO, IRTF, UKIRT, UH 0.6m and UH 2.2m all pre-date the 1980's establishment of new Department of Health requirements for individual wastewater systems to utilize septic tank and leaching systems. In the future, all new or redeveloped observatories or other new facilities will be required to comply with the IWS standards, and some observatories will be required to upgrade or replace their wastewater management facilities

Footprints

The total area occupied by actual buildings and surrounding site area (parking, storage, etc.) in the Science Reserve is less than 30 acres, and the projected area to be covered by new facilities is less than 10 acres. The Draft EIS will present more information about the existing and proposed buildings.

Construction Traffic and Accidents

Traffic in the Science Reserve and along the Summit Road will be addressed in the Draft EIS, including construction-related traffic. If widening of an existing road is required, such as the access roads to observatory sites located to the north of the summit, these work areas would require monitoring by an archaeologist during grading or excavation activities.

The access road to the summit has had accidents, on the average of one or two reported per year. Some of these have involved construction traffic and other have involved visitors to the summit.

Compliance and Enforcement

Compliance requirements relating to the 1983 plan are addressed in project-specific CDUA permitting documents, which are the responsibility of the DLNR. There have

been no fines issued that we are aware of. Enforcement of laws and regulations relating to the Conservation District is the responsibility of the DLNR.

Public Input

The statement you reference has to do with the on-going management entity and its advisory board, which is expected to become effective in 2000. The EIS process includes a public review and comment process, which is one major purpose of the subject document.

Revenues

Economic analyses are provided in the Draft EIS. The astronomy uses at Mauna Kea, Hale Pōhaku and base facilities in Waimea and Hilo contribute $142 million to the State and County of Hawai'i economy on an annualized basis.

Military

There are no known plans for military involvement with the existing observatories at Mauna Kea. None of the new facilities being considered have a military purpose or sponsor.

Noise

Noise is being addressed in the Draft EIS, however, there are no plans to conduct detailed noise surveys. The summit is a quiet place and there are no known chronic sources of noise that affect the summit as you describe. Short-term noise from construction activities will be audible, however, this will be a temporary effect.

World Astronomy

Mauna Kea is the best place in the world to conduct astronomical observations due to its global location and atmospheric environment conditions. There are no known locations that are superior to Mauna Kea. The facilities you mention are less suitable for the top level science investigations occurring and proposed for Mauna Kea. At locations elsewhere in the world, funds provided to landowners and governments are assigned to astronomy-related benefits, such as construction and maintenance of support infrastructure.

1975 DLNR Report

The criteria subjects presented in the 1975 DLNR report are all addressed in different sections of the current Master Plan and Draft EIS.

Keck Auxiliary Telescopes

Although we were not the authors of the subject document, it appears that the statements made in the Draft EA alternatives section are accurate.

Documentation

Please contact the Co-Chairs of the Mauna Kea Advisory Committee or the President of the University of Hawai'i for any information you would like to obtain regarding their proceedings.

Thank you again for providing your comments on the Draft EIS Notice of Preparation.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

LIFE OF THE LAND

Ua Mau Ke Ea O Ka 'Aina I Ka Pono
Hawai'i's own Community Action Group
Protecting our Fragile Environment through
Research, Education, Advocacy and Litigation

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JUN - 4 1999
GROUP 70

June 3, 1999

Mr. Allan Ah San
Assistant Vice President for Administration
University of Hawai'i
2440 Dole Street, Bachman Hall 112
Honolulu, Hawai'i 96822

Jeffrey Overton, AICP
Group 70 International, Inc.
9215 Bethel Street, 5th Floor
Honolulu, Hawai'i 96813

Re: Mauna Kea Science Reserve Master Plan
Environmental Impact Statement Preparation Notice

Aloha!

We are currently reviewing the Mauna Kea Science Reserve Master Plan and will be submitting comments shortly.

The purpose of this letter is to ask that you hold public scoping meetings on the other islands in addition to the meetings you held last week in Kona, Waimea, and Hilo. Mauna Kea is an important asset to all of Hawai'i Nei and Life of the Land requests the widest possible net be cast to garner all the mana'o about this development proposal.

We look forward to hearing for you.

Sincerely,

Kat Brady
Assistant Executive Director

1111 Bishop Street * Suite 503 * Honolulu, Hawai'i 96813 * phone (808) 533-3454 * fax (808) 533-0993

LIFE OF THE LAND

Ua Mau Ke Ea O Ka 'Aina I Ka Pono
Hawai'i's own Community Action Group
Protecting our Fragile Environment through
Research, Education, Advocacy and Litigation

Comments on Environmental Impact Statement Preparation Notice
for MAUNA KEA SCIENCE RESERVE MASTER PLAN
Public Hearing - Thursday, May 27, 1999 - 6:30 PM
University of Hawai'i - Hilo - Wentworth Hall I

Aloha Kakou!

My name is Kat Brady and I am the Assistant Executive Director of Life of the Land, Hawai'i's own environmental and community action group advocating for the people and the land since 1970. Our mission is to preserve and protect the life of the land through sustainable land use and energy policies and to promote open government through research, education, advocacy and, when necessary, litigation.

It is difficult for us to look at any expansion of Mauna Kea Science Reserve when a 1998 Legislative Audit charged the University of Hawai'i and the Department of Land and Natural Resources with "having failed to implement adequate controls to balance environmental concerns with astronomy development." The Mauna Kea Advisory Committee, 23 members appointed by UH President Kenneth Mortimer, has many of the same people criticized by the Audit. Why is this?

We were at a briefing at the Board of Land and Natural Resources several years ago when scientists from Mauna Kea were asking to create roads on the mountain so they could bring equipment to remote areas. At that meeting, a staff person from the State Office of Historic Preservation showed slides and talked about the many sacred sites on Mauna Kea and then showed pictures of the garbage strewn across this sacred place. I remember feeling very sad that Mauna Kea was being treated with such disrespect.

Also attending that same meeting, were some people who worked at Haleakala who questioned why roads were needed at all. Why couldn't the equipment be backpacked in to preserve this fragile environment as they did on Maui? I wondered the same thing. I left that briefing feeling that the scientific community just didn't understand what Mauna Kea means to the people of Hawai'i and the Pacific.

Now comes this proposal to almost triple the number telescopes on Mauna Kea.

1111 Bishop Street * Suite 503 * Honolulu, Hawai'i 96813 * phone (808) 533-3454 * fax (808) 533-0993

Life of the Land asks that you include in the Draft Environmental Impact Statement a discussion on how the applicant complied with their prior agreement with respect to the number of telescopes allowed and their stewardship of this sacred mountain. In regard to the number of telescopes, we have a few questions:

What is the definition of a telescope? Is a telescope 1 lens requiring 1 "pad"? Are there smaller units requiring the construction of "pads" around that 1 telescope? If so, how many smaller units? How many lenses are currently on Mauna Kea? At full build-out, how many lenses are proposed?

As to the applicant's stewardship of the mountain, the only thing the community can rely on is their performance to date. Has the applicant been a good caretaker of the Summit? Have they treated Mauna Kea with respect? What actions have they taken to manage their waste? How can the community be assured that Mauna Kea will be respected and cared for with almost three times the development there now? Who is responsible for enforcement of any agreement made? Is there a clause for "citizen's suits" in the agreement? What guarantee does the community have that our voices will be heard? Would your "citizen's advisory committee" have the clout to stop bad actions on Mauna Kea?

When the applicant speaks of "recycling 2 to 4 of the existing observatory sites" what do they do with equipment that is being replaced? Do the "renovations or new optical/Infrared facilities" constitute a portion of the 52 new telescopes, or is the proposal actually for 52 - 56 more new telescopes?

Who will use this "Astronomy Precinct?" What is the data used for? Please describe the current and proposed uses and users of this site. Do the various users pay rent for use of the site? How does the community benefit from this development? We understand that there is a similar astronomy site in Chile. What arrangements or agreements are in place there to protect and preserve the environment and sacred cultural sites in that country? Do the users of that location pay rent? What is that rent? Has Hawai`i considered charging rent to the various entities?

The State Office of Historic Preservation has verified that there are burials and several other possible burial areas on the Summit. It is our understanding the Hawai`i Island Burial Council was not notified of this. Why?

Life of the Land has been informed that archaeological data confirms that there are over 70 sacred shrines on the Summit, four of which are in the "Astronomy Precinct." How will the sites within the "Astronomy Precinct" be protected? We have been told that astronomy personnel have already destroyed contemporary places of worship on the Summit two times. How do you mitigate the destruction of someone's place of worship? How can you? What are your mitigation plans regarding sacred cultural sites?

Mauna Kea is ceded land. Why is it that the Hawaiians are always aced out of the discussion or so seriously outnumbered that their concerns are minimized? Other interests always seem to override the cultural protocols. This is wrong. The people of Hawai`i need a full airing of ***exactly*** what is going on at the Summit. We need the broadest possible participation NOW before any more development occurs. We must assess how prior agreements with the applicant were adhered to before giving "carte blanche" for any expansion plans at the Summit.

We have read the Draft Environmental Impact Statement Preparation Notice and have been speaking with community members around Hawai`i, not just Hawai`i Island, who are very concerned about this plan. We have also been told that Mauna Kea has special spiritual significance to the Maori people. Hence, any plans for Mauna Kea are of concern to people all around Hawai`i and the Pacific. We ask that your broaden the discussion...not limit it.

As for short-term impacts, it is a known construction practice to have a "staging area" for construction equipment and material storage. Will this "staging area" be within the "Astronomy Precinct"? Please include maps of any "staging areas" and their proximity to sacred sites.

How will you protect the habitat of the wekiu insect and the endemic biota of the area?

How can you mitigate the impacts to the viewplanes from Waimea and Honoka`a when there will be instrumentation industrializing the landscape?

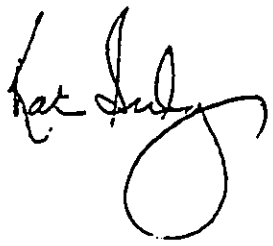
How will public access be protected if there is registration required at a "control point?" Will the road be open for night time visitors? Would the applicant be willing to sign an agreement for unfettered public access to the site? Who would enforce such agreement?

Please include U.S. Geological Survey topographical maps in the Draft EIS along with visual simulations of a full build-out of the proposal so the community can have a clear understanding of this proposal.

Please disclose full mitigation plans for any disturbance of ecological habitat and cultural sites.

In closing, Life of the Land asks that you open discussion of this proposal to all of Hawai`i, as Mauna Kea is important to all of us who love the `aina and have dedicated our lives to protecting our home.

Mahalo for this opportunity to testify.



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August 26, 1999

Life of the Land
76 North King Street, Suite 203
Honolulu, HI 96817

Attention: Kat Brady, Assistant Executive Director

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft EIS Notice of Preparation

Dear Ms. Brady:

Thank you for providing comments on the Draft EIS Notice of Preparation for the Mauna Kea Science Reserve Master Plan in your letters of May 27, 1999 and June 3, 1999. The issues you have raised are addressed in the response to Mr. Henry Curtis, Executive Director of Life of the Land, dated June 21, 1999. Please refer to the attached response letter dated August 26,1999.

Thank you again for providing your comments on the Draft EIS Notice of Preparation. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

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SIERRA CLUB, HAWAI'I CHAPTER

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To: Governor, State of Hawaii
c/o Office of Environmental Quality Control
235 South Beretania St. Room 702
Honolulu, Hawaii 96813

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JUN 24 1999
GROUP 70

COMMENTS FOR THE MAUNA KEA SCIENCE RESERVE DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) FOR THE PROPOSED MASTER PLAN. JUNE 22,1999

Many Sierra Club members enjoy the insight and scientific information garnered from modern day astronomy. No outdoor camping trip is complete without a night spent learning the stories and exploring the patterns of the rivers of stars overhead. It is with sadness and disappointment that our members witness the current mismanagement and unbalanced development on Mauna Kea.

The University of Hawaii (UH) administration and its Institute for Astronomy (IfA) have initiated this Chapter 343 environmental impact statement (EIS) process in order to begin a twenty year plan of massive, culturally insensitive and publicly unacceptable facilities development within the "Science Reserve" at the summit of Mauna Kea.

Sierra Club believes this DEIS should not be processed any further until a new integrated cultural and natural resources master plan has been accepted by a new Mauna Kea Commission and fully implemented by the UH Board of Regents and DLNR (which has been silent during this long controversy). This position is based on the materials presented in the 1998 Legislative Auditor's Report on Mauna Kea, the past 30 years of mismanagement of the Science Reserve by the UH and the Department of Land and Natural Resources (DLNR), IfA/Group 70 International's proposed Master Plan (Draft 2, dated May 10, 1999) and the EIS Preparation Notice.

As a member of the current UH Mauna Kea Advisory Committee, Sierra Club finds the timing and content of this DEIS unfortunate and insensitive. The proposers seeks to add significantly more telescopes to the summit at a time when controversy surrounds the 20 telescopes exceeding the limits of 11 major and 2 minor sized telescopes. This proposal continues the practice of piecemeal development of Hawaii's most special mountain. The DLNR, IfA, the University administration (and now the UH Board of Regents) know full well that the UH Mauna Kea Advisory Committee has not yet successfully addressed the mismanagement and public distrust issues.

In response to the May 23, 1999 preparation notice for the EIS accompanying the proposed UH master plan for Mauna Kea, Sierra Club is submitting the following comments.

FEDERAL NEPA/EIS REQUIREMENTS SHOULD PREVAIL

The EISPN fails to disclose that this programmatic environmental impact statement should be written in compliance with federal National Environmental Policy Act requirements. There have been numerous violations of this requirement during the history of the Science Reserve and this noncompliance should end.

The EISPN lists permits or approvals needed for the planning process and who the accepting authority will be. Absent is information disclosing significant federal action equal in the eyes of the Council on Environmental Quality to the funding of the proposed Keck Six Telescopes. See the Keck 6 EA admissions to this need. EISPN p. 3-2.

1) The Club believes this Master Plan needs early application of NEPA. Section 1501.2(d) of the NEPA regulations requires agencies to provide for the early application of NEPA to cases where actions are planned by private applicants or non-Federal entities and are, at some stage, subject to federal approval of permits, loans, loan guarantees, insurance or other actions.

Section 1501.2(d) requires federal agencies to take steps toward ensuring that private parties and state and local entities initiate environmental studies as soon as federal involvement in their proposals can be foreseen. This section is intended to ensure that environmental factors are considered at an early stage in the planning process and to avoid the situation where the applicant for a federal permit or approval has completed planning and eliminated all alternatives to the proposed action by the time the EIS process commences or before the EIS process has been completed.

2) Federal agencies such as the National Science Foundation, the National Aeronautics and Space Administration, the National Radio Astronomy Observatory, the National Optical Astronomy Observatories and others must designate staff to advise IfA of the agency's NEPA information requirements.

Section 1506.5(b) allows agencies to authorize preparation of environmental assessments by applicants. Thus, the procedures should also include a means for anticipating and utilizing applicants' environmental studies or "early corporate environmental assessments" to fulfill some of the federal agency's NEPA obligations.

These and other provisions are intended to encourage and enable UH/IfA and other non-federal entities to build environmental considerations into their planning processes in a way that facilitates the application of NEPA and avoids delay.

3) In order to insure that these kinds of noncompliance become a thing of the past, please disclose what federal agencies have had significant involvement with facilities built or planned as of 6/99 and why their involvement had not triggered IfA to undertake a NEPA compliant EA or EIS. The NASA Infrared Telescope, the Very Long Baseline Array (VLBA) Telescope, the Gemini telescope and the Smithsonian Institution's Eight Telescope Array should all have triggered federal NEPA processes because of the substantial federal money involved.

4) Please also discuss why and how the NASA telescope, the Gemini Telescope, the Japanese National Large Telescope (Subaru) and the Smithsonian Institution's Submillimeter Array, despite their large impacts on the landscape, generated only Chapter 343 environmental assessments and Finding of No Significant Impact (FONSI) determinations.

5) Every one of the new facilities proposed in the Group 70 draft has a sponsor or agency that IfA has been in contact with. To get to this stage of proposal, IfA must have had consultation with specific agencies or entities with specific budgetary and planning objectives.

Please disclose sponsorship of the new planned facilities. Specifically, who has IfA been in contact with - which federal agency, foreign government, US educational institution, etc. for each of the following:

> Twelve 6 meter Smithsonian submillimeter radio antennas, for a total of 20 antennas on an expanded grid of forty-eight concrete anchoring pads.
>
> A giant array of 30 optical/infrared domes located on the Waimea/Honoka'a face of the mountain in a circle one kilometer in diameter.
>
> Three conventional optical/infrared telescopes, at least two of which could be larger than the Kecks.
>
> A 20-50 meter multiple-mirror "Next Generation Telescope" with a dome at least twice the size of the existing Kecks, facing Waimea and Honoka'a.
>
> Five observatory domes now on Mauna Kea's upper ridge which would be substantially enlarged to accommodate "upgraded" telescopes equal in the size to the existing Kecks.

Doing separate environmental documents, some under Hawaii Chapter 343 and some under NEPA, may constitute "segmentation" of the planning and disclosure process, a practice frowned upon by the courts because it can conceal cumulative adverse impacts and deny due process to whole groups of affected parties. Among other conditions triggered or mandated are consultations with Native Hawaiian organizations over the significant cultural impacts. What will be IfA's proposed time line for compliance with the federal process?

35 YEARS OF PIECEMEAL PLANNING NEEDS TO END; UNIVERSITY LEASE ALREADY HALF OVER

6) The lease for the Science Reserve is nearly half over (expires in 12/31/33). Please discuss why the conceptual and management plans only cover the next 15 or it 20 years (it varied in the documents). This is an unacceptable continuation of the piecemeal planning that has contributed to the mismanagement of Mauna Kea.

7) What will the summit landscape look like in 2033 when the lease is up and "full build out" is achieved? Group 70's draft evades the discussion of impacts and mitigation for facilities with multiple elements or arrays. Small sites may transform into huge sprawling complexes when upgraded to arrays with multiple elements. Please disclose impacts and possible mitigation strategies.

8) Within and without the "astronomy precinct," the proposed Mauna Kea Management Authority can "amend" the master plan freely. Page II-1. The major "sustainable" thing about this document is the ability for astronomy to keep on expanding. Please comment on the ability of the proposed advisory committee to impact such amendments.

9) What is so "integrated" about having the cultural and environmental landscape absorb 50 more telescopes? Bottom page III-1.

10) Is Group 70's proposed plan merely masquerading as an integrated natural and cultural resources management plan because Ka Lahui Hawaii, other civic organizations and Sierra Club have called for one? The EISPN says that there is an "integrated natural and cultural resources management (INCRM) plan for the period 2000 to 2020." Pg. 1-2.

11) Please disclose the expertise of Group 70 in preparing INCRM plan's. Please disclose what academically reviewed and accepted criteria were used in the production of the Mauna Kea and other INCRM documents.

TRUE ENVIRONMENTAL STUDIES AND ANALYSIS NEEDED

12) The 1998 update surveys and regurgitated 1983 information are insufficient to assess the impacts of 35 years of development totaling $826 million on the summit. For example, all the DEIS proposed actions are relying on flora studies done in 1982 and only a literature search follow up by Winona Char (1998). What has disturbing over 60 acres with telescopes, roads, utility corridors, temporary materials storage areas, cement batch mixing facilities and construction activities done to the insect and flora ecology and cultural significance of the summit?

13) Please disclose what scientific research, studies and new information support the continued expansion of astronomy facilities into the 600 acre "Astronomy Precinct"? What has been done within this area to conclude that development should be concentrated there without an irrevocable commitment to loss or destruction of any natural or cultural resource?

14) The analysis of the archeological surveys was not completed at the time the proposed plan was being written. What is the basis for justifying new activity within the 600 acres?

15) Please disclose the process by which the figure of 60 acres for all the current activity within the Science Reserve was reached. When was this calculation made? Who made the calculation? What does this figure include? Are all summit facilities, roadway (from Hale Pohaku to the summit, turnouts, two parking lots, the two batch plant areas (the first one at the lower elevation has not been restored to its original condition and is still used for emergency helicopter operations), temporary materials storage areas, Hale Pohaku facilities and utility corridors included?

16) Please discuss and disclose actions taken to investigate the 76 shrines and other archeological features for their archeo-astronomical significance. Has there been any attempts to assess and analyze early Hawaiian use of the summit for astronomical and navigational education? Any features or sites could be degraded or destroyed by the ongoing and proposed activities delineated in draft 2.

17) Hawaiians and observatory staff have mention over the years the rumors of burials being disturbed and destroyed. Has there been any attempt by UH/IfA to investigate persistent rumors that Hawaiian burials have been dug up during construction activities? Have any discussion taken place with the Hawaii Island Burial Council for mitigation measures? Please discuss mitigation measures for burial disturbance from construction activities.

18) In order to proceed with the Subaru Telescope construction, IfA agreed (to DLNR) to fund and implement a historic management plan. Please disclose and discuss the current status of the 10 year overdue Historic Preservation Management plan and how it will be integrated with the master plan.

NEED TO DISCUSS CARRYING CAPACITY, RECOGNIZING CULTURAL AND ENVIRONMENTAL CONSTRAINTS EXIST

19) Under cumulative impacts, please discuss the "carrying capacity" of Mauna Kea to support more astronomical facilities. On previous occasions, Francis Oda of Group 70 has stated that if they were to investigate this subject as recommended by state Legislative Auditor Marion Higa, Oda's analysis would probably show that hundreds of telescopes could be accommodated in the science reserve.

20) Does this viewpoint ignore the principles of constraints analysis where a telescope proposal is run through a matrix of concerns ranging from visual, cultural through environmental? Is Group 70 saying that none of these concerns conflicts with IfA's desire for more telescopes?

21) Please discuss the efficacy of having consulting biologists, archeologists and Hawaiian practitioners involved in the oversight of construction projects.

22) Please discuss the use of familiarization lectures, cultural sensitivity sessions mandatory for all facilities personnel, visiting astronomers, and construction personnel as part of mitigation for environmental and cultural impacts.

RARE FLORA AND INSECT SPECIES AND HABITAT STILL ENDANGERED BY 1999 PROPOSED PLAN

23) Actual habitat range of Wekiu insects and other endemic flora and fauna species are still unknown after 30 years of use. Biotic populations and their survivability are inferred from habitat suitability criteria and assumptions of presence rather than direct observation and study.

Please discuss the drastic drop of Wekiu insects from the 1982 studied levels to the 1998 levels. The April 1999 Arthropod Study of Selected Science Reserve Areas Report describes the possibility that insects inadvertently brought in from aboard in astronomy equipment containers could have caused the decline.

24) Spiders introduced possibly from Japan or Canada which were not present in the 1980's are now widespread in summit area. Please discuss mitigation measures including quarantine procedures and decontamination procedures. The goal must be to prevent introductions of high elevation adapted biota to the Science Reserve.

25) Sierra Club supports the broad range of Management recommendations in that Arthropod Study report, especially the need for habitat restoration and a comprehensive long term monitoring program. Please discuss how these recommendations can be institutionalized and implemented more successfully than the 1982 recommendations for arthropods.

33) Please describe the preventive measures taken after the tragic Subaru fire, which killed four Big Island workers. Do all the telescope facilities meet the County and State building codes imposed on commercial buildings?

34) Please disclose which building codes apply? Are facilities exempt because they have been classified as equipment or motors because of their moving domes? Did the loss of life occur in part, or because of, lack of enough fire extinguishers and exit doors required by state and county building codes?

WHY SHOULD HAWAII TAXPAYERS FOOT THIS BILL? INTERNATIONAL ASTRONOMY PROMISED TO PAY YEARS AGO

35) Currently the astronomy facilities pay the Institute for Astronomy about 10% - 15% of their operating budget for the privilege of being on the summit. This is in the form of *observing time given to the IfA. For the currently operating telescopes* the annual operating cost are about $30 million/year and this will more than double when the Subaru, Gemini and Smithsonian come on line. The IfA has been taking this $3 million per year, albeit in time instead of cash, and doing nothing to fulfill their obligations under the 1983 master plan.

The Hawaii taxpaying public is already overburdened with funding important services from a pool of shrinking funds. A May 26, 1999 President Mortimer letter to Advisory Committee Co-Chairs Kimura/Wilson sought to assure the committee that $400,000 will be committed for the following budget year.

Please disclose how the figure of $400,000 was derived as the needs for management plan implementation. It was stated in advisory meetings that these numbers were "back of the envelope" calculations. How is the money to be used?

36) Many statements were made at the advisory committee meetings by Vice President for Research Alan Teramura stating that the UH is "priority driven" and monetary costs are a secondary consideration (thus trying to reassure committee members money would always be found to fund science reserve management). However the public is wary of the UH's commitment to promised responsibilities.

Please discuss the recent controversy regarding the Council on Education in Public Health decision to revoke the accreditation of the University's Schools of Public Health, citing a lack of a permanent dean and lack of funding. There is also a controversy over the lack of resources to address overcrowded conditions for the undergraduates.

In a June 3, 1999 Honolulu Advertiser article Dean Smith, UH Senior Vice President said "The university is not in a position to provide the additional resources necessary to address... these problems, particularly when it cannot even exempt higher priority programs from budget cuts." Please discuss the long term likelihood of University funding being committed to long neglected management implementation when it can not meet current higher priority educational and staffing commitments.

26) Sierra Club supports the study of the cryptogramic soils and microbial ecosystems in the Science Reserve. Little is known about their extent and vulnerability. For the latter ecosystem, only one minor study was done in 70's by Siegel and Siegel.

27) Please address the need for intensive biological and archeological studies PRIOR to committing a site for development. Include a discussion of mitigation for HP expansion into palila bird habitat, road to summit and the utility corridor.

FAILURE TO DISCLOSE THAT THE OPTICAL/IR INTERFEROMETER COULD CONTAIN AS MANY AS 30 DOMES ON A SPRAWLING GRIDWORK OF ROADS AND UTILITY TRENCHES MILES LONG.

28) The larger the facility the greater the potential impacts. The size or "footprint" of facilities and array elements are indicative of adverse impacts to cultural, environmental, aesthetic and viewplane attributes of Mauna Kea. Please discuss why the master plan and EISPN does not count telescopes and elements for impact assessment purposes.

29) Group 70 was present when UH Mauna Kea Advisory Committee member and Interim IfA Director Bob McLaren disclosed that the new optical/interferometer facility (that is being proposed in Draft 2) may contain up to 30 telescopes distributed over an area 1 kilometer in diameter. Why have you not included that information in your list of existing and proposed observatories and in the proposed master plan? EISPN p. 2-8.

30) Please disclose what length of roadway was bulldozed into the North Plateau for the Smithsonian Institution's Array and how much more could be disturbed to double the number of pads and antennae elements already approved?

NONEXISTENT PROBLEM USED TO JUSTIFY PUBLIC LOCKOUT AFTER DARK

31) The excuse being used by the University's proposal for excluding the public from the summit area "one half hour after sunset and one half hour before sunrise" is that nighttime car lights may at some future time shine at facilities and degrade observations.

Bob McLaren admitted in advisory committee meetings that public nighttime use of summit of Mauna Kea was not a problem for the observatories. Please discuss and disclose how many incidents have actually occurred regarding degraded viewing time because public vehicle lights illuminated a facility.

32) Please disclose what facilities could be affected. Please disclose what mitigation measures other than exclusion of the public for the whole night could be considered and implemented.

Sierra Club believes that the restrictive access measures being considered for the public should be no less or more restrictive than those imposed on the astronomers. Many members of the public (including Sierra Club) supported Hawaii County's strict lighting ordinance in order to protect the nighttime viewing conditions by minimizing light pollution for the Science Reserve.

37) Please discuss the merits of a new Sublease Impact Fee and whether that should be established for all existing observatories, paid annually but assessed as part of a five year renewable sublease. A minimum five year fee of $1.2 million per facility along with a $1,000/acre Acreage Assessment to reflect the additional environmental impact of the more sprawling facilities should be considered. (These fees are equivalent to 5 to 7 percent of each observatory's annual operating budget or one to two nights a month of observing expenses).

These annual moneys would fund, among other things, the people and programs needed to protect the mountain's natural environment and Native Hawaiian cultural sites; enhance visitor programs and establish a summit shuttle service for visitors; improve public safety and emergency response; establish educational links with Hawai'i's public schools; and provide annual compensation to Native Hawaiians for use of the mountain's ceded lands (specifically for Mauna Kea related cultural programs, such as astronomy scholarships to Native Hawaiian students and a "kahu" system of Native Hawaiian docents).

38) Please discuss the idea of replacing the University's current sixty-five year lease for the Mauna Kea Science Reserve with a five year revocable lease. Nonperformance of its provisions - whether by the University or its tenants - would result in revocation of the lease and surrender of the Science Reserve, which would then be made available to other possible applicants (such as other universities) willing to abide by the contract.

CEDED LAND FEES DENIED TO OHA

39) Please discuss the implications of the Office of Hawaiian Affairs (OHA) not getting 20% of the viewing time or its equivalent as part of the revenues from ceded lands on the financing and management of the Science Reserve. Could the application of some of these fees have a positive effect on the management of the Science Reserve?

40) Please discuss the merits and adverse impacts of having OHA be given the lease or title to the Science Reserve as partial payment for the ceded lands settlement, as suggested by members of the public at the Master Plan hearings held on the Big Island in May, 1999.

PUBLIC TRUST, CULTURAL AND ECONOMIC LOST OPPORTUNITIES

41) These improvements in the Visitor Information Station programs and hours of operation are long overdue. An expanded visitor program was promised way back in 1983 as part of the original Master Plan. A $300,000 dollar telescope purchased by Hawaii taxpayers for public stargazing has been sitting in a box for years. Please disclose where it is currently warehoused, its future location at Hale Pohaku and what is holding up its use.

42) Past IfA Director Don Hall told Sierra Club that he was unable to prohibit the commercial tour vehicles or any other vehicles from driving to Puu Poliahu's summit because it was a publicly paid for road. Yet UH has been given the authority by DLNR to gate off the road at Hale Pohaku at IfA's discretion. Please discuss whether the road segment from the base of Puu Poliahu can be returned into a walking trail.

VISUAL DESIGN GUIDELINES ARE CRUEL ILLUSIONS?

43) It is assumed in the proposed master plan that coloration mitigation technology will be developed, yet it was clear from the advisory committee discussions that telescope construction would not stop if the technology failed to materialize. No facility would be denied if it failed to meet any of the Design guidelines as it relates to color, siting, scale, heights and widths. Please disclose the visual and cultural impacts if the design guidelines can not be met.

44) As a UH Mauna Kea committee member appointed by President Mortimer, Sierra Club asked Group 70 to provide an illustration depicting what the visual impact would be if one was standing beside the shrines on the north plateau, looking back up toward the summit. Our concern was the visual pollution of up to 30 telescope domes spread out over a circle nearly a kilometer in diameter in addition to 12 more Smithsonian radio dishes. To this date, it has not been produced. Please include this view in your Visual Impacts analysis portion of the DEIS.

45) Contrary to a draft 2 assertion that there have been no impacts to archeological features, please consult with Dr. McCoy for documentation on the alteration of an archeological site near the VLBA facility.

CULTURAL RESPECT SHOULD INCLUDE ENDING CESSPOOL USE

46) Please list all facilities with cesspools for human waste collection and discuss efforts to convert them to septic tank systems page 6-8 draft 2 master plan. Please disclose if the Japan National Telescope has a cesspool or septic tank system and whether it ever had a "spill" of human waste at Puu Hauoki or within the Science Reserve.

47) Please disclose what chemicals, solvents, cleaners are used at the facilities. Please disclose if toxic metals like mercury are used in the facilities. Have there been any spills or contamination incidents?

48) What quantities of the above items are in the Science Reserve and what measures are in place to deal with spills or contamination. What measures are taken to insure proper disposal of all such chemicals and toxic materials. Are any of them flushed down the wastewater lines?

MILITARY INVOVLEMENT WITH MAUNA KEA POSSIBLE?

49) Astronomers are adapting lasers and optics to cancel out atmospheric distortions. The military is also very interested in the laser as a weapon. What is the state of laser use and laser research on Mauna Kea?

50) IfA has military telescopes located within their Haleakala Science City complex and the public has expressed their opposition to the military's use of both Haleakala and Mauna Kea. Have there been and are there any ongoing discussions with the military regarding the use of the Mauna Kea Science Reserve?

51) Please discuss whether Gemini, Smithsonian, Kecks or any other facility on the summit has contracts, programs or experiments with military missions?

NOISE IMPACTS NEED TO BE DISCLOSED

52) When the wind does not blow, Mauna Kea's plateau within the Science Reserve can be much quieter than a library study room. Please discuss whether any study of noise impacts (with actual noise measurements taken under various conditions) had been conducted within the Science Reserve. Please disclose how quiet the ambient noise level is without wind.

53) Noise from ventilator fans, refrigeration units, construction activity, vehicular traffic and other sources radiate out from the summit. Please disclose noise impacts from all these sources, and their dispersion into sensitive areas such as the band of archeological shrines surrounding the summit. Please also disclose the noise impacts within the adze quarry complex and the two parcels of Natural Area Reserve.

People have reported hearing the low harmonics from summit noise sources over a kilometer downslope and away from the summit. Specifically, a group of hikers walked out to Puu Pohaku NAR and could hear and objected to the noises from the summit.

1983 COMMUNITY ADVISORY COMMITTEE NEVER CONVENED. WILL IT HAPPEN AGAIN?

54) In order to keep this pattern of practice from reoccurring this DEIS needs to discuss the citizen advisory committee mandated in the 1983 management plan. Please discuss why it never convened and functioned. When was that committee supposed to form and whose responsibility it was to convene the committee?

Sierra Club hopes that these comments are helpful in preparing the upcoming draft EIS for the proposed project. Please send a copy of the draft EIS to Sierra Club c/o 32 Kahoa St. Hilo, HI 96720, instead of our Honolulu office. Mahalo.

Malama Mauna Kea,

Nelson Ho

Nelson Ho
for the Sierra Club

August 26, 1999

GROUP 70
INTERNATIONAL

Sierra Club, Hawai'i Chapter
P.O. Box 2577
Honolulu, HI 96803

Attention: Nelson Ho, Hawai'i Island Conservation Committee

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft EIS Notice of Preparation

Francis S. Oda, AIA, AICP
Norman G.Y. Hong, AIA
Sheryl B. Seaman, AIA, ASID
Hitoshi Hida, AIA
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Mary J. O'Leary, AICP
Frank B. McCue, AIA
Chad M. Asuncion, AIGA
Christine M. Ruotola, AICP
Stuart M. Jow, AIA

Dear Nelson:

Thank you for providing comments on the Draft EIS Notice of Preparation for the Mauna Kea Science Reserve Master Plan in your letter of June 22, 1999. The following responses address the scope of issues you have raised for consideration in preparing the Draft EIS.

NEPA & Chapter 343 Requirements

There is no requirement for NEPA documentation for the subject Master Plan EIS. The Master Plan is being prepared under funding from the Research Corporation of the University of Hawai'i, and addresses uses on State lands. Specific individual projects, such as the Keck Outrigger project, have involved federal funding and are appropriately subject to NEPA compliance. Future observatories on Mauna Kea may or may not involve Federal funding, and NEPA will be complied with as applicable. The Office of Environmental Quality Control does not believe that NEPA compliance is required for this Master Plan.

In terms of Chapter 343 compliance for previous projects, the OEQC has also determined that environmental assessment documentation was adequate. Cumulative impacts are being addressed in a comprehensive manner in the EIS to address each of the facilities proposed in the Master Plan.

Integrated Natural and Cultural Resources Management Planning

The EIS will address natural resources and cultural resources in depth, both to comply with Chapter 343. "Integrated Natural and Cultural Resources Management " is an emerging term of art in planning with no official or commonly held definition. The Master Plan represents an integrated approach in considering the natural resources and cultural resources of the mountain. The recommendations to prepare an INCRMP reflect the leading edge of environmental planning. Group 70 has completed numerous plans which address cultural and natural resources and management planning, including the award-winning Ke'anae-Wailuanui Cultural Landscapes Plan on Maui, the Kekaha Kai Regional Park Master Plan in North Kona, and Coconut Island Master Plan in Kaneohe Bay.

Environmental Studies

Updated technical studies of environmental resources are being completed for the EIS in the areas of botany, arthropods, cultural resources/ethnography, and archaeological resources. Rare flora and fauna are evaluated in these studies. Each of the issues you raise regarding archaeological sites and mitigation are addressed in the EIS. DLNR is currently progressing with their completion of the Historic Preservation Plan, and the EIS will discuss the DLNR's current direction for the plan.

Burials

There are no known burials at the summit and very few confirmed burials in the Science Reserve. This is based on over 30 years of research on the summit and interviews with elders of the island. If there are records of such burials, we encourage these reports to come forward to be verified and added to the record. There have been no actions in and around burials, and there has been no findings or actions warranting notification of the Burial Council.

Carrying Capacity

As you note in your comments, the carrying capacity of Mauna Kea for astronomy development is substantial from a technical analysis viewpoint. Utilizing the GIS resource layering studies, the Master Plan addresses each of the constraints you suggest. The EIS will further address the Master Plan's approach to protecting natural and cultural resources, and minimizing cumulative effects to these resources. These measures include the physical planning actions (the Astronomy Precinct limits, avoidance of habitat areas, etc.) and the management plan measures (rangers, monitoring, etc.).

Funding Questions

The University has committed to funding for the new Office of Mauna Kea Management (MKM) subject to the adoption of a Master Plan. The budget is based upon staffing requirements for an Executive Director, administrative assistant, Program Director for the Visitor Information Station at Hale Pōhaku, and four full-time rangers. Additional staffing and budgets relating to the Mauna Kea Support Services will be incorporated into the MKM as appropriate. The EIS will present additional detail on the form and function of the management program.

Optical/Infrared Interferometer

The Master Plan proposes a future site for an optical/IR interferometer within the Astronomy Precinct for planing purposes only. The Plan does not provide specific details about this potential facility. This facility will not be built with the present state of technology for the optical/IR interferometer. The Plan would require the multiple elements of this facility to be visually unobtrusive. At present this is not possible, given the current facility requirements to combine light from multiple elements. This facility will only be considered for development if, over the next 10 to 20 years, there are

advances in the light-combining technology. In order for the facility to be built, a revision of the Master Plan would need to be approved. Also, a full EIS and a CDUA permit would need to be approved.

Access Management

Public access management issues will be a responsibility of the new management entity. The Management Plan recommends that public access be managed (but not limited) for public safety and protection of natural and cultural resources. One possible reason for controlled nighttime public access to the summit would be to offset the increase in off-road vehicle activities. The EIS addresses management plan issues including access management, however, the real decisions will be made by the future management group which surely will consider the wide range of public access needs.

Fee Issues

Assessment of fees to existing observatories would violate contracted agreements. New or redeveloped facilities will offer the opportunity to examine appropriate sub-lease terms, which could include fees for management of the Science Reserve. Ceded land issues are a State-wide concern that the Governor is presently addressing.

Visual Impacts

The Draft EIS will include a complete visual resources section to address the potential impacts to views from locations both on the mountain and from lower elevation communities. Design guidelines are established in the Master Plan to guide the future development of observatories and other facilities on Mauna Kea. The Draft EIS will include a perspective view of the summit from shrine locations to the north.

Wastewater Management

Each of the observatories has an individual wastewater system (IWS). The older facilities such as CFHT, CSO, IRTF, UKIRT, UH 0.6m and UH 2.2m all pre-date the 1980's establishment of new Department of Health requirements for individual wastewater systems to utilize septic tank and leaching systems. In the future, all new or redeveloped observatories or other new facilities will be required to comply with the IWS standards, and some observatories will be required to upgrade or replace their wastewater management facilities.

Military Involvement

There are no known plans for military involvement with the existing observatories at Mauna Kea. None of the new facilities being considered have a military purpose or sponsor.

Noise Impacts

Noise is being addressed in the Draft EIS, however, there are no plans to conduct detailed noise surveys. The summit is a quiet place and there are no known chronic sources of noise that affect the summit as you describe. Short-term noise from construction activities will be audible, however, this will be a temporary effect.

Thank you again for providing your comments on the Draft EIS Notice of Preparation. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

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Jun. 22 1999 02:13PM P1

Anthony Ako Arnzo
P.O. Box: 943 or 310
Kapaau, HI 96755

June 21, 1999

Governor of Hawaii
% OEQC
DLNR, IFA,
UH Hilo, et al
235 South Beretania St. #702
Honolulu, HI 96813

RECEIVED
JUN 25 1999
GROUP 70

Dear Sirs:

Enclosed is a 5-page letter that was presented to Group 70 at the Kona Hearing regarding the management plan for Mauna Kea. I would like to add that an unbiased study done by a new group of people needs to be implemented so to keep the fact-finding to be unbiased! How can any group hired by the state or an advisory committee with majority members being pro-develop Mauna Kea (due to Mr. Rohrig's meddling of the selection process of candidates) be able to perform their duties in the best interest of the Hawaiian community?

And, why is it that UH as an entity is to be autonomous to do as they damn please? To insult Hawaiians further, there is definitely a poor representation of Hawaiians to voice an opinion against the further development of Mauna Kea. An independent committee made up of community individuals (much like a jury) needs to be put in place to insure an honest decision in the community's best interests. The advisory committee Mr. Mortimer, McLaren, et al are not acting

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2/

in the best interests of the Hawaiian community. Witness the distorted perception that astronomy is more important than having an accredited School of Public Health. People are more important than looking at stars or "black-holes" in space; or, can it be said that astronomers are really over-glorified doctors of proctology peering into the anus of space all in the name of scientific endeavors? How arrogant to put pure science ahead of solving the problems of a world that has disease, hunger, war and poverty — and it is getting worse..

Of course the solution is too simplistic — share the telescopes and stop building <u>any</u> more! Get off the ego-trip of scientific discovery and work collaboratively. Use the tax money to solve real-world problems. Science is a luxury and is <u>not</u> a sacred cow — especially Ass<u>s</u>tronomy. It does not take the solving of a mathematical algorithm and apply it to astronomy at the cost of billions of dollars to the tax paying public. Let's stop this insanity and deal with fixing the problems on earth, instead of trying to colonize space!

Mahalo,

Anthony Ako Arrigo

(808) #889-5309

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[illegible]
P.O. Box 310
Kapaau, HI 96755

May 24, 1999

DLNR;
State of Hawaii;
U.H. of Hilo;
Inst. of Astronomy, et al

To all concerned:

After attending the 1st meeting (of May 24, 1999) in regard to input of how to protect and preserve Maura Kea as a sacred resource for Hawaiian people, we have come to ask these questions (I am only the messenger speaking on behalf of my family and my Hawaiian ancestors):

1) How is it that at the meeting in Waimea, the majority of people (sent by Keck or other companies connected to the business of astronomy) spoke of their titles, degrees that they earned, their hardship to find a job in a limited work field as astronomy but yet none of them spoke of the impact this will have on the entire community

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1) in Hawaii and elsewhere because of monies to pay for these projects (NASA = $5.5 million or more)? Where is it that the taxpayer has to subsidize a special interest group (astronomy, etc that creates only income for *3%-5% of the work force nationwide (*hypothetical estimate)? And, where will this NASA expense be justified with all of the cuts being done at all levels of government?

2) Why is astronomy being treated as a "sacred cow" at the expense of UH School of Public Health being sent packing due to lack of funding?

3) How is it that McLaren, Mortimer, UH Hilo Chancellor, are being given major roles to make decisions that are essential decisions that could be made by Hawaiians who are more in-touch with the culture and historical aspects of Mauna Kea? Why are Hawaiians being given 2nd-class status or for that matter, 2nd-class status to anyone who opposes development on Mauna Kea? Why are Hawaiians being left out of the decision-making process involving all cultural and historical sites in Hawaii?

4) What will be NASA's role now that it is trying to build a $5.5 million dollar array of telescopes? Is the true mission really to perpetuate SDI research, but yet no one is willing to

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3) Say this in public! And why is NASA pushing so hard to get their project off the ground ASAP? Why is there a race to colonize the limits of space?

5) Why is it that the engineers and astronomers who spoke on May 24, 1999, worshipping the "god" of Hi-Tech astronomy and not facing real world problems of poverty, education, disease research, etc. etc. Not one of them spoke compassionately of helping to better the lives of indigenous people or of solving these problems that face the majority of us who are not part of their elite "community".

7) Why is it that one of the Keck engineers spoke of the sanctity of Mauna Kea, but yet he did nothing to protect Mauna Kea by building of telescopes on the summit. If, as he said, the summit is Kapu, why keep building? And further, this same engineer claimed the Hawaiians were excellent astronomers and revered the heavens, why did he stretch his fictitious story that Hawaiians would be in awe of what could be learned by "using" Mauna Kea to continue the astronomy studies? The problem with this type of thinking is that it seems to proclaim that Hawaiians would endorse what is happening (with telescopes) today and worship the false "god of technology". This is not true at all because the Hawaiians would never [illegible] (telescopes) that [illegible] the "sins

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correction per telephone Anthony Anjo

7) because their goal was to ~~to~~ be in harmony with their gods of the land and sea. The entire community came first and not special interests!

