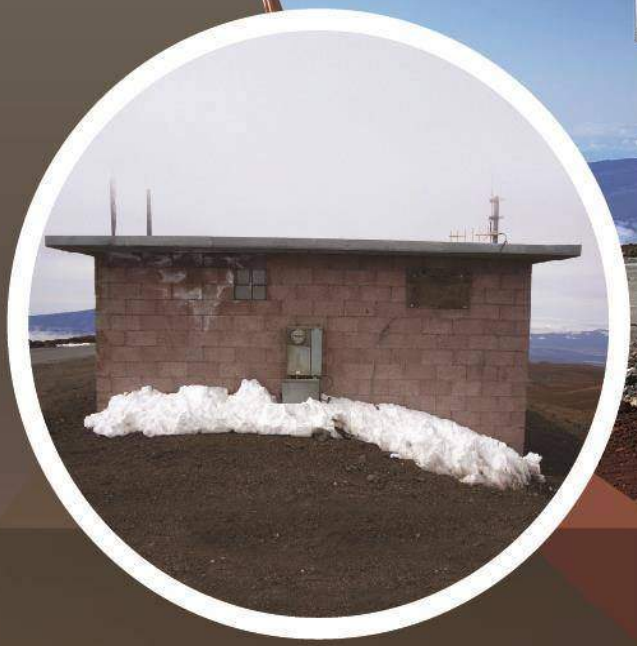

March 2021

Draft Environmental Assessment

Hōkū Keʻa Observatory Decommissioning Project

Prepared for University of Hawai'i at Hilo

Prepared by SSFM International, Inc.

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Hilo, Hawai'i 96720

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Draft Environmental Assessment

Hōkū Keʻa Observatory Decommissioning Project

Maunakea, Island of Hawaiʻi, Hawaiʻi

Prepared for:

University of Hawaiʻi at Hilo

Prepared by:

SSFM International, Inc.

March 2021

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Project Summary

Project Name	Hōkū Keʻa Observatory Decommissioning Project
Location	Mauna Kea Science Reserve, island of Hawaiʻi, Hawaiʻi
District	Hāmākua
Project Site Tax Map Key	(3) 4-4-015:009 por
Landowners	State of Hawaiʻi
Project Site Existing Uses	Astronomy Observatories
State Land Uses	Conservation
Hawaiʻi County Zoning	FR – Forest Reserve
Proposed Action	The University of Hawaiʻi at Hilo (UH Hilo) intends to decommission the Hōkū Keʻa Observatory. The Proposed Action includes full removal of the Observatory Building and Generator Buildings and associated telecommunications and electrical infrastructure and partial (minimal) restoration.
Anticipated Impacts	The Proposed Action would have short-term and temporary impacts during deconstruction and site restoration activities that would be less than significant to biological resources, geology and soils, water resources, air quality, the existing noise environment, traffic and transportation, socioeconomics, public facilities and services, and natural hazards. BMPs and other measures would be implemented to minimize impacts, as applicable. The Proposed Action would have beneficial impacts to the visual environment, cultural practices, and archaeological and historic resources.
Proposing Agency	University of Hawaiʻi at Hilo
Anticipated Determination	Finding of No Significant Impact (FONSI)
Project Site Permits/ Approvals Required	See **Section 2.5**
EA Preparer	SSFM International 99 Aupuni Street, Suite 202 Hilo, Hawaiʻi 96720 Contact: Jennifer Scheffel (808) 356-1273
Consultations	See **Section 6.0**

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Acronyms

%	percent
°F	degrees Fahrenheit
AAQS	Ambient Air Quality Standards
ALR	Archaeological Literature Review
BCA	Benefit-Cost Analysis
BLNR	Board of Land and Natural Resources
CDP	Community Development Plan
CDUP	Conservation District Use Permit
CMP	*Mauna Kea Comprehensive Management Plan*
CSO	Caltech Submillimeter Observatory
CSR	Cultural Setting Report
DLNR	Department of Land and Natural Resources
DOH	Department of Health
DPW	Department of Public Works
ESA	Environmental Site Assessment
FHWA	Federal Highways Administration
HAR	Hawai'i Administrative Rules
HDOT	Hawai'i Department of Transportation
HRS	Hawai'i Revised Statutes
LCP	lead-containing paint
MKMB	Maunakea Management Board
MKSR	Mauna Kea Science Reserve
MNA	Myounghee Noh & Associates, LLC
msl	mean sea level
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NOI	Notice of Intent
OCCL	Office of Conservation and Coastal Lands
OMKM	Office of Maunakea Management
OSHA	Occupational Safety and Health Administration
REC	recognized environmental condition
SDP	Site Decommissioning Plan
SDRP	Site Deconstruction and Removal Plan
SRP	Site Restoration Plan
TMT	Thirty-Meter Telescope
UH Hilo	University of Hawai'i at Hilo
UKIRT	United Kingdom Infrared Telescope

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1.0 Project Description

1.1 Introduction

The University of Hawaiʻi at Hilo (UH Hilo) intends to decommission the Hōkū Keʻa Observatory Building, Generator Building, and associated telecommunications and electrical infrastructure and restore the site to the extent practicable. The deconstruction, removal, and restoration activities would be conducted pursuant to a Site Decommissioning Plan (SDP) that includes a Site Deconstruction and Removal Plan (SDRP) and a Site Restoration Plan (SRP). Use of the site for astronomy purposes would be permanently ended, and no astronomy re-use is contemplated.

This project is subject to the state environmental review process prescribed under Chapter 343 (Environmental Impact Statements), Hawaiʻi Revised Statutes (HRS), as amended, also known as the Hawaiʻi Environmental Policy Act, and Title 11, Chapter 200.1 (Environmental Impact Statement Rules), Hawaiʻi Administrative Rules (HAR). Under these regulations, nine specific types of actions are identified that "trigger" environmental review. This project triggers the state environmental review process under these regulations because it proposes the use of state or county lands and the use of state or county funds (HRS Section 343-5(1)). In addition, UH Hilo will apply for a Conservation District Use Permit (CDUP) from the Department of Land and Natural Resources (DLNR) Office of Conservation and Coastal Lands (OCCL).

1.2 Project Background

The Hōkū Keʻa telescope and observatory was built in the 1960s for use by the National Aeronautics and Space Administration (NASA) and the U.S. Air Force. The University of Hawaiʻi acquired the telescope in 1970. In 2003, the University of Hawaiʻi gave control of the telescope to UH Hilo's Department of Physics and Astronomy to train undergraduates on the instrument. In 2010, the old 24-inch telescope was replaced by a 36-inch telescope. Although the Hōkū Keʻa telescope was intended to play a critical role in the educational mission of UH Hilo's Department of Physics and Astronomy, it did not achieve satisfactory operational performance. UH Hilo ceased operations and decided to decommission the telescope in an effort to comply with Governor Ige's "10 point action plan for the stewardship of Maunakea" (10-point plan), which included decommissioning at least three (25 percent [%]) of the 13 telescopes currently on the summit. The mission of decommissioning is to return the site to as close to the original natural form as possible.

UH Hilo, on behalf of its Department of Physics and Astronomy, has submitted a Notice of Intent (NOI) to decommission its Hōkū Keʻa Observatory Building at Maunakea on the island of Hawaiʻi to the DLNR-OCCL and the Office of Maunakea Management (OMKM). The NOI was approved by DLNR-OCCL on February 19, 2016. DLNR-OCCL identified the following "next steps":

1. Preparation of an Environmental Assessment that discusses the preferred alternatives for the deconstruction and removal of the facility, and the restoration plan for the site.
2. Preparation of a Conservation District Use Application.

The NOI was approved by the Maunakea Management Board (MKMB) on March 25, 2020. Approval by MKMB included the following seven conditions:

1. All planning and permitting for decommissioning Hōkū Keʻa should proceed expeditiously up to the point of actual removal of the structure and restoration of the site.
2. Planning and permitting to deploy the new teaching telescope shall go forward concurrently with the planning and permitting for decommissioning Hōkū Keʻa.
3. Removal of Hōkū Keʻa Observatory Building and site restoration shall commence upon a new teaching telescope having been successfully permitted at a site acceptable to UH Hilo, subject to condition 5 (below).
4. From time to time, UH Hilo will present to MKMB updates about decommissioning and deployment activity, including information about permitting and funding needed for both the Hōkū Keʻa decommissioning and the new teaching telescope.
5. If funding, permits, or anything else needed to successfully complete decommissioning of Hōkū Keʻa or the commissioning of a new teaching telescope cannot be secured in a manner acceptable to UH Hilo, MKMB will be consulted for recommendations on how to proceed so as to allow UH Hilo to fulfill its commitment to decommission Hōkū Keʻa without delay.
6. MKMB members will support UH Hilo's plan for a next teaching telescope by advising and participating in community outreach to ensure that the community has the opportunity to provide input on the proposed use and siting of the new telescope.
7. The MKMB encourages the UH Board of Regents to support in writing these proposed conditions on the decommissioning the Hōkū Keʻa facility on Maunakea and the deployment of a new teaching telescope.

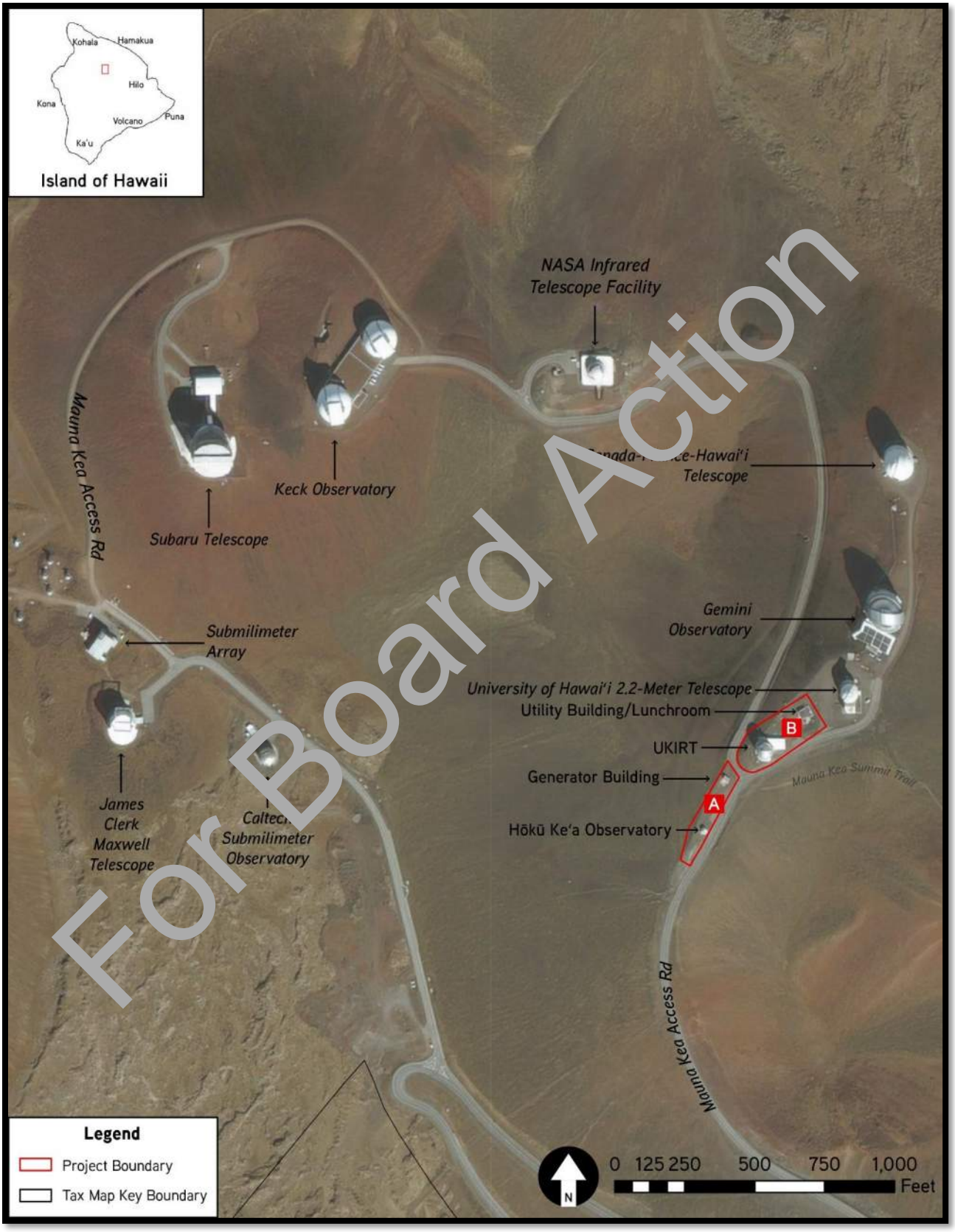
1.3 Project Location

The project area is on the southeastern side of the 528-acre Astronomy Precinct within the approximately 11,288-acre Mauna Kea Science Reserve (MKSR), located at the summit of Maunakea, as shown in **Figure 1**. MKSR lands are leased to the University of Hawai'i (GL S-4191), and approximately 40.5 acres are currently used for the 13 current observatories and associated infrastructure. Hōkū Keʻa occupies approximately 0.25 acre.

The Observatory Building is a dome that is located at the south end of the summit ridge that accommodates (from north to south) the Canada-France-Hawai'i telescope, Gemini North, the UH 2.24-m telescope, and the United Kingdom Infrared Telescope (UKIRT) observatory. The project site is approximately 450-feet south of UKIRT. The geographic location is north latitude 19° 49' 17.81", west longitude 155° 28' 15.47". The project site is on a narrow ridge top with a slight slope to the south-southwest and is directly adjacent to the main paved road to the summit observatories.

The project area has been divided into two sections: Area A and Area B. Area A contains the Observatory Building and Generator Buildings, as well as telecommunication and electrical infrastructure. Area B contains telecommunication and electrical infrastructure associated with the Observatory Building and Generator Buildings, as well as the UKIRT observatory and utility building/lunchroom that are not included as part of the proposed project.

Figure 1. Project Location Map



1.4 Purpose and Need

1.4.1 Purpose of the Proposed Action

The Purpose of the Proposed Action is to decommission and remove the Hōkū Keʻa Observatory Building, Generator Building, and associated telecommunications and electrical infrastructure as part of Governor Ige's 10-point plan, which was announced on Mau 26, 2015. The 10-point plan includes ten significant actions to be taken by the University of Hawai'i to enhance stewardship of Maunakea in general, as well as specific to the Thirty-Meter Telescope (TMT) project. The third action outlined in the ten-point plan is to "decommission – beginning this year – as many telescopes as possible with at least 25% of all telescopes gone by the time TMT is ready for operation."

1.4.2 Need for the Proposed Action

The Proposed Action is needed to comply with Governor Ige's 10-point plan for the improved management of Maunakea, which included decommissioning at least three (25%) of the 13 telescopes currently on the summit. While the Hōkū Keʻa telescope was intended to play a critical role in the educational mission of UH Hilo's Department of Physics and Astronomy, it did not achieve satisfactory operational performance. Therefore, UH Hilo has ceased efforts to bring it into full operation and the facility needs to be decommissioned. Hōkū Keʻa is the first of three telescopes to be decommissioned, which also includes the Caltech Submillimeter Observatory (CSO) and UKIRT.

2.0 Proposed Action and Alternatives

A total of five (5) alternatives were initially considered as part of the proposed project:

- Alternative 1: No-Action
- Alternative 2: Infrastructure Capping and Partial Restoration
- Alternative 3: Full Removal and Partial Restoration
- Alternative 4: Full Removal and Full Restoration
- Alternative 5: Partial Removal and Partial Restoration

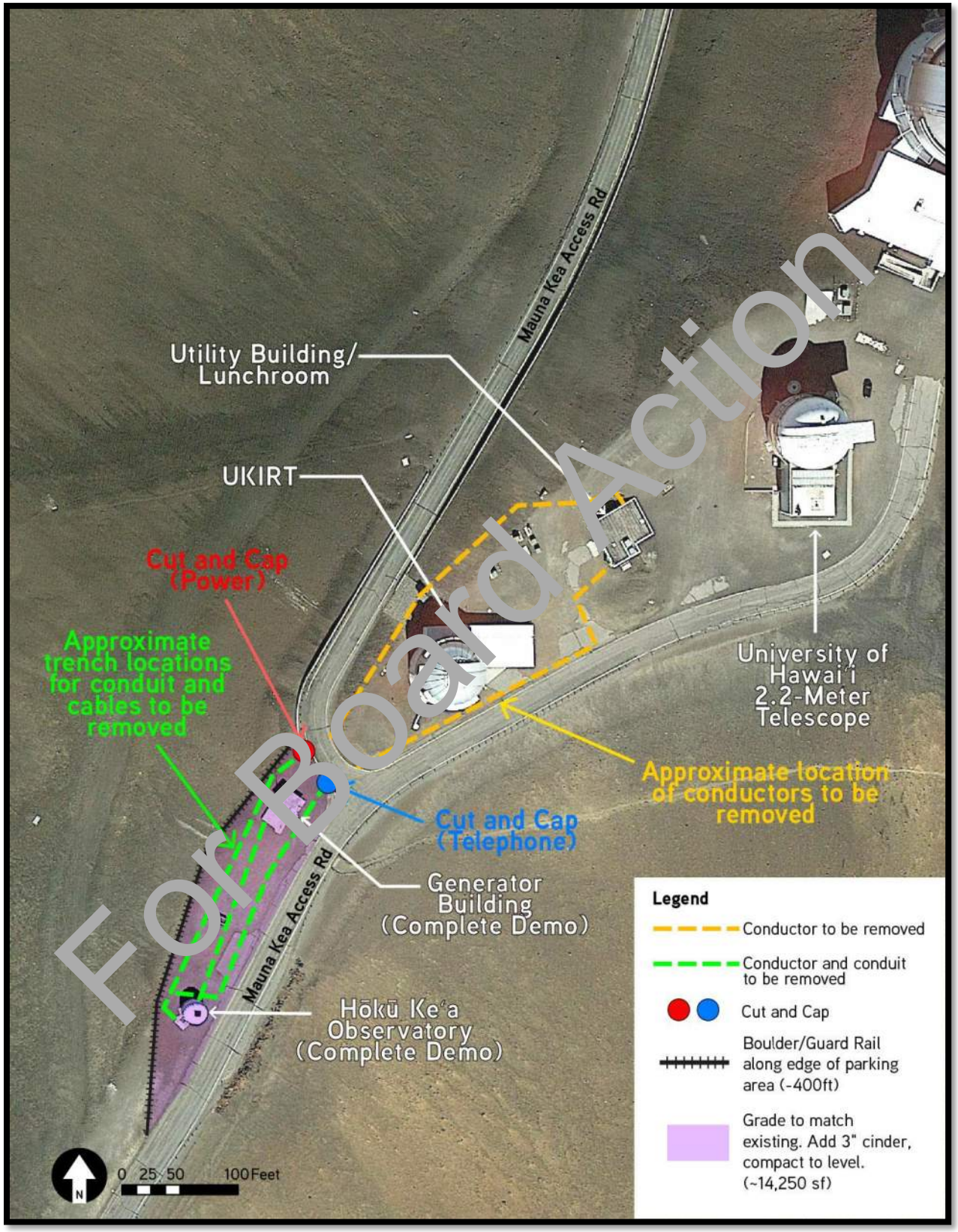
All five (5) alternatives are presented in the SDP, and a Benefit-Cost Analysis (BCA) was conducted for each. As a result of that process, as well as a determination of whether the alternatives met the Purpose and Need of the proposed project, three (3) of the alternatives have not been carried forward for further analysis in this Environmental Assessment, as discussed in **Section 2.3**. Thus, this Environmental Assessment only includes a full analysis of potential impacts associated with the Proposed Action (Alternative 3) and the No-Action Alternative (Alternative 1), which is included to provide a comparison of potential impacts against those that would occur if there were no changes to existing site conditions.

2.1 Proposed Action: Full Removal and Partial Restoration (Alternative 3)

The Proposed Action includes full removal and partial (minimal) restoration. Specifically, the Proposed Action would include the following, as shown in **Figure 2**:

- Complete removal of the Hōkū Keʻa Observatory Building in Area A
  - Demolish Hōkū Keʻa observatory dome
  - Remove foundation in its entirety
  - Remove underground utilities (cables and conduit) back to the access road between Area A and Area B
- Complete removal of the Generator Building in Area A
  - Demolish the Generator Building structure
  - Remove foundation in its entirety
  - Remove underground utilities (cables and conduit) back to the access road between Area A and Area B
- Conductor removal in Area B
- Restoration in Area A
  - Backfill with local native cinder
  - Compact excavated areas to allow for continued use for sunset viewing and trailhead access
  - Line top of slope with barrier, such as large, local boulders or guardrail

Figure 2. Proposed Action



2.1.1 Site Deconstruction and Removal

Site deconstruction and removal would consist of the following tasks which are discussed below:

- BMP installation
- Observatory Building demolition and debris removal
- Generator Building demolition and debris removal
- Electrical conduit and conductor removal
- Utility room electrical demolition and debris removal

BMP Installation

BMPs would be installed prior to any site deconstruction activities. BMPs would likely include a truck washdown area outside the project site, construction fence around the project site, silt fence or equivalent controls to prevent runoff from the site to adjacent areas, a construction entrance, and a wash out area. Specific locations and applications would be determined during final design and provided in the contract documents.

Observatory Building Demolition and Debris Removal

Demolition of the Observatory Building would include the following:

- Hazardous material remediation
- Interior electrical demolition
- Remove telescope steel base
- Building demolition

As discussed in **Section 3.7.1**, LCP has been identified within the Observatory Building in the gray paint on the concrete floor and on the exterior of the Observatory Building in the white paint on metal doors, door frames, and walls. A hazardous materials removal industrial hygienist would be on-site during demolition of the Observatory Building to ensure the proper treatment of these materials. In addition, the measures detailed in **Section 3.7.3** would be implemented to minimize potential impacts associated with the removal of LCP.

