

**IMPLEMENTING AND EVALUATING THE  
COMPREHENSIVE MANAGEMENT PLAN FOR  
UH MANAGED LANDS ON MAUNA KEA**

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Office of Mauna Kea Management

640 N. Aohoku Place, Room 203

Hilo, Hawaii 96720



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### Acronymns

BLNR	Board of Land and Natural Resources
CMP	Comprehensive Management Plan
CRC	Cultural Resource Coordinator
CRMP	Cultural Resources Management Plan
DLNR	Department of Land and Natural Resources
DOCARE	Division of Conservation and Resources Enforcement (DLNR)
DOFAW	Division of Forestry and Wildlife (DLNR)
GIS	Geographic Information System
GPS	Global Positioning System
MKMB	Mauna Kea Management Board
OMKM	Office of Mauna Kea Management
MKSS	Mauna Kea Observatories Support Services
NAR	Natural Area Reserve
NARS	Natural Area Reserve System
NRC	Natural Resource Coordinator
NRMP	Natural Resources Management Plan
PAP	Public Access Plan
SHPD	State Historic Preservation Division (DLNR)
UH	University of Hawai‘i
UHH	University of Hawai‘i at Hilo
VIS	Visitor Information Station

# 1 Introduction

Implementing the Mauna Kea Comprehensive Management Plan (CMP) requires careful planning, sufficient funding, adequate staffing, and ongoing review and evaluation of program successes and failures. This document provides a strategy for implementing the Mauna Kea CMP, with a focus on immediate and short-term needs. It also identifies a methodology for evaluating the success of the plan and for determining any needed changes in management strategies.

## 1.1 Management Entities

UH Hilo, through its Office of Mauna Kea Management (OMKM), together with the Mauna Kea Management Board (MKMB) and the Kahu Kū Mauna Council, comprise the University of Hawai‘i’s management entity for its managed lands on Mauna Kea. The University of Hawai‘i at Hilo (UHH), through OMKM, is responsible for implementing the CMP for UH Management Areas on Mauna Kea. On management issues, OMKM consults with Kahu Kū Mauna Council and MKMB. The latter shall recommend a course of action. OMKM reports MKMB’s recommendations directly to the UHH Chancellor, who in turn forwards their recommendations to the University of Hawai‘i (UH) President for final decision. If required, the UH Board of Regents has final approval.

While policy-making authority ultimately rests with the UH Board of Regents, development of policy matters related to UH Management Areas on Mauna Kea originates with OMKM and UH Hilo, and as needed, in coordination with other UH divisions, State and Federal agencies, and appropriate community organizations. In the review and approval process for projects, including major projects, UH Hilo follows the guidelines established in the 2000 Master Plan, and protocols and policies established by the Board of Regents.

The roles of the various University entities involved in the management of UH Management Areas are outlined in Table 1.

**Table 1. University of Hawai‘i Divisions with Responsibility for Mauna Kea**

UH Division	Roles and Responsibilities
University of Hawai‘i Hilo Chancellor	<ul style="list-style-type: none"> <li>• Oversight of OMKM</li> <li>• Authorized to sign commercial tour use permits<sup>1</sup></li> </ul>
Office of Mauna Kea Management	<ul style="list-style-type: none"> <li>• Oversees efforts to protect, preserve and enhance the natural, cultural, and recreational resources of Mauna Kea.</li> <li>• Day-to-day management of the cultural and natural resources of the UH Management Areas</li> <li>• Ensure compliance with and implementation of the 2000 Master Plan and the 2009 Mauna Kea CMP</li> <li>• Manages together with Mauna Kea Observatories Support Services (MKSS) the ranger program</li> <li>• Oversees commercial permits</li> <li>• Approves film permits</li> <li>• Coordinates with other stakeholders, both public and private, on issues related to Mauna Kea</li> <li>• Works with other agencies on issues that are related to the mountain but are outside their jurisdiction</li> </ul>

<sup>1</sup> The University is responsible for the regulation of commercial tour and film activities.

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UH Division	Roles and Responsibilities
Mauna Kea Management Board	<ul style="list-style-type: none"> <li>• Volunteer board representing the community</li> <li>• Advises UHH Chancellor on activities, operations and land uses planned for Mauna Kea</li> <li>• Has advisory committees (MKMB Environment Committee, the Wēkiu Bug Scientific Committee, the MKMB Hawaiian Culture Committee, and the Public Safety Committee)</li> </ul>
Kahu Kū Mauna	<ul style="list-style-type: none"> <li>• Volunteer council appointed by MKMB</li> <li>• Advises MKMB, OMKM, and the UHH Chancellor on Hawaiian cultural matters affecting the UH Management Areas</li> </ul>
Mauna Kea Observatories Support Services	<ul style="list-style-type: none"> <li>• Funded by and operates under the direction of the observatories through the Mauna Kea Observatories Oversight Committee</li> <li>• Oversees the general maintenance and logistical services to all Mauna Kea observatories and the facilities at Hale Pōhaku (including water hauling, operation of food services and lodging, and fuel supply)</li> <li>• Conducts Summit Access Road maintenance (including weekly grading of unpaved portion of road and snow removal)</li> <li>• Manages the Visitor Information Station (VIS)</li> <li>• Manages together with OMKM the ranger program</li> </ul>
Mauna Kea Rangers	<ul style="list-style-type: none"> <li>• On-site management of public health and safety               <ul style="list-style-type: none"> <li>- Distributes safety brochure</li> <li>- Advises visitors of weather conditions, potential hazards associated with ascending the mountain (e.g., altitude sickness, road conditions), and recommended approaches to safely visiting Mauna Kea</li> <li>- Manages road closures for safety reasons</li> <li>- Provides emergency assistance when necessary</li> </ul> </li> <li>• On-site management of public access               <ul style="list-style-type: none"> <li>- Conducts summit patrols to observe and document activities</li> <li>- Provides information on the unique natural, cultural, and scientific resources; directs visitors to established hiking trails; and educates visitors on prohibited or destructive activities</li> <li>- Monitors commercial tours</li> <li>- Manages visitors on peak use days</li> <li>- Performs site maintenance activities including litter removal and trail maintenance to deter use of non-established trails</li> <li>- Supports other approved activities (e.g. filming, research) to ensure that impacts are minimal</li> <li>- Conducts twice yearly observatory Conservation District Use Permit compliance inspections</li> </ul> </li> </ul>

### 1.2 Management Actions

The Mauna Kea CMP contains a set of management actions designed to address the identified needs in managing the UH Management Areas. Management actions are organized by topic into component plans (see Table 2 and Appendices A and B). Each component plan has a specific desired outcome goal and an associated statement of need. The component plans address the range of management challenges from protecting resources, to managing access and use, to managing the built environment, to managing operations.

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**Table 2. Mauna Kea CMP Component Plans**

Section	Component Plan
7.1	Understanding and Protecting Mauna Kea's Resources
7.1.1	Native Hawaiian Cultural Resources
7.1.2	Natural Resources
7.1.3	Education and Outreach
7.1.4	Astronomy Resources
7.2	Managing Access and Use
7.2.1	Activities and Uses
7.2.2	Permitting and Enforcement
7.3	Managing the Built Environment
7.3.1	Infrastructure and Maintenance
7.3.2	Construction Guidelines
7.3.3	Site Recycling, Decommissioning, Demolition and Restoration
7.3.4	Considering Future Land Use
7.4	Managing Operations
7.4.1	Operations and Implementation
7.4.2	Monitoring, Evaluation, and Updates
7.5	1995 Management Plan Controls

In addition to the management actions outlined in the Mauna Kea CMP, four sub-plans have been developed to provide specific recommendations and guidance. The sub-plans include:

- *Natural Resources Management Plan for the UH Management Areas on Mauna Kea (NRMP)* (September 2009)
- *Cultural Resources Management Plan for the UH Management Areas on Mauna Kea (CRMP)* (October 2009)
- *Mauna Kea Public Access Plan (PAP)* (January 2010)
- *Decommissioning Plan for the Mauna Kea Observatories* (January 2010)

Implementation of these plans will occur in conjunction with the Mauna Kea CMP. They will be referenced for detail and utilized to provide additional guidance as needed.

### **1.3 Programmatic Management Actions**

Most of the desired outcomes, needs and management actions of the Mauna Kea CMP are presented in the component plans. However, there are several management actions at the programmatic level that apply to the overall OMKM management program and will be implemented as part of OMKM's general management strategy. These programmatic management actions include:

1. Establish cultural and natural resources management programs within OMKM.

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Obtain sufficient funding to support the programs (see Section 3). Hire staff members (see Section 2.2.1). Contract out high-priority, field-intensive projects such as baseline inventory studies, to ensure they are conducted quickly.

2. Continue to engage the MKMB committees in the review of proposals, projects, and management plans, and in making recommendations to the MKMB.

The establishment of the MKMB and its associated committees has enabled the broader community to become directly involved in advising on the management of Mauna Kea. The committees have been useful in involving a range of interests to ensure a collaborative and informed management planning process. Boards and committees will interact to achieve agreement on management goals, objectives, and activities.<sup>2</sup>

3. Continue to develop working relationships with Federal and State agencies.

Currently there is no mechanism for integrated or coordinated management of Mauna Kea's resources (including lands outside of the UH Management Areas). No regular meetings are held between the governmental agencies with management responsibilities for Mauna Kea—in particular involving OMKM and the various divisions of the Department of Land and Natural Resources (DLNR). Significantly, because there is so little interaction between the various State and Federal agencies responsible for the management of Mauna Kea, applicable rules and regulations in the UH Management Areas are little enforced. Development of coordinated management between State and Federal agencies and OMKM is discussed in Section 2.3.

4. Conduct public outreach and education to increase awareness of Mauna Kea's unique resources and their threats, increase community involvement in decision-making processes, and inform the public about progress regarding the protection of Mauna Kea's resources.

An information/education effort will support public participation and build management capacity related to adopted management actions. OMKM shall encourage and seek out community participation, including Native Hawaiians, in educational and outreach efforts. Informing the public about OMKM's management activities will help reassure the public that Mauna Kea's resources are being protected. Education and outreach activities are discussed in Section 7.1.3 of the CMP, and also in the CRMP, NRMP and PAP.

5. Establish legal authority for OMKM to promulgate rules and enforce regulations on Mauna Kea properties leased by the University of Hawai'i.

On June 18, 2009, the governor signed bill HB1174 HD3 SD2 CD1, into law as Act 132 (2009), giving UH the authority to develop, implement and enforce rules and regulations for public and commercial activities within the UH Management Areas. UH must now conduct a public process to develop public access-related administrative rules, which are subject to review and approval of the Board of Land and Natural Resources (BLNR). Principles and policies to guide UH in this process are provided in the PAP.

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<sup>2</sup> As the advisory board for OMKM, MKMB has responsibility for making final recommendations, based on input from committees including Kahu Kū Mauna and the MKMB Environment Committee. Potential conflicts between interests must be considered as this is done.



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6. Manage access to the summit to reduce impacts to cultural and natural resources.

Unrestricted access to the summit region can negatively impact resources. Strategies are provided in Sections 7.2 and 7.5 of the CMP, and also in the CRMP, NRMP, and PAP.

7. Follow the review process for new project proposals adopted by the MKMB.

This process is designed to ensure participation of relevant entities, compatibility with recommendations in approved management plans, and protection of cultural and natural resources when considering proposed future land uses.

## 2 Implementation Planning

OMKM and related entities provide day-to-day management of activities designed to protect the cultural, natural, recreational, and scientific resources of Mauna Kea. The Mauna Kea CMP and its related sub-plans provide a detailed framework for program development to shape management activities. Implementation of the Mauna Kea CMP involves prioritizing activities and conducting the management actions in a structured format in order to ensure adequate resources are available and desired outcomes are being met. Main components of an implementation plan include:

- A schedule for implementing priority management actions
- An estimate of the technical and financial resources and authorities needed to implement the plan
- Interim milestones to determine whether management actions are being implemented
- Criteria by which to measure progress toward achieving desired outcomes and goals
- A monitoring and evaluation framework to evaluate the effectiveness of implementation efforts

### 2.1 Schedule and Priorities

The implementation schedule for the Mauna Kea CMP identifies a timeframe for when each management action will be implemented and accomplished. The implementation schedule ranges from: Ongoing (currently being implemented), Immediate (1-3 years); Short-term (4-6 years); Mid-term (7-9 years); to Long-term (10+ years) (see Appendix B).<sup>3</sup> In most cases OMKM is either directly responsible for implementing the action or for ensuring its implementation by others (see Appendix C). Current efforts are focused on maintaining ongoing activities, ensuring resources to implement immediate and short-term actions, and beginning the planning process for mid-term and long-term actions. Inherent in this initial schedule is a prioritization of actions that focuses on solidifying a foundation for management activities that builds on the existing capacity. Immediate and short-term goals focus on hiring personnel, filling data gaps, and conducting monitoring to better inform management needs. Longer-term actions involve ongoing implementation, maintenance of the expanded program activities and development and execution of new activities resulting from the implementation of earlier management actions.

The primary immediate needs are for conducting baseline inventories and establishing research and monitoring efforts to fill data gaps and provide an on-going process for data collection to inform management efforts. Until good information about the resources has been obtained, it is difficult to plan with certainty the best methods for protection. Since there are some significant data gaps, in particular for

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<sup>3</sup> In cases where an action continues after it is initially developed or implemented, the shading continues to denote ongoing activity.

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natural resources, a considerable portion of the management effort and funding in the immediate and short-term will be focused on filling these gaps.<sup>4</sup> Inventories of cultural resources have been completed and the interpretation of the findings will be used to inform management actions. In addition, the development of policies and/or protocols for the range of cultural practices will be a time-consuming project in the first few years of CMP implementation. On-going activities in the immediate term, including monitoring, developing and implementing administrative rules, conducting public outreach and education, and training VIS personnel, staff, rangers, and observatory personnel will necessitate a substantial commitment of time and funding.

The adaptive management approach calls for continuous review and revision of activities based on the successes and failures of efforts. As described in Section 4.2.2, new, expanded, or amended management actions will be identified and incorporated into management strategies. **However, in the immediate and short-term, more focus will be placed on filling basic information gaps, which is essential to informing management.**

Table 3 summarizes the current number of management actions by component plan and implementation schedule. Appendix A contains a summary table of the Mauna Kea CMP management actions arranged by component plan, including implementation schedules and related sub-plan section references. Appendix B presents more detailed implementation schedules for each management action. Appendix C identifies entities responsible for implementation.