8) Since when (probably since 1778) does a guest (in this case the "haole") come to someone's land, is invited to the home, but in turn kicks out the owner (Hawaiians) of the house and proclaims the land and house as his own? The "ceded" lands are stolen lands and stolen land or anything stolen can never be owned by the people who stole it! Mauna Kea is part of this fiasco of "ceded" stolen lands and can never be owned except by those who owned it originally unless the *palapala proclaims a new owner (which has not happened). And referring to "haoles", anyone can be of this mind-set and it isn't to be limited to being a racial term. "Haole" is ~~probably~~ someone who is foreign to the philosophies and cultural practices of the area and isn't in harmony with the rest of the community's beliefs.

9) The lies and deceit done to Hawaiians and other indigenous people is endless. Why is it

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P.7 that this hearing to discuss Mauna Kea seems like those of us who want to protect and not profit from Mauna Kea's use are being lied to once more? where is truth and honesty and when will government, et al, realize that oppressing people and dictating to them will only result in the same oppression being thrown back at those in power? Stop the lies and listen to those of us who were the first to be here. This is our land and we will not allow this to continue. Ke Akua will hold all of us responsible for our actions and decisions.....

Mahalo

Ke Aloha Akua,

Anthony Aka Ayo
P.O. Box 310
Kapaau, HI 96755

(808) 889-5309

WOW!

* 600 acres = 27,000,000 sq.ft;
* 1 sq. mile = 28,000,000 sq.ft;
* 10 Ala Moana Shopping Centers;
* 20 Science Cities as on Haleakala;
* Outright stupidity and desecration! Mauna Kea could be compared to Vatican City or to Kyoto — a very sacred place in the culture and history of Hawaiian people....

August 26, 1999

GROUP 70
INTERNATIONAL

Francis S. Oda, AIA, AICP
Norman G.Y. Hong, AIA
Sheryl B. Seaman, AIA, ASID
Hitoshi Hida, AIA
Roy H. Nihei, AIA, CSI
James I. Nishimoto, AIA
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Frank B. McCue, AIA
Chad M. Asuncion, AIGA
Christine M. Ruotola, AICP
Stuart M. Jow, AIA

Mr. Anthony Ako Anjo
P.O. Box 943
Kapa'au, Hawai'i 96760

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft EIS Notice of Preparation

Dear Anthony:

Thank you for providing comments on the Draft EIS Notice of Preparation for the Mauna Kea Science Reserve Master Plan in your letters of May 24 and June 21, 1999. The following responses briefly address the scope of issues you have raised for consideration in preparing the Draft EIS. More detailed information will be in the DEIS.

Working Together

As a messenger of your family and ancestors, your points about working together and listening to the Hawaiian community are well taken. A relationship-building process is currently being started to achieve this goal. In this process, members of the Hawaiian community and astronomy community will come together to share their thoughts about Mauna Kea and its future. Through this process, and the longer term *Kūpuna* Advisory Committee that is proposed, it is hoped that some of the "lies and deceit done to Hawaiians" and other concerns can be discussed and the beginning of an understanding can develop.

My impression from the public meetings is that members of the astronomy, Hawaiian, and broader community seem to be starting the process of talking with each other and trying to understand each other more fully. The more that this kind of discussion occurs, the better off Mauna Kea and all of Hawai'i will be in the future.

Role of Astronomy in Community

Hearing the astronomy employees speak at the public meetings, my sense is that most are quite sincere about their role in the larger community. Beyond the role that organizations such as Keck play in bringing astronomy to the island's classrooms and by hiring local high school students and professional and technical staff, their employees express a very personal aloha for the larger community and a desire to be more involved in the community.

In a practical sense, the entire community benefits somewhat from the direct job opportunities (about 400) provided by astronomy but more so by the expenditures of the observatories and their employees in other sectors of our economy. The number of jobs

and total economic benefit rises during periods of construction. I understand, however, that you are referring to more specific community benefits which may arise out of the *ho'oponopono* process.

Role of NASA and Federal Tax Dollars

I believe you are talking about the Keck Outrigger Telescopes when you mention the $55 million array. The 4 to 6 auxiliary telescopes are planned to create a powerful infrared interferometer. The primary purpose of the facility will be to study planetary systems around nearby stars.

The Keck interferometer is not intended to be used to further SDI research. None of the existing or proposed Mauna Kea telescopes is or will be used for military purposes.

Role of University of Hawai'i

The University of Hawai'i, as the leasee of the Mauna Kea Science Reserve, is committed to improving the management of Mauna Kea. While the proposed Office of Mauna Kea Management (MKM) will be housed at the UH-Hilo and project decisions will be made by the UH administration, the intent is for the MKM and associated programs to provide a permanent and much more significant local community role than has ever occurred before.

The Mauna Kea Advisory Committee has proposed that the Mauna Kea Advisory Board, which will advise the UH-Hilo Chancellor and will oversee the Office of Mauna Kea Management, be made up of individuals from native Hawaiian organizations, State departments, local business organizations, and environmental groups. In addition, the Master Plan proposes, and the Mauna Kea Advisory Committee concurs with, the formation of a *Kūpuna* Advisory Committee to advise the Office of Mauna Kea Management on cultural practices and issues. With the establishment of these organizations, native Hawaiians will be intimately involved in daily operations and broader policy decision-making for Mauna Kea.

Hawaiian Cultural Concerns

In addition to the formation of the Office of Mauna Kea Management and the *Kūpuna* Advisory Committee, the Master Plan attempts to support the use and respect of Mauna Kea by all members of the community – native Hawaiians, astronomers, skiers, students, etc. A major component of this philosophy is the designation of 10,760 acres of the Mauna Kea Science Reserve as a Natural and Cultural Preservation Area where no development is proposed.

Concerning access, the Master Plan directs that there should be no constraints to contemporary or traditional practitioners as long as the existing archeological features continue to be honored.

Again, the establishment of the MKM, Mauna Kea Advisory Board, and *Kūpuna* Advisory Committee will greatly increase formal native Hawaiian participation in managing the mountain. Your discussion of Hawaiian astronomers, and disagreement

with the claim by a speaker that ancient Hawaiian's would have endorsed astronomy development is one such topic that can be discussed and clarified by the *kūpuna*. Through the guidance of *kūpuna*, the future of Mauna Kea is hopeful.

Ceded Land

With regard to ceded lands, the University recognizes that they have an educational exemption (Hawai'i Revised Statutes, 10-2) and that the land contained in the Mauna Kea Science Reserve is not being used for commercial development. The educational exemption and larger ceded land issues are a State-wide concern and the Governor is addressing trust obligations to the native Hawaiian community and the general public.

Thank you again for participating in the public meetings and for providing your comments on the Draft EIS Notice of Preparation. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

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FAXFORM

RECEIVED
JUN 14 1999
GROUP 70

PAGES: 1

TO FAX: 808-523-5874
TO: Jeffrey H. Overton
Chief Environmental Planner
Group 70

FROM: James A. Roberts, Ph.D., CEP
Geographer and Resource Planner
540 Morris Way
Sacramento, CA USA 95864
FAX: 916-484-7124

SUBJECT: **NOTICE OF PREPARATION OF DRAFT ENVIRONMENTAL IMPACT STATEMENT (MAUNA KEA SCIENCE RESERVE MASTER PLAN)**
DATE: June 11, 1999
CC: Board of Regents
UH Mauna Kea Advisory Committee (via Nelson Ho)
Senator Malama Soloman

FILE: MaunaKea061199

Dear Mr. Overton:

Thank you for sending me a copy of the subject notice. I appreciate having the opportunity to review it. While the document appears to be quite comprehensive, it does raise several critical questions:

- Since the notice reads essentially like an advocacy document (for the proposed project), how can the authors, who we understand have prepared or are preparing the project plan, complete an objective, independent assessment of the project impacts?

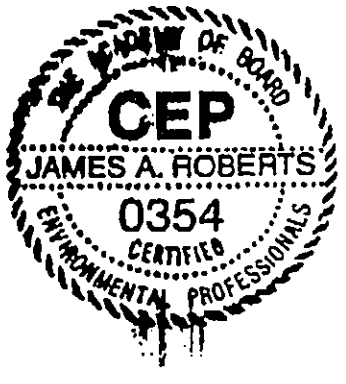
- It is our understanding that funding sources and project developers have included and will continue to include the Smithsonian Institution and NASA. Hence, what is the status of the Federal environmental impact assessment process? Pursuant to Section 1508.18 (b) (4) ["Projects (for which a NEPA process is required) include actions approved by permit or other regulatory decision as well as federal and federally assisted activities."] it is clear that the use of Federal funds for all or portions of the proposed development will require a Federal, NEPA documentation process in parallel with or after completion of the State process.

- Is there a completely independent reviewing body which has no vested interest either in the development or the planning process that is to review the conclusions of the environmental assessment process?

It is our opinion that the environmental impact assessment for the proposed project should not be prepared by the University or a contractor under its direction. This is particularly true in view of the controversy that the project has raised to date.

Again, I appreciate your sending me the copy to review.

James A. Roberts, Ph.D. CEP



August 26, 1999

GROUP 70
INTERNATIONAL

James A. Roberts, Ph.D., CEP
540 Morris Way
Sacramento, CA 95864

Subject: **Mauna Kea Science Reserve Master Plan**
Responses to Comments on the Draft EIS Notice of Preparation

Francis S. Oda, AIA, AICP
Norman G.Y. Hong, AIA
Sheryl B. Seaman, AIA, ASID
Hitoshi Hida, AIA
Roy H. Nihei, AIA, CSI
James I. Nishimoto, AIA
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Mary J. O'Leary, AICP
Frank B. McCue, AIA
Chad M. Asuncion, AIGA
Christine M. Ruotola, AICP
Stuart M. Jow, AIA

Dear Dr. Roberts:

Thank you for providing comments on the Draft EIS Notice of Preparation for the Mauna Kea Science Reserve Master Plan in your letter of June 11, 1999. The following responses address the scope of issues you have raised for consideration in preparing the Draft EIS.

Draft EIS Preparers

Group 70 International, Inc. is the preparer of the Draft EIS, which includes a thorough assessment of the potential impacts of the proposed Master Plan, pursuant to Chapter 343 HRS. As the environmental planners responsible for completion of the Master Plan, Group 70 is very familiar with the environmental and cultural setting of Mauna Kea. We have also engaged several highly qualified consultants to prepare technical studies of the environmental and cultural conditions, to ensure that accurate information is included in the EIS documents. The EIS is an environmental information disclosure document which undergoes a rigorous public/agency review process, and therefore cannot function as an advocacy document.

NEPA & Chapter 343 Requirements

There is no requirement for NEPA documentation for the subject Master Plan EIS. The Master Plan is being prepared under funding from the Research Corporation of the University of Hawai'i, and addresses uses on State lands. Specific individual projects, such as the Keck Outrigger project, have involved federal funding and are appropriately subject to NEPA compliance. Future observatories on Mauna Kea may or may not involve Federal funding, and NEPA will be complied with as applicable. The Office of Environmental Quality Control does not believe that NEPA compliance is required for this Master Plan.

Environmental Review Agency

The State Office of Environmental Quality Control is the reviewing body that is responsible for the acceptance of the EIS for the Governor. The OEQC does not have a vested interest in the development or the planning process.

Thank you again for providing your comments on the Draft EIS Notice of Preparation. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

RECEIVED AS FOLLOWS

Mauna Kea Science Reserve Master Plan.....2020

Universe Trail & Bikeway Outdoor Learning Center

Creator: Toby S. Hazel
RR3 Box 2298, Pahoa, Hawaii, 96778
965-9799

June 10,1999

'99 JUN 16 A8:15

In the expansion of the Mauna Kea Reserve Master Plan to the year 2020, I propose a scientific model of the Universe to be established on the Big Island as a part of the development of Trail and Bikeway System surrounding the Island. Scientists and Artists with the help of Big Island school children will create and build models of the various planets and other celestial bodies in a variety of sites around our Island, with the center emanating from the Mauna Kea Solar Observatories.

This plan integrates elements of education, technology, scientific and visual arts with the participation of all different ages in our community. International Artists could be invited to create a planet in their medium, with local artists and art students from each of the Big Island schools would design and implements the informational bases that would hold up each of the individual celestial bodies. The co-ordination of such a large project would easily take until 2020, however each module completed would be an occasion for celebration and announcement of a unique resource forming on our Island.

Students could network around the world as they decided with their mentor and teachers what types of information would be depicted and built into the encoded bases that would hold each planet. The process of this research would bond many more people and visitors to the Mauna Kea Reserve Project. Ideally, the sites chosen for each model would be in view of Mauna Kea. I was told by an astronomer, formally with the Center, that according to the size of the round observatories on the mountain that Pluto would be the size of a golf ball in Pahoa.

I believe that a project such as I am suggesting would enhance the understanding of students, inspire artists and engage scientific contributions. As families walk or ride their bikes around the Universe, they will contemplate some of the most amazing knowledge of mankind and the great mystery of our creator.

cc: University of Hawaii
2444 Dole Street, Bachman Hall
Honolulu, Hawaii, 96822
Contact: Allan Ah San

Governor, State of Hawaii
c/o Office of Environmental Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii, 96813

Group 70 International, Inc.
925 Bethel Street, 5th Floor
Honolulu, Hawaii, 96813
Contact: Jeff Overton

Puna Trail & Bikeways
PO Box 1641
Hilo, Hawaii, 96721
Contact: Ginny Aste

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GROUP 70
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Stuart M. Jow, AIA

August 26, 1999

Toby Hazel
RR 3 Box 2298
Pahoa, Hawai'i 96778

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft EIS Notice of Preparation

Dear Toby:

Thank you for providing comments on the Draft EIS Notice of Preparation for the Mauna Kea Science Reserve Master Plan in your letter of June 10, 1999. The following responses address the scope of issues you have raised for consideration in preparing the Draft EIS.

The integration of the arts has not been addressed in the Master Plan. We will pass on your ideas with the Draft EIS and possibly the new management group could address these thoughts in the specific management program.

Thank you again for providing your comments on the Draft EIS Notice of Preparation. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

May 27, 1999

Group 70, Members of the Mauna Kea Advisory Committee

Thank you for the opportunity to address concerns regarding the management of the Mauna Kea Science Reserve. After spending some time, I was finally able to locate a copy of the plan to review. It was not available at the University of Hawaii at Hilo Library until today, three days after the first meeting was held. Is there really an intent to involve the local university community in this decision-making process?

I am quite surprised to find that an EIS is presently being prepared, but that the information being generated by the EIS was not considered when the group developed and voted on this plan. How can you plan to protect natural resources you have not assessed? Additionally I note that a full biological assessment has not been funded. An EIS should look at all of the natural resources, including the flora.

In the course of assessing the arthropods, Dr. Howarth has found that the populations of the wekiu bug, an organism unique to the summit of Mauna Kea, have drastically crashed since the original survey in 1983, before the observatory facilities were built. Much of the original habitat was destroyed deliberately by the IfA, contrary to the guidelines outlined in the 1983 Management Plan, thanks in part to inadequate oversight by the DLNR.

The report claims that much of the 1983 plan has been implemented. Actually, the building of the astronomical facilities has been implemented, but the promises to the community were broken. Plans to facilitate visitors, establish a telescope at the visitor center, fund full-time ranger and interpretive staff, collect trash, enforce environmental protection, and protect the cultural heritage from vandalism have all gone unfunded.

In the 1999 plan I see no dedicated funding, no enforcement regulations, and no punitive consequences that would discourage mismanagement in the future. Nor do I see dedicated funding for interpretation, signage, trash collection, habitat restoration and visitor education. I would assert that no further expansion of astronomical facilities should be allowed until a fail-safe mechanism is put in place to fund the visionary promises heralded in this plan.

On a personal note, I feel tremendous sadness when I think of our beautiful mountain as it once was, and the industrial construction zone it is today. Gone is the spiritual serenity, the pristine and ethereal vision of the heavens. I know it cannot be recovered. I realize that the astronomy industry offers us an opportunity to learn more about the heavens while stimulating the economic and intellectual well-being of our community, but I the industrialization of a most sacred place weighs heavily on my heart. We are not in a competition to get the MOST, the BIGGEST, or the HIGHEST toys in the world. I ask you to stop, include the concerns of the Hawaiian practitioners, the environmental community, and the residents of this island in your management plans. The telescopes you build today will be outdated by the time the lease expires, but the mountain cannot be restored to its original condition. Please do not pave, bulldoze, pollute and disturb any more that you already have.

Deborah Ward, P.O.Box 918 Kurtistown, HI 96760 dward@hawaii.edu 966-7361

August 26, 1999

GROUP 70
INTERNATIONAL

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Christine M. Ruotola, AICP
Stuart M. Jow, AIA

Ms. Deborah Ward
P.O. Box 918
Kurtistown, Hawai'i 96760

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft EIS Notice of Preparation

Dear Deborah:

Thank you for providing comments on the Draft EIS Notice of Preparation for the Mauna Kea Science Reserve Master Plan in your letter of June 10, 1999. The following responses address the scope of issues you have raised for consideration in preparing the Draft EIS.

We appreciate the concerns you have raised. The issues you have raised will be addressed in Draft EIS, including biological and cultural studies, along with visitor center improvements, management plan improvements, and a funded management entity. The majority of the Mauna Kea Science Reserve (over 95%) will become a natural and cultural preservation area, with astronomy development directed to small low-impact areas within an Astronomy Precinct. Wēkiu bug habitat areas, for example, will not be affected by new construction at the summit. The new management plan, and particularly the local-based management entity, is expected to solve many of the problems you raise.

Thank you again for providing your comments on the Draft EIS Notice of Preparation. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
FT. SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF

September 27, 1999

Civil Works Technical Branch

Mr. Allan Ah San
University of Hawaii
2444 Dole Street
Bachman Hall 112
Honolulu, Hawaii 96822

Dear Mr. Ah San:

Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement (DEIS) for the Mauna Kea Science Reserve Master Plan, Hamakua, Hawaii (TMK 4-4-15: 09 and 12). The following comments are provided in accordance with Corps of Engineers authorities to provide flood hazard information and to issue Department of the Army (DA) permits.

a. Based on the information provided, a DA permit will not be required for the project.

b. The drainage information provided on page 4-26 of the DEIS is correct.

Sincerely,

James K. Hatashima
Acting Chief, Civil Works
Technical Branch

GROUP 70
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Francis S. Oda, AIA, AICP
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Kathryn A. Nam
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Frank B. McCue, RA
Christine M. Ruotola, AICP
Stuart M. Jow, AIA

December 27, 1999

Department of the Army
U.S. Army Engineer District, Honolulu
Ft. Shafter, HI 96858-5440

Attention: James K. Hatashima
Acting Chief, Civil Works Technical Branch

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Acting Chief Hatashima:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of September 27, 1999.

We appreciate the verification of the drainage and flood hazard information presented in the Draft EIS.

If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pacific Islands Ecoregion
300 Ala Moana Boulevard, Room 3-122
Box 50088
Honolulu, Hawaii 96850

In reply refer to: MSR

RECEIVED
OCT 7 - 1999
GROUP 70

OCT -6 1999

Jeff Overton
Group 70 International, Inc.
925 Bethel St., 5th Floor
Honolulu, HI 96813-4307

Re: Mauna Kea Science Reserve Master Plan - Responses to Comments on the Draft EIS Notice of Preparation and Request for Technical Assistance

Dear Mr. Overton:

The U.S. Fish and Wildlife Service (Service) has received your letter of August 26, 1999, regarding the Mauna Kea Science Reserve Master Plan - Responses to Comments on the Draft EIS Notice of Preparation. The Service supports measures detailed in your response letter to minimize astronomy development impacts to endemic arthropods on the Mauna Kea summit and minimize the impacts to this high altitude environment from alien species introductions, garbage generation and collection, and visitor impact. Furthermore, we support the recommendation to include ongoing monitoring of the wekiu bug (*Nysius wekiuicola*) as a component of the Master Plan. The Service would be happy to review the components of a specific program for monitoring for the wekiu bug and other resources when it is available.

Currently, the wekiu bug is a Species of Concern. Species of Concern is a term used to signify those species for which information in the possession of the Service indicates that it may be appropriate to propose to list such species as endangered or threatened under the U.S. Endangered Species Act of 1973, as amended (ESA), but for which sufficient data on biological vulnerability and threat are not currently available to support proposed rules. Species of Concern receive no protection under the ESA.

However, on November 9, 1998, our office prepared a recommendation, currently under review by the Service's Washington office, proposing candidate status for the wekiu bug. A candidate taxon is one for which the Service has on file sufficient information on biological vulnerability and threats to support a proposal to list it as an endangered or threatened taxon. A copy of the information included in the candidate recommendation is enclosed.

The Service appreciates your concern for native Hawaiian wildlife species and the opportunity to provide comments on the preparation of the proposed Mauna Kea Science Reserve Master Plan. If you have any further questions, please contact Fish and Wildlife Biologist Mike Richardson by telephone at (808) 541-3441 or facsimile transmission at (808) 541-3470.

Sincerely,

Robert P. Smith
Pacific Islands Manager

enclosure

CANDIDATE AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Nysius wekiuicola*

COMMON NAME: Wekiu bug

LEAD REGION: Region 1

INFORMATION CURRENT AS OF: 09/28/99

STATUS/ACTION (Check all that apply):
_X_ New candidate
___ Continuing candidate
  ___ Non-petitioned
  ___ Petitioned - Date petition received: ___
    ___ 90-day positive - FR date: ___
    ___ 12-month warranted but precluded - FR date: ___
  ___ Listing priority change
    Former LP: ___
    New LP: ___
___ Candidate removal: Former LP: ___ (Check only one reason)
  ___ A - Taxon more abundant or widespread than previously believed or not subject to a degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.
  ___ F - Range is no longer a U.S. territory.
  ___ M - Taxon mistakenly included in past notice of review.
  ___ N - Taxon may not meet the Act's definition of "species."
  ___ X - Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Lygaeidae (seed bugs)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Hawaii, island of Hawaii

CURRENT STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Hawaii, island of Hawaii

LEAD REGION CONTACT (Name, phone number): Catrina Martin (503/231-6131)

LEAD FIELD OFFICE CONTACT (Office, name, phone number): Pacific Islands Office, Christa Russell (808/541-3441)

BIOLOGICAL INFORMATION (Describe habitat, historic vs. current range, historic vs. current population estimates (# populations, #individuals/population), etc.):

The island of Hawaii today consists of five volcanic mountains. All are very young and three have been active in recent history (MacDonald et al. 1983; Wolfe et al 1997). Mauna Kea is the highest of these volcanoes, rising 4,206 meters (m) (13,796 feet (ft)) above sea level. The surface lavas of this volcano are all younger than middle Pleistocene, and it has probably not been active during the last 2,000 years. During the Pleistocene epoch an ice cap existed on the summit of Mauna Kea, with at least four distinct glacial episodes during the last 300,000 years (Porter 1979; Wolfe et al. 1997). The most recent glacial event (the Makanapa ice cap) disappeared from Mauna Kea about 9,000 years ago, but permanent ice still exists in the cinder of the summit cones just a few feet below the surface (Woodcock 1974; Wolfe et al 1997).

Presently, the summit of Mauna Kea above 3,000 m (9,843 ft) is an alpine lava community sparsely vegetated with growths of crustose lichens numbering about 25 species and the mosses numbering about 15 species, *Racometrium lanuginosum* (Gagne and Cuddihy 1990). Prior to the 1980's, due to an apparent lack of vegetation, it was popularly believed the Mauna Kea summit was a lifeless alpine desert. One well-known astronomist was even quoted as saying "(the summit) is a lifeless, red-black jumble of lava blocks" (Waldrop 1981). However, in 1979 with the discovery of the wekiu bug and subsequently into the early 1980's, a whole aeolian community of arthropods was discovered at the summit (Mull and Mull 1980, Papp 1981, Gagne and Howarth 1982). Aeolian ecosystems are characterized by a near lack of natural producers, a windborne supply of nutrient material, a few plants such as algae, mosses, and lichens, and by a community of mostly arthropod predators and scavengers evolved to feed on the windborne food supply. On Mauna Kea's summit, the major faunal components include a moth whose caterpillars feed on the lichens, a *Lycosa* wolf spider and a centipede that prey on moribund insects blown to the summit, and of course, the unique, flightless wekiu bug (Howarth and Stone 1982).

At least six major habitat types can be recognized within this alpine ecosystem, and not all are suitable for each of the species (Howarth and Stone 1982): 1) Snow patches provide a moisture and food resource for all of the summit arthropods but are not directly utilized by any of the species, 2) tephra ridges and slopes on cinder cones are important habitat for the spider, the wekiu bug, and smaller arthropods such as springtails, 3)Ash and ash-sized deposits are not suitable habitat for the wekiu bug, 4)lava flows with large outcrops of andesitic rock are the primary habitat for the moth, the spider, and the centipede, but the wekiu bug is rare in this habitat due to the lack of suitable microclimate, 5)talus slopes and fractured rock outcrops are typically smaller areas that occur within areas of andesitic lava flows and are suitable habitat for the wekiu bug and, 6)compacted ash, silt, and mud along roadsides and in depressions. Because the interstitial voids among the cinders are filled, some aeolian arthropods cannot utilize this habitat (Howarth and Stone 1982).

The wekiu bug (*Nysius wekiuicola*) was first discovered in 1979 by F.G. Howarth, S.L. Montgomery, and W.P. Mull on Pu'u Wekiu, the summit cinder cone of Mauna Kea on the island of Hawaii. Wekiu is a Hawaiian word meaning, "tip, top, topmost, summit," and the common name 'wekiu bug' was selected in reference to the insect's habitat (Ashlock and Gagne 1983).

Lygaeidae is a family within the order of insects known as Hemiptera (true bugs). The family is characterized as a variable group, usually recognized by their four-segmented antennae, four-segmented beak, ocelli (light-sensing structures), and four or five simple veins in the membrane of the hemelytra

(wings) (Borror et al. 1992). Length varies from 2 to 18 millimeters (mm) (0.079 to 0.71 inches (in)) and many species are brightly marked with bands of black, white, or red. Most members of this family are primarily seed feeders, earning the family nickname "seed bugs." Although the order Hemiptera contains many predators, including entire families of predators, (i.e. Reduviidae), Lygaeidae itself contains few predators (Borror et al. 1992). In Hawaii, the genus *Nysius* is characterized by the following physical attributes: conspicuous pubescence and erect setae (hairs) which clothe the greater part of the dorsal surfaces; the breadth of the head across the eyes is less than the narrowest breadth of the pronotum (the plate covering the thorax); and the hind margins of the metapleura (side of thorax) are concave with the postero-lateral angle rounded off (Zimmerman 1948). Hawaiian *Nysius* also exhibit a wider range of characters than is exhibited worldwide by *Nysius*. For example, the form of the bucculae (mouth), length of the beak, and shape of the costal margins are unreliable clues to identification (Zimmerman 1948). In Hawaii, *Nysius* has radiated into over 26 endemic species which feed on the seed heads of native plants (Polhemus 1998).

Adult wekiu bugs are about 3.4 to 4.9 mm (0.13 to 0.19 in) in total length and 1.0 to 1.8 mm (0.039 to 0.07 in) in total width. The head is black, with pale reddish-brown median bars from the base of head to just short of the anterior eye margins. The pronotum is black, grayish-brown. The abdomen is black with pale lateral margins, and black legs (Ashlock and Gagne 1983).

The wekiu bug is a particularly unique component of the Mauna Kea aeolian ecosystem due to the evolution of its predatory habits. Excluding its close relative and Mauna Loa counterpart, *Nysius a'a*, the wekiu bug differs from all the world's *Nysius* species in its predatorial habits and unusual physical characteristics (Polhemus 1998). Furthermore, the bug is micropterous (possessing nearly microscopically small wings), has by far the longest, thinnest appendages in relation to body length of any Lygaeid in the world, and the most elongate head as well. With all those characteristics in mind, one could easily argue that the bug earns distinction as the most unusual of 106 worldwide species of *Nysius* (Ashlock and Gagne 1983).

The wekiu bug occupies a predator-scavenger niche on the top of Mauna Kea. It is most often found under rocks and cinders where diurnally it preys upon moribund and dead insects and even birds blown up from lower elevations. The presence of high altitude arthropods on Mauna Kea has been known since the 1920's (Bryan 1923, 1926; Swezey and Williams 1932; Wentworth et al. 1935; Usinger 1936; Gagne 1971), but it wasn't until 1980 that *N. wekiuicola* and some other arthropods were identified as being resident predator-scavengers. In field conditions, the wekiu bug has been observed feeding upon adult lady beetles, upon recently dead adult syrphid flies, and as mentioned above, even dead birds. The wekiu bug has not been observed feeding upon other resident arthropods (Ashlock and Gagne 1983; Howarth 1997a).

Wekiu bugs, both nymphs and adults, apparently remain active during winter months, and even exhibit activity at ambient air temperatures of plus 7 degrees Celsius (45 degrees Fahrenheit) (Frank Howarth, Bishop Museum, pers. comm. 1998). They use snow to their advantage by feeding on insects that are either kept 'fresh' or immobilized by the cold when they are escorted by winds to the summit. Although difficult to establish, it is widely believed the wekiu bug has some obligatory association with snow and/or permafrost, the former for food, and the latter especially for year-around moisture. This would at least partly explain its restriction to higher elevations on Mauna Kea. Wekiu bugs are fairly susceptible

to dehydration, which is probably related to their attribute of abdominal physogastricity (extreme swelling) exhibited after feeding (Ashlock and Gagne 1983).

Wekiu bugs will emerge from beneath the tephra where they live, to feed and mate when the sun has warmed the rock surfaces, particularly at the margins of snow fields. Apparently, they will remain along the narrow melting, outer perimeter of a snowfield to take advantage of any frozen insects which drop from the receding snowfield perimeter (Howarth 1997a). Should a shadow cross the sun when wekiu bugs are foraging in this warm, moist, food-rich habitat, they will quickly retreat deep into the tephra. Although not established with complete certainty, it is believed the distribution and biology of these bugs will be strongly linked with the tephra cinder cones present on Mauna Kea's summit (Ashlock and Gagne 1983). During most surveys up to now, tephra habitats have yielded the highest capture rates for these bugs. It is believed it utilizes the tephra to their benefit by migrating vertically through the interstitial spaces according to day and night or seasonal temperatures. Most likely, the bugs also safely follow shifting snowfield edges by means of these spaces between the lightweight tephra (Howarth 1997b).

THREATS (Describe threats in terms of the five factors in section 4 of the ESA providing specific, substantive information. If this is a removal of a species from candidate status or a change in listing priority, explain reasons for change):

A. The present or threatened destruction, modification, or curtailment of its habitat or range.

Due to certain ideal atmospheric qualities and ideal weather conditions at the summit of Mauna Kea, the University of Hawaii has developed the summit area as the Mauna Kea Science Reserve for astronomical study (Research Corporation of the University of Hawaii (RCUH) 1983). Since 1968, approximately 25 hectares (ha) (62 acres (ac)) of potential wekiu bug and other Mauna Kea arthropod habitat has been lost to astronomy development on the summit. There are 4,536 ha (11,200 ac) in the Institute for Astronomy (IfA) Reserve. The Reserve's lower elevational boundary ranges from 3,569 m (11,700 ft) to 3,691 m (12,100 ft). Above 3,660 m (12,000 ft), there are approximately 1,539 ha (3,800 ac) contained within the protected state-owned natural area reserves (NARS)(RCUH 1983). The absolute lower elevational range boundary of the wekiu bugs is believed to be at approximately 3,660 m (12,000 ft) (Ashlock and Gagne 1983). More than two thirds of it's potential range is unprotected from astronomical development.

To date, fourteen telescopes (including the removal of one in 1994) and several buildings and associated structures have been constructed on the summit. The 1985 Summit Management Plan authorized a total of 13 telescopes (State Auditor 1998). Resultant impacts have included road construction, parking areas, tourist facilities, temporary storage areas, substrate removal, & oil spills, and constant traffic to the summit with the concomitant human dispersal of trash and debris. The suspected preferred habitat of the wekiu bug, tephra cinders, are easily crushed to dust-sized particles, and vehicular traffic can quickly and permanently change a rocky tephra habitat to one of compacted silt and mud. Furthermore, the silt and mud has the potential to degrade nearby tephra habitat by filling the interstitial spaces between cinders that are used by this bug and other arthropods (Ashlock and Gagne 1983).

Since 1963, when the first modern road was bulldozed to the summit of Mauna Kea, an estimated 25 percent of the potential wekiu bug habitat has been destroyed or degraded by astronomical

development. The IfA receives and entertains new inquiries/proposals for telescope construction on an on-going basis (State Auditor 1998). While few groups have the money to invest in Mauna Kea, due to the cost of operating the facilities and the shared maintenance, it remains one of the most desirable locations worldwide for astronomical observation. In addition to the possibility of new facility construction, many of the existing facilities and structures are nearly 25 years old and will probably soon require rebuilding and updating (State Auditor 1998). Obviously, this would include new construction and expansion.

B. Over-utilization for commercial, recreational, scientific, or educational purposes.

Not applicable.

C. Disease or predation.

Since the wekiu bug and other Mauna Kea arthropods rely on the mechanics of an aeolian system for obtaining prey, the amounts and type of prey upon which they depend may be affected by introductions of alien arthropods and parasites (Howarth et al 1999). For example, the wekiu bug now competes for food with at least one introduced species of Linyphiidae (small sheetweb) spiders which have become established on the summit (Howarth and Stone 1982).
Of even greater concern is the recent establishment of *Meriola arcifera* (Simon), a ground hunting spider (family Clubionidae), native to Chile, Bolivia, and Argentina. *M. arcifera* actively hunts on the ground surface, since it is not a web-builder, and is common enough in the Mauna Kea Science Reserve to be preying upon and reducing populations of the smaller native arthropod species, including the wekiu bug.

D. The inadequacy of existing regulatory mechanisms.

The summit area lies within a State conservation district and any construction in the area requires a permit from the State Department of Land and Natural Resources (DLNR) (State Auditor 1998). Prior to development of the Mauna Kea Science Reserve, a development plan for the summit area was written which addressed the sensitivity of the wekiu bug and its habitat. Despite the fact that important wekiu bug habitat was identified as sensitive in the 1983 plan and was to be avoided in the development of the facilities, a lack of communication and monitoring of construction activities at the summit during construction of the Subaru telescope facility resulted in the loss of most wekiu bug habitat in Puu Hau Oki (Fred Stone, Univ. of Hawaii, in litt. 1996; State Auditor 1998).

A 1997 report on the State of Hawaii's audit of the management of Mauna Kea and the Mauna Kea Science Reserve stated, "Management of Mauna Kea fails to adequately ensure protection of our natural resources" (State Auditor 1998). In addition, unapproved construction activities on the summit area, unauthorized cinder cone and crater "reshaping" activities, and large spills of motor oil have been reported (Stone in litt. 1996; State Auditor 1998)

In response to the State Auditor's 1998 report, the IfA, the University of Hawaii, and DLNR have agreed to better manage the Mauna Kea Science Reserve and its natural resources. Currently, the IfA is developing a new Mauna Kea Science Reserve master plan and has funded a recent series of surveys to

determine how the impact of future development might impact the flora and fauna (particularly the wekiu bug) of the summit area (State Auditor 1998). Under the current management plan, telescope number is limited to 13 telescopes. However, old facilities could be torn down and replaced with submillimeter arrays which can have up to twenty times the surface impact of construction of a standard telescope and still count as "one telescope" (State Auditor 1998). Furthermore, development of interferometers on Mauna Kea may continue under the current management plan since they do not count as 'telescopes'. Interferometers are specialized antennae for observing astronomical occurrences, and the resulting structure impacts at least as much surface area as a large telescope (State Auditor 1998).

E. Other natural or manmade factors affecting its continued existence.

Shifts in global climate (toward warmer winters with less snowfall on the Mauna Kea summit) may potentially threaten the Mauna Kea arthropods, including the wekiu bug. The summit area has been warmer and has had less snowfall since 1982 (Howarth 1997a). The capture rates for wekiu bugs in a 1997 study were significantly lower than the rates obtained ina the 1982 study (Howarth 1997c). It is possible that as the summit area becomes warmer over time, alien predators and parasites could more easily establish themselves or have indirect effects on the wekiu bug's food supply. In addition, if available habitat is seriously reduced by summit development, the wekiu bug will likely be less capable of responding and surviving during climatic changes (F. Howarth, pers. comm. 1998).

BRIEF SUMMARY OF REASONS FOR REMOVAL OR LISTING PRIORITY CHANGE:

FOR RECYCLED PETITIONS:
Is listing still warranted?
Is preparation of a proposal to list still precluded by other higher priority listing actions?

LAND OWNERSHIP (Estimate proportion Federal/state/local government/private, identify non-private owners): This species occurs only on the upper Mauna Kea summit, which is owned by the State of Hawaii and managed by the Institute for Astronomy.

PRELISTING (Describe status of conservation agreements or other conservation activities):

- Several local community members and members of the scientific community are interested in and have taken active steps to help protect the arthropod fauna of the Mauna Kea summit. In 1982, two biological surveys above the 13,000 foot level were completed as part of the environmental impact studies for planned construction of astronomy facilities. A second, more inclusive environmental impact study was conducted in 1985, which developed into the (first) Mauna Kea Master Plan (a summit management plan).

- The Bishop Museum was recently (1998/1999) contracted by the IfA to conduct research necessary for development of an arthropod conservation plan for the Mauna Kea summit. The Bishop Museum's goal is to develop and include adequate protection for the wekiu bug in the Mauna Kea Science Reserve Master Plan.

- A draft EIS for the new Mauna Kea Science Reserve Master Plan is currently under review (09/99).

REFERENCES (Identify primary sources of information (e.g., status reports, petitions, journal publications, unpublished data from species experts) using formal citation format):

Ashlock, P.D. and W.C. Gagne. 1983. A remarkable new micropterous *Nysius* species from the aeolian zone of Mauna Kea, Hawai'i Island (Hemiptera: Heteroptera: Lygaeidae). International Journal of Entomology 25(1): 47- 55.

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Swezey, O.H. and F.X. Williams. 1932. Insects from the summit of Mauna Kea. Proc. Hawaii. Entomol. Soc. 8: 191-192.

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Woodcock, A.H. 1976. Permafrost and climatology of a Hawaii volcano crater. Arctic and Alpine Research 6: 49-62.

Zimmerman, E.C. 1948. Insects of Hawaii: Volume 3-Heteroptera. University of Hawaii Press. Honolulu, HI. p. 93.

LISTING PRIORITY (place * after number)

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2*
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes to the candidate list, including listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all additions of species to the candidate list, annual retentions of candidates, removal of candidates, and listing priority changes.

Approve: _____ _____

Regional Director, Fish and Wildlife Service Date

Concur: _____ _____

Director, Fish and Wildlife Service Date

Do not concur: _____

Director, Fish and Wildlife Service

Date

Director's Remarks: _____

_____

_____

_____

(rev.7/98)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Ecoregion
300 Ala Moana Boulevard, Room 3-122
Box 50088
Honolulu, Hawaii 96850

In reply refer to: MSR

RECEIVED
OCT 29 1999
GROUP 70

OCT 28 1999

Jeff Overton
Group 70 International, Inc.
925 Bethel St., 5th Floor
Honolulu, HI 96813-4307

Re: Draft Environmental Impact Statement for the Mauna Kea Science Reserve Master Plan, Hamakua District, Island of Hawaii

Dear Mr. Overton:

The U.S. Fish and Wildlife Service (Service) has reviewed the Draft Environmental Impact Statement for the Mauna Kea Science Reserve Master Plan, Hawaii. The project sponsor is the University of Hawaii. The proposed Mauna Kea Science Reserve Master Plan (MKSRMP) includes a physical plan and a resources management plan, the stated purpose of which is to preserve natural and cultural resources in the reserve while specifying the scope of astronomy facilities development at the summit and support facilities development at Hale Pohaku for the years 2000 to 2020. The proposed project site is entirely located on ceded land owned by the State of Hawaii and managed by the Institute for Astronomy, an affiliate of the University of Hawaii. The Service offers the following comments for your consideration.

The Service believes that the Draft Environmental Impact Statement (DEIS) adequately describes the proposed action and identifies reasonable project alternatives. We believe that the proposed project should provide greater net overall benefit to native species and wildlife than the current management system. Considering the programmatic nature of the proposed management plan, the important existing plant and animal species and their habitats contained within the project site have been adequately identified.

As the DEIS acknowledges, the summit area of Mauna Kea is home to a unique Hawaiian ecosystem. Several endemic lichens, ferns, and arthropods including a lycosid spider (*Lycosa* sp.), a moth species belonging to the genus *Agrotis*, and the Wekiu bug (*Nysius wekiuicola*) are found on Mauna Kea and nowhere else in the world. Currently, the Wekiu bug is a candidate for Federal listing under the Endangered Species Act. To the best of our knowledge, no other federally endangered, threatened, or candidate species, significant wetlands, or other federal trust resources occur in the immediate summit area of the proposed project site.

The Service is pleased that the DEIS supports our recommendations to minimize astronomy development impacts to endemic arthropods on the Mauna Kea summit and minimize the impacts to this high altitude environment from alien species introductions, garbage generation and collection,

and visitor use. Furthermore, we support the recommendation to include ongoing monitoring of the Wekiu bug as a component of the Master Plan. The Service would be happy to review the components of a specific program for monitoring for the Wekiu bug and other resources when it is available. The Service also supports the proposed designation of a Natural and Cultural Preserve Area consisting of over 10,760 acres and its permanent preservation as described in the MKSRMP.

Several sections of the DEIS should be corrected and/or further clarified in the Final EIS:

On page 2-16, paragraph one, and page 4-38, paragraph one, the DEIS states that trap capture rates for wekiu bugs were significantly higher in disturbed areas than in undisturbed areas. This statement is taken out of context from the referenced report and it is misleading to suggest that observatory construction and other human activities on the summit have not impacted the Wekiu bug. According to the DEIS-attached 1999 report, "An Arthropod Assessment within Selected Areas of the Mauna Kea Science Reserve," the difference in capture rates may be easily attributable to other factors. For example, capturing Wekiu bugs in the ash-like and compacted substrate common to disturbed areas is inherently more effective than the same trapping methods used in undisturbed substrate areas characteristically comprised of larger cinder material. Secondly, it is known that Wekiu bugs use disturbed areas only for foraging territory rather than as shelter habitat, and it is therefore inappropriate to assume that disturbed areas are suitable habitat for the Wekiu bug.

On page 3-18, the DEIS states that the proposed future construction site of the New Conventional Optical/IR Telescopes is outside of the known Wekiu bug habitat. While the area on the north slope does not contain cinder cone surface geology, Wekiu bugs were collected within this area during the 1982 arthropod surveys and there may be small refuge habitats within the area.

On page 3-22, the DEIS states that the proposed future construction site of the Next Generation Telescope site is outside of the Wekiu bug habitat. In actuality, this area has never been surveyed for arthropods. This is not a major concern at this time as the MKSRMP clearly states that all potential sites will be thoroughly surveyed for flora and fauna prior to any disturbance.

On page 3-24 in section 3.2.3: Recreational Components, the DEIS does not adequately address the issue of how current practices may be negatively impacting Wekiu bug habitat and other summit natural resources. Specific management recommendations were made in the April 1999 report entitled: "An Arthropod Assessment within Selected Areas of the Mauna Kea Science Reserve," which was prepared for and funded by the project sponsor. The report recommends that skiing and snow play on Mauna Kea be discouraged and/or restricted to specific sites and times when the snow is deep and impacts to Wekiu bug habitat would be minimal. The Service supports this recommendation since it is widely believed that disturbance of snow-patch habitats during periods of high Wekiu bug activity may be detrimental to its survival. The Final EIS should outline a more specific management plan and contain a map showing areas for which winter activities on Mauna Kea will be and will not be permitted.

Furthermore, the Service recommends that areas where Wekiu bug populations are the greatest, or where they occur during periods of extremely low population levels, be clearly identified and marked with appropriate sign placement and be designated off-limits to visitors. Areas that are worthy of being off-limits include portions of the inner and outer scoria (loose, mid-sized rocks) slopes of Pu'u Hauoki and Pu'u Wekiu (Kukahauula) in the summit region and Pu'u Mahoe and Pu'u Makanaka in the lower areas.

On page 6-4, paragraph one states that at Hale Pohaku, the proposed actions of the Master Plan are not expected to affect the population of feral ungulates, birds, and other fauna inhabiting the lower and middle elevations of the mountain. However, it appears faunal surveys have not been conducted within this area, so it is unclear how effects of the action can be predicted. The Service suspects that the federally listed Palila (*Loxioides bailleui*) and other federally protected birds may inhabit or use the area. We recommend that fauna surveys for birds and significant invertebrates such snails and arthropods be conducted.

On page 6-12, in section 6.2.4, paragraph one states that given the current knowledge of the extent of the Wekiu bug habitat, there is little potential for long-term impacts to the habitat. This statement is unsupported by information contained in the DEIS.