The following items associated with the Observatory Building would be removed as shown in the demolition plans in **Appendix A**:

- Steel grade
- Concrete pad/foundation
- Steel telescope base plate
- Building shell, including dome, and structural columns

Electrical demolition within the Observatory Building would consist of removal of all existing electrical conduit, light fixtures, outlets, wiring, and equipment and wiring devices in the building. This includes the following:

- 15 kilovolt-ampere (kVA) transformer
- 4-Switch banks (two with dimmer switches)
- Non-fused disconnect switch
- 9-Wall mounted duplex receptacle

- 9-Wall mounted luminaire light fixtures
- 4-Suspended luminaire light fixtures
- Surface mounted panelboard
- 2-Junction boxes for louvers

In addition, all feeders would be completely removed back to the main service and disconnected.

Debris removal would include building debris, concrete pad debris, and electrical debris. It is estimated that seven round trips would be required to remove the debris associated with the Observatory Building.

Generator Building Demolition and Debris Removal

Demolition of the Generator Building would include the following:

- Hazardous material remediation
- Interior electrical demolition
- Building demolition
- Foundation demolition

LCP has been identified within the Generator Building in the beige paint on CMU walls, metal ceiling, and door frame. A hazardous materials removal industrial hygienist would be on-site during demolition of the Generator Building to ensure the proper treatment of these materials. In addition, the measures detailed in **Section 3.7.3** would be implemented to minimize potential impacts associated with the removal of LCP.

The following items associated with the Generator Building would be removed as shown in the demolition plans in **Appendix A**:

- Concrete pad/foundation
- Exterior CMU wall
- Wainscot
- Concrete roof

Electrical demolition within the Generator Building would consist of removal of all existing electrical conduit, light fixtures, outlets, wiring, and equipment and wiring devices in the building. All feeders would be completely removed back to the main service and disconnected.

Debris removal would include building debris, concrete pad debris, foundation debris, and electrical debris. It is estimated that five round trips would be required to remove the debris associated with the Generator Building.

Electrical Conduit and Conductor Removal

Electrical conduit removal would include the following:

- Toning
- Trenching
- Conduit removal
- Capping

It is assumed that direct buried conduits are 18 inches under existing grade except under the roadway which is assumed to have a depth of 24 inches. Power and telephone cables would be removed from inside the conduits from the Observatory Building and Generator Building to their source. Conduits would

be demolished from the Observatory Building to the roadway. The remaining existing conduit would be capped and remain in place. The existing transformer powers UH88 and would remain in place.

It is estimated that two round trips would be required to remove the debris associated with electrical conduit and conductor removal.

Utility Room Electrical Demolition and Debris Removal

Electrical components associated with Hōkū Keʻa located in the electrical room of the lunchroom would be removed. All other electrical infrastructure would remain in place. This includes removal of the following:

- All cabling in the fiber optic panel that serves the Observatory Building
- Conduit above ceiling
- Non-fused disconnect switch
- Telephone cabling and equipment
- Telephone conduit

Debris removal is expected to take one trip.

Personnel and Traffic

Site deconstruction and removal would require minimal staffing. It is anticipated that the following personnel would be required to complete the restoration tasks:

- 1-Site foreman
- 1-Excavator operator
- 1-Backhoe/Loader operator
- 1-Crane operator
- 1-General laborer
- 1- Journeyman electrician
- 1-Apprentice electrician
- 1-Hazmat removal industrial hygienist
- 1-Archaeological monitor
- 2-Dump truck drivers

Additional traffic on Mauna Kea Access Road during site deconstruction and removal would be limited and would include mobilizing and demobilizing equipment, transportation of project personnel, and removal of debris. Vehicles would be limited to those used by the site foreman, the hazmat removal industrial hygienist, and the archaeological monitor. It is expected that the equipment operators (i.e., excavator operator, backhoe/loader operator, and crane operator), laborer, and electricians would be transported to the project site by van from either a central location off Maunakea or from Halepōhaku.

It is expected that there would be two dump trucks to remove debris from the site.

In total, it is anticipated that a maximum of six vehicles would access the project site daily via Mauna Kea Access Road from Saddle Road. An additional five vehicles may travel up Mauna Kea Access Road from Saddle Road to Halepōhaku where they would remain parked.

2.1.2 Site Restoration

Site restoration under the Proposed Action would restore the site to a basic topography consistent with the area. Based on the preliminary plans, only minor grading consisting of cuts and fills of less than about one foot may be required to achieve the design finish grades. Excavation and backfilling of existing foundations and utility lines of up to approximately two to three feet may be required. The following grading items are discussed in the following subsections:

- Fills and Backfills
- Site Delineation

Fills and Backfills

Over-excavations resulting from the demolishing of the Hōkū Keʻa Observatory and Generator Building and resulting excavations from the removal of existing underground utilities would be backfilled with compacted, non-expansive select granular fill material. Native material from Maunakea would be used to the extent practicable.

Fill Material

Fill material would have the following qualities:

- The granular fill would include coarse to fine particles with no particles larger than three inches in diameter.
- Fill material would have a California Bearing Ratio (CBR) value of 20 or higher, and a swell potential of 1% or less when tested in accordance with American Society for Testing and Materials (ASTM) D1883.
- Fill material would contain less than 30% particles passing the Number 200 sieve (i.e., less than 74 microns).

Excavated on-site materials may be reused as a source of select granular fill if they meet the above requirements.

Stockpiles of fill materials may be available at other areas of Maunakea that may be used as a source of imported fill. Imported fill materials would be free of organics and deleterious materials and would be suitable for the intended use.

Fill Placement and Compaction Requirements

Select granular fill would be placed in eight-inch loose lifts, moisture conditioned to above the optimum moisture content, and compacted. Areas not subject to vehicular traffic shall be compacted to a minimum of 85% relative compaction. In areas subject to vehicular traffic, the fill shall be compacted to a minimum 90% relative compaction. Due to the relatively dry condition of the existing materials at the site, moisture-conditioning would be required to achieve proper compaction. This would be achieved by sheepsfoot rollers, vibratory rollers, or other types of acceptable compaction equipment. Water tamping, jetting, or ponding would not be allowed to compact the fills.

Cut and Fill Slopes

The cut subgrades and areas to be filled would be scarified to a depth of about eight (8) inches, moisture conditioned to above the optimum moisture content, and compacted. Areas not subject to vehicular

traffic shall be compacted to a minimum of 85% relative compaction. In areas subject to vehicular traffic, the fill shall be compacted to a minimum 90% relative compaction.

Cut slopes planned at the site exposing cinder and volcanic ash materials are designed with a maximum slope inclination of two horizontal to one vertical (2H:1V). Permanent fill slopes constructed of select granular fill materials are also designed with a maximum slope inclination of 2H:1V. Any fills placed on slopes steeper than 5H:1V would be benched. The fill slope face would be finished to a relatively smooth and well-compacted surface.

The filling operations would start at the lowest point and continue up in level horizontal compacted layers in accordance with the fill placement requirements discussed above. Fill slopes would be constructed by overfilling and cutting back to the design slope ratio to obtain a well-compacted slope face.

Site Delineation

Upon completion of site preparation, fill placement, and compaction, a barrier would be placed along the top of the slope on the west side of the project site. There are two options proposed for the barrier, which would be finalized during design review.

- Boulders
    - Size = Approximately 3.5 feet
    - Spacing = no more than 6 feet apart
    - Source = Halepōhaku or a local quarry
- Guardrail
    - Length = 400 linear feet
    - Includes two end terminals

Personnel and Traffic

Site restoration would require minimal staffing. It is anticipated that the following personnel would be required to complete the restoration tasks:

- 1-Site foreman
- 1-Excavator operator
- 1-Loader/Roller operator
- 1-Archaeological monitor
- 2-Material delivery drivers

There would be minimal additional traffic on Mauna Kea Access Road during site restoration activities. Vehicles would be limited to those used by the site foreman and the archaeological monitor. It is expected that the equipment operators (i.e., excavator operator and loader/roller operator) would be transported to the project site by the site foreman from either a central location off Maunakea or from Halepōhaku.

Other vehicles that would access the site via Mauna Kea Access Road include the following:

- A water truck for dust control
- Those hauling cinder from a to be determined location on Maunakea
- Those hauling boulders, if used, from Halepōhaku or a local quarry, or those hauling guardrails
- Those to demobilize heavy equipment upon project completion

In total, it is anticipated that a maximum of four vehicles would access the project site daily via Mauna Kea Access Road from Saddle Road. An additional two vehicles may travel up Mauna Kea Access Road from Saddle Road to Halepōhaku where they would remain parked.

2.2 No-Action Alternative (Alternative 1)

Under the No-Action alternative, there would be no change to current conditions. Both the Observatory Building and the Generator Building would remain in place. In addition, all utilities would remain in place. There would be no site restoration.

The No-Action Alternative does not meet the Purpose and Need of the proposed project since it would not result in the decommissioning and removal of the facilities or comply with Governor Ige's 10-point plan for the improved management of Maunakea, which included decommissioning at least three (25 percent [%]) of the 13 telescopes currently on the summit.

2.3 Alternatives Considered But Not Carried Forward For Further Analysis

2.3.1 Infrastructure Capping and Partial Restoration (Alternative 2)

The Infrastructure Capping and Partial Restoration Alternative would include the removal of the Observatory Building and Generator Building structures in Area A. The foundations for both buildings would be removed to a depth of approximately 12 inches below grade. All deeper foundation elements would remain in place and would be covered with native cinder materials. Direct bury utilities in Area A would remain in place, although electrical and communication cables within conduits would be removed from conduits. In Area B, Hōkū Keʻa related cables would be removed from conduits and conduits would be cut and capped. Electrical and communication cables would be removed from the conduit directly under the access road between Area A and Area B, but the conduit would remain in place.

Site restoration activities would occur in Area A but would be limited, consistent with "minimal" restoration level defined in the 2010 Decommissioning Plan. The existing graded area would remain for continued use for sunset viewing, snow play, hikers, and other summit activities. Native cinder would be used to backfill voids left after removal of the foundations. Barriers would be erected to prevent off-road vehicle use and to demarcate the area. No site restoration activities would occur in Area B.

There are potential maintenance concerns with a portion of the building foundations and utility infrastructure remaining in place due to erosion associated with use by visitors for summit activities.

2.3.2 Full Removal and Full Restoration (Alternative 4)

The Full Removal and Full Restoration Alternative would include the removal of the Observatory Building and Generator Building in Area A, including the foundations of both buildings. In addition, all utilities (including conduits) would be removed in both Area A and Area B. Electrical and communication cables would be removed from the conduit directly under the access road between Area A and Area B, but the conduit would remain in place.

Site restoration would occur in Area A to return the area to its original (i.e., preconstruction) conditions to the extent possible, consistent with "full" restoration level as defined in the 2010 Decommissioning Plan. This would include restoring the terrain and biological habitat. Foot and vehicle traffic would be prohibited on the restored area, and a physical barrier would be installed to prevent both vehicle and pedestrian access.

Removal of buildings, foundations, and utility infrastructure in Area A is feasible; however, there may be complications with removal of utility infrastructure in Area B. Specifically, there are no as-built drawings for the utilities in Area B; therefore, there is no clear understanding of the spatial or interconnected aspects of utilities from Hōkū Keʻa where it passes the UKIRT observatory and ties into utilities of other summit facilities. In addition, utilities in Area B are close to the top of the slope, and slope failure is a risk with removal operations and the proximity of the use of heavy equipment. Geotechnical slope stabilization would likely be required. If the UKIRT observatory is to be decommissioned in the reasonably foreseeable future, removal of utilities in Area B may be better accomplished during that process so as to avoid potentially undesirable impacts from the removal of utilities in the area.

2.3.3 Partial Removal and Partial Restoration (Alternative B)

The Partial Removal and Partial Restoration Alternative would include removal of the Observatory Building, foundation, and associated utilities (including conduits) in Area A. However, the Generator Building and associated conduits and utilities would remain in place. Future uses of the Generator Building are to be determined and would be for public purposes such as infrastructure maintenance, public safety, or community stewardship activities.

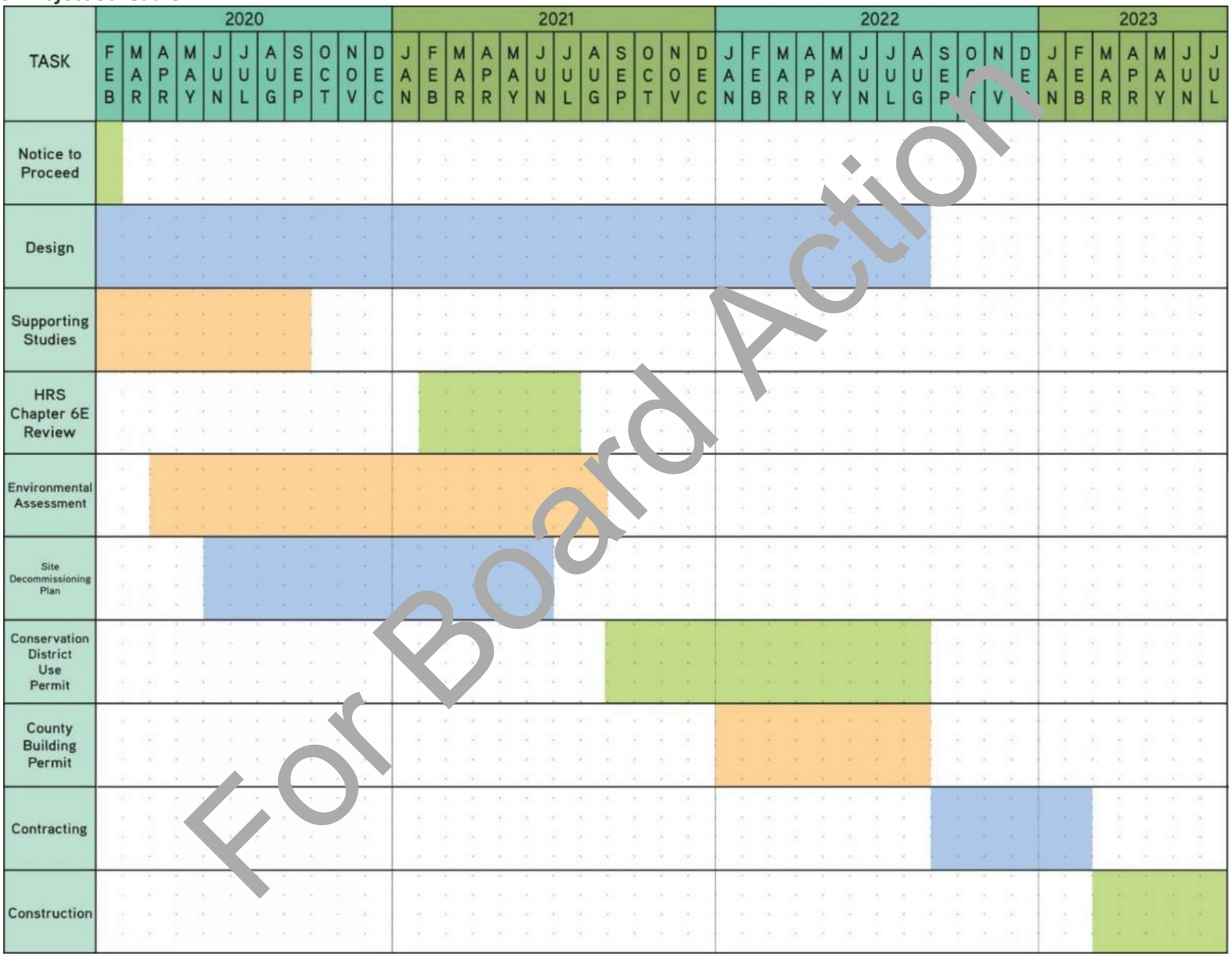
Site restoration activities would occur in Area A but would be limited, consistent with "minimal" restoration level defined in the 2010 Decommissioning Plan. The existing graded area would remain for continued use for sunset viewing, snow play, hikers, and other summit activities. Native cinder would be used to backfill voids left after removal of the observatory foundation and utility conduits. Barriers would be erected to prevent off-road vehicle use and to demarcate the area. No site restoration activities would occur in Area B.

Under Alternative B, there are concerns about ownership, lease, and/or management of the remaining Generator Building. In addition, there may be code upgrades required to utilize the building for another use, such as a ranger station or first aid station.

2.4 Project Schedule

Upon completion of environmental documentation, permitting, and design, the Proposed Action would be implemented, including deconstruction and removal of the existing facilities and site restoration. It is expected that site deconstruction and removal would begin in early-March 2023 and take approximately three months (through late-May 2023). Site restoration would commence upon the completion of deconstruction and removal and would take approximately two months and be completed by August 2023. The project schedule for all activities is shown in **Figure 3**.

Figure 3. Project Schedule



2.5 Permits and Approvals Which May Be Required for the Proposed Action

Implementation of the Proposed Action would require coordination with state and county agencies for permits or approvals. The permits and approvals presented in **Table 1** may be required for the Proposed Action. Permit requirements would be determined through continued agency coordination during the HRS Chapter 343 process.

Table 1. Permits and Approvals Which May Be Required for the Proposed Action

Permit or Approval	Description	Regulation(s)	Administrative Authority
Environmental Assessment and FONSI	Required for projects that "trigger" environmental review, including those that propose the use of state or county lands and the use of state or county funds.	• HRS Chapter 343, Environmental Impact Statements • HAR Title 11 Section 200.1, Environmental Impact Statement Rules	Department of Health (DOH), Office of Environmental Quality Control (OEQC)
Historic Preservation Review	Required for projects that may affect historic property or a burial site.	• HRS 6E	DLNR, State Historic Preservation Division (SHPD)
Conservation District Use Permit	Required for projects located within the Conservation District	• HRS Chapter 183C HAR Title 13, Chapter 5	DLNR-OCCL
County Grading Permit	Required when any one of the following items are exceeded: • 100 cubic yards of excavation or fill; • Vertical height of excavation or fill measured at its highest point exceeds 5 feet; or When the general and localized drainage pattern with respect to abutting properties is altered.	• Hawai'i County Code, Chapter 10 – Erosion and Sedimentation Control	County of Hawai'i Department of Public Works (DPW)
County Building (Demolition) Permit	Required for any project that proposes to erect, construct, enlarge, alter, repair, move, convert, or demolish any building or structure in the County.	• Hawai'i County Code, Chapter 5 – Building	DPW

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3.0 Affected Environment, Potential Impacts, and Avoidance and Minimization Measures

3.1 Cultural Practices and Beliefs

3.1.1 Affected Environment

A Cultural Setting Report (CSR), *Cultural Setting Report in Support of the Hōkū Keʻa Decommissioning Project, Mauna Kea, Hawaiʻi Island, Hawaiʻi,* was prepared for the project by Pacific Consulting Services, Inc. (PCSI) in December 2020 (see **Appendix B**). This report documents that cultural practices and beliefs involving Maunakea have been changing since the arrival of the earliest Polynesian settlers, which is a process that continues today.

A variety of cultural and religious beliefs and practices pertain to and are occurring on the mountain today. This includes traditional and customary cultural practices and beliefs as well as contemporary cultural practices and beliefs, as defined below.

- **Traditional and customary cultural practices and beliefs:** Those beliefs, customs, and practices of a living community of people that have been passed down through generations, usually orally or through practice. Traditional and customary cultural practices and beliefs contribute to the maintenance of a community's cultural identity and demonstrate historical continuity through the present.
- **Contemporary cultural practices and beliefs:** Those current practices and beliefs for which no clear specific basis in traditional culture can be clearly established or demonstrated (e.g., the conducting of ritual ceremonies at sites or features for which no such prior traditional use and associated beliefs can be demonstrated).

Modern-day oral history interviewees have described their knowledge concerning cultural practices in the summit region. These include the following:

- **Ahu and Kūahu:** Ahu are a pile or mound of stones that may have served historically as altars or shrines, markers signifying burial locales, ahupuaʻa boundaries, or trail routes. Kūahu refers to a shrine or altar erected and maintained by a family. Oral history consultants have noted the presence of ahu in the summit region and their general function without identifying specific ahu functions.
- **Burials and scattering of cremated remains**
- **Piko (umbilical cord) deposition in Waiʻau**
- **Navigation and orienteering**

Cultural activities are documented by the rangers in their daily observation reports, there is no estimate of the level of use of the summit by cultural practitioners. The three most visited areas are Lake Waiau, the Adze Quarry, and Puʻu Wēkiu (Kuʻiwalu, 2009).

3.1.2 Potential Impacts

Based on the significance criteria set forth in HAR Chapter 11-200.1, the Proposed Action would result in a significant impact to cultural practices and beliefs if it would have a substantial adverse effect on the cultural practices of the community or state. Significant impacts would occur if the Proposed Action were to cause the following:

- Substantially alter or remove a location where cultural practices take place
- Unduly restrict or prevent a cultural practice from taking place
- Introduce new elements that substantially alter the setting in which cultural practices take place. This can include visual elements, noise, traffic, and human presence.

The Proposed Action would remove man-made elements from the summit, which would enhance the area for cultural practitioners. During decommissioning and restoration activities associated with the Proposed Action, the project site would be fenced, and access would be limited to construction and monitoring personnel for safety reasons. However, access would be maintained to the remaining parts of the summit. It is expected that a maximum of 11 personnel and six vehicles would be accessing the site during decommissioning and restoration activities. The presence of additional personnel, vehicles, and construction equipment would alter the setting of the area. However, this would be short-term and temporary as construction activities would be completed in approximately five months. Therefore, there would be no long-term negative impacts associated to cultural practices with the Proposed Action. Conversely, the Proposed Action would have beneficial impacts removing man-made facilities, thereby enhancing the experience for cultural practitioners.