**Table 3. Number of Mauna Kea CMP Management Actions Planned for Implementation**

Component Plan	Implementation Schedule (as of 2010)						
	Ongoing	Immediate	Short-term	Mid-term	Long-term	Completed	As needed
<b>7.1: Understanding and Protecting Mauna Kea's Resources</b>							
7.1.1: Native Hawaiian Cultural Resources (14)	1	10	2			1	
7.1.2: Natural Resources (18)	2	5	3	3	2		3
7.1.3: Education and Outreach (8)	3	2		2	1		
7.1.4: Astronomy Resources (2)	2						
<b>7.2: Managing Access and Use</b>							
7.2.1: Activities and Uses (12)	7	2	2			1	
7.2.2: Permitting and Enforcement (8)	4	1				2	1
<b>7.3: Managing the Built Environment</b>							
7.3.1: Infrastructure and Maintenance (14)	1	4	3	3	2		1
7.3.2: Construction Guidelines (9)							9
7.3.3: Site Recycling, Decommissioning, Demolition & Restoration (3)							3

<sup>4</sup> As of the first draft of the CMP, no quantitative baseline inventories of the natural resources on UH Management Areas have been conducted except for the wēkiu bug, and therefore, the true state of the natural resources is currently unknown. Completion of the baseline inventories will necessitate a re-evaluation of the management actions recommended in CMP Section 7 and in the NRMP.

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Component Plan	Implementation Schedule (as of 2010)						
	Ongoing	Immediate	Short-term	Mid-term	Long-term	Completed	As needed
7.3.4: Considering Future Land Use (7)		1					6
<b>7.4: Managing Operations</b>							
7.4.1: Operations and Implementation (5)	4		1				
7.4.2: Monitoring, Evaluation, and Updates (3)		1	1				1
<b>7.5: 1995 Management Plan Controls (1)</b>							1

## 2.2 Personnel, Training, Equipment, and Facilities

OMKM has identified the initial staffing requirements and facilities needs for implementation of the CMP, including oversight of the cultural and natural resources management programs and expansion of the ranger program.

### 2.2.1 Personnel Requirements

Minimum personnel requirements for implementation of the CMP are presented in Table 4. Several of the positions listed below are existing funded OMKM positions or volunteer boards or committees. New positions requested include: Cultural Resource Coordinator (CRC); Natural Resource Coordinator (NRC); Education and Outreach Coordinator; GIS and Database Coordinator; Projects Administrator; Archaeologist; Chief Ranger; two additional rangers; fiscal support; and internal legal counsel.

The on-site ranger program has demonstrated effectiveness in protecting public health and safety, educating the public, and providing for resource protection. With a large spatial extent to cover, and the impending need to enforce administrative rules, there is a need to expand this program. There are currently no dedicated natural or cultural resources management personnel within OMKM—all resource management activities are currently conducted by other existing staff or contractors. A range of management actions could be conducted by contractors, including geographic information system (GIS) services, archaeological monitoring, natural resources baseline inventories, hydrological and climate studies, human activities studies, traffic and parking studies, and other research projects.

**Table 4. Personnel Requirements**

Position	Role	Current Status	Location	Funding Status
<b>ADMINISTRATIVE</b>				
OMKM Director	Oversight, guidance	Exists and filled (Interim director)	OMKM Hilo	Currently funded
OMKM Associate Director	Oversight, guidance	Exists and vacant	OMKM Hilo	Currently funded
Secretary	Clerical Support	Exists and filled	OMKM Hilo	Currently funded
Student help	General support	Exists and filled	OMKM Hilo	Currently funded
Projects Administrator	Administrative duties	Position does not yet exist	OMKM Hilo	Funding requested
Fiscal Support	Administrative duties	Position does not yet exist	OMKM Hilo	Funding requested

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Position	Role	Current Status	Location	Funding Status
Internal Legal Counsel	Legal support	Position does not yet exist	OMKM Hilo	Funding requested
Mauna Kea Management Board	Oversight, guidance	Exists and filled	Various (meets at OMKM Hilo)	Unfunded volunteers
<b>PROGRAMMATIC</b>				
Kahu Kū Mauna Council	Cultural guidance on management issues	Exists and filled	Various (meets at OMKM Hilo)	Unfunded volunteers
MKMB Environmental Committee	Oversight, guidance	Exists and filled	Various (meets at OMKM Hilo)	Unfunded volunteers
Cultural Resources Coordinator	Implementation of CMP / CRMP	Needed	OMKM Hilo, VIS	Funding requested
Natural Resources Coordinator	Implementation of CMP / NRMP	Needed	OMKM Hilo, VIS	Funding requested
Education and Outreach Coordinator	Outreach and education	Needed	OMKM Hilo, VIS	Funding requested
GIS and Database Coordinator	Implementation of CMP	Needed	OMKM Hilo	Funding requested
Volunteers	Implementation of CMP	As needed	Various	Unfunded volunteers, but requires oversight
Contractors	Implementation of CMP	As needed	Various	Requires funding (project specific)
Resource Librarians	Document retrieval and organization	Exists and filled	OMKM Hilo	Currently funded
<b>PUBLIC ACCESS, SAFETY, AND EDUCATION</b>				
Chief Ranger	Oversight guidance; visitor safety and outreach, and resource protection	Needed	VIS OMKM Hilo	Funding requested
Rangers	Visitor safety and outreach; resource protection	Exists and filled (5)	VIS	Currently funded
Rangers (additional)	Visitor safety and outreach; resource protection	Needed (2)	VIS	Funding requested
VIS Staff	Visitor outreach and education	Exists and filled through MKSS	VIS	Currently funded staff and unfunded volunteers
MKSS	Facility support	Exists and filled	Hale Pōhaku, VIS	Currently funded

### 2.2.2 Training Requirements

A training plan for employees and volunteers will be developed. Training needs to be addressed in the plan include specialized ranger training, field-personnel training, volunteer training and general staff training. General training requirements include review of applicable laws and regulations, basic cultural and natural resources orientation, education and outreach methods appropriate to Hawai‘i, and standard procedures for documenting potential violations (for non-enforcement personnel). Training requirements for all OMKM personnel involved in field-based management activities include general safety training, 4-

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wheel drive vehicle operation, orientation to working at high elevations, emergency response, CPR and first aid, Global Positioning System (GPS) operation, and recognition of culturally significant areas and items and protected flora and fauna. All staff who access the mountain should receive safety orientation and basic cultural and natural resources training. It is also advisable to provide basic emergency response training (including CPR and first aid) to all VIS staff. Education and training requirements for the CRC include gaining an intimate familiarity with the written literature on Mauna Kea’s cultural resources, including historic properties and cultural practices, and detailed knowledge of the location and status of historic properties in the UH Management Areas. Prior to hiring, the NRC should have extensive training in natural resources management issues, preferably in the form of a graduate degree and relevant work experience. On hiring, initial training would include training in project management and familiarization with the plant and animal species found on Mauna Kea, with emphasis on protected species.

### 2.2.3 Facilities and Equipment

Facilities and basic equipment needed to implement the CMP (not including administrative facilities and equipment already possessed by OMKM) include:

**Table 5. Facility and Equipment Requirements**

Facilities	Equipment
<u>OMKM Hilo</u> Office space for Education and Outreach Coordinator, CRC, NRC , GIS and Database Coordinator, Projects Coordinator, Archaeologist, Fiscal Support, legal counsel and Chief Ranger	Computers for all new hires and general software; printers, database software, and GIS software Digital cameras (one for each field person) Walkie-talkies (one for each field person) GPS units (one for each field person)
<u>Hale Pōhaku</u> Small office space and work area for Education and Outreach Coordinator, CRC, NRC, archeologist, and Chief Ranger Equipment storage area	4-wheel-drive vehicle(s) (available for resource management fieldwork) Field equipment (maps, backpacks, measuring tapes, metal stakes, flagging, compasses, field notebooks, binoculars, sample collection materials, vegetation maintenance tools) Identification guides (plants, birds, arthropods)

### 2.3 Coordination with Other Agencies

Coordination between State and Federal agencies regarding management of Mauna Kea’s resources is required. Some ideas for improving and coordinating multi-agency management activities on the mountain include developing interagency working groups, cooperative agreements/memorandums of understanding, and conducting interagency review.

*Interagency Working Group.* The principles of ecosystem management require that neighboring landowners and managers work together, guided by well-established management goals and visions. Overlapping and adjacent jurisdictions at the high elevations of Mauna Kea involve multiple agencies in management and decision-making. OMKM will serve as the focal point for coordinating actions related to the management of the UH Management Areas, including cross-boundary issues. An interagency working group can assist in streamlining management activities on the mountain and ensuring that management

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occurs at an ecosystem level. OMKM will communicate issues and concerns that it receives to the appropriate agencies and will follow through in their resolution.

*Cooperative Agreements.* OMKM should formalize management objectives and cross jurisdictional activities with memorandums of agreement or understanding similar to the recently developed cooperative agreement between BLNR and the University with respect to the Mauna Kea Ice Age Natural Area Reserve (NAR).<sup>5</sup> Cooperative arrangements shall be established with emergency-response agencies capable of providing services on Mauna Kea. Formal collaborative enforcement relationships shall be developed with the Hawai'i County Police Department and DLNR Division of Conservation and Resources Enforcement (DOCARE) for public access control through cooperative agreements or other means to strengthen the partnerships needed for effective response.

*CMP Interagency Review.* OMKM personnel will meet annually with relevant State and Federal agencies to review the status of the OMKM program. Before the meeting, the program coordinators will prepare an annual progress report describing the state of the resources, the status of the management program, progress towards meeting annual goals, and other pertinent information. The report will be reviewed and approved by MKMB, its committees, and OMKM and will then be submitted to the stakeholders and agencies participating in the review process, allowing ample time before the meeting for the agencies to review it. The annual meeting will provide a mechanism for various agencies to review the OMKM program, provide feedback on management activities, and suggest additional activities or changes to the management program. The annual progress report is discussed further in Section 4.2.1.

### 3 Financial Resources Required for Implementation

#### 3.1 Budget

OMKM has developed a proposed CMP implementation budget, based on known and estimated personnel, equipment, and program funding needs to continue Mauna Kea management operations and implement the Mauna Kea CMP. Future budgetary requirements will be identified as the management program is refined.

The proposed CMP implementation budget is in addition to the OMKM's current funding for carrying out general management activities, including the current ranger program, administrative salaries, and daily operations. The proposed CMP implementation budget is summarized in Table 6; additional details are provided in Appendix D. There are three primary budget categories: salaries, operating expenses, and program expenses (see Box 1). Appendix D contains a summary budget, along with a summary table of the Mauna Kea CMP management actions, organized by budget categories.

OMKM foresees high costs over the first few years of CMP implementation, but anticipates these costs diminishing once additional programs are implemented. Over the long-term funds will primarily be required to maintain daily operations in support of program management. Although many of the management actions can be implemented by operational funds to support staff, program-specific funds may be required for one-time projects or projects that require large amounts of funding, such as baseline

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<sup>5</sup> In 2008 OMKM developed a cooperative agreement with DLNR, DOFAW-NARS in order to work more closely on cross-boundary management issues between the UH Management Areas and the Mauna Kea Ice Age NAR. Under the agreement, OMKM provides visitor assistance using OMKM rangers, engages in joint research and educational efforts with NAR staff, and reports violations occurring in the NAR.

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inventories, research studies, and mitigation projects. Most of this funding is being requested in the “immediate” timeframe to cover baseline inventory studies, research needs, cultural protocol development, and public awareness activities. The need for additional program funds may be identified in the future. Other funds, such as those to cover capital or infrastructure costs (i.e., paving the road, improving visitor facilities) would be budgeted separately and would likely be funded by seeking legislative funding.

Although implementation of some CMP management actions is already occurring, full implementation of the CMP depends on receiving funding. Implementation of the CMP per the schedule outlined in Section 2.1 will begin upon receipt of funding.

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Table 6. Proposed OMKM Budget for Implementing the CMP, Years 1-6

Proposed OMKM Budget	Immediate			Short-term	
	Yr 1	Yr 2	Yr 3	Yrs 1-3	Yrs 4-6
<b>Salaries</b>					
Enforcement	175,100	175,100	175,100	525,300	525,300
Administrative and Professional	297,200	297,200	297,200	741,600	741,600
Other payroll	84,720	84,720	84,720	254,160	254,160
<b>Total Salaries</b>	<b>507,020</b>	<b>507,020</b>	<b>507,020</b>	<b>1,521,060</b>	<b>1,521,060</b>
<b>Operating Expenses</b>					
UH Hilo Government and Community Relations	181,750	181,750	181,750	545,250	545,250
Legal Fees	300,000	350,000	300,000	950,000	300,000
<b>Total Operating Expenses</b>	<b>481,750</b>	<b>481,750</b>	<b>481,750</b>	<b>1,495,250</b>	<b>845,250</b>
<b>Program Expenses</b>					
Research	556,200	526,500	317,500	1,400,200	557,500
Monitoring Programs	235,000	314,700	314,700	864,400	1,388,400
Management Programs	220,000	330,000	240,000	790,000	860,000
Public Awareness and Outreach	146,500	135,750	155,750	438,000	454,750
Equipment and Supplies	133,650	72,500	50,500	256,650	266,500
<b>Total Program Expenses</b>	<b>1,291,350</b>	<b>1,379,450</b>	<b>1,078,450</b>	<b>3,749,250</b>	<b>3,527,150</b>
<b>Total Salaries, Operating Expenses and Program Expenses</b>	<b>2,280,120</b>	<b>2,418,220</b>	<b>2,067,220</b>	<b>6,765,560</b>	<b>5,893,460</b>
Less Revenue from Fees	(100,000)	(100,000)	(100,000)	(300,000)	(300,000)
<b>Total Proposed Budget</b>	<b>\$2,180,120</b>	<b>\$2,318,220</b>	<b>\$1,967,220</b>	<b>\$6,465,560</b>	<b>\$5,593,460</b>



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### Box 1. OMKM Budget Categories