Finally, the recommendation contained on page 6-13, under item #4 "Long-Term Monitoring" is insufficient as a measure of mitigation. The Service believes an integrated natural resources management plan should include a comprehensive monitoring program. Since astronomy development began on the summit in 1963, only two formal on-site arthropod studies have been conducted. Since 1963, an estimated 25% of the potential Wekiu bug habitat has been lost due to astronomy development. Recent studies have corroborated incidental observations that Wekiu bug populations have declined. Therefore, the Service requests the final EIS should specifically describe a long-term biological monitoring program, not just "recommend" that one be implemented. The monitoring program should be designed to provide the project sponsor with inferences about ecological changes and the impacts of its management strategies on natural resources within the reserve.

The Service appreciates the opportunity to comment on the DEIS for the proposed project. We look forward to reviewing the Final EIS when it is available. If you have any questions regarding these comments, please contact Fish and Wildlife Entomologist Mike Richardson by telephone at (808) 541-3441 or facsimile transmission at (808) 541-3470.

Sincerely,

Barbara A. Maybeld, Acting

for Robert P. Smith
Pacific Islands Manager

cc: Mr. Michael Buck, DOFAW
Mr. John Giffin, DOFAW

December 27, 1999

GROUP 70
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Stuart M. Jow, AIA

U.S. Department of the Interior
Fish and Wildlife Service
300 Ala Moana Boulevard, Room 3122
Honolulu, HI 96850

Attention: Robert P. Smith, Pacific Islands Manager

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Mr. Smith:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letters of October 6, 1999 and November 2, 1999.

Benefits of Master Plan

Your letter notes that the Draft EIS has adequately identified the important existing plant and animal species and their habitats. We further appreciate your recognition that the Master Plan will yield a net overall benefit to native species and wildlife under the new management plan, and a 10,760 acre Natural and Cultural Preserve.

Wēkiu Bug Status

Thank you for providing the information on the Wēkiu bug status as a Species of Concern and recommendation as a Candidate Endangered Species.

As you have recognized, the Draft EIS proposes mitigation measures to minimize astronomy development effects to sensitive endemic arthropod habitat areas. Essentially, the cinder cone habitat areas of the Wēkiu bug will be preserved through the actions of the Master Plan. Development activities are limited to non-cinder areas which are not habitat areas for the Wēkiu bug.

Candidate Status Recommendation

We note that the Candidate Recommendation contains the assertion that there were unapproved construction activities and unauthorized grading activities. We would like to point out that all construction was conducted following detailed plans approved by the BLNR.

Corrections and Clarifications

The corrections and clarifications you have suggested to Sections 2, 3 and 4 have been integrated into the Final EIS. Text regarding the difference in Wēkiu bug capture rates is included in these sections, as well as the record of possible small refuge habitats in the

area to the north of the summit cinder cones. Section 6.2.4 points out that habitat area disturbance will be avoided, therefore, there is little potential for creating new long-term impacts to the habitat.

Wekiu Bug Monitoring

On-going monitoring of the Wēkiu bug is a recommendation of the Master Plan, however, a specific overall program for monitoring has yet to be defined for the Astronomy Precinct. A long-term Wēkiu bug monitoring program will be initiated. Specific details have to be defined and such a program will be initiated following adoption of the Master Plan.

The implementation of an overall monitoring program for the Astronomy Precinct or the entire Science Reserve may ultimately be developed in conjunction with the Office of Mauna Kea Management. The appropriate monitoring frequency and locations for monitoring must be developed with close coordination with your office and recognized experts in this field, such as Dr. Frank Howarth.

Winter Recreational Components

The Master Plan does not limit the current practice of skiing and snow play. The technical report recommendation to restrict the disturbance of snow patch habitat areas is not proposed at this time. The responsibility for this management issue is passed on to the new Office of Mauna Kea Management and its Board. These entities will include community input in the decision on how, when and where to regulate snow play with regard to Wēkiu bug habitat. The Final EIS includes a recommended mitigation measure for the management office to evaluate the possible need to regulate winter activities as it relates to Wēkiu bug habitat, in conjunction with community input.

Sign Placement in Sensitive Habitat Areas

The recommendation to place signs to avoid sensitive Wēkiu bug habitat is included.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

xc: Group 70
Bob McLaren

SEP 29

BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO. (P) 1663.9

SEP 24 1999

RECEIVED
OCT 4 - 1999
GROUP 70

TO: Mr. Eugene S. Imai
Senior Vice President for Administration
University of Hawaii

SUBJECT: Mauna Kea Science Reserve Master Plan
Draft Environmental Impact Statement
Ka'ohe, Hamakua District, Hawai'i
TMK: (3) 4-4-15: 9,12

Thank you for the opportunity to review the subject document which we received with your September 8, 1999, letter.

The project should not affect any of our existing or proposed facilities. Therefore, we have no comment to offer at this time.

In the future, when actions described by Environmental Assessments, Environmental Impact Statement Preparation Notices, Environmental Impact Statements, Plan Review Use, etc., do not impact on specific State plans or facilities, we, for work reasons, will not provide a "no comments" or a "good planning principles" type of response. But, since we are still interested in knowing what is going on planning-wise in our State, we would still appreciate the opportunity to review all such documents.

If there are any questions, please have your staff contact Mr. Ronald Ching of the Planning Branch at 586-0490.

GORDON MATSUOKA
Public Works Administrator

RC:mo

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

RECEIVED
OCT 28 1999
GROUP 70

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801

BRUCE S. ANDERSON, Ph.D., M.P.H.
DIRECTOR OF HEALTH

In reply, please refer to:
File:

October 25, 1999

99-196/epo

Mr. Allan Ah San
Associate Vice President for Administration
University of Hawaii
2444 Dole Street, Bachman Hall 112
Honolulu, Hawaii 96822

Dear Mar. Ah San:

Subject: Draft Environmental Impact Statement (DEIS)
Mauna Kea Science Reserve Master Plan
Mauna Kea, Hawaii
TMK: 4-4-15: 9 & 12

Thank you for allowing us to review and comment on the subject document. We have the following comments to offer:

Fugitive Dust

There is a significant potential for fugitive dust emissions during any construction activities within the Reserve. Implementation of adequate dust control measures during all construction phases within the reserve are warranted. Construction activities must comply with provisions of Chapter 11-60.1, "Air Pollution Control" Hawaii Administrative Rules, section 11-60.1-33 on Fugitive Dust.

The contractor should provide adequate means to control dust from road and construction areas and during the various phases of construction activities, including but not limited to:

a. planning the different phases of construction, focusing on minimizing the amount of dust-generating materials and activities, centralizing material transfer points and on-site vehicular traffic routes, and locating potentially dusty equipment in areas of the least impact;
b. providing an adequate water source at site prior to start-up of construction activities;
c. landscaping and rapid covering of bare areas, including slopes, starting from the initial grading phase;

d. controlling of dust from shoulders, project entrances, and access roads;
e. providing adequate dust control measures during weekends, after hours, and prior to daily start-up of construction activities; and
f. controlling of dust from debris being hauled away from project site.

Although not identified in the DEIS, please be aware that the installation and operation of any diesel engine generator or portable concrete batch plant may require an air permit from the Department of Health.

If there are any questions on comments, please contact Mr. Steven Okoji of the Clean Air Branch at 586-4200.

Sincerely,

GARY GILL
Deputy Director
of Environmental Health

c: OEQC
Group 70 International, Inc.

December 27, 1999

GROUP 70
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Francis S. Oda, AIA, AICP
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Christine M. Ruotola, AICP
Stuart M. Jow, AIA

Department of Health
State of Hawai'i
P.O. Box 3378
Honolulu, HI 96801

Attention: Gary Gill, Deputy Director for Environmental Health

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Mr. Gill:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of October 25, 1999.

Fugitive Dust

The information that you have provided regarding dust control will be included in the Final EIS. Most or all of the measures proposed will be applied by contractors working in the Science Reserve. As discussed in the Draft EIS, the use of water for dust control at Mauna Kea is done judiciously due to the limited source and long-distance trucking requirements. Alternative methods for dust control are being considered for limited application such as polymer emulsion, which is environmentally benign and is effective at stabilizing job site work surfaces.

Air Permit

The information provided regarding diesel generators and concrete batch plants is also appreciated. If these types of facilities are proposed, the department of health will be contacted to satisfy the appropriate permit requirements.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

BENJAMIN J. CAYETANO
GOVERNOR

COPY

GENEVIEVE SALMONSON
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

236 SOUTH BERETANIA STREET
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RECEIVED
OCT 26 1999
GROUP 70

October 22, 1999

Mr. Eugene Imai
Senior Vice President for Administration
University of Hawaii
2444 Dole Street, Bachman Hall
Honolulu, Hawaii 96822

Dear Mr. Imai:

Subject: Draft Environmental Impact Statement for the Mauna Kea Science Reserve Master Plan

1. As the landowner and Conservation District regulator, the Board of Land and Natural Resources has significant responsibility over all aspects of the management of Mauna Kea. We recommend that a process be established for the Land Board to formally review and approve the Mauna Kea Science Reserve Master Plan before any new project is proposed. This will enable the Land Board to review the entire Master Plan from a more holistic perspective rather than a limited review of the individual projects.

2. All the research on the historical, archaeological and cultural resources clearly indicate that Mauna Kea is of great significance to the traditions and beliefs of the Hawaiian people. Therefore, we recommend that formal consultation with the Office of Hawaiian Affairs be completed on the entire master plan before any new project is proposed. The method for the formal consultation should be functionally equivalent to the procedure envisioned in Section 106 of the National Historic Preservation Act.

3. Please identify all persons, firms, or agencies who prepared this EIS.

Should you have any questions, please call Jeyan Thirugnanam at 586-4185. Thank you.

Sincerely,

Genevieve Salmonson
Director

c: Jeff Overton
DLNR
OHA

December 27, 1999

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Office of Environmental Quality Control
State of Hawai'i
235 South Beretania Street, Suite 702
Honolulu, HI 96813

Attention: Genevieve Salmonson, Director

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Mrs. Salmonson:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of October 22, 1999.

Land Board Review

The Master Plan has been developed and reviewed in its formative stages with various officials from the Department of Land and Natural Resources. DLNR Deputy Director Janet Kawelo, Dr. Patrick McCoy of the Historic Preservation Division, and Charlene Unoki of the Land Division attended most of the meetings of the Mauna Kea Advisory Committee, and participated in the formation of concepts presented in the first three drafts of the Master Plan.

There has been no request made by the DLNR for a formal review process involving the Board of Land and Natural Resources. Further, the DLNR has reviewed the Draft EIS for the Master Plan and has not suggested such a review is expected. The BLNR will be conducting a project-specific review of the Keck Outriggers CDUA in the coming year. If desired, the University would be willing to provide the BLNR with an informational briefing on the Master Plan and conduct a field visit at the Board's convenience.

Cultural Resources

The Master Plan devotes extensive attention to the cultural resources of Mauna Kea, as evidenced by the numerous studies of archaeology, historical documentary research, and ethnographic oral histories. The Final EIS includes full copies of these reports. A formal Section 106 consultation is currently being conducted for the Keck Outriggers project.

A future consultation with the Office of Hawaiian Affairs would be best served under the new Office of Mauna Kea Management, once this entity becomes established in the coming year. The entire Master Plan could be considered in this consultation, to ensure the continued integrity of the cultural resources at the summit.

Preparers of the EIS

The Draft EIS for the Mauna Kea Science Reserve Master Plan was prepared by Group 70 International, Inc. under the guidance of Francis S. Oda, AIA, AICP. Environmental planners at Group 70 that participated in the EIS preparation included Jeffrey H. Overton, AICP; George I. Atta, AICP; and Christine M. Ruotola, AICP.

Consultants to Group 70 providing scientific and technical studies, or serving as sources of technical advisors, included the following idnividuals and organizational affiliations: Kepa Maly of Kumu Pono Associates (Ethnographic and Cultural Studies); Paul Rosendahl, Ph.D. of PHRI (Cultural Impact Assessment); Patrick McCoy, Ph.D. and Holly McEldowney, Ph.D. of the DLNR (Archaeology and Culture); Winona Char (Botany); Frank Howarth, Ph.D. of Bishop Museum (Arthropods); Dennis Hirota, Ph.D., P.E. of Sam Hirota (Civil Engineering); and John Kirkpatrick, Ph.D.of SMS Research.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

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NOV - 3 1999
GROUP 70

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

P.O. BOX 621
HONOLULU, HAWAII 96809

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND DIVISION
STATE PARKS
WATER RESOURCE MANAGEMENT

Ref.:SL:PB

NOV -2 1999

Mr. Allan Ah San, Associate Vice President
For Administration
University of Hawaii
2444 Dole Street, Bachman Hall 112
Honolulu, Hawaii 96822

Dear Mr. Ah San:

Subject: Mauna Kea Science Reserve Master Plan/Draft Environmental Impact Statement

Thank you for this opportunity to comment on the subject document. Our comments are as follows.

1. Construction of New Telescopes:

The concept of an astronomy precinct, sighting criteria, design guidelines, avoidance of cinder cones and shrines, redevelopment of existing telescope sites, decentralization and augmentation of management functions demonstrates a paper commitment by the University to address long standing issues and management deficiencies on Mauna Kea.

The University proposes to provide for additional telescopes, expansion of existing facilities and redevelopment of existing sites. The Department of Land and Natural Resources (DLNR) would continue to review each situation in the context of a Conservation District Use Application and Environmental Assessment or Environmental Impact Statement, and then sublease agreements.

If new telescope development is to occur, it must be preceded by implementation of Master Plan elements. In addition, DLNR's acceptance and consideration of applications for new uses, such as telescopes, will be contingent upon implementation of the local design review process and more generally, the performance of the local management authority in fulfilling its stated responsibilities. Finally, consideration of new telescope development will be based on the adequacy and content of environmental documents and the potential impact to the summit's resources.

It will be the University's and the telescope operators' responsibility to ensure that procedures outlined in the Master Plan are followed for day-to-day management and development guidelines. Failure to do so could jeopardize Conservation District Use Application approvals and any future telescope development on Mauna Kea.

2. Funding:

Funding is critical. Without adequate funding, the Master Plan elements cannot be implemented. The status quo will continue, creating divisiveness and leading to potentially serious resource impacts.

We are concerned whether the University can perform adequately in this area. The University will be required to become a better property/asset manager, charging users fees where appropriate and seeking fees from telescope operators to underwrite facility development and operations management.

3. New Management Responsibilities:

The Land Division is presently responsible for permitting commercial operators, processing permits and subleases for facilities development, and some aspects of enforcement. Under the new plan, the University would assume responsibility for permitting and regulating commercial operators. A Hilo-based review process, with the Board of Land and Natural Resources continuing to consider individual CDUAs and sublease agreements, would guide new telescope and facilities development. DLNR enforcement would be limited primarily to compliance with Conservation District Use Permit conditions and response to enforcement issues related to violations of Conservation District laws pursuant to Title 13-5, Hawaii Administrative Rules.

Please feel free to contact Sam Lemmo of the Land Division Planning Branch at 587-0381, should you have any questions on this matter.

Aloha,

TIMOTHY E. JOHNS
Chairperson

Cc: Hawaii Board Member
Hawaii Land Agent
Group 70 International, Inc.
Bob McLaren

December 27, 1999

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Timothy E. Johns, Chairperson
State of Hawaii
Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96809

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Chairperson Johns:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of November 2, 1999.

Master Plan Implementation and Construction of New Telescopes

The implementation of the Master Plan elements will begin upon adoption of the Master Plan by the Board of Regents. It is anticipated that in early 2000, the funding and formation of the Office of Mauna Kea Management and the Mauna Kea Advisory Board will be implemented. Among the first actions by this Board will be the hiring of the Executive Director of the Office of Mauna Kea Management and the development of rules and regulations for Mauna Kea. These actions will be a major step forward in the resolution of long-standing issues and management deficiencies on Mauna Kea. It is understood that Conservation District permitting for future telescope projects will be contingent upon implementation of Master Plan elements.

Funding

The funding of Mauna Kea management operations will be initiated with the approval of the Master Plan by the Board of Regents, and a $400,000 annual commitment by UH President Mortimer. The Office of Mauna Kea Management will be structured to perform its property management responsibilities within the Science Reserve. As appropriate, facility and user fees will be a subject of discussion with the Office and its Advisory Board.

New Management Responsibilities

The new Management Office will assume responsibility for the permitting and regulating of commercial operators, and enforcement of new rules and regulations for the Science Reserve. It is understood that the BLNR will continue to be responsible for CDUAs and sublease agreements. It is also understood that the DLNR enforcement would be limited to compliance with CDUP conditions and issues related to violations of Conservation District laws pursuant to Title 13-5, HAR. As a stakeholder member of the Mauna Kea Advisory Board, it is anticipated that the DLNR will participate in the

formulation and review of the new rules and regulations for the Science Reserve. DLNR's ongoing presence on the Board will allow for continued close communications on management and regulatory issues.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

RECEIVED AS FOLLOWS

DEC- 3-99 FRI 15:31 UH SR VP ADMIN STAFF FAX NO. 8089569097 P. 01

FAX: Bob McLaren
Jeff Overton

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

TIMOTHY E. JOHNS, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES
JANET E. KAWELO

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND RESOURCES
ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND
STATE PARKS
WATER RESOURCE MANAGEMENT

OFFICE OF SR VP ADMIN

'99 DEC -3 P3:07

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
Kakuhihewa Building, Room 555
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November 23, 1999

Mr. Eugene s. Imai
Senior Vice President for Administration
University of Hawaii
2444 Dole Street, Bachman Hall 112
Honolulu, Hawaii 96822

LOG NO:24434
DOC NO: 9911NN01
& 9911RC31

Dear Imai:

Subject: **Historic Preservation Division Review -- Mauna Kea Science Reserve Master Plan and Draft Environmental Impact Statement**
Ka'ohe, Hamakua District, Hawai'i
TMK 4-415:09, 12`

We note that this plan proposes to divide the Mauna Kea Science Reserve into an Astronomy Precinct and a Natural & Cultural Preservation Area, with future astronomy activities to occur solely in the Astronomy Precinct area. It is proposed to have the area managed by the University with more active management with rangers and to have the Mauna Kea Advisory Board continue as a community conduit. The intent is to have all historic properties (archaeological and cultural) protected, better preserved, and monitored--and to have educational approaches (at the visitor's center and probably at some properties) and traditional access rights developed. Also, we note that our Division is preparing a Historic Preservation Plan for Mauna Kea and that we will have the ongoing opportunity to provide input into the management strategies for historic properties on Mauna Kea.

The general setting of past Hawaiian use of the mountain and the historic properties that are present (archaeological and cultural) seem generally acceptable. We have a few minor comments on some of the statements, which might be rewarded if possible (see attachment). Additionally, we have few major comments addressed below. It is important to emphasize that our Division is primarily concerned with historic properties which are specific physical properties with definable boundaries. This Plan includes a cultural impact assessment study(Appendix H) which groups cultural resources into three categories i.e traditional cultural properties, traditional and customary cultural practices. Of these three categories, SHPD can only address traditional cultural properties and traditional and customary practices directly related to historic property. Contemporary cultural practices are not within our Division's purview unless these practices affect historic properties.

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1. We are concerned that the Plan's cultural assessment limits its discussion of historic properties to traditional cultural properties. The specific designation of traditional cultural property as defined in NPS Bulletin 38 represents only a small portion of the historic properties to be found on Mauna Kea. Other historic properties exist on Mauna Kea that do not fall into the limited NPS definition of traditional cultural property, but these clearly have cultural importance, and cultural assessments should include all such historic properties, not only "traditional cultural properties". A good example of historic properties of cultural importance that are not considered traditional cultural properties by the NPS definition are shrines, some of which were used by adze makers. These properties are important to any cultural assessment of Mauna Kea. It seems important that the Hawaiian cultural perspective on such properties should be integrated in those sections of the Plan that address and evaluate cultural impacts.

2. Our proposed nomination of the entire summit region as a historic district will be a useful integrative tool. It will include an interrelated discussion of the archaeological and traditional cultural historic properties within this boundary. This discussion will also address the relationship of Native Hawaiians to the summit over time. Early accounts state that Hawaiians purposely avoided this summit region considering it to be the realm of the gods. As noted by McCoy, this avoidance probably would account for a minimal number of man made properties on the summit. This lack of tangible properties should not be misinterpreted to mean that this area therefore lacks cultural significance. The creation of a historic district for the summit region will also allow the Historic Preservation Plan to integrate the long-term management of the Science Reserve and the Mauna Kea Ice Age Natural Area Reserve.

The impacts to the historic properties seem to be generally pointed out acceptably. One problem that clearly does exist is that the existing telescopes are within what is now perceived to be an important historic district focused in part among the summit cones once associated with deities.

Proposed resolution of the impacts to historic properties seems generally acceptable and a more wholistic and improved approach. We note that the complete mitigation measures will not be developed until after the Historic Preservation Plan is finished by our Division. We do have a number of comments on mitigation measures:

1. We like the approaches purposed to reduce the visual impacts of the existing telescopes to the landscape (when they are upgraded in the future). Design and colors should help these developments blend better into the landscape and thus reduce visual impacts on historic district. This seems to be a productive approach.

2. Set backs from the historic properties in the Astronomy Precinct cannot yet be evaluated. These will be covered in the Historic Preservation Plan. 200 feet may or may not be adequate. There is no such thing as a standard setback and comparisons to quite small burial sites may not be appropriate. Setbacks are determine on a case by case bases given the type of site being preserved, the intent of preservation, and the needs of

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preserving the visual and physical setting of the sites. This is not to say that 200 feet may not be acceptable. It simply cannot yet be evaluated.

3. Level of consultation with the Native Hawaiian Community: Cultural Resource Specialist, Kepa Maly has made a good faith attempt at contacting members of the community might have specific knowledge about Mauna Kea. This process involved the oral history documentation of twenty-two individuals. This preliminary consultation with some members of the Native Hawaiian community is a good beginning to the consultation process which is still unfolding.

4. Kahu/Kupuna Advisory Committee to the Advisory Board. The Kahu/Advisory Committee could provide important cultural guidance in determining protocol and access issues surrounding historic properties. This group could also provide input on the religious and sacred aspects of management and access. If this group will only function in an advisory capacity, it appears it might be to much to assume that they would also be the instrument for conflict resolution. Section 3.3.3.3. states that "native Hawaiian practices and values should take priority" when conflicts arise between Hawaiians.

5. Ranger Program: The Ranger program will be a critical element for managing, interpreting and protecting historic properties. The past plan outlined a ranger program that was never implemented due to funding shortages. Because of the anticipated increase of public traffic on the mountain this program is vital for visitor safety as well as historic/cultural property protection.

6. Native Hawaiian Burials: This plan is currently being reviewed by Hawai'i Island Burial Council who will be submitting their comments to our Burial's Program Staff. These comments will be considered and addressed in our Historic Preservation Plan.

Aloha,

Timothy E. Johns
State Historic Preservation Officer

RC:lm

Attachment

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ATTACHMENT

MINOR POINTS

MAUNA KEA SCIENCE RESERVE MASTER
PLAN DRAFT EIS

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1. p. 4-2, last 2 lines. these dates for arrival of the first Hawaiians are far from widely accepted. A.D. 0-600s is the common settlement frame that most agree with. A.D. 0-300 is likely in some professionals' views and would be the more standard presentation format. You might wish to reword. Sources like Kirch's Feathered Gods and Fishhooks are a common reference. Similarly, there is considerable disagreement as to how many settling voyages occurred after initial settlement (if Andy additional voyages occurred), so you might carefully reword that sentence.

2. p. 4-5, last para. Nearly all of Hamakua's ahapua'a were on the "lower slopes of Mauna Kea", not just Humu'ula and Ka'ohe. These ahupua'a included lands up into the 'ohi'a forests, and most ahupua'a had canoe and feather bird resources. The higher mamane forests were in Humu'ula (Hilo) and Pa'auhau (Hamakua). You might reword a bit to make this correct.

3. p. 4-7, intended quote on mid-page. It would be useful to indicate the year this visit was made.

4. Page 4-19, para 3. While the top of Mauna Kea clearly was viewed as sacred, we are not sure that one can claim it was accessible to "only the highest chiefs or priest". The nature of the sacredness may not have been formalized under the national religion, but rather under the religious beliefs of many individual families. It might be better to delete this interpretation, or to clearly note it is but one interpretation.

December 27, 1999

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Timothy E. Johns, Chairperson
State of Hawaii
Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96809

Attention: Mr. Don Hibbard, Director, State Historic Preservation Division

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Chairperson Johns:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter from the Historic Preservation Division dated November 23, 1999.

Cultural Assessment

The Cultural Impact Assessment, in its findings and conclusion addresses all three different claims, including traditional and contemporary practices as well as Traditional Cultural Properties. All properties are culturally important, and nothing is distinguished in the CIA. The Master Plan section on cultural resources includes native Hawaiian cultural perspectives derived from the interviews conducted by Maly.

Historic District

The Final EIS mentions the SHPD historic district proposal for the entire summit region. There is agreement with Dr. McCoy that the lack of tangible properties is not interpreted as a lack of cultural significance. The Master Plan respects the summit cinder cone complex of Kukahu'ula by strictly limiting the redevelopment options for the existing observatories. We appreciate your concurrence that the impacts to historic properties have been appropriately documented, and the proposed resolution of these impacts is acceptable. The University looks forward to the preserving the integrity of the historic district in the re-development of existing facilities along the summit cinder cone ridge.

Setbacks From Shrines

It is recognized that the recommended setbacks from known shrines in the Astronomy Precinct may require further consideration at the point where facilities are proposed in the future. The detailed issues involved with the type of site, preservation intent and visual/physical setting will warrant case-by-case review. The recommendation in the plan for a 200 ft setback was to ensure that there would be adequate buffer to avoid potential disturbance during construction and separation to avoid long-term effects.

On-Going Consultation and the Kahu/Kupuna Advisory Committee

The Native Hawaiian community is engaged in an on-going dialogue with the astronomy community, and there is a plan for continued and expanded discussions regarding the cultural protocol and access issues. The potential involvement of the Advisory Committee in formal conflict resolution has not been discussed, however, this body was conceived with the intention of creating an "elder council" which could effectively work to resolve conflicts regarding use of the mountain. The scope of responsibilities for the Kahu/Kupuna Advisory Committee has yet to be formalized, however, it is anticipated that conflict resolution will be part of their function.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH
Don Hibbard, Director, State Historic Preservation Division

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OCT 12 1999
GROUP 70

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
P.O. BOX 621
HONOLULU, HAWAII 96809

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND DIVISION
STATE PARKS
WATER RESOURCE MANAGEMENT

October 5, 1999

LD:NAV

Ref.:MAUNAKEA.RCM

Mr. Eugene S. Imai
Senior Vice president for
Administration
University of Hawaii
2444 Dole Street, Bachman Hall 112
Honolulu, Hawaii 96822

Dear Mr. Imai:

Subject: Review Draft Environmental Impact (DEIS) Statement for Mauna Kea Science Reserve Master Plan, Kaohe, Hamakua District, Hawaii TMKs: 3rd/4-4-015: 9 & 12

Thank you for the opportunity to review and comment on the subject DEIS.

The Department of Land and Natural Resources' Land Division submitted the subject DEIS to our Division of Forestry and Wildlife, State Parks, Historic Preservation and Land Division's Planning and Technical Services and Hawaii District Land Office for their review and comment on the proposed project(s).

Attached herewith is a copy of our Division of Forestry and Wildlife's comments.

The Department of Land and Natural Resources has no other comment to offer on the subject matter at this time.

Should you have any questions, please contact Nicholas Vaccaro of our Land Division's Support Services Branch at 587-0438

Very truly yours,

DEAN Y. UCHIDA
Administrator

c: HDLO - OEQC - Group 70 International

Division of Forestry & Wildlife

1151 Punchbowl Street, Rm. 325 • Honolulu, HI 96813 • (808) 587-0166 • Fax: (808) 587-0160

October 1, 1999

MEMORANDUM

TO: Nick Vaccaro, Land Agent
Land Division

THRU: Dean Uchida, Administrator
Land Division

FROM: Michael G. Buck, Administrator
Division of Forestry and Wildlife

SUBJECT: **Draft EIS for Mauna Kea Science Reserve Master Plan, Kaohe, Hamakua District, Hawaii TMK: 4-04-015: 009 and 012.**

We have reviewed the above referenced EIS and provide the following comments:

Page 1-7, Sec. 1.5 Construction Impact Mitigation. The EIS states that construction activities will be limited by following, "best management practices" (BMP). Because there are so many versions of BMP's around, please reference the agency who authored the BMP and also reference the document itself. By doing so, this will identify the appropriate BMP that will be used to mitigate the impacts of the construction activities. In addition, there are no guarantee that all of the mitigation efforts identified in the EIS to protect the various habitat types will be implemented. The need for quality control and overseeing of the actual construction activities to ensure compliance with the construction guidelines to minimize ground disturbance of the surrounding area is missing. Previous improvements involving new roads, retaining walls and other structures that were planned for the Mauna Kea Science Reserve have gone beyond what was identified in the plans. Because of the sensitivity and nature of the natural resources there, the protection and mitigation must be clearly identified and complied with.

Page 2-3, Sec. 2.2 1970s Planning. Management of the summit access road is described as a function of the State Department of Transportation (DOT). Table 2-1 on page 2-10 shows UH as being responsible for the summit road. Was there an official transfer of the road from DOT to UH? UH should not control activities outside the Science Reserve including public access for hunting and forest recreation.

Page 3-27, Hunting. Insert additional language in the last sentence to read: "The Master Plan places no new restriction on the future use of the Science Reserve for hunting or access to hunting areas."

Page 3-41, Halepohaku, This paragraph should mention that the mid-elevation facilities at Halepohaku are within the area designated by the U. S. Fish and Wildlife Service as Palila Critical Habitat. Future expansion of the facilities will have a direct impact of the bird's habitat, causing substantial mitigation measures which will need to be addressed.

Page 3-53, Management. This section should mention that all lands at Halepohaku and the Science Reserve are subject to DLNR's rules regulating game mammal and game bird hunting.

Page 4-39, second paragraph. Please state that Halepohaku is within the Palila Critical Habitat.

Page 6-4 Sec. 6.1.3. Fauna. This section should indicate that removal of mamane trees from Palila Critical Habitat will result in direct modification of the bird's habitat and will trigger substantial mitigation measures which will need to be addressed.

Page 6-24, Cumulative Impacts to Fauna Habitat. This section should review the cumulative impacts to Palila and their habitat as a result of the proposed developments at Halepohaku.

General Comments:

- Although the plan explains the funding of the astronomy infrastructures, no mention of funding to protect and maintain of the natural and cultural resources which has been identified for protection at the summit area.

- The "No Action" alternative misleads people and implies that it will be detrimental to the efforts of improving and developing Hawaii's astronomy and research capabilities but at the expense of Hawaii's fragile native ecosystem and cultural resources.

- Expanded community input to this plan must be heard and dealt with relating to the cultural and resource impacts proposed by the development.

Thank you for allowing us to review this document which will have major implications to the protection of our natural resources and heritage at the summit of Mauna Kea.

C: Hawaii DOFAW Branch

December 27, 1999

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Michael G. Buck, Administrator
Division of Forestry and Wildlife
State of Hawaii
Department of Land and Natural Resources
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Mr. Buck:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of October 1, 1999.

Construction Impact Mitigation

It is anticipated that the civil engineers would specify procedures outlined by the State Department of Health's example Best Management Practices programs that are standard for areas of the State with dry climates and a high potential for wind erosion and periodic runoff situations. No specific existing document is applicable, however, the construction mitigation measures provided for grading and excavation specifications for the proposed Keck Outrigger project would be appropriate.

1970's Planning

Thank you for pointing out an error in Section 2.2. There was no official transfer of the Summit Access Road to the University, however, the road was developed by the University under the Science Reserve lease with the State. The DLNR granted an easement for the road to the Science Reserve which extends through 2033 (No. S-4697). UH is responsible for the maintenance of this road. Below Hale Pohaku, the road was deeded to the County for maintenance purposes. UH does not propose to control activities outside the Science Reserve, including public access for hunting and forest recreation, both of which are also allowed with the Science Reserve.

Hunting

We will add the language you suggest at Page 3-27, to read: "The Master Plan places no restriction on the future use of the Science Reserve for hunting or access to hunting areas."

Hale Pohaku Issues

Expansion of facilites at the Visitor Information Center is proposed but is expected to be accomplished without direct impact to the habitat of the Palila Bird. The project will avoid impacts to mamane trees in the area, and other mitigation measures will be implemented to avoid habitat disturbance.

Group 70 International, Inc. • Architecture • Planning • Interior Design • Environmental Services • Building Diagnostics • Assets Management
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Page 3-53 will be revised to mention that all lands at Hale Pohaku and the Science reserve are subject to DLNR's rules regulating game mammal and game bird hunting. On Page 4-39 there will be a revision to state that Hale Pohaku is within the Palila Critical Habitat.

Fauna

This section has been revised to indicate that removal of mamane trees from the Palila Critical Habitat would result in direct modification of the bird's habitat and will trigger substantial mitigation measures. The cumulative impact section has also been revised to review the cumulative impacts to Palila and their habitat as a result of the proposed development at Hale Pohaku. Every effort will be made in the design and construction to completely avoid disturbance to mamane trees, which will greatly minimize potential impacts to the Palila Critical Habitat.

Funding for Management

The new funding proposed for the management office and field staff will provide protection and maintenance of the natural and cultural resources of the summit area.

No Action Alternative

The no-action option would result in no improvements to the existing management of the summits' resources, which would be extremely detrimental to Hawaii's fragile native ecosystem and cultural resources.

Community Input

There has been substantial community input to the Master Plan and EIS, as evidenced in the summary appendix on community input. We agree that expanded community input must be heard and considered, which is a primary reason for the new Office of Mauna Kea Management, the Mauna Kea Advisory Board and the Kahu/Kupuna Advisory Committee. These groups will be formed with the adoption of the Master Plan, and will bring direct community input under a newly funded management entity.

Thank you again for your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

BENJAMIN J. CAYETANO
GOVERNOR

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
BRIAN K. MINAAI
GLENN M. OKIMOTO

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:

STP 8.9245

September 14, 1999

RECEIVED
SEP 17 1999
GROUP 70

Mr. Allan Ah San
Associate Vice President for Administration
2444 Dole Street, Bachman Hall 112
Honolulu, Hawaii 96822

Dear Mr. San:

Subject: Mauna Kea Science Reserve Master Plan
Draft Environmental Impact Statement (DEIS)
Ka'ohe, Hamakua District Hawaii
TMK: 4-4-15: 09, 12

Thank you for your transmittal requesting our comments on the subject plans.

The proposed plans will not have a significant impact on our State transportation facilities.

We appreciate the opportunity to provide comments.

Very truly yours,

Kazu Hayashida

KAZU HAYASHIDA
Director of Transportation

c: Ms. Genevieve Salmonson, Office of Environmental Quality Control
Mr. Jeffrey Overton, Group 70 International, Inc.

cc: Francis Oda
Alan Teramura
Walter Kirimitsu
Rose Tseng
Bob McLaren
Allan Ah San

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GROUP 70

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STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
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HONOLULU, HAWAI'I 96813

OCT 5

September 30, 1999

Mr. Eugene S. Imai
Senior Vice President for Administration
University of Hawai'i
2444 Dole Street, Bachman Hall 112
Honolulu, Hawai'i 96822

Doc. # EIS 315

Re: Mauna Kea Science Reserve Master Plan, Draft Environmental Impact Statement, Ka'ohe Hamakua, District, Hawai'i, TMK: 4-4-15:09,12

Dear Mr. Imai:

Thank you for the opportunity to review the Draft Environmental Impact Statement (DEIS) for the Mauna Kea Science Reserve Master Plan. The Office of Hawaiian Affairs (OHA) has the following concerns. Our comments are directed at both the DEIS and the Master Plan (the Plan).

The Master Plan lacks the depth that would be expected from a document produced for the University of Hawaii's astronomy program. The Master Plan as well as the DEIS systematically fail to put concerns for natural resources, cultural resources or other uses on a par with the astronomy program. Hawaii has a limited amount of land. Plans and uses often overlap. The DEIS acknowledges this overlap but offers only a superficial attempt to find workable answers. The Plans strong bias towards the needs of the astronomy program, with little genuine interest in other issues makes it unacceptable.

Management Plan Deficiencies

The Master Plan creates two distinct management areas. The summit area is separated from the lower areas to create an "Astronomy Precinct". Management of the Astronomy Precinct will remain with the Institute for Astronomy (IfA). The remaining area will be separated into a new management unit responsible for the resources found within that unit. The majority of the archaeological "sites" and recreational areas are contained within this second area. The Plan also calls for the IfA to continue to manage the leases, development, and funding for the Astronomy Precinct. In addition, the Plan lays out a formula that allows the IfA to expand the use of the summit area by adding several new telescopes as well as renovating several of the existing scope sites. For several reasons, OHA believes that the cultural sites as well as the entire sacred summit area are not adequately protected under the proposed plan.

FO ✓
GM ✓
JO ✓

First, the responsibility for these resources will be given to a new agency to be created within the University system. As yet there is no approval or funding for this new agency. Moreover, it is unclear what kind of authority, if any, this new agency will be able to exercise under the University of Hawaii bureaucracy. We would like more discussion of what specific powers the new agency will have in guiding the future development plans for Mauna Kea.

Second, this Plan fails to address a crucial element of the discussion by Native Hawaiians and non-Hawaiians alike who care for Mauna Kea. The DEIS accurately identifies that Mauna Kea is a very sacred place to Native Hawaiians. It describes the cultural sites found predominately at the 13,000' level and acknowledges that these sites form a ring around the summit area. It also acknowledges that the summit is the most sacred part of the mountain. The sacred nature of Mauna Kea is confirmed in oral histories and cultural studies prepared for the project.

However, the Master Plan attempts to deal with this sacred nature in a manner which is inconsistent with the cultural information contained in the document. The Master Plan concludes that the summit can be separated from the historic sites at the 13,000' level for management purposes. Putting the summit into the Astronomy Precinct and the associated sites into the remaining district is inappropriate. The rationale is that the public would then be permitted to visit the "sites" unobstructed while the Astronomy Precinct was kept off limits except to research. This attempt to distinguish the cultural importance into "sites" verses the entire summit area is artificial and inconsistent. It fails as an alternative because it is not the sites individually which gives Mauna Kea its unique spiritual qualities; it is the whole.

The DEIS states that "[t]he cultural landscape is .... preserved within the Science Reserve and to the NAR, in a manner where people may experience the cultural resources of Mauna Kea in the traditional manner at the 13,000 ft elevation without interacting with the modern astronomy facilities." This statement shows a fundamental misunderstanding of the sacred nature of Mauna Kea. It is not possible to separate the summit and the three sites found at the summit, which are included in the Science Reserve from the sites at the 13,000' elevation. The cultural importance of Mauna Kea is not only in the sites that are found there, but also in its meaning to Native Hawaiians. Segregating areas of the mountain into different uses and management zones increases impacts to the cultural resources of Mauna Kea. Moreover, this segregation allows the further utilization of a physical area deemed particularly sacred, namely the summit. This segregation in management therefore clearly has a self-serving purpose for the IfA.

Third, it is unclear how IfA intends to resolve Native Hawaiian gathering rights with the planned restrictions on public visitation of sites and other areas in the Science Reserve. The document fails to address how this plan will mesh with the PASH rights recognized by the Hawaii Supreme Court. Instead, the Master Plan refers to "managed access to the Science Reserve for education and research use" only, with no discussion of other reasons for requiring access. Clearly Hawaiians practiced cultural, religious and gathering rights on Mauna Kea. Those rights must be accommodated at all levels of the mountain but most importantly at the summit. OHA strongly suggests and will take every measure to assure that the preparers seek expert opinion on

gathering practices from the local Hawaiian community before the establishment of any limitations on public access.

Section 106 Consultation Required

The Master Plan qualifies as an undertaking for the purposes of Section 106 of the National Historic Preservation Act (NHPA). Several historic and cultural resources that are eligible for, if not already included on, the National Register of Historic places will be affected by the proposed plan. It also appears that at least indirectly, a portion of the funding for the Master Plan is federal money. Several of the observatories are owned and operated by federal agencies, for example the NASA Infrared Telescope Facility and the Smithsonian Submillimeter Array.

It is reasonable to assume then, that large amounts of federal funds will continue to contribute to the operation of the observatories and is therefore directly tied to the implementation of the plan.

In addition, the Master Plan and its findings will be used as base documentation for several separate actions that include federal funding and approval, such as the Keck telescopes project. All of these conditions indicate that the Master Plan is an undertaking which requires a Section 106 consultation.

36 CFR Part 800 establishes a consultation process which specifically includes OHA as a party to the process. This process must begin as soon as possible. Further, it must not be assumed that OHA's participation on the Mauna Kea Advisory Group met the criteria for consultation. The Master Plan must be presented to OHA for specific discussion of the issues involving cultural resources. Since one of the Federal agencies that fund, operate or buy time at the Mauna Kea observatories will have to be designated the lead agency for the Section 106 consultation, we request that you send a list to us that includes all of these agencies and their specific involvement with the observatories.

Ceded Lands

Much of the University of Hawaii operates on ceded land which was made part of the public land trust in 1959. In 1979, the people of the Sate of Hawaii directed their state government to pay to OHA a pro rata share of the revenue and proceeds from the public land trust.

UH has consistently and knowingly avoided its obligation to pay to OHA its constitutionally-mandated pro rata share of ceded land revenues not specifically tied to educational purposes. OHA seeks payment of all past due rents from UH activities on ceded lands, including but not limited to the Mauna Kea Science Reserve. OHA strongly suggests that Hawaiians be consulted before any efforts to use, lease, transfer, destroy, or otherwise modify ceded lands.

Other Issues

OHA also maintains that the Master Plan has failed to address several other issues adequately. These topics include the impact on the Wēkiu Bug, whose population has declined significantly as disclosed in the arthropod assessment report attached to the Master Plan, the lack of a carrying

capacity study, and handling of waste generated at observatory facilities. We share concerns about these and other issues. However, as they are adequately addressed by other organizations, we decline to comment further on them at this time.

The overriding question is then one of trust. To recap, the 1983 management plan mandated certain actions be implemented, such as the convening of a citizen's advisory committee. Needless to say, no such group was ever established. Given IfA's track record of broken promises, what is in the current Master Plan that ensures the implementation and enforcement of some of the stated intentions? What assurances can IfA provide that it will follow through on plans and agreements as written this time? Or more specifically, on what basis is it reasonable to ask for the continued trust of the Hawaiian community in the University's discharge of its trust obligations? Until the document can answer such difficult questions, it will remain inadequate in the eyes of the general public, and Native Hawaiians specifically. Therefore, we take this opportunity to impress upon you once again the importance of clarifying the intent, purpose, motive, and design of the Master Plan itself and all other foreseeable projects that may be planned under it at a later date.

Thank you for the opportunity to comment on this Master Plan. Should you have any questions concerning our comments, please contact Jalna Keala, Community Officer at 594-1946. Please refer to the document number noted at the top of this letter in any future correspondence.

Sincerely,

Sebastian Aloot, Director
Hawaiian Rights Division

cc: OHA Board of Trustees
West Hawai'i Community Affairs Office
East Hawai'i Community Affairs Office
Advisory Council on Historic Preservation

December 27, 1999

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Office of Hawaiian Affairs
State of Hawai'i
711 Kapiolani Boulevard, Suite 500
Honolulu, HI 96813

Attn: Mr. Sebastian Aloot, Director
Hawaiian Rights Division

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Director Aloot:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of September 30, 1999.

Management Plan

The creation of the Astronomy Precinct and it's function as a no-build line does not create separate management districts. The cluster of sites at the 13,000 ft. elevation was used as one of several constraints to the locating potential future telescope siting areas. The Precinct boundary creates a limit to the area at the summit which may be considered for future astronomy development, and it is not intended to segregate resource management and other management activities.

Protection of the summit area and its shrines is assured under the new management plan, to a much greater degree than presently exists with the DLNR authority and lack of regulatory presence on the mountain. Funding for the new Office of Mauna Kea Management is committed from UH, which will employ rangers to monitor activities on the mountain and help protect the existing resources. The OMKM will direct future management activities with the guidance of the Mauna Kea Management Board and the Kahu/Kupuna Advisory Committee. The UH Board of Regents and the Board of Land and Natural Resources will continue to have authority over the future development plans for the Science Reserve, consistent with the new Master Plan.

Cultural Landscape

The intent of the Master Plan was to describe the concentration of shrines at 13,000 ft., and apply this pattern of the resource in the overall planning for the summit. Creation of the No-Build Line which is now represented in the Astronomy Precinct Boundary, is a response to the presence of the cultural resources and one of the objectives assigned by the State Auditor. As you probably recognized in the plan, the utilization of the Astronomy Precinct is strictly limited to existing developed areas and carefully selected siting areas which avoid disturbance to the natural and cultural resources. The summit cinder cone at Kukahau'ula is preserved in perpetuity, lying outside the Precinct boundary, as are the closest features of Pu'u Poliahu, Pu'u Mahoe and Pu'u Lilinoe.