Under the No-Action Alternative, the Observatory Building, Generator Building, and associated utilities would remain in place. The No-Action Alternative would have no direct impact to cultural practices. However, since the facilities would not be removed, there would be no enhancement of the summit. Therefore, the No-Action Alternative would have negative impacts to cultural practices.

3.1.3 Avoidance and Minimization Measures

The following measure would be implemented to minimize impacts to cultural practices:

- In compliance with the *Mauna Kea Comprehensive Management Plan* (CMP) (Kuʻiwalu, 2009), access would be maintained to the summit region during decommissioning and restoration activities.

3.2 Archaeological and Historic Resources

3.2.1 Affected Environment

An Archaeological Literature Review (ALR), *Archaeological Literature Review with Field Inspection and Architectural Evaluation in Support of the Hōkū Keʻa Decommissioning Project, Mauna Kea, Hawaiʻi Island, Hawaiʻi,* was prepared for the project by PCSI in December 2020 (see **Appendix C**). This report documents background research regarding archaeological and historic properties in the project area. In addition, the

report provides an evaluation of significance and integrity of identified historic properties that would be impacted by the project.

Historic properties are defined as those that are greater than 50 years in age. A total of 264 historic properties have been recorded in the MKSR, as shown in **Table 2**.

Table 2. Historic Properties Recorded in the Mauna Kea Science Reserve (MKSR)

Site Type	Number
Traditional Cultural Properties	2
Shrines and Possible Shrines	141
Mauna Kea Adze Quarry Complex Sites	7
Burials and Possible Burials	29
Stone Markers/Memorials	15
Temporary Shelters	3
Historic Campsites	2
Historic Transportation Route	1
Maunakea Summit Region Historic District	1
Unknown Function	3

Source: PCSI, 2020b

No above ground historic sites have been recorded within the project area. However, four sites are located within 500 meters of the Proposed Action:

- **Site 50-10-23-26224:** USGS marker located on the summit of Kūkahau'ula (Pu'u Wekiu). The marker is a brass disc cemented to a metal pole approximately 10 centimeters in diameter.
- **Site 50-10-23-21209:** Possible burial. The site has been altered to the point that none of the original features (a mound and an adjacent alignment) are extant.
- **Site 50-10-23-21438:** Kūkahau'ula (the summit), a Traditional Cultural Property (TCP) that comprises three pu'u. TCPs are defined as properties that are eligible for inclusion in the National Register of Historic Places (NRHP) because of their association with cultural practices or beliefs of a living community that are rooted in the community's history and are important in maintaining the continuing cultural identity of the community. The Hōkū Ke'a Observatory and Generator Building are located within the Kūkahau'ula TCP.
- **Site 50-10-23-21369:** Mauna Kea Summit Region Historic District, which includes all historic properties within the MKSR plus additional properties outside the management control of OMKM.

In addition to the four historic sites located within 500 meters of the Proposed Action, both the Observatory Building and the Generator Building were built around 1968 and are over 50 years old. However, neither building is evaluated as eligible for the Hawai'i State Register of Historic Places under any criteria established in HAR 13-275-6(b).

Despite significance relating to its role as the first telescope put into use at the Mauna Kea Stellar Observatory, and as a component of the "highest stellar observatory in the world," the Observatory Building has lost integrity due to replacement of the dome, wood interior walls, metal exterior walls, the installation of a new doorway opening, a replaced original door, and removal of both the original and a second telescope.

Although the Generator Building supported the observatory function, it lacks integrity of association, setting, and feeling due to the modifications to the building it originally supported, the Observatory Building. On its own, and without an eligible property to anchor its significant, it does not have sufficient significance or integrity for listing on the state or national registers.

3.2.2 Potential Impacts

Based on the significance criteria set forth in HAR Chapter 11-200.1, the Proposed Action would result in a significant impact to archaeological and historic resources if it would irrevocably commit a natural, cultural, or historic resource. Significant impacts would occur if any of the identified historic properties discussed in **Section 3.2.1** were physically altered or disturbed by the Proposed Action or if the Proposed Action substantially compromises the integrity of an historic property.

Based on the archival background research conducted as part of the ALR, it is anticipated that no above ground or subsurface archaeological resources would be encountered during the decommissioning and site restoration activities. Ground-disturbing activities associated with the original construction of the Observatory Building and Generator Building altered the original ground surface, and any historic properties, if they were present, would have been destroyed.

While no above ground archaeological properties are expected to be impacted by the Proposed Action, there would likely be short-term impacts to Kūkahauʻula while the structures, subsurface foundations, and utilities are removed. Following the removal of these facilities, the SRP would be implemented to restore the project site. Therefore, there would be no long-term negative impacts associated with the Proposed Action. Conversely, the Proposed Action would have beneficial impacts to the Kūkahauʻula TCP and Mauna Kea Summit Region Historic District by removing man-made facilities, thereby enhancing the Hawaiʻi Register of Historic Places integrity of setting.

Under the No-Action Alternative, the Observatory Building, Generator Building, and associated utilities would remain in place and no ground disturbing activities would occur. The No-Action Alternative would have no direct impact to archaeological and historic resources. However, since the facilities would not be removed, there would be no enhancement of the integrity of setting of the Kūkahauʻula TCP and Mauna Kea Summit Region Historic District.

3.2.3 Avoidance and Minimization Measures

The following measures would be implemented to minimize impacts to archaeological and historic resources:

- An archaeological monitor would be on-site during all ground-disturbing activities. Monitoring would be compliant with a SHPD-approved monitoring plan.
- If human remains or burials are identified, all earth-moving activities in the area would stop, the area would be cordoned off, and SHPD and the Police Department would be notified pursuant to HAR Section 13-300-40.
- If any potential historic properties are identified during construction activities, all activities would cease and SHPD would be notified pursuant to HAR Section 13-280-3.

3.3 Biological Resources

3.3.1 Affected Environment

The summit of Mauna Kea is located in the alpine stone desert ecosystem. In this ecosystem, there is little or no soil development, and the ground surface has the appearance of a desert pavement. The climate is dry and cold. Vegetation at the summit consists of lichens, mosses, and a few species of vascular plants. Fauna consists of arthropods, including the endemic Hawaiian wēkiu bug *(Nysius wekiuicola)*.

Lichens

Lichens are the most frequent life-form at the summit, but their cover is estimated to be less than 1%. Twenty-six species of lichens have been recorded at the summit. This includes two species that are endemic to the Hawaiian Islands and 24 species that are indigenous to Hawai'i. The most abundant species is the near ubiquitous *Lecanora polytropa,* a small, light-colored, crustose lichen that can be found most places where the substrate is stable, as well as on rocks buried below the surface of coarse-textured material. The two next most common lichens are the bright yellow *Candelariella vitellina* and the relatively large, black, foliose lichen, *Umbilicaria decussata* (Gerrish, 2013). Lichen species identified in the Astronomy Precinct are provided in **Table 3** (species endemic to the Hawaiian Islands are shown in **bold**).

The substrate type with the greatest abundance of lichens is glaciated pahoehoe lava that is vesicular and usually shades of brown and red. The second substrate type is the dense (lacks vesicles), gray lava that fractures along sharp lines producing a jumble or relatively large blocks and slabs. This substrate type supports few lichens with the exception of *Umbilicaria decussata* community. The glacial rubble substrate and cinder and ash substrate support very few lichens. In addition, lichens generally occur in microsites that provide protection from the elements (Derryman and Smith, 2011). The highest densities and diversity of lichens tend to grow on north and west facing rocks in protected locations away from direct early morning sun exposure (UHH, 2019).

Lichens occur in low abundance in the summit area. However, no lichens are known to be present at the project site.

Table 3. Lichen Species Identified at the Summit of Maunakea

Lichen Name	% Abundance[a]
Acarospora cf. depressa	28
Acarospora sp. #1	72
Acarospora sp. #3	41
Buellia sp. #1	3
Buellia cf. fuscochracea	21
Buellia punctulate	Rare
Buellia punctiformis	Rare
Caloplaca lithophila	14
Candelariella vitellina	79
Carbonea vitellinaria	3
Lecanora polytropa	100
Lecanora cf. subaurea	66
Lecidea baileyi	**86**
Lecidea cf. maunakeanensis	**3**
Lepraria incana	10

Lichen Name	% Abundance[a]
Leprearia vouaxii	21
Physcia dubia	10
Pseudephebe miniscula	48
Rhizocarpon geographicum	31
Umbilicaria decussata	45
Umbilicaria deusta	3
Umbilicaria hirsute	3
Undetermined #1	3
Undetermined #2	3
Undetermined #3	38
Undetermined #4	3

Source: Gerrish, 2013

[a] Frequency of occurrence from Berryman and Smith (2011)

Mosses

Mosses at the summit occur in protected places where water is more consistently available, such as under overhanging rocks and in shaded crevices or caves where snow melts slowly. There are 13 species of mosses known to be present in the alpine stone desert ecosystem, as provided in **Table 4**. The most common species of moss in the vicinity of the project are a previously undescribed species of *Grimmia* and *Pohlia cruda. Grimmia* are silvery-gray mosses that form clumps in runoff channels and semi-exposed rock faces. *Pohlia cruda* is a bright green moss found in well-protected, deeply shady locations. This species is so well hidden that it is unlikely to be seen by the casual observer.

Mosses are predominantly found on the north-northeast and south-southeast facing sides of rocky mounds, generally in association with runoff channels from snow melt. Mosses have not been observed in loose cinders. No mosses have been observed at the project site.

Table 4. Mosses Identified at the Summit of Maunakea

Name	Abundance
Amphidium tortuosum	Occasional
Andreaea acutifolia	Occasional
Bryum caespiticum	Uncommon
Bryum hawaiicum	**Uncommon**
Grimmia apocarpa var. *pulvinate*	Occasional
Grimmia cf. *pilifera*	Uncommom
Grimmia sp.	Occasional
Pohlia* cf. *mauiensis	**Uncommon**
Pohlia cruda	Common
Racomitrium lanuginosum Brid. Var. *pruinosum*	Unknown
Rosulabryum capillare	Historical Records Only
Tortella humilis	Uncommon
Zygodon tetragonostromus	Uncommon

Source: Sustainable Resources Group International, Inc., 2009

Vascular Plants

Vascular plant life is inconspicuous and consists of widely scattered, low-stature, herbaceous plants. Two native grasses, *pili uka (Trisetum glomeratum)* and Hawai'i bentgrass *(Agrostis sandwicensis)* are the most frequent species, followed by the endemic fern *'Iwa 'Iwa (Asplenium adiantum-nigrum)* (Gerrish, 2013). A total of 15 vascular plant species have been identified at the summit, as shown in **Table 5** (native species are shown in **bold**).

Although these plant species have been identified in the Astronomy Precinct, no vascular plants have been found along or near the foundations of any of the observatories or their out-buildings, parking areas, or other constructed facilities near the observatories. The unoccupied spaces between astronomy facilities are cinder substrates that are also devoid of vascular plants. This includes the immediate project area.

Table 5. Vascular Plant Species Identified at the Summit of Maunakea

Common Name	Scientific Name	Species Group
Grasses		
***Pili uka, he'upueo,* mountain pili**	***Trisetum glomeratum***	**UNG**
Hawai'i bentgrass	***Agrostis sandwicensis***	**UNG**
Rescue grass	*Bromus catharticus*	AGH
Sweet vernalgrass	*Anthoxanthum odoratum*	AGH
Kentucky bluegrass	*Poa pratensis*	AGH
Ferns		
Kalamoho, Lau-kahi	***Diplazium ternifolia***	**UNF**
'olali'i, 'owali'i	***Asplenium trichomanes***	**UNF**
***'iwa 'iwa,* Bird's nest fern**	***Asplenium adiantum-nigrum***	**UNF**
***'I'o nui, laukahi,* Alpine woodfern**	***Dryopteris wallichiana***	**NAF**
Douglas' bladderfern	***Cystopteris douglasii***	**NAF**
Herbs		
Fireweed	*Senecio madagascariensis*	UAH
Hairy cat's ear, Gosmore	*Hypochoeris radicata*	UAH
Laulele, lauhele, Common dandelion	*Taraxacum officinale*	UAH
Alfilaria, Pin clover	*Erodium cicutarium*	AGH
Common groundsel	*Senecio* cf. *vulgaris*	AGH

Source: Gerrish, 2013

Definitions:
UNG = ubiquitous native grasses
AGH = alien grasses and herbs
UNF = ubiquitous ferns
NAF = high elevation ferns
UAH = ubiquitous alien herbs

Arthropods

The only resident fauna occurring at the summit is arthropods. The loose packing of the cinder creates suitable habitat that provides shelter for resident arthropods from adverse weather conditions, intense solar radiation, freezing temperatures, and predators. Upslope winds carry insects, spores, seeds, and organic debris to the summit from surrounding forests, which is a major food source of the resident arthropods.

The endemic Hawaiian wēkiu bug *(Nysius wekiuicola)* is a carnivorous scavenger that only inhabits volcanic cinder cones above approximately 11,500 feet elevation on Maunakea. The wēkiu bug was previously a candidate for listing under the Endangered Species Act but was removed in 2011. Wēkiu bugs are restricted to cinder cones that consist of cinder tephra layers at various depths that are sorted by tephra size with interstitial spaces through which the insects can crawl.

Regular monitoring arthropods, including invasive species, was begun in 2002. Monitoring and conservation efforts occur year-round. Two traps are located within (at the Utility Building/Lunchroom) and adjacent to the project area (at Gemini Observatory). The following species shown in **Table 6** were identified during the annual surveys between 2013 and 2018 (endemic species are shown in **bold**). As shown, wēkiu bug are located in the vicinity of the Proposed Action.

One arthropod trap was also placed within the Hōkū Keʻa Observatory Building and a hand search was conducted around the perimeter of the facility quarterly between 2013 and 2018. Species identified within and around the Observatory Building are shown in **Table 7**. No wēkiu bug were identified within or adjacent to the Observatory Building.

Table 6. Arthropod Species Identified Within and Adjacent to the Project Area, 2013-2018

Order	Family	Genus species	Nativity
Araneae	Linyphiidae	*Erigone* sp.	N/NN
Araneae	Linyphiidae	unknown	N/NN
Araneae	unknown	unknown	N/NN
Coleoptera	Cleridae	*Necrobia rufipes*	NN
Coleoptera	Coccinellidae	*Coccinella septempunctata*	NN
Coleoptera	Coccinellidae	*Harmonia conformis*	NN
Coleoptera	Coccinellidae	*Hippodamia convergens*	NN
Coleoptera	Coccinellidae	unknown	NN
Coleoptera	Hydrophillidae	unknown	N/NN
Collembola	unknown	unknown	N/NN
Diptera	Agromyzidae	unknown	N/NN
Diptera	Anthomyiidae	unknown	NN
Diptera	Calliphoridae	unknown	NN
Diptera	Chamaemyiidae	unknown	NN
Diptera	Chloropidae	unknown	NN
Diptera	Drosophilidae	unknown	N/NN
Diptera	Ephydridae	unknown	N/NN
Diptera	Muscidae	unknown	N/NN
Diptera	Phoridae	unknown	N/NN
Diptera	Sciaridae	unknown	N/NN
Diptera	Sepsidae	unknown	NN
Diptera	Sphaeroceridae	unknown	N/NN

Order	Family	Genus species	Nativity
Diptera	Syrphidae	unknown	NN
Diptera	unknown	unknown	N/NN
Hemiptera	Geocoridae	*Geocoris pallens*	NN
Hemiptera	Geocoridae	*Geocoris* sp.	NN
Hemiptera	Lygaeidae	*Neacoryphus bicrucis*	NN
Hemiptera	Lygaeidae	*Nysius palor*	NN
Hemiptera	Lygaeidae	*Nysius terrestris*	N
Hemiptera	Lygaeidae	*Nysius* sp.	N/NN
Hemiptera	**Lygaeidae**	***Nysius wekiuicola***	**E**
Hemiptera	Pentatomidae	*Bagrada hilaris*	NN
Hemiptera	Rhyparochromidae	unknown	NN
Homoptera	Aphididae	unknown	NN
Homoptera	Psyllidae	unknown	N/NN
Hymenoptera	Braconidae	unknown	N/NN
Hymenoptera	**Colletidae**	***Hylaeus difficilis***	**E**
Hymenoptera	Encyrtidae	unknown	N/NN
Hymenoptera	Eulophidae	unknown	N/NN
Hymenoptera	Ichneumonidae	unknown	N/NN
Hymenoptera	Pteromalidae	unknown	N/NN
Hymenoptera	Vespidae	*Vespula pensylvanica*	NN
Hymenoptera	unknown	unknown	N/NN
Lepidoptera	Pyralidae	unknown	N/NN
Lepidoptera	unknown	unknown	N/NN
Thysanoptera	Thripidae	unknown	U

Source: OMKM

Definitions:
N = Native
NN = Non-native
E = Endemic
U = Unknown

Table 7. Arthropods Identified Within and Around the Hōkū Keʻa Observatory Building, 2013-2018

Order	Family	Genus species	Nativity
Araneae	Linyphiidae	unknown	N/NN
Diptera	Sciaridae	unknown	N/NN
Diptera	Phoridae	unknown	N/NN
Diptera	Sepsidae	unknown	NN
Hemiptera	Lygaeidae	*Nysius palor*	NN
Hemiptera	Geocoridae	*Geocoris pallens*	NN
Hemiptera	Lygaeidae	*Nysius terrestris*	N
Homoptera	Psyllidae	unknown	N/NN
Homoptera	Aphididae	unknown	NN
Hymenoptera	Encyrtidae	unknown	N/NN

Source: OMKM

Definitions:
N = Native
NN = Non-native
E = Endemic
U = Unknown

Special Status Species

The U.S. Fish and Wildlife Service (USFWS) identified the following special status species known to occur in the immediate vicinity of the project area:

- The federally endangered Hawaiian hoary bat *(Lasiurus cinereus semotus)*
- The federally endangered Mauna Kea silversword *(Argyroxiphium sandwicense* subsp.)

In addition, the USFWS stated that Hawaiian seabirds may transit the area flying to breeding colonies.

The federally endangered Hawaiian hoary bat roosts in both exotic and native woody vegetation across all islands and will leave young unattended in trees and shrubs when they forage. No Hawaiian hoary bat have been documented at the summit of Maunakea, and there is not sufficient habitat for the species at or near the project site.

The Mauna Kea silversword is an endangered plant species that occurs on Maunakea at elevations ranging from approximately 8,500 to 12,500 feet. The project site is at a higher elevation than the appropriate habitat for the Mauna Kea silver sword.

Hawaiian seabirds nest in the mountains and forage over the ocean. The project site is located at the summit of Maunakea, which is upland of breeding habitat. No Hawaiian seabirds have been documented traversing the summit of Maunakea.

3.3.2 Potential Impacts

Based on the significance criteria set forth in HAR Chapter 11-200.1, the Proposed Action would result in a significant impact to biological resources if it would irrevocably commit a natural resource or have a substantial adverse effect on a rare, threatened, or endangered species, or its habitat. A significant impact would occur if the Proposed Action resulted in the following:

- Long-term loss or impairment of a substantial potion of local habitat of indigenous Hawaiian species
- Substantial reduction in the population of a protected species, as designated by Federal and State agencies, or a species with regional and local significance
- Introduction or increase of the prevalence of undesirable non-native species
- Curtail the range of native Hawaiian species
- Reduce the range of beneficial uses of the environment

Although the wēkiu bug has been documented at and adjacent to the project site, the project site has been disturbed by past construction and the use of fill material and is not considered wēkiu bug habitat or potential habitat. The Proposed Action would restore the site to a basic topography consistent with the area. This would be accomplished through the use of fill material that would be compacted to a minimum of 90% relative compaction. Since the project site has previously been disturbed and is not considered wēkiu bug habitat or potential habitat, the Proposed Action is not expected to have negative impacts to the wēkiu bug.

The Proposed Action would have no impact on protected species (i.e., special status, threatened, or endangered) as none have been observed at the project site. In addition, the project site does not contain unique habitat resources important to native or protected species.

Under the No-Action Alternative, no construction activities would occur; therefore, there would be no impacts to biological resources.

3.3.3 Avoidance and Minimization Measures

The following measures detailed in the *Maunakea Invasive Species Management Plan* (Casper, et.al, 2015) would be implemented to minimize the spread of invasive species:

- All vehicles would be externally cleaned at least monthly and the interior maintained in a clean condition at all times prior to arrival at the Saddle Road and Mauna Kea Access Road junction. (SOP #1)
- All vehicles with three or more axles and heavy equipment would be thoroughly cleaned prior to arrival at the Saddle Road and Mauna Kea Access Road junction and inspected by a DLNR-approved biologist. (SOP #1)
- Aggregate and fill materials would be inspected by a DLNR-approved biologist for plant, animal, and earthen materials. Both the load and the site where aggregate and fill materials were extracted or stored shall be inspected. (SOP #2)

In addition to the measures above, all contractors would be educated regarding protection of environmental resources of the summit, including identification of wēkiu bug, as per management action C-8 of the CMP.

3.4 Visual Resources

3.4.1 Affected Environment

The visual environment at the project site is characterized by the summit plateau cinder cones and astronomy facilities. The topography of the mountain blocks the view of the existing facilities, including the facilities associated with the Proposed Action, from the access road approaching the summit. The observatories, including Hōkū Keʻa, are visible from nearby sacred sites and trails within the Maunakea summit area. The observatories are also visible to varying extents from Hilo, Honokaʻa, and Waimea. Because of its small size, the Hōkū Keʻa Observatory Building is not visible from Hilo, Honokaʻa, or Waimea.