<b>Salaries</b>	
Rangers	Chief Ranger to manage the ranger program Two additional rangers
Professional	GIS & Database Coordinator
Administrative	Fiscal Support, Project Administrator, Internal Legal Counsel (Rules Administrator), and casual hire
Other payroll	Overtime, and seasonal requirements
<b>Operating Expenses</b>	
UH Hilo Government and Community Relations	UH Hilo activities relating to government advocacy and community relations on behalf of OMKM and Mauna Kea
Legal Fees	Retain outside legal counsel to review policies and other actions that may necessitate legal review
<b>Program Expenses</b>	
Research:	Baseline studies to fill in data gaps: Flora, arthropod, invasive species, mammals, birds, threatened and endangered species, erosion, hydrology, geology, erosion, human activity, climate, and air quality.  Other research needs: Continuing research on the wēkiu bug, public facilities, traffic and parking, energy audits
Monitoring:	Ongoing monitoring of cultural and natural resources (archaeological and historic properties, wēkiu bug). Initiate monitoring of new resource groups (flora, invasive species, arthropods, etc.)
Management Program Plans:	Develop cultural practices protocols/policies and management plans (burial treatment, historic property activities monitoring plan, invasive species prevention and control plans, and delineate areas of high biological diversity and unique communities and/or geological formation). Develop and implement administrative rules; review and update 1995 plan. Establish GIS program; map resources. Develop and implement education, training and outreach programs for the general public, staff, and stakeholders. Increase opportunities for public input and participate in stewardship activities.
Public Awareness:	Develop and print brochures, develop and implement signage program, and develop exhibits
Equipment and Supplies	Field equipment, computers, printers, software, vehicles, and furniture

### 3.2 Funding Sources

Primary operational funding for OMKM is received from the University as part of legislative appropriations based on internal program estimates. Funding is required to carry out the primary functions of the Mauna Kea CMP. Additional funds are obtained through the collection of fees from commercial tour operators. This money is deposited into an account that is used to cover expenses attributed to the commercial tour activities, including water, sewage fees, utilities, trash removal, road maintenance, and ranger and VIS staff time. Over time it may be possible for OMKM to identify and utilize other potential sources of funding and to develop a more diversified funding strategy. Other potential funding sources include:

*Existing astronomy entities.* Observatories currently contribute funding for VIS operations and road maintenance through MKSS, and also support a range of astronomy-related educational and outreach programs, both on-site and in the local communities. Mauna Kea observatories, through the Institute for Astronomy, contributed funding and logistical support for the recent archaeological inventory and wēkiu bug research and surveys. Funding for other resource management needs would be voluntary or part of renegotiated subleases.

*Potential new astronomy development.* All future astronomy development projects shall commit funding toward the broader resource management and maintenance responsibilities of Mauna Kea.

*User fees and licenses.* In addition to fees charged to commercial tour companies, other types of user fees may be instituted (e.g., entrance, shuttle, film permit). These funds would be deposited into the same fund.

*Fines.* Revenue collected from enforcement of rules (administrative fines) shall be deposited into a Mauna Kea lands management special fund that is used assist UH in local management of Mauna Kea.

*Research and other grants.* In addition to soliciting funds for research projects conducted in-house, OMKM also could provide logistical and other support for researchers planning to conduct research that would be compatible and consistent with the needs identified in the CMP.

*Private and non-profit donations.* Donations could be solicited for specific program needs.

*Corporate donations.* Local and national businesses could provide funding for specific program needs (educational camps, restoration programs) in return for recognition of their donation.

*Department of Land and Natural Resources funding.* As the agency with management authority for Mauna Kea's conservation district lands and the surrounding properties, support from DLNR could also be provided in the form of management activities such as fencing and hunting of feral ungulates and resource sharing.

*Cooperative arrangements.* Some of the costs of implementing the CMP may be defrayed by leveraging existing efforts and seeking in-kind services (e.g. data sharing, partnerships with State, county or Federal agencies to provide technical assistance, researchers or school programs).

## 4 Monitoring and Evaluation

An important part of the implementation of the Mauna Kea CMP is ensuring that management actions are achieving stated CMP desired outcomes and objectives. This section describes methods that can be used to monitor progress. It includes mandatory reporting procedures for the UH Board of Regents and BLNR on the progress of CMP implementation. Progress reports will document successes, failures, ongoing activities, the status of resources, and planned changes to improve management. The Mauna Kea CMP was designed using an adaptive management approach, which provides mechanisms by which to reevaluate implementation plans if substantial progress toward meeting desired outcomes is not being made.

### 4.1 Monitoring Implementation of the CMP

Regular monitoring of CMP implementation must occur in order to determine if progress is being made towards meeting the desired outcomes and objectives of the CMP. Monitoring is ongoing, with annual progress reports issued as described in Section 4.2.1. A major review and revision of the CMP will occur every five years, as described in Section 4.2.2.

Monitoring of a management program requires collection of concrete data that can be objectively analyzed and compared between years. This requires preparation at the beginning of each year, to determine the performance measures by which the year will be judged, followed by collection of data throughout the year on progress made toward meeting these measures. Preferably, the program coordinators will conduct brief monthly progress checks, to ensure that management activities are begun at appropriate times, that nothing is forgotten, and that projects are progressing as scheduled. Good notes taken throughout the year on the causes of delays or concerning unrealistic scheduling will support a more thoughtful analysis of the annual progress and help determine course-corrections for the following year. The annual monitoring program should occur as follows:

1. At the beginning of each year, the program coordinators will establish a list of priority management actions to occur that year, along with a realistic schedule. These actions should be derived from the CMP and its sub-plans, along with any new pressing issues that may have come to light since the last update of the CMP. See Appendix A for a list of management actions and implementation schedule.
  - a. The program coordinators should take care that the schedule is realistic and that there are not more tasks than can be completed in the number of man-hours available in the year. If it is consistently found that there are more tasks that must be completed than there are man-hours to complete them, staffing needs should be reviewed and new staff added, as needed. Management actions and projects that require a great deal of field labor or expertise that is not available in-house should be contracted out to ensure that they are conducted on schedule.
2. The priority management actions and the schedule should be placed into a progress-tracking datasheet in order to measure progress towards meeting the actions.
  - a. Larger actions and ongoing projects can be broken up into smaller components that can be individually tracked and checked off when complete. This will give a sense of

## Implementation and Evaluation

progress for some of the items that may be complete only at the end of the year, or even after several years.

- b. As each action is completed, the program coordinators should enter the date of completion into the datasheet. It is easy to forget when projects were completed if you are attempting to recall this information at the end of a busy year.
  - c. Notes on problems encountered during management actions, interesting outcomes, successes, and ideas for improving management actions in the future should be kept on a linked document, to allow for easy cross-reference. This will help when writing the annual progress report.
  - d. The progress-tracking datasheets and schedule should be referenced at the beginning of each month, and updated as appropriate.
3. At the end of each year, the program coordinators should review the progress of that year's management program activities using the progress-tracking datasheet.
    - a. The progress-tracking datasheet will provide information on the percentage of management actions completed during the year and can reveal patterns in the strengths and weaknesses in the management program. The notes will provide helpful information on how best to improve the management actions, if they are to be continued the next year. Comparison of the projected schedule with the actual schedule will enable the program coordinators to better estimate timelines for future projects and will help determine if the scale and scope of the actions slated for the following year(s) are appropriate for the staffing level.
  4. After the progress-tracking datasheets are analyzed, the program coordinators should produce an annual report, as described in Section 4.2.1.

### 4.2 Review and Revision

The principles of adaptive management require regular review of the program and revision of management goals, objectives, actions, and techniques, to improve the performance of the program. There are two primary reasons to evaluate the implementation of the Mauna Kea CMP. The first is to demonstrate that by implementing the management actions, desired outcomes are being achieved. The second is to continually improve the management program in terms of efficiency and quality.

Two review processes, an annual progress report and a five-year management outcome assessment, are recommended to assess the success of the management program and to enable revision of the CMP.

#### 4.2.1 Annual Progress Report

At the end of each year OMKM should produce an annual progress report describing in detail the management goals, objectives, and actions for the year and what progress was made towards meeting them. The report should also describe actions to be taken to improve the program for the next year(s). This report is not intended to be a status report on the resources in UH Management Areas, rather it is meant to inform management and stakeholders of the progress of the program and direction it is to take in the future. This progress report should be developed before the following year's management priorities

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and schedule are set. The annual progress report will be reviewed by MKMB, MKMB committees, DLNR, other agencies, and the public, and submitted to BLNR (see Section 2.3).

### **4.2.2 Five-Year Management Outcome Analysis and CMP Revision**

The OMKM program should be subjected to a major review every five years, and the CMP should be revised, as necessary. This process should involve input from State and Federal agencies and the public.

#### **4.2.2.1 Management Outcome Analysis**

Determination of the outcome of management activities on the cultural and natural resources and of the success of the management program will be accomplished through a report summarizing (1) the state of cultural and natural resources on Mauna Kea and (2) the progress of the management program over the preceding five years.

The first section of the report will discuss the state of the cultural and natural resources in UH Management Areas. This section will summarize data collected during monitoring, research, restoration, and threat prevention and control activities conducted over the preceding five years. This portion of the report will analyze trends in cultural and natural resources, and the impacts (positive, negative, or neutral) that management actions have had on them. It will also summarize what future management actions are needed to protect, enhance, or restore Mauna Kea's cultural and natural resources.

The second section of the Five-Year Management Outcome Analysis should include a summary of the progress of the management program towards meeting management goals, objectives, and actions, as outlined in the CMP and in the annual listing of priority management actions (see Section 4.1). The source of information for this section of the report will be the annual progress reports from the last five years (see Section 4.2.1). Additionally, the CMP should be reviewed to determine if any desired outcomes were not addressed during the preceding five years, and if so, why not. This section will discuss strengths and weaknesses of the CMP and the management program and ways to improve them.

The purpose of the Management Outcome Analysis is to provide analysis of both the condition of the resources in UH Management Areas and the status of the CMP and management program. This information will be used to update the CMP so that it better addresses the needs of the resources, and to improve management activities through adaptive management.

A draft of this report should be submitted for review and comment to OMKM, MKMB, MKMB committees, and State and Federal agencies, as deemed necessary or appropriate. This will provide a mechanism for the interested parties to provide input into the direction the management program and suggestions for changes to the CMP. A final version of the report can then be presented to the public for comments and suggestions to be used in revising the CMP.

#### **4.2.2.2 Revising the CMP**

Following the production of the Five-Year Management Outcome Analysis, and after input from appropriate stakeholders, the CMP should be revised and updated to incorporate current status descriptions, new or updated desired outcomes, and new management actions. This major review and revision process should occur on the sixth year (to allow for time to process the five-year review). If it is determined that the five-year cycle is too short to show real changes in resource conditions, then after two five-year review and revision cycles, the frequency of the process can be lengthened, as needed.

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As described above (see Section 2.1), the current status of natural resources is unknown, and baseline inventories are required. Completion of the baseline inventories will necessitate a re-evaluation of the management actions recommended in CMP Section 7 and in the NRMP. It may be necessary to complete one or more in-house reviews and revisions of the natural resource management priorities during the first several years of the program, to determine impediments to successful management of natural resources, develop realistic timelines for projects, and make necessary changes to the structure of the program. This can be done on an as-needed basis, to be determined by the NRC, OMKM director, and MKMB Environment Committee.

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**Appendix A. Mauna Kea CMP Management Actions: Cross-Reference  
to Subplans**



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<b>COMPONENT PLAN: UNDERSTANDING AND PROTECTING MAUNA KEA'S RESOURCES</b>			
		<b>Implementation Schedule</b>	<b>Subplans</b>
<b>NATIVE HAWAIIAN CULTURAL RESOURCES</b>			
<b>Management</b>			
CR-3	Conduct educational efforts to generate public awareness about the importance of preserving the cultural landscape.	Immediate	NRMP 4.4.2 CRMP 4.3.3 PAP 4.2, 5.2, 6.1
CR-1	Kahu Kū Mauna shall work with families with lineal and historical connections to Mauna Kea, cultural practitioners, and other Native Hawaiian groups, including the Mauna Kea Management Board's Hawaiian Culture Committee, toward the development of appropriate procedures and protocols regarding cultural issues.	Immediate	NRMP 5.1.1 CRMP 4.2.1 PAP 2.3, 6.1, 6.3, 6.8
CR-2	Support application for designation of the summit region of Mauna Kea as a Traditional Cultural Property, per the National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470 et seq. in consultation with the larger community.	Short-term	CRMP 2.4.2.1
<b>Cultural Practices</b>			
CR-4	Establish a process for ongoing collection of information on traditional, contemporary, and customary cultural practices.	Short-term	CRMP 4.2.1.1
CR-5	Develop and adopt guidelines for the culturally appropriate placement and removal of offerings	Immediate	CRMP 4.2.1.3 PAP 6.3. 6.8
CR-7	Kahu Kū Mauna shall take the lead in determining the appropriateness of constructing new Hawaiian cultural features.	Immediate	CRMP 4.2.1.6
CR-8	Develop and adopt a management policy for the UH Management Areas on the scattering of cremated human remains.	Immediate	CRMP 4.2.1.7
CR-9	A management policy for the cultural appropriateness of building ahu or "stacking of rocks" will need to be developed by Kahu Kū Mauna who may consider similar policies adopted by Hawai'i Volcanoes National Park.	Immediate	CRMP 4.2.1.8 PAP 6.8
CR-6	Develop and adopt guidelines for the visitation and use of ancient shrines.	Immediate	CRMP 4.2.1.5 PAP 2.7.2, 6.3
<b>Historic Properties</b>			
CR-14	Immediately report any disturbance of a shrine or burial site to the rangers, DOCARE, Kahu Kū Mauna Council, and SHPD.	Ongoing	CRMP 4.3.1.6 PAP 2.5.1
CR-10	Develop and implement a historic property monitoring program to systematically monitor the condition of the historic district and all historic properties, including cultural sites and burials.	Immediate	CRMP 4.3.1 PAP 5.2

## Implementation and Evaluation

		<b>Implementation Schedule</b>	<b>Subplans</b>
CR-12	Consult with Kahu Kū Mauna about establishing buffers (preservation zones) around known historic sites in the Astronomy Precinct, to protect them from potential future development.	Immediate	CRMP 4.2.7
CR-13	Develop and implement a burial treatment plan for the UH Management Areas in consultation with Kahu Kū Mauna Council, MKMB's Hawaiian Culture Committee, the Hawai'i Island Burial Council, recognized lineal or cultural descendants, and SHPD.	Immediate	CRMP 4.3.2, 4.3.7
CR-11	Complete an archaeological survey of the portions of the Summit Access Road corridor that are under UH management.	Completed	CRMP 4.3.7