Based on the advice of the *kupuna*, these *pu'u* remain undeveloped, and an unmarred visual linkage is retained between these features which is not disturbed by new facilities.

Sacred Place

The notion of sacredness of the summit needs to be addressed. Accepting this premise as a given, it is apparent that the cultural records nor the cultural interpretation is clear. Sacred does not mean no-build, although many have stated such. No one has a definitive understanding of why the summit area is devoid of features, including the current native Hawaiians. Everyone is speculating here and while some may value speculations, the only true evidence lies in the features found on the ground today.

One point of speculation relates to the existence and function of the adze quarry, which was an industrial materials manufacturing operation located in the heart of this "sacred"site. It is quite possible that the idea of a sacred site holding a strict no-build designation is a modern invention. Many Hawaiian sacred sites, such as Pu'uhonu and *luakini heaiu*, had extensive construction associated with them. In fact, some of the most extensive construction monuments of old Hawai'i are associated with these places.

It is not the existence or lack of construction or even the type of construction that identified the respect for the sacredness of a site. It was the attitude with which people approached it, and the *mana* of the person engaging in the act. These are issues of attitude and protocol. Asking permission and expressing appreciation of the generosity of the gods and the earth was the key, not the use of construction. Adze makers built shelters, shrines and chipped stones. Canoe builders cut down the largest koa trees. Nature was used. The difference was that it was used with permission and protocol.

PASH Rights

It was recommended unanimously by the Mauna Kea Advisory Committee that public access to the summit be managed, not restricted. The Master Plan and Management Plan is clear in its statements of there being no restriction of access for Hawaiian cultural, religious and gathering rights.

Section 106 Consultation

The requirement for Section 106 consultation will be met as required under the law, which does not apply to the subject programmatic Master Plan. The Master Plan is not funded by Federal monies. Individual facilities will be subject to this review should they involve Federal funding. Nevertheless, the University is fully willing to meet with the representatives of OHA for discussions about the cultural resource aspects of the proposed Master Plan at any point.

Ceded Lands

With regard to ceded lands, the University recognizes that they have an educational exemption (Hawai'i Revised Statutes, 10-2) and that the land contained in the Mauna Kea Science Reserve is not being used for commercial development. The educational exemption and larger ceded land issues are a State-wide concern and the Governor is addressing trust obligations to the native Hawaiian community and the general public.

There is no interest in diminishing the rights of native Hawaiians to access and utilize the land on Mauna Kea. Instead, the Master Plan includes no restriction on traditional access for Hawaiian cultural and religious purposes.

Other Issues

The Wēkiu bug has been studied extensively in the 1983 survey and the recent survey completed in 1999. The Office of Mauna Kea Management is anticipated to institute more frequent monitoring of the Wēkiu bug population. As a condition of the Keck Outriggers project, the Keck Observatory is anticipated to institute Wēkiu bug monitoring for the area of the Keck Observatory.

The carrying capacity of Mauna Kea for astronomy development is substantial from a technical analysis viewpoint. Utilizing the GIS resource layering studies, the Master Plan addresses each of the constraints you suggest. The Final EIS addresses the Master Plan's approach to protecting natural and cultural resources, and minimizing cumulative effects to these resources. These measures include the physical planning actions (the Astronomy Precinct limits, avoidance of habitat areas, etc.) and the Management Plan measures (rangers, monitoring, etc.).

Each of the observatories has an individual wastewater system (IWS). The older facilities such as CFHT, CSO, IRTF, UKIRT, UH 0.6m and UH 2.2m all pre-date the 1980's establishment of new Department of Health requirements for individual wastewater systems to utilize septic tank and leaching systems. In the future, all new or redeveloped observatories or other new facilities will be required to comply with the IWS standards, and some observatories will be required to upgrade or replace their wastewater management facilities.

Trust

It is recognized that certain aspects of the earlier plan were never implemented. The new commitment to initial funding and creation of an active management entity based in Hilo, with on-mountain rangers, will be a major step forward toward resolving past problems. The current Draft Master Plan and Final EIS are very specific in identifying the intent, purpose, motive and design of the Physical Plan and Management Plan. All foreseeable projects are specified in this updated Master Plan, based on the latest information available to the UH Institute for Astronomy. We appreciate your continued trust in the University and welcome your continued participation in a cooperative effort toward future planning and management.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

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University of Hawai'i at Mānoa

Environmental Center
A Unit of Water Resources Research Center
2550 Campus Road • Crawford 317 • Honolulu, Hawai'i 96822
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October 25, 1999

Group 70 International, Inc.
925 Bethel Street, 5th Floor
Honolulu, HI 96813-4307
Attn: Jeffery Overton, AICP

Dear Mr. Overton:

Draft Environmental Impact Statement
Mauna Kea Science Reserve Master Plan
District of Hamakua, Hawaii

The University of Hawaii proposes to implement a Master Plan for future management of the Mauna Kea Science Reserve. The Physical Plan includes documentation of natural, cultural, recreational, and education and research resources, and it specifies both preservation and utilization goals. These include designation of a Natural and Cultural Preservation Area (redesignation of an existing area of the Science Reserve) and establishment of an Astronomy Precinct (525 acres at summit.) The Management Plan delineates the structure of management policies including creation of a locally-based management entity, on-mountain management presence, and creation of an on-going Advisory Board.

This review was completed with the assistance and contributions of Jim Bayman and Terry Hunt, U.H. Manoa Archeology, Jon Matsuoka, U.H. Manoa Social Science, Fred D. Stone, Hawaii Community College, and Jolie Wanger, Environmental Center.

General comments

Overall our reviewers noted that the DEIS was prepared with considerable research effort. However, they questioned several specific issues relating to sensitive physical and cultural features of Mauna Kea that deserve further consideration.

Regarding the proposed alternatives, why do none propose *limiting* new development, *while still* improving (rebuilding)/addressing existing facilities/issues? The options in the current plan include either, 1)no action, 2)postpone for further study, 3) alternative locations, 4) *more* intensive development than what is proposed, or 5) management organization alternatives. The options given make the choice seem an easy one. As buffer, it is stated on p.1-11 that "[t]he astronomy research community continues to support the limited future expansion of the

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observatory complex on Mauna Kea..." Since the Science Reserve resides on State Land, is it not necessary, in fact, to have full support from the public and not merely an endorsement by the astronomy community? Therefore, broader issues may be, what is the *need* for new astronomical development and has the public been convinced that this is the best use of public land? The Master Plan proposes the designation of an Astronomy Precinct of 525 acres. This is an expansion of the current area of astronomical use of ~60 acres. The Institute for Astronomy explains in their Astronomy Research Development Plan that they expect no more than one or two new telescopes in the future, although the Astronomy Precinct could actually support many more. The summit ridge is the limiting factor, as it can only accommodate a couple of additional telescopes and is the preferred location. Why then is so much land being proposed for the Astronomy Precinct? Why not include only the usable land within the Astronomy Precinct and include the 'unusable' land in the Reserve?

Archeological concerns

The DEIS is quite notable for its consideration of indirect impacts to archeological sites in the Science Reserve. Particularly useful is the recommendation that "rangers" be deployed to protect archeological sites. However, it will be difficult to assess damage to these sites given the current extent of the inventory. It appears that only 27% of the Mauna Kea Science Reserve has been examined for archeological remains (p 4-2.) The remaining 73% of the Reserve ought to be systematically examined for archeological resources to enhance the management and protection of this truly unique resource. The importance of this resource should not be under valued; Mauna Kea is the site of the largest lithic quarry in the Pacific Region, perhaps the largest prehistoric quarry in the world. The DEIS noted that a single comprehensive document is needed including detailed plan view maps, site descriptions, and high quality photographs to allow for careful monitoring of potential adverse effects on archeological sites in the Science Reserve. We suggest that the tabular summary of the 93 documented archeological sites is not as sufficient and in fact has negligible value for managing archeological resources. Complete survey and documentation are necessary to ensure protection of archeological sites on Mauna Kea and will provide essential basis to evaluate potential impacts over time.

Another concern, with regard to archeological management, pertains to the actual researching body. In the past, almost all archeological research at Mauna Kea has been conducted by staff at the DLNR. This same agency also reviews permitted archeological research in the State. Therefore, there is a potential conflict of interest, in that the staff from the agency that reviews research is also conducting the research. Perhaps legally mandated archeological work at Mauna Kea Science Reserve should be performed by an outside agency or institution. The University of Hawaii is well-staffed with archeologists, historians, and specialists in Hawaiian culture. Since the Science Reserve is managed by the University of Hawaii, perhaps the U.H. community would benefit from utilizing such a research and training ground for students and faculty at UH. The quality of research would be insured by an independent (DLNR) reviewing agency.

The present Draft EIS (section 6.1.4) describes mitigative measures to protect archeological resources. The archeological site complexes (the quarries and shrines) are particularly vulnerable to visitor impacts. Adze preforms (blanks), hammer stones, and flakes are commonly moved, disturbed, and/or collected by visitors. The fragile upright stones of shrines and their ancient flaked "offerings" are similarly vulnerable. These actions by naïve

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visitors have a continued and real impact on the integrity of these unique sites. While we understand that a historic preservation plan is in preparation, a workable plan to protect sites from visitor impacts is critical. Can one or two rangers really monitor visitor activities? Such continuing impacts (likely to increase given easy access) are not directly addressed in the present DEIS, and need to be.

Invertebrate Survey concerns

Another issue for our reviewers is the status of native invertebrates on Mauna Kea, in particular the Wekiu bug (*Nusius wekiucola*). Of principal concern is the fact that a complete invertebrate survey has not been conducted. A complete survey should include the support facilities at Hale Pohaku and the road and utility corridor to the summit. In both the 1982 and current arthropod assessment, work was restricted to the Science Reserve only. Additionally, the current assessment was intended as a *monitoring* survey to "gather information necessary for protection and management of resident arthropod species including the Wekiu bug and lycosid spiders." It was *not* intended as a thorough EIS study (Appendix D, p.2.)

Secondly, the populations of Wekiu bug are considered extremely low and have declined drastically from the initial survey in 1982. At that time, the species was abundant in the cinder cones and slopes. Now, it is very rare. Intensive searching by a team of biologists found only a few dozen individuals over the entire period of the current survey. The original management plan called for regular monitoring of the Wekiu bug and other summit arthropods. However, this was not done until the current survey, 16 years later. The reason for this failure was lack of funding. The current Master Plan is similarly deficient in funding earmarked for such regular monitoring. Therefore, a *funded* protection and management program is deemed essential for the current Master Plan. Without funding, no matter how well intentioned the current plan, it will not result in an *operational* protection and management program for the summit arthropods. Considering the drastic decline of the Wekiu population, continued monitoring is essential to determine the reason(s) for this trend, and to determine if, in fact, it is able to survive in the buffer zones of the outer cinder cones. Informal visual monitoring by biologists from the mid-1980's to the 1990's indicated that it remained abundant until the early 1990's. Several changes were occurring as detailed in the current survey, including a decline in the summit snow pack, construction impacts to some of the prime habitat, and the spread of an introduced spider. An active monitoring and management program could determine the cause of the Wekiu bug decline and its trends as well as searching for a way to ensure its survival.

Our reviewers also suggest that the Advisory Board, as recommended in the Plan, should include biologists. An Advisory Board mandated to make recommendations on the management of Mauna Kea Science Reserve will need regular input from biologists experienced in high altitude ecosystems (including birds, plants, and invertebrates.) Without the presence of qualified biologists, the board will be unable to make informed decisions regarding the impacts of activitites on Mauna Kea.

Cultural impact concerns

Lastly, with regard to sensitive cultural issues, our reviewers felt the Cultural Impact Assessment Study and Oral History and Consultation Study were quite thorough. Federal guidelines appeared to be followed, the methodology was robust, and the people selected seemed

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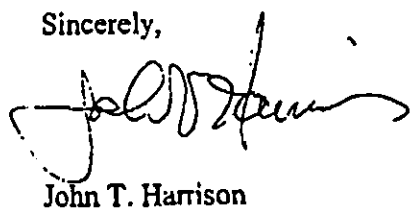
quite representative. However, there appears to be a disconnect between the appendices and the main body of the DEIS. In section 6.1.4 it is stated that "Implementation of the Master Plan should have no adverse short-term direct effects to the rich historic properties and cultural

practices, features and beliefs of the summit region of Mauna Kea." This statement is not necessarily backed up by the Cultural Impact Assessment Study. Long-term *visual* impacts are discussed on p. 6-14 as being mitigated by redevelopment using compliant colors. The mitigative measures in 1.5, 6.1.4 and 6.2.5 are cursory and don't seem to get at the heart of the sentiments expressed in the ethnography of the Oral History and Consultation Study. In fact, it may be that some issues are not amenable to mitigation which is never discussed. We refer to such sentiments as on p. 25 of the Oral History Study (Appendix C): "Sixteen of the interviewees expressed the opinion that the proposed development of additional observatory complexes on Mauna Kea was inappropriate and not acceptable. Two of the interviewees expressed hesitancy at further development based on a deep respect for Mauna Kea. One interviewee felt that the benefits of the work done by the observatories far out weighed other concerns...Thus, nearly all the interviewees and all others who participated in the consultation process (*Appendices B and C*) called for a moratorium on any further development on the summit of Mauna Kea." It is evident that visual impacts are not the only concern of those people consulted. We therefore recommend that the Master Plan should more faithfully implement its own studies, and we suggest that the final EIS should incorporate such an enhanced attention to the recommendations, both of our participating reviewers and of those who contributed to the planning process.

Thank you for the opportunity to comment.

Sincerely,



John T. Harrison
Environmental Coordinator

Cc: OEQC
Allan Ah San (UH)
Jolie Wanger
Jim Bayman
Terry Hunt
Jon Matsuoka
Fred D. Stone

December 27, 1999

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2550 Campus Road, Crawford 317
Honolulu, HI 96822

Attention: John T. Harrison
Environmental Coordinator

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Mr. Harrison:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of October 25, 1999.

Alternatives

The Final EIS addresses the option of limiting new development while improving (redeveloping) existing facilities and addressing planning and management issues. This option is not feasible due to the constant evolution of astronomy science, for which the premier location is Mauna Kea. If Mauna Kea is to continue in its role as the world's leading location and observatory complex, it must be able to evolve and grow, within reasoned limits. If Mauna Kea is relegated to only rebuilt facilities, astronomy science and its related benefits to the State and Hawaii island will diminish over time.

The recently constructed facilities, such as Keck I & II and Gemini North, will have a productive research lifespan of 20 to 30 years. There will be several opportunities to redevelop the older existing facilities on the summit ridge, however, in 5 to 10 years, these redeveloped facilities will not represent the leading instruments in the field. New observatory technologies, such as the interferometer and NGLT, will necessitate the selection of new sites on the summit.

Astronomy Precinct

The Astronomy Precinct was created in response to the State Auditor's request to establish a no-build line for astronomy facilities on Mauna Kea. The precinct is 525-acres, however, the actual area for siting new (and existing) telescopes is limited to 150 acres. The 1983 plan, for reference, allocated 160 acres for telescope siting areas. The actual footprint of the existing facilities is less than 30 acres, with the future expansion and new facilities are estimated to cover less than 15 acres.

The Precinct represents less than five percent of the total area of the Science reserve. As shown clearly in the GIS mapping composites in the Master Plan and Final EIS, the majority of the Astronomy Precinct (285 acres or 72%) remains as preserve area outside of the telescope siting areas. As mentioned above, the actual impact on the land will be under 50 acres or less than 10% of the Precinct.

Archaeological Resources

The value of the archaeologcial resources within the Science Reserve, as well as the adjoining Natural Area Reserve, is very much appreciated. Under the direction of the new Office of Mauna Kea Management, further archaeological research and reporting could be conducted for the remaining un-surveyed areas of the Science Reserve. Due to its immense size, the Science Reserve was studied most intensively in the summit region since the 1970's. The DLNR's Historic Preservation Plan for Mauna Kea is currently in production, and we anticipate completion in early 2000. This document will help guide the future protection and management of the resource.

Archaeology Research

The DLNR Historic Preservation Division has completed much of the archaeological research for Mauna Kea. Bishop Museum has also been directly involved during the period when Dr. Patrick McCoy was under their employ. Clearly, Dr. McCoy and Dr. McEldowney of DLNR are the most qualified researchers to complete such work. The idea of involving UH researchers and students in future archaeological studies is a fine idea, to provide benefits as a training ground for students. The decision to advance the study of archaeological resources beyond the current study area would come from the new management entity.

Visitor Impacts to Sites

We agree that there is the potential in the future for greater damage and disruption to the existing shrines and other cultural sites in the Science Reserve. The DLNR's Historic Preservation Plan addresses measures for informing visitors and limiting activities that could affect these resources. Rangers on the mountain will have a significant effect on informing visitors and regulating activities. The Visitor Information Center could become a focal point for educating visitors to the sensitivity of the resources on the mountain. The new management entity will also have the opportunity to provide added focus on the methods for managing the archaeological resources in the Science Reserve.

Native Arthropods

The lack of a complete invertebrate survey for areas outside the summit is recognized. There are no known endangered invertebrates in the lower elevation areas. The new management entity will also have the opportunity to provide new efforts to expand arthropod surveys in the Science Reserve.

The protection and management of the wekiu habitat is an ongoing requirement for all redevelopment projects in the cinder cones substrate areas of the summit. It is recognized that follow-up surveys were not conducted since 1983. Changes to the wekiu bug population are a concern that is shared by all, and mitigation measures are proposed in the Final EIS to protect against further habitat disruption. One issue that has not been noted is the fact that over 10,000 wekiu bugs were taken from the mountain in the 1983 survey. This level of sampling may potentially have had something to do with the decline to current population levels.

We agree that that an active management and monitoring program be initiated, and such a program is set to occur with the Keck Outriggers project. The Advisory Board could also initiate a special committee of biologists to advise the Board on the matters such as the wekiu bug habitat.

Cultural Perspectives

The opinions cited in the ethnographic studies are viewed with deep respect for the feeling people have for Mauna Kea. The oral histories are a valuable insight into the people with a history of work or family ties to the mountain. These thoughts and perspectives are integrated largely into the future planning for the world's leading astronomy complex.

- More than 95 percent of the available land in the Science Reserve has become a perpetual preservation area for natural and cultural resources concerns.
- All of the culturally significant landforms at the summit which have not been developed will remain preserved, including Puu Poliahu, Kukahauula (summit puu), Puu Lilinoe and the immense surrounding area containing over 100 shrines.
- Visual connections between the culturally significant landforms will be retained in perpetuity, such that the overall cultural context of the summit remains intact.
- Only areas with the least potential impact to the cultural sites and landforms were considered for future astronomy development, following strict design guidelines to minimize visual impact.

The continued participation of the elder native Hawaiian representatives, through a Kahu/Kupuna Advisory Committee to the Advisory Board and Management Office, will ensure the proper implementation of the plan without diminishing the integrity of the summit as a cultural landscape.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

Stephen K. Yamashiro
Mayor

William G. Davis
Managing Director

Henry Cho
Deputy Managing Director

County of Hawaii
25 Aupuni Street, Room 215 • Hilo, Hawaii 96720-4252 • (808) 961-8211 • Fax (808) 961-6553
KONA: 75-5706 Kuakini Highway, Suite 103 • Kailua-Kona, Hawaii 96740
(808) 329-5226 • Fax (808) 326-5663

November 18, 1999

Mr. Donald Kim, Chairman
And Members of the Board of Regents
University of Hawaii
2444 Dole Street
Honolulu, HI 96822

Dear Chairman Kim and Members of the Board of Regents:

Thank you for the opportunity to present testimony on the Master Plan and Management Plan for the Mauna Kea Science Reserve.

I support the general concepts of the multi-uses for scientific activities, recreation, hunting, religious and cultural practices and open access under certain restrictions for safety and resource protection.

I also agree with the concepts proposed in the Master Plan and Environmental Impact Statement, including the proposed new management structure within the administrative purview of the Office of the Chancellor at UH-Hilo and the appointment of a citizen's advisory board appointed by the University of Hawaii.

While I support a variety of uses, my administration gives its full endorsement to the astronomy industry that has invested millions of dollars in our community in the development of one of the best sites in the world to view the universe. The telescopes atop Mauna Kea employ some 400 people and significantly contribute annually to our economy. This industry has helped sustain us during difficult economic times. It has provided educational and employment opportunities for our people, and enhanced our understanding of the universe and our own planet.

Many astronomers, support staff and their families have permanently located to the Big Island and are contributing members of our community. They have made personal commitments to make our island a better place to live.

We are working with astronomers and staff to create educational opportunities for our children. One such outreach program being developed by Gemini will enable our students to video conference with young people in La Serena, Chile. This program also includes teacher exchanges between Chile and Hawaii.

The recent dedication ceremonies for Gemini and Subaru drew international media attention, which focused on the Big Island, not just as a tropical vacation destination, but also as a world leader in astronomy and high technology.

There has been much discussion about the high technology potential of Hawaii. Our astronomy industry is the ultimate in high technology.

The astronomy industry is now a key component of our University of Hawaii at Hilo Research Park on Komohana Street and is also an integral part of the Waimea community. In your review, I would ask that you keep in mind that astronomy is a cornerstone of our economy and our university.

With proper management and cooperation, Mauna Kea will continue to be a wonderful asset that can be shared by our entire community.

Thank you for considering my comments.

Sincerely,

Stephen K. Yamashiro
MAYOR

December 27, 1999

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Kathryn A. Nam
Roy A. Inouye, AIA, CSI
Frank B. McCue, RA
Christine M. Ruotola, AICP
Stuart M. Jow, AIA

Mayor Stephen K. Yamashiro
County of Hawai'i
25 Aupuni Street, Room 215
Hilo, HI 96720-4252

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Mayor Yamashiro:

Thank you for providing the Board of Regents with your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of November 18, 1999.

We appreciate your support of the Mauna Kea Science Reserve Master Plan, and its management approach which will bring management responsibilities to the UH Hilo Chancellor. You have recognized the significant economic contributions of the astronomy research operations to Hawaii island, as well as the educational opportunities for our children. In addition, the high technology potential for Hawaii is another positive aspect of astronomy that will be enhanced under this new plan.

There has also been a concerted effort during the planning process to include the Hawaii Island community in the discussions, particularly those with environmental and native Hawaiians perspectives. The plan includes significant measures to protect the unique environment of Mauna Kea and respect its sacred Hawaiian cultural values.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

JAMES Y. ARAKAKI
Chairman & Presiding Officer

Phone: (808) 961-8272
FAX: (808) 961-8912

COUNTY COUNCIL

County of Hawai'i
Hawai'i County Building
25 Aupuni Street
Hilo, Hawai'i 96720

November 3, 1999

Mr. Donald Kim, Chairman
Board of Regents
University of Hawaii
2444 Dole Street
Honolulu, Hawaii 96822

Dear Mr. Kim:

As a member of the Mauna Kea Advisory Committee, I know that all the members of the committee put in a great deal of valuable time discussing the many complex issues regarding Mauna Kea.

After more than a year of continuous meetings I believe that the university benefited from the best effort of each member of the committee in coming up with the recommendation for the Mauna Kea Reserve Master Plan. Group 70 helped greatly in facilitating parts of the meeting and sharing technical expertise.

As a member of the Mauna Kea Advisory Committee, I ask that you please give favorable consideration to the Mauna Kea Science Reserve Master Plan at your duly meeting that this plan will be examined.

Aloha and Mahalo,

James Y. Arakaki, Council Chairman
Hawaii County Council

JYA/jv

December 27, 1999

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Stuart M. Jow, AIA

James Y. Arakaki, Council Chairman
County of Hawai'i
25 Aupuni Street
Hilo, HI 96720-4252

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Chairman Arakaki:

Thank you for providing the Board of Regents with your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of November 3, 1999.

We appreciate your hard work as a member of the Mauna Kea Advisory Committee. Your support of the Mauna Kea Science Reserve Master Plan is noted.

As a member of the Advisory Committee, you participated in the sincere effort during the planning process to include the Hawaii Island community in the discussions, particularly those with environmental and native Hawaiians perspectives. The Master Plan includes significant measures to protect the unique environment of Mauna Kea and respect its sacred Hawaiian cultural values.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

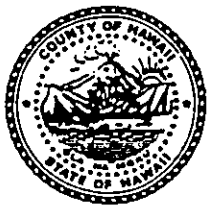
Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

Stephen K. Yamashiro
Mayor



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OCT 25 1999
GROUP 70

Diane S. Quitiquit
Director

County of Hawaii
DEPARTMENT OF RESEARCH AND DEVELOPMENT
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E-mail: chresdev@interpac.net

October 22, 1999

Allan Ah San, Associate Vice President for Administration
University of Hawaii
2444 Dole Street, Bachman Hall 112
Honolulu, HI 96822

Dear Mr. Ah San:

Re: Mauna Kea Science Reserve Master Plan - Draft Environmental Impact Statement

We believe the proposed Physical and Management Plans for Mauna Kea will reconcile the careful development of this outstanding astronomical observation site with the preservation of the unique natural, cultural and archaeological values of this mountain. This expectation is based on the assumption that the $400,000 annual funding from the University of Hawaii for the new Office of Mauna Kea Management will be maintained together with any additional funds as conditions eventually dictate.

We support the general approach that only the top astronomy research ideas, in terms of new facilities, will be considered for development on Mauna Kea. We also hope that the proposed methods for minimizing visual impacts, painting new domes to blend in with the landscape and sinking much of the structures below grade, prove to be technically and economically feasible.

The County endorses management of vehicular access for visitors to Mauna Kea on the basis that public safety and resource protection will be best achieved through creation of a check-in station at Hale Pohaku, limited hours of public access and vehicle standards. As shown in Table 2-1 of the Draft EIS, the County carries responsibilities for safety and security on the mountain - medical emergencies, fire and crime; it is felt that vehicular control will help to minimize accidents and emergencies in this remote and often hostile environment. Such control can also serve to educate the public about the natural and archaeological resources on the mountain leading to improved conservation of these fragile resources.

Finally, we would note that a correction is required in Section 4.3, NATURAL HAZARDS, on page 4-20. As a result of a recent change, the island of Hawaii is now located in Seismic Zone 4 (not 3) for building design under the Uniform Building Code.

We thank you for the opportunity to review this Draft Environmental Impact Study.

Yours truly,

Raymond Carr
Economic Development Specialist

c.c. Genevieve Salmonson, Director, State of Hawaii, Office of Environmental Control
Jeffrey Overton, Group 70 International Inc.
Diane Quitiquit, Director
Mayor Stephen K. Yamashiro

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Jeffrey H. Overton, AICP
Kathryn A. Nam
Roy A. Inouye, AIA, CSI
Frank B. McCue, RA
Christine M. Ruotola, AICP
Stuart M. Jow, AIA

December 27, 1999

Department of Research and Development
County of Hawai'i
25 Aupuni Street, Room 219
Hilo, HI 96720-4252

Attention: Mr. Raymond Carr,
Economic Development Specialist

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Mr. Carr:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of October 22, 1999.

We appreciate your recognition of the proposed management approach for the Science Reserve and Hale Pōhaku. It is also proposed to create the Mauna Kea Advisory Board to provide the community with an on-going voice in the management of the Science Reserve and Hale Pōhaku.

As you have noted, the Master Plan includes several design measures intended to mitigate the visual impact of observatory enclosures. With these measures in place, the new facilities and redeveloped facilities will be less noticeable from down-slope locations

Thank you for correcting the information included in our Natural Hazards section. We understand that the island of Hawaii is now located in Seismic Zone 4 for building design under the Uniform Building Code.

The Advisory Committee voted unanimously to support some type of managed access for vehicular access for visitors to Mauna Kea, especially two-wheel drive vehicles. You raise an interesting point about the anticipated reduction of accidents and emergencies as a result of proper access management. The need for a check-in station, and the best approach for implementing such a station, will be determined by the new Office of Mauna Kea Management.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

Stephen K. Yamashiro
Mayor

Jiro A. Sumada
Deputy Chief Engineer

County of Hawaii
DEPARTMENT OF PUBLIC WORKS
25 Aupuni Street, Room 202 • Hilo, Hawaii 96720-4252
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September 13, 1999

ALLAH AH SAN
UNIVERSITY OF HAWAII
2444 DOLE STREET BACHMAN HALL 112
HONOLULU HAWAII 96822

SUBJECT : DRAFT ENVIRONMENTAL IMPACT STATEMENT
MAUNA KEA SCIENCE RESERVE MASTER PLAN
TMK: 4-4-015: 09 & 12

We acknowledge receipt of your letter concerning the subject matter and have no comments to offer.

Should there be any additional questions concerning this matter, please feel free to contact Mr. Casey Yanagihara in our Engineering Division at (808)961-8327

Galen M. Kuba, Division Chief
Engineering Division

CR

cc: State OEQC
Group 70 International, Inc.

MaunaKeaScienceReserveMasterPlan.DEIS.wpd

Stephen K. Yamashiro
Mayor

Virginia Goldstein
Director

Russell Kokubun
Deputy Director

County of Hawaii
PLANNING DEPARTMENT
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720-4252
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October 29, 1999

Mr. Allan Ah San
Associate Vice President for Administration
University of Hawai'i
2444 Dole Street, Bachman Hall 112
Honolulu, HI 96822

Dear Mr. Ah San:

Draft Environmental Impact Statement for the Mauna Kea Science Reserve Master Plan
TMK: 4-4-15: 9 and 12; Ka'ohe, Hamakua, Hawaii

This letter is in response to a September 8, 1999 letter from Mr. Eugene Imai of the University of Hawaii, transmitting a copy of the above-described draft environmental impact statement (DEIS) for our review and comment.

We have completed our review of the DEIS and have found that the information relative to County of Hawaii land use plans, policies and controls (Chapter 5) are accurate.

We have no further comments to offer. Thank you for allowing our office the opportunity to review the DEIS. We look forward to receiving a copy of the Final Environmental Impact Statement upon its filing with the Office of Environmental Quality Control.

Sincerely,

VIRGINIA GOLDSTEIN
Planning Director

DSA:pak
f:\wp60\Ch343\1999\LAhSan01.dsa

c: Office of Environmental Quality Control (OEQC)
Mr. Jeff Overton, Group 70

December 27, 1999

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Stuart M. Jow, AIA

Planning Department
County of Hawai'i
25 Aupuni Street, Room 109
Hilo, HI 96720-4252

Attention: Mrs. Virgina Goldstein
Planning Director

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Mrs. Goldstein:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan in your letter of October 29, 1999.

We appreciate your verification of the information provided in the EIS relative to the County of Hawaii land use plans, policies and controls. A copy of the Final EIS will be provided upon its filing with the Office of Environmental Quality Control.

If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAII
25 AUPUNI STREET • HILO, HAWAII 96720
TELEPHONE (808) 961-8660 • FAX (808) 961-8657

September 9, 1999

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GROUP 70

University of Hawai'i
2444 Dole Street, Bachman Hall 112
Honolulu, HI 96822

MAUNA KEA SCIENCE RESERVE MASTER PLAN
DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS)
KA'OHE, HAMAKUA DISTRICT, HAWAII
TAX MAP KEY 4-4-015:009 AND 012

We have reviewed the subject draft EIS. Please be informed that the subject property is not within the service limits of the Department's existing water system facilities.

Should there be any questions, please call our Water Resources and Planning Branch at (808) 961-8665.

Milton D. Pavao, P. E.
Manager

WA:gms

Enc.

copy - State of Hawaii, OEQC
Group 70 International, Inc.

...Water brings progress...

December 27, 1999

GROUP 70
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Department of Water Supply
County of Hawai'i
25 Aupuni Street
Hilo, HI 96720-4252

Attention: Milton D. Pavao, P.E.
Manager

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Manager Pavao:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of September 9, 1999.

We appreciate your confirmation that the facilities at the Mauna Kea Science Reserve and Hale Pohaku are not within the service limits of the existing water system facilities. Water supply for the observatories and other facilities on the mountain will be provided through the current method of trucking water to storage systems serving the individual users.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

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NOV- 1-99 MON 15:51 UH SR VP ADMIN STAFF FAX NO. 8089569097 P. 01

xc: Bob McLaren
NOV - 1 1999 fax: Jeff Overton

UNIVERSITY OF HAWAII
OFFICES OF
SR VP ADMIN
'99 NOV -1 A9:19

Stephen K. Yamashiro
Mayor

Wayne G. Carvalho
Police Chief

James S. Correa
Deputy Police Chief

County of Hawaii
POLICE DEPARTMENT
349 Kapiolani Street • Hilo, Hawaii 96720-3998
(808) 935-3311 • Fax (808) 961-2702

October 26, 1999

Mr. Allan Ah San
Associate Vice President
Administration
University of Hawaii
Bachman Hall 112
2444 Dole Street
Honolulu, HI 96822

Dear Mr. Ah San:

Re: Mauna Kea Science Reserve Master Plan
Draft Environmental Impact Statement

This responds to Mr. Raymond Carr's memorandum of October 14, 1999, regarding the Mauna Kea Draft EIS on vehicular access management.

The Hawaii County Police Department supports the Mauna Kea Science Reserve Master Plan, which proposes the management of vehicular access by visitors to Mauna Kea. The creation of a check-in station at Hale Pohaku, along with limited hours of public access and vehicle types, would minimize potential public hazards in this remote and often hostile environment.

If we can be of any further assistance, please contact Lieutenant Ernest Correia of our Traffic Services Section at 961-2225.

Sincerely,

WAYNE G. CARVALHO
POLICE CHIEF

JAMES S. CORREA
DEPUTY POLICE CHIEF
ACTING POLICE CHIEF

CMC/EEC/sy

xc: Mr. Raymond Carr

December 27, 1999

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Christine M. Ruotola, AICP
Stuart M. Jow, AIA

Police Department
County of Hawai'i
349 Kapiolani Street
Hilo, HI 96720-4252

Attention: James S. Correa
Acting Police Chief

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Acting Chief Correa:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of October 26, 1999.

The Advisory Committee voted unanimously to support some type of managed access for vehicular access for visitors to Mauna Kea, especially two-wheel drive vehicles. There is anticipation of a reduction of accidents and emergencies as a result of proper access management. The need for a check-in station, and the best approach for implementing such a station, will be determined by the Office of Mauna Kea Management.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

LIFE OF THE LAND

Ua Mau Ke Ea O Ka 'Aina I Ka Pono
Hawai'i's own local Community Action Group
Protecting our Fragile Natural & Cultural Resources
through Research, Education, Advocacy & Litigation

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OCT 22 1999
GROUP 70

October 21, 1999

Mr. Allan Ha San
University of Hawai'i
2444 Dole St. Bachman 112
Honolulu, Hawai'i 96822

Mr. Jeff Overton
Group 70
925 Bethel Street, 5th Floor
Honolulu, Hawai'i 96813

Ms. Genevieve Salmonson
OEQC
235 S. Beretania Street
Honolulu, Hawai'i 96813

Re: Mauna Kea Science Reserve Master Plan Draft Environmental Impact Statement

Aloha!

Life of the Land is Hawai'i's own environmental and community action group advocating for the people and the land since 1970. Our mission is to preserve and protect the life of the land through sustainable land use and energy policies and to promote open government through research, education, advocacy and, when necessary, litigation.

Life of the Land stands with nā kūpuna and the Hawaiian community in objecting to any further expansion of the Mauna Kea Science Reserve facilities. At our July 1999 Board of Directors meeting, the Life of the Land Board unanimously passed a motion stating that we stand with the Hawaiian community and will take whatever action is necessary to protect this sacred mountain.

It is difficult for us to look at any expansion of Mauna Kea Science Reserve when a 1998 Legislative Audit charged the University of Hawai'i ("UH") and the Department of Land and Natural Resources ("DLNR") with "having failed to implement adequate controls to balance environmental concerns with astronomical development."

We were at a briefing at the Board of Land and Natural Resources ("BLNR") several years ago when scientists from Mauna Kea were asking to create roads on the mountain so that they could bring equipment to remote areas. At that meeting, a staff person from the State Office of Historic Preservation showed slides and talked about

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the many sacred sites on Mauna Kea and then showed pictures of the garbage strewn across this sacred place. We remember feeling very sad that Mauna Kea was being treated with such disrespect.

Mauna Kea is sacred. It was the first sight of land that the voyaging Polynesians got as their canoes approached Hawai`i. This view of Mauna Kea told them they were home. The significance of Mauna Kea to the Hawaiian culture can not be defined in western terms...there is a spiritual connection with Mauna Kea that is shared by many people in the Hawaiian community. Please respect their *mana`o* (thoughts.)

1. *"In scoping the cultural portion of an environmental assessment, the geographic extent of the inquiry should, in most circumstances, be greater than the area over which the proposed action will take place. This is to ensure that cultural practices which may not occur within the boundaries of the proposed project area, but which may nonetheless be affected, are included in the cultural assessment. Thus, for example, a proposed action that may not physically alter gathering practices, but may affect access to gathering areas would be included in the assessment. An ahupua`a is usually the appropriate geographic unit to begin an assessment of cultural impacts of a proposed action, particularly if it includes all of the types of cultural practices associated with the project area. In some cases, cultural practices are likely to extend beyond the ahupua`a and the geographical extent of the study area should take into account those cultural practices."* (Cultural Impact Guidelines: Section II: Cultural Impact Assessment Methodology) [emphasis added]

Mauna Kea is part of the Ahupua`a o Ka`ohe. Why was the cultural impacts limited to only a small section of the ahupua`a? Why is there no analysis on why only a section of the ahupua`a was chosen as the geographic unit to analyze under the Cultural Impact Guidelines? The Hawaiian's considered this to be a very powerful ahupua`a containing part of the summit of both Mauna Kea and Mauna Loa. Why was Mauna Loa excluded from the cultural impact guidelines? What are the major cultural impacts to Mauna Loa as the result of the proposed expansion on Mauna Kea?

2. The EIS does not discuss the numerous Mauna Kea Drafts. The Draft Plan concept is quite confusing.

Mauna Kea Draft Plan No. 1 = ?
Mauna Kea Draft Plan No. 2 = Environmental Impact Statement Preparation Notice
Mauna Kea Draft Plan No. 3 = Draft Environmental Impact Statement
Mauna Kea Draft Plan No. 3a = Concurrent review for someone while the public is reviewing Draft 3.
Mauna Kea Draft Plan No. 4 = Presentation to the Regents.

Isn't this odd?

Generally, when an environmental review document is out for comments, the applicant waits until all the public comments are received and then prepares the final document. Life of the Land feels that it is UNFAIR of the Institute for Astronomy and Group 70 to intentionally confuse the issue.

3. Master Plan 3 states: *"the Master Plan for Mauna Kea Science Reserve and Hale Pohaku"* while Master Plan 3a states: *"The purpose of this Plan update is to develop physical and management plans to guide the use of and facilitate development with the*

Mauna Kea Science Reserve, Summit Access Road, and Hale Pohaku , for the next 20 years." (Draft 3a: Page I-1).

Did the scope of the Master Plan increase?
(Science Reserve & Hale Pohaku --> Science Reserve & Hale Pohaku & Access Road)

4. *"Altogether, the No Action Alternative would result in detrimental impacts to the resources of the mountain."* (DEIS page I-9).

Currently you have a 30 year plan in place. If the revised plan is rejected, you would still be operating under the constraints of the old plan. Are you stating that if this happens, you would ignore the auditor's report, and continue to abuse your lease? What does this say about your getting a new lease?

5. *"Mauna Kea is not the place for just any instrument."* (DEIS page 2-19).

Please name all instruments that were rejected for Mauna Kea.

6. *"The plan is to preserve the existing historical trails to Waiau and the summit."* (3-25)

Are all of these areas part of the proposed Master Plan? Are all of these areas part of the Environmental Impact Statement? What is the difference in the geographic area between Draft 1, Draft 2, Draft 3, Draft 3a, and the DEIS?

7. *"The number of parking spaces is currently planned to increase by 75 spaces to a total of approximately 150 spaces. More parking may be needed at the Visitor Information Center in the future."* (DEIS page 3-33)

Amendments to the Master Plan: Class A: require Regents approval; Class B: require Administrator approval. Exempt: parking, etc. (Draft 3a, XI-16).

"When the [Saddle] road improves, it will become a major crossing, and Hale Pohaku will easily become part of the itinerary taken by tourists. Visitor counts could easily increase to the level seen at Lava State Monument in Puna (143,000 counted in 1994) or the Lapakahi State Park Historical Site (336,000 in 1994)." (DEIS, SMS page 11)

Are you kidding about exempting parking spaces from review? No matter how many are proposed?

8. *"The fiber optic communication system and the electric power system will be expanded"* (DEIS page 3-34).

Are the utility corridors part of either Science City or Hale Pohaku? If not, how can they be managed by this Plan? Doesn't the Environmental Impact Statement

exclude utility corridors and infrastructure outside of the Science Reserve and Hale Pohaku?

9. *"The inadequacy of a forum for public input has been a long standing issue"* (DEIS page 3-36)

AND IT STILL IS AN ISSUE!

10. *"Class B amendments would be administrative"* (DEIS page 3-52)

This includes expansions which increase the total floor area by less than 50% of the current floor area. Does this include sites where the existing floor space includes underground areas but the expansion includes only surface areas? Would this appear to double or triple the apparent (aboveground) floor space?

11. Summary of unresolved issues: rough breakdown (by the amount of print dedicated to each issue within the Chapter):

very large telescope carry capacity on Mauna Kea.....29%
access.....29%
new management.....20%
recycling sites..... 9%
limited expansion on Mauna Kea.....5%
no expansion on Mauna Kea..... 4%
physical planning issues/management issues.....4%
(Source: DEIS Chapter 8)

Do you really believe that this is the weight of various unresolved issues? What weight do you give to unresolved cultural issues?

12. *"Compliance requirements relating to the 1983 plans are addressed in the project-specific CDUA permitting documents, which are the responsibility of the DLNR. There have been no fines issued that we are aware of."* (Group 70 response to LOL, page 5-6)

13. The observatories pay "rent" in the form of "time" to UH. The state has an obligation to native Hawaiians. That obligation is 20% of the revenue from ceded lands. Since Mauna Kea is ceded land (although we believe all of Hawai`i nei is Hawaiian land), what arrangements have you made with the Office of Hawaiian Affairs (OHA) to fulfill this obligation?

14. *"utility lines should be buried. Accessory utility structures will be screened. Road design should minimize slope cutting."* (Draft 3a: XI-6)

All statements with "should" in them can be ignored. Why not change the wording to "must"? After all, you include variances for extreme cases.

15. *"Temporary facilities are facilities that, when constructed, are planned for removal within five years of completion of construction."* (Draft 3a: XI-13)

Please clearly state in the Final Environmental Impact Statement that temporary facilities.....WILL BE REMOVED AS SOON AS POSSIBLE OR WITHIN ONE YEAR AFTER CONSTRUCTION.

16. What is a *"strong proposals for temporary facilities"*?

Wouldn't a strong proposal be for permanent structures only?

17. Appendix B. *"Botanical Resources. Hale Pohaku Mid Elevation Facility" (7/99) and "Botanical Resources, Mauna Kea Summit"* (7/99)

Are there any botanical resources between the Summit and Hale Pohaku? Would such resources receive direct, indirect, or occasional impact as the result of either the expansion of the Science Reserve or the increased flow in visitor traffic brought about due to the expansion of the Science Reserve, including, but not limited to, movement of re-suspended and/or fugitive dust.?

18. *"Over the last 20 years, the IfA has been concerned with the status of rare plants and animals found on or near the summit of Mauna Kea. Among those concerns is a special interest in the anthropod community."* (DEIS page D-2).

Unfortunately, that concern has not translated into protection of those rare plants and animals.

"The changes in the biotic community within the MKSR since the 1982 study indicate that active management of the habitat should be initiated." (DEIS page D-4)

Why haven't best management practices been established and implemented?

"The auditor's report identified many problems that require change but did not identify sources of finance to implement the change." (DEIS page 2-13)

You fault the Auditor for specifying the need for funding without identifying the source, and then you do the same thing.

19. *"Mauna Kea is home to the most powerful collection of astronomical observatories on the surface of the earth."* (DEIS Appendix G re SMS study: page 1). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training.* (DEIS page G-1)

Is SMS an expert in astronomy? Should astronomical assumptions be left to astronomical experts?

20. *"The summit offers an exceptional basis for astronomy"* (DEIS Appendix G re SMS study: page 1). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training.* (DEIS page G-1)

Is SMS an expert in astronomy?

21. *"planning is needed ... to follow environmental safeguards ... to make culturally sensitive land use of some or all of the summit area."* (DEIS Appendix G re SMS study: page 1). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training.* (DEIS page G-1)

Is SMS an expert in environmental safeguards and culturally sensitive land use? How can such a statement (*make culturally sensitive land use of some or all of the summit area*) be made when the Hawaiian community has clearly and repeatedly stated that the summit was *kapu* (taboo)? Have you noticed that the cultural sites are in a ring below the summit, encircling the summit as if to protect Mauna Kea?