3.4.2 Potential Impacts

Based on the significance criteria set forth in HAR Chapter 11-200.1, the Proposed Action would result in a significant impact to visual and recreational resources if it had a substantial adverse effect on scenic vistas and viewplanes, during day or night, identified in County or State plans or studies. The Proposed Action would have a significant impact if it would block or substantially obstruct a vista by placing a structure in the foreground so as to prevent a view of an identified resource from an identified area or create a structure that would be so incongruous with existing structures currently in the vista or viewplane.

The Proposed Action includes removing existing buildings that are located in a visually sensitive environment and restoring the site to a basic topography consistent with the area. The Proposed Action includes construction of a barrier at the top of the slope on the west side of the project site. This barrier would either consist of boulders sourced from Halepōhaku or a guardrail similar to the existing guardrail along Mauna Kea Access Road. The barrier would not block or substantially obstruct a vista. The removal of existing unused buildings and restoration of the site would improve the visual character of the area. Therefore, the Proposed Action would have beneficial impacts to visual resources.

Under the No-Action Alternative, the existing Observatory Building and Generator Building would remain. Unless maintained, the buildings would continue to deteriorate and decrease the visual character of the area. Therefore, the No-Action Alternative would have negative impacts to visual resources.

3.4.3 Avoidance and Minimization Measures

No minimization or mitigation measures are proposed or expected to be required.

3.5 Geology and Soils

3.5.1 Affected Environment

The project site is located at the summit of Maunakea on the island of Hawaiʻi. Maunakea is the highest of the five shield volcanoes forming the island of Hawaiʻi, rising to 13,796 feet above mean sea level (msl). There are numerous cinder cones and associated lava flows on what is commonly known as the summit plateau, which is described as "a rudely circular dome five or six miles in diameter rising between 500 and 1,000 feet per mile to a central area above 13,000 feet" (Wentworth and Powers, 1941). The remnants of three or four glacial drift sheets located above 9,000 feet above msl are also present.

The existing Hōkū Keʻa Observatory and Generator Building are located along a paved access road on the way to the UKIRT Observatory Building. Materials exposed at the ground surface of the project site generally consist of cinder mixed with some volcanic ash. Based on laboratory tests, the surface materials generally consist of medium dense gravelly sands with little silt. In some areas, the surface materials are mostly gravel with very little sands and silts. Surface materials are generally dry with relatively low moisture content. There is little or no soil development, and the ground surface has the appearance of a desert pavement. It is expected that subsurface conditions are similar to the materials observed at the ground surface.

The unpaved ground surface around the Observatory Building and Generator Building generally follows the grades of the access road and is slightly sloping down from northeast to southwest. The existing ground surface elevations range from 13,725 to 13,74[illegible] feet above msl.

3.5.2 Potential Impacts

Based on the significance criteria set forth in HAR Chapter 11-200.1, the Proposed Action would result in a significant impact to geological and soil resources if it would involve a substantial degradation of environmental quality or would have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as geologically hazardous land. Therefore, a significant impact would occur if the Proposed Action caused a substantial degradation of environmental quality through erosion or affected or suffered damage by being located in an environmentally sensitive area.

The Proposed Action is located in an area that has already been impacted by construction of observatories, support facilities, and roads. These actions have resulted in substantial, significant, and adverse impacts to geologic resources, primarily due to the alteration of cinder cone morphology. The Proposed Action would remove the existing Hōkū Keʻa Observatory Building and Generator Building, including foundations up to 12 inches below the ground surface, as well as underground utilities. The project site would be restored to a basic topography consistent with the area. Therefore, the Proposed Action would have beneficial impacts to the local geology by restoring the topography of the area to the extent practicable.

There is very little to no soil present at the project site. However, the Proposed Action has the potential for soils or other fines (e.g., volcanic ash) in the construction area to be eroded as a result of being carried away by storm water runoff or wind and the potential for contaminants to be present that could be imparted to the ground surface. Contaminants have the potential to be transported in normal runoff flows

to receiving waters and can pose a direct health risk to people living, working, or playing in or near the area.

Under the No-Action Alternative, no construction activities would occur and there would be no impacts to topography or soil resources. The project site would not be restored to a basic topography consistent with the area; therefore, there would be no beneficial impacts.

3.5.3 Avoidance and Minimization Measures

The following measures would be implemented to minimize potential impacts to geological and soil resources:

- Any grading would be in conformance with the Hawai'i County Grading Ordinance.
- Installation of a silt fence or equivalent to prevent runoff from the site to adjacent areas.
- All construction would conform to the 2018 International Building Code and the latest State of Hawai'i amendments and ordinances.
- All work would be confined to the designated area of work. Any damage caused by the contractor would be repaired by the contractor.
- All work would comply with the requirements of the latest Mauna Kea Comprehensive Management Plan and other construction-related plans.
- A monitor would be on-site during site restoration to monitor fill placement and compaction.

3.6 Water Resources

3.6.1 Affected Environment

As shown in **Figure 4**, the project site is underlain by the Waimea Aquifer System. This is a "high-level" aquifer, which means that it is entirely fresh water, and has an estimated yield of 16 million gallons per day. The depth to groundwater at the summit is unknown, but the nearest wells to the summit show the groundwater level ranging from 950 to 1,510 feet above msl.

There are no perennial streams in the Mauna Kea Science Reserve. The only surface water regularly present in the summit region is Lake Waiau, as shown in **Figure 5**. Lake Waiau is one of Hawai'i's only lakes and is one of the highest alpine lakes in the United States. The lake has never been known to dry up and is frozen during colder times of the year. Water in the lake is from snow melt and rain. Lake Waiau is located approximately 0.9 mile southwest of the project site.

Figure 4. DLNR Aquifers

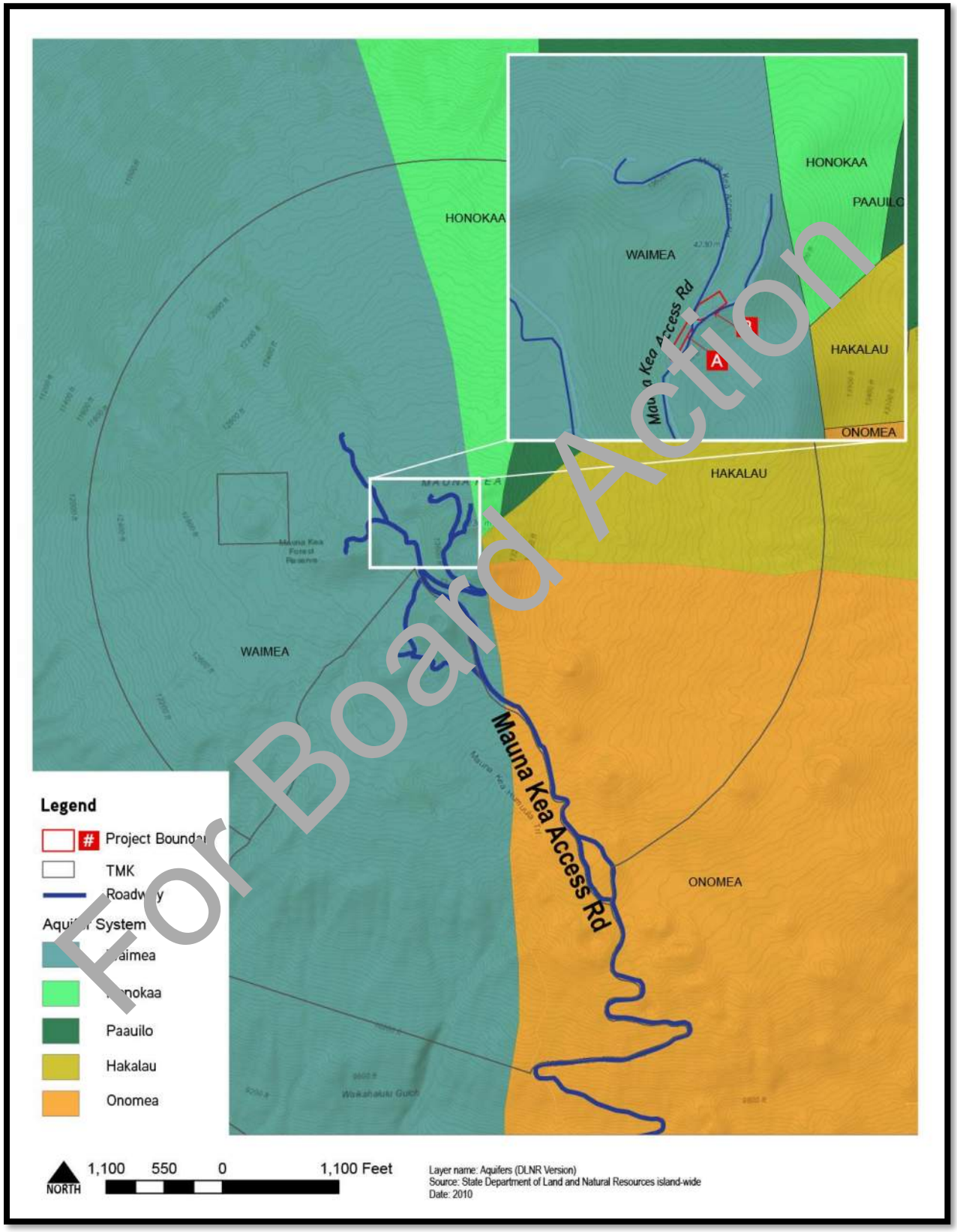
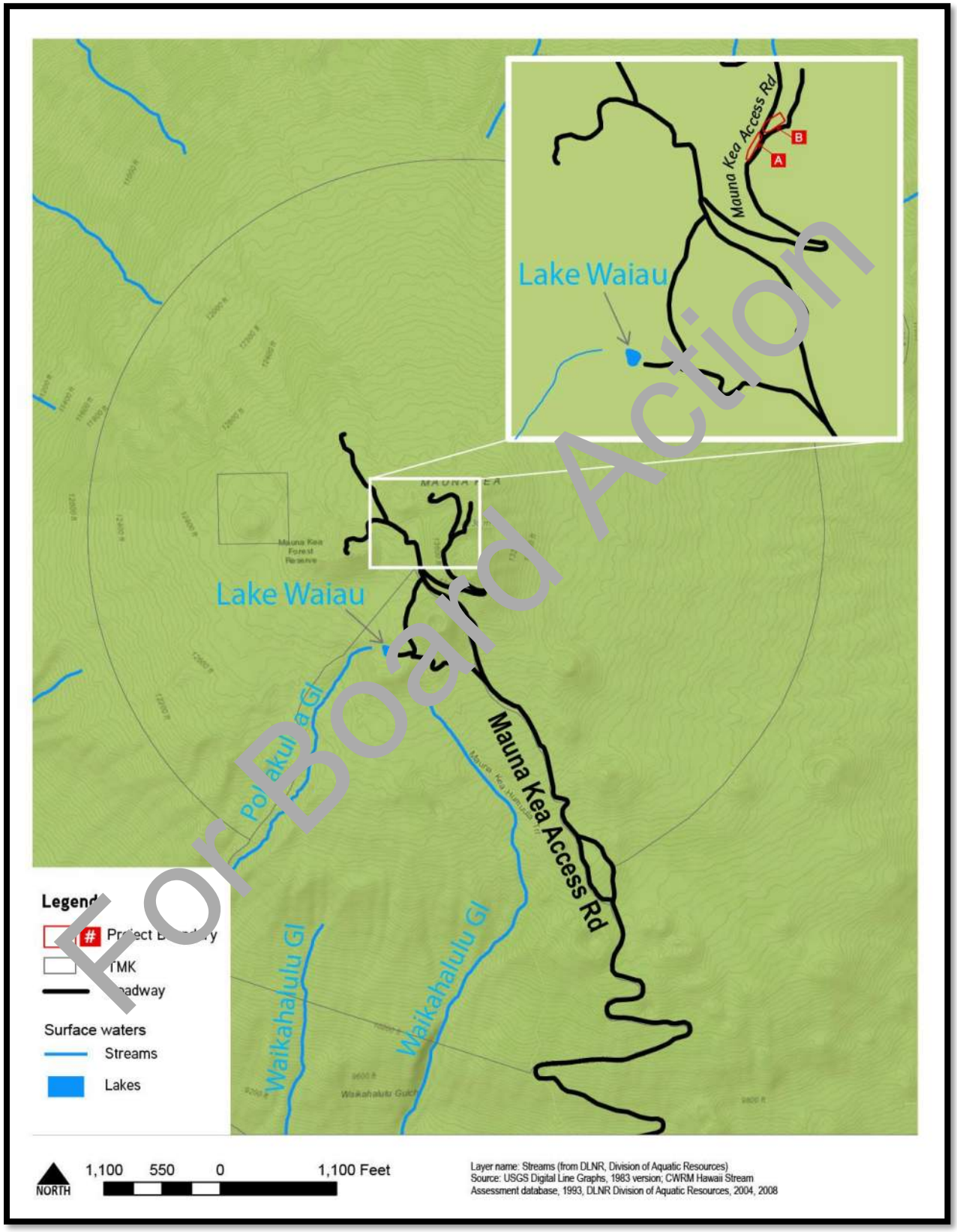


Figure 5. Surface Waters



3.6.2 Potential Impacts

Based on the significance criteria set forth in HAR Chapter 11-200.1, the Proposed Action would result in a significant impact to water resources if the Proposed Action would involve a substantial degradation of environmental quality or a substantial adverse effect on water quality. Therefore, a significant impact would occur if the Proposed Action affected water resources so that their quality was degraded to the point that they were no longer fit for their designed use and/or the chemical composition exceeded applicable regulatory water standards.

There are no water bodies at the project site; therefore, there would be no direct impacts to surface waters from the Proposed Action. Deconstruction and restoration activities may produce sediment from soil erosion during and after excavation. In addition, contaminants associated with equipment during construction may leak percolate into groundwater or be transported off-site to surface waters. With the implementation of BMPs, impacts to water resources during the short-term construction period would be less than significant.

Under the No-Action Alternative, no construction activities would occur and there would be no impacts to water resources.

3.6.3 Avoidance and Minimization Measures

The following measures would be implemented to minimize potential impacts to water resources:

- Construction plans and specifications would include BMPs to minimize erosion on the project site during and after construction, as well as measures to contain runoff on-site during construction.
- Temporary erosion control measures would be used during construction to prevent soil loss and to minimize surface runoff into downslope intermittent streams and Lake Waiau.

3.7 Solid Waste and Hazardous Materials

3.7.1 Affected Environment

Solid Waste

Solid waste at the summit consists of municipal solid waste (i.e., rubbish). This includes paper products, spent containers, and limited amounts of food waste. Waste is generated from three sources: construction activity, visitors, and observatory operation and maintenance activities. The solid waste generated by each of the observatories is discarded in standard containers for transport and disposal off the mountain.

There are two landfills on the island of Hawaiʻi: the South Hilo Landfill in Hilo and the West Hawaiʻi Sanitary Landfill at Puʻuanahulu in North Kona. Construction and demolition debris is only accepted at the West Hawaiʻi Sanitary Landfill.

Hazardous Materials

A Phase I Environmental Site Assessment (ESA) (see **Appendix D**) and Hazardous Materials Survey (see **Appendix E**) were conducted by Myounghee Noh & Associates, LLC (MNA) in April and May 2020.

The Phase I ESA consisted of the following:

- A review of federal, state, and local environmental records
- A site reconnaissance survey
- Interviews with key site personnel and other individuals with knowledge of the subject property
- Administration of a "User Questionnaire" to individuals with knowledge of the subject property
- Preparation of a report documenting the collection of information about the subject property and an evaluation of that information towards determining the presence of recognized environmental conditions (RECs) at the property.

Standard federal and state government databases for hazardous substance or petroleum product releases were reviewed. Government records were examined with respect to environmental conditions, citations, complaints, and permits at the subject property, adjoining properties and the surrounding area. During the review, no records of the following were identified at the subject property or in the adjacent areas of the subject property:

- State Sites of Interest
- Delisted National Priorities List sites
- Comprehensive Environmental Response, Compensation, and Liability Act sites
- Resource Conservation and Recovery Act non-Corrective Action Treatment, Storage, and Disposal facilities
- State of Federal Brownfield sites
- Landfill or solid waste disposal sites
- State Voluntary Cleanup sites
- Institutional controls/engineering controls registries
- State Hazardous Waste sites
- Federal Emergency Response Notification System list sites

A site reconnaissance was conducted on April 2, 2020. All areas of the subject property, including the Hōkū Keʻa Observatory and associated Generator Building, were walked and visually surveyed; adjoining properties were visually surveyed and photo documented. During the site reconnaissance and review of historical topographic maps and aerial photos, no RECs were indicated at the subject property or immediately adjoining properties.

Interviews were conducted with the following key site personnel and other individuals with knowledge of the property:

- Dr. Pierre Martin, UH Associate Professor of Astronomy
- David Longborg, UH Institute for Astronomy
- Ligaya Hill, UH Hilo Facilities Planning & Coordination
- Bruce Teramoto, UH Mānoa Construction Management

- Stewart Hunter, Maunakea Observatories Support Services
- Frederick Klasner, Natural Resource Program Manager for OMKM

Based on the information provided in the interviews, no RECs were identified. MNA had also requested information from the DLNR-Land Division and DLNR-OCCL, and responses were still pending at the time the report was completed.

In addition to the interviews, a "User Questionnaire" was administered by MNA and completed by Stewart Hunter and Dr. Pierre Martin. The questionnaires found no indication of any spills, chemical releases, or environmental cleanups that had taken place at the property.

A hazardous material survey of the Hōkū Keʻa Observatory was conducted on May [illegible] 2016 to support planned renovations. During the 2016 survey, a total of eight (8) suspect building materials were identified, including two (2) lead-containing paints (LCP) in and on the observatory structure.

MNA conducted a supplemental hazardous material survey on April 2, 2020 to support the decommissioning of the Hōkū Keʻa Observatory. The inspector confirmed lead containing materials from the 2016 survey. Materials suspected of containing asbestos, lead or arsenic were identified in the Generator Building, and samples were collected of these materials. Light ballasts and light components and switches were also surveyed.

During the April 2020 survey, MNA identified an additional five (5) suspect building materials in and on the Observatory and Generator Buildings. On May [illegible] 2020, MNA collected two (2) additional samples from the exterior dome of the Observatory Building. Based on sampling and analysis of three (3) asbestos/bulk, eight (8) lead/paint chips, and a visual inspection of light ballasts, fluorescent light tubes, and light switches from the 2016 and 2020 surveys, the following confirmed hazardous materials were identified within the Observatory Building and Generator Building:

- LCP identified within the Observatory Building in the gray paint on the concrete floor
- LCP identified on the exterior of the Observatory Building in the white paint on metal doors, door frames, and walls
- LCP identified within the Generator Building in the beige paint on concrete masonry unit (CMU) walls, metal ceiling, and door frame

None of the paint samples collected from the observatory contained lead levels in excess of laboratory reporting limits. In the Generator Building, none of the LCP were identified as lead-based paint (LBP), exceeding 5,000 mg/kg, which is the threshold for LBP.

From the suspect materials collected in both the 2016 and 2020 surveys, none were confirmed to be asbestos-containing material. No suspected arsenic-containing material was identified in the Observatory Building and Generator Buildings during both the 2016 and 2020 surveys. In addition, no polychlorinated biphenyls-containing light ballasts or conventional mercury-containing lamps were identified within the Observatory Building and Generator Building.

3.7.2 Potential Impacts

Based on the significance criteria set forth in HAR Chapter 11-200.1, the Proposed Action would result in a significant impact regarding solid waste and hazardous materials if the Proposed Action would involve a substantial degradation of environmental quality. Therefore, the Proposed Action would have a significant impact if the generation, storage, use, transportation, or disposal of solid waste and hazardous materials resulted in the degradation of air, soil, or water quality to the point that the resource could no longer be used for its intended purpose, or contained pollutants or toxic elements exceeding allowable levels.

The Proposed Action would result in the generation of solid waste. Demolition debris would be removed from the summit and transported to the West Hawaiʻi landfill for disposal. Therefore, the Proposed Action would not result in significant impacts associated with solid waste and hazardous materials.

Under the No-Action Alternative, the existing facilities would remain in place and would not be deconstructed creating solid waste. Since the facility is no longer in use it does not generate solid waste; therefore, there would be no impacts associated with the No-Action Alternative.

3.7.3 Avoidance and Minimization Measures

Since the Phase I ESA revealed no evidence of RECs, there are no mitigation recommendations for the decommissioning of the Hōkū Keʻa Observatory and Generator Building, regarding surrounding environmental conditions.

In the Hazardous Material Survey Report, MNA provided recommendations for renovation or demolition activities that disturb lead-containing paints. Work should be conducted in general accordance with 29 CFR 1926.62 Occupational Safety and Health Administration (OSHA) Lead Construction Standard. The types of activities that would trigger OSHA requirements include, but are not limited to, sanding, blasting, welding, cutting, scraping, and spot/whole paint removals. The contractor must determine the appropriate safety measures based on the areas to be disturbed, the lead concentration and the condition of the paint.

The following is a summary of applicable work practice guidelines involving the disturbance of lead paints:

- Employees must anticipate hazards and utilize appropriate engineering controls and personal protective equipment (PPE).
- Employees must utilize respiratory protection until the initial air monitoring assessment documents safe working levels of airborne lead (29 CFR 1926.62[d][1] and [2][i][A]).
- An exposure assessment should be carried out when employees are disturbing LCP or LBP to ensure that they are not exposed to airborne lead concentrations greater than the Permissible Exposure Limit of 50 micrograms per cubic meter (µg/m3) averaged over an 8-hour period. Additional periodic exposure monitoring may be required if the Action Level, 30 µg/m3, averaged over an 8-hour period is exceeded.
- Employees must implement stringent dust control procedures to prevent airborne lead dust.