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<b>COMPONENT PLAN: UNDERSTANDING AND PROTECTING MAUNA KEA'S RESOURCES</b>			
		<b>Implementation Schedule</b>	<b>Subplans</b>
<b>NATURAL RESOURCES</b>			
<b>Threat Prevention and Control</b>			
NR-6	Reduce threats to natural resources by educating stakeholders and the public about Mauna Kea's unique natural resources.	Immediate	NRMP 4.4 PAP 2.7.1, 4.2 5.2, 6.1, 6.3, 6.6
NR-2	Limit damage caused by invasive species through creation of an invasive species prevention and control program.	Immediate	NRMP 4.2.3.7, 4.3 PAP 2.7.1, 6.3
NR-1	Limit threats to natural resources through management of permitted activities and uses.	Short-term	NRMP 4.2.3
NR-3	Maintain native plant and animal populations and biological diversity.	Mid and Long-term	NRMP 4.2.3.8
NR-4	Minimize barriers to species migration, to help maintain populations and protect ecosystem processes and development.	Mid and Long-term	NRMP 4.2.3.11
NR-5	Manage ecosystems to allow for response to climate change.	Long-term	NRMP 4.2.3.11
<b>Ecosystem Protection, Enhancement &amp; Restoration</b>			
NR-7	Delineate areas of high native diversity, unique communities, or unique geological features within the Astronomy Precinct and at Hale Pōhaku and consider protection from development.	Short and Mid-term	NRMP 4.1, 4.2.3.1
NR-8	Consider fencing areas of high native biodiversity or populations of endangered species to keep out feral ungulates (applies to areas below 12,800 ft elevation).	Mid-term	NRMP 4.2.3.7, 4.3
NR-9	Increase native plant density and diversity through an outplanting program.	Long-term	NRMP 4.3, 4.4
NR-10	Incorporate mitigation plans into project planning and conduct mitigation following new development.	As needed	NRMP 4.3
NR-11	Conduct habitat rehabilitation projects following unplanned disturbances.	As needed	NRMP 4.3
NR-12	Create restoration plans and conduct habitat restoration activities, as needed.	As needed	NRMP 4.3
<b>Program Management</b>			
NR-13	Increase communication, networking, and collaborative opportunities, to support management and protection of natural resources.	Immediate	NRMP 4.1.3.3, 4.3, 5.1.3 PAP 4.2, 4.5
NR-14	Use the principles of adaptive management when developing programs and methodologies. Review programs annually and revise any component plans every five years, based on the results of the program review.	Short-term / As needed	NRMP 5.2 PAP 5.1, 5.2, 6.4, 6.7, 7

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		Implementation Schedule	Subplans
<b>Inventory, Monitoring and Research</b>			
NR-16	Conduct regular long-term monitoring, as outlined in an inventory, monitoring, and research plan.	Ongoing	NRMP 4.1 PAP 6.4
NR-18	Develop geo-spatial database of all known natural resources and their locations in the UH Management Areas that can serve as baseline documentation against change and provide information essential for decision-making.	Ongoing	NRMP 4.1, 4.5
NR-15	Conduct baseline inventories of high-priority resources, as outlined in an inventory, monitoring, and research plan.	Immediate	NRMP 4.1
NR-17	Conduct research to fill knowledge gaps that cannot be addressed through inventory and monitoring.	Immediate	NRMP 4.1.2.3

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<b>COMPONENT PLAN: UNDERSTANDING AND PROTECTING MAUNA KEA'S RESOURCES</b>			
		<b>Implementation Schedule</b>	<b>Subplans</b>
<b>EDUCATION AND OUTREACH</b>			
<b>Program Development</b>			
EO-1	Develop and implement education and outreach program	Immediate and Short-term	NRMP 4.1 CRMP 4.3.3 PAP 2.7.1, 4.2, 5.2, 6.1, 6.3, 6.6
<b>Education</b>			
EO-3	Continue to develop, update, and distribute materials explaining important aspects of Mauna Kea.	Ongoing	NRMP 4.4 CRMP 4.3.3 PAP 6.1
EO-4	Develop and implement a signage plan to improve signage throughout the UH Management Areas (interpretive, safety, rules and regulations).	Immediate	NRMP 4.4.2 PAP 4.2, 5.2, 6.2
EO-5	Develop interpretive features such as self-guided cultural walks and volunteer-maintained native plant gardens.	Mid-term	NRMP 4.3, 4.4.2 CRMP 4.3.3 PAP 6.2
EO-6	Engage in outreach and partnerships with schools, by collaborating with local experts, teachers, and university researchers, and by working with the 'Imiloa Astronomy Center of Hawai'i.	Mid-term	NRMP 4.4.2 PAP 5.2, 6.1
EO-2	Require orientation of users, with periodic updates and a certificate of completion, including but not limited to visitors, employees, observatory staff, contractors, and commercial and recreational users.	Long-term	NRMP 4.4.2 PAP 6.1, 6.6
<b>Outreach</b>			
EO-7	Continue and increase opportunities for community members to provide input to cultural and natural resources management activities on Mauna Kea, to ensure systematic input regarding planning, management, and operational decisions that affect natural resources, sacred materials or places, or other ethnographic resources with which they are associated.	Ongoing	NRMP 4.4.2 CRMP 5.3 PAP 5.2, 6.3, 6.8
EO-8	Provide opportunities for community members to participate in stewardship activities.	Ongoing	NRMP 4.4.2
<b>ASTRONOMICAL RESOURCES</b>			
<b>Protection of Astronomical Resources</b>			
AR-1	Operate the UH Management Areas to prohibit activities resulting in negative impacts to astronomical resources.	Ongoing	PAP 5.1
AR-2	Prevent light pollution, radio frequency interference (RFI) and dust.	Ongoing	NRMP 4.2.3.2

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<b>COMPONENT PLAN: MANAGING ACCESS AND USE</b>			
		<b>Implementation Schedule</b>	<b>Subplans</b>
<b>ACTIVITIES AND USES</b>			
<b>General Management</b>			
ACT-1	Continue and update managed access policy of 1995 Management Plan.	Short-term	NRMP 4.2, 4.4 PAP 2.5.2, 5.2, 7
ACT-2	Develop parking and visitor traffic plan.	Immediate	NRMP 3.1.1.2 PAP 5.2, 6.4, 6.6, 6.7
ACT-3	Maintain a presence of interpretive and enforcement personnel on the mountain at all times to educate users, deter violations, and encourage adherence to restrictions.	Ongoing	NRMP 5.1.2 CRMP 4.1.1 PAP 4.2, 4.4, 4.5, 4.6, 5.2, 6.1, 6.2, 6.5, 6.6, 6.7
ACT-4	Develop and enforce a policy that maintains current prohibitions on off-road vehicle use in the UH Management Areas and that strengthens measures to prevent or deter vehicles from leaving established roads and designated parking areas.	Ongoing	NRMP 4.2.3.1 CRMP 4.1.2 PAP 2.5.1, 2.5.2, 2.6.3, 5.2, 6.3, 6.5
<b>Recreational</b>			
ACT-5	Implement policies to reduce impacts of recreational hiking	Short-term	NRMP 4.2.3.1 CRMP 4.2.3.4 PAP 3.3.7, 5.2, 6.2, 6.3
ACT-6	Define and maintain areas where snow-related activities can occur and confine activities to slopes that have a protective layer of snow.	Ongoing	NRMP 4.2.3.1 CRMP 4.2.3.2 PAP 3.3.5, 5.2, 6.1, 6.3, 6.4
ACT-7	Confine University or other sponsored tours and star-gazing activities to previously disturbed ground surfaces and established parking areas.	Ongoing	NRMP 6.2.3 CRMP 4.2.3.1 PAP 2.5.3, 2.6.2, 3.3.3, 5.2
ACT-8	Coordinate with DLNR in the development of a policy regarding hunting in the UH Management Areas.	Immediate	NRMP 3.1.3.5 3.2.12 CRMP 4.2.3.3 PAP 2.5.1, 3.3.6, 5.2
<b>Commercial</b>			
ACT-9	Maintain commercial tour permitting process; evaluate and issue permits annually.	Ongoing	NRMP 3.1.4 PAP 2.5.3, 2.5.4, 3.3.3, 4.3, 5.2, 6.1, 6.7

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ACT-10	Ensure OMKM input on permits for filming activities	Ongoing	NRMP 3.1.4.2 PAP 2.5.3, 3.3.3, 4.3, 6.1, 6.7
		<b>Implementation Schedule</b>	<b>Subplans</b>
ACT-11	Seek statutory authority for the University to regulate commercial activities in the UH Management Areas.	Completed	NRMP 1.4.2.3
<b>Scientific Research</b>			
ACT-12	Ensure input by OMKM, MKMB, and Kahu Kū Mauna on all scientific research permits and establish system of reporting results of research to OMKM.	Ongoing	NRMP 4.2.3.1, 4.2.3.7, 4.2.3.9 CRMP 4.2.6
<b>PERMITTING AND ENFORCEMENT</b>			
<b>Laws and Regulations</b>			
P-1	Comply with all applicable federal, state, and local laws, regulations, and permit conditions related to activities in the UH Management Areas.	Ongoing	NRMP 1.4.3 PAP 2.4, 2.5, 2.5.1, 2.5.2, 2.5.3, 5.1
P-2	Strengthen CMP implementation by recommending to the BLNR that the CMP conditions be included in any Conservation District Use Permit or other permit.	As needed	NRMP 1.4.3.2
P-3	Obtain statutory rule-making authority from the legislature, authorizing the University of Hawai'i to adopt administrative rules pursuant to Chapter 91 to implement and enforce the management actions.	Completed	NRMP 1.4.3.2
P-4	Educate management staff and users of the mountain about all applicable rules and permit requirements.	Immediate	NRMP 4.4 PAP 4.2, 5.2, 6.1, 6.2, 6.5
<b>Enforcement</b>			
P-5	Continue coordinating with other agencies on enforcement needs.	Ongoing	NRMP 5.1 PAP 4, 6.5
P-6	Obtain legal authority for establishing, and then establish, a law enforcement presence on the mountain that can enforce rules for the UH Management Areas on Mauna Kea.	Completed / As needed	NRMP 1.4.2.3, 3.1.3.2, 5.1 PAP 4.4, 4.5, 4.6, 5.2, 6.5, 6.6
P-7	Develop and implement protocol for oversight and compliance with Conservation District Use Permits.	Ongoing	NRMP 1.4.2.3
P-8	Enforce conditions contained in commercial and Special Use permits.	Ongoing	NRMP 3.1.4 PAP 2.5.3, 3.3.3, 4.3, 4.5, 4.6, 6.5



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<b>COMPONENT PLAN: MANAGING THE BUILT ENVIRONMENT</b>			
		<b>Implementation Schedule</b>	<b>Subplans</b>
<b>INFRASTRUCTURE AND MAINTENANCE</b>			
<b>Routine Maintenance</b>			
IM-1	Develop and implement an OMMP.	Ongoing	
IM-2	Reduce impacts from operations and maintenance activities by educating personnel about Mauna Kea's unique resources.	Immediate	NRMP 4.4
IM-3	Conduct historic preservation review for maintenance activities that will have an adverse effect on historic properties.	Short-term	CRMP 4.1.3
IM-4	Evaluate need for and feasibility of a vehicle wash station near Hale Pōhaku, and requiring that vehicles be cleaned.	Short-term	NRMP 4.2.3.7
IM-5	Develop and implement a Debris Removal, Monitoring and Prevention Plan.	Immediate	NRMP 4.2.3.5 CRMP 4.1.4, 4.3.4
IM-6	Develop and implement an erosion inventory and assessment plan.	Long-term	NRMP 3.2.4, 4.1.4.2, 4.2.3.4 PAP 2.6.3, 6.3, 6.4
IM-7	Prepare a plan, in collaboration with the Department of Defense, to remove military wreckage from a remote area of the UH Management Areas, while ensuring protection of natural and cultural resources.	Mid-term	CRMP 4.3.4.1
<b>Infrastructure</b>			
IM-8	Assess feasibility of paving the Summit Access Road.	Long-term	NRMP 4.2.3
IM-9	Evaluate need for additional parking lots and vehicle pullouts and install if necessary.	Mid-term	NRMP 3.1.1.2.3 PAP 5.2, 5.4, 6.7
IM-10	Evaluate need for additional public restroom facilities in the summit region and at Hale Pōhaku, and install close-contained zero waste systems if necessary.	Immediate	NRMP 3.1.3.1, 3.2.3, 4.2.3.3 PAP 5.2, 6.4, 6.6, 6.7, 6.8
<b>Sustainable Technologies</b>			
IM-11	Encourage existing facilities and new development to incorporate sustainable technologies, energy efficient technologies, and LEED standards, whenever possible, into facility design and operations.	As needed	
IM-12	Conduct energy audits to identify energy use and system inefficiencies, and develop solutions to reduce energy usage.	Immediate	NRMP 4.2.3.3
IM-13	Conduct feasibility assessment, in consultation with Hawaii Electric Light Company, on developing locally-based alternative energy sources.	Mid-term	NRMP 3.1.1.2.3

## Implementation and Evaluation

IM-14	Encourage observatories to investigate options to reduce the use of hazardous materials in telescope operations.	Short-term	
		<b>Implementation Schedule</b>	<b>Subplans</b>
<b>CONSTRUCTION GUIDELINES</b>			
<b>General Requirements</b>			
C-1	Require an independent construction monitor who has oversight and authority to insure that all aspects of ground based work comply with protocols and permit requirements.	As needed	NRMP 3.2, 4.2
<b>Best Management Practices</b>			
C-2	Require use of Best Management Practices Plan for Construction Practices.	As needed	NRMP 4.2.3
C-3	Develop, prior to construction, a rock movement plan.	As needed	NRMP 4.2.3.1
C-4	Require contractors to provide information from construction activities to OMKM for input into OMKM information databases.	As needed	
C-5	Require on-site monitors (e.g., archaeologist, cultural resources specialist, entomologist) during construction, as determined by the appropriate agency.	As needed	CRMP 4.2.7
C-6	Conduct required archaeological monitoring during construction projects per SHPD approved plan.	As needed	CRMP 4.2.7
C-7	Education regarding historical and cultural significance	As needed	NRMP 4.4
C-8	Education regarding environment, ecology and natural resources	As needed	NRMP 4.4
C-9	Inspection of construction materials	As needed	NRMP 4.2.3.7
<b>SITE RECYCLING, DECOMMISSIONING DEMOLITION AND RESTORATION</b>			
<b>Site Recycling, Decommissioning, Demolition, and Restoration</b>			
SR-1	Require observatories to develop plans to recycle or demolish facilities once their useful life has ended, in accordance with their sublease requirements, identifying all proposed actions.	As needed	NRMP 4.3.3.4.1
SR-2	Require observatories to develop a restoration plan in association with decommissioning, to include an environmental cost-benefit analysis and a cultural assessment.	As needed	NRMP 4.3.3.4.1
SR-3	Require any future observatories to consider site restoration during project planning and include provisions in subleases for funding of full restoration.	As needed	NRMP 4.3.3.4.1