22. *"As an industry, astronomy begins with a renewable natural resource"* (DEIS Appendix G re SMS study: page 2). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training."* (DEIS page G-1)

Is SMS an expert in renewable natural resources? How is that term defined? Does it include the toxic chemicals needed to cool the lenses? Does it include the toxic chemicals needed to make lenses? Does it include the air pollution caused by flying to airports and driving up mountains to view telescopes? Or are the stars the "renewable natural resource"?

23. *"In this document, SMS follows the convention of treating telescope arrays as single instruments ... The Mauna Kea telescopes all have more than one instrument."* (DEIS Appendix G re SMS study: page 2). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training."* (DEIS page G-1)

Is SMS an expert in telescope conventions? SMS is being asked to provide "expert testimony" in this Appendix. The idea that all telescope arrays are a single unit but that all telescopes have more than one instrument sounds contradictory, doesn't it?

24. *"Astronomy is an export industry."* (DEIS Appendix G re SMS study: page 2). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training."* (DEIS page G-1)

What does astronomy export? Does astronomy "import" scientists who leave with "exported" information? Or does astronomy "import" light from other galaxies and "export" less intense light to other galaxies?

25. *"The observatories do not explicitly place a dollar value on viewing time."* (DEIS Appendix G re SMS study: page 3). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training."* (DEIS page G-1)

It is common practice to reduce events to money. Planners equate traffic jams with lost revenue based on the number of people stuck times some wage equivalency. Does Group 70 follow this practice in any of its analyses? Does IfA do this in any of their analyses? Do any of the telescope operations on Mauna Kea sell any of their time or price any of their viewing time? Are you saying that astronomy is not a business? Unfortunately, everything in western society is based on money, so saying *"The observatories do not explicitly place a dollar value on viewing time."* sounds like an unreal statement to us. Do telescopes on Mount Graham or in Chile pay rent for the use of the site? How much per annum? Wouldn't charging rent for the telescopes generate revenue for protection of Mauna Kea? There's your financial source!

26. *"In Hawai`i, the Input-Output Model used by the State is based on local and national studies of the relationships among local industries."* (DEIS Appendix G re SMS study: page 4). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training."* (DEIS page G-1)

Was the model developed using data from the astronomical industry? What assumptions allow the model to be transferred to the astronomical industry? Was this model adjusted due to Hawai`i's prolonged recession?

27. *"The thirteen observatories constitute a medium-size industry."* (DEIS Appendix G re SMS study: page 4). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training."* (DEIS page G-1)

"The thirteen observatories constitute a medium-size industry." And you have turned the summit of Mauna Kea into an industrial park. Auwe!

Is it a medium size industry for all other industries or all astronomical industries? What is a small industry? What is a large industry? What experience does SMS have in analyzing the size of astronomical industries?

The astronomical industry has disrespected the first people of this land by disregarding the cultural importance of Mauna Kea to the Hawaiian community. And now you are asking for more. You do NOT own the mountain. The mountain is Hawaiian land. Protocol demands that you ask the Hawaiian community before you do anything. The astronomical community may be able to see distant solar systems, but you are pitifully BLIND to the treasures y au are so rudely treading on.

28. *"The totals shown in Exhibit 2 are conservative:" Budgets: "These are for Hawai`i operations and Hawai`i based personnel only" Table 2 has "Visiting researchers"* (DEIS Appendix G re SMS study: page 5). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training."* (DEIS page G-1)

Are "visitors" counted as part of the Hawai`i operation? Is this a common practice when analyzing money flows to Hawai`i and out of Hawai`i?

29. *"Visitor spending is modest in relation to the number of researchers who visit, because much of the costs of researchers' stay is covered by the observatories."* (DEIS Appendix G re SMS study: page 6). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training."* (DEIS page G-1)

Does it matter whether the dollar is spent by an astronomer or an observatory? If the observatories can cover research expenses as a "cost of doing business", isn't paying rent for the site a "cost of doing business"? Why has the scientific community been allowed to run roughshod over sacred ground?

30. *"Visiting astronomers resemble tourists in bringing capital to Hawai`i to spend ... researchers who stay in hotels while they review data are estimated here as spending about as much as the average tourist from their home area."* (DEIS Appendix G re SMS study: page 6). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training."* (DEIS page G-1)

According to the DBEDT model, tourists from the east spend about $136/day while tourists from the west spend about $98/day. What would account for the difference in spending by astronomers reviewing data? Aren't the tourist figures based on the average tourist, which includes children? How did SMS determine the average amount spent by astronomers?

31. *"After discussion of examples with Observatory personnel, SMS took 25% of capital values, as, on average, spent in Hawai`i."* (DEIS Appendix G re SMS study: page 7). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training."* (DEIS page G-1)

Money can flow out of Hawai`i in several ways. A payment can go directly to a foreign firm, or it can go to a local firm which subcontracts or purchases goods from foreign firms, or a payment can go to a Hawai`i firm owned in principal by a foreign firm. (foreign = out-of-state). Did SMS attempt to determine what percentage of the money actually stays in Hawai`i? If so, please include there analysis in the FEIS.

32. *Multipliers based on 1992 data.* (DEIS Appendix G re SMS study: page 8). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training."* (DEIS page G-1)

Has SMS sought to update its reference data in light of the fact that Hawai`i has been in a recession since 1991?

33. *"The Big Island is becoming an important site for scientific work, not just a field outpost from which data is collected."* (DEIS Appendix G re SMS study: page 9).

"with the development of sophisticated controls off the mountain and improving communication from the summit to the Big island towns and overseas, it is often possible for astronomers to direct and analyze their observatories away from the summit." (DEIS Appendix G re SMS study: page 3).

"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training." (DEIS page G-1)

How did SMS attempt to analyze future trends in on-site/off-site use of the Mauna Kea telescopes?

34. *"It makes good sense to locate a headquarters near the best viewing site ... changes in telecommunications ... makes it less and less necessary for researchers to come to the Big Island at all."* (DEIS Appendix G re SMS study: page 9). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training."* (DEIS page G-1)

So you are saying that IfA proposes to expand the number of telescopes, but will have researchers somewhere else? How does that compute with your economic analysis which is saying what an economic boom astronomy is for Hawai`i? *... changes in telecommunications ... makes it less and less necessary for researchers to come to the Big Island at all."* Why?

35. *"The economic impact from an industry are evidently greater that the measurements in an Input-Output Model."* (DEIS Appendix G re SMS study: page 10). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training."* (DEIS page G-1)

This statement needs explanation. Why is the economic impact greater than the I-O Model prediction? Please provide both a scientific and an economical explanation in understandable English terms.

36. *"with construction of the Subaru telescope, for the National Astronomical Observatory of Japan, there has been speculation that large numbers of Japanese tourists will come to Hilo to visit. It is simply too early to know whether there will be much impact."* (DEIS Appendix G re SMS study: page 11). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training."* (DEIS page G-1)

Has SMS analyzed tourist impacts on observatories? Do Japanese and Koreans visit telescope operations in their own countries? An Environmental Impact Statement should examine the worst-case-scenario. Please explore impacts from Japanese and/or Korean tourists. ...*"It is simply too early to know whether there will be much impact."* This statement is ludicrous. Whenever you examine future impacts you are estimating. The numbers are based on market trends, historical data, etc. Please don't insult us with statements such as this.

37. *"When the road improves, it will become a major crossing, and Hale Pohaku will easily become part of the itinerary taken by tourists. Visitor counts could easily increase to the level seen at Lava State Monument in Puna (143,000 counted in 1994) or the Lapakahi State Park Historical Site (336,000 in 1994)."* (DEIS Appendix G re SMS study: page 11). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training."* (DEIS page G-1)

So, assuming Mauna Kea gets between 143,000 and 336,000 tourists a year, some who will stop at Hale Pohaku, some who will travel to the summit, some who will come

with tours and some who will drive, some with 4-wheel drives and some without, what is the likely and what is the extreme worst-case-scenario for environmental impacts, cultural impacts and alien species/endangered species/ecosystem impacts? Chapter 343 mandates that you explore ALL IMPACTS of a proposed plan. You must examine them independently and cumulatively. You must assess ALL the impacts at full build-out.

38. *"Hawai`i can claim comparable viewing conditions, and hence can treat astronomy as not just an interest to tourists, but as an attraction that will bring a niche market to the islands."* (DEIS Appendix G re SMS study: page 11). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training."* (DEIS page G-1)

Again we remind you that Mauna Kea is Hawaiian land. In our discussions with kupuna on all islands, we have been told that they do not want tourism or recreation on such a sacred site. Perhaps the scientific community needs some cultural sensitivity training to learn the importance of these sites to the Hawaiian community. Inherent in the word "aloha" is respect. You are in Hawai`i and MUST respect the indigenous culture. MAUNA KEA IS NOT YOUR MOUNTAIN!

With the rapid expansion of street lights in rural areas (Hale`iwa, Helemano on O`ahu to name just two), the niche market for tourism is decreasing. How would you influence the desire to light up everything all night long?

"Hawai`i can claim comparable viewing conditions..." Compared to what/where?

39. *"Astronomy hardly forms a large enough industry for the retail economy. Instead, their importance has been to contribute to the image of Waimea as more sophisticated than nearby communities."* (DEIS Appendix G re SMS study: page 11-12). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training."* (DEIS page G-1)

Astronomers make rural areas sophisticated? This statement is arrogant and insulting. Which communities lack that sophistication? Perhaps the astronomical community should come out of the clouds and TALK with the community.

40. *"When and if astronomical work is shown at a site, that can be easily integrated into trips of many tourists"* (DEIS Appendix G re SMS study: page 13).

Again we remind you that Mauna Kea is Hawaiian land. In our discussions with kupuna on all islands, we have been told that they do not want tourism or recreation on such a sacred site. Perhaps the scientific community needs some cultural sensitivity training to learn the importance of these sites to the Hawaiian community. Inherent in the word "aloha" is respect. You are in Hawai`i and MUST respect the indigenous culture. MAUNA KEA IS NOT YOUR MOUNTAIN!

Wouldn't you agree that the purpose of the EIS is to show possible impacts? You imply that there will be impacts from this expansion. You imply that you will not explore them until the impacts occur. You imply that this will help the economy. The impact will occur well after the public comment period is over. Wouldn't you agree that this constitutes a procedural error under Chapter 343?

41. *"For the purpose of this report, road access management is treated as mandated by the Plan"* (DEIS Appendix G re SMS study: page 14). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training."* (DEIS page G-1)

Why does SMS feel that one sector of the mountain community should control other sectors? Again we remind you that Mauna Kea is Hawaiian land. MAUNA KEA IS NOT YOUR MOUNTAIN!

42. *"The Plan calls for control of access to the upper elevations of the mountain"* (DEIS Appendix G re SMS study: page 14). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training."* (DEIS page G-1)

Does SMS believe that access should be limited. Is this an expert opinion?

43. *"It seems likely, however, that improvements at the VIS and the rangers' monitoring of the upper slopes will correlate with, and could even stimulate, increased traffic to the mountain."* (DEIS Appendix G re SMS study: page 18). *"SMS is an expert in consulting, database marketing, economic and social impact studies, research and training."*
(DEIS page G-1)

Does this mean that keeping the road primitive will "save" the mountain from hordes of tourists? Would this be better for the Mauna Kea ecosystem?

44. How will you protect the habitat of the wekiu insect and the endemic biota of the area? How recent is the flora and fauna studies? How much of the data is simply a re-hash of earlier data? How much new research has been done? Are the works peer reviewed? Who reviewed them? Why has there been a drastic drop of Wekiu insects from the 1982 studied levels? What is the extent of microbial studies? Could alien species, such as insects inadvertently brought with astronomy related containers, or on the shoes of construction workers, have caused the decline? Is there an increase of alien species on or near the summit? Have spiders been introduced? What are they eating? Will they lead to a decrease of native fauna and flora? What quarantine system is in place? What type of quarantine system should be in place? How can the spiders be eliminated?

Gorst, an alien species, is rampant on the mountain. What plans do you currently have in place to eliminate this pest? Please outline your maintenance plan to stem the threat from this plant.

45. How can you mitigate the impacts to the viewplanes from Waimea and Honoka`a when there will be instrumentation industrializing the landscape? Camera pictures and the human eye analyze the same viewplane quite differently. How have pictures been computer-modified to make them more consistent to actual viewing conditions? How have scientists dealt with this problem?

46. Is the telescope industry a clean industry? Is the industry willing to discuss the toxics used on site? What chemicals, solvents, cleaners are used at the facilities for? How are they used? How are the contaminated chemicals disposed of? Are any of them flushed down the wastewater lines? Which chemicals are regulated under TSCA and/or RCRA? What pesticides are used at the facilities?

47. What military facilities and/or time are on Mauna Kea? What is planned for the future? Is NASA involved? Is the National Science Foundation involved? Please outline any National plans for use of Mauna Kea.

48. In speaking with kupuna regarding Kepa Maly's interviews, we have been told repeatedly that their *mana`o* was not reflected in this document. Please, therefore, include the full transcripts of those interviews in the FEIS.

49. You have not been completely honest with the community in this document. There were 3 public meetings held in May 1999 in Kona, Waimea, and Hilo after the EIS Prep Notice was released. You recorded those meetings, but failed to incorporate the comments of the testifiers into this document. Life of the Land believes that this has compromised the environmental review process.

Hawai`i Administrative Rule Title 11 Chapter 200 - Environmental Impact Statement Rules - Section 11-200-17 (p) states: "The draft EIS shall include a separate and distinct section that contains reproductions of all substantive comments and responses made during the consultation process."

Life of the Land attended the Hilo hearing, which was during the consultation process, and heard many issues raised that should have been reflected in this document. All pertinent information should be included and explored so that any reviewer of the Draft EIS can make informed comments on the proposal.

Life of the Land believes that this document is flawed. We contend that the IfA is acting in bad faith and with deceit. The concerns of the Hawaiian community and the general public have been ignored or minimized.

We further contend that IfA has been a "bad actor" in terms of complying with their current agreement and can see absolutely no reason to grant further rights to an entity who have a proven record of non-compliance.

In short, there is no trust.

Sincerely,

Henry Curtis

Henry Curtis
Executive Director

Kat Brady

Kat Brady
Assistant Executive Director

December 27, 1999

GROUP 70
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Attention: Henry Curtis and Kat Brady, Directors

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Mr. Curtis and Ms. Brady:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of October 20, 1999.

Cultural Assessment

The cultural impact assessment includes an ethnographic study which called for residents of the ahupua'a of Ka'ohe to volunteer for interviews or offer relevant information about the region. There are residents of the ahupua'a included in the interview set.

The cultural impact assessment focussed on the areas emphasized in the Master Plan and the comments offered in the public meetings and the Preparation Notice. Most of these comments were directed toward the potential cultural effects of activities in the Science Reserve.

There was little discussion of Mauna Loa by people interviewed or people offering comments in the public meeting or the Prep Notice/Draft EIS review process. There are no significant cultural effects to Mauna Loa as a result of implementation of the proposed Master Plan

Draft Versions of the Master Plan

Some people may feel confused about the Draft versions of the Master Plan. Given the range of on-going discussions with agencies and the community, it is logical for the plan to continue being improved over time. From the outset of the EIS process, there was a clear statement that the Master Plan was in draft form and there would continue to be refinements made over time. As it relates to the current EIS process, Draft 3 was completed in August 1999, and it was the subject of the Draft EIS.

There is now a Draft 4 Master Plan, which primarily makes some modifications and clarifications to the Physical Plan and Master Plan. There is change to the proposed action in terms of the numbers and types of facilities proposed, and preservation areas proposed. The modifications also improve the cultural information provided in the plan.

Draft 4 was made available for public review at the libraries and on the world wide web during mid-November. Changes made to Draft 3 are summarized at the front of the Draft 4 Master Plan and on a summary page at the web site. Changes to the project description are highlighted in the new and modified text in the Final EIS.

Scope of the Master Plan

Access to the Science Reserve from Hale Pohaku is via the Summit Access Road. All three elements are properly included in the overall programmatic Master Plan, composed of both a Physical Plan and Management Plan.

No Action Alternative and Auditor's Report

The Auditor's report has most definitely not been ignored. There have been substantial changes to the management approach to the mountain which have already been implemented. These include more respectful protocols for treatment of contemporary Hawai'ian religious sites, improved trash management, funding to complete the DLNR Historic Preservation Plan, updated wekiu bug surveys, a comprehensive ethnographic survey, and integration of community input to the future planning process. We are not aware of any lease violations that have occurred.

Incompatible Instruments for Mauna Kea

At least four instruments that were dismissed in the early stages of the new Master Plan process are described briefly below:

Millimeter Array (MMA) – a 3.0 km array of radio astronomy antenna to be positioned on the Hilo side of the summit cinder cone complex. The antenna were over 40 feet in height and would have been visible from the Hilo area. This project will be built in Chile.

Large Millimeter Submillimeter Array (LMSA) – another large millimeter band array instrument, planned for the summit area at about the 12,000 elevation. This project was directed away from Mauna Kea as being incompatible with the new plan.

SMA Expansion to the South – The SMA expansion was previously planned to cover the area extending near Waiau, directly inline between Poliahu and Waiau. This project was scaled back and re-configured to a less sensitive area since it was not compatible with the new plan.

Italian Cosmic Ray Study – This project included approximately 40 to 50 light collecting instruments that appear very similar to an ocean freight container. This project was turned away because it was incompatible.

Optical/IR Interferometer (Current technology) – The current technology for the optical/IR interferometer cannot be built at Mauna Kea without resulting in excessive impacts to the environment and visual setting. There is great promise for this type of instrument, so there was only a general area reserved in the Master Plan, pending the possible development of fiber optic technology. It is not a foregone conclusion that this instrument will ultimately come to Mauna Kea.

The world astronomy community is constantly testing new technologies, and it is very likely that more new types of instruments will be proposed for Mauna Kea in the future. These new instruments will never locate at Mauna Kea unless they are consistent with the Master Plan.

Historic Trails

The trail to Waiau is in the NARS, so this cannot be covered under the scope of the Science Reserve EIS. The recognized historic trails to the summit will be preserved.

Parking Lot Review

There will be a need for CDUA approval of any future parking area expansion, however, minor parking lot construction may not require an amendment to the Master Plan. A major parking lot expansion is not anticipated, and would likely require a higher level of approval from the UH and BLNR.

Communications and Electrical Corridors

The fiber optic system and electrical supply system will only be expanded from the existing network in the Science Reserve to the new telescope sites to the north and northwest of the existing facilities. Utility corridors in the Science Reserve and at Hale Pohaku are the responsibility of UH. The corridor between Hale Pohaku and the Science Reserve is within DLNR responsibility.

Floor Area Expansion

The Class B amendment would include a building expansion of less than 50% of the current floor area. These types of improvements would still require a CDUA from the BLNR.

Unresolved Issues

Various unresolved issues should have included more direct consideration of the cultural issues, and this has been included in the Final EIS.

Ceded Lands

With regard to ceded lands, the University recognizes that they have an educational exemption (Hawai'i Revised Statutes, 10-2) and that the land contained in the Mauna Kea Science Reserve is not being used for commercial development. The educational exemption and larger ceded land issues are a State-wide concern and the Governor is addressing trust obligations to the native Hawai'ian community and the general public.

There is no interest in diminishing the rights of native Hawai'ians to access and utilize the land on Mauna Kea. Instead, the Master Plan includes no restriction on traditional access for Hawai'ian cultural and religious purposes.

Design Guidelines

The excerpts from the Design Guidelines contain typical language that emphasizes the guidelines, which are not rules or regulations. These guidelines apply to all new and redeveloped facilities and must be complied with unless there is an extreme situation. The new Design Review Committee will critique each project to ensure their compliance with the Design Guidelines.

Temporary Facilities

There are currently needs for installing short-term scientific research facilities which are not intended to remain for more than five years. These involve weather experiments, observatory testing equipment, etc. The Keck siderostats are a perfect example of short term facilities which still required DLNR approval. These types of temporary facilities are not to stay in place following the conclusion of the research period, typically one or two years. A one-year limit to these facilities would not allow enough flexibility in construction and operation to make their installation practical.

Botanical Resources

Botanical resources between the Summit and Hale Pohaku become quite sparse as the elevation increases. There are no known unique or threatened plant species found along this section of the access roadway. On a daily basis, the creation of fugitive dust remains significant along the lower unpaved portion of the access road. The activity associated with construction traffic would cause a short-term increase in the dust generation. There is a long-term plan to eventually pave the lower portion of the access road, and this will minimize future dust generation.

SMS Expertise

SMS is a research company, established in 1960, with experience in market studies, program evaluation, and related areas. SMS Vice President John Kirkpatrick has conducted economic and social impact studies in Hawai'i since 1987. SMS is not an expert in astronomy and environmental issues, and does not claim to be such.

Astronomy as an Industry

By noting that astronomy "begins with a renewable natural resources," SMS meant simply that astronomy begins with celestial events, not extraction of a resource from the earth. While a particular observation cannot be repeated a month or a year later, astronomers can find data to test their understanding of the world when viewing time is available. Astronomy is an export industry in that it exports information, in the form of observations that will become part of the exchange of information among astronomers. Astronomy is a "medium size industry" by comparison to other industries on the Big Island. Counting activities at both the base facilities and the summit, astronomy involves wages valued at $28.2 million annually. This is comparable in size to utilities, as an industry category ($26.9 million in 1997) and much smaller than the hotel industry ($386.8 million). Small industries, from this perspective, include insurance on the Big

Island (with some 208 persons in agencies and employed by carriers, with a payroll of $7.1 million in 1997) and museums ($1.3 million in wages in 1997).

Definitions of "Visiting" Researchers

Care was taken to include all sources of income flowing to the Big Island. One concern was to avoid double counting, e.g., counting visiting researchers' accommodations as an input, when some are housed as guests of observatories (at base facilities or Hale Pohaku) and that cost is already counted in facility budgets. On the other hand, travel to and from the Big Island, stays in hotels, and other spending are part of the cost of doing astronomy by researchers. These costs are estimated in Exhibits 2 and 3. As Life of the Land notes, the average costs are lower than average visitor costs for tourists, taking into account low housing costs for some researchers, and low travel, housing and expenditure budgets for graduate students (especially interisland "visitors" from Honolulu).

Rental of Observatory Sites

The contracts between the University of Hawai'i and observatories specify that the observatories will make viewing time available to University of Hawai'i researchers, but do not place a dollar value on that time. Other researchers compete for viewing time by submitting proposals for review, and time is allotted by the observatories based on judgments of scientific value and fit with particular observatories' mission and strengths. While the State might propose rental charges in future contract negotiations, these are not currently part of the economic relationships studied by SMS.

Circulation of Capital

Observatory construction costs include development of complex equipment – until now, nearly all done overseas – transportation, actual construction, and installing specialized equipment (including mirrors and instruments). With much of the cost going to build and import mirrors and instruments, the local share of construction spending is modest.

The question "what percentage of the money actually stays in Hawai'i?" is answered in Exhibit 4 of Appendix G. It indicates that money spent on construction recirculates in the local economy: a dollar of capital imported to Hawai'i for special construction is spent, and then spent again (by workers or suppliers) on average 2.1 times (including the original construction expenditure). Other multipliers deal with job-creation and wages.

The Input-Output model is based on national and local economic censuses. The major censuses are conducted every five years. Only partial results of the 1997 economic census are as yet available, so the next update of the input-output model can only begin in 2000 or later. It should be stressed that the model deals with relations among industries, not the absolute size of the industries. Those relations are likely to change less, and more slowly, than the output of particular industries. The Input-Output multipliers used were for astronomy were for scientific research. In the course of work on this study, SMS gathered further information about the volume of local purchasing by the observatories, which was in line with the Input-Output model.

Location of Observers

SMS "attempted to analyze future trends in on-site/off-site use of the Mauna Kea telescopes" firstly by reporting findings, based largely on interviews with observatory personnel, about the impact of information and communications technology on the conduct of research. On the one hand, much of the technical control over telescopes and optical instruments can be exerted from stations away from the mountain summit. On the other hand, a human presence is needed on and near the summit to maintain, calibrate, repair or change equipment. For researchers, staying near the observatory can make it possible to follow up on research leads quickly (through additional observations within reserved observation periods or through analysis). Different observatories depend on a local human presence to different extents. There is a clear trend not to locate large staffs on the summit itself, but variation in the number of support staff and researchers in base facilities.

SMS is not saying that "IfA proposes to ... have researchers somewhere else." Rather, observatories make their own decisions about the space allocated for researchers and the way viewing time is allotted. If an astronomer is allotted a block of telescope time for a series of observations, an incentive is created to monitor telescope usage closely, in order to be able to use the available time for as many observations that bear on the researcher's interest. Such a researcher may well seek to be on-island. If, instead, a researcher is guaranteed a series of observations on or about a certain date, and has no further right to telescope time when those observations are made, there is less incentive to come to Hawai'i. New observatories are trying both sorts of scheduling.

Economic Impacts

The input-output model quantifies some, but not all, impacts. Others may be demonstrable, but not easily quantified. Two mentioned in the text – astronomy as a factor helping to attract and interest tourists, and as encouraging and contributing to education – are not fully modeled in input-output terms. In the former case, few or no inter-industry purchases are involved. In the latter case, a key input is the provision of free services which might not otherwise be available.

Extent of Tourism Impacts

SMS views the idea that the Subaru telescope would attract many tourists to the Big Island as plausible. After all, Mount Fuji has long been a site of pilgrimage and tourism in Japan, and the Subaru, as a Japanese installation located in the United States, could well be a focus of national pride. The question, however, is whether the presence of the telescope affects tourists' purchasing decisions: will more Japanese tourists decide to come to the Big Island because of the observatory? SMS has not, to date, observed an increase in Japanese tourism to the Big Island that can be attributed to the Subaru.

As noted in the text, astronomy is a niche market in Arizona tourism, with local resorts providing telescopes to guests. (The reference to "comparable viewing conditions" was to the Kitt Peak area in Arizona.) Some Hawai'i resort operators are offering stargazing events and demonstrations. Apart from eclipses, however, Hawai'i has not seen extensive marketing of astrotourism. When and if a stop at an astronomy-related site such as Hale Pohaku becomes normal for large group tours, or some tours are aimed

above all at amateur astronomers, then astronomy would become a major tourism attractor. Currently, bus tour guides can do little more than point to Mauna Kea and mention the observatories. SMS finds that access and limited marketing constrain the potential development of astronomy-related tourism. As noted in the text, a proposed Mauna Kea Center – located in Hilo – might provide an accessible site for group tourism, so increased tourist interest in astronomy will not necessarily be concentrated on Mauna Kea itself.

Visitors to Hale Pohaku

The number of visitors to Hale Pohaku in the future is anticipated to increase, as discussed in the Draft EIS. The potential environmental impacts and cultural impacts of the increase in visitors is anticipated to be quite limited. This position is based on the mitigating action of improving the management of the Science Reserve with a Hilo-based central office with on-mountain rangers. The Hawai'i Island community will have a direct say in the management of visitors, which could range from few to many depending upon the group decision-making. The new Visitor Information Center will also be planned to accommodate the increased demand, to avoid impacts to the surrounding environment.

Visitors coming to Hale Pohaku and Mauna Kea does not mean that it will be promoted as a tourism market opportunity. These facilities are accommodating a public interest that exists in the world community. The demand will grow as the world grows, and most certainly may people who spend any length of time on Hawai'i Island will be interested in experiencing the visit to Hale Pohaku to learn more about Mauna Kea. We should take this opportunity to educate these people about the sacred qualities of the mountain and Hawai'ian cultural aspects. This will add to a respect for the mountain and the culture.

Waimea Town

SMS staff have been told by Big Island residents since the early 1990s that Waimea stands out as a town attracting professionals and supporting upscale amenities, notably restaurants. Residents of the area have repeatedly mentioned the astronomy base facilities as a key example of this trend. The perception described in the text is residents', not an imposition by the researcher.

The long term presence of astronomy base facilities in Waimea has brought people with above average incomes to work and reside in the area. The observatory workers and scientists are part of the community, with families and children. They spend money locally, educate their children at local schools, and participate in community activities. These are facts about astronomy's influence on Waimea, and the term sophisticated should not have been used.

Public Access

There was a unanimous vote of the Mauna Kea Advisory Group in favor of managing vehicular access. Nonetheless, the Master Plan does not recommend closing off the road to the Science Reserve rather it proposes the management of access.

Public access management issues will be a responsibility of the new management entity. The Management Plan recommends that public access be managed (but not limited) for public safety and protection of natural and cultural resources. One possible reason for controlled nighttime public access to the summit would be to offset the increase in off-road vehicle activities. The Final EIS addresses management plan issues including access management, however, the real decisions will be made by the future management group, including community input, which surely will consider the wide range of public access needs.

Road Paving

Keeping the access road unpaved from Hale Pohaku to about one-half way to the summit would porbably deter some tourists from travelling to the Science Reserve. With a managed access condition, it was suggested that two-wheel drive vehicles may not travel to the summit. Whether or not the new Management Office and it's Board will implement this suggestion is an unknown at this point. The effect on the ecosystem could be less with less visitors to the summit, unless a managed access solution with group transportation is implemented.

Flora and Arthropods

The habitat of the wekiu and endemic biota are protected principally through avoidance of the sensitive habitat areas. The oldest studies date back to the 1983 Master Plan, which have been updated recently for the subject Master Plan. The earlier data were used as a baseline which has been expanded with more recent field confirmation and sampling.

The wekiu surveys are updated with new findings, and there was an updated and expanded botany reconnaissance. Peer review was conducted by Dr. Greg Brenner for the wekiu study. There were no microbial studies conducted. Alien species such a spiders may have been inadvertently brought into the Science Reserve. There is no knowledge an alien species has caused the decline of the wekiu bug. Two factors that may have played a part in its decline were the lack of a snow pack for the many of the past 20 years, and the removal of over 10,000 wekiu bugs in the 1983 survey sampling. There needs to be more studies done to confirm whether or not there has been an increase in alien species at the summit, such as the previously mentioned spiders. Dr. Frank Howarth believes the spiders could be eating other arthropods, possibly including the wekiu, but this is currently speculation. There will need to be more study in the future to determine the abundance and habits of the introduced arthropods at Mauna Kea, and whether or not they are causing any change to the native fauna. There is no quarantine program in effect, and none is planned at present. We believe that very few containers are shipped to the summit from other high altitude locations, which makes the likelihood of future introduction of exotic arthropods very low. Elimination of the current spider population has not been considered at present.

There is also no program in place to address gorst on Mauna Kea, although we understand that DLNR is addressing the issue.

Views of Observatories

The Final EIS includes a complete visual resources section to address the potential impacts to views from locations both on the mountain and from lower elevation communities. Design guidelines are established in the Master Plan to guide the future development of observatories and other facilities on Mauna Kea. The views are generated using a computer simulation of the summit with actual ground data for topography and existing facilities, as well as preliminary design of future facilities. The ever-changing natural shades of the sky and ground colors can not be designed, so this must be taken from photographs and input to the simulation. Given the response from residents of Hilo, Honoka'a and Waimea, we have been pleased to learn that the simulation is felt to be quite accurate.

Chemical Use at the Observatories

We have not made an inventory of the chemicals used at all the observatories. Our discussions with Keck Observatory found them to have very strict policies for containing substances such as cleaning solutions, lubricating oils, solvents, etc. They have a contract with an established hazardous materials management firm to conduct their transport and disposal needs. None of the chemicals are disposed outside the observatory building or disposed through their wastewater system without approved pre-treatment. Pesticides are not commonly used at these facilities due to the lack of pests at high altitude and cold weather conditions.

A hazardous materials control plan has been established for Keck as part of their Wekiu Bug Mitigation Plan. A Safety Program with specific safety procedures for responding to and reporting spills involving hazardous substances, and other emergencies. This plan has been in place since the observatory opened in 1991 and is in accordance with the rules established by RCRA.

Mirror maintenance at this observatory requires the use of two solutions whose active ingredients include copper sulfate, hydrochloric acid and potassium hydroxide. Resultant compounds include aluminum chloride, aluminum sulfate, copper chloride, copper sulfate and potassium hydroxide. The annual quantities generated are less than 5% of the Reportable Quantity required under CERCLA. Rinse water from the mirror maintenance process enters the wastewater disposal system at the site, consisting of a septic tank and seepage pit. Wastewater enters the two-stage, 1000-gallon septic tank where bacteria digest bio-solids that settle to the bottom of the tank. Separated from solids, the wastewater flows from the septic tank into a 20-foot deep seepage pit that drains into deep subsurface cinder. Rinse water from the mirror washing has a copper ion concentration of 0.9 mg/l, below the 1.0 mg/l community drinking water standard for copper. Carbon disulfide is added to the rinse water, which causes the copper to precipitate out of solution and sink to the bottom of the tank. The tank is pumped periodically to remove accumulated solids. This process presents no risk to Wekiu bugs or their habitat.

No Military Facilities

There are no military facilities at Mauna Kea nor are there any plans for these. NASA has been present since the 1970's at Mauna Kea at the IRTF facility, and they are also

participating in the Keck Observatory. There are no national plans for use of Mauna Kea.

Oral Histories

The summary document prepared by Kepa Maly of Kumu Pono Associates for the Mauna Kea Master Plan was quite complete in its description of the oral histories findings. The detailed transcripts will be part of the Final EIS record copy, public library copies, and are provided to those requesting copies for organizations.

Public Meetings

The public meetings were held under the Mauna Kea Advisory Committee's invitation to the community provide input on the Draft Master Plan. The OEQC found that these meetings were clearly intended to address the master plan and were not public scoping meetings. The University or their consultants did not record these meetings, although there was a private video made. The EIS process has not been compromised because there has been a full public comment period for both the Notice of Preparation (30 days) and the Draft EIS (45 days).

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

xc: Bob McLaren
Jeff Overton

SIERRA CLUB, HAWAI'I CHAPTER

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Governor Benjamin Cayetano
c/o Office of Environmental Quality Control
235 South Beretania St., Suite 702
Honolulu, HI 96813

October 25, 1999

'99 OCT 28 A8:15

Subject: **Response to the Draft EIS**
Mauna Kea Science Reserve Master Plan Update 2000
Ka'ohe, Hamakua District, Hawai'i

Sierra Club has reviewed the draft EIS document and found it to be a disservice to the University of Hawaii, the people of Hawaii, the international astronomy community and Mauna Kea. As written by Group 70, it does not fulfill its legally mandated purpose to fully disclose the likely impacts of the proposed Master Plan (draft 3), nor does it assist decision makers like the UH Board of Regents, UH President Kenneth Mortimer, the Dept. of Land and Natural Resources and the Governor in accurately assessing and mitigating future actions within the Science Reserve.

Secondary and cumulative impacts (environmental, cultural and aesthetic) are cursorily discussed and this draft lacks substantive measures to mitigate proposed actions. Sierra Club calls for the removal of Group 70 and the beginning of a new process and Master Plan to control the future use of Mauna Kea's Science Reserve.

1. We hereby include and incorporate the questions and requests for information we previously submitted (in response to the Mauna Kea EIS Prep Notice), as most of the Group 70 responses to it have been inadequate, incomplete or misleading.

2. The Keck 6 Telescope "outrigger" proposal should not be build before a master plan has been accepted and implemented by the UH Board of Regents, a final EIS accepted by the Governor of Hawaii and the building moratorium lifted. We note the draft environmental assessment for the 6 scopes was written by MCM Planning of Honolulu and not Group 70. We hereby include and incorporate those questions and comments for inclusion and response in this EIS document. (See attached 4/22/99 Sierra Club correspondence regarding the California Association for Research in Astronomy's proposed 6 telescope expansion.)

3. This DEIS fails to propose or analyze reasonable alternatives to the preferred action nor does it disclose adequately the impacts to wildlife, Hawaiian culture and archeological sites under each action. In this disclosure, please include a discussion of alternative locations for all the proposed 58 telescopes in the following locations: Atacama Desert in the Chilean Andes; Las Campanas, Chile; the Canary Islands, Anderson Mesa, Arizona; Mount Hopkins, AZ; Palomar, CA; Mount Wilson, CA and any other sites developed or being considered for astronomical facilities similar to those being proposed in Group 70's "astronomy precinct."

4. In 1995 Sierra Club asked then IfA Director Donald Hall to close off the 4x4 road leading up to the top of Puu Poliahu, and turn it into a walking trail. He declined saying that IfA had no authority to close off that road segment to vehicular access. Why is the University now taking the position that the public can legally be barred from the Science Reserve after dark and before sunrise?

5. The road to the summit is a public road, built with public funds released by Gov. John Burns (even though it is now maintained with some money from the astronomical facilities). What laws allow the university to close off this public road to the summit? If public safety is stated as a rationale, what "safety" issues are involved with this proposed rule?

6. The final EIS should disclose the identity and credentials of the person or persons who wrote the Economic Impact of Mauna Kea Observatories report which has a SMS cover and the Cultural Impact Assessment Study which has a Paul H. Rosendahl Inc. cover. The anonymous cultural report contains unsubstantiated assertions of mitigation of cultural impacts with only a general reference to the draft 3 Master plan and management plan. The professional and ethical credibility of Group 70 is questioned for accepting such material for inclusion into the DEIS.

7. It has been disclosed in the Saddle Road EIS and the Maly Report that the whole summit ridge complex is a traditional cultural property and considered sacred by the Hawaiian people. It should no longer be asserted in the final EIS that "the summit has not been built on."

8. Short term and cumulative impacts of excavation in the summit area are inadequately disclosed in the DEIS. From the beginning, words of disturbed burials and removed iwi have accompanied construction within the Science Reserve. A qualified archeologist or DLNR regulator should be present at all times when excavation is being done within the Reserve. Included is a 1986 photograph illustrating the massive amount of material removed when over 34 feet of the top of Puu Hauoki was removed for the building of the Keck facilities.

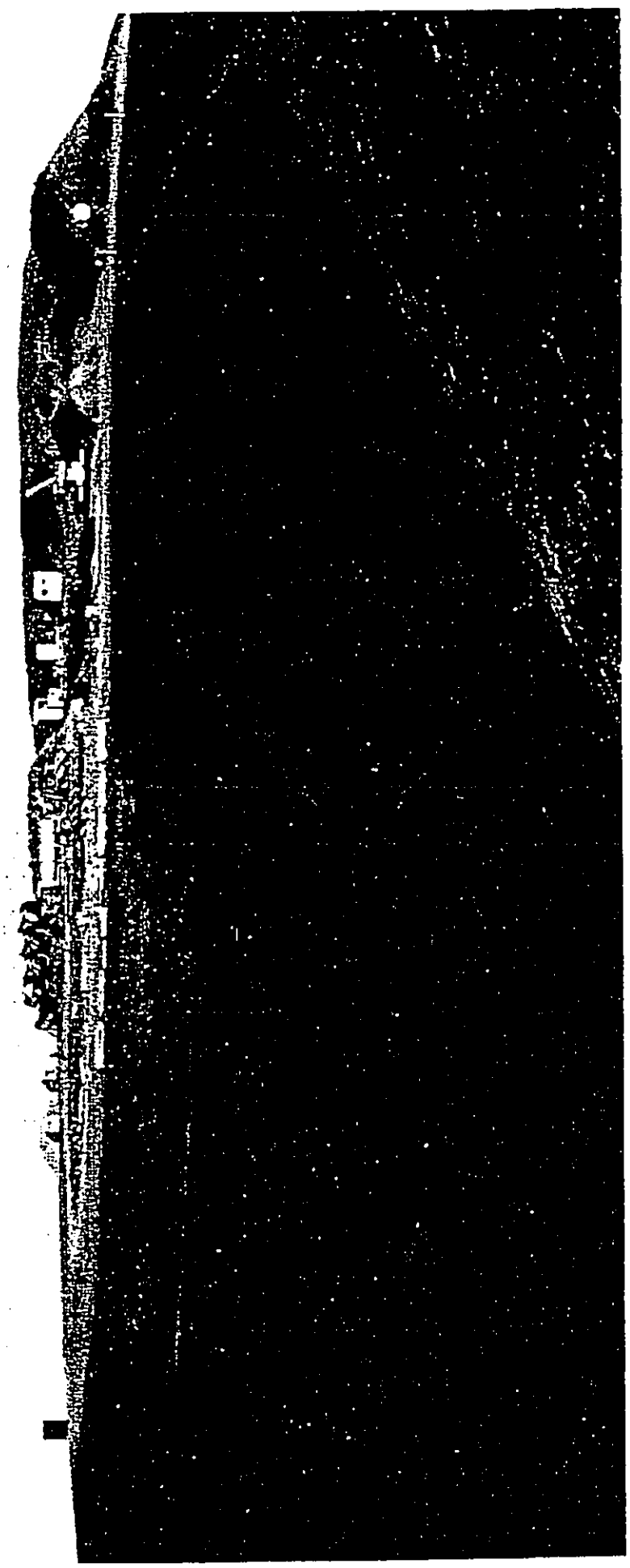
9. The DEIS gave an inadequate and incomplete disclosure to the question of why the rule of limiting night time access to the summit should be enacted. It stated that controlled night time access would be justified to offset increased night time off-road vehicle activity. Please disclose and document any case of night time 4x4 off-road activity. Please discuss alternatives to complete lockout of the public from sunset to sunrise.

Thank you for the opportunity to comment on this draft EIS. Please send the response to this letter and a copy of the Final EIS to Sierra Club c/o 32 Kahoa St. Hilo, HI 96720.

Nelson Ho

Nelson Ho
Conservation Chair, Hawaii Chapter

RECEIVED AS FOLLOWS



Excavations of Keck Observatory showing amount of material disturbed. August 1986.

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SIERRA CLUB, HAWAI'I CHAPTER

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April 22, 1999

Dr. Robert McLaren
Institute for Astronomy
University of Hawaii
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Honolulu, HI 96822

Subject: Draft Environmental Assessment for the W.M. Keck Observatory Interferometer Six Telescope Project, Mauna Kea, Hawaii (TMK 4-4-15:09)

The California Association for Research in Astronomy (CARA) has asked the UH IfA for permission to construct up to six 1.8 meter telescopes on the Keck Observatory site. Based on the material presented in this DEA, the past 30 years of mismanagement of the Science Reserve by the UH and DLNR, and the 1998 Legislative Auditor's Report on Mauna Kea, Sierra Club believes this CARA request should not be processed any further until a new integrated cultural and natural resources master plan has been accepted by the UH Mauna Kea Advisory committee and fully implemented by the UH Board of Regents.

These six Keck proposed telescopes, if built before such a plan is implemented, would violate the spirit and intent of the 1982 master plan, which was written in part to allay the concerns of the public that the astronomy industry would take over Mauna Kea.

As a member of the UH Advisory Committee, Sierra Club finds the timing this proposal insensitive and unfortunate. The proposers seeks to add significantly more telescopes to the summit at a time when controversy surrounds the exceeding of the limits of 11 major and 2 minor sized telescopes. This request continues the practice of piecemeal development of Hawaii's most special mountain. IfA knows full well that the committee is in the midst of grappling with 30 years of mismanagement issues and public distrust.

FEDERAL NEPA/EIS REQUIREMENTS SHOULD PREVAIL

We believe that when the determination of this proposal's impacts are made, it should be under federal NEPA rules and procedures. This DEA acknowledges substantial federal involvement and the applicability of federal agency and permit requirements. The $50 million NASA moneys does constitute a federal action, as disclosed in this DEA. It is not disclosed what NASA/IfA's proposed time line is for the federal process. Among other conditions triggered or mandated to be addressed is consultations with Native Hawaiian organizations. Does NASA intend to undergo such consultations and if so, when?

Doing separate environmental documents may constitute "segmentation" of the planning and disclosure process, a practice frowned upon by the courts because it can conceal adverse impacts and deny due process to whole groups of affected parties.

INADEQUATE DISCLOSURE OF ADVERSE IMPACTS ON WEKIU BUG HABITAT

It is a known construction practice to use land adjacent to the facility site for temporary storage of building materials, preassembled structural components awaiting placement, movement of vehicles and crew, etc. all of which further degrade the potential habitat of the complex of endemic biota including the referenced Wekiu insects.

The Legislative Auditor found that the 1983 Mauna Kea EIS was violated - and that document had similar assurances of care and oversight as this DEA regarding protection of the Wekiu bug. (P.24) What specific measures will be undertaken to insure contractor compliance with this DEA's assurances? At the bottom of Puu Hau Oki, the crater floor and walls were bulldozed flat and destroyed as a Wekiu habitat. This DEA and FONSI procedure denies affected parties, the public and decision makers to attach specific mitigation on this proposal.

INADEQUATE DISCLOSURE OF CUMULATIVE ENVIRONMENTAL IMPACTS

The UH refuses to acknowledge or study limits to telescope development on the mountain, indeed this DEA flaunts the fact that since 1983 "No attempt was made to determine the ultimate capacity of the summit for telescopes..." (p. S-5)

How can a complete discussion be conducted and full disclosure made about the cumulative impacts of this proposal without such inquiry? As an example, this proposal discusses possible reasons for the dramatic decline of one endemic insect species yet does not disclose that since the 1982 original biological survey, no other follow-up studies were permitted or encouraged to gauge the impact of $500 million worth on construction activity within the Science Reserve.