- Employees must clean the work area thoroughly using wet methods and a high-efficiency particulate air vacuum. Dry sweeping or air blowing of lead debris and dust must be avoided.
- Lead-containing debris must be segregated from other wastes, collected, and containerized. Waste must be characterized per State of Hawaiʻi requirements, including a determination of the waste as hazardous or non-hazardous. Lead-containing waste must be handled and disposed of in accordance with applicable requirements.
- Visually inspect and verify the work area to ensure all lead-containing debris and dust has been properly removed and the project site is free of lead hazard.
- Conduct clearance in accordance with contract specifications.

There are low mercury vapor tubes present in the project area. The low mercury vapor tubes should be removed in a manner that will prevent breakage of the light tube prior to disposal.

3.8 Air Quality, Climate, and Climate Change

3.8.1 Affected Environment

Air Quality

The Clean Air Act of 1972 and its 1990 Amendments (CAA) and subsequent legislation regulate air emissions from area, stationary, and mobile sources. Both the U.S. Environmental Protection Agency (USEPA) and the State of Hawaiʻi have instituted Ambient Air Quality Standards (AAQS) to maintain air quality in the interest of public health and secondary public welfare.

At the present time, seven parameters are regulated: particulate matter, sulfur dioxide, hydrogen sulfide, nitrogen dioxide, carbon monoxide, ozone, and lead. The Hawaiʻi AAQS are in some cases considerably more stringent than the comparable National Ambient Air Quality Standards (NAAQS). In particular, the Hawaiʻi 1-hour AAQS for carbon monoxide is four times more stringent than the comparable national limit. **Table 8** illustrates the NAAQS and state AAQS and the units of measure (micrograms per cubic meter [$\mu g/m^3$] and parts per million [ppm]).

In addition to the NAAQS and the State AAQS, the State of Hawaiʻi Department of Health (DOH) regulates fugitive dust. HAR Section 11-60.1-33, Fugitive Dust, states that no person shall cause or permit visible fugitive dust to become airborne without taking reasonable precautions, and no person shall cause or permit the discharge of visible fugitive dust beyond the property lot line on which the fugitive dust originates (DOH, 2014). This rule applies to construction projects and would, therefore, be applicable to the Proposed Action.

Prevailing winds throughout the year in Hawaiʻi are the northeasterly trade winds. These trade winds generally help maintain good air quality conditions. The DOH operates a network of air quality monitoring stations at various locations around the state; however, there are no air quality monitoring stations at the summit of Maunakea. Air quality monitoring has occurred at the Mauna Loa Observatory, which provides data that is representative of the conditions at Maunakea. The air quality at Mauna Loa Observatory is excellent and in attainment status with the State AAQS and NAAQS. Due to the similarities between Maunaloa and Maunakea, it is assumed that the air quality at Maunakea is excellent as well.

The project site is located above the atmospheric temperature inversions that occur at around 7,000 feet above mean sea level (msl). Particulates and aerosols like vog, smog, dust, smoke, salt particles, and water vapors generated below the inversion level are capped by the temperature inversion and do not rise above the inversion level. However, winds can occasionally come up the slopes of Maunakea, penetrating the inversion layer, bringing small volumes of air from lower elevations.

Locally generated contributors to air pollution at the project site include vehicle exhaust, chemical fumes from construction and maintenance activities, and fugitive dust from various sources, including vehicles traveling on unpaved surfaces and road grading and construction or other activities occurring on unpaved roads. Air pollutants are rapidly dispersed by strong winds.

Table 8. State of Hawai'i and National Ambient Air Quality Standards

Pollutant	Units	Averaging Time	Maximum Allowable Concentration		
			National Primary	National Secondary	State of Hawai'i
Particulate Matter <10 microns (PM_{10})	µg/m³	Annual 24 Hours	- 150[a]	- 150[a]	50 150[b]
Particulate Matter <2.5 microns ($PM_{2.5}$)	µg/m³	Annual 24 Hours	12 35[d]	15[c] 35[d]	- -
Sulfur Dioxide (SO_2)	ppm	Annual 24 Hours 3 Hours 1 Hour	- - - 0.075[e]	- - 0.5[b] -	0.03 0.14[b] 0.5[b] -
Nitrogen Dioxide (NO_2)	ppm	Annual 1 Hour	0.053 0.100[f]	0.053 -	0.04 -
Carbon Monoxide (CO)	ppm	8 Hours 1 Hour	9[b] 35[b]	- -	4.4[b] 9[b]
Ozone (O_3)	ppm	8 Hours	0.070[g]	0.070[g]	0.08[g]
Lead	µg/m³	3 Months Quarter	0.15[h] 1.5[i]	0.15[h] 1.5[i]	- 1.5[i]
Hydrogen Sulfide	ppb	1 Hour	-	-	25[b]

Notes: [a]Not to be exceeded more than once per year on average over three years.
[b]Not to be exceeded more than once per year.
[c]Three-year average of the weighted annual arithmetic mean.
[d]98th percentile value averaged over three years.
[e]Three-year average of fourth-highest daily 1-hour maximum.
[f]98th percentile value of the daily 1-hour maximum averaged over three years.
[g]Three-year average of annual fourth-highest daily 8-hour maximum.
[h]Rolling 3-month average.
[i]Quarterly average.
Source: DOH, 2015

Climate

The Proposed Action is located at the summit of Maunakea. Winter temperatures on Maunakea range from 10 degrees Fahrenheit (°F) to 40 °F, but wind chill can make it feel below zero. Summer temperatures range between 30°F and 60°F. Average annual precipitation at the project site is approximately 15 inches and comes in the form of both rain and snow. Snowfall can occur during any month of the year but is generally concentrated during January through March.

Wind velocities range from 10 to 30 miles per hour (mph) but can exceed 100 mph during severe winter storms. High winds can also occur due to atmospheric anomalies such as the jet stream dipping down or low- and high-pressure systems creating vortexes.

Climate Change

There is a scientific consensus that the earth is warming due to manmade increases in greenhouse gases in the atmosphere, according to the United Nation's Intergovernmental Panel on Climate Change. Global mean air temperatures are projected to increase by at least 2.7°F by the end of the century. This will be accompanied by the warming of ocean waters, which is expected to be highest in tropical and subtropical seas of the Northern Hemisphere. Wet and dry season contrasts will increase, and wet tropical areas are likely to experience more frequent and extreme precipitation. For Hawaii, where warming air temperatures are already quite apparent, not only is the equable climate at risk but also agriculture, ecosystems, the visitor industry, and public health. In Hawaii the key consideration regarding climate change is sea level rise. This is not of concern for this project due to its location at the summit of Maunakea.

3.8.2 Potential Impacts

Based on the significance criteria set forth in HAR Chapter 11-200.1, the Proposed Action would result in a significant impact to air quality, climate, and climate change if it would result in a substantial degradation of environmental quality, have a substantial adverse effect on air quality, or require substantial energy consumption or emit substantial greenhouse gases. Therefore, the Proposed Action's impact to air quality would be considered significant if it would result in emissions of air pollutants that could substantially impair the existing air quality through generation of substantial pollutant concentrations, lead to the area becoming a non-attainment area for State AAQS and NAAQS, or substantially emit greenhouse gases.

Air pollutant emissions from deconstruction and site restoration activities would include dust or particulate matter and exhaust fumes from vehicular travel to and from the project site and from equipment operations during the deconstruction and restoration activities. Specifically, construction activities would include grading and vehicle and equipment engine operations during the construction period. Because levels of criteria pollutants in Hawaiʻi are consistently below Federal and State AAQS, and because the prevailing trade winds rapidly carry pollutants offshore limiting the effect on receptors, increases in levels of criteria pollutants at the project sites from construction activities are not expected to be significant. It is not anticipated that Federal or State AAQS would be exceeded during construction activities. In addition, the Proposed Action would not substantially emit greenhouse gases as emissions would be short-term and temporary during deconstruction and site restoration activities.

Under the No-Action Alternative, no construction activities would occur; therefore, there would be no impact to the existing air quality.

3.8.3 Avoidance and Minimization Measures

All construction activities would comply with the provisions of HAR Chapter 11-60.1, Air Pollution Control, and HAR Chapter 11.60.1-33, Fugitive Dust. A dust control plan would be developed and implemented to minimize fugitive dust during construction, to be approved by the DOH. Measures to control fugitive dust during construction may include, but not be limited to, the following:

- Watering of active work areas and project access roads, as needed
- Screening piles of materials from wind, if appropriate
- Covering open trucks carrying construction materials
- Limiting areas to be disturbed at any given time

Additionally, contractors would be required to maintain equipment with emission controls.

3.9 Noise

3.9.1 Affected Environment

Noise is defined as "any sound that may produce adverse physiological or psychological effects or interfere with individual or group activities, including but not limited to communication, work, rest, recreation, or sleep" (HAR Title 11, Chapter 46). A number of factors affect sound as it is perceived by the human ear. These include the actual level of the sound (i.e., noise), the frequencies involved, the period of exposure to the noise, and changes or fluctuations in the noise levels (HAR, Title, Chapter 200.1 – Occupational Noise Exposure).

The State of Hawai'i Community Noise Control Rules (HAR Title 11, Chapter 46) defines three classes of zoning districts and specifies corresponding maximum permissible sound levels due to stationary noise sources such as air-conditioning units, exhaust systems, and generators. The accepted unit of measure for noise levels is the decibel (dB). The Community Noise Control Rules do not address most moving sources, such as vehicular traffic noise, air traffic noise, or rail traffic noise. However, the Community Noise Control Rules do regulate noise related to construction activities, which may not be stationary.

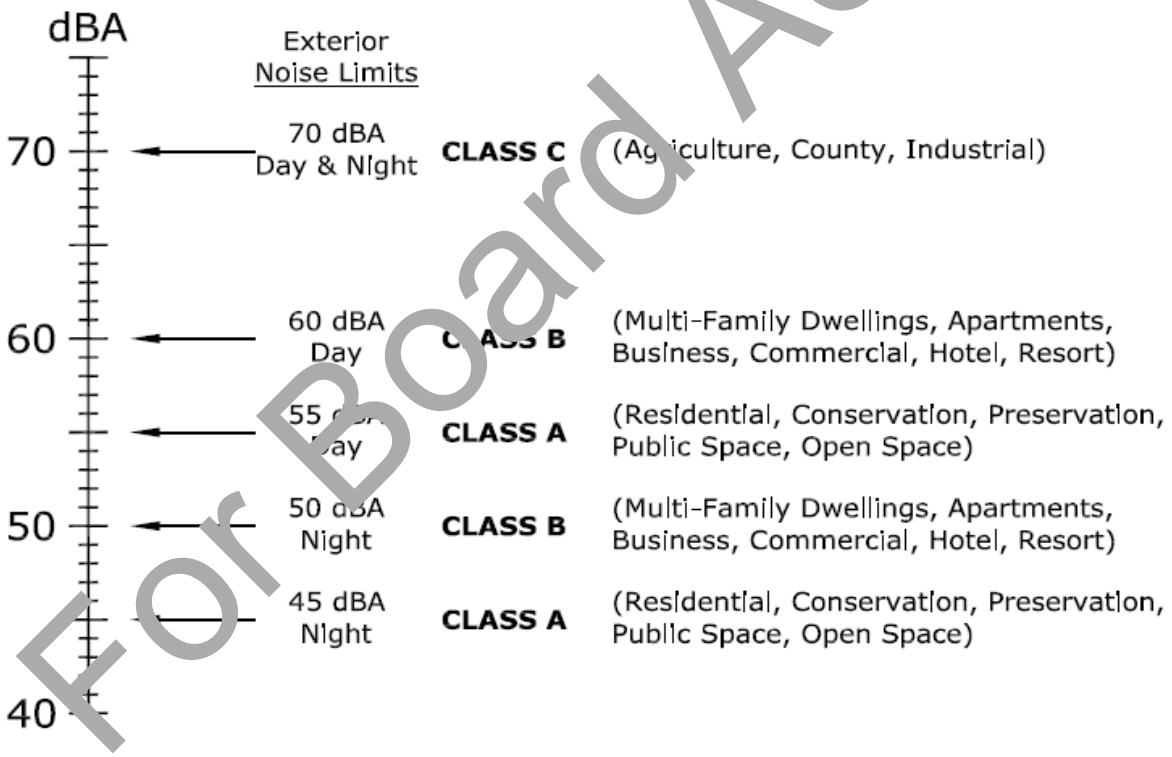
The State of Hawai'i regulates noise exposure in the following statutes and rules:

- HRS, Section 342F – Noise Pollution
- HAR, Title 11, Chapter 46 – Community Noise Control

The maximum permissible noise levels are enforced by the DOH for any location at or beyond the property line and shall not be exceeded for more than 10% of the time during any 20-minute period. The specified noise limits which apply are a function of the zoning and time of day as shown in **Figure 6**. With respect to mixed zoning districts, the rule specifies that the primary land use designation shall be used to determine the applicable zoning district class and the maximum permissible sound level. In determining the maximum permissible sound level, the background noise level is taken into account by the DOH.

Figure 6. Hawai'i Maximum Permissible Sound Levels for Various Zoning Districts

Zoning District	Day Hours (7 AM to 10 PM)	Night Hours (10 PM to 7 AM)
CLASS A Residential, Conservation, Preservation, Public Space, Open Space	55 dBA (Exterior)	45 dBA (Exterior)
CLASS B Multi-Family Dwellings, Apartments, Business, Commercial, Hotel, Resort	60 dBA (Exterior)	50 dBA (Exterior)
CLASS C Agriculture, Country, Industrial	70 dBA (Exterior)	70 dBA (Exterior)



As discussed in **Section 4.1.2**, the project area is zoned Conservation. This puts the project area in a Class A Zoning District with a maximum permissible sound level during daytime hours (7 AM to 10 PM) of 55 dBA and a maximum permissible sound level of 45 dBA during nighttime hours (10 PM to 7 AM) as measured at the property line of the parcel. Noise levels are not to exceed these maximum permissible levels within any 20-minute period, except by permit or variance.

Noise-sensitive sites near the project site are limited to areas where outdoor use is common. The Proposed Action is located in a secluded area with generally low ambient noise levels. No one resides at the summit, but visitors frequent the summit for stargazing and astronomy, hiking, general sightseeing, hunting, and skiing/snowplay. The primary activities that produce sounds above the natural background level include vehicular travel, observatory operations, and construction and maintenance operations.

3.9.2 Potential Impacts

Based on the significance criteria set forth in HAR Chapter 11-200.1, the Proposed Action would result in a significant noise impact if it has a substantial adverse effect on ambient noise levels. Therefore, a significant noise impact would occur if the Proposed Action would result in increased ambient noise levels to the extent that noise-sensitive receptors would be exposed to noise exceeding regulatory levels.

The Proposed Action would result in a short-term increase in noise levels during deconstruction and restoration activities. Noise would be generated by construction equipment employed to implement the Proposed Action. Construction equipment would include dump trucks, an excavator, a loader, a roller, a backhoe, and a crane. Additional vehicle traffic to the project site would also generate noise during; however, it is anticipated that a maximum of six vehicles would access the project site daily. Typical noise emission levels for construction equipment are shown in **Table 9**.

Table 9. Typical Noise Emission Levels for Construction Equipment

Type of Equipment	Noise Level at 50 feet (dBA)
Excavator	85
Front End Loader	80
Dump Truck	88
Backhoe	80
Crane (100 ton)	83
Pick-up Truck	55
Roller	80

Source: FHWA, 2015

3.9.3 Avoidance and Minimization Measures

Noise generated from short-term construction activities and the use of machinery would be minimized by requiring contractors to adhere to state and county noise regulations, including HRS Chapter 342F, Noise Pollution, and HAR Chapter 11-46, Community Noise Control. In the event that work occurs after normal working hours (i.e., at night or on weekends), or if permissible noise levels are exceeded, appropriate permitting and monitoring, as well as development of administrative and engineering controls, would be employed.

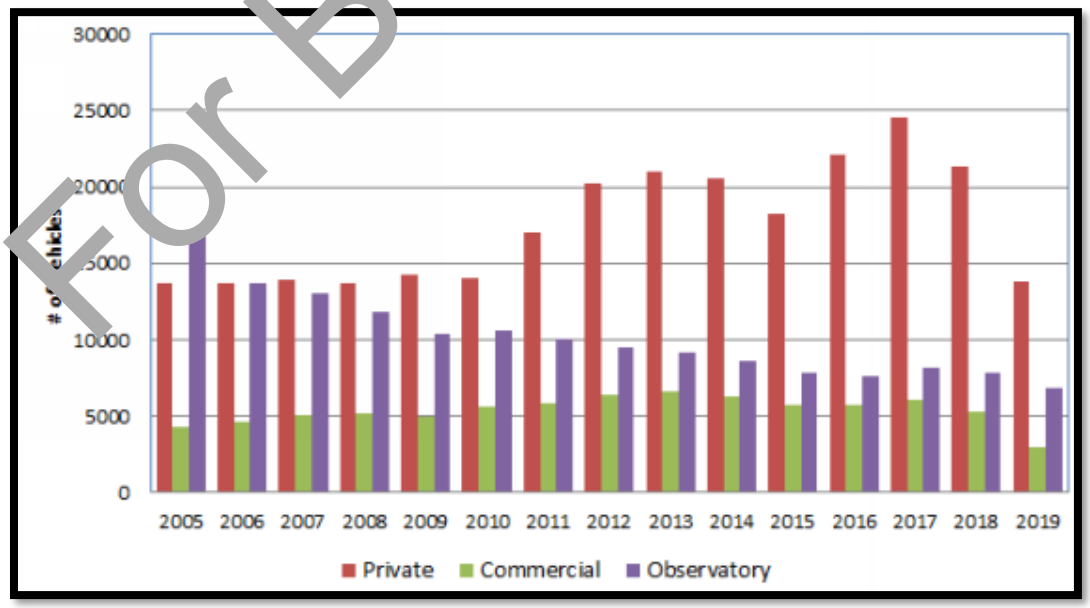
3.10 Traffic and Transportation

3.10.1 Affected Environment

Access to the project site is via Saddle Road (Route 200) to Mauna Kea Access Road at Puʻu Huluhulu. The first six miles of Mauna Kea Access Road from Saddle Road to Halepōhaku is paved and 20-feet-wide. The next approximate 4.5 miles of Mauna Kea Access Road is unpaved until an elevation of 11,800 feet above msl where it becomes paved again. It is recommended, although not required, that visitors to the summit use a four-wheel drive vehicle beyond Halepōhaku.

The Maunakea Rangers monitor activities on UH's managed lands on a daily basis, including the number of vehicles by type. In addition, an automated vehicle counter was installed in 2015 to count the number of vehicles that drive above Halepohaku. This information is provided in an annual report to the Board of Land and Natural Resources (BLNR). The total yearly vehicle counts by types of users between 2005 and 2019 is shown in **Figure 7**. Since 2005 observatory vehicles have declined and private vehicles have been the dominant vehicle type accessing the summit. Private and commercial vehicle use declined in 2019 due to the closure of Mauna Kea Access Road for over 200 days (OMKM, 2020).

Figure 7. Total Yearly Vehicle Counts by Types of Users, 2005-2019



Source: OMKM, 2020

3.10.2 Potential Impacts

Based on the significance criteria set forth in HAR Chapter 11-200.1, the Proposed Action would result in a significant impact if it involves a substantial degradation of environmental quality. Therefore, the Proposed Action would have a significant impact if it would increase traffic resulting in a substantial deterioration of traffic conditions and/or requiring additional road improvements beyond minor modifications at the access point and routine maintenance.

The Proposed Action would have minor, short-term direct and indirect impacts on Saddle Road and Mauna Kea Access Road from project-related vehicles, equipment and materials delivery/removal and personnel access to the project site. Additional traffic on Mauna Kea Access Road above Halepōhaku would be limited as it is expected that equipment operators, laborers, and electricians would be transported to the project site by van. In total, it is anticipated that a maximum of six vehicles would access the project site daily via Mauna Kea Access Road from Saddle Road. An additional five vehicles may travel up Mauna Kea Access Road from Saddle Road to Halepōhaku where they would remain parked.

Transportation of equipment and materials to and from the project site would require oversized and/or overweight loads. The contractor would be required to obtain a permit from the Hawai'i Department of Transportation (HDOT) to transport oversized and/or overweight materials and equipment on State highways.

Under the No-Action Alternative, no construction activities would occur and there would be no transportation-related impacts.

3.10.3 Avoidance and Minimization Measures

The following measures would be implemented to minimize traffic and transportation related impacts:

- Equipment and materials would be transported to and from the project site during non-peak hours.
- All construction vehicles would be maintained in proper operating condition and loads would be properly secured to prevent dust, debris, leakage, or other adverse conditions from affecting public roadways.
- The majority of project personnel (e.g., equipment operators, laborers, and electricians) would be transported to the project site via van from either Halepōhaku or other central location.

3.11 Socioeconomics

3.11.1 Affected Environment

The Proposed Action is located within the Hāmākua District of the island of Hawai'i. The Hāmākua District is a relatively sparsely populated district with the majority of the population located in towns near the coast. According to the *Hawai'i County Data Book* (COH DRP, 2015), the Hāmākua District had 6,513 residents in 2010, which is approximately 3.5% of the total population of the county. The population of the Hāmākua District is located in small communities along the Hāmākua Coast, including Āhualoa,

Honokaʻa, Kukuihaele, Paʻauilo, and Pāpaʻaloa. There are no permanent residents on Maunakea, although there are three dorm buildings with a total of 72 rooms at Halepōhaku that provide lodging for guests, although Halepōhaku does not provide lodging to the general public. Services at Halepōhaku are managed by Mauna Kea Support Services.