## Implementation and Evaluation

		Implementation Schedule	Subplans
<b>CONSIDERATION OF FUTURE LAND USE</b>			
<b>Facility Planning Guidelines</b>			
FLU-1	Follow design guidelines presented in the 2000 Master Plan.	As needed	NRMP 5.1.1
FLU-2	Develop a map with land-use zones in the Astronomy Precinct based on updated inventories of cultural and natural resources, to delineate areas where future land use will not be allowed and areas where future land use will be allowed but will require compliance with prerequisite studies or analysis prior to approval of Conservation District Use Permit.	Immediate	NRMP 4.3.3.1
FLU-3	Require cataloguing of initial site conditions for use when conducting site restoration.	As needed	
FLU-4	Require project specific visual rendering of both pre- and post-project settings to facilitate analysis of potential impacts to view planes.	As needed	NRMP 4.1.4.11
FLU-5	Require an airflow analysis on the design of proposed structures to assess potential impacts to aeolian ecosystems.	As needed	NRMP 4.1.4.4
FLU-6	Incorporate habitat mitigation plans into project planning process.	As needed	NRMP 4.3.3.3
FLU-7	Require use of close-contained zero-discharge waste systems for any future development in the summit region, from portable toilets to observatory restrooms, if feasible.	As needed	NRMP 3.1.1.2.6

## Implementation and Evaluation

<b>COMPONENT PLAN: MANAGING OPERATIONS</b>			
		<b>Implementation Schedule</b>	<b>Subplans</b>
<b>OPERATION AND IMPLEMENTATION OF THE CMP</b>			
<b>Management</b>			
OI-1	Maintain OMKM, MKMB, and Kahu Kū Mauna in current roles, with OMKM providing local management of the UH Management Areas, and MKSS providing operational and maintenance services.	Ongoing	
OI-2	Develop training plan for staff and volunteers.	Ongoing	NRMP 5.1 CRMP 5.2 PAP 5.1, 5.2, 6.1, 6.4, 6.5
OI-3	Maintain and expand regular interaction and dialogue with stakeholders, community members, surrounding landowners, and overseeing agencies to provide a coordinated approach to resource management.	Ongoing	NRMP 5.1 PAP 5.1
OI-4	Establish grievance procedures for OMKM, to address issues as they arise.	Short-term	PAP 6.6
OI-5	Update and implement emergency response plan.	Ongoing	CRMP 4.1.6, 4.3.5 PAP 6.1, 6.4, 6.5, 6.7
<b>CMP MONITORING, EVALUATION AND UPDATES</b>			
<b>Management</b>			
MEU-1	Establish a reporting system to ensure that the MKMB, DLNR, and the public are informed of results of management activities in a timely manner.	Immediate	NRMP 4.1.3.3 PAP 6.4, 6.6, 7
MEU-2	Conduct regular updates of the CMP that reflect outcomes of the evaluation process, and that incorporate new information about resources.	Short-term / As needed	NRMP 5.2 CRMP 5.5 PAP 7
MEU-3	Revise and update planning documents, including the master plan, leases, and subleases, so that they will clearly assign roles and responsibilities for managing Mauna Kea and reflect stewardship matters resolved with DLNR.	As needed	PAP 7

## Implementation and Evaluation

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## **Appendix B. Mauna Kea CMP Management Actions: Implementation Schedule**

Note: In cases where an action continues after it is initially developed or implemented, the shading continues to denote ongoing activity.

## Implementation and Evaluation

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Implementation and Evaluation

Management Action	Initiation of Action	Duration of Implementation					
		Yr 1	Yr 2	Yr 3	Yrs 4-6	Yrs 7-9	Yrs 10+
<b>COMPONENT PLAN: UNDERSTANDING AND PROTECTING MAUNA KEA'S RESOURCES</b>							
<b>NATIVE HAWAIIAN CULTURAL RESOURCES</b>							
<b>Management</b>							
CR-3	Conduct educational efforts to generate public awareness about the importance of preserving the cultural landscape.	Immediate					
CR-1	Kahu Kū Mauna shall work with families with lineal and historical connections to Mauna Kea, cultural practitioners, and other Native Hawaiian groups, including the Mauna Kea Management Board's Hawaiian Culture Committee, toward the development of appropriate procedures and protocols regarding cultural issues.	Immediate					
CR-2	Support application for designation of the summit region of Mauna Kea as a Traditional Cultural Property, per the National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470 et seq. in consultation with the larger community.	Short-term					
<b>Cultural Practices</b>							
CR-4	Establish a process for ongoing collection of information on traditional, contemporary, and customary cultural practices.	Short-term					
CR-5	Develop and adopt guidelines for the culturally appropriate placement and removal of offerings	Immediate					
CR-7	Kahu Kū Mauna shall take the lead in determining the appropriateness of constructing new Hawaiian cultural features.	Immediate					
CR-8	Develop and adopt a management policy for the UH Management Areas on the scattering of cremated human remains.	Immediate					
CR-9	A management policy for the cultural appropriateness of building ahu or "stacking of rocks" will need to be developed by Kahu Kū Mauna who may consider similar policies adopted by Hawai'i Volcanoes National Park.	Immediate					
CR-6	Develop and adopt guidelines for the visitation and use of ancient shrines.	Immediate					
<b>Historic Properties</b>							



## Implementation and Evaluation

	Management Action	Initiation of Action	Duration of Implementation					
			Yr 1	Yr 2	Yr 3	Yrs 4-6	Yrs 7-9	Yrs 10+
CR-14	Immediately report any disturbance of a shrine or burial site to the rangers, DOCARE, Kahu Kū Mauna Council, and SHPD.	Ongoing						
CR-10	Develop and implement a historic property monitoring program to systematically monitor the condition of the historic district and all historic properties, including cultural sites and burials.	Immediate						
CR-12	Consult with Kahu Kū Mauna about establishing buffers (preservation zones) around known historic sites in the Astronomy Precinct, to protect them from potential future development.	Immediate						
CR-13	Develop and implement a burial treatment plan for the UH Management Areas in consultation with Kahu Kū Mauna Council, MKMB's Hawaiian Culture Committee, the Hawai'i Island Burial Council, recognized lineal or cultural descendants, and SHPD.	Immediate						
CR-11	Complete an archaeological survey of the portions of the Summit Access Road corridor that are under UH management.	Completed	--	--	--	--	--	--
<b>NATURAL RESOURCES</b>								
<b>Threat Prevention and Control</b>								
NR-6	Reduce threats to natural resources by educating stakeholders and the public about Mauna Kea's unique natural resources.	Immediate						
NR-2	Limit damage caused by invasive species through creation of an invasive species prevention and control program.	Immediate						
NR-1	Limit threats to natural resources through management of permitted activities and uses.	Short-term						
NR-3	Maintain native plant and animal populations and biological diversity.	Mid and Long-term						
NR-4	Minimize barriers to species migration, to help maintain populations and protect ecosystem processes and development.	Mid and Long-term						
NR-5	Manage ecosystems to allow for response to climate change.	Long-term						
<b>Ecosystem Protection, Enhancement &amp; Restoration</b>								
NR-7	Delineate areas of high native diversity, unique communities, or unique geological features within the Astronomy Precinct and at Hale Pōhaku and consider protection from development.	Short and Mid-term						

## Implementation and Evaluation

	Management Action	Initiation of Action	Duration of Implementation					
			Yr 1	Yr 2	Yr 3	Yrs 4-6	Yrs 7-9	Yrs 10+
NR-8	Consider fencing areas of high native biodiversity or populations of endangered species to keep out feral ungulates (applies to areas below 12,800 ft elevation).	Mid-term						
NR-9	Increase native plant density and diversity through an outplanting program.	Long-term						
NR-10	Incorporate mitigation plans into project planning and conduct mitigation following new development.	As needed						
NR-11	Conduct habitat rehabilitation projects following unplanned disturbances.	As needed						
NR-12	Create restoration plans and conduct habitat restoration activities, as needed.	As needed						
<b>Program Management</b>								
NR-13	Increase communication, networking, and collaborative opportunities, to support management and protection of natural resources.	Immediate						
NR-14	Use the principles of adaptive management when developing programs and methodologies. Review programs annually and revise any component plans every five years, based on the results of the program review.	Short-term / As needed						
<b>Inventory, Monitoring and Research</b>								
NR-16	Conduct regular long-term monitoring, as outlined in an inventory, monitoring, and research plan.	Ongoing						
NR-18	Develop geo-spatial database of all known natural resources and their locations in the UH Management Areas that can serve as baseline documentation against change and provide information essential for decision-making.	Ongoing						
NR-15	Conduct baseline inventories of high-priority resources, as outlined in an inventory, monitoring, and research plan.	Immediate						
NR-17	Conduct research to fill knowledge gaps that cannot be addressed through inventory and monitoring.	Immediate						

## Implementation and Evaluation

Management Action	Initiation of Action	Duration of Implementation					
		Yr 1	Yr 2	Yr 3	Yrs 4-6	Yrs 7-9	Yrs 10+
<b>EDUCATION AND OUTREACH</b>							
<b>Program Development</b>							
EO-1	Develop and implement education and outreach program	Immediate and Short-term					
<b>Education</b>							
EO-3	Continue to develop, update, and distribute materials explaining important aspects of Mauna Kea.	Ongoing					
EO-4	Develop and implement a signage plan to improve signage throughout the UH Management Areas (interpretive, safety, rules and regulations).	Immediate					
EO-5	Develop interpretive features such as self-guided cultural walks and volunteer-maintained native plant gardens.	Mid-term					
EO-6	Engage in outreach and partnerships with schools, by collaborating with local experts, teachers, and university researchers, and by working with the 'Imiloa Astronomy Center of Hawai'i.	Mid-term					
EO-2	Require orientation of users, with periodic updates and a certificate of completion, including but not limited to visitors, employees, observatory staff, contractors, and commercial and recreational users.	Long-term					
<b>Outreach</b>							
EO-7	Continue and increase opportunities for community members to provide input to cultural and natural resources management activities on Mauna Kea, to ensure systematic input regarding planning, management, and operational decisions that affect natural resources, sacred materials or places, or other ethnographic resources with which they are associated.	Ongoing					
EO-8	Provide opportunities for community members to participate in stewardship activities.	Ongoing					
<b>ASTRONOMICAL RESOURCES</b>							
<b>Protection of Astronomical Resources</b>							
AR-1	Operate the UH Management Areas to prohibit activities resulting in negative impacts to astronomical resources.	Ongoing					

Implementation and Evaluation

Management Action		Initiation of Action	Duration of Implementation					
			Yr 1	Yr 2	Yr 3	Yrs 4-6	Yrs 7-9	Yrs 10+
AR-2	Prevent light pollution, radio frequency interference (RFI) and dust.	Ongoing						
Management Action		Initiation of Action	Duration of Implementation					
			Yr 1	Yr 2	Yr 3	Yrs 4-6	Yrs 7-9	Yrs 10+
COMPONENT PLAN: MANAGING ACCESS AND USE								
ACTIVITIES AND USES								
General Management								
ACT-1	Continue and update managed access policy of 1995 Management Plan.	Short-term						
ACT-2	Develop parking and visitor traffic plan.	Immediate						
ACT-3	Maintain a presence of interpretive and enforcement personnel on the mountain at all times to educate users, deter violations, and encourage adherence to restrictions.	Ongoing						
ACT-4	Develop and enforce a policy that maintains current prohibitions on off-road vehicle use in the UH Management Areas and that strengthens measures to prevent or deter vehicles from leaving established roads and designated parking areas.	Ongoing						
Recreational								
ACT-5	Implement policies to reduce impacts of recreational hiking	Short-term						
ACT-6	Define and maintain areas where snow-related activities can occur and confine activities to slopes that have a protective layer of snow.	Ongoing						
ACT-7	Confine University or other sponsored tours and star-gazing activities to previously disturbed ground surfaces and established parking areas.	Ongoing						
ACT-8	Coordinate with DLNR in the development of a policy regarding hunting in the UH Management Areas.	Immediate						
Commercial								
ACT-9	Maintain commercial tour permitting process; evaluate and issue permits annually.	Ongoing						
ACT-10	Ensure OMKM input on permits for filming activities	Ongoing						

## Implementation and Evaluation

	Management Action	Initiation of Action	Duration of Implementation					
			Yr 1	Yr 2	Yr 3	Yrs 4-6	Yrs 7-9	Yrs 10+
ACT-11	Seek statutory authority for the University to regulate commercial activities in the UH Management Areas.	Completed	--	--	--	--	--	--

	Management Action	Initiation of Action	Duration of Implementation					
			Yr 1	Yr 2	Yr 3	Yrs 4-6	Yrs 7-9	Yrs 10+
<b>Scientific Research</b>								
ACT-12	Ensure input by OMKM, MKMB, and Kahu Kū Mauna on all scientific research permits and establish system of reporting results of research to OMKM.	Ongoing						
<b>PERMITTING AND ENFORCEMENT</b>								
<b>Laws and Regulations</b>								
P-1	Comply with all applicable federal, state, and local laws, regulations, and permit conditions related to activities in the UH Management Areas.	Ongoing						
P-2	Strengthen CMP implementation by recommending to the BLNR that the CMP conditions be included in any Conservation District Use Permit or other permit.	As needed						
P-3	Obtain statutory rule-making authority from the legislature, authorizing the University of Hawai'i to adopt administrative rules pursuant to Chapter 91 to implement and enforce the management actions.	Completed	--	--	--	--	--	--
P-4	Educate management staff and users of the mountain about all applicable rules and permit requirements.	Immediate						
<b>Enforcement</b>								
P-5	Continue coordinating with other agencies on enforcement needs.	Ongoing						
P-6	Obtain legal authority for establishing, and then establish, a law enforcement presence on the mountain that can enforce rules for the UH Management Areas on Mauna Kea.	Completed - As needed						