There is inadequate disclosure of the added traffic impacts, construction and post construction activities. Please disclose the number and quantity of diesel spilled at the summit, at Hale Pohaku and on the summit access roadway due to runaway vehicles and cranes. Already statistics released to the UH Advisory Committee show that astronomy generated traffic is most of the traffic up the mountain. Construction crews and observatory crews account for 405 vehicles on the summit road per week, well exceeding (3 times the amount) the public's 155 visitor related vehicles. (Group70 Master Plan Draft p. VIII-9) What short and long term contributions to the cumulative environmental impacts will the proposal have?

INADEQUATE DISCLOSURE OF IMPACTS TO NATIVE HAWAIIANS

Sierra Club believes that implementation of this proposal would involve an irrevocable commitment to loss or destruction of natural and cultural resources. Under federal NEPA requirements there are provisions for consultations between agencies and native Hawaiian organizations. See above discussions

Short term and cumulative impacts of excavation are inadequately discussed. There should be requirements that a qualified archeologist or DLNR personnel be present to oversee all excavation activities in the Science Reserve, including this one. Not withstanding the fact that about 40 feet of the summit of Puu Hau Oki has already been bulldozed off and removed. While this DEA states that no known archeological sites have been uncovered during construction within the Science Reserve, there has been no regulatory oversight (personnel) present when excavation was done. Hawaiians have used the tops and sides of cinder cones on and around Mauna Kea for many cultural uses including burials.

The Auditor stated, "Changes in the political climate, environmental regulations, and increasing public opposition require the University to change it's focus and approach to Mauna Kea or their efforts could be stymied by litigation or a possible moratorium on further development, including improvement of future facilities. Public and community groups will continue to remonstrate until their concerns are met. (p.25)

INADEQUATE DISCLOSURE OF SOCIAL IMPACTS ON PUBLIC

Again, this DEA has inadequately disclosed that the proposal is being processed in isolation of the broader move to fix 30 years of mismanagement caused by DLNR and IfA. It constitutes a continuation of incremental development which has over the years caused the public to lose confidence in the ability of IfA to manage the mountain properly.

Included in the DEA should be a discussion about moneys set aside (or bonding) to deal with the remove the proposed facility and restore the landscape for Wekiu habitat and other factors.

Again, to proceed with this proposal, shows bad faith on the part of Keck and IfA. According to the Auditor, the UH and IfA conducted an ambitious program of observatory expansion which blinded the University to its responsibilities to protect the mountain's natural and cultural attributes.

INADEQUATE DISCLOSURE OF VISUAL IMPACTS OF PROPOSAL

These six telescopes would substantially affect the scenic vistas and viewplanes, especially within the Science Reserve. Illustrations within the DEA are misleading when depicting the scale of six telescopes and the visual impact from within the Science Reserve. Who did the illustrations? The UH 88 inch telescope facility is close in size to the proposed telescopes and is housed in a much largerdome.

In summary, some agency other than IfA should be proposing, reviewing and accepting new development on Mauna Kea. The report of Hawai'i's Legislative Auditor corroborated much of the public criticism and found that the University "did not fulfill its obligations as a responsible leaseholder of conservation land." The audit noted violations of master plans, the environmental impact statement, the original lease, and various rules and regulations.

Thank you for the opportunity to comment on this proposal.

Submitted on behalf of Sierra Club Nelson Ho
by Nelson Ho, Hawaii Chapter Conservation Committee Chairman
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COMMENTS FOR THE MAUNA KEA SCIENCE RESERVE DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) FOR THE PROPOSED MASTER PLAN. JUNE 22,1999.

Many Sierra Club members enjoy the insight and scientific information garnered from modern day astronomy. No outdoor camping trip is complete without a night spent learning the stories and exploring the patterns of the rivers of stars overhead. It is with sadness and disappointment that our members witness the current mismanagement and unbalanced development on Mauna Kea.

The University of Hawaii (UH) administration and its Institute for Astronomy (IfA) have initiated this Chapter 343 environmental impact statement (EIS) process in order to begin a twenty year plan of massive, culturally insensitive and publicly unacceptable facilities development within the "Science Reserve" at the summit of Mauna Kea.

Sierra Club believes this DEIS should not be processed any further until a new integrated cultural and natural resources master plan has been accepted by a new Mauna Kea Commission and fully implemented by the UH Board of Regents and DLNR (which has been silent during this long controversy). This position is based on the materials presented in the 1998 Legislative Auditor's Report on Mauna Kea, the past 30 years of mismanagement of the Science Reserve by the UH and the Department of Land and Natural Resources (DLNR), IfA/Group 70 International's proposed Master Plan (Draft 2, dated May 10, 1999) and the EIS Preparation Notice.

As a member of the current UH Mauna Kea Advisory Committee, Sierra Club finds the timing and content of this DEIS unfortunate and insensitive. The proposers seeks to add significantly more telescopes to the summit at a time when controversy surrounds the 20 telescopes exceeding the limits of 11 major and 2 minor sized telescopes. This proposal continues the practice of piecemeal development of Hawaii's most special mountain. The DLNR, IfA, the University administration (and now the UH Board of Regents) know full well that the UH Mauna Kea Advisory Committee has not yet successfully addressed the mismanagement and public distrust issues.

In response to the May 23, 1999 preparation notice for the EIS accompanying the proposed UH master plan for Mauna Kea, Sierra Club is submitting the following comments.

FEDERAL NEPA/EIS REQUIREMENTS SHOULD PREVAIL

The EISPN fails to disclose that this programmatic environmental impact statement should be written in compliance with federal National Environmental Policy Act requirements. There have been numerous violations of this requirement during the history of the Science Reserve and this noncompliance should end.

The EISPN lists permits or approvals needed for the planning process and who the accepting authority will be. Absent is information disclosing significant federal action equal in the eyes of the Council on Environmental Quality to the funding of the proposed Keck Six Telescopes. See the Keck 6 EA admissions to this need. EISPN p. 3-2.

1) The Club believes this Master Plan needs early application of NEPA. Section 1501.2(d) of the NEPA regulations requires agencies to provide for the early application of NEPA to cases where actions are planned by private applicants or non-Federal entities and are, at some stage, subject to federal approval of permits, loans, loan guarantees, insurance or other actions.

Section 1501.2(d) requires federal agencies to take steps toward ensuring that private parties and state and local entities initiate environmental studies as soon as federal involvement in their proposals can be foreseen. This section is intended to ensure that environmental factors are considered at an early stage in the planning process and to avoid the situation where the applicant for a federal permit or approval has completed planning and eliminated all alternatives to the proposed action by the time the EIS process commences or before the EIS process has been completed.

2) Federal agencies such as the National Science Foundation, the National Aeronautics and Space Administration, the National Radio Astronomy Observatory, the National Optical Astronomy Observatories and others must designate staff to advise IfA of the agency's NEPA information requirements.

Section 1506.5(b) allows agencies to authorize preparation of environmental assessments by applicants. Thus, the procedures should also include a means for anticipating and utilizing applicants' environmental studies or "early corporate environmental assessments" to fulfill some of the federal agency's NEPA obligations.

These and other provisions are intended to encourage and enable UH/IfA and other non-federal entities to build environmental considerations into their planning processes in a way that facilitates the application of NEPA and avoids delay.

3) In order to insure that these kinds of noncompliance become a thing of the past, please disclose what federal agencies have had significant involvement with facilities built or planned as of 6/99 and why their involvement had not triggered IfA to undertake a NEPA compliant EA or EIS. The NASA Infrared Telescope, the Very Long Baseline Array (VLBA) Telescope, the Gemini telescope and the Smithsonian Institution's Eight Telescope Array should all have triggered federal NEPA processes because of the substantial federal money involved.

4) Please also discuss why and how the NASA telescope, the Gemini Telescope, the Japanese National Large Telescope (Subaru) and the Smithsonian Institution's Submillimeter Array , despite their large impacts on the landscape, generated only Chapter 343 environmental assessments and Finding of No Significant Impact (FONSI) determinations.

5) Every one of the new facilities proposed in the Group 70 draft has a sponsor or agency that IfA has been in contact with. To get to this stage of proposal, IfA must have had consultation with specific agencies or entities with specific budgetary and planning objectives.

Please disclose sponsorship of the new planned facilities. Specifically, who has IfA been in contact with - which federal agency, foreign government, US educational institution, etc. for each of the following:

> Twelve 6 meter Smithsonian submillimeter radio antennas, for a total of 20 antennas on an expanded grid of forty-eight concrete anchoring pads.
>
> A giant array of 30 optical/infrared domes located on the Waimea/Honoka'a face of the mountain in a circle one kilometer in diameter.
>
> Three conventional optical/infrared telescopes, at least two of which could be larger than the Kecks.
>
> A 20-50 meter multiple-mirror "Next Generation Telescope" with a dome at least twice the size of the existing Kecks, facing Waimea and Honoka'a.
>
> Five observatory domes now on Mauna Kea's upper ridge which would be substantially enlarged to accommodate "upgraded" telescopes equal in the size to the existing Kecks.

Doing separate environmental documents, some under Hawaii Chapter 343 and some under NEPA, may constitute "segmentation" of the planning and disclosure process, a practice frowned upon by the courts because it can conceal cumulative adverse impacts and deny due process to whole groups of affected parties. Among other conditions triggered or mandated are consultations with Native Hawaiian organizations over the significant cultural impacts. What will be IfA's proposed time line for compliance with the federal process?

35 YEARS OF PIECEMEAL PLANNING NEEDS TO END; UNIVERSITY LEASE ALREADY HALF OVER

6) The lease for the Science Reserve is nearly half over (expires in 12/31/33). Please discuss why the conceptual and management plans only cover the next 15 or 20 years (it varied in the documents). This is an unacceptable continuation of the piecemeal planning that has contributed to the mismanagement of Mauna Kea.

7) What will the summit landscape look like in 2033 when the lease is up and "full build out" is achieved? Group 70's draft evades the discussion of impacts and mitigation for facilities with multiple elements or arrays. Small sites may transform into huge sprawling complexes when upgraded to arrays with multiple elements. Please disclose impacts and possible mitigation strategies.

8) Within and without the "astronomy precinct," the proposed Mauna Kea Management Authority can "amend" the master plan freely. Page II-1. The major "sustainable" thing about this document is the ability for astronomy to keep on expanding. Please comment on the ability of the proposed advisory committee to impact such amendments.

9) What is so "integrated" about having the cultural and environmental landscape absorb 50 more telescopes? Bottom page III-1.

10) Is Group 70's proposed plan merely masquerading as an integrated natural and cultural resources management plan because Ka Lahui Hawaii, other civic organizations and Sierra Club have called for one? The EISPN says that there is an "integrated natural and cultural resources management (INCRM) plan for the period 2000 to 2020." Pg. 1-2.

11) Please disclose the expertise of Group 70 in preparing INCRM plan's. Please disclose what academically reviewed and accepted criteria were used in the production of the Mauna Kea and other INCRM documents.

TRUE ENVIRONMENTAL STUDIES AND ANALYSIS NEEDED

12) The 1998 update surveys and regurgitated 1983 information are insufficient to assess the impacts of 35 years of development totaling $826 million on the summit. For example, all the DEIS proposed actions are relying on flora studies done in 1982 and only a literature search follow up by Winona Char (1998). What has disturbing over 60 acres with telescopes, roads, utility corridors, temporary materials storage areas, cement batch mixing facilities and construction activities done to the insect and flora ecology and cultural significance of the summit?

13) Please disclose what scientific research, studies and new information support the continued expansion of astronomy facilities into the 600 acre "Astronomy Precinct"? What has been done within this area to conclude that development should be concentrated there without an irrevocable commitment to loss or destruction of any natural or cultural resource?

14) The analysis of the archeological surveys was not completed at the time the proposed plan was being written. What is the basis for justifying new activity within the 600 acres?

15) Please disclose the process by which the figure of 60 acres for all the current activity within the Science Reserve was reached. When was this calculation made? Who made the calculation? What does this figure include? Are all summit facilities, roadway (from Hale Pohaku to the summit, turnouts, two parking lots, the two batch plant areas (the first one at the lower elevation has not been restored to its original condition and is still used for emergency helicopter operations), temporary materials storage areas, Hale Pohaku facilities and utility corridors included?

16) Please discuss and disclose actions taken to investigate the 76 shrines and other archeological features for their archeo-astronomical significance. Has there been any attempts to assess and analyze early Hawaiian use of the summit for astronomical and navigational education? Any features or sites could be degraded or destroyed by the ongoing and proposed activities delineated in draft 2.

17) Hawaiians and observatory staff have mention over the years the rumors of burials being disturbed and destroyed. Has there been any attempt by UH/IfA to investigate persistent rumors that Hawaiian burials have been dug up during construction activities? Have any discussion taken place with the Hawaii Island Burial Council for mitigation measures? Please discuss mitigation measures for burial disturbance from construction activities.

18) In order to proceed with the Subaru Telescope construction, IfA agreed (to DLNR) to fund and implement a historic management plan. Please disclose and discuss the current status of the 10 year overdue Historic Preservation Management plan and how it will be integrated with the master plan.

NEED TO DISCUSS CARRYING CAPACITY, RECOGNIZING CULTURAL AND ENVIRONMENTAL CONSTRAINTS EXIST

19) Under cumulative impacts, please discuss the "carrying capacity" of Mauna Kea to support more astronomical facilities. On previous occasions, Francis Oda of Group 70 has stated that if they were to investigate this subject as recommended by state Legislative Auditor Marion Higa, Oda's analysis would probably show that hundreds of telescopes could be accommodated in the science reserve.

20) Does this viewpoint ignore the principles of constraints analysis where a telescope proposal is run through a matrix of concerns ranging from visual, cultural through environmental? Is Group 70 saying that none of these concerns conflicts with IfA's desire for more telescopes?

21) Please discuss the efficacy of having consulting biologists, archeologists and Hawaiian practitioners involved in the oversight of construction projects.

22) Please discuss the use of familiarization lectures, cultural sensitivity sessions mandatory for all facilities personnel, visiting astronomers, and construction personnel as part of mitigation for environmental and cultural impacts.

RARE FLORA AND INSECT SPECIES AND HABITAT STILL ENDANGERED BY 1999 PROPOSED PLAN

23) Actual habitat range of Wekiu insects and other endemic flora and fauna species are still unknown after 30 years of use. Biotic populations and their survivability are inferred from habitat suitability criteria and assumptions of presence rather than direct observation and study.

Please discuss the drastic drop of Wekiu insects from the 1982 studied levels to the 1998 levels. The April 1999 Arthropod Study of Selected Science Reserve Areas Report describes the possibility that insects inadvertently brought in from aboard in astronomy equipment containers could have caused the decline.

24) Spiders introduced possibly from Japan or Canada which were not present in the 1980's are now widespread in summit area. Please discuss mitigation measures including quarantine procedures and decontamination procedures. The goal must be to prevent introductions of high elevation adapted biota to the Science Reserve.

25) Sierra Club supports the broad range of Management recommendations in that Arthropod Study report, especially the need for habitat restoration and a comprehensive long term monitoring program. Please discuss how these recommendations can be institutionalized and implemented more successfully than the 1982 recommendations for arthropods.

26) Sierra Club supports the study of the cryptogramic soils and microbial ecosystems in the Science Reserve. Little is known about their extent and vulnerability. For the latter ecosystem, only one minor study was done in 70's by Siegel and Siegel.

27) Please address the need for intensive biological and archeological studies PRIOR to committing a site for development. Include a discussion of mitigation for HP expansion into palila bird habitat, road to summit and the utility corridor.

FAILURE TO DISCLOSE THAT THE OPTICAL/IR INTERFEROMETER COULD CONTAIN AS MANY AS 30 DOMES ON A SPRAWLING GRIDWORK OF ROADS AND UTILITY TRENCHES MILES LONG.

28) The larger the facility the greater the potential impacts. The size or "footprint" of facilities and array elements are indicative of adverse impacts to cultural, environmental, aesthetic and viewplane attributes of Mauna Kea. Please discuss why the master plan and EISPN does not count telescopes and elements for impact assessment purposes.

29) Group 70 was present when UH Mauna Kea Advisory Committee member and Interim IfA Director Bob McLaren disclosed that the new optical/interferometer facility (that is being proposed in Draft 2) may contain up to 30 telescopes distributed over an area 1 kilometer in diameter. Why have you not included that information in your list of existing and proposed observatories and in the proposed master plan? EISPN p. 2-8.

30) Please disclose what length of roadway was bulldozed into the North Plateau for the Smithsonian Institution's Array and how much more could be disturbed to double the number of pads and antennae elements already approved?

NONEXISTENT PROBLEM USED TO JUSTIFY PUBLIC LOCKOUT AFTER DARK

31) The excuse being used by the University's proposal for excluding the public from the summit area "one half hour after sunset and one half hour before sunrise" is that nighttime car lights may at some future time shine at facilities and degrade observations.

Bob McLaren admitted in advisory committee meetings that public nighttime use of summit of Mauna Kea was not a problem for the observatories. Please discuss and disclose how many incidents have actually occurred regarding degraded viewing time because public vehicle lights illuminated a facility.

32) Please disclose what facilities could be affected. Please disclose what mitigation measures other than exclusion of the public for the whole night could be considered and implemented.

Sierra Club believes that the restrictive access measures being considered for the public should be no less or more restrictive than those imposed on the astronomers. Many members of the public (including Sierra Club) supported Hawaii County's strict lighting ordinance in order to protect the nighttime viewing conditions by minimizing light pollution for the Science Reserve.

33) Please describe the preventive measures taken after the tragic Subaru fire, which killed four Big Island workers. Do all the telescope facilities meet the County and State building codes imposed on commercial buildings?

34) Please disclose which building codes apply? Are facilities exempt because they have been classified as equipment or motors because of their moving domes? Did the loss of life occur in part, or because of, lack of enough fire extinguishers and exit doors required by state and county building codes?

WHY SHOULD HAWAII TAXPAYERS FOOT THIS BILL? INTERNATIONAL ASTRONOMY PROMISED TO PAY YEARS AGO

35) Currently the astronomy facilities pay the Institute for Astronomy about 10% - 15% of their operating budget for the privilege of being on the summit. This is in the form of observing time given to the IfA. For the currently operating telescopes the annual operating cost are about $30 million/year and this will more than double when the Subaru, Gemini and Smithsonian come on line. The IfA has been taking this $3 million per year, albeit in time instead of cash, and doing nothing to fulfill their obligations under the 1983 master plan.

The Hawaii taxpaying public is already overburdened with funding important services from a pool of shrinking funds. A May 26, 1999 President Mortimer letter to Advisory Committee Co-Chairs Kimura/Wilson sought to assure the committee that $400,000 will be committed for the following budget year.

Please disclose how the figure of $400,000 was derived as the needs for management plan implementation. It was stated in advisory meetings that these numbers were "back of the envelope" calculations. How is the money to be used?

36) Many statements were made at the advisory committee meetings by Vice President for Research Alan Teramura stating that the UH is "priority driven" and monetary costs are a secondary consideration (thus trying to reassure committee members money would always be found to fund science reserve management). However the public is wary of the UH's commitment to promised responsibilities.

Please discuss the recent controversy regarding the Council on Education in Public Health decision to revoke the accreditation of the University's Schools of Public Health, citing a lack of a permanent dean and lack of funding. There is also a controversy over the lack of resources to address overcrowded conditions for the undergraduates.

In a June 3, 1999 Honolulu Advertiser article Dean Smith, UH Senior Vice President said "The university is not in a position to provide the additional resources necessary to address... these problems, particularly when it cannot even exempt higher priority programs from budget cuts." Please discuss the long term likelihood of University funding being committed to long neglected management implementation when it can not meet current higher priority educational and staffing commitments.

37) Please discuss the merits of a new Sublease Impact Fee and whether that should be established for all existing observatories, paid annually but assessed as part of a five year renewable sublease. A minimum five year fee of $1.2 million per facility along with a $1,000/acre Acreage Assessment to reflect the additional environmental impact of the more sprawling facilities should be considered. (These fees are equivalent to 5 to 7 percent of each observatory's annual operating budget or one to two nights a month of observing expenses).

These annual moneys would fund, among other things, the people and programs needed to protect the mountain's natural environment and Native Hawaiian cultural sites; enhance visitor programs and establish a summit shuttle service for visitors; improve public safety and emergency response; establish educational links with Hawai'i's public schools; and provide annual compensation to Native Hawaiians for use of the mountain's ceded lands (specifically for Mauna Kea related cultural programs, such as astronomy scholarships to Native Hawaiian students and a "kahu" system of Native Hawaiian docents).

38) Please discuss the idea of replacing the University's current sixty-five year lease for the Mauna Kea Science Reserve with a five year revocable lease. Nonperformance of its provisions - whether by the University or its tenants - would result in revocation of the lease and surrender of the Science Reserve, which would then be made available to other possible applicants (such as other universities) willing to abide by the contract.

CEDED LAND FEES DENIED TO OHA

39) Please discuss the implications of the Office of Hawaiian Affairs (OHA) not getting 20% of the viewing time or its equivalent as part of the revenues from ceded lands on the financing and management of the Science Reserve. Could the application of some of these fees have a positive effect on the management of the Science Reserve?

40) Please discuss the merits and adverse impacts of having OHA be given the lease or title to the Science Reserve as partial payment for the ceded lands settlement, as suggested by members of the public at the Master Plan hearings held on the Big Island in May, 1999.

PUBLIC TRUST, CULTURAL AND ECONOMIC LOST OPPORTUNITIES

41) These improvements in the Visitor Information Station programs and hours of operation are long overdue. An expanded visitor program was promised way back in 1983 as part of the original Master Plan. A $300,000 dollar telescope purchased by Hawaii taxpayers for public stargazing has been sitting in a box for years. Please disclose where it is currently warehoused, its future location at Hale Pohaku and what is holding up its use.

42) Past IfA Director Don Hall told Sierra Club that he was unable to prohibit the commercial tour vehicles or any other vehicles from driving to Puu Poliahu's summit because it was a publicly paid for road. Yet UH has been given the authority by DLNR to gate off the road at Hale Pohaku at IfA's discretion. Please discuss whether the road segment from the base of Puu Poliahu can be returned into a walking trail.

VISUAL DESIGN GUIDELINES ARE CRUEL ILLUSIONS?

43) It is assumed in the proposed master plan that coloration mitigation technology will be developed, yet it was clear from the advisory committee discussions that telescope construction would not stop if the technology failed to materialize. No facility would be denied if it failed to meet any of the Design guidelines as it relates to color, siting, scale, heights and widths. Please disclose the visual and cultural impacts if the design guidelines can not be met.

44) As a UH Mauna Kea committee member appointed by President Mortimer, Sierra Club asked Group 70 to provide an illustration depicting what the visual impact would be if one was standing beside the shrines on the north plateau, looking back up toward the summit. Our concern was the visual pollution of up to 30 telescope domes spread out over a circle nearly a kilometer in diameter in addition to 12 more Smithsonian radio dishes. To this date, it has not been produced. Please include this view in your Visual Impacts analysis portion of the DEIS.

45) Contrary to a draft 2 assertion that there have been no impacts to archeological features, please consult with Dr. McCoy for documentation on the alteration of an archeological site near the VLBA facility.

CULTURAL RESPECT SHOULD INCLUDE ENDING CESSPOOL USE

46) Please list all facilities with cesspools for human waste collection and discuss efforts to convert them to septic tank systems page 6-8 draft 2 master plan. Please disclose if the Japan National Telescope has a cesspool or septic tank system and whether it ever had a "spill" of human waste at Puu Hauoki or within the Science Reserve.

47) Please disclose what chemicals, solvents, cleaners are used at the facilities. Please disclose if toxic metals like mercury are used in the facilities. Have there been any spills or contamination incidents?

48) What quantities of the above items are in the Science Reserve and what measures are in place to deal with spills or contamination. What measures are taken to insure proper disposal of all such chemicals and toxic materials. Are any of them flushed down the wastewater lines?

MILITARY INVOVLEMENT WITH MAUNA KEA POSSIBLE?

49) Astronomers are adapting lasers and optics to cancel out atmospheric distortions. The military is also very interested in the laser as a weapon. What is the state of laser use and laser research on Mauna Kea?

50) IfA has military telescopes located within their Haleakala Science City complex and the public has expressed their opposition to the military's use of both Haleakala and Mauna Kea. Have there been and are there any ongoing discussions with the military regarding the use of the Mauna Kea Science Reserve?

51) Please discuss whether Gemini, Smithsonian, Kecks or any other facility on the summit has contracts, programs or experiments with military missions?

NOISE IMPACTS NEED TO BE DISCLOSED

52) When the wind does not blow, Mauna Kea's plateau within the Science Reserve can be much quieter than a library study room. Please discuss whether any study of noise impacts (with actual noise measurements taken under various conditions) had been conducted within the Science Reserve. Please disclose how quiet the ambient noise level is without wind.

53) Noise from ventilator fans, refrigeration units, construction activity, vehicular traffic and other sources radiate out from the summit. Please disclose noise impacts from all these sources, and their dispersion into sensitive areas such as the band of archeological shrines surrounding the summit. Please also disclose the noise impacts within the adze quarry complex and the two parcels of Natural Area Reserve.

People have reported hearing the low harmonics from summit noise sources over a kilometer downslope and away from the summit. Specifically, a group of hikers walked out to Puu Pohaku NAR and could hear and objected to the noises from the summit.

1983 COMMUNITY ADVISORY COMMITTEE NEVER CONVENED. WILL IT HAPPEN AGAIN?

54) In order to keep this pattern of practice from reoccurring this DEIS needs to discuss the citizen advisory committee mandated in the 1983 management plan. Please discuss why it never convened and functioned. When was that committee supposed to form and whose responsibility it was to convene the committee?

Sierra Club hopes that these comments are helpful in preparing the upcoming draft EIS for the proposed project. Please send a copy of the draft EIS to Sierra Club c/o 32 Kahoa St. Hilo, HI 96720, instead of our Honolulu office. Mahalo.

Malama Mauna Kea,

Nelson Ho

Nelson Ho
for the Sierra Club

December 27, 1999

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Attention: Nelson Ho, Hawai'i Island Conservation Committee

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Nelson:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of October 25, 1999.

The University of Hawaii appreciates your passion for the protection of Mauna Kea and your participation in the Mauna Kea Advisory Committee during 1998 and 1999. The input you provided in the committee meetings helped to shape the content and direction of the Master Plan, and many of your concerns have been integrated into the Plan.

Previous Comments on the Draft EIS Notice of Preparation.

We are once again responding to your comments from the NOP process, including some updates to our responses which reflect new information developed since mid-year.

NEPA & Chapter 343 Requirements

There is no requirement for NEPA documentation for the subject Master Plan EIS. The Master Plan is being prepared under funding from the Research Corporation of the University of Hawai'i, and addresses uses on State lands. Specific individual projects, such as the Keck Outrigger project, have involved federal funding and are appropriately subject to NEPA compliance. Future observatories on Mauna Kea may or may not involve Federal funding, and NEPA will be complied with as applicable.

In terms of Chapter 343 compliance for previous projects, the OEQC has also determined that environmental assessment documentation was adequate. Cumulative impacts are being addressed in a comprehensive manner in the Final EIS to address each of the facilities proposed in the Master Plan.

Integrated Natural and Cultural Resources Management Planning

The Final EIS addresses natural resources and cultural resources in depth, both to comply with Chapter 343. "Integrated Natural and Cultural Resources Management " is an emerging term of art in planning with no official or commonly held definition. The Master Plan represents an integrated approach in considering the natural resources and cultural resources of the mountain. The recommendations to prepare an INCRMP reflect the leading edge of environmental planning. Group 70 has completed numerous plans which address cultural and natural resources and management planning, including the

award-winning Ke'anae-Wailuanui Cultural Landscapes Plan on Maui, the Kekaha Kai Regional Park Master Plan in North Kona, and Coconut Island Master Plan in Kaneohe Bay.

Environmental Studies

Updated technical studies of environmental resources are included the Final EIS in the areas of botany, arthropods, cultural resources/ethnography, and archaeological resources. Rare flora and fauna are evaluated in these studies. Each of the issues you raise regarding archaeological sites and mitigation are addressed in the Final EIS. DLNR is currently progressing with their completion of the Historic Preservation Plan, and the Final EIS provides the DLNR's detailed outline for the plan.

Burials

There are no recorded burials at the summit and very few recorded burials in the Science Reserve. This is based on over 30 years of research on the summit and interviews with elders of the island. If there are records of such burials, we encourage these reports to come forward to be verified and added to the record. There have been no actions in and around burials, and there has been no findings or actions warranting notification of the Burial Council.

The IfA and representatives of NASA and the Keck Observatory have met with the Hawaii Island Burial Council to discuss the potential for affecting any unknown burials at the edges of the Keck site during construction of the Outrigger facilities. The Burial Council has also visited the site with the IfA and Keck, and have discussed the plan for monitoring during construction excavation. The Master Plan is committed to providing a qualified archaeologist to monitor excavation at construction sites for observatories or other facilities in the summit region.

Carrying Capacity

As you note in your comments, the carrying capacity of Mauna Kea for astronomy development is substantial from a technical analysis viewpoint. Utilizing the GIS resource layering studies, the Master Plan addresses each of the constraints you suggest. The Final EIS further addresses the Master Plan's approach to protecting natural and cultural resources, and minimizing cumulative effects to these resources. These measures include the physical planning actions (the Astronomy Precinct limits, avoidance of habitat areas, etc.) and the management plan measures (rangers, monitoring, etc.).

Funding Questions

The University has committed to providing initial annual funding of $400,000 for the new Office of Mauna Kea Management (MKM) subject to the adoption of a Master Plan. The budget is based upon staffing requirements for an Executive Director, administrative assistant, Program Director for the Visitor Information Station at Hale Pōhaku, and four full-time rangers. Additional staffing and budgets relating to the Mauna Kea Support

Services will be incorporated into the MKM as appropriate. The Final EIS presents additional details on the form and function of the management program.

Optical/Infrared Interferometer

The Master Plan proposes a future general area for an optical/IR interferometer within the Astronomy Precinct for planning purposes only. The Plan does not provide specific details about this potential facility. This facility will not be built with the present state of technology for the optical/IR interferometer. The Plan would require the multiple elements of this facility to be visually unobtrusive. At present this is not possible, given the current facility requirements to combine light from multiple elements. This facility will only be considered for development if, over the next 10 to 20 years, there are advances in the light-combining technology. In order for the facility to be built, a revision of the Master Plan would need to be approved. Also, a full EIS and a CDUA permit would need to be approved.

Access Management

This response addresses your current comments on the Draft EIS and past comments on the EIS Prep Notice. There is a further response dealing with public safety concerns later in this letter.

In your letters and other public statements you have made several incorrect remarks about managing public access in the Master Plan. Nelson, we understand that you were part of a unanimous vote in favor of managing vehicular access during the Advisory Committee process. Nonetheless, the Master Plan does not recommend closing off the road to the Science Reserve rather it proposes the management of access.

Public access management issues will be a responsibility of the new management entity. The Management Plan recommends that public access be managed (but not limited) for public safety and protection of natural and cultural resources. One possible reason for controlled nighttime public access to the summit would be to offset the increase in off-road vehicle activities. The EIS addresses management plan issues including access management, however, the real decisions will be made by the future management group, including community input, which surely will consider the wide range of public access needs.

Fee Issues

Assessment of fees to existing observatories would violate contracted agreements. New or redeveloped facilities will offer the opportunity to examine appropriate sub-lease terms, which could include fees for management of the Science Reserve. Ceded land issues are a State-wide concern that the Governor is presently addressing.

Visual Impacts

The Final EIS will includes a complete visual resources section to address the potential impacts to views from locations both on the mountain and from lower elevation

communities. Design guidelines are established in the Master Plan to guide the future development of observatories and other facilities on Mauna Kea. The Final EIS includes a perspective view of the summit from shrine locations to the north.

Wastewater Management

Each of the observatories has an individual wastewater system (IWS). The older facilities such as CFHT, CSO, IRTF, UKIRT, UH 0.6m and UH 2.2m all pre-date the 1980's establishment of new Department of Health requirements for individual wastewater systems to utilize septic tank and leaching systems. In the future, all new or redeveloped observatories or other new facilities will be required to comply with the IWS standards, and some observatories will be required to upgrade or replace their wastewater management facilities.

Military Involvement

There are no plans for military involvement with the existing observatories at Mauna Kea. None of the new facilities being considered have a military purpose or sponsor.

Noise Impacts

Noise is addressed in the Final EIS, however, there are no plans to conduct detailed noise surveys. The summit is a quiet place and there are no known chronic sources of noise that affect the summit as you describe. Short-term noise from construction activities will be audible, however, this will be a temporary effect.

Keck Observatory (repeat comment)

As discussed previously, the Keck Observatory proposal for up to six auxiliary telescopes is currently completing a Section 106 review. After its conclusion, UH will be submitting its Final EA/FONSI and proceeding with the Conservation District Use Application (CDUA) process. As of the date of this Final EIS, there has been no formal response completed to these comments.

Alternatives

The alternatives to the proposed action that were to be included in the Draft EIS were clearly identified in the Notice of Preparation. The Final EIS includes additional analysis of these resources for each of the alternatives studied. As a programmatic EIS for the Master Plan, the technical studies of wildlife, culture and archaeological sites are quite detailed and thoroughly address the existing conditions and potential impacts of the actions and alternatives contemplated under the Master Plan. There is also a recognition that individual actions will also require their own environmental and CDUA processes, which will provide much more site-specific studies of these resources.

Alternative locations to Mauna Kea are addressed in the Final EIS, however, for many of the instruments contemplated in the Master Plan, most of these sites are either not practical or are far less suitable locations. Mauna Kea is the best place in the world to

conduct astronomical observations due to its global location and atmospheric environment conditions. Even though there are other potential sites in the Northern hemisphere, there are no known locations that are nearly as good as Mauna Kea. It is possible that a site in Chile may be quite good for astronomy observations, however, it has yet to be proven. The facilities you mention are less suitable for the top level science investigations occurring and proposed for Mauna Kea.

Poliahu and Public Access

The jeep road to the top of Puu Poliahu could be converted into a walking trail if the new management entity determines this is in the best interest of the community. There is no intention to legally bar the public from access to the Science Reserve. There is no current policy to close the road to public access except during severe winter weather conditions. At any time, people may enter the Science Reserve on foot, if so desired.

There is clear evidence of off-road 4x4 activity in the NARS and Science Reserve. Vehicle tracks are noticeable on either side of the access road at several locations between elevation 10,000 and 12,000 ft. because of the nature of the surface soils material, these tracks remain for long time periods, and essentially become scars in the landscape. Along the access road, new barriers and signs have been erected to deter off-road driving at these locations.

Public Safety

For public safety reasons, there is a need to inform people about the hazards of driving to the summit of Mauna Kea. Hazards include altitude sickness, winter weather exposure, winter driving conditions and steep road decent. There is no policy to close the road to public access except during severe winter weather conditions. At any time, people may enter the Science Reserve on foot, if so desired.

Altitude sickness is one potential factor that many visitors are unaware of unless they are educated either prior to or during their visit to the mountain. The symptoms can sometimes become especially acute to very young people and very old people. In addition, people may also be unaware of the low temperatures and high winds that occur frequently in the summit region. With ice and snow on the road during adverse winter weather periods, driving can become difficult and dangerous. Further, the decent along the road from 13,500 ft to 9,000 ft requires use of low gear to avoid brake failure due to overheated brake pads. All of these are significant public safety issues which should be considered by the Mauna Kea Advisory Board in its discussion of access management policies and public information dissemination.

Economic and Cultural Assessments

The author of the SMS Research report on Economic Impacts is John Kirkpatrick, Ph.D. The author of the PHRI report on Cultural Impact Assessment is Paul H. Rosendahl, Ph.D. Both of these gentlemen are leading professionals in their respective professions within the State of Hawaii and the Pacific region.

Kukahau'ula

The summit of Mauna Kea is the highest point in the State, named in recent historical times as Pu'u Wekiu. Kukahau'ula represents the summit cinder cones complex, and observatories have been constructed on a portion of the complex. The DLNR is considering designation of the summit as an Historic District, which require additional consideration of the historic integrity of the complex in the future physical and management planning. To our knowledge, the summit has yet to be designated as a Traditional Cultural Property.

Excavation Monitoring

Future construction activities in the Science Reserve will be monitored by a qualified archaeologist to observe for possible cultural deposits and remains. As stated previously, there has been no evidence presented of disturbed burials or removed iwi from any construction operation in the history of astronomy development at Mauna Kea. Each site was thoroughly surveyed prior to construction and no remains were identified. Over the past two years of public meetings, there has been a call for people with knowledge of disturbed burials to come forward so the historic record can be corrected, however, there has been no response.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

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Post-it® Fax Note 7671	Date 10/27/99	# of pages ▶ 7
To J. Overton	From A. Ah San	
Co./Dept. Group 70	Co. UH	
Phone #	Phone # 956-7935	
Fax # 523-5874	Fax #	

Anthony Hko Anjo
Valerie Luhrian Anjo
P.O. Box 943
Kapaau, HI 96755

RECEIVED
OCT 27 1999
GROUP 70

University of Hawaii
c/o Mr. Allan Ah San;
Board of Regents;
Kenneth Mortimer;
Robert McLaren;
all other people or agencies
involved with Mauna Kea Master Plan

State of Hawaii
c/o Ben Cayetano; Governor
Tim Johns; DLNR
Russell Kokubun; BLNR
and all other BLNR members
and State Legislators

Dear Sirs:

This is a PROTEST letter written on behalf of our families and all other Hawaiian and non-Hawaiian families who are Against UH-IFA's Master Plan to cause further damage and destruction to a very sacred site of our ancestors. We condemn all those who are proposing all of the various methods to shut Hawaiians out from their historical and cultural ties to Mauna Kea by limiting access (to Hawaiians) and by allowing foreign agencies (haole) to move ahead with their pseudo-science studies of the Universe. These so-called studies are really a disguise to allow NASA and other foreign agencies to test/study methods to develop space and SDI warfare for use against

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2/ innocent civilians. NASA proclaims that they will spend at least $55 million or more to develop array telescopes to study life in space. Can you believe NASA or what the Federal government says? The U.S. is notorious for having a well-funded Military/Defense complex that wastes billions of taxpayer dollars! Many of these research projects are top-secret and NASA would never acknowledge what their research is really used for. Perhaps, NASA's real mission is to colonize Space before any other government does because the history of the U.S. was to colonize the world with their "Manifest Destiny" policies of the last century (e.g. look at what Teddy Roosevelt did in the Phillipines and Hawaii).

There have been numerous conversations with Fred Chaffee (of Keck) and Francis Oda (of Gmp 70). As sincere as these two persons are, their agenda is to get what they want. As human beings, they are commended for their professionalism, but neither one has any connection to being raised in the Hawaiian culture. Put it like this, to be a kahuna you need to spend a lifetime of learning how to attain the spirituality of the art of being a Kahuna. You put your being, your soul, into what you are to become. Both Mr. Oda and Mr. Chaffee have become outstanding in their fields of study, but neither is even qualified to pass judgement on Hawaiian culture and the sanctity of various sites determined by Hawaiians.

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3/

Because Hawaiians are raised in a culture that is very spiritual and ritualistic, foreigners cannot look from the outside and pass judgement on our cultural beliefs. That is why the sanctity of Mauna Kea must be preserved at all costs! There are no compromises as the desecration has already been done and it is immoral for Mr. Mortimer, McLaren, et al to think that they have the right to decide what is best for Mauna Kea. That kind of thinking led to the demise of another person, Capt. James Cook, who thought he knew what was best for the Hawaiian people. It seems that "haole" people think that their way is the correct way and they forget that they are the guests in a foreign land.

Let it be further explained that whatever is stolen is always stolen! There is no such thing as "ceded" as it is a haole word and not in the Hawaiian language. When the Kingdom of Hawaii was overthrown in 1893 by white terrorists, Liliuokalani never relinquished her government. It is of record that she said that at a future date her government would be resurrected (PBS: Hawaii's Last Queen) to lead her people. And, in 1993 the Secretary of the Interior, Bruce Babbitt, read a formal apology by President Clinton denouncing what was done by the white terrorists back in 1893. Therefore, the de facto government that controls Hawaii today is still trying to force Hawaiians to give up their rights of

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i/ self-determination and the preservation of their culture (which includes Mauna Kea and all other historical and sacred sites).

We have read GROUP 70's Study and find it seriously flawed for many reasons. It takes the attitude that UH/IFA will determine what can and cannot be done at Mauna Kea. THIS IS WRONG!!! It's as if you ask someone for their opinion on how to spend their $$, but then you tell them to go to hell!!! The arrogance of UH/IFA and the telescope companies is horrible. We attended the hearings and the community of scientists behaved as if the telescope was the embodiment of the resurrection of Jesus Christ, Buddha and Yahweh all rolled into one. It's as if scientists worship their god of technology, but yet turn a blind-eye (Makapo) to Hawaiian culture and what happens in the real-world! To them, science is pure-science and you study something just to do it as a challenge. The absurdity of all this is why cultures and societies go to war. One society refuses to respect the other's beliefs and values. And, what makes it worst is that in almost all cases, it is the foreign society that clashes with the native society's values that are already in place for a long time.

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5/

We demand several things regarding the study of Group 70 (on Mauna Kea):

1) No more building on Mauna Kea! STOP IT NOW! Establish a KAPU on this desecration of Mauna Kea.

2) No commercial activity! KAPU on people who make money taking hikers, skiers, etc, etc. onto Mauna Kea as this desecrates the sanctity of the area. No more tourist-type activity or any commercial venture (including the telescopes since it is a business activity to make money).

3) Establish a group of Hawaiians (from the working community) New commission that will oversee everything that concerns Mauna Kea. These individuals are to be chosen for their commitment to preserving Hawaiian culture and not for their college degrees or connections to being high muka-muka. We don't want any Rowena Akanas or Hannah Springers, etc. We need real people from the community such as Hank Ferguston, Rayleen Lancaster, Patti Solomon (No Malama'), Happy Hanohano, etc, etc. People who really care about Hawaiian culture and the preservation of Hawaiian sites. People who know how to be Hawaiian — how to be a real person in touch with the community, to be like Abraham Akaka.

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6/

4) Stop the B.S. Rhetoric and useless verbiage! After reading the Group 70 study, it could have been condensed into 5-10 pages titled "This is what IFA wants and screw the Hawaiians". Of course, Group 70 and IFA will say otherwise, but it is because they are blinded by what they want to accomplish at the expense of continuing to steal from Hawaiians. Sorry, Fred Chaffee, as much as you don't like the word stolen, Mauna Kea has been stolen from DHHL (and being given back to Hawaiians to decide what is best for her)!

5) Return Mauna Kea to DHHL and let Hawaiians decide how to best manage her resources. The best usage of Mauna Kea is no usage. We remember when there were no telescopes on Mauna Kea and her beauty was unspoiled. It is further recommended that at a future date, in the best interests of Mauna Kea, why not disassemble all of the telescopes and send them back to the countries that they came from? We don't do this desecration at Japanese,

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7/ British or French sacred sites, but why do they do it to us (Hawaiians)? Again, the Hawaiians have been most gracious in their requests for autonomy of Mauna Kea and to return her back to the Hawaiian people. And remember, what is stolen can never be owned by the one who steals. Further, in Hawaiian culture, those who steal or commit desecrations will be cursed by the Gods and ancestors who protect Mauna Kea and all sacred, historical sites of Hawaii. It is time to put an end to all of this by creating an independent group (of Hawaiians) who oversees the future of Mauna Kea, not some foreign (haole) committee that kow-tows to UH/IFA and perpetuates further insults upon the Hawaiian People....

Mahalo,

Anthony Ako Anjo

Valerie Lubiane Anjo

P.S.
There are no threats in this letter, only historical facts. Check history to help find the Truth.....

(808) #889-5309
phone and Fax

December 17, 1999

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Kapa'au, Hawai'i 96755

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Anthony and Valerie:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of October 25, 1999.

Hawaiian Culture

The Master Plan for the Science Reserve integrates Hawaiian culture into the future planning and management of the summit region. The Plan does not represent an effort to pass judgement on the culture, rather it makes extensive efforts to retain the overall integrity of the summit area as a sacred place for Hawaiian people. The values expressed in the plan are the result of direct involvement in the planning effort by Native Hawaiians, through the meetings, direct discussions, and oral histories.

It is apparent that members of the astronomy, Hawaiian, and broader community seem to be starting the process of talking with each other and trying to understand each other more fully. This type of discussion process needs to happen more, and will become a part of the on-going management process through the *Kahu/Küpuna* Advisory Committee.

In addition to the formation of the Office of Mauna Kea Management and the *Kahu/Kūpuna* Advisory Committee, the Master Plan attempts to support the use and respect of Mauna Kea by all members of the community – native Hawaiians, astronomers, skiers, students, etc. A major component of this philosophy is the designation of 10,760 acres of the Mauna Kea Science Reserve as a Natural and Cultural Preservation Area where no development is proposed.

Concerning access, the Master Plan directs that there should be no constraints to contemporary or traditional practitioners as long as the existing archeological features continue to be honored.