Astronomy is an important industry in Hawaiʻi and in particular on the island of Hawaiʻi. It is estimated that in 2012 there were $58.43 million of expenditures attributed to astronomy activities in Hawaiʻi County that generated $91.48 million in local business sales, $27.98 million in employee earnings, $4.00 million in state tax revenues, and over 800 jobs (UHERO, 2014). The Hōkū Keʻa Observatory has not been operational since 2013; therefore, the observatory does not contribute to the economy.

3.11.2 Potential Impacts

Based on the significance criteria set forth in HAR Chapter 11-200.1, the Proposed Action would result in a significant impact to socioeconomics if the Proposed Action would have a substantial adverse effect on the economic or social welfare of the community or State. Therefore, a significant socioeconomic impact would occur if the Proposed Action adversely affected the revenue, employment, or overall economic conditions of the island community or the state.

The Proposed Action would not increase the population of the area. Deconstruction and site restoration activities would result in temporary, positive economic activity in the form of construction jobs and material procurements. The decommissioning of the Hōkū Keʻa Observatory would have no impact on the economy since the observatory has not been operational since 2013.

Under the No-Action Alternative, no construction activities would occur and there would be no short-term economic benefits.

3.11.3 Avoidance and Minimization Measures

No minimization or mitigation measures are proposed or expected to be required.

3.12 Public Facilities and Services

3.12.1 Affected Environment

Police

The County of Hawaiʻi Police Department is divided into two patrol districts: Area I (East Hawaii) and Area II (West Hawaii). The Proposed Action is located in the Hāmākua District of Area I. The nearest police stations to the project area are Waimea Station (approximately 47 miles from the project site) and Hilo Station (approximately 43 miles from the project site).

Fire

The County of Hawaiʻi Fire Department is primarily responsible for fire protection and suppression, pre-hospital emergency medical services, land and sea search and rescue, hazardous materials response,

ocean safety, and fire prevention and public education for the County of Hawai'i. There are 20 full time fire and medic stations and 20 volunteer fire stations across the island.

Medical Services

There are five hospitals on the island of Hawai'i. The hospitals closest to the project site are the North Hawai'i Community Hospital in Waimea with 33 beds (approximately 46 miles from the project site) and the Hilo Medical Center with 276 beds (approximately 41 miles from the project site).

Schools

There are 41 public schools, 15 public charter schools, 2 community schools, and 20 private schools on the island of Hawai'i.

Recreation Areas

There are several recreation areas on the island of Hawai'i. The nearest improved recreation area to the project site is the Gilbert Kahele Recreation Park, which is located approximately 6.7 miles northwest of the intersection of Mauna Kea Access Road and Saddle Road.

Recreational activities on Maunakea include hiking, sightseeing, bird watching, camping, hunting, and other similar activities. Recreational activities in the MKSR include hiking, sightseeing, skiing, snowplay, and stargazing.

3.12.2 Potential Impacts

Based on the significance criteria set forth in HAR Chapter 11-200.1, the Proposed Action would result in a significant impact to public facilities and services if the Proposed Action involves substantial secondary impacts such as population changes or effects on public facilities that would impact public health. Therefore, a significant impact on public facilities or services would occur if the Proposed Action caused a substantial change in population or adversely affected public facilities.

Deconstruction and site restoration activities associated with the Proposed Action would require approximately 10 personnel that would be sourced from the local workforce. Therefore, the Proposed Action would not cause population changes that could cause a strain on public facilities (e.g., schools and recreation areas) and services (e.g., fire, police, and medical). Due to the remote location of the project site, there would be no impact to emergency vehicle access during construction. It is not anticipated that construction activities would result in an increase in calls for fire, police or medical services. However, if an incident were to occur during construction that required fire, police, or medical attention, it is anticipated that the level of demand could be met by the existing fire, police, and emergency medical services force. Therefore, the Proposed Action would not have a significant impact on emergency services.

Since the workforce would be local, there would be no changes in population and no impact to schools or recreation areas. The removal of existing unused buildings and restoration of the site would improve the visual character of the area, and thereby the user experience. Therefore, the Proposed Action would have beneficial impacts to recreational resources.

Under the No-Action Alternative, there would be no construction activities; therefore, there would be no impacts on public facilities and services.

3.12.3 Avoidance and Minimization Measures

No minimization or mitigation measures are proposed or expected to be required.

3.13 Natural Hazards

3.13.1 Affected Environment

Floods

The Federal Emergency Management Agency (FEMA) creates Flood Insurance Rate Maps (FIRM) that delineate flood hazard areas. The FEMA FIRM flood zone designations include the following:

- A – Areas of 100-year flood, base flood elevations not determined
- AE – Areas of 100-year flood, base flood elevation determined
- XS – Areas of 500-year flood; areas of 100-year flood with average depths of less than one foot or within the drainage area less that one square mile, and areas protected by levees from 100-year flood
- X – Areas determined to be outside the 500-year floodplain
- D – Areas in which flood hazard is undetermined
- VE – Areas of 100-year coastal flood with velocity (wave action), base flood elevations determined (Coastal High Hazard District)

As shown in **Figure 8**, the Proposed Action is located in Flood Hazard Zone D (i.e., Areas in which flood hazard is undetermined).

The project site is located in a relatively flat area that is bordered on the west and east by steep ravines. Due to the low average annual precipitation at the summit, the occurrence of ephemeral streams is limited to winter storms and/or rapid snowmelts. These infrequent runoff occurrences have cut small channels and gullies that connect with larger gulches further down the mountain slope. Given the topography of the project site, as well as the low rainfall, flooding has not been observed and is not expected to occur.

Volcanic Activity and Lava Flows

Maunakea is a dormant shield volcano that is one of the five volcanoes that comprise the island of Hawai'i. Maunakea has erupted 12 times within the last 10,000 years with the most recent eruption over 4,600 years ago.

As shown in **Figure 9**, the Proposed Action is located in an area designated "Low Hazard." Although there are several post-glacial (post-10,000-year-old) eruptive vents on the middle flanks of Maunakea, there are none younger than 40,000 years old at the summit. Thus, the potential for renewed volcanic activity at the summit of Maunakea is extremely rare. Any future volcanic activity would likely occur well below the summit.

Figure 8. Flood Hazard Areas

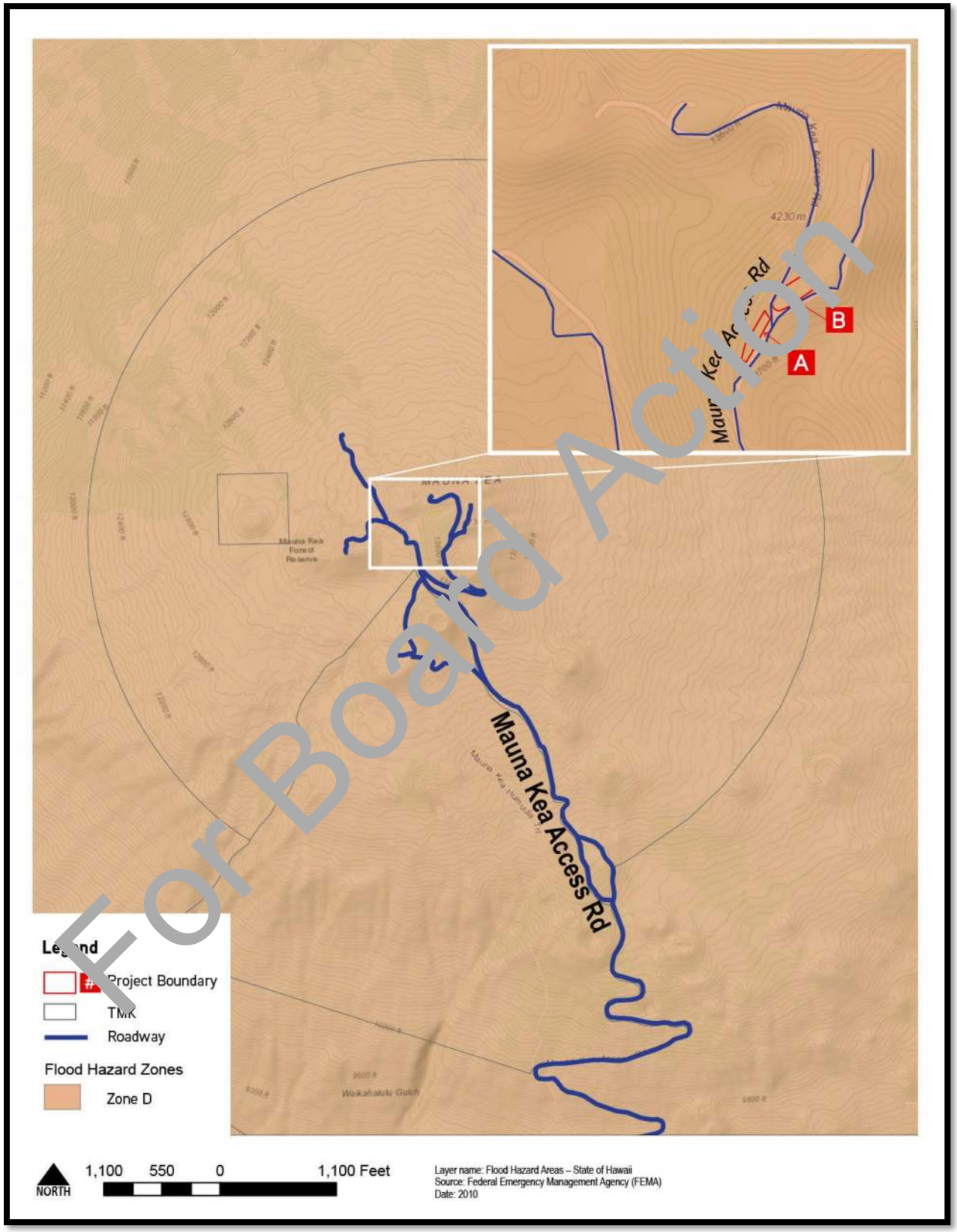
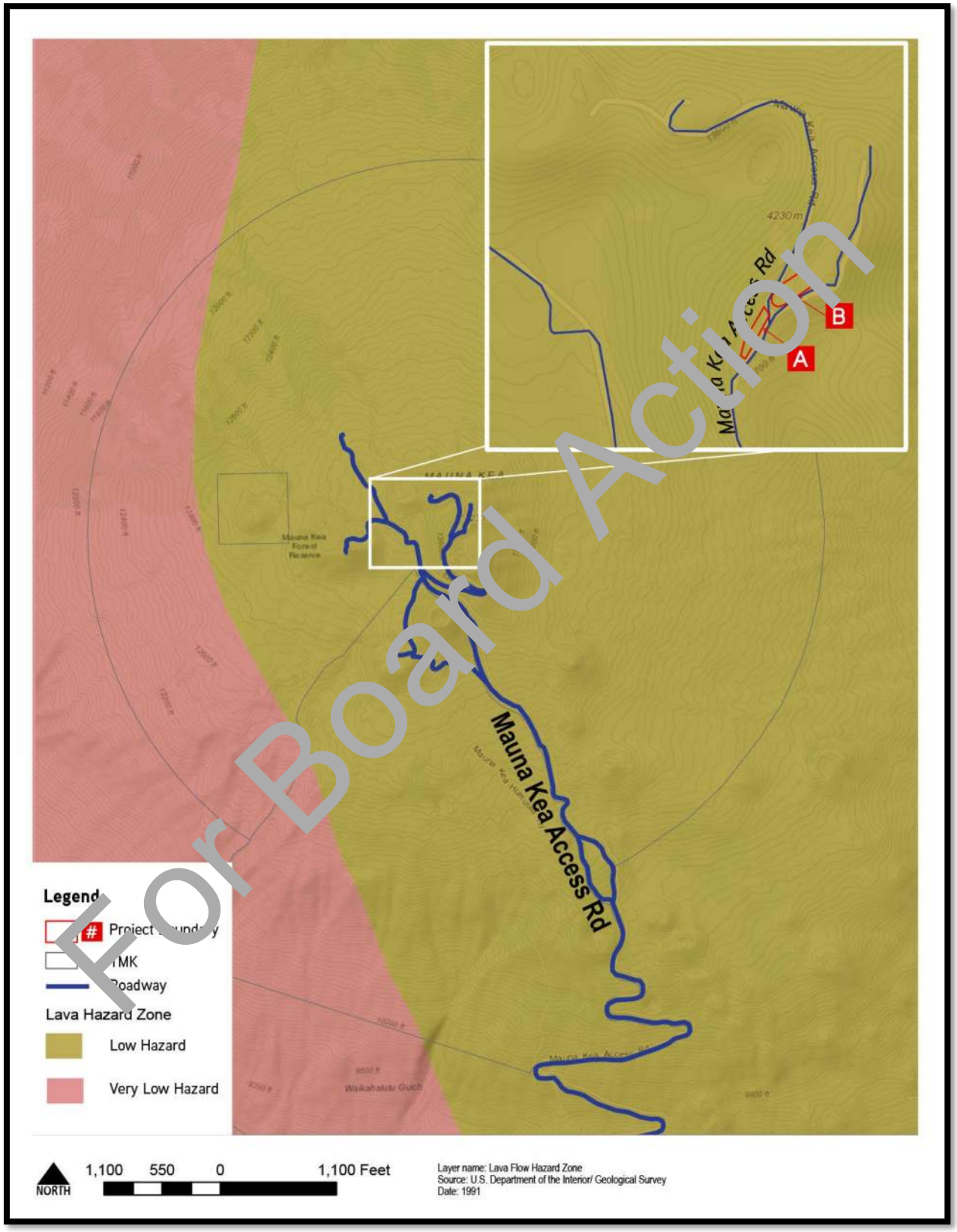


Figure 9. Lava Hazard Zones



Earthquakes

Strong earthquakes endanger people and property by shaking structures and by causing ground cracks, ground settling, and landslides. The size of an earthquake is commonly expressed by its magnitude on the Richter scale, which is a measure of the relative size of the earthquake wave recorded on seismographs. Thousands of earthquakes occur every year in Hawaiʻi, most on and around the island of Hawaiʻi. Many of these earthquakes are directly related to volcanic activity.

Hawaiʻi Island is one of the most seismically active areas on earth. In 2006 an earthquake caused minor damage to the W.M. Keck, Subaru, UH 2.2-meter, and Canada-France-Hawaiʻi Telescope observatories. Damage was limited to auxiliary equipment; the telescopes' mirrors and overall facility structural integrity were not affected. Earthquakes will continue to impact the Maunakea summit area.

Hurricanes and Tropical Storms

The Hawaiian Islands are seasonally affected by Pacific hurricanes from June through November. On average, there are between four and five tropical cyclones observed in the Central Pacific every year. The state has been affected by significant hurricanes and tropical storms over the years. These include Hiki (1950), Nina (1957), Dot (1959), Iwa (1982), ʻIniki (1992), Iselle (2014), Lane (2018), and Olivia (2018).

According to a report presented at the International Union of Conservation of Nature World Conservation Congress, global climate change could mean that Hawaiʻi may experience more frequent and more severe hurricanes in the future.

3.13.2 Potential Impacts

Based on the significance criteria set forth in HAR Chapter 11-200.1, the Proposed Action would result in a significant impact if it would have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a flood plain. Therefore, a significant impact would occur if the Proposed Action was substantially adversely impacted by natural hazards.

Deconstruction and site restoration activities would not create conditions that would exacerbate natural hazards. The County of Hawaiʻi Civil Defense directs and coordinates the County's emergency preparedness and response program to ensure prompt and effective action when natural or man-caused disaster threatens or occurs anywhere in the County of Hawaii. Construction personnel would respond to any emergency messages or alerts, as appropriate, to ensure their safety during deconstruction and site restoration activities.

Under the No-Action Alternative, no construction activities would occur and there would be no change in existing conditions.

3.13.3 Avoidance and Minimization Measures

No minimization or mitigation measures are proposed or expected to be required.

3.14 Secondary and Cumulative Impacts

3.14.1 Secondary Impacts

Secondary impacts are those effects that are caused by an action and are later in time or farther removed in distance but are reasonably foreseeable. They may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water or other natural systems. The Proposed Action would not involve a change in land use and would not induce growth. Therefore, the Proposed Action would not have secondary impacts.

3.14.2 Cumulative Impacts

Cumulative impacts refer to the impact on the environment that results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant impacts taking place over time.

All impacts associated with the Proposed Action would either be beneficial or short-term and temporary. Two other observatories are proposed to be decommissioned, deconstructed, and the sites restored. Impacts associated with those future actions would be similar to those for the Proposed Action with any potential negative impacts being short-term and temporary. The removal of additional observatories at the summit would have further beneficial impacts. Specifically, the removal of man-made facilities at the summit is expected to have the following additional beneficial impacts:

- Enhance the summit experience for cultural practitioners and other visitors.
- Enhancing the Hawai'i Register of Historic Places integrity of setting of the Kūkahau'ula TCP and Mauna Kea Summit Region Historic District.
- Improve the visual setting of the summit.
- Restore the topography of the summit to the extent practicable.

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4.0 Relationship to Land Use Plans and Policies

4.1 State of Hawai'i Planning Documents

4.1.1 The Hawai'i State Plan

The Hawai'i State Plan, codified as HRS Chapter 226, provides goals, objectives, policies, and priorities for the State. The Hawai'i State Plan also provides a basis for determining priorities, allocating limited resource, and improving coordination of State and County plans, policies, programs, projects, and regulatory activities. It establishes a set of themes, goals, objectives, and policies that are meant to guide the State's long-range growth and development activities. The Proposed Action is consistent with the following applicable objectives and policies:

Section 226-8. Objectives and policies for the economy – visitor industry.

(a) Planning for the State's economy with regard to the visitor industry shall be directed towards the achievement of the objective of the visitor industry that constitutes a major component of steady growth for Hawai'i's economy.
(b) To achieve the visitor industry objective, it shall be the policy of this State to:
    (2) Ensure that visitor industry activities are in keeping with the social, economic, and physical needs and aspirations of Hawai'i's people.
    (3) Improve the quality of existing visitor destination areas by utilizing Hawai'i's strengths in science and technology.

Discussion: Maunakea is a visitor destination. Recreational activities on Maunakea include hiking, sightseeing, bird watching, camping, and other similar activities. The removal of existing unused buildings and restoration of the site would improve the visual character of the area, and thereby the user experience. Therefore, the Proposed Action would have beneficial impacts to recreational resources.

Section 226-11. Objectives and policies for the physical environment – land-based, shoreline, and marine resources.

(a) Planning for the State's physical environment with regard to land-based, shoreline, and marine resources shall be directed towards achievement of the following objectives:
    (1) Prudent use of Hawai'i's land-based, shoreline, and marine resources.
    (2) Effective protection of Hawai'i's unique and fragile environmental resources.
(b) To achieve the land-based, shoreline, and marine resources objectives, it shall be the policy of this State to:
    (1) Exercise an overall conservation ethic in the use of Hawai'i's natural resources.
    (3) Take into account the physical attributes of areas when planning and designing activities and facilities.

Discussion: The Purpose of the Proposed Action is to decommission and remove the Hōkū Ke'a Observatory Building, Generator Building, and associated telecommunications and electrical infrastructure as part of Governor Ige's 10-point plan, which was announced on May 26, 2015. The 10-

point plan includes ten significant actions to be taken by the University of Hawai'i to enhance stewardship of Maunakea. The third action outlined in the ten-point plan is to "decommission – beginning this year – as many telescopes as possible with at least 25% of all telescopes gone by the time TMT is ready for operation."

The Proposed Action includes site restoration that would restore the site to a basic topography consistent with the area. Removal of the Observatory Building, Generator Building, and associated utilities would enhance the summit experience for cultural practitioners and other visitors, enhance the Hawai'i Register of Historic Places integrity of setting of the Kūkahau'ula TCP and Mauna Kea Summit Region Historic District, and improve the visual setting of the summit.

Section 226-12. Objectives and policies for the physical environment – scenic, natural beauty, and historic resources.

(a) Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawaii's scenic assets, natural beauty, and multi-cultural/historical resources.
(b) To achieve the scenic, natural beauty, and historic resources objective, it shall be the policy of this State to:
    (1) Promote the preservation and restoration of significant natural and historic resources.
    (3) Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features.
    (4) Protect those special areas, structures, and elements that are an integral and functional part of Hawaii's ethnic and cultural heritage.

Discussion: The Proposed Action would improve the visual setting of the summit. This would enhance the summit experience for cultural practitioners and other visitors, as well as enhance the Hawai'i Register of Historic Places integrity of setting of the Kūkahau'ula TCP and Mauna Kea Summit Region Historic District, and improve the visual setting of the summit.

Section 226-13. Objectives and policies for the physical environment – land, air, and water quality.

(a) Planning for the State's physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives:
    (1) Maintenance and pursuit of improved quality in Hawaii's land, air, and water resources.
(b) To achieve the land, air, and water quality objectives, it shall be the policy of this State to:
    (6) Encourage design and construction practices that enhance the physical qualities of Hawaii's communities.
    (7) Foster recognition of the importance and value of the land, air, and water resources to Hawai'i's people, their culture, and visitors.

Discussion: The Proposed Action includes site restoration that would restore the site to a basic topography consistent with the area. Removal of the Observatory Building, Generator Building, and associated utilities would enhance the summit experience for cultural practitioners and other visitors.

Section 226-23. Objectives and policies for socio-cultural advancement – leisure.

(a) Planning for the State's socio-cultural advancement with regard to leisure shall be directed towards the achievement of the objective of the adequate provision of resources to accommodate diverse cultural, artistic, and recreational needs for present and future generations.
(b) To achieve the leisure objective, it shall be the policy of this State to:
    (1) Enhance the enjoyment of recreational experiences through safety and security measures, educational opportunities, and improved facility design and maintenance.
    (4) Promote the recreational and educational potential of natural resources having scenic, open space, cultural, historical, geological, or biological values while ensuring that their inherent values are preserved.