## Implementation and Evaluation

	Management Action	Initiation of Action	Duration of Implementation					
			Yr 1	Yr 2	Yr 3	Yrs 4-6	Yrs 7-9	Yrs 10+
P-7	Develop and implement protocol for oversight and compliance with Conservation District Use Permits.	Ongoing						
P-8	Enforce conditions contained in commercial and Special Use permits.	Ongoing						

Implementation and Evaluation

Management Action	Initiation of Action	Duration of Implementation					
		Yr 1	Yr 2	Yr 3	Yrs 4-6	Yrs 7-9	Yrs 10+
<b>COMPONENT PLAN: MANAGING THE BUILT ENVIRONMENT</b>							
<b>INFRASTRUCTURE AND MAINTENANCE</b>							
<b>Routine Maintenance</b>							
IM-1	Develop and implement an OMMP.	Ongoing					
IM-2	Reduce impacts from operations and maintenance activities by educating personnel about Mauna Kea's unique resources.	Immediate					
IM-3	Conduct historic preservation review for maintenance activities that will have an adverse effect on historic properties.	Short-term					
IM-4	Evaluate need for and feasibility of a vehicle wash station near Hale Pōhaku, and requiring that vehicles be cleaned.	Short-term					
IM-5	Develop and implement a Debris Removal, Monitoring and Prevention Plan.	Immediate					
IM-6	Develop and implement an erosion inventory and assessment plan.	Long-term					
IM-7	Prepare a plan, in collaboration with the Department of Defense, to remove military wreckage from a remote area of the UH Management Areas, while ensuring protection of natural and cultural resources.	Mid-term					
<b>Infrastructure</b>							
IM-8	Assess feasibility of paving the Summit Access Road.	Long-term					
IM-9	Evaluate need for additional parking lots and vehicle pullouts and install if necessary.	Mid-term					
IM-10	Evaluate need for additional public restroom facilities in the summit region and at Hale Pōhaku, and install close-contained zero waste systems if necessary.	Immediate					
<b>Sustainable Technologies</b>							
IM-11	Encourage existing facilities and new development to incorporate sustainable technologies, energy efficient technologies, and LEED standards, whenever possible, into facility design and operations.	As needed					

Implementation and Evaluation

	Management Action	Initiation of Action	Duration of Implementation					
			Yr 1	Yr 2	Yr 3	Yrs 4-6	Yrs 7-9	Yrs 10+
IM-12	Conduct energy audits to identify energy use and system inefficiencies, and develop solutions to reduce energy usage.	Immediate						
IM-13	Conduct feasibility assessment, in consultation with Hawaii Electric Light Company, on developing locally-based alternative energy sources.	Mid-term						
IM-14	Encourage observatories to investigate options to reduce the use of hazardous materials in telescope operations.	Short-term						
<b>CONSTRUCTION GUIDELINES</b>								
<b>General Requirements</b>								
C-1	Require an independent construction monitor who has oversight and authority to insure that all aspects of ground based work comply with protocols and permit requirements.	As needed						
<b>Best Management Practices</b>								
C-2	Require use of Best Management Practices Plan for Construction Practices.	As needed						
C-3	Develop, prior to construction, a rock movement plan.	As needed						
C-4	Require contractors to provide information from construction activities to OMKM for input into OMKM information databases.	As needed						
C-5	Require on-site monitors (e.g., archaeologist, cultural resources specialist, entomologist) during construction, as determined by the appropriate agency.	As needed						
C-6	Conduct required archaeological monitoring during construction projects per SHPD approved plan.	As needed						
C-7	Education regarding historical and cultural significance	As needed						
C-8	Education regarding environment, ecology and natural resources	As needed						
C-9	Inspection of construction materials	As needed						
<b>SITE RECYCLING, DECOMMISSIONING DEMOLITION AND RESTORATION</b>								
<b>Site Recycling, Decommissioning, Demolition, and Restoration</b>								



Implementation and Evaluation

	Management Action	Initiation of Action	Duration of Implementation					
			Yr 1	Yr 2	Yr 3	Yrs 4-6	Yrs 7-9	Yrs 10+
SR-1	Require observatories to develop plans to recycle or demolish facilities once their useful life has ended, in accordance with their sublease requirements, identifying all proposed actions.	As needed						
SR-2	Require observatories to develop a restoration plan in association with decommissioning, to include an environmental cost-benefit analysis and a cultural assessment.	As needed						
SR-3	Require any future observatories to consider site restoration during project planning and include provisions in subleases for funding of full restoration.	As needed						
<b>CONSIDERATION OF FUTURE LAND USE</b>								
<b>Facility Planning Guidelines</b>								
FLU-1	Follow design guidelines presented in the 2000 Master Plan.	As needed						
FLU-2	Develop a map with land-use zones in the Astronomy Precinct based on updated inventories of cultural and natural resources, to delineate areas where future land use will not be allowed and areas where future land use will be allowed but will require compliance with prerequisite studies or analysis prior to approval of Conservation District Use Permit.	Immediate						
FLU-3	Require cataloguing of initial site conditions for use when conducting site restoration.	As needed						
FLU-4	Require project specific visual rendering of both pre- and post-project settings to facilitate analysis of potential impacts to view planes.	As needed						
FLU-5	Require an airflow analysis on the design of proposed structures to assess potential impacts to aeolian ecosystems.	As needed						
FLU-6	Incorporate habitat mitigation plans into project planning process.	As needed						
FLU-7	Require use of close-contained zero-discharge waste systems for any future development in the summit region, from portable toilets to observatory restrooms, if feasible.	As needed						

Implementation and Evaluation

Management Action	Initiation of Action	Duration of Implementation					
		Yr 1	Yr 2	Yr 3	Yrs 4-6	Yrs 7-9	Yrs 10+
<b>COMPONENT PLAN: MANAGING OPERATIONS</b>							
<b>OPERATION AND IMPLEMENTATION OF THE CMP</b>							
<b>Management</b>							
OI-1	Maintain OMKM, MKMB, and Kahu Kū Mauna in current roles, with OMKM providing local management of the UH Management Areas, and MKSS providing operational and maintenance services.	Ongoing					
OI-2	Develop training plan for staff and volunteers.	Ongoing					
OI-3	Maintain and expand regular interaction and dialogue with stakeholders, community members, surrounding landowners, and overseeing agencies to provide a coordinated approach to resource management.	Ongoing					
OI-4	Establish grievance procedures for OMKM, to address issues as they arise.	Short-term					
OI-5	Update and implement emergency response plan.	Ongoing					
<b>CMP MONITORING, EVALUATION AND UPDATES</b>							
<b>Management</b>							
MEU-1	Establish a reporting system to ensure that the MKMB, DLNR, and the public are informed of results of management activities in a timely manner.	Immediate					
MEU-2	Conduct regular updates of the CMP that reflect outcomes of the evaluation process, and that incorporate new information about resources.	Short-term / As needed					
MEU-3	Revise and update planning documents, including the master plan, leases, and subleases, so that they will clearly assign roles and responsibilities for managing Mauna Kea and reflect stewardship matters resolved with DLNR.	As needed					

**Appendix C. Mauna Kea CMP Management Actions: Entities  
Responsible for Implementation**

## Implementation and Evaluation

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Implementation and Evaluation

		Responsible Entity
COMPONENT PLAN: UNDERSTANDING AND PROTECTING MAUNA KEA'S RESOURCES		
NATIVE HAWAIIAN CULTURAL RESOURCES		
Management		
CR-1	Kahu Kū Mauna shall work with families with lineal and historical connections to Mauna Kea, cultural practitioners, and other Native Hawaiian groups, including the Mauna Kea Management Board's Hawaiian Culture Committee, toward the development of appropriate procedures and protocols regarding cultural issues.	To be developed by Kahu Kū Mauna, Mauna Kea Management Board (MKMB), and Hawaiian Cultural Committee, in consultation with families with historic connections Mauna Kea, cultural practitioners, and other Native Hawaiians.
CR-2	Support application for designation of the summit region of Mauna Kea as a Traditional Cultural Property, per the National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470 et seq. in consultation with the larger community.	OMKM
CR-3	Conduct educational efforts to generate public awareness about the importance of preserving the cultural landscape.	OMKM
Cultural Practices		
CR-4	Establish a process for ongoing collection of information on traditional, contemporary, and customary cultural practices.	OMKM, in partnership with UH-Hilo and Hilo Community College to establish an oral history program.
CR-5	Develop and adopt guidelines for the culturally appropriate placement and removal of offerings	Kahu Kū Mauna, and/or the Hawaiian Cultural Committee, in consultation with families of lineal connections, kūpuna, cultural practitioners, or Native Hawaiian organizations.
CR-6	Develop and adopt guidelines for the visitation and use of ancient shrines.	Kahu Kū Mauna, and/or the Hawaiian Cultural Committee, in consultation with families of lineal connections, kūpuna, cultural practitioners, or Native Hawaiian organizations.
CR-7	Kahu Kū Mauna shall take the lead in determining the appropriateness of constructing new Hawaiian cultural features.	Kahu Kū Mauna, and/or the Hawaiian Cultural Committee, in consultation with families of lineal connections, kūpuna, cultural practitioners, or Native Hawaiian organizations.

## Implementation and Evaluation

		Responsible Entity
CR-8	Develop and adopt a management policy for the UH Management Areas on the scattering of cremated human remains.	Kahu Kū Mauna, and/or the Hawaiian Cultural Committee, in consultation with families of lineal connections, kūpuna, cultural practitioners, or Native Hawaiian organizations.
CR-9	A management policy for the culturally appropriateness of building ahu or “stacking of rocks” will need to be developed by Kahu Kū Mauna who may consider similar policies adopted by Hawai‘i Volcanoes National Park.	Kahu Kū Mauna, and/or the Hawaiian Cultural Committee, in consultation with families of lineal connections, kūpuna, cultural practitioners, or Native Hawaiian organizations.
<b>Historic Properties</b>		
CR-10	Develop and implement a historic property monitoring program to systematically monitor the condition of the historic district and all historic properties, including cultural sites and burials.	OMKM
CR-11	Complete an archaeological survey of the portions of the Summit Access Road corridor that are under UH management.	OMKM – completed by consultants
CR-12	Consult with Kahu Kū Mauna about establishing buffers (preservation zones) around known historic sites in the Astronomy Precinct, to protect them from potential future development.	OMKM, Kahu Kū Mauna, DLNR (SHPD)
CR-13	Develop and implement a burial treatment plan for the UH Management Areas in consultation with Kahu Kū Mauna Council, MKMB’s Hawaiian Culture Committee, the Hawai‘i Island Burial Council, recognized lineal or cultural descendants, and SHPD.	OMKM, with approval as indicated.
CR-14	Immediately report any disturbance of a shrine or burial site to the rangers, DOCARE, Kahu Kū Mauna Council, and SHPD.	OMKM, rangers, DOCARE, Kahu Kū Mauna Council, and SHPD.
<b>NATURAL RESOURCES</b>		
<b>Threat Prevention and Control</b>		
NR-1	Limit threats to natural resources through management of permitted activities and uses.	OMKM
NR-2	Limit damage caused by invasive species through creation of an invasive species prevention and control program.	OMKM
NR-3	Maintain native plant and animal populations and biological diversity.	OMKM
NR-4	Minimize barriers to species migration, to help maintain populations and protect ecosystem processes and development.	OMKM
NR-5	Manage ecosystems to allow for response to climate change.	OMKM

## Implementation and Evaluation

		Responsible Entity
NR-6	Reduce threats to natural resources by educating stakeholders and the public about Mauna Kea's unique natural resources.	OMKM
<b>Ecosystem Protection, Enhancement &amp; Restoration</b>		
NR-7	Delineate areas of high native diversity, unique communities, or unique geological features within the Astronomy Precinct and at Hale Pōhaku and consider protection from development.	OMKM
NR-8	Consider fencing areas of high native biodiversity or populations of endangered species to keep out feral ungulates (applies to areas below 12,800 ft elevation).	OMKM
NR-9	Increase native plant density and diversity through an outplanting program.	OMKM
NR-10	Incorporate mitigation plans into project planning and conduct mitigation following new development.	Prepared by project applicants; approved by UH and DLNR.
NR-11	Conduct habitat rehabilitation projects following unplanned disturbances.	As determined
NR-12	Create restoration plans and conduct habitat restoration activities, as needed.	OMKM
<b>Program Management</b>		
NR-13	Increase communication, networking, and collaborative opportunities, to support management and protection of natural resources.	OMKM; working group
NR-14	Use the principles of adaptive management when developing programs and methodologies. Review programs annually and revise any component plans every five years, based on the results of the program review.	OMKM
<b>Inventory, Monitoring and Research</b>		
NR-15	Conduct baseline inventories of high-priority resources, as outlined in an inventory, monitoring, and research plan.	OMKM
NR-16	Conduct regular long-term monitoring, as outlined in an inventory, monitoring, and research plan.	OMKM
NR-17	Conduct research to fill knowledge gaps that cannot be addressed through inventory and monitoring.	OMKM
NR-18	Develop geo-spatial database of all known natural resources and their locations in the UH Management Areas that can serve as baseline documentation against change and provide information essential for decision-making.	OMKM