Again, the establishment of the MKM, Mauna Kea Advisory Board, and *Kahu/Küpuna* Advisory Committee will greatly increase formal native Hawaiian participation in managing the mountain. This is the type of participation and direct involvement that you suggest in your letter. Through the guidance of *kūpuna*, the future of Mauna Kea is hopeful.

Ceded Land

With regard to ceded lands, the University recognizes that they have an educational exemption (Hawai'i Revised Statutes, 10-2) and that the land contained in the Mauna Kea Science Reserve is not being used for commercial development. The educational exemption and larger ceded land issues are a State-wide concern and the Governor is addressing trust obligations to the native Hawaiian community and the general public.

There is no interest in diminishing the rights of native Hawaiians to access and utilize the land on Mauna Kea. Instead, the Master Plan includes no restriction on traditional access for Hawaiian cultural and religious purposes.

Astronomy in Our Community

Hearing the astronomy employees speak at the public meetings, my sense is that most are quite sincere about their role in the larger community. Beyond the role that organizations such as Keck play in bringing astronomy to the island's classrooms and by hiring local high school students and professional and technical staff, their employees express a very personal aloha for the larger community and a desire to be more involved in the community.

There is no intention on the part of the University or the planners to determine what can and cannot be done under the Master Plan. Many of the concepts and policies described in the Master Plan are a reflection of statements issued by the people attending the public meetings and the Mauna Kea Advisory Committee.

Commercial Activity

We understand your interest in deterring commercial uses of Mauna Kea, such as commercial tour groups. This is not a determination offered in the Master Plan, as it is more appropriately discussed by the new management entity, in conjunction with the community.

The existing and proposed astronomy facilities are most definitely not commercial facilities, in that their purpose is to conduct scientific research and not to generate profits.

Thank you again for participating in the public meetings and for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

October 24, 1999

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OCT 26 1999
GROUP 70

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Mr. Jeffery Overton, AICP (U.S. Mail & joverton@group70int.com)
Group 70 International, Inc.
925 Bethel Street, 5th Floor
Honolulu, Hawai'i 96813-4307

Subject: Comments on the Mauna Kea Science Reserve Master Plan – Draft #3A (Sept. 3, 1999) and Mauna Kea Science Reserve Master Plan-Draft Environmental Impact Statement (August 1999)

Dear Ladies and Gentlemen:

By way of this communication, I present a few concerns and comments on the above referenced documents compiled by Group 70 International, Inc. First, I note that in a professional capacity, I served in the process of collection and reporting on cultural-historical resources and documenting, through a formal oral history and consultation program, various facets of traditional and customary and ongoing practices and beliefs associated with Mauna Kea (cf. Maly 1997/1998 and 1999, cited in both of the above referenced draft reports). To the best of my ability, I conducted the studies and prepared the reports in a manner consistent with Federal and State Laws and guidelines (e.g., NHPA, ACHP, DLNR-SHPD, and OEQC), and made every effort to respect the integrity of the documentation and the context in which it was originally recorded.

My comments below, relate only to the area of cultural and historical resources.

The specific ethnographic study for the Master Plan document was completed on February 1st 1999, and given to Group 70 on February 23rd 1999. The study comprised nearly 800 pages of ethnographic documentation, yet the first draft of the Mauna Kea Science Reserve Master Plan/EIS (Master Plan, March 1999), incorporated little more than two paragraphs of this

work into it. While subsequent additions to the cultural component of the Master Plan/EIS, leading to Draft #3A and the Draft EIS have evolved significantly since the first draft of the Master Plan, it does not appear that the proposal (including goals, objectives, and implementation) have changed.

The present Master Plan/EIS now liberally quotes from traditional, historical and oral historical accounts reported in the work I prepared as well as other studies. While the Master Plan/EIS may be in general compliance with requirements of the laws for identifying and addressing cultural resources and laying out a plan for mitigation of adverse impacts on Mauna Kea, issues regarding cultural integrity and sensitivity remain. The problem that I see with the present Master Plan/EIS is that some of the right words are quoted from interviews and cultural descriptors given, but the plan does not step back from the original proposals in any meaningful way that acknowledges the ongoing traditional and customary practices, beliefs, and cultural values attributed to Mauna Kea.

One of the clearest examples of misapprehension of the cultural significance of Mauna Kea is found in *Figure 3-1* (Draft EIS, August 19993-3) and *Figure IX-4* (Master Plan Draft #3A Sept. 1999:IX:IX-9) and in the texts associated with these figures. The artificial ring shown encircling the summit of Mauna Kea in the figures gives the impression that the "*piko*" (summit, umbilical) of Mauna Kea is not as important as the area highlighted by the ring because there are only a 'few archaeological sites' in the *piko* region (cf. George Atta Oct. 14, 1999, informal public meeting at Keaukaha). This representation is simply incorrect. In the Hawaiian context, the sacredness of place begins with the land itself and is only accentuated by (to quote one cultural practitioner) "the signature of man" (i.e., *heiau* or other man-made features).

In the study that I prepared as a part of the Master Plan Update[1], I provide the following summary about the significance attributed to Mauna Kea —

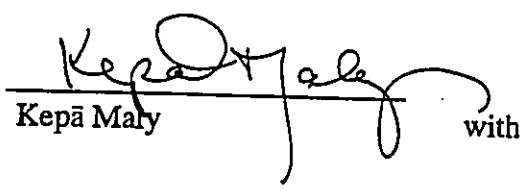
> In conducting the study, limited (yet important) site-specific information for the summit was recorded. This fact is not surprising, and can be attributed in-part to the remoteness, environmental conditions, and nature of the Mauna Kea summit region. Also, by the time of undertaking this study, nearly all of the elders (i.e., the parent and grandparent generations of the interviewees who were born in the period between 1850 to 1900) who traveled to Mauna Kea with their own elders had passed away. In reading the interviews, it will be seen that a significant portion of the information recorded for Mauna Kea focuses on the mountain as a whole feature in the cultural and natural

[1] *Mauna Kea Science Reserve and Hale Pōhaku Complex Development Plan Update: Oral History and Consultation Study, and Archival Literature Research; Ahupua'a of – Ka'ohe (Hāmākua District) and Humu'ula (Hilo District), Island of Hawai'i...*" (Maly February 1, 1999)

> landscape, rather than focusing on specific regions or zones. This attachment to the mountain landscape is rooted in antiquity and remains important in the lives of native Hawaiians today, who attribute spiritual and cultural values to Mauna Kea... (Maly Feb. 1, 1999:12)

Based on the extensive research, interviews, and consultations that I have undertaken on the subject of Mauna Kea (and upon having heard numerous testimonies at public meetings and hearings[2]), I believe that proposals for further development and construction on Mauna Kea, the "*piko kaulana o ka 'āina*" (famous mountain peak of the land), are inappropriate at the present time.

Sincerely,



Kepā Maly with

Kamakaonaona Pomroy-Maly
(Pana'ewa Hawaiian Homesteader)

554 Keonaona Street
Hilo, Hawai'i 96720

(808) 981-0196
kepa@interpac.net

cc. interview/consultation program participants

---

[2] Most of the public testimonies (provided on this issue since August 1998), as well as most of the individuals who participated in the above referenced oral history/consultation program observed that 'actions speak louder than words.' They noted that most of the promises and commitments to take certain actions on Mauna Kea have gone unfulfilled. All of the participants in a special (informal) meeting with Hawaiian Homesteaders of East Hawai'i (at Keaukaha, October 14, 1999), presented by George Atta and Bob McClaren, expressed a real sense of disbelief in the integrity of the present process and "new promises." Native Hawaiian participants in the October 14th meeting (whose ages ranged from the 30s to the 70s) asked Mr. Atta and Mr. McClaren to take the message – "Don't come ask us for more, when you haven't demonstrated that you can keep your word on past promises"– back to the planners and Board of Regents.

December 27, 1999

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Mr. Kepa Maly
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554 Keonaona Street
Hilo, Hawaii 96720

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Mr. Maly:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of October 24, 1999.

We would like to take this opportunity to express the appreciation of the University of Hawaii and Group 70 International, Inc. for the effort and thoroughness provided by Kepa in completing the interviews and documentation of several contemporary Hawaiian cultural viewpoints. Your work contributed to the necessary cultural impact assessment documentation completed by Paul H. Rosendahl, Ph.D. and will also be consulted in the completion of the Historic Preservation Plan by the State of Hawaii Department of Land and Natural Resources. The work has provided a substantial base of cultural information that has helped to guide the update of the Mauna Kea Science Reserve Master Plan.

Draft Versions of the Master Plan

The evolution of the Draft Master Plan has progressed over the course of nearly one year. The input of the cultural information provided by your consultant report was not fully integrated in the earlier version. As you have noted, the information provided in the later draft and the Draft EIS present a more complete traditional, historical and oral history account.

Not present in the draft versions of the Master Plan are the numerous potential inappropriate uses of the Science reserve that have been proposed in recent years. Major international projects have been guided away from Mauna Kea because of the cultural sensitivity of the mountain. One such project is the Millimeter Array – a 3.0 kilometer loop containing over 45 instruments each 45 feet tall. Another was an international project involving the placement of over 40 instruments that appear very similar to oversea shipping containers. Neither of these world-class astronomy projects will be built at Mauna Kea.

Very early in the planning process it was clear that several significant development proposals would violate the base criteria for possible consideration for siting at Mauna Kea. Had these types of observatories been included in the early version of the plan, your stated objective of generating a pull-back in the future physical development plan due to cultural concerns could have been met. The first draft Master Plan was already pre-screened for incompatible uses using criteria such as cultural resources and values, environmental habitat presence, and potential adverse visual effects. The scope of the proposed physical development has not been substantially diminished since the earlier

draft, because it reflects the true range of potential observatory projects that could be proposed in the next 20 years and can be accommodated without detrimental effects to the cultural and environmental resources. Even so, there have been numerous significant refinements to the physical plan that further respect the cultural values of the summit region, and are reflected in the more recent drafts of the Master Plan.

Cultural Perspectives

The opinions cited in the ethnographic studies are viewed with deep respect for the feeling people have for Mauna Kea. The oral histories are a valuable insight into the people with a history of work or family ties to the mountain. These thoughts and perspectives are integrated largely into the future planning for the world's leading astronomy complex.

- More than 95 percent of the available land in the Science Reserve has become a perpetual preservation area for natural and cultural resources concerns.
- All of the culturally significant landforms at the summit which have not been developed will remain preserved, including Puu Poliahu, Kukahauula (summit puu), Puu Lilinoe and the immense surrounding area containing over 100 shrines.
- Visual connections between the culturally significant landforms will be retained in perpetuity, such that the overall cultural context of the summit remains intact.
- Only areas with the least potential impact to the cultural sites and landforms were considered for future astronomy development, following strict design guidelines to minimize visual impact.

The continued participation of the elder native Hawaiian representatives, through a Kahu/Kupuna Advisory Committee to the Advisory Board and Management Office, will ensure the proper implementation of the plan without diminishing the integrity of the summit as a cultural landscape.

Thank you again for providing your comments on the Draft EIS Notice of Preparation. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

RECEIVED
OCT 26 1999
GROUP 70

MAUNA KEA LELE

Once again, Na Kanaka Mauoli
are being swept aside

Colonialism's oppression,
Continuance of **GENOCIDE**

Mauna Kea's Summit covered
over with Telescopic "eyes"

Continued, expanded Building
Deafened to "All" Cries (to Stop!)

E - X - P - A - N - D - I - N - G
their "take" for "economic, ego's" sake

Mauna Kea's physical/spiritual Beauty
Her "Kapu" (Sacredness) demised

OVERTHROWN AGAIN!!!
by Western Greed, Hauoles aggrandize*

Motivated, Supported by their titles,
documented, paper trail strides

Ravaging, Desecrating Mauna Kea's
Kapu sights, our Lawful Religious Rights

Mauna Kea's Our Plight
We stand Ikaika, for our Rights
with NA AKUA's Aloha, guidance!

Again, **Hawaiians voices**
listened to, **yet seldom adhered to**

Ignoring our Constitutional rights,
IGNORANCE of Our views

Promotion of foreigners' scientific,
non-cultural ties

Built on falsely, with economic lies

With God, their money, they try!

Mauna Kea's not really seen,
'Buried Alive' with telescopic eyes.

1893 1st Overthrow--many more since then
taken over by greed, again and again...

(Benefiting who??)pushing Hawaiians
ways (down) aside, outside,

Not caring if Hawaiian Values
" Live or Die "

Mauna Kea's our link to Ancient Ones, still,
in **STRENGTH** we stand for Our Selves
with Gods'/Godess's Love and Will!

*make richer, more powerful

(original)
Group 70 - Jeff Overton

Once again Na Kanaka Mauoli are mere puppets and victims upon our own lands of an American game of "hypocrisy", in a colonialism dominated society where America's Constitution, words or creed, counts for nothing if it interferes with entrenched American interests. Trapped in this situation, what can we do? One thing is to take counsel in the words of our latest Queen, Lili'uokalani:

> Oh, honest Americans, as Christians hear me for my down-trodden people! Their form of government is as dear to them as yours is precious to you. Quite as warmly as you love your country, so they love theirs. Do not covet the little vineyards of Naboth's so far from your shores, lest the punishment of Ahab fall upon you, if not in your day in that of your children, for "**be not deceived, God is not mocked.**" The people to whom your fathers told of the living God, and taught to call "Father," and whom the sons now seek to despoil and destroy **[Mauna Kea]** are crying aloud to Him in their time of trouble: and He will keep His promise, and will listen to the voices of His Hawaiian children lamenting for their ....**[aina, sacred heiaus', hales']**....

With all the 1,000,800,000 acres of ceded lands why should the kapu (sacred) Mauna Kea lands where our people and others of like mind and spirit go to honor and pule (pray), be the aina chosen of those building upon Mauna Kea, additional telescopes, unwanted buildings that clutter our ancestral grounds so sacred?!

The essence of the Proposed Master Plan fails to deal with the following question! Its accompanying Environmental Impact Statement draws a line between the questions of State and Federal Law.

1. Whether the Proposed Master Plan has jurisdiction over ceded lands, pursuant to 5(f) Trust Laws. They are: The lands granted to the State of Hawaii by subsection (b) of this section and public lands retained by the U.S. under subsections (c) and (d) and later conveyed to the State under subsection (e), together with the proceeds from the sale or other disposition of any such lands and the income therefrom shall be held by said State as a public trust for the support of the public schools and other public educational institutions, **for the betterment of the conditions of native Hawaiians, as defined in the Hawaiian Homes Commission Act, 1920, as amended,** for the development of farm and home ownership on as widespread a basis as possible for the making of public improvements, and for the provision of lands for public use. Such lands, proceeds, and income shall be managed and disposed of for one or more of the foregoing purposes in such manner as the constitution and laws of said State may provide, and their use for any other object shall constitute a breach of trust for which suit may be brought by the U.S. The schools and other education institutions supported, in whole or in part out of such public trust shall forever remain under the exclusive control of said State; and no part of the proceeds or income from the lands granted under this Act shall be used for the support of any sectarian or denomination school, college, or university.

Those lands are for the use of native Hawaiians, pursuant to Hawaii Constitution, Article XII, Sec. 1,2,3 and 7, "Traditional and Customary Rights".

2. Whether or not the Proposed Master Plan has jurisdiction over Mauna Kea, without compensation to the Hawaiian people or their sovereign government, of the Hawaiian Monarchy, illegally overthrown? See. **Public Law No. 103-105, 107 Stat. 1510 (1993)**

3. Whether the Proposed Master Plan has jurisdiction **over the Treaty of 1850, between the United States and Hawaiian monarch?** See. **U.S. Constitution Article VI [2] "The Treaty shall be the Supreme Law of the Land".**

4. Whether or not Group 70 has the authority to destroy kapu religious sites upon Mauna Kea by its economic development?

3. Whether the Proposed Master Plan is contrary to "traditional and customary rights of native cultural and religous"? See. **Hawaii Constitution Article XII, Section 1, 2, 3, 4, and 7** "Traditional and Customary Rights."

Therefore, the Japanese, Chinese have their sacred sites and temples, as well as Indians their sacred sites, burial grounds. It is an undisputed fact that Mauna Kea is no different than the Japanese, Chinese, and Indians of their sacred sites which are kapu to foreigners. Americans have their cemeteries....would they allow others to walk, build upon, desecrate their ohana's (family's) graves?

The proposed question from Department of Land and Natural Resources of protecting the public trust? **ANSWER:** **Is absolutely in violation of that public trust under 5(f) federal, state compact--cooperative federalism.**

In conclusion, I, Anakura Melemai, **OPPOSE and CHALLENGE** the use of Mauna Kea, native Hawaiian kapu religious sites, pursuant to the Hawaii Administration Procedure Act, Chapter 91, of your findings, facts and conclusion of law.

If you do not give me your findings, facts and conclusion of law, in alternative, a lawsuit will be filed against you.

May Na Akua guide and direct our kuleana in ways that will benefit and preserve Mauna Kea's spiritual purposes', and carrys on our sacred traditions of our dearly beloved Na Kanaka Mauoli Ancestors.

Anakura Melemai

Anakura Melemai
P.O. Box 1509
Kea'au, Hawaiian Kingdom 96749

cc: (Original to: Jeff Overton, Group 70)
Allan Ah San, Board of Regents,University of Hawai'i
Office of Environmental Quality Control
Nelson Ho, Sierra Club, Hawai'i Chapter
file copy

December 27, 1999

GROUP 70
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Ms. Ankura Melemai
P.O. Box 1509
Kea'au, Hawai'i, USA 96720

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Ms. Melemai:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter received on October 26, 1999.

Ceded Lands

With regard to ceded lands, the University recognizes that they have an educational exemption (Hawai'i Revised Statutes, 10-2) and that the land contained in the Mauna Kea Science Reserve is not being used for commercial development. The educational exemption and larger ceded land issues are a State-wide concern and the Governor is addressing trust obligations to the native Hawaiian community and the general public.

There is no interest in diminishing the rights of native Hawaiians to access and utilize the land on Mauna Kea. Instead, the Master Plan includes no restriction on traditional access for Hawaiian cultural and religious purposes.

Cultural Perspectives

The opinions cited in the ethnographic studies are viewed with deep respect for the feeling people have for Mauna Kea. The oral histories are a valuable insight into the people with a history of work or family ties to the mountain. These thoughts and perspectives are integrated largely into the future planning for the world's leading astronomy complex.

- More than 95 percent of the available land in the Science Reserve has become a perpetual preservation area for natural and cultural resources concerns.
- All of the culturally significant landforms at the summit which have not been developed will remain preserved, including Puu Poliahu, Kukahauula (summit puu), Puu Lilinoe and the immense surrounding area containing over 100 shrines.
- Visual connections between the culturally significant landforms will be retained in perpetuity, such that the overall cultural context of the summit remains intact.
- Only areas with the least potential impact to the cultural sites and landforms were considered for future astronomy development, following strict design guidelines to minimize visual impact.
- There will be no actions in the Master Plan that conflict with the right to traditional access for Hawaiian religious worship.

The continued participation of the elder native Hawaiian representatives, through a Kahu/Kupuna Advisory Committee to the Advisory Board and Management Office, will

ensure the proper implementation of the plan without diminishing the integrity of the summit as a cultural landscape.

Kapu Religious Sites

No one has the authority to destroy kapu religious sites upon Mauna Kea. There is no economic development plan for Mauna Kea. The observatory facilities located near the summit are strictly for astronomy research.

Traditional and Customary Rights

Native cultural gathering and religious worship rights are not affected by the Master Plan. There will be no actions in the Master Plan that conflict with the right to traditional access for Hawaiian religious worship.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

RECEIVED AS FOLLOWS

October 25, 1999

To: University of Hawai'i, Attn;: Mr. Allan Ah San, Assoc. V.P. Administration
University of Hawai'i, Attn: Mr. Donald Kim, Chair, Board of Regents

c.c. State of Hawai'i, Off. Environmental Control, Attn: Genevieve Salmonson, Dir.
Group 70 International, Attn; Jeffrey Overton, AICP

Subject: Comment on the Mauna Kea Science Reserve Master Plan, Draft 3A.

From its start in 1967 with construction of the U of H 88 inch telescope, funded by NASA, the state of Hawai'i has enjoyed, hosted and participated in astronomical discoveries and technological advances, which were at best ideas back then. the search for the origins of the universe has made incredible strides. Equipment unheard of then is almost accepted as commonplace: Hubble, Chandra, segmented mirrors, interferometry, submillimeter observatories, and other things came to fruition through this time.

With this advance in the science of astronomy, the University IFA was born, and has grown with a graduate program, telescope time for viewing that others covet, and the opportunity to be on the cutting edge of astronomical development.

We have enjoyed steady growth in new employment (400 jobs) funded by new money from outside the state. Each hire represents a family of 2 to 4, and payrolls are above average. 400 employees means 800 to 1200 stomachs to the grocer, 800 to 1200 insurance policies, 400 living units to the realtor, patients to the doctor, and taxes to the government. To those at the hearings last May who said they did not see the telescopes putting food on their tables, yes they do. It's the ripple effect. A rising tide lifts all boats. We all benefit in some way.

We also have the opportunity to build a unique first-class undergraduate school of astronomy at the University of Hawai'i, Hilo. It could draw students from all over the world to study. Without the telescopes, I think that this would not happen.

There has been a down side to this incredible science growth. There has been environmental degradation, and impact upon the mountain. There is potential for destruction of ancient and sacred sites, and pressure upon the flora and fauna of Mauna Kea. The Impact Statement shows much awareness of these dangers, addresses them, and works to mitigate the effects of such growth. I think there is a great sensitivity being shown now that perhaps was not as strong 10 to 20 years ago, and a strong desire to work out the problems

I think that one of the larger problems to be worked out are the feelings of some of the Hawaiian peoples toward Mauna Kea, & toward the observatory development on it. It is perhaps the most sacred and spiritual place in the Hawaiian Islands, and holds great meaning for them. The buildup has violated these feelings. Coupled with this were feelings expressed by some at

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the hearings that they were ignored when they tried to give input. They felt disenfranchised from their traditional land, and were given short shrift again.

The plan shows sensitivity toward these feelings and attempts to mitigate. Sacred sites have been identified and saved. No limitations have been put on religious worship. More community involvement in the planning. Recreational use encouraged to the fullest. More parking areas to be built for the public. Education programs are encouraged. More cabins for overnight use will be available.

The observatories have, or are developing outreach programs for the school students & the public. At the May hearings, several students from Kohala H.S. and H.P.A. told about summer experiences at the Keck, and how they were inspired. And the Gemini group has been visiting the schools, explaining what they do, arousing interest in astronomy. I hope the other observatories are, or will be encouraged to do similar programs. It is just plain good citizenship.

I think the more that the Hawaiian people can be involved in the operation and planning for Mauna Kea will help to reduce the feelings of alienation. Form a planning group with the Hawaiian practitioners, what special events would they want, and not necesarily astronomical. You could have Hawaiian teachers available on the staff, have programs related to Hawaiian traditions, history, culture, etc. Get input from the Hawaiian groups. Traditional navigation, voyages of the Hokulea, etc. Involvement like this may go a long way toward bringing people together.

I said this before on May 28, and I think it is still a valid perception of where the State, the Institute for Astronomy, and we the people are at in terms of the future. We have the premier astronomical viewing site in the Northern Hemisphere at Mauna Kea. It is in great demand for viewing time and locations for observatories. We, the state, etc, have made an agreement with the Astronomy World to share this place, to help advance the science, knowledge, technology and discovery. This is a "growth industry", and we have a very strong niche in it. This is the state'most successful "high technology" development. It can be used as an example to those who might want to bring in more high tech projects to Hawaii, to show that we can support them, and want them to consider us as a location. Science can not take too many restrictions or it will not progress, or will move on to another location. It must have the freedom to follow new discoveries. Few people in the 60's or 70's would have guessed that Mauna Kea would have the development that it is now experiencing.

There is need to review further expansion, accepting what we can accomodate. Space is going to be limited in time, & will have to be allocated depending on need. Selected growth.

On the other hand, if we completely stop the growth of science (astronomy) here, no matter how noble the reasons are to curtail growth, we will eventually slide into the backwater and be passed by. There will be a ripple effect on others who may wish to relocate a high tech business here to think again.

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No plan will satisfy everybody's points of view. We will have to pull differing points of view together and bring about better mutual understanding. We can all win if we want to.

John F. Villesvik
P.O. Box 188
Naalehu, Hi 96772
Ph: 808-929-9733
Fax 808-929-9709
email <vllsvk@kona.net>

December 27, 1999

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Mr. John Villesvik
P.O. Box 188
Na'alehu, Hawai'i, 96772

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Mr. Villesvik:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter received on October 25, 1999.

Benefits for Hawaii Island Residents. Your comments recognize the significant employment and economic benefits as a result of the astronomy complex at Mauna Kea, and the related facilities in Waimea and Hilo. Not only the direct jobs but the ripple-down effect (as you call it) has a substantial benefit to the overall economy.

Further, there has been great response to the educational outreach programs for school students led by Keck and Gemini Observatories. This has shown an encouraging path for the young minds in our community, and also help to build a stronger relationship with the science organizations that bring these benefits to the island.

Hawaiian Peoples. The input of the native Hawaiian community has brought attention to the deep cultural ties to Mauna Kea. The people of the State and the astronomy community have learned greatly from the past year, witnessing a strong message from Hawaiians to respect the culture and respect the mountain. A new and deeper understanding has emerged where the culture has guided the formation of a future plan for the summit – one where the integrity of the cultural landscape will be preserved.

We agree that the Hawaiian people should be more involved in the operation and planning for Mauna Kea, there will be less alienation felt. The new management organization planned for the Science Reserve will include Hawaiian community representatives and a special Kahu/Kupuna Advisory Committee. Currently, there is an effort underway to build this understanding through a series of relationship-building meetings between the Hawaiian elders and the observatory directors, sponsored by Senator Inouye. This is a beginning toward learning more about the values held by each group, and reflecting these in the future planning and management of the mountain.

Growth of Science. You raise several issues which are crucial aspects of the Master Plan for the next 20 years. It is not an expansion plan for the summit, rather it is a blueprint to accommodate the most advanced astronomy science instruments in the world. As the leading astronomy complex in the world, it will not be possible to continue to lead without having room for growth. New technologies are rapidly changing the manner in which astronomy observations occur, and the recent findings have been miraculous. The Master Plan for Mauna Kea Science Reserve represents an opportunity to continue to lead the world with much greater sensitivity to cultural and environmental concerns at home.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

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Alexa Russell
P. O. Box 1132
Kapa'au, Hawai'i 96755

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OCT 25 1999
GROUP 70

geoh2@lava.net

October 21, 1999

University of Hawai'i
2444 Dole Street, Bachman Hall 112
Honolulu, HI 96822
Att: Eugene S. Imai, Senior Vice President for Administration
Allen Ah San, Associate Vice President for Administration

Re: Mauna Kea Science Reserve Master Plan
Draft Environmental Impact Statement
Ka'ohe, Hamakua District, Hawai'i
TMK: 4-4-15:09,12

Please be informed that I support the development of a Mauna Kea Science Reserve. I am especially in favor of the proposed "daisy chain" project. Although I am not an expert in EIS analysis I do not believe the development would pose much of a problem to the environment of the Mauna Kea Reserve and that Draft EIS Mauna Kea Science Reserve R Master plan does not appear to be in violation of HRS rules nor Administrative Rules. I saw the plan at the Bond Memorial Library in North Kohala.

Mahalo and Sincerely,

Alexa Russell

cc: State of Hawai'i, Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, HI 96813
Att: Genevieve Salmonson, Director

Group 70 International, Inc.
925 Bethel Street, 5th Floor
Honolulu, HI 96813-4307
Att: Jeffrey Overton, AICP

December 27, 1999

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Stuart M. Jow, AIA

Mrs. Alexa Russell
P.O. Box 1132
Kapaau, HI 96755

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Mrs. Russell:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of September 20, 1999.

Your support for the Mauna Kea Science Reserve Master Plan is noted. We appreciate your recognition that the project will not pose environmental problems.

The project you refer to as the "daisy chain" is most likely the planned optical/infrared interferometer. The light-combining technology for this type of observatory has yet to be fully developed, so this type of facility cannot be constructed at Mauna Kea until the fiber optics science is advanced. Therefore, this observatory is included in the plan only as a general area within the Astronomy Precinct. The facility would require an amendment to the plan if it is proposed to be built in the next 20 years.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

December 27, 1999

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Stuart M. Jow, AIA

Mr. George Russell
P.O. Box 1132
Kapaau, HI 96755

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Mr. Russell:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of September 20, 1999.

Your support for the Mauna Kea Science Reserve Master Plan is noted. We appreciate your recognition that the project will not pose environmental problems.

The project you refer to as the "daisy chain" is most likely the planned optical/infrared interferometer. The light-combining technology for this type of observatory has yet to be fully developed, so this type of facility cannot be constructed at Mauna Kea until the fiber optics science is advanced. Therefore, this observatory is included in the plan only as a general area within the Astronomy Precinct. The facility would require an amendment to the plan if it is proposed to be built in the next 20 years.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

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OCT 22 1999
GROUP 70

October 19, 1999
428 Auwae Road
Hilo, Hawaii 96720

Mr. Jeff Overton
Group 70
925 Bethel Street, 5th Floor
Honolulu, Hawaii 96813

Dear Mr. Overton:

To many Native Hawaiians Mauna Kea is like a virgin that has been violated; they do not have an untouched holy ground at Mauna Kea. As they worship there under Mauna Kea's present condition, they inwardly cry to Akua for forgiveness for the loss of Mauna Kea's virginity. Further telescopic structural development would so adulterate and desecrate it that Native Hawaiians could no longer consider it holy ground.

On the other hand, there is a need for further research into the unknown. We need to learn more about the universe and ourselves. ***Before new structures are added we must maximize usage of the present telescopic structures on Mauna Kea, thus learning more from what we have without incurring further damage to this holy ground.*** In addition, there is a possibility that telescopic research on Mauna Kea will become obsolete in view of the fast pace of technological advancements today. Examples which are occurred recently are: research on improving the Hubbel telescope, the usage of other sites for telescopes, and wider usage of communication rockets fired from former floating oil rigs. These or other technological advancements could obliterate the use of telescopic structures on Mount Mauna Kea.

In view of these needs of Native Hawaiians and science on Mauna Kea, I strongly support a 10 year moratorium on development of new telescopic structures on Mauna Kea.

Sincerely yours,

Tuck Wah K. Lee

(Rev.) Tuck Wah K. Lee

December 27, 1999

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Rev. Tuck Wah K. Lee
428 Auwae Road
Hilo, HI 96720

Subject: **Mauna Kea Science Reserve Master Plan**
Responses to Comments on the Draft Environmental Impact Statement

Dear Rev. Lee:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter received on October 19, 1999.

Preservation of Cultural Landscape

The cultural significance of Mauna Kea to the native Hawaiians is very well recognized in the Master Plan and EIS documents. We believe there needs to be a much more sensitive approach to the cultural values in the future use of the mountain for research, education and recreation. The current Master Plan now sets aside over 95% of the Science Reserve (over 10,000 acres) for a cultural and environmental preserve. It preserves all the *pu'u* landforms and *ahu* shrines which are so important to the cultural landscape. The plan strictly limits new uses to less visible sites, away from sensitive cultural sites, and designed to limit their visibility using colors that blend with the surrounding area. The problems of the past will also be corrected through an improved management program based in Hilo, which will involve advisors from the community and a *kahu/kupuna* advisory committee for cultural matters.

Use of Existing Telescopes

Technology is advancing rapidly in the field of astronomy, and you are correct that certain types of instruments may become obsolete in the future. The older instruments at Mauna Kea, such as the UH 2.2m telescope, are prime candidates for redevelopment. The master plan prioritizes redevelopment of facilities above all other types of observatory development. There is a directive in the plan to first attempt siting telescopes at one of the existing facility sites, rather than building at a new location. This priority will minimize the effects of observatory construction upon the environment of Mauna Kea. There will always be a need for ground-based observatories to complement the future space-based telescopes, and Mauna Kea will remain as the premier location for the ground-based instruments. Telescopes built at sea level would not perform well due to the atmospheric interference.

Development Schedule

A moratorium on the development of new telescopes would essentially leave Mauna Kea behind in the evolution of astronomy facilities. Projects that are funded and ready to be built in the next decade would go to another location. The benefits created in our

community would also be carried elsewhere, such as jobs, expenditures and educational programs. Eventually, it will not be Mauna Kea that is the world's astronomy center, rather it will be some other place. At that point, it will be very hard if not impossible for Mauna Kea to recapture its pre-eminent position.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

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OCT 27 1999
GROUP 70

Hilo, Hi
10-14-99

TO: JEFF OVERTON, — OFFICE OF ENVIRONMENTAL
GROUP 70. QUALITY CONTROL,
HONOLULU, HI.

ALLAN AH SAN, —
UNIVERSITY OF HAWAII OTHERS

FROM: GENESIS LEE LOY
NATIVE HAWAIIAN

SUBJECT: MAUNA KEA SCIENCE RESERVE DEVELOPMENT

I object to Group 70's method of coming into a Hawaiian community uninvited and unannounced. I, a kupuna, was not invited so I'll say my piece and ask the questions.

The Federal Acts that follow, which deal with Mauna Kea and its environs, list FOR ME the studies and conclusions reached that were conducted in a manner so as to comply with the basic guidelines and requirements of the following: (a) the antiquities act of 1906, as amended (16 U.S.C. 431-433); (b) the Historic Sites act of 1935, as amended, (16 U.S.C. 461-467); (c) the national Historic Preservation act of 1966, as amended (16 U.S.C 470 [note sections 106, 110, 111, 112, and 402]); (d) the National Environmental Policy act of 1969, as amended (U.S.C. 4321-4347); (e) the Advisory Council on Historic Preservations "Guidelines for Consideration of Traditional Cultural Values in Historic Preservation review" of 1985 (ARCHP 1985);

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CONT

(f) the Native American Graves Protection and Reparation Act (NAGPRA) 1990, as amended (25 U.S.C. 3001).

again, what were the studies or what studies were made and conclusions reached and list them for me in all the categories enumerated; (b) why are you building on and in our sacred sites, and in so doing how will you protect our cultural and intellectual rights and properties?

The National Register Bulletin 38 (Parker and King 1990) lists The Guide Lines for Evaluating and Documenting Traditional cultural Properties. May I see the evaluations? (b) are you documenting the various properties? (c) how do you propose to let us know of your responsibilities to them?

Under the Hawaii State Historic Preservation Statute (chapter 6E) how do you propose to let me and the Hawaiian know what you are doing on our sacred mountain? This is asked because of Group 70's and the University of Hawaii policy of limiting testimony only to our Hawaii Island, and in Keaukaha here to-nite, Oct 14, 1999, the Hawaiian Community of Hawaii objects to this obscure and secret behavior.

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And what are the University's plans to restore the habitat of the rare and endangered Wekiu insect? restore the destroyed graves, ahu markers, the trails?

Please provide me the answers to my questions)

Genesis Namakaokalani
Lee Loy
510 Auwae Rd
Hilo, Hi 96720

copies to
Hawaii State, Dept of Land and Natural Resource
Office of Senator Akaka, U.S. Congress
United Nations (UNHCHR)

December 27, 1999

GROUP 70
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Francis S. Oda, AIA, AICP
Norman G.Y. Hong, AIA
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Jeffrey H. Overton, AICP
Kathryn A. Nam
Roy A. Inouye, AIA, CSI
Frank B. McCue, RA
Christine M. Ruotola, AICP
Stuart M. Jow, AIA

Mr. Genesis Lee Loy
510 Auwae Road
Hilo, HI 96720

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Mr. Lee Loy:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter received on October 27, 1999.

Hawaiian Community

Group 70 International, Inc. has worked with representatives of the Hawaiian community on most of it planning projects since formation in 1971. On the island of Hawaii especially, Group 70 has worked closely with Hawaiian interests to prepare land use plans and environmental documents which help to protect and preserve Hawaiian cultural resources. As consultants to the University, Group 70 was asked to again work closely with native Hawaiian interests to address concerns over the current management and future planning for Mauna Kea

Federal Acts

Several of the Federal acts that you listed are relevant to the Mauna Kea Science Reserve and the current master planning process and supporting consutlant studies. Historic, archaeological and cultural research was conducted by consultants and researchers Patrick McCoy, Ph.D., Holly McEldowney, Ph.D., Paul Rosendahl, Ph.D. and Kepa Maly. These studies relate to guidelines and requirements of the four Federal acts you have cited on historic preservation guidelines and procedures. The National Environmental Policy Act of 1969 applies to federally funded individual projects such as the Keck Outriggers.

The findings of DLNR point to the creation of an Historic District for the summit region, which would allow for future observatory development without diminishing the integrity of the district as a whole. The Maly report stated that further astronomy development at the summit would be inappropriate. The overall conclusions of the consultant and researcher studies showed that the historic integrity and cultural significance of the Mauna Kea Science Reserve, and the summit area in particular, would not be diminished with the mitigation measures proposed in the new Master Plan and Management Plan.

Traditional Cultural Properties.

The Master Plan and EIS do address the potential for portions of the Science Reserve to qualify as TCP's under the criteria set forth in National Register Bulletin 38. The

findings of the expert researcher Dr. McEldowney indicate that Kukahau'ula and Lilinoe represent potential TCP's as does Waiau in the Natural Area Reserve. The DLNR plans to address these sites in their Historic Preservation Plan, which is currently in preparation. DLNR's Historic Preservation Plan is due to be completed by spring 2000.

Testimony at Public Meetings.

The public has had ample opportunity to offer their testimony at over 12 public meetings held at 3 different locations on Hawaii Island over the past year. There is no policy of limiting testimony.

Wekiu Bug Habitat, Graves, Markers and Trails.

Under the new Master Plan, the Wekiu bug habitat will be preserved. There are no known recorded graves that currently exist or previously existed in the summit region. There are some burials identified at one location nearly one mile from the summit, and there are reports of burials in the NARS area. There has been no evidence of burials, historical markers or historic trails being destroyed in the Science Reserve. We would appreciate any further information on these subjects.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

RECEIVED AS FOLLOWS

1. What does ceded lands mean?
2. What year was Mauna Kea declared ceded lands, by Whom?

I am concerned about the further development of Mauna Kea Science Reserve as described in the Master Plan - Draft Environmental Impact Statement.

3. What was the source of obtaining it?
4. Were the ceded lands for the Hawaiians or the general Public?
5. Are they conservation lands? If so, why are they going hog wild using it for other purposes?
6. Is DLNL the Trustee, mandated to protect the lands & not exploit it?

Please let me know the answer to my question(s).

7. How are they protecting it?
8. Who is being paid for use of the land?
9. How much, by whom, length of duration?

Kupuna Native Hawaiian

Signed, Elizabeth G. L. Lee Loy
Print Name 510 Auwae Rd.
Address Hilo, Hi. 96720

Aren't you erodin a significant part of our Hawaiian History & culture?

I am concerned about the further development of Mauna Kea Science Reserve as described in the Master Plan - Draft Environmental Impact Statement.

1. Why are you in such a rush? 2. Why can't you comply with a moratorium? 3. Scientists are not always right, example, satelite disastor on Mars to the tune of 245 million. Why? Scientists, astronomers please pay attention! question their prudence, integrity, honesty? Can I trust & have faith in them. Their effortless, short-sighted plan & track record? How will your plan impact & protect Mauna Loa? Do they clean up after themselves? Where is all the human waste, garbage, being stored?

Please let me know the answer to my question(s).

Kupuna

Signed, Elizabeth G. L. Lee Loy
Print Name Elizabeth G. L. LEE Loy
Address 510 Auwae Rd.
Hilo, Hi. 96720

RECEIVED AS FOLLOWS

1. Did payments for the use of Mauna Kea lands start 30 years ago when the first telescopes were built? How much, to whom?
2. What countries own the telescopes on Mauna Kea?

I am concerned about the further development of Mauna Kea Science Reserve as described in the Master Plan - Draft Environmental Impact Statement.

3. How deep down into the earth is required, to install support, anchor, secure, the facilities on the ground?
4. Isn't this too risky & fragile? Could it repeat another disaster like accident at Sacred Falls on Oahu?
5. What guarantee can you provide us, assure us, that what you are doing is sane, safe for use & the environment?

Please let me know the answer to my question(s).

Respectfully,
Signed, Elizabeth G. L. Lee Loy
Print Name Elizabeth G. L. LEE LOY
Address 510 Auwae Rd.
Hilo, Hi. 96720

6. How many DLNR staff are in the controlling decision body? 7. How many are Hawaiians?

1. How many University Bd. of Regents in decision control? How many are Hawaiians?
2. Who else is involved in the authority, decision body?

I am concerned about the further development of Mauna Kea Science Reserve as described in the Master Plan - Draft Environmental Impact Statement.

3. What is the source of funding? By whom, how much?
4. Have you invited the Hawaiians & environmentalists to all your meetings?
5. Is everyone voting well informed on the subject? What is the expertise?
6. Mauna Kea is a sacred & spiritual place, for the Hawaiians. How does astronomy & telescopes related or are relevant? 7. Would the Hawaiians be allowed to go to Arlington National Cemetary, to dig up the bones

Please let me know the answer to my question(s).

Signed, Elizabeth G. L. Lee Loy
Print Name Elizabeth G. L. LEE LOY
Address 510 Auwae Rd - Hilo, Hi. 96720

rearrange the landscape & alter the topography Malama Ka 'Aina. You are doing a grave disservice & travesty.

RECEIVED AS FOLLOWS

I am concerned about the further development of Mauna Kea Science Reserve as described in the Master Plan - Draft Environmental Impact Statement.

As a Hawaiian Kupuna, I vehemently oppose to anymore harm, damage, evil on our Sacred Mountain. Stop being so greedy - Premeditated continued devastation, is a Criminal act of aggression, abuse, disrespect, rude, bad manners, intrusive intimidating, the vulnerable Hawaiians who have been taken advantage of, overpower.

Please let me know the answer to my question(s)

How will astronomy help alleviate all the suffering, misery to Kupuna & Mankind instead of star gazing?

Signed, Elizabeth G. L. Lee Loy

Print Name Elizabeth G. L. LEE LOY

Address 510 Auwae Rd.
Hilo, Hi. 96720

Question: Isn't Mauna Kea Sacred to the Hawaiians? Why aren't you skirting around & in violation of the National Graves Act?

December 17, 1999

GROUP 70
INTERNATIONAL

Francis S. Oda, AIA, AICP
Norman G.Y. Hong, AIA
Sheryl B. Seaman, AIA, ASID
Hitoshi Hida, AIA
Roy H. Nihei, AIA, CSI
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Frank B. McCue, RA
Christine M. Ruotola, AICP
Stuart M. Jow, AIA

Elizabeth G. L. Loy
510 Auwae Road
Hilo, HI 96720

Subject: **Mauna Kea Science Reserve Master Plan**
Responses to Comments on the Draft Environmental Impact Statement

Dear Ms. Loy:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your five postcards received in October 1999.

Hawaiian Culture

The updated Master Plan and Management Plan for Mauna Kea Science Reserve takes dramatic steps to correct the improper activities of the past with respect to Hawaiian cultural respect. None of the currently undeveloped cinder cones will be affected by new development. All shrines and known burials will be avoided. There have been no violations of the NGPRA. Activity involving cultural sites will be managed through on-mountain rangers. The plan is not intended to erode the past, rather the plan would result in protection of the past through preservation areas and active management.

Development Proposals

There is no moratorium on development at Mauna Kea Science reserve. There will be no new construction until the new Master Plan and Management Plan is adopted by the Board of Regents. The only projects that are currently under construction are those which have received permits.

Waste and Garbage

Wastes generated within the Science Reserve are collected within each observatory and transported off the mountain for proper disposal. There has been some construction trash that has been blown from work sites. This material has been cleaned up, and this type of problem will not be allowed to continue in the future.

UH Board of Regents and BLNR

There are 12 Regents and one Regent is a native Hawaiian. The other decision-making body is the Board of Land and Natural Resources. There are part Hawaiian members of the Board. These decision-makers are very well informed.

Funding

Funding for individual observatories is from universities, private foundations and science agencies. The most expensive facility that has been constructed on Mauna Kea

is the Subaru Observatory (National Astronomy Organization of Japan) which cost approximately $225 million.

Meeting Attendance

All public meetings have been open and were attended by both Hawaiians and environmentalists. The Mauna Kea Advisory Committee was selected by President Mortimer and met as a Committee which was not subject to the Sunshine law. The Advisory Committee chose to have several public meetings to provide community input.

Sacred Nature of Mauna Kea

The astronomy community is very well informed about the sacred nature of Mauna Kea to the native Hawaiian people. The information shared in the public process this past year and the results of studies have increased their understanding and respect for the culture.

Even thought there has been excavation and alteration of topography, the sites were completely survey by professional archaeologists prior to construction, and there were no remains found. In addition, there has been no known record of bones being removed from observatory development sites.

We do not believe that people are allowed to go to National Cemeteries to dig up remains. Nor are people allowed to dig up remains at Mauna Kea, and this has not happened to our knowledge. If this has happened, as some claim, there needs to be some type of evidence (e.g. record such as an official report to the State, a photograph, a journal log, etc.) that can support the claim.