Discussion: The Proposed Action includes site restoration that would restore the site to a basic topography consistent with the area. Removal of the Observatory Building, Generator Building, and associated utilities would enhance the summit experience for cultural practitioners and other visitors.

Section 226-25. Objectives and policies for socio-cultural advancement – culture.

(a) Planning for the State's socio-cultural advancement with regard to culture shall be directed toward the achievement of the objective of enhancement of cultural identities, traditions, values, customs, and arts of Hawai'i's people.
(b) To achieve the culture objective, it shall be the policy of this State to:
    (2) Support activities and conditions that promote cultural values, customs, and arts that enrich the lifestyles of Hawai'i's people and which are sensitive and responsive to family and community needs.

Discussion: The Purpose of the Proposed Action is to decommission and remove the Hōkū Ke'a Observatory Building, Generator Building, and associated telecommunications and electrical infrastructure as part of Governor Ige's 10-point plan, which was announced on May 26, 2015. The 10-point plan includes ten significant actions to be taken by the University of Hawai'i to enhance stewardship of Maunakea. The third action outlined in the ten-point plan is to "decommission – beginning this year – as many telescopes as possible with at least 25% of all telescopes gone by the time TMT is ready for operations."

The Proposed Action includes site restoration that would restore the site to a basic topography consistent with the area. Removal of the Observatory Building, Generator Building, and associated utilities would enhance the summit experience for cultural practitioners and other visitors, enhance the Hawai'i Register of Historic Places integrity of setting of the Kūkahau'ula TCP and Mauna Kea Summit Region Historic District, and improve the visual setting of the summit.

Section 226-109. Climate change adaptation priority guidelines: Priority guidelines to prepare the State to address the impacts of climate change, including impacts to the areas of agriculture; conservation lands; coastal and nearshore marine areas; natural and cultural resources; education; energy; higher education; health; historic preservation; water resources; the built environment, such as housing, recreation, transportation; and the economy shall:

(10) Encourage planning and management of the natural and built environments that effectively integrate climate change policy.

Discussion: Climate change as it relates to the Proposed Action is addressed in this Environmental Assessment in **Section 3.8**. In Hawaii the key consideration regarding climate change is sea level rise. This is not of concern for this project due to its location at the summit of Maunakea. The Proposed Action would not substantially emit greenhouse gases that contribute to climate change as emissions would be short-term and temporary during deconstruction and site restoration activities.

The following themes of Part I of the Hawaii State Plan are not applicable to the Proposed Action for the following reasons:

- **Section 226-5.** Objective and policies for population: The Proposed Action would not result in population growth.
- **Section 226-6.** Objectives and policies for the economy – in general: The Proposed Action would not result in increased and diversified employment opportunities other than the temporary construction jobs.
- **Section 226-7.** Objectives and policies for the economy – agriculture. The Proposed Action is located at the summit of Maunakea and would have no impacts on agriculture.
- **Section 226-9.** Objective and policies for the economy – federal expenditures: The Proposed Action does not include the use of federal funds.
- **Section 226-10.** Objective and policies for the economy – potential growth and innovative activities: The Proposed Action does not include opportunities for investment or employment growth.
- **Section 226-10.5.** Objective and policies for the economy – information industry: The Proposed Action does not include nor impact telecommunications or information technology resources.
- **Section 226-14.** Objectives and policies for facility systems – in general. The Proposed Action does not include development of any facilities.
- **Section 226-15.** Objective and policies for facility systems – solid and liquid wastes. The Proposed Action does not include development of solid or liquid waste facilities.
- **Section 226-16.** Objective and policies for facility systems – water. The Proposed Action does not include development or use of water supply systems.
- **Section 226-17.** Objectives and policies for facility systems – transportation. The Proposed Action does not include transportation systems.
- **Section 226-18.** Objectives and policies for facility systems – energy. The Proposed Action does not involve energy generation.
- **Section 226-18.5.** Objective and policies for facility systems – telecommunications. The Proposed Action does not include new telecommunication facilities.

- **Section 226-19.** Objectives and policies for socio-cultural advancement – housing. The Proposed Action does not include development of housing.
- **Section 226-20.** Objectives and policies for socio-cultural advancement – health. The Proposed Action does not include health facilities or services.
- **Section 226-21.** Objectives and policies for socio-cultural advancement – education. The Proposed Action does not include educational programs or facilities.
- **Section 226-22.** Objectives and policies for socio-cultural advancement – social services. The Proposed Action does not include social services or activities.
- **Section 226-24.** Objectives and policies for socio-cultural advancement – individual rights and personal well-being. The Proposed Action would have no impact to personal rights and personal well-being.
- **Section 226-26.** Objectives and policies for socio-cultural advancement – public safety. The Proposed Action does not include public safety programs.
- **Section 226-27.** Objectives and policies for sociocultural advancement – government. The Proposed Action would have no impact on government services.

The themes of Part II of the Hawaii State Plan are not applicable to the Proposed Action since the Proposed Action does not involve the preparation of planning documents.

The following themes of Part III of the Hawaii State Plan are not applicable to the Proposed Action for the following reasons:

- **Section 226-103.** Economic priority guidelines. The Proposed Action would not stimulate economic growth or encourage business expansion and development, including the sugar and pineapple industries, diversified agriculture and aquaculture, water use and development, energy use and development, the information industry, or the visitor industry.
- **Section 226-104.** Population growth and land resources priority guidelines. The Proposed Action would not result in population growth nor any change in land use.
- **Section 226-105.** Crime and criminal justice. The Proposed Action does not involve the criminal justice system.
- **Section 226-106.** Affordable housing. The Proposed Action would not provide housing.
- **Section 226-107.** Quality education. The Proposed Action would have no impact on education opportunities or facilities.
- **Section 226-108.** Sustainability. The Proposed Action would have no impact on sustainability.

4.1.2 State Land Use Law

Hawaiʻi was the first of the fifty States to have a State Land Use Law and a State Plan. Today, Hawaiʻi remains unique among the fifty states with respect to the extent of control that the state exercises in land use regulation. The State Land Use Law, HRS Chapter 205, was originally adopted by the State Legislature in 1961. This law establishes an overall framework of land use management whereby all lands in the State of Hawaiʻi are classified into one of four land use districts: Urban, Agricultural, Conservation, and Rural.

The State Land Use Law is administered by the Land Use Commission. The Commission is "responsible for preserving and protecting Hawaiʻi's lands and encouraging those uses to which lands are best suited."

Discussion: As shown in **Figure 10**, the Proposed Action is located in an area designated Conservation. Designated uses within the Conservation District are dependent on the designated subzone. As shown in **Figure 11**, the Proposed Action is located within the Resource subzone of the Conservation District. The objective of the Resource subzone is "to ensure, with proper management, the sustainable use of the natural resources of those areas" (HAR Section 13-5-13).

The Proposed Action would remove an existing observatory and associated facilities and restore the site to a basic topography consistent with the area. UH Hilo will apply for a CDUP from the DLNR-OCCL. Therefore, the Proposed Action is consistent with the State Land Use Law.

Figure 10. State Land Use Districts

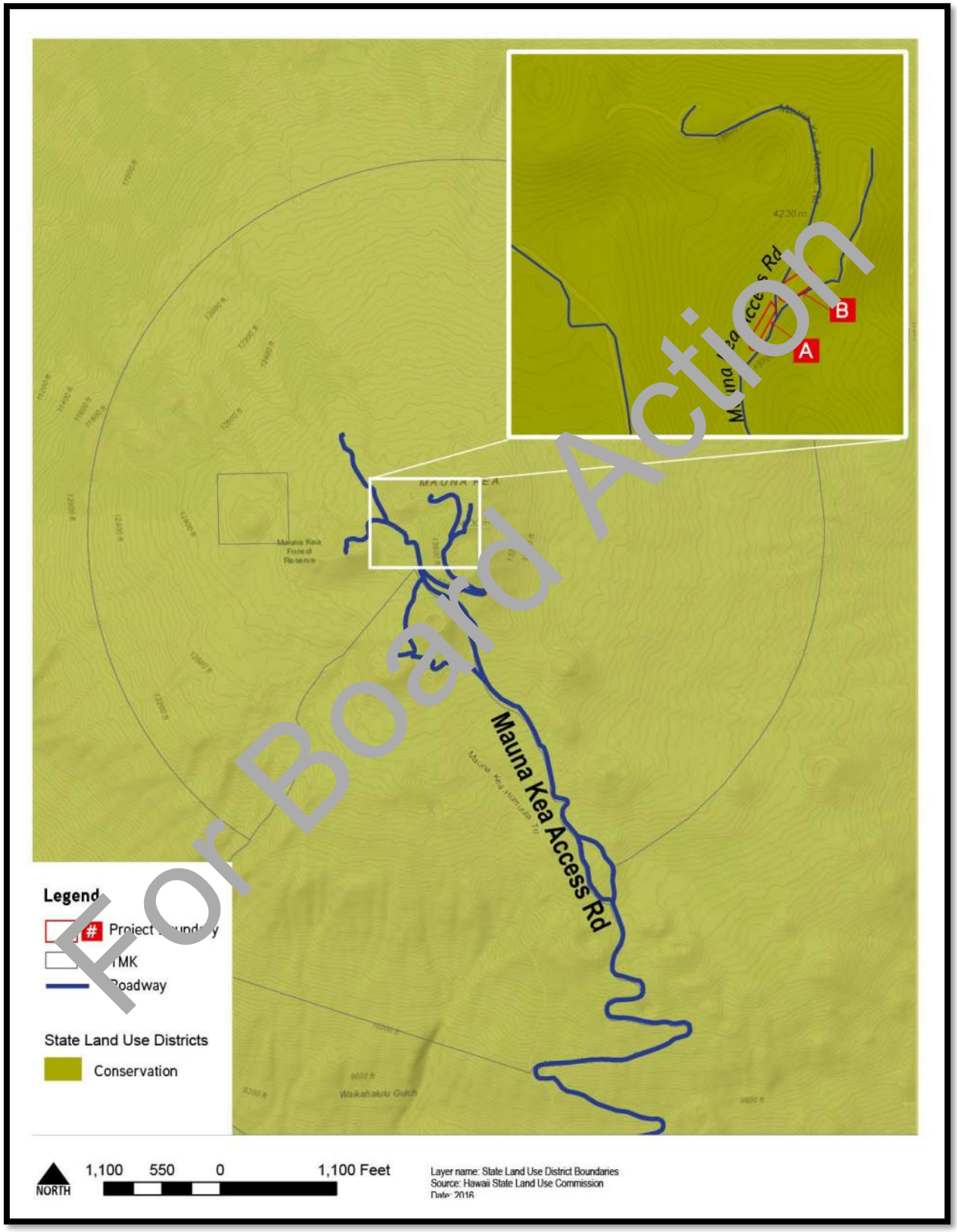
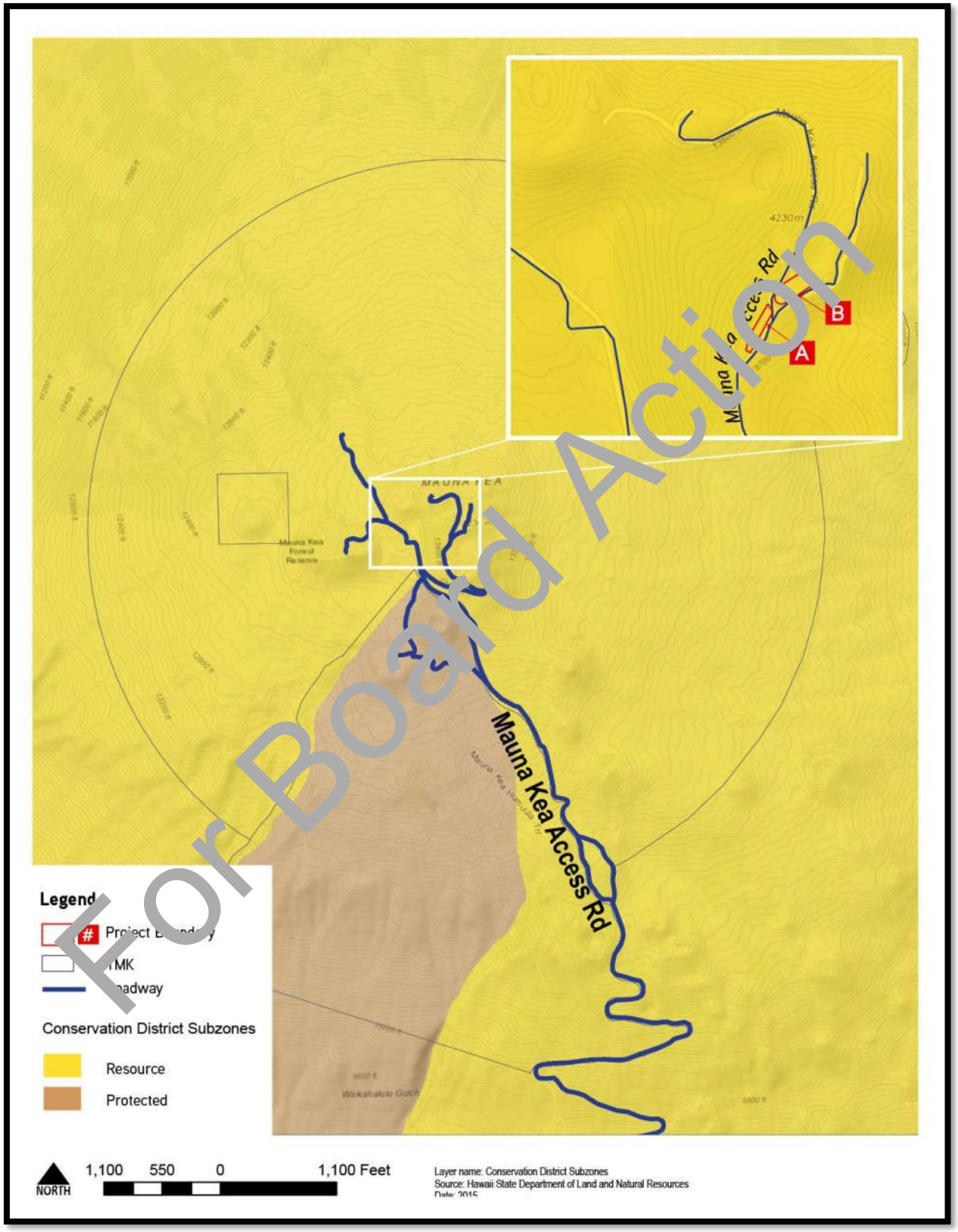


Figure 11. Conservation District Subzones



4.1.3 Hawai‘i Coastal Zone Management Program

The National Coastal Zone Management (CZM) Program was created with the passage of the Coastal Zone Management Act of 1972 (CZMA). Hawai‘i's CZM Program, established pursuant to HRS Chapter 205A, as amended, is administered by the State of Hawai‘i Office of Planning and provides for the beneficial use, protection, and development in the State's coastal zone. The objectives and policies of the Hawai‘i CZM Program encompass a wide array of concerns including impacts to recreational resources, historic and archaeological resources, coastal scenic resources and open space, coastal ecosystems, coastal hazards, and the management of development. The Hawai‘i CZM area includes all lands within the State and the areas seaward to the extent of the State's management jurisdiction. Therefore, the Proposed Action is located within the CZM area.

The Proposed Action is consistent with the following objectives and policies of the Hawai‘i CZM Program:

RECREATIONAL RESOURCES
Objective: Provide coastal recreational opportunities accessible to the public.

Policies:

1) Improve coordination and funding of coastal recreational planning and management.
2) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:
    a) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas.
    b) Requiring replacement of coastal resources having significant recreational value including, but not limited to surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development, or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable.
    c) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value.
    d) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation.
    e) Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources.
    f) Adopting water quality standards and regulating point and non-point sources of pollution to protect, and where feasible, restore the recreational value of coastal waters.
    g) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing.
    h) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of Hawai‘i Revised Statutes, section 46-6.

Discussion: The Proposed Action is located at the summit of Maunakea and would have no impacts on coastal recreational opportunities.

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

Policies:

1) Identify and analyze significant archaeological resources.
2) Maximize information retention through preservation of remains and artifacts or salvage operations.
3) Support state goals for protection, restoration, interpretation, and display of historic resources

Discussion: The Proposed Action includes site restoration that would restore the site to a basic topography consistent with the area. Removal of the Observatory Building, Generator Building, and associated utilities would enhance the summit experience for cultural practitioners and other visitors, enhance the Hawai'i Register of Historic Places integrity of setting of the Kūkahau'ula HRP and Mauna Kea Summit Region Historic District, and improve the visual setting of the summit.

SCENIC AND OPEN SPACE RESOURCES
Objective: Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources.

Policies:

1) Identify valued scenic resources in the coastal zone management area.
2) Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline.
3) Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources.
4) Encourage those developments that are not coastal dependent to locate in inland areas.

Discussion: The Proposed Action includes site restoration that would restore the site to a basic topography consistent with the area. Removal of the Observatory Building, Generator Building, and associated utilities would enhance the summit experience for cultural practitioners and other visitors.

COASTAL ECOSYSTEMS
Objective: Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Policies:

1) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources.
2) Improve the technical basis for natural resource management.

3) Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance.

4) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land water uses, recognizing competing water needs.

5) Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

Discussion: The Proposed Action is located at the summit of Maunakea and would have no impacts on coastal ecosystems.

ECONOMIC USES

Objective: Provide public or private facilities and improvements important to the state's economy in suitable locations.

Policies:

1) Concentrate coastal development in appropriate areas.

2) Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area.

3) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such development and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:
   a) Use of presently designated locations is not feasible;
   b) Adverse environmental effects are minimized; and
   c) The development is important to the State's economy.

Discussion: The Proposed Action does not include development. The Purpose of the Proposed Action is to decommission and remove the Hōkū Keʻa Observatory Building, Generator Building, and associated telecommunications and electrical infrastructure.

COASTAL HAZARDS

Objective: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.

Policies:

1) Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards.

2) Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards.

3) Ensure that developments comply with requirements of the Federal Flood Insurance Program.

4) Prevent coastal flooding from inland projects.

Discussion: The Proposed Action is located at the summit of Maunakea and would have no impacts on coastal hazards.

MANAGING DEVELOPMENT
Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policies:

1) Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development.
2) Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements.
3) Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

Discussion: The Draft Environmental Assessment is being provided for public comment and review. To facilitate the agency review process for the required permits for the Proposed Action, UH Hilo would meet with the various agencies prior to submitting permit application packages. The permit review process would provide additional opportunities for public involvement.

PUBLIC PARTICIPATION
Objective: Stimulate public awareness, education, and participation in coastal management.

Policies:

1) Promote public involvement in coastal zone management processes.
2) Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities.
3) Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.

Discussion: Opportunities for public awareness, education, and participation in coastal management are provided through the regulatory review processes. The Draft Environmental Assessment is being provided for public comment and review. Additional opportunities for review would come during the permit review process.

BEACH PROTECTION
Objective: Protect beaches for public use and recreation.

Policies:

1) Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion.
2) Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities.
3) Minimize the construction of public erosion-protection structures seaward of the shoreline.
4) Prohibit private property owners from creating a public nuisance by inducing or cultivating the private property owner's vegetation in a beach transit corridor.

5) Prohibit private property owners from creating a public nuisance by allowing the private property owner's unmaintained vegetation to interfere or encroach upon a beach transit corridor.

Discussion: The Proposed Action is located at the summit of Maunakea; therefore, there would be no effect on the use of beaches for public use and recreation.

MARINE RESOURCES
Objective: Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

Policies:

1) Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial.
2) Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency.
4) Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone.
5) Promote research, study, and understanding of ocean processes, marine life, and other ocean resources to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources.
6) Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Discussion: The Proposed Action is located at the summit of Maunakea, away from marine resources.

4.2 County of Hawai'i Planning Documents

4.2.1 Hawai'i County General Plan

The Hawaii County General Plan is the policy document for the long-range comprehensive development of the island of Hawaii. The purposes of the General Plan are as follows:

- Guide the pattern of future development in this County based on long-term goals;
- Identify the visions, values, and priorities important to the people of this County;
- Provide the framework for regulatory decisions, capital improvement priorities, acquisition strategies, and other pertinent government programs within the County organization and coordinated with State and Federal programs.
- Improve the physical environment of the County as a setting for human activities; to make it more functional, beautiful, healthful, interesting, and efficient.
- Promote and safeguard the public interest and the interest of the County as a whole.
- Facilitate the democratic determination of community policies concerning the utilization of its natural, man-made, and human resources.
- Effect political and technical coordination in community improvement and development.
- Inject long-range considerations into the determination of short-range actions and implementation.

The County's existing General Plan that was adopted in 2005 is currently undergoing revision. The initial draft of the new General Plan 2040 has undergone public review (comment period ended on October 31, 2019) and the recommended plan is currently being prepared. The General Plan 2040 will undergo public review in Winter 2020-2021, and the plan is expected to be adopted in late-2021.

The following analyzes the Proposed Action's consistency with the goals and policies of the 2005 General Plan. The Proposed Action is consistent with the following goals and policies of the 2005 General Plan:

ENVIRONMENTAL QUALITY

Goals:

(a) Define the most desirable uses of land within the County that achieves an ecological balance providing residents and visitors the quality of life and an environment in which the natural resources of the island are viable and sustainable.
(b) Maintain and, if feasible, improve the existing environmental quality of the island.
(c) Control pollution.

Policies:

(a) Take positive action to further maintain the quality of the environment.