## Implementation and Evaluation

		Responsible Entity
<b>EDUCATION AND OUTREACH</b>		
<b>Program Development</b>		
EO-1	Develop and implement education and outreach program	OMKM
<b>Education</b>		
EO-2	Require orientation of users, with periodic updates and a certificate of completion, including but not limited to visitors, employees, observatory staff, contractors, and commercial and recreational users.	OMKM
EO-3	Continue to develop, update, and distribute materials explaining important aspects of Mauna Kea.	OMKM
EO-4	Develop and implement a signage plan to improve signage throughout the UH Management Areas (interpretive, safety, rules and regulations).	OMKM, with approval by DLNR
EO-5	Develop interpretive features such as self-guided cultural walks and volunteer-maintained native plant gardens.	OMKM/DLNR (SHPD/DOFAW)
EO-6	Engage in outreach and partnerships with schools, by collaborating with local experts, teachers, and university researchers, and by working with the 'Imiloa Astronomy Center of Hawai'i.	OMKM, with public and private schools, and universities.
<b>Outreach</b>		
EO-7	Continue and increase opportunities for community members to provide input to cultural and natural resources management activities on Mauna Kea, to ensure systematic input regarding planning, management, and operational decisions that affect natural resources, sacred materials or places, or other ethnographic resources with which they are associated.	OMKM
EO-8	Provide opportunities for community members to participate in stewardship activities.	OMKM
<b>ASTRONOMICAL RESOURCES</b>		
<b>Protection of Astronomical Resources</b>		
AR-1	Operate the UH Management Areas to prohibit activities resulting in negative impacts to astronomical resources.	OMKM
AR-2	Prevent light pollution, radio frequency interference (RFI) and dust.	OMKM



## Implementation and Evaluation

<b>COMPONENT PLAN: MANAGING ACCESS AND USE</b>		<b>Responsible Entity</b>
<b>ACTIVITIES AND USES</b>		
<b>General Management</b>		
ACT-1	Continue and update managed access policy of 1995 Management Plan.	OMKM and DLNR
ACT-2	Develop parking and visitor traffic plan.	OMKM
ACT-3	Maintain a presence of interpretive and enforcement personnel on the mountain at all times to educate users, deter violations, and encourage adherence to restrictions.	OMKM
ACT-4	Develop and enforce a policy that maintains current prohibitions on off-road vehicle use in the UH Management Areas and that strengthens measures to prevent or deter vehicles from leaving established roads and designated parking areas.	OMKM/DLNR working group
<b>Recreational</b>		
ACT-5	Implement policies to reduce impacts of recreational hiking	OMKM
ACT-6	Define and maintain areas where snow-related activities can occur and confine activities to slopes that have a protective layer of snow.	OMKM
ACT-7	Confine University or other sponsored tours and star-gazing activities to previously disturbed ground surfaces and established parking areas.	OMKM
ACT-8	Coordinate with DLNR in the development of a policy regarding hunting in the UH Management Areas.	OMKM and DLNR with hunting associations.
<b>Commercial</b>		
ACT-9	Maintain commercial tour permitting process; evaluate and issue permits annually.	OMKM
ACT-10	Ensure OMKM input on permits for filming activities	OMKM
ACT-11	Seek statutory authority for the University to regulate commercial activities in the UH Management Areas.	UH/OMKM – completed
<b>Scientific Research</b>		
ACT-12	Ensure input by OMKM, MKMB, and Kahu Kū Mauna on all scientific research permits and establish system of reporting results of research to OMKM.	OMKM, MKMB, and Kahu Kū Mauna

## Implementation and Evaluation

		Responsible Entity
<b>PERMITTING AND ENFORCEMENT</b>		
<b>Laws and Regulations</b>		
P-1	Comply with all applicable federal, state, and local laws, regulations, and permit conditions related to activities in the UH Management Areas.	UH / OMKM
P-2	Strengthen CMP implementation by recommending to the BLNR that the CMP conditions be included in any Conservation District Use Permit or other permit.	OMKM / BLNR
P-3	Obtain statutory rule-making authority from the legislature, authorizing the University of Hawai'i to adopt administrative rules pursuant to Chapter 91 to implement and enforce the management actions.	UH/OMKM – completed
P-4	Educate management staff and users of the mountain about all applicable rules and permit requirements.	OMKM
<b>Enforcement</b>		
P-5	Continue coordinating with other agencies on enforcement needs.	OMKM
P-6	Obtain legal authority for establishing, and then establish, a law enforcement presence on the mountain that can enforce rules for the UH Management Areas on Mauna Kea.	UH with rule-making authority, or DLNR (DOCARE)
P-7	Develop and implement protocol for oversight and compliance with Conservation District Use Permits.	DLNR (OCCL) with assistance from OMKM
P-8	Enforce conditions contained in commercial and Special Use permits.	OMKM, MKMB, and Kahu Kū Mauna

## Implementation and Evaluation

		Responsible Entity
<b>COMPONENT PLAN: MANAGING THE BUILT ENVIRONMENT</b>		
<b>INFRASTRUCTURE AND MAINTENANCE</b>		
<b>Routine Maintenance</b>		
IM-1	Develop and implement an OMMP.	OMKM
IM-2	Reduce impacts from operations and maintenance activities by educating personnel about Mauna Kea's unique resources.	OMKM and DLNR.
IM-3	Conduct historic preservation review for maintenance activities that will have an adverse effect on historic properties.	OMKM and DLNR (SHPD)
IM-4	Evaluate need for and feasibility of a vehicle wash station near Hale Pōhaku, and requiring that vehicles be cleaned.	OMKM
IM-5	Develop and implement a Debris Removal, Monitoring and Prevention Plan.	OMKM
IM-6	Develop and implement an erosion inventory and assessment plan.	OMKM
IM-7	Prepare a plan, in collaboration with the Department of Defense, to remove military wreckage from a remote area of the UH Management Areas, while ensuring protection of natural and cultural resources.	OMKM / Department of Defense
<b>Infrastructure</b>		
IM-8	Assess feasibility of paving the Summit Access Road.	OMKM
IM-9	Evaluate need for additional parking lots and vehicle pullouts and install if necessary.	OMKM
IM-10	Evaluate need for additional public restroom facilities in the summit region and at Hale Pōhaku, and install close-contained zero waste systems if necessary.	OMKM
<b>Sustainable Technologies</b>		
IM-11	Encourage existing facilities and new development to incorporate sustainable technologies, energy efficient technologies, and LEED standards, whenever possible, into facility design and operations.	OMKM
IM-12	Conduct energy audits to identify energy use and system inefficiencies, and develop solutions to reduce energy usage.	OMKM
IM-13	Conduct feasibility assessment, in consultation with Hawaii Electric Light Company, on developing locally-based alternative energy sources.	OMKM

## Implementation and Evaluation

		Responsible Entity
IM-14	Encourage observatories to investigate options to reduce the use of hazardous materials in telescope operations.	OMKM
<b>CONSTRUCTION GUIDELINES</b>		
<b>General Requirements</b>		
C-1	Require an independent construction monitor who has oversight and authority to insure that all aspects of ground based work comply with protocols and permit requirements.	DLNR (OCCL) and OMKM
<b>Best Management Practices</b>		
C-2	Require use of Best Management Practices Plan for Construction Practices.	Project proposer, DLNR (OCCL) and OMKM
C-3	Develop, prior to construction, a rock movement plan.	Project proposer
C-4	Require contractors to provide information from construction activities to OMKM for input into OMKM information databases.	OMKM
C-5	Require on-site monitors (e.g., archaeologist, cultural resources specialist, entomologist) during construction, as determined by the appropriate agency.	Project proposer
C-6	Conduct required archaeological monitoring during construction projects per SHPD approved plan.	Project proposer with DLNR (SHPD) approval
C-7	Education regarding historical and cultural significance	OMKM in consultation with Kahu Kū Mauna or other Native Hawaiian groups, and approval by DLNR (SHPD).
C-8	Education regarding environment, ecology and natural resources	OMKM
C-9	Inspection of construction materials	OMKM under review by DLNR.
<b>SITE RECYCLING, DECOMMISSIONING DEMOLITION AND RESTORATION</b>		
<b>Site Recycling, Decommissioning, Demolition, and Restoration</b>		
SR-1	Require observatories to develop plans to recycle or demolish facilities once their useful life has ended, in accordance with their sublease requirements, identifying all proposed actions.	Project proposer
SR-2	Require observatories to develop a restoration plan in association with decommissioning, to include an environmental cost-benefit analysis and a cultural assessment.	Project proposer
SR-3	Require any future observatories to consider site restoration during project planning and include provisions in subleases for funding of full restoration.	Project proposer

## Implementation and Evaluation

## Implementation and Evaluation

		Responsible Entity
CONSIDERATION OF FUTURE LAND USE		
Facility Planning Guidelines		
FLU-1	Follow design guidelines presented in the 2000 Master Plan.	OMKM and DLNR (OCCL)
FLU-2	Develop a map with land-use zones in the Astronomy Precinct based on updated inventories of cultural and natural resources, to delineate areas where future land use will not be allowed and areas where future land use will be allowed but will require compliance with prerequisite studies or analysis prior to approval of Conservation District Use Permit.	OMKM
FLU-3	Require cataloguing of initial site conditions for use when conducting site restoration.	OMKM, project proposer
FLU-4	Require project specific visual rendering of both pre- and post-project settings to facilitate analysis of potential impacts to view planes.	Project proposer
FLU-5	Require an airflow analysis on the design of proposed structures to assess potential impacts to aeolian ecosystems.	Project proposer
FLU-6	Incorporate habitat mitigation plans into project planning process.	Project proposer
FLU-7	Require use of close-contained zero-discharge waste systems for any future development in the summit region, from portable toilets to observatory restrooms, if feasible.	Project proposer

## Implementation and Evaluation

		Responsible Entity
<b>COMPONENT PLAN: MANAGING OPERATIONS</b>		
<b>OPERATION AND IMPLEMENTATION OF THE CMP</b>		
<b>Management</b>		
OI-1	Maintain OMKM, MKMB, and Kahu Kū Mauna in current roles, with OMKM providing local management of the UH Management Areas, and MKSS providing operational and maintenance services.	OMKM, MKMB, and Kahu Kū Mauna
OI-2	Develop training plan for staff and volunteers.	OMKM
OI-3	Maintain and expand regular interaction and dialogue with stakeholders, community members, surrounding landowners, and overseeing agencies to provide a coordinated approach to resource management.	OMKM
OI-4	Establish grievance procedures for OMKM, to address issues as they arise.	OMKM
OI-5	Update and implement emergency response plan.	OMKM
<b>CMP MONITORING, EVALUATION AND UPDATES</b>		
<b>Management</b>		
MEU-1	Establish a reporting system to ensure that the MKMB, DLNR, and the public are informed of results of management activities in a timely manner.	OMKM
MEU-2	Conduct regular updates of the CMP that reflect outcomes of the evaluation process, and that incorporate new information about resources.	OMKM
MEU-3	Revise and update planning documents, including the master plan, leases, and subleases, so that they will clearly assign roles and responsibilities for managing Mauna Kea and reflect stewardship matters resolved with DLNR.	OMKM

## **Appendix D. Mauna Kea CMP Management Actions: Budget Requirements**

Includes:

- Budget for Implementing the Mauna Kea CMP: Summary
- CMP Management Actions Arranged by Budget Category



## Implementation and Evaluation

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Implementation and Evaluation

Budget for Implementing the Mauna Kea CMP: Summary

	Immediate Term				Short-term <sup>a</sup>
	Year 1	Year 2	Year 3	3 Year Total	Yrs 4 - 6
<b>Salaries</b>					
<b>Enforcement</b>					
Chief Ranger	72,100	72,100	72,100	216,300	216,300
Ranger	51,500	51,500	51,500	154,500	154,500
Ranger	51,500	51,500	51,500	154,500	154,500
<b>Subtotal Enforcement Salaries</b>	<b>175,100</b>	<b>175,100</b>	<b>175,100</b>	<b>525,300</b>	<b>525,300</b>
<b>Administrative and Professional</b>					
Projects Administrator	51,500	51,500	51,500	154,500	154,500
GIS and Database Coordinator	51,500	51,500	51,500	154,500	154,500
Fiscal Support	41,200	41,200	41,200	123,600	123,600
Internal Legal Counsel (Rules Administrator)	103,000	103,000	103,000	309,000	309,000
<b>Subtotal Administrative &amp; Professional Salaries</b>	<b>247,200</b>	<b>\$247,200</b>	<b>\$247,200</b>	<b>741,600</b>	<b>741,600</b>
<b>Other Payroll Costs</b>					
Overtime & seasonal requirements	34,720	34,720	34,720	104,160	104,160
Casual Hire	50,000	50,000	50,000	150,000	150,000
<b>Subtotal Other Payroll Costs</b>	<b>84,720</b>	<b>84,720</b>	<b>84,720</b>	<b>254,160</b>	<b>254,160</b>
<b>Subtotal Salaries</b>	<b>507,020</b>	<b>507,020</b>	<b>507,020</b>	<b>1,521,060</b>	<b>1,521,060</b>
<b>Operating Expenses</b>					
UH Hilo Government/Community Relations and Administrative Support	181,750	181,750	181,750	545,250	545,250
Legal Fees	300,000	350,000	300,000	950,000	300,000
<b>Subtotal Operating Expenses</b>	<b>481,750</b>	<b>531,750</b>	<b>481,750</b>	<b>1,495,250</b>	<b>845,250</b>
<b>Subtotal Salaries &amp; Operating Expenses</b>	<b>988,770</b>	<b>1,038,770</b>	<b>988,770</b>	<b>3,016,310</b>	<b>2,366,310</b>
<b>Program Expenses</b>					
Research					
Base line inventories	225,200	262,500	157,500	645,200	257,500
Other Research	331,000	264,000	160,000	755,000	300,000
Monitoring Programs					
Cultural Resources <sup>b</sup>	128,000	128,200	128,200	384,400	384,600
Natural Resources & Environmental Monitoring <sup>c</sup>	107,000	186,500	186,500	480,000	1,003,800
Management Programs and Plans					
Resources Management Programs	90,000	160,000	90,000	340,000	305,000
Compliance, Education, Training, Outreach	130,000	170,000	150,000	450,000	555,000
Public Awareness					
Brochures, Newsletters, Exhibits, Signage	75,750	65,000	85,000	225,750	242,500
Public Meetings <sup>d</sup>	70,750	70,750	70,750	212,250	212,250
Equipment and Supplies	133,650	72,500	50,500	256,650	266,500
<b>Subtotal Program Expenses</b>	<b>1,291,350</b>	<b>1,379,450</b>	<b>1,078,450</b>	<b>3,749,250</b>	<b>3,527,150</b>
<b>TOTAL SALARIES, OPERATING AND PROGRAM EXPENSES</b>	<b>2,280,120</b>	<b>2,418,220</b>	<b>2,067,220</b>	<b>6,765,560</b>	<b>5,893,460</b>
<b>Less Revenues from Fees</b>	<b>(100,000)</b>	<b>(100,000)</b>	<b>(100,000)</b>	<b>(300,000)</b>	<b>(300,000)</b>
<b>TOTAL SALARIES, OPERATING AND PROGRAM EXPENSES Less REVENUE</b>	<b>\$2,180,120</b>	<b>\$2,318,220</b>	<b>\$1,967,220</b>	<b>\$6,465,560</b>	<b>\$5,593,460</b>

a Total estimated budget for the three year period; b Includes a Cultural Resources Coordinator; c Includes a Natural Resources Coordinator; d Includes an Outreach Coordinator