Ceded Lands and Conservation Lands

As we understand, ceded lands were lands that originally belonged to the Hawaiian government and kingdom that were taken by the territorial government at the time of overthrow and annexation. With regard to ceded lands, the University recognizes that they have an educational exemption (Hawai'i Revised Statutes, 10-2) and that the land contained in the Mauna Kea Science Reserve is not being used for commercial development. The educational exemption and larger ceded land issues are a State-wide concern and the Governor is addressing trust obligations to the native Hawaiian community and the general public.

There is no interest in diminishing the rights of native Hawaiians to access and utilize the land on Mauna Kea. Instead, the Master Plan includes no restriction on traditional access for Hawaiian cultural and religious purposes.

The Mauna Kea Science Reserve is also designated as State Conservation District lands, which allows for astronomy observatories with an approved management plan. The Master Plan is a comprehensive document which will keep the development of observatories in balance with the primary values of the conservation district resource values.

The Board of Land and Natural Resources is the decision-making authority for these lands. There are rules which allow for astronomy observatories to be constructed with

approved management plans. There is no payment to the State for the use of these lands, rather the University benefits by receiving viewing time on the instruments in the Science Reserve. The Science Reserve lease is a 65-year lease with the State Board of Land and Natural Resources.

Countries with Instruments on Mauna Kea

The countries with partial or whole ownership of observatories at Mauna Kea include the Netherlands, Japan, Canada, France, Taiwan, the United Kingdom, Argentina, Brazil, Chile, Australia and the United States.

Excavation Safety and Environmental Risk

The amount of excavation required for the telescopes varies by location. The construction of the Keck Observatory extends approximately 20 feet below grade. The facility is built on a broadly spread slab foundation which is very stable. There is no potential for landslides to result from the excavation involved at the telescope sites. The Canada France Hawaii facility has been at its current location for over 25 years and has not seen evidence of sliding or foundation failure.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

I am concerned about the further development of Mauna Kea Science Reserve as described in the Master Plan - Draft Environmental Impact Statement.

(!) BEFORE YOU STARTED TO BUILD WHAT HAPPEN TO TO ALL MY ANCESTORS THAT WAS BURIED ON THE MOUNTAIN WHERE THE JAPAN DOME IS BUILD NOW?

(@) WHAT DID YOU DO WITH MY ANCESTORS? I DEMAND THATX THAT ALL OF THE BONES AND I WANT THEM NOW AND YOU GET THEM TO ME(300) OF THEM I WANT NOW ANY OF THEM MISSING I HOLD YOU AND ALL OF YOU JAPAN DOMES AND THE REST OF THE OTHER DOMES.

Please let me know the answer to my question(s).

Hannah Wahinemaikai O Kaahumanu Keliiulanani

Signed, Ole O Kalama (Kane) Reeve

Print Name

Address P.O. BX 844

Kailua, Kona, Hi 96740

I am concerned about the further development of Mauna Kea Science Reserve as described in the Master Plan - Draft Environmental Impact Statement.

(1) WHAT DID YOU DO WITH THE BONES?

(2) WHO GAVE YOU THE AUHTORIY TO REMOVED THEM?

(3) WHERE IS THE MARKERS I WANTS THEM ALL OF IT WHO HAVE THE MARKERS AND WHAT AUTHORITY DO YOU TO REMOVED?

(4) DID YOU CONTACT ALL OF THE FAMILIES OF THE MOUNTAIN MAUNA KEA? (Relations)

Please let me know the answer to my question(s).

Hannah Wahinemaikai O Kaahumanu Keliiulanani

Signed, Ole O Kalama Kane Reeve

Print Name

Address P.O. BX 844

Kailua, Kona, Hi 96740

RECEIVED AS FOLLOWS

I am concerned about the further development of Mauna Kea Science Reserve as described in the Master Plan - Draft Environmental Impact Statement.

(1) I AM THE DIRECT DESCENDANTS AND OWNER OF MAUNAKE AND ALL THE AUPUAA MY FAMILIES IS CONNECTED. DID YOU TRY TO FIND THE OWNERS? IT TIME TO TRUTHFUL TO YOUR_ SELF IT TIME TO BE HONEST. DONT YOU THINK SO?

SINCE THE APOLOGY OF THE PRESIDENT OF YTHE U.S.A. ALL OF THE GOS BACK TO THE HAWAIIANS RIGHT?

MAUNA KEA_ IS THE MOST SARED MOUNTION WHY DIRTY THE LANDS NO IT TIME TO MAKE RIGHT????????

Please let me know the answer to my question(s).

Hannah Wahinemaikai O Kaahumanu Keliiula

Signed, Naniole O Kalama Kane Reeve

Print Name

Address P.O. BX 844

Kailua, Kona, Hi 96740

I am concerned about the further development of Mauna Kea Science Reserve as described in the Master Plan - Draft Environmental Impact Statement.

(1)WHEN REMOVING OF THE BONES WAS THE HISTORIC PRESERVATION ACT WS INVOLVED?

WHAT ARE THEIR NAMES?

WHO GAVE THEM AUTHORITY OVER OUR ANCESTORS?

(2) WHY WAS THE HISTORIC AREA AND CULTURAL AREA WA NEGLECTED AND NOT CARE FOR????

(3) WHO GAVE YOU THE LEASE OF THE LANDS?

($4) HOW DID ~~MESS IN~~ you REMOVING THE ROCKS FROM THE AND TAKE SOMEWHERE?

Please let me know the answer to my question(s).

Hannah Wahinemaikai O Kaahumanu Keliiula

Signed, Naniole O Kalama Kane Reeve

Print Name

Address P.O. BX 844

Kailua, Kona, Hi 96740

RECEIVED AS FOLLOWS

I am concerned about the further development of Mauna Kea Science Reserve as described in the Master Plan - Draft Environmental Impact Statement.

(1) I DO NOT KNOW YOUR WHITE MAN LAW I DID NOT KNOW THAT I HAD TO SUBMIT AWRITTENSTATEMENTS TO QUALIFY ME TO APPEAL I SAY IT A DISCRIMINATIONS WHY? I DONT KNOW THE LAWW THIS IS HAWAII I AM 100% HAWAIIAN AND I HAVE RIGHTS SHOW ME YOUR.

WHAT IS YOUR BOOKS SAY???????

Please let me know the answer to my question(s).

Hannah Wahinemaikai O Kaahumanu Keliiulanani

Signed Naniole O Kalama Kane Reeve

Print Name

Address P.O. BX 844

Kailua, Kona, Hi

96740

I am concerned about the further development of Mauna Kea Science Reserve as described in the Master Plan - Draft Environmental Impact Statement.

1. WHERE IS HAWAII LOA,S BONES ?

(2) HAWAII LOA BONES WAS REMOVED FROM THE MOUNTAIN WHERE JAPANS DOME IS BUILD WHERE THE BONES ? I MUST RETURN IT BACK TO WHERE IT BELONG THE RESTING PLACE.

(3) HOW MANY OF THE BONES WAS REMOVED?

(4) WHO GAVE YOU THE AUTORITY TO TAKE? AND WHO HAVE IT? AND WHATM THEIR NAMES ?

Please let me know the answer to my question(s).

Hannah Wahinemaikai O Kaahumanu Keliiulanani

Signed, Ole O Kalama Kane Reeve

Print Name

Address P.O. BX 844

Kailua, Kona, Hi 96740

I am concerned about the further development of Mauna Kea Science Reserve as described in the Master Plan - Draft Environmental Impact Statement.

(1) DID YOU HAVE A TITLE SEARCH ON ALL THE AUPUHA?

2. HAVE YOU CONTACTED ALL OF THE HEERS OF THE LANDS?

DID YOU KNOW THAT THE HAWAIIANS OWN THE LANDS BEFORE WHITE MAN CAME HERE?

4. THE UNITED STATES DO NOT OWN THE LANDS NOT EVEN YOU HAVE RIGHTS TO THE LANDS DID YOU CHECK WITH PRESIDENT OF THE UNITED STATES?

5. DO YOU KNOW THAT YOU ARE INVIOLATIONS? BECAUSE OF OVERTHROWN OF THE KINGDOM OF HI?

Please let me know the answer to my question(s).

Hannah Wahinemaikai O Kaahumanu Keliiulanani Ole O Kalama Kane Reeve

Signed

Print Name

Address P.O. BX 844

Kailua, Kona, Hi 96740

December 27, 1999

GROUP 70
INTERNATIONAL

Francis S. Oda, AIA, AICP
Norman G.Y. Hong, AIA
Sheryl B. Seaman, AIA, ASID
Hitoshi Hida, AIA
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Frank B. McCue, RA
Christine M. Ruotola, AICP
Stuart M. Jow, AIA

Hanna Wahinemaikai o Ka'ahumanu Keli'iulanui Naniole o Kalama Kane Reeves
P.O. Box 844
Kailua Kona, HI 96740

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Ms. Reeves:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your seven postcards received in October 1999.

Burials and Markers

To the best of our knowledge, there have been no burials found in the area of the summit cinder cone complex known as Kukahau'ula. This area was intensively surveyed for archaeological and cultural remains in advance of telescope construction. There are some burials identified at one location nearly one mile from the summit, and there are reports of possible burials in the NARS area.

In particular, the more recently constructed telescopes have had intensive site surveys for cultural material. The Subaru telescope site was very closely studied, and there were no archaeological findings. The excavation for the foundations did not uncover any cultural remains. There were no bones removed and there is no record of burials being uncovered at any of the observatory locations. In addition, there were no markers found or removed.

There has been no evidence of burials or historical markers being destroyed in the Science Reserve. We would appreciate any further information on these subjects.

Contact with Families and Individuals With Ties to Mauna Kea

In 1998, during the preparation of the historical documentation and oral histories, Kepa Maly made advertisements in the local and State-wide newspapers attempting to make contact with people claiming personal or family ties to the mountain. There were only one or two responses to this query. Since that time, Mr. Maly sought out and conducted interviews with many families and individuals, and compiled these interviews into an oral histories summary.

Ahupuaa and Hawaiian Lands

There was no title search completed for the entire ahupuaa of Kaohe. There was an effort made to contact relatives and families with ties to the land, as descibed before.

Ceded Lands

Ceded land issues are a State-wide concern that the Governor is presently addressing trust obligations to both the native Hawaiian community and the general public.

Written Comments

Your written comments are part of a formal record of the environmental review process. The questions you raised are addressed in this letter and included with the Final EIS document that is printed, filed with the State, and distributed to the State libraries, relevant government agencies, and concerned citizens.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

RECEIVED AS FOLLOWS

I am concerned about the further development of Mauna Kea Science Reserve as described in the Master Plan - Draft Environmental Impact Statement.

Aloha - My concern for further development of the Mauna Kea Science Reserve is addressed by this SLOGAN of HAWAII NEI. The life of land is perpetuated through Righteous - Ua i ka ea o ka 'āina i ka pono. This message speaks for itself for the people of Hawaii. Is the answer to the above SLOGAN YES OR NO?

Please let me know the answer to my question(s).

Signed, [signature]
Print Name Wiliani T. Evangelista
Address 1840 Aauwe Rd.
Hilo Hi 96720

If yes, how will the development perpetuate the life land through righteous?
If no, then no to the development.

December 27, 1999

GROUP 70
INTERNATIONAL

Francis S. Oda, AIA, AICP
Norman G.Y. Hong, AIA
Sheryl B. Seaman, AIA, ASID
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Kathryn A. Nam
Roy A. Inouye, AIA, CSI
Frank B. McCue, RA
Christine M. Ruotola, AICP
Stuart M. Jow, AIA

Ululani T. Evangelista
1840 Auwae Road
Hilo, HI 96720

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Ms. Evangelista:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your postcard received in October 1999.

We believe that the Master Plan is a balanced approach to address the many issues and concerns that exist today at Mauna Kea. The preservation of the cultural resources atop Mauna Kea cannot occur without planning and management. This means a physical plan is needed to protect the pu'u and shrines and habitats. It also takes financial resources to prepare such a plan, including surveys, maps, studies, etc. There would be a need for such a plan for Mauna Kea to protect its future, and astronomy has provided the resources to complete such a plan. Astronomy development will be strictly controlled in the new Master Plan, to protect the resources of Mauna Kea.

People, both Hawaiians and non-Hawaiians, will be visiting Mauna Kea in the future. To protect the resources of this mountain, a well-planned management program is needed. The University will now fund and implement an ongoing management program that is Hilo-based, involving the local community and especially the Hawaiian community.

With the new physical plan and management plan in place, we believe the outcome will help perpetuate the life of the land. Of course there will be a continued use of the summit area for astronomy research, and it will need to grow with a much greater respect for the land and its native people. With the continued involvement of the community in the planning and management effort, the outcome will favor a balanced future.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

RECEIVED AS FOLLOWS

Mauna Kea!

Oct. 19, 1999

99 OC 28 P3:12

Mr. Eugene S. Imai
Senior Vice President
for Administration
University of Hawaii
2444 Dole St. Bachman Hall 112
Honolulu, Hawaii 96822

Elcanen K. Ahuna
171 King Ave.
Hilo, Hawaii 96720

Re: Mauna Kea Science Reserve Master Plan, UH Hilo, Kaohe Hamakua, District of Hawaii, TMK 4-4-15:09, 12

Dear Sir,

Thank you for allowing us to share our comments and concerns with the University of Hawaii Administration, Group 70, the Scientific Consortium that all share a great desire to further develop the Science Reserve at the summit of Mauna Kea into the near future, and as such the Master Plan for development there, a strong desire to do so with no limitation on a time frame.

I am a native Hawaiian, a Kapuna very concerned about the use of our beautiful mountain as an "outpost" so to speak, here in Hawaii for all the interests of many countries who find our home land so "perfectly" situated in this whole wide world, for development of a very prestigious, world class Astronomical Reserve Complex on the very summit of our beloved Mauna Kea.

RECEIVED AS FOLLOWS

I read with great interest and concern for all the Kupuna who speak of their spiritual connection to their ancestors, for whom they have placed place of meditation and honor to their memory, where they go to, to praise and thank Ke Akua for all they appreciate. This is a history that lives on in the hearts of many ohana who hold deep Aloha and honor for their departed ohana and for the sacredness of Mauna Kea for its very hallowed presence.

I, personally, have had no connection to Mauna Kea myself, however, I feel very strongly that my forefathers traveled from Puna, Kaii, Kona, Kohala and Hamakua and Hilo to Mauna Kea to worship and gather their share of "pahaku" from Keana Kakoi for their Koi, so necessary in their lifestyle then.

My strong convictions as to the sacredness of Mauna Kea, does not come from my experiences there. Like I said earlier, I have none. My deepest statement comes from what I feel very strongly. Mauna Kea is a sentinel, a Tower of Strength and Humility if you could follow my thoughts.

When our first Kupuna Kahiko, Our Ancestors first came to Hawaii, Mauna Kea was their Tower of Joy. How grateful they must have been to see Mauna Kea from far off at sea and know that they were indeed almost there. No one has yet pinpointed where our Kupuna came from with an agreement. I believe, however that they were a special chosen people led here by divine direction and protection, to be separated from the world, to be taught by their Heavenly Father, to live in perfect isolation on purpose - To teach them to be obedient, to love him,

RECEIVED AS FOLLOWS

to learn of His Love, to love one another and to learn the very important lessons of survival all by themselves, seperated from the world and to live together caring for one another.

They learned the lessons of righteous living, of helping each other. They mastered the agricultural and ocean planting and fishing seasons and tides, weather and moon schedules for planting, fishing navigation, astronomy, astrology, conservation, environmental and land use stewardship. They created their own needs from the natural resources available. You see they revered the land and the ocean - from the mountains to the sea - and into the ocean deeps.

Before others arrived from the South, our Kupuna were law abiding, very industrious, very intelligent people. They had learned the truth of their existence and taught to be self sufficient and were honorable people.

The spiritual strength has always been the strongest trait, an attribute of our people. Still instilled in our very being, is that very deep sense of "Abha Ke Akua" - God is Love, or Love God.

The land, the sea, the forests, the plains, the entire expanse of Hawaii is sacred. It is still strongly felt because we all know that land is our bond to Ke Akua that we can see and feel and live and work on. It bonds us to a very commitment to be strongly possessive of aina that is ours.

Mauna Kea is the Tower of Strength - The Spiritual

3.

RECEIVED AS FOLLOWS

Every country claims their connection to its mountain Hawaiians more so, does so very deeply.

When a Kupuna declares to his family to scatter his ashes on Mauna Kea, he has the right to do so from his historic affinity to the site. It is very meaningful to him. It is his closest goal to Heaven, and he shall be in company with his Kupuna there long before him.

The Master Plan does not clearly state what they shall do specifically because it says that they "may add or change their development plans in the future to suit the situations facing them then".

The cultural presentation addresses the shrines the ahu(s) the flora & fauna, the historical sites and the plans to not site the development where such places shall be impacted. Yet, the plan paints a picture of development that, of necessity shall have some adverse impact on some of the prime, or other cultural sites.

To me, the greatest sacrilege has already occurred. The present roadway and observatories sited to on the ridge of the summit of Kukahauula was a terrible act of ~~[illegible]~~ Aaa ogan ce! That crater stands at the 13,825 ft. elevation, seventy (70) ft. higher than 13,755, and bearing the already constructed observatories and roadways. That was not poro. That crater must be the life giving prime to our island of Hawaii!!

RECEIVED AS FOLLOWS

You, perhaps, wished for the best site to construct your facilities on, and did so.

It is sad that at the time of its original inception, ~~in~~adequate cultural input was not shared and if it had been, insufficient cultural knowledge was lacking - sorely.

To construct roadways on the very ridges of that crater upon which they run and to have constructed those facilities sited on the outside rims of that same crater, to me, was a commission of the greatest ~~and~~ disregard to the land as it presented itself to the original planners and architects of the Mauna Kea Science Reserve.

To me it was a great commission of sacriledge! That action paid no attention to the fact that the crater was the "Piko" the source of life with its connection to the very foundation of life for our island, the source of the "Land" birthing lava that oriented and flowed freely ~~up and~~ downslope to create our lovely, beautiful, gentle, kind mountain and island so coveted

RECEIVED AS FOLLOWS

by the scientific world for their studies in Astronomy. For the sake of science, we Hawaiians find ourselves again in opposition to the world this time, who wish to come to our mountain.

Normally, we welcome the world to come visit us and enjoy what we know Hawaii is — a haven for a tired, worn out world. We welcome all who come to rest, relax, rejuvenate and ~~and~~ wish to live if they can. However, when a sixty five year lease, at its midterm now, wishes to be ~~extended~~ renewed to further intense study of the Universe and possibilities of more foreign countries ~~contemplating~~ contemplating further study results already being done by French astronomers, that thought and many others cause great concern.

We lost Hawaii a hundred years ago — We are certainly not about to see any hint of that possibility occur in our time or our children's future.

In essence, we want to, we need to save our mountain for our future

RECEIVED AS FOLLOWS

generations. They need to be able to enjoy their Kina, the way it was.

We need to do this for ourselves too so that we shall know that even though we are thirty years late, we ~~we~~ are able to share real honest concerns of our people with the scientific community.

The entire mountain is sacred. I know you have heard all the testimonies of our people speaking of their sites and stone shrines where they honor their aumakua, their forefathers and Te Akua. I have a feeling these words are part of your vocabulary today too.

I have no such site or shrine there. I have physically never ~~touched~~ touched these hallowed grounds at the summit. I reached the heights where snow was plentiful when we took our children only once to snow slide on cardboard boxes and enjoyed that lovely warm day in the snow. It was a wonderful experience. It was about 11,000 - 12,000 ft area. Wonderful experience.

RECEIVED AS FOLLOWS

Mauna Kea is precious! She is priceless! She must remain the tower of strength for us in God's own way, not in Mauna way.

In conclusion, although more thoughts crowd my completion here, please know these facts.

1. Hawaiians are very unhappy on what is happening in Hawaii re Mauna Kea.

2. Plans are made before telling writes us as a people of the land.

3. We have a strong sad feeling that even as we oppose in testimony, verbal or written, your plans shall still prevail.

4. We worry about what may be a sad consequence of all of this history of Y.H.O.'s desire to expand the scientific area and be a magnet for more foreign connections and even maybe military plans from research from these discoveries from Mauna Kea. Can you see what could happen? ~~Happy~~ Please think carefully about the program. We see it ~~as~~ as a warning to you

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and to ourselves, and we have very adamantly said, in unison,

STOP THE EXPANSION!!!

Recycle what you must. No new sites! No camouflaging! It creates another danger.

Please answer my question. I shall be sure to share them with our people.

I do this very humbly but with a very strong conviction and understanding of what the E.I.S. Draft says and further implies. We are very unhappy with it - with the very thoughts of further expansion -

STOP!!!

Sincerely,

Eleanor K. Hanna
Kayuna

171 King Ave.
Hilo, Hi. 96720

RECEIVED AS FOLLOWS

xc: Bob McLaren
Jeff Overton

'99 OCT 28 P3:14

Questions for the Scientists

1. Kind sir, please tell us what your purposes are in searching for off into the depths of the Universe created ~~by one~~ with perfect harmony in their existence presently?

2. And when you discover some exciting "newness" that may never have been ~~found~~ recorded before, have you somehow discovered why they "were never" in sight" before, and what impact that discovery has on mankind and the Universe?

3. Have you found the Universe to be as the scientists of old have recorded them to be, and are they in truth, in their own harmonious course, each as they were originally organized? and are they on their special path without question?

4. What truths have you discovered in the Universe that man has not been aware of, ~~and~~ which would at this time or in future generations have great impacts on mankind?

5. I believe that God, our Heavenly Father, created the Heavens and Earth and all within its entirety. Do you share such "truth" too?

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6. Have you found some profound facts in your discoveries that perhaps begs deeper "sciencing" for correction perception?

7. Is one of your mission goals to pierce the heavens in deep space in the Universe, looking for a possibility or many, that perhaps a planet or more may possibly be inhabited.

8. If yes, do you have (all scientists) valid reasons to know that?

9. Are plans earnestly and honestly being made to form colonies on other planets? If so, are your studies of the sciences of the Universe dependable to firmly rely on as being factual and viable?

10. Are these valid reasons why N.T.S.A. has its presence in the Mauna Kea Science Reserve? Are the above 4 questions pertinent to that?

11. If I am correct, presently there are several countries' observatories sited and constructed on Mauna Kea – England, France, Canada, Japan and the United States of course. We read in the Draft E.I.S. Report that "other countries" shall surely want to come to this

RECEIVED AS FOLLOWS

most special, best, choicest spot on Earth to look into the mysteries of Heaven and the Universe's deep space to seek? (What?)

Pray tell us, what great benefits are there in God's great creation, the Universe, the Heavens, the Galaxies the great space that intelligent men such as you, work so persistently with a deep passion of discovering some unrecorded place so far away from earth, and how would those "finds" help mankind in his everyday, normal life - such as is the case today?

12. What "everyday" benefits does Astronomy share with the public - the common everyday working 8-4 - or (whatever hours) who have families still at home, or away those of us who are without the gifts of your "scientific Wisdom"?

13. How does Astronomy find Hawaii to be? Ecologically, environmentally, socially, economically, cross-culturally, intellectually, livelihood, community-friendliness and open disagreement by the host culture to the ~~seemingly~~ strong insensitivity of the State, the

RECEIVED AS FOLLOWS

University of Hawaii, and all involved in the continual development & planned construction of facilities & infrastructure across campus, roadways, public facilities and all that may happen, and even when approved, shall happen, for the sake of more Scientific discoveries by the Astronomers?

Much is happening in the community, more so the Hawaiian Community. I share this with you because you are now doing your business, depending on your best administrators to protect your mission.

You must all know by now the great groundswell of a passionate people over which Mauna Kea towers. We are thirty years late in this situation however, that does not cancel our time now, to document our resistance to and opposition on further development of plans for the Science Reserve on Mauna Kea.

Presently, the infrastructure and community facilities on Mauna Kea ~~presently~~ and historically have committed great acts of ~~[illegible]~~ sacrilege to Mauna Kea.

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It sits there as her ridges support your present Science Reserve and it has been badly abused by you.

Hawaii is a very special place on this earth. We are very grateful to be natives of this beautiful island chain in the middle of this Great Pacific Ocean. You have defiled the sacredness of our grateful Volcano, now dormant for centuries. Every Hawaii looks upon this with sorrow for the Crater there is the very "Piko" for our Islands – It is sad that no consideration was given to this fact. Bad!!

I speak for myself, my family and for the many who do not know their ~~[illegible]~~ ethos yet feel it. I speak for my parents, my Kupuna and for all of my forefathers, and more ~~[illegible]~~ importantly for all of our yet unborn spirits who when they shall look at Mauna Kea, shall see the "falsely camouflaged structures" to be so done to blend into the environment.

It is so sad that such avenues of deceit need to be even thought of.

As the plan is presented, all whom I represent and I soundly say, no further development ~~at~~ on Mauna Kea. STOP !!!

With humble respect, and deep conviction,
Eleanor Kalawaia Ahuna, Kupuna
* "Hawaii Maoli"

5.

December 27, 1999

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Ms. Eleanor K. Ahuna
1717 King Avenue
Hilo, HI 96720

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Ms. Ahuna:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of October 19, 1999.

Sacred Nature of Mauna Kea

We respect your belief in the spiritual nature of Mauna Kea. The cultural values of the Native Hawaiians are now much more a part of the plan for the future of Mauna Kea. Telescopes cannot be built wherever the scientists please. There have been many surveys of the land to map where shrines exist, so they may be avoided from any disturbance. There have been interviews of elders in the Hawaiian community to gain a deeper understanding of the cultural values. The talks with the community have also helped understand the people's perceptions of the past, present and future of astronomy on Mauna Kea. All of this information comes together into a comprehensive plan that integrates the cultural values, environmental resources and astronomy research programs to create a balanced future for the mountain.

Pu'u and Cultural Sites

The Master Plan actions will have no adverse effects on the *pu'u* in the Science reserve and the *ahu* shrines. In fact, these will be given the most highest respect and avoidance from future disturbance. Preservation areas are created to protect these resources from adverse effects.

Preservation of Pu'u Wekiu at Kukahau'ula

The highest point on Mauna Kea is the complex of cinder cones named Kuukahau'ula. We learned that in more recent times, Pu'u Wekiu is a name given to the one highest peak at the summit proper. This cinder cone has no development upon it. There are no roads or building on this *pu'u*. This cinder cone is outside of any future development area, and cannot be used for any astronomy activities.

We know more about the history and cultural meaning of the land at Mauna Kea. There should be no feeling of opposition with the world's astronomy community. Mauna Kea remains the mountain of spiritual meaning for the Hawaiian people, and the international astronomers are now learning about this sacred spiritual value and the respect that must be provided today and in the future.

However, it is not realistic to believe that the world's leading observatory organizations with facilities at this complex will pick up their facilities and leave. Instead, these groups have been brought to a much deeper awareness of the issue, and recognition that the future use of the mountain for astronomy must be done with great care and respect. The Master Plan is the tool to bring this new-found respect and relationship with the Hawaiian people.

Growth of Astronomy at Mauna Kea

The future plans for the summit now take away 95% of the area previously available to astronomers for potential observatory development. This is a major change in direction for the mountain. Over 10,000 acres has essentially been given back to preservation of natural and cultural resources. The cinder cone pu'u that you described are all preserved, as well are all the shrines. Four new telescopes may be built over the next 20 years, but they will be done in a much more sensitive manner, away from the cinder cone ridges and designed to hide in the landscape.

The fact is that the astronomy complex cannot stand still today without becoming a second-rate location. Eventually the values gained by the community would diminish, including the future for our young. Times have changed greatly for the people of Hawaii. No longer can we depend upon the tourist or the plantation to provide our bread and butter. The world is a different place, as much as many of us would have loved it to stand still.

Our children need a tremendous amount of education to just get by in the working world today. In Hawaii island, with over 45% of the families on food stamps, we need to take advantage of the opportunities we are presented with. And Mauna Kea's resource richness also includes its place as the greatest astronomy location in the world. Now, how does this help us for the future? Our children and grandchildren need to learn the trades and knowledge necessary to participate in this new world of technology and science.

The question best asked is how do the two needs and values coexist in harmony with the rest of Hawaii? With the resource of Mauna Kea and the world's astronomy community, maybe we can make our home the best place to focus this knowledge. This means enriching the university campus and programs at Hilo, introducing better science and math programs into the high schools, and leading our young people into the fields of the future. This doesn't preclude them from retaining the values of their culture, instead it allows them to better guide the activities to protect and preserve the past along with a rich future in the next millenium.

Astronomy Purpose

The reason why astronomers peer into space is to answer questions about the Universe surrounding Earth. They ask questions about the planets, the sun, other stars, groups of stars, and the universe as a whole. The discoveries made at the observatories on Mauna Kea have led the world to a much greater understanding about the heavens around us. We have discovered planets orbiting nearby stars, and there is an effort to attempt to discover life forms that may exist on these far away planets.

It begins to take on a very philosophical meaning when we think about how these observations are made and what they are seeing. For instance, the light from the closest stars we see in the night sky took over three years to arrive at the Earth. Light from distant stars and galaxies studied atop Mauna Kea go far back in time to the earliest period of the Universe as we understand it, well over 10 billion years ago.

Of course the astronomers don't have all the answers to their questions, and they continue to raise new questions. The key now is that they will not be able to erect an instrument anywhere they please on Mauna Kea. The people of Hawaii have spoken loudly that the culture must receive its rightful priority in the future of Mauna Kea. The Master Plan that is currently proposed takes significant steps to insure this balance for the future.

We honestly invite you to continue participating in this bright future by bringing your knowledge, spirit and strength to the discussion. Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

RECEIVED AS FOLLOWS

I am concerned about the further development of Mauna Kea Science Reserve as described in the Master Plan - Draft Environmental Impact Statement.
I understand there are 3 meetings scheduled on Oct 12, 13, 14 in Hilo, Kona & Waimea regarding the Mauna Kea EIS and master plan and that only Hawaiians were informed about these meetings. I want to know why the general concerned public was not notified and why these meetings are/were "behind closed doors."

Please let me know the answer to my question(s).

Signed, Carole Nervig
Print Name CAROLE NERVIG
Address POB 1050
PEPEEKEO, HI 96783

I am concerned about the further development of Mauna Kea Science Reserve as described in the Master Plan - Draft Environmental Impact Statement.
Am I understand Kepa Maly, Kumu Pono Assoc, compiled nearly 800 pages of research on Mauna Kea oral history + cultural significance. Why is it that only a two paragraph summary of his research appears in the third draft of the "master plan/development plan update"?

Please let me know the answer to my question(s).

Signed, Carole Nervig
Print Name CAROLE NERVIG
Address POB 1050
PEPEEKEO, HI 96783

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December 27, 1999

Carole Nervig
P.O. Box 1050
Pepeekeo, HI 96783

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Ms. Nervig:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your two postcards received in October 1999.

Oral History Study and Transcripts

The report completed by Kepa Maly included a summary report of his research, including the findings from the individual interviews he conducted during the process. His summary was included as an appendix to the Draft EIS.

The earlier versions of the Master Plan each had an entire chapter devoted to cultural resources and values. Draft 3 issued in July 1999 had over 21 pages of quotes, references and descriptions of the cultural resources and perspectives. This section utilized much of the information provided in the Kepa Maly report.

The Draft EIS (August 1999) also included the Kepa Maly report summary in its entirety, with a note to all readers that they could request the full transcript copy from Group 70. We have provided copies of the full transcript set (800 pages) for those who wish to review the detailed wording from the interviews.

Contact with Families and Individuals With Ties to Mauna Kea

In 1998, during the preparation of the historical documentation and oral histories, Kepa Maly made advertisements in the local and State-wide newspapers attempting to make contact with people claiming personal or family ties to the mountain. There were only one or two responses to this query. Since that time, Mr. Maly sought out and conducted interviews with many families and individuals, and compiled these interviews into an oral histories summary.

October Meetings with Hawaiian Homestead Representatives

The meetings held with Hawaiian Homestead residents were follow-up meetings that were requested by the broader Hawaiian community in testimony offered in the earlier

public meetings. There was a call from the people to have the University and their planning consultants present to others so the Master Plan could be discussed on a broader basis in the community, especially the island's Hawaiian community.

One of the members of the Mauna Kea Advisory Committee was Herring Kalua, who is a DHHL Commissioner. Mr. Kalua arranged for the three meetings to facilitate discussion of the Master Plan in the Hawaiian Homeland communities. The meetings helped to dispell much of the false information that has been spread in the community about the Master Plan. The doors were not closed, and many non-Hawaiian people attended, even thought the meetings were not publicized outside the DHHL communities.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

RECEIVED
OCT 20 1999
GROUP 70

TO: Allan Ah Sam, Genevieve Salmonson, Jeffrey Overton
FROM: Connie Y.K. Erger (808)885-0018 email:oconger@webtv.net
RE: Proposed expansion of Mauna Kea Science Complex

Taking into consideration there are current "problems", such as Native Hawaiian protests and the complaints about the U of H not hauling away (nor enforcing same of sub-leasees) unused building materials, etc, I nonetheless thought of a conceptual possibility (im-?) for more observatories.

It seems to me that only the top one-third of an observatory is used for a 180° viewspan. Could the bottom two-thirds be subterraneous? Perhaps each new observatory could be built in a wide, shallow crater, so to speak, so that only the dome is visible to the communities below. Or, quite radically, the entire new addition of Mauna Kea Astro Park could be a shallow crater in which to build new observatories.

.....either way, appropriately landscaped and with good drainage.....

What a dilemma! On the one hand, the U of H needs to listen to the cultural wishes/needs of the indigenous people of Hawai`i, and also to be rightfully proud of Mauna Kea's unique, pure, magnificent and perfect geographical spot in the world for scientific research.

Much Luck to you environmental-architectural-economic development planners. If you can "marry" the Past, Present and Future____ you will be geniuses!

Respectfully submitted with aloha,

Connie Y.K. Erger October 18, 1999

Connie Y.K. Erger
P.O. Box 2934
Kamuela, Hawai`i 96743

December 27, 1999

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Ms. Connie Erger
P.O. Box 2934
Kamuela, HI 96743

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Ms. Erger:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of October 18, 1999.

The current Master Plan process has involved over 12 public meetings and numerous contacts with the Native Hawaiian community. The result is a much more balanced approach to addressing cultural issues and management.

In terms of the idea for subterranean construction, we have proposed that several of the new telescopes be developed with a partially buried structure. The planned Next Generation Large Telescope (NGLT) would only have its dome exposed, which would be colored to match the surrounding landscape, and shaped like a small pu'u. This would largely minimize the daytime visibility of the structure from locations both off-mountain and at the summit. Thank you for confirming the intent behind this design concept.

The Master Plan is on file at Thelma Parker Library or on the web www.hawaii.edu/maunakea. Refer to Ch. 9 Fig. IX-21 p. IX-38 to see how the dome will look, with a color and shape (pu'u) to blend with surroundings.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

October 19, 1999

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OCT 19 1999
GROUP 70

OPEN LETTER TO:

UH Board of Regents - Manoa
Kenneth Mortimer, UH President-Manoa
Eugene S. Imai, UH Senior VP-Administration
Alan Teramura, UH Senior VP-Research
Allan Ah San, UH Associate VP-Administration
Genevieve Salmonson, Director State of Hawaii Environmental Quality Control
Francis Oda, Group 70 International, Inc.

SUBJECT: Mauna Kea Master Plan - Draft Environmental Impact Statement

Dear Sirs and Madam:

The Draft EIS of September 1999 is seriously flawed, and is a gross distortion of the truth. The first paragraph of Page 1-3, implies approval of the Draft Mauna Kea Master Plan by the Mauna Kea Advisory Committee....including native Hawaiians. This is not true, as the Committee voted not to accept the Plan in its last meeting before disbanding.

The second paragraph of Page 1-3 is another distortion of the truth. It states as follows: "The Mauna Kea Advisory Committee discussed the following overall goals for the Master Plan." They discussed - not approved the goals of the plan. Then it goes on to imply of first importance was "1) Develop a vision for the sustainable use and enhancement of the Mauna Kea Science Reserve as a Hawaiian place with significant and unique cultural, natural, educational/research and recreational values, meanings and potentials , both locally and globally;" and "2) Integrate and balance cultural, natural, education/research and recreational values and uses in a physical and management plan which will remedy existing problems and provide a framework and structure for the responsible and sustainable stewardship of the Mauna Kea Science Reserve." These two statements appear in the first two paragraphs of the first page 1-3 of the EIS statement, under Description of the Master Plan. It avoids the primary mission statement regarding the proposed expansion atop Mauna Kea; and presumably incorporates their ultra aggressive plans under "education/research."

The second page 1-4 is again a distortion of the truth; starting with the second sentence at the top: "Appropriate sites for the future expansion of education and research at astronomy facilities are identified, with respect for natural and cultural resource preserve areas." In other words, future sites have been identified for four new observatories; six to ten new Optical/IR Interferometer domes; six 1.8m outrigger domes for Keck (two are already under construction); forty eight (48) pads for potentially 24 to 48 Sub-millimeter Arrays, each with 25-ft high dish antennas, for Smithsonian (two are already being built, and will be followed by 10 more); and who knows what more could be in the hidden agendas. The aforementioned explains why there is a need to expand the Astronomy precinct from 60 acres to 525 acres; it is to accommodate their pressing need for unrestricted expansion. When referring to paragraph 2 under "Highlights of the Physical Plan," does the above numbers substantiate the statement of: "limited construction of new observatories"? Also in this paragraph is the statement "limited to the redevelopment ("recycling") of older existing observatories"- - a very misleading impression is given in this statement. What they are saying is that four of the five observatories would be rebuilt two to five times greater than the existing (see Table IX-1 of Draft Master Plan under Existing and Proposed Observatories); and the

FILE

remaining UH 0.6m telescope being replaced by a 4-times larger observatory. This latter case of gross understatement is exemplified by the earlier "recycling" of yet another UH 0.6m telescope, when the new Gemini 8m telescope was completed this year. This new observatory was essentially a massive overbuilding of the smaller obsolete facility.

Page 1-6, Section 1.4.1 Under Beneficial Impacts: In view of the foregoing, the fourth statement regarding education and research benefits can be seen as a gross distortion of truth. It states : "Education and research benefits will result from the creation of an Astronomy Precinct , providing for the limited redevelopment of older observatories at the summit, and the limited development of new observatories at pre-determined areas with the least potential to affect significant natural and cultural resources."

To continue scrutinizing this Draft EIS would be pointless, as it is formatted to evade the true intent of Astronomy's expansion plans for the mountain top. The true impact of their plan is diluted and covered over by statements indicating profound concern for the preservation of cultural treasures, and over-emphasizing their concern for the preservation of the endemic flora and fauna. They need to start telling the truth; the truth about what the mountain would look like if Astronomy was to have it their way....the random proliferation of shiny domes atop our sacred mountain must be stopped.

Very truly yours,

Edward G. Stevens

Edward G. Stevens
76-6335 Leone Street
Kailua Kona, HI 96740

cc Ben Cayetano, Governor - State of Hawaii
Daniel K. Inouye, US Senator
Rowena Akana, OHA Chairperson
Timothy Johns, DLNR Chairperson
Richard Nelson, Governor's Liaison
Ahahui Ku Mauna
Bill Kikuchi

December 27, 1999

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Stuart M. Jow, AIA

Edward G. Stevens
76-6335 Leone Street
Kailua Kona, HI 96740

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Mr. Stevens:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of October 19, 1999.

First, we would like to thank you for your involvement in the present planning effort for the Mauna Kea Master Plan. Your appearance at several key public meetings has reinforced the values we believe are clearly expressed in the updated plan. Thank you for recognizing the plan for its effort to respect the cultural and environmental resources of Mauna Kea.

Mauna Kea Advisory Committee

The Advisory Committee voted to approve Draft 2 of the Master Plan in May 1999. There was a motion to approve the Master Plan at the Advisory Committee in August 1999, and this motion did not pass. There never was a vote by the committee to not accept the plan. Further, the committee voted unanimously that the Board of Regents could adopt the Master Plan in the future with additional consideration of Native Hawaiian cultural concerns.

Overall Master Plan Goals

The overall goals of the Master Plan are exactly as you have you reported. These goals were selected with the Advisory Committee, and the group reached a consensus to accept these goals for the Master Plan.

Limited Construction of Observatories

Appropriate sites for future expansion of education and research at astronomy facilities are identified in the plan. The plan is very specific in its description of future facilities. Your letter correctly states the Master Plan proposes four new observatories; six 1.8 m. outrigger telescopes at Keck; the 24 additional SMA pads with 12 new antennas (25 ft. high); and four or five redeveloped facilities. There is no instrument projected in the Master Plan for the Optical/IR interferometer, rather only a general area is identified for some future point when the technology advances.

The redeveloped facilities will be limited in size due to the space restrictions at the smaller summit ridge sites. In particular, the UH 0.6m telescope will not be replaced by a four-times larger observatory enclosure as you claim. An instrument the size of Gemini could not be placed at the old UH telescope site. The UH 0.6 m site could have

another small educational telescope (1.0 to 3.0 m) put in place of the existing instrument, with an enclosure of equal or smaller size. This would easily qualify as a limited redevelopment.

Education and Research Benefits

Education and research benefits will result from the creation of an Astronomy Precinct through the new Master Plan. This will allow for a measured future expansion of astronomy facilities with respect for and protection of the rich resources of the summit area. With the plan in place, there will be a continuation of the world's leading astronomy research complex and continued benefits for the residents of the island of Hawaii through jobs, economic stimulus and technology-based educational programs.

We have heard from many people that the Astronomy Precinct is a good idea, and is a necessary element of the future plan. The State Auditor recommended that a no-build line is necessary to depict the limits of where astronomy development could occur over the long term. This boundary was selected through a very careful process, including significant input from native Hawaiians offering their cultural perspectives for the planning, such as you. The areas delineated in the Astronomy Precinct most definitely identify the areas which have the least potential for new astronomy development to affect natural and cultural resources.

View of the Mountain

The view of the Mauna Kea summit, and its visual integrity, appears to be the biggest concern that you have shared over this past year. Your characterization of the random proliferation of shiny domes atop the mountain is not accurate. Let us offer two examples of the effort made to address this concern in a meaningful way in the Master Plan.

You have cited the current and future views of the SMA antennas as one of your greatest concerns. We appreciate your concerns, and have worked diligently with the observatory to refine their antenna siting plans for the future. Their original plans were to extend the array for up to 0.5 km to the south, including the area between Poliahu and Waiau. Based on our discussions with you and other native Hawaiians, we did not include their plans, and redirected their effort to a smaller array and less sensitive area to the north of Poliahu. The SMA officials agreed to this change based on their improved understanding of the cultural significance and inter-relationship of the culturally significant landforms and places in the summit region.

As another example, we have instituted design guidelines for new and redeveloped observatories. The coloring, texture, shape, and locations for these facilities will largely diminish their visibility. Views from the prominent cultural sites and landforms, such as Waiau, will not be affected by the new facilities. Off-mountain views of the facilities will likely be similar or less apparent than the present views.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH

Beings in Touch

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GROUP 70

September 20, 1999

Jeffrey Overton
Group 70 International Inc.
925 Bethel St., 5th floor
Honolulu, HI 96813

Dear Mr. Ah Sam,

The following are my comments regarding the master plan for the development of the summit of Mauna Kea:

It is absolutely imperative that any further development on the mountain be done with the input of the Hawaiian community. There are many sacred sites on and around the summit, some of which have already been violated. It is very important for the future harmony of all of our people that henceforth these sites be awarded the utmost respect. I am not aware of what steps have been taken in that direction thus far, but do urge you to pay close attention.

Sincerely,

Mare Grace

Mare Grace,
President

P.O. Box 6593, Kamuela HI 96743 - Phone: 808-885-3455 - Fax: 808-885-4031
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December 27, 1999

Ms. Mare Grace, President
Beings in Touch
P.O. Box 6593
Kamuela, HI 96743

Subject: Mauna Kea Science Reserve Master Plan
Responses to Comments on the Draft Environmental Impact Statement

Dear Ms. Grace:

Thank you for providing your comments on the Draft EIS for the Mauna Kea Science Reserve Master Plan. We have prepared the following responses to issues raised in your letter of September 20, 1999.

The current Master Plan process has involved over 12 public meetings and numerous contacts with the Native Hawaiian community. The plan for the future of the Mauna Kea Science Reserve is a much better balanced plan as a result of the input and comments from the Hawaiian community.

The astronomy community has not caused any violations of sacred sites on the mountain. Each facility site was surveyed for cultural features prior to initiating construction activities. To the contrary, the University has conducted detailed surveys of all the ahu shrines at the summit and other archaeological and cultural resources. The plan for the future of the summit area insures the preservation of these sacred sites, and sets aside over 10,000 acres as a natural and cultural preserve.

Thank you again for providing your comments on the Draft EIS. If you have further questions or comments, please call me at 523-5866 ext. 135.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP
Chief Environmental Planner

Cc: Allan Ah San, UH