## Implementation and Evaluation

### CMP Management Actions Arranged by Budget Category

Management Action		Implementation Schedule
<b>RESEARCH</b>		
<b>Baseline Inventories</b>		
NR-15	Conduct baseline inventories of high-priority resources, as outlined in an inventory, monitoring, and research plan.	Immediate
FLU-2	Develop a map with land-use zones in the Astronomy Precinct based on updated inventories of cultural and natural resources, to delineate areas where future land use will not be allowed and areas where future land use will be allowed but will require compliance with prerequisite studies or analysis prior to approval of Conservation District Use Permit.	Immediate
<b>Other Research</b>		
NR-17	Conduct research to fill knowledge gaps that cannot be addressed through inventory and monitoring.	Immediate
ACT-2	Develop parking and visitor traffic plan.	Immediate
IM-10	Evaluate need for additional public restroom facilities in the summit region and at Hale Pōhaku, and install close-contained zero waste systems if necessary.	Immediate
IM-12	Conduct energy audits to identify energy use and system inefficiencies, and develop solutions to reduce energy usage.	Immediate
IM-9	Evaluate need for additional parking lots and vehicle pullouts and install if necessary.	Mid-term
IM-13	Conduct feasibility assessment, in consultation with Hawaii Electric Light Company, on developing locally-based alternative energy sources.	Mid-term
IM-8	Assess feasibility of paving the Summit Access Road.	Long-term
<b>MONITORING PROGRAMS</b>		
<b>Cultural Resources Monitoring</b>		
CR-10	Develop and implement a historic property monitoring program to systematically monitor the condition of the historic district and all historic properties, including cultural sites and burials.	Immediate
<b>Natural Resources and Environmental Monitoring</b>		
NR-16	Conduct regular long-term monitoring, as outlined in an inventory, monitoring, and research plan.	Ongoing
ACT-7	Confine University or other sponsored tours and star-gazing activities to previously disturbed ground surfaces and established parking areas.	Ongoing

## Implementation and Evaluation

Management Action		Implementation Schedule
<b>MANAGEMENT PROGRAMS AND PLANS</b>		
<b>Resources Management Program: Cultural Resources</b>		
CR-1	Kahu Kū Mauna shall work with families with lineal and historical connections to Mauna Kea, cultural practitioners, and other Native Hawaiian groups, including the Mauna Kea Management Board's Hawaiian Culture Committee, toward the development of appropriate procedures and protocols regarding cultural issues.	Immediate
CR-4	Establish a process for ongoing collection of information on traditional, contemporary, and customary cultural practices.	Short-term
CR-5	Develop and adopt guidelines for the culturally appropriate placement and removal of offerings	Immediate
CR-6	Develop and adopt guidelines for the visitation and use of ancient shrines.	Immediate
CR-7	Kahu Kū Mauna shall take the lead in determining the appropriateness of constructing new Hawaiian cultural features.	Immediate
CR-8	Develop and adopt a management policy for the UH Management Areas on the scattering of cremated human remains.	Immediate
CR-9	A management policy for the cultural appropriateness of building ahu or "stacking of rocks" will need to be developed by Kahu Kū Mauna who may consider similar policies adopted by Hawai'i Volcanoes National Park.	Immediate
CR-13	Develop and implement a burial treatment plan for the UH Management Areas in consultation with Kahu Kū Mauna Council, MKMB's Hawaiian Culture Committee, the Hawai'i Island Burial Council, recognized lineal or cultural descendants, and SHPD.	Immediate
IM-3	Conduct historic preservation review for maintenance activities that will have an adverse effect on historic properties.	Immediate
CR-12	Consult with Kahu Kū Mauna about establishing buffers (preservation zones) around known historic sites in the Astronomy Precinct, to protect them from potential future development.	Immediate
CR-11	Complete an archaeological survey of the portions of the Summit Access Road corridor that are under UH management.	Completed
<b>Resources Management Program: Natural Resources</b>		
NR-2	Limit damage caused by invasive species through creation of an invasive species prevention and control program.	Short-term
NR-7	Delineate areas of high native diversity, unique communities, or unique geological features within the Astronomy Precinct and at Hale Pōhaku and consider protection from development.	Short and Mid-term

## Implementation and Evaluation

Management Action		Implementation Schedule
NR-8	Consider fencing areas of high native biodiversity or populations of endangered species to keep out feral ungulates (applies to areas below 12,800 ft elevation).	Mid -Term
NR-3	Maintain native plant and animal populations and biological diversity.	Mid and Long-term
NR-4	Minimize barriers to species migration, to help maintain populations and protect ecosystem processes and development.	Mid and Long-term
NR-5	Manage ecosystems to allow for response to climate change.	Long-term
NR-9	Increase native plant density and diversity through an outplanting program.	Long-term
IM-6	Develop and implement an erosion inventory and assessment plan.	Long-term
NR-11	Conduct habitat rehabilitation projects following unplanned disturbances.	As needed
NR-12	Create restoration plans and conduct habitat restoration activities, as needed.	As needed
<b>Compliance, Education, Training, Outreach</b>		
CR-14	Immediately report any disturbance of a shrine or burial site to the rangers, DOCARE, Kahu Kū Mauna Council, and SHPD.	Ongoing
NR-18	Develop geo-spatial database of all known natural resources and their locations in the UH Management Areas that can serve as baseline documentation against change and provide information essential for decision-making.	Ongoing
AR-2	Prevent light pollution, radio frequency interference (RFI) and dust.	Ongoing
P-8	Enforce conditions contained in commercial and Special Use permits.	Ongoing
AR-1	Operate the UH Management Areas to prohibit activities resulting in negative impacts to astronomical resources.	Ongoing
ACT-4	Develop and enforce a policy that maintains current prohibitions on off-road vehicle use in the UH Management Areas and that strengthens measures to prevent or deter vehicles from leaving established roads and designated parking areas.	Ongoing
ACT-3	Maintain a presence of interpretive and enforcement personnel on the mountain at all times to educate users, deter violations, and encourage adherence to restrictions.	Ongoing
ACT-9	Maintain commercial tour permitting process; evaluate and issue permits annually.	Ongoing
ACT-10	Ensure OMKM input on permits for filming activities	Ongoing
ACT-12	Ensure input by OMKM, MKMB, and Kahu Kū Mauna on all scientific research permits and establish system of reporting results of research to OMKM.	Ongoing

## Implementation and Evaluation

Management Action		Implementation Schedule
ACT-6	Define and maintain areas where snow-related activities can occur and confine activities to slopes that have a protective layer of snow.	Ongoing
ACT-8	Coordinate with DLNR in the development of a policy regarding hunting in the UH Management Areas.	Immediate
P-1	Comply with all applicable federal, state, and local laws, regulations, and permit conditions related to activities in the UH Management Areas.	Ongoing
P-7	Develop and implement protocol for oversight and compliance with Conservation District Use Permits.	Ongoing
P-5	Continue coordinating with other agencies on enforcement needs.	Ongoing
OI-5	Update and implement emergency response plan.	Ongoing
IM-1	Develop and implement an OMMP.	Ongoing
IM-5	Develop and implement a Debris Removal, Monitoring and Prevention Plan.	Immediate
OI-1	Maintain OMKM, MKMB, and Kahu Kū Mauna in current roles, with OMKM providing local management of the UH Management Areas, and MKSS providing operational and maintenance services.	Ongoing
OI-3	Maintain and expand regular interaction and dialogue with stakeholders, community members, surrounding landowners, and overseeing agencies to provide a coordinated approach to resource management.	Ongoing
OI-2	Develop training plan for staff and volunteers.	Ongoing
CR-3	Conduct educational efforts to generate public awareness about the importance of preserving the cultural landscape.	Immediate
NR-6	Reduce threats to natural resources by educating stakeholders and the public about Mauna Kea's unique natural resources.	Immediate
EO-1	Develop and implement education and outreach program	Immediate and Short-term
P-4	Educate management staff and users of the mountain about all applicable rules and permit requirements.	Immediate
IM-2	Reduce impacts from operations and maintenance activities by educating personnel about Mauna Kea's unique resources.	Immediate
NR-1	Limit threats to natural resources through management of permitted activities and uses.	Short-term
ACT-5	Implement policies to reduce impacts of recreational hiking	Short-term
CR-2	Support application for designation of the summit region of Mauna Kea as a Traditional Cultural Property, per the National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470 et seq. in consultation with the larger community.	Short-term

## Implementation and Evaluation

<b>Management Action</b>		<b>Implementation Schedule</b>
IM-14	Encourage observatories to investigate options to reduce the use of hazardous materials in telescope operations.	Short-term
IM-4	Evaluate need for and feasibility of a vehicle wash station near Hale Pōhaku, and requiring that vehicles be cleaned.	Short-term
OI-4	Establish grievance procedures for OMKM, to address issues as they arise.	Short-term
ACT-1	Continue and update managed access policy of 1995 Management Plan.	Short-term
NR-14	Use the principles of adaptive management when developing programs and methodologies. Review programs annually and revise any component plans every five years, based on the results of the program review.	Short-term / As needed
MEU-2	Conduct regular updates of the CMP that reflect outcomes of the evaluation process, and that incorporate new information about resources.	Short-term / As needed
MEU-1	Establish a reporting system to ensure that the MKMB, DLNR, and the public are informed of results of management activities in a timely manner.	Immediate
EO-6	Engage in outreach and partnerships with schools, by collaborating with local experts, teachers, and university researchers, and by working with the 'Imiloa Astronomy Center of Hawai'i.	Mid-term
IM-7	Prepare a plan, in collaboration with the Department of Defense, to remove military wreckage from a remote area of the UH Management Areas, while ensuring protection of natural and cultural resources.	Mid-term
ACT-11	Seek statutory authority for the University to regulate commercial activities in the UH Management Areas.	Completed
P-3	Obtain statutory rule-making authority from the legislature, authorizing the University of Hawai'i to adopt administrative rules pursuant to Chapter 91 to implement and enforce the management actions.	Completed
P-6	Obtain legal authority for establishing, and then establish, a law enforcement presence on the mountain that can enforce rules for the UH Management Areas on Mauna Kea.	Completed / As needed
EO-2	Require orientation of users, with periodic updates and a certificate of completion, including but not limited to visitors, employees, observatory staff, contractors, and commercial and recreational users.	Long-term
IM-11	Encourage existing facilities and new development to incorporate sustainable technologies, energy efficient technologies, and LEED standards, whenever possible, into facility design and operations.	As needed
MEU-3	Revise and update planning documents, including the master plan, leases, and subleases, so that they will clearly assign roles and responsibilities for managing Mauna Kea and reflect stewardship matters resolved with DLNR.	As needed
<b>Project Development and Review</b>		
NR-10	Incorporate mitigation plans into project planning and conduct mitigation following new development.	As needed

## Implementation and Evaluation

<b>Management Action</b>		<b>Implementation Schedule</b>
P-2	Strengthen CMP implementation by recommending to the BLNR that the CMP conditions be included in any Conservation District Use Permit or other permit.	As needed
C-1	Require an independent construction monitor who has oversight and authority to insure that all aspects of ground based work comply with protocols and permit requirements.	As needed
C-2	Require use of Best Management Practices Plan for Construction Practices.	As needed
C-3	Develop, prior to construction, a rock movement plan.	As needed
C-4	Require contractors to provide information from construction activities to OMKM for input into OMKM information databases.	As needed
C-5	Require on-site monitors (e.g., archaeologist, cultural resources specialist, entomologist) during construction, as determined by the appropriate agency.	As needed
C-6	Conduct required archaeological monitoring during construction projects per SHPD approved plan.	As needed
C-7	Education regarding historical and cultural significance	As needed
C-8	Education regarding environment, ecology and natural resources	As needed
C-9	Inspection of construction materials	As needed
SR-1	Require observatories to develop plans to recycle or demolish facilities once their useful life has ended, in accordance with their sublease requirements, identifying all proposed actions.	As needed
SR-2	Require observatories to develop a restoration plan in association with decommissioning, to include an environmental cost-benefit analysis and a cultural assessment.	As needed
SR-3	Require any future observatories to consider site restoration during project planning and include provisions in subleases for funding of full restoration.	As needed
FLU-1	Follow design guidelines presented in the 2000 Master Plan.	As needed
FLU-3	Require cataloguing of initial site conditions for use when conducting site restoration.	As needed
FLU-4	Require project specific visual rendering of both pre- and post-project settings to facilitate analysis of potential impacts to view planes.	As needed
FLU-5	Require an airflow analysis on the design of proposed structures to assess potential impacts to aeolian ecosystems.	As needed
FLU-6	Incorporate habitat mitigation plans into project planning process.	As needed
FLU-7	Require use of close-contained zero-discharge waste systems for any future development in the summit region, from portable toilets to observatory restrooms, if feasible.	As needed



## Implementation and Evaluation

Management Action		Implementation Schedule
<b>PUBLIC AWARENESS AND OUTREACH</b>		
<b>Brochures, Newsletters, Exhibits, Signage</b>		
EO-3	Continue to develop, update, and distribute materials explaining important aspects of Mauna Kea.	Ongoing
EO-4	Develop and implement a signage plan to improve signage throughout the UH Management Areas (interpretive, safety, rules and regulations).	Immediate
EO-5	Develop interpretive features such as self-guided cultural walks and volunteer-maintained native plant gardens.	Mid-term
<b>Public Meetings</b>		
EO-7	Continue and increase opportunities for community members to provide input to cultural and natural resources management activities on Mauna Kea, to ensure systematic input regarding planning, management, and operational decisions that affect natural resources, sacred materials or places, or other ethnographic resources with which they are associated.	Ongoing
EO-8	Provide opportunities for community members to participate in stewardship activities.	Ongoing
NR-13	Increase communication, networking, and collaborative opportunities, to support management and protection of natural resources.	Immediate