Discussion: The Proposed Action would have short-term and temporary impacts during deconstruction and site restoration activities that would be less than significant to biological resources, geology and soils, water resources, air quality, the existing noise environment, traffic and transportation, socioeconomics, public facilities and services, and natural hazards. BMPs and other measures would be implemented to minimize impacts, as applicable.

HISTORIC SITES

Goals:

(a) Protect, restore and enhance the sites, buildings, and objects of significant historical and cultural importance to Hawai'i.

Policies:

(c) Require both public and private developers of land to provide historical and archaeological surveys and cultural assessments, where appropriate, prior to the clearing or development of land when there are indications that the land under consideration has historical significance.
(e) Embark on a program of restoring significant historic sites on County lands. Assure the protection and restoration of sites on other public lands through a joint effort with the State.

Discussion: The Purpose of the Proposed Action is to decommission and remove the Hōkū Keʻa Observatory Building, Generator Building, and associated telecommunications and electrical infrastructure as part of Governor Ige's 10-point plan, which was announced on May 26, 2015. The 10-point plan includes ten significant actions to be taken by the University of Hawai'i to enhance stewardship

of Maunakea. The third action outlined in the ten-point plan is to "decommission – beginning this year – as many telescopes as possible with at least 25% of all telescopes gone by the time TMT is ready for operation."

A CSR and ALR were prepared for the Proposed Action and are included in **Appendix B** and **Appendix C**, respectively, of this Draft Environmental Assessment. The Proposed Action includes site restoration that would restore the site to a basic topography consistent with the area. Removal of the Observatory Building, Generator Building, and associated utilities would enhance the summit experience for cultural practitioners and other visitors, enhance the Hawaiʻi Register of Historic Places integrity of setting of the Kūkahauʻula TCP and Mauna Kea Summit Region Historic District, and improve the visual setting of the summit.

NATURAL BEAUTY

Goals:

(a) Protect, preserve, and enhance the quality of areas endowed with natural beauty, including the quality of coastal scenic resources.
(b) Protect scenic vistas and view planes from becoming obstructed.

Discussion: The Proposed Action includes removing existing buildings that are located in a visually sensitive environment and restoring the site to a basic topography consistent with the area. The Proposed Action includes construction of a barrier at the top of the slope on the west side of the project site. This barrier would either consist of boulders sourced from Halepōhaku or a guardrail similar to the existing guardrail along Mauna Kea Access Road. The barrier would not block or substantially obstruct a vista. The removal of existing unused buildings and restoration of the site would improve the visual character of the area.

NATURAL RESOURCES

Goals:

(f) Ensure that alterations to existing landforms, vegetation, and construction of structures cause minimum adverse effect to water resources, scenic and recreational amenities, and minimum danger of floods, landslides, erosion, siltation, or failure in the event of an earthquake.

Policies:

(i) Encourage an overall conservation ethic in the use of Hawaiʻi's resources by protecting, preserving, and conserving the critical and significant natural resources of the County of Hawaiʻi.
(u) Ensure that activities authorized or funded by the County do not damage important natural resources.

Discussion: The Proposed Action includes site restoration that would restore the site to a basic topography consistent with the area. The Proposed Action would have short-term and temporary impacts during deconstruction and site restoration activities that would be less than significant to biological resources,

geology and soils, water resources, air quality, the existing noise environment, traffic and transportation, socioeconomics, public facilities and services, and natural hazards. BMPs and other measures would be implemented to minimize impacts, as applicable.

4.2.2 Land Use Pattern Allocation Guide

The Land Use Pattern Allocation Guide (LUPAG) is part of the Hawai'i County General Plan. LUPAG is a design tool that guides the direction and quality of future developments. Specifically, LUPAG designations guide decisions related to future land use.

As shown in **Figure 12**, the Proposed Action is located within the designated Conservation Area. The Conservation Area includes forest and water reserves, natural and scientific preserves, areas in active management for conservation purposes, areas to be kept in a largely natural state with minimal facilities consistent with open state uses, and lands within the State Land Use Conservation District.

Discussion: The Proposed Action includes site restoration that would restore the site to a basic topography consistent with the area. Removal of the Observatory Building, Generator Building, and associated utilities would enhance the summit experience for cultural practitioners and other visitors, enhance the Hawai'i Register of Historic Places integrity of setting of the Kūkahau'u TCP and Mauna Kea Summit Region Historic District, and improve the visual setting of the summit.

4.2.3 Hāmākua Community Development Plan

The *Hāmākua Community Development Plan* (CDP) is an official plan that translates the broad goals and objectives of the *Hawai'i County General Plan* to the unique needs and conditions of the Hāmākua CDP Planning Area, which encompasses the judicial districts of Hāmākua and North Hilo and a portion of the South Hilo district commonly referred to as Rural South Hilo. CDPs do the following: establish County policy, direct County actions, guide the policy and actions of State and Federal agencies, and focus and guide community actions.

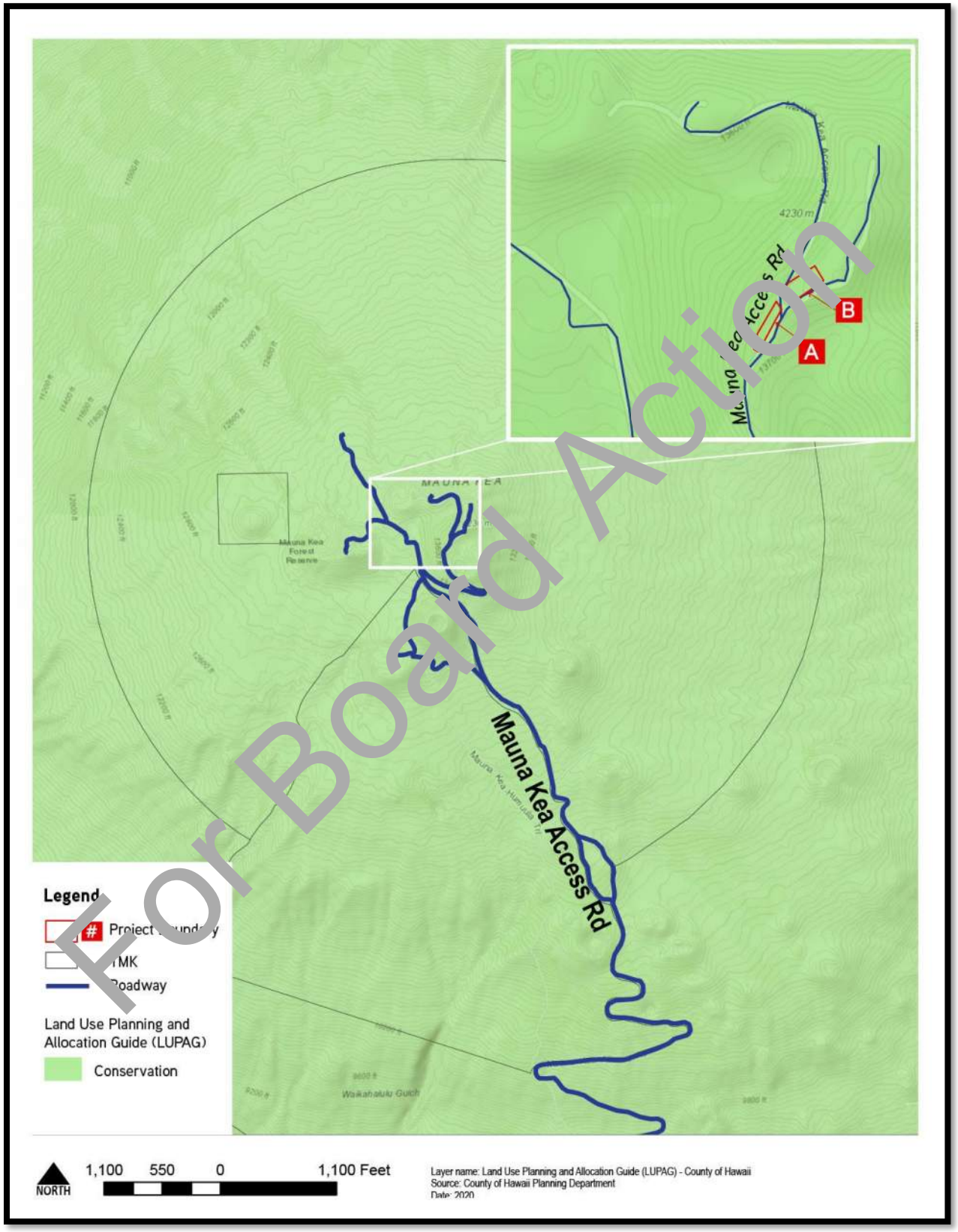
The Proposed Action is consistent with the following objectives and actions of the Hāmākua CDP:

Community Objective 2: Protect and restore viable agricultural lands and resources. Protect and enhance viewscapes and open spaces that exemplify Hāmākua's rural character.

Discussion: The Proposed Action is located at the summit of Maunakea and would have no impacts to agricultural lands and resources.

The Proposed Action includes removing existing buildings that are located in a visually sensitive environment and restoring the site to a basic topography consistent with the area. The Proposed Action includes construction of a barrier at the top of the slope on the west side of the project site. This barrier would either consist of boulders sourced from Halepōhaku or a guardrail similar to the existing guardrail along Mauna Kea Access Road. The barrier would not block or substantially obstruct a vista. The removal of existing unused buildings and restoration of the site would improve the visual character of the area.

Figure 12. Land Use Pattern Allocation Guide (LUPAG)



Kōkua Action 31: Continue to engage the Hawaiian community while exploring a cooperative agreement to formalize the coordinated management efforts on Mauna Kea.

Discussion: A scoping letter requesting comments on the Proposed Action was provided to State and County agencies and public stakeholders, including those in the Hawaiian community, prior to the preparation of the Draft Environmental Assessment. In addition, representatives of the Hawaiian community were consulted as part of the preparation of CSR.

This Draft Environmental Assessment is being provided for public comment and review. To facilitate the agency review process for the required permits for the Proposed Action, UH Hilo would meet with the various agencies prior to submitting permit application packages. The permit review process would provide additional opportunities for public involvement.

Kōkua Action 43: Collaborate with Observatories to develop a site decommissioning plan for each observatory, in accordance with the *Decommissioning Plan for Mauna Kea Observatories.*

Discussion: The deconstruction, removal, and restoration activities of the Proposed Action would be conducted pursuant to a SDP that includes a SDRP and a SRP. Use of the site for astronomy purposes would be permanently ended, and no astronomy re-use is contemplated.

4.2.4 Special Management Area

The Special Management Area (SMA) is the area of the island that is in close proximity to the shoreline. The SMA permit was established in 1975 with the enactment of Act 176, Shoreline Protection Act. Pursuant to HRS Chapter 205A, all state and county agencies shall enforce the CZM objectives and policies defined in HRS Chapter 205A-2 (see **Section 4.1.3**). The County of Hawai'i Planning Department administers SMA permits for the island of Hawai'i.

The Proposed Action is inland, away from shoreline, and is not located within the SMA.

5.0 Findings and Conclusions

5.1 Significance Criteria

HAR Chapter 11-200.1 provides significance criteria for which all projects in Hawaii are assessed. These significance criteria and their relationship to the Proposed Action are as follows:

(1) Irrevocably commit a natural, cultural, or historic resource.

The Proposed Action would not irrevocably commit a natural, cultural, or historic resource. No lichens, mosses, or vascular plants have been documented at the project site. Although the wēkiu bug has been documented at and adjacent to the project site, the project site has been disturbed by past construction and the use of fill material and is not considered wēkiu bug habitat or potential habitat; therefore, the Proposed Action is not expected to have negative impacts to the wēkiu bug.

The Proposed Action would remove man-made elements from the summit, which would enhance the area for cultural practitioners; therefore, the Proposed Action would have beneficial impacts associated with cultural resources and practices.

Based on the archival background research conducted as part of the ALR, it is anticipated that no above ground or subsurface archaeological resources would be encountered during the decommissioning and site restoration activities. The removal of the Observatory Building, Generator Building, and associated utilities would have beneficial impacts to the Kūkahauʻula TCP and Mauna Kea Summit Region Historic District, thereby enhancing the Hawaiʻi Register of Historic Places integrity of setting.

(2) Curtail the range of beneficial uses of the environment.

The Proposed Action includes the deconstruction and site restoration of the Hōkū Keʻa Observatory and associated facilities. There would be no change to the current or potential land use within the project area, and the Proposed Action would not curtail the range of beneficial uses of the environment. Rather, the removal of man-made features would enhance the visual environment and thereby the experience for visitors to the summit, including cultural practitioners.

(3) Conflict with the State's environmental policies or long-term environmental goals established by law.

HRS 344 states that "It shall be the policy of the State, through its programs, authorities, and resources to:

(1) Conserve the natural resources, so that land, water, mineral, visual, air and other natural resources are protected by controlling pollution, by preserving or augmenting natural resources, and by safeguarding the State's unique natural environmental characteristics in a manner which will foster and promote the general welfare, create and maintain conditions under which humanity and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of the people of Hawaii.
(2) Enhance the quality of life by:

(A) Setting population limits so that the interaction between the natural and artificial environments and the population is mutually beneficial;
(B) Creating opportunities for the residents of Hawaii to improve their quality of life through diverse economic activities which are stable and in balance with the physical and social environments;
(C) Establishing communities which provide a sense of identity, wise use of land, efficient transportation, and aesthetic and social satisfaction in harmony with the natural environment which is uniquely Hawaiian; and
(D) Establishing a commitment on the part of each person to protect and enhance Hawaii's environment and reduce the drain on nonrenewable resources."

As discussed in **Section 3.0**, the Proposed Action would have short-term and temporary impacts during deconstruction and site restoration activities that would be less than significant to biological resources, geology and soils, water resources, air quality, the existing noise environment, traffic and transportation, socioeconomics, public facilities and services, and natural hazards. BMPs and other measures would be implemented to minimize impacts, as applicable.

The Proposed Action would have beneficial impacts to the visual environment, cultural practices, and archaeological and historic resources.

(4) Have a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community or State.

The Proposed Action would result in temporary, positive economic activity in the form of construction jobs and material procurements. The decommissioning of the Hōkū Keʻa Observatory would have no impact on the economy since the observatory has not been operational since 2013.

The Proposed Action would remove man-made elements from the summit, which would enhance the area for cultural practitioners; therefore, the Proposed Action would have beneficial impacts associated with cultural resources and practices.

(5) Have a substantial adverse effect on public health.

The Proposed Action would have some temporary, short-term, minor impacts to water resources, air quality, and the existing noise environment; however, these impacts would be minimized through the implementation of BMPs and other measures, as applicable, and would not affect public health.

Due to the remote location of the project site, there would be no impact to emergency vehicle access during construction and any emergency calls could be met by the existing fire, police, and emergency medical services force.

(6) Involve adverse secondary impacts, such as population changes or effects on public facilities.

The Proposed Action would not involve a change in land use and would not induce growth. Therefore, the Proposed Action would not have secondary impacts.

(7) Involve a substantial degradation of environmental quality.

As discussed in **Section 3.0**, no long-term negative impacts are anticipated from implementation of the Proposed Action. All impacts would be short-term and temporary during deconstruction and site restoration activities and would be minimized through the implementation of BMPs and other measures.

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

All impacts associated with the Proposed Action would either be beneficial or short-term and temporary. Two other observatories are proposed to be decommissioned, deconstructed, and the sites restored. Impacts associated with those future actions would be similar to those for the Proposed Action with any potential negative impacts being short-term and temporary. The removal of additional observatories at the summit would have further beneficial impacts. Specifically, the removal of man-made facilities at the summit is expected to have the following additional beneficial impacts:

- Enhance the summit experience for cultural practitioners and other visitors.
- Enhancing the Hawai'i Register of Historic Places integrity of setting of the Kūkahau'ula TCP and Mauna Kea Summit Region Historic District.
- Improve the visual setting of the summit.
- Restore the topography of the summit to the extent practicable.

(9) Have a substantial adverse effect on a rare, threatened, or endangered species, or its habitat.

The Proposed Action would have no impact on rare, threatened, or endangered species as none have been observed at the project site. In addition, the project site does not contain unique habitat resources important to native or protected species.

Although the wēkiu bug has been documented at and adjacent to the project site, the project site has been disturbed by past construction and the use of fill material and is not considered wēkiu bug habitat or potential habitat. The Proposed Action would restore the site to a basic topography consistent with the area. This would be accomplished through the use of fill material that would be compacted to a minimum of 90% relative compaction. Since the project site has previously been disturbed and is not considered wēkiu bug habitat or potential habitat, the Proposed Action is not expected to have negative impacts to the wēkiu bug.

(10)Have a substantial adverse effect on air and water quality or ambient noise levels.

Air pollutant emissions from deconstruction and site restoration activities would include dust or particulate matter and exhaust fumes from vehicular travel to and from the project site and from equipment operations. Potential impacts would be short-term and temporary and would be minimized through the implementation of BMPs and other measures.

There are no water bodies at the project site; therefore, there would be no direct impacts to surface waters from the Proposed Action. Deconstruction and restoration activities may produce sediment from soil erosion during and after excavation. In addition, contaminants associated with equipment during

construction may leak percolate into groundwater or be transported off-site to surface waters. With the implementation of BMPs, potential indirect impacts to water resources during the short-term construction period would be less than significant.

The Proposed Action would result in a short-term increase in noise levels during deconstruction and restoration activities. Noise generated from short-term construction activities and the use of machinery would be minimized by requiring contractors to adhere to state and county noise regulations, including HRS Chapter 342F, Noise Pollution, and HAR Chapter 11-46, Community Noise Control.

(11) Have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.

The project site is located in a relatively flat area that is bordered on the west and east by steep ravines. Due to the low average annual precipitation at the summit, the occurrence of ephemeral streams is limited to winter storms and/or rapid snowmelts. These infrequent runoff occurrences have cut small channels and gullies that connect with larger gulches further down the mountain slope. Given the topography of the project site, as well as the low rainfall, flooding has not been observed and is not expected to occur.

The Proposed Action is located at the summit of Maunakea and is not located in any environmentally sensitive area. At an elevation of between 13,725 to 13,740 feet above msl, the Proposed Action is well outside the tsunami zone or sea level exposure area.

(12) Have a substantial adverse effect on scenic vistas and viewplanes, during day or night, identified in county or state plans or studies.

The Proposed Action includes removing existing buildings that are located at the summit of Maunakea. The removal of existing unused buildings and restoration of the site would improve the visual character of the area. Therefore, the Proposed Action would have beneficial impacts to visual resources.

(13) Requires substantial energy consumption or emit substantial greenhouse gases.

The Proposed Action would not require substantial energy consumption other than during the construction period with the use of construction equipment, which would be short-term and temporary.

The Proposed Action would not substantially emit greenhouse gases as emissions would be short-term and temporary during deconstruction and site restoration activities.

5.2 Anticipated Finding of No Significant Impact

Based on the significance criteria set forth in HAR Chapter 11-200.1 and discussed in **Section 5.1**, it is anticipated that the Proposed Action would not have a significant effect on the environment and that a Finding of No Significant Impact (FONSI) would be filed with the State of Hawai'i Office of Environmental Quality Control following the public comment period.

6.0 Agencies and Organizations Consulted

The following Federal (**Section 6.1**), State of Hawaiʻi agencies (**Section 6.2**), County of Hawaiʻi agencies (**Section 6.3**), elected officials (**Section 6.4**), non-governmental organizations (**Section 6.5**), and individuals (**Section 6.6**) were consulted prior to the preparation of the Draft EA. All written comments received during the early consultation period of the Draft EA and the responses are included in **Appendix F**.

6.1 Federal Agencies

The following Federal agencies were consulted prior to the preparation of the Draft EA.

- Environmental Protection Agency
- Natural Resources Conservation Service, Pacific Islands Area
- U.S. Army Pohakuloa Training Area
- National Marine Fisheries Service, Pacific Islands
- U.S. Fish and Wildlife Service*
- U.S. Geological Survey
- U.S. National Park Service

6.2 State of Hawaiʻi Agencies

The following State of Hawaiʻi agencies were consulted prior to the preparation of the Draft EA.

- Department of Accounting and General Services
- Department of Agriculture
- Department of Hawaiian Home Lands
- DOH, Clean Water Branch
- DOH, Clean Air Branch
- DOH, Indoor and Radiological Health Branch
- DOH, Office of Environmental Quality Control
- DLNR, Land Division
- DLNR, Division of Forestry and Wildlife*
- DLNR, Natural Area Reserves System
- DLNR, OCCL*
- DLNR, SHPD
- Department of Transportation
- Department of Business, Economic Development & Tourism
- Office of Planning
- Office of Hawaiian Affairs
- University of Hawaiʻi
- OMKM
- OMKM, Kahu Kū Mauna
- OMKM, MKMB
- OMKM Environment Committee

6.3 County of Hawaiʻi Agencies

The following County of Hawaiʻi Agencies were consulted prior to the preparation of the Draft EA.

- Civil Defense Agency
- Department of Environmental Management
- Fire Department
- Police Department
- Department of Parks and Recreation
- Planning Department
- Department of Public Works
- Department of Water Supply
- Department of Research & Development

6.4 Elected Officials

The following elected officials were consulted prior to the preparation of the Draft EA.

6.4.1 State of Hawaiʻi Officials

- Senator Brian Schatz
- Governor David Ige
- Lt. Governor Josh Green
- Senator Lorraine Inouye
- Senator Kaialiʻi Kahele
- Senator Dru Mamo Kanuha
- Senator Russell E. Ruderman
- Representative Richard P. Creagan
- Representative Nicole E. Lowen
- Representative Mark M. Nakashima
- Representative Richard H.K. Onishi
- Representative Joy A. Buenaventura
- Representative Chris Todd
- Representative David A. Tarnas

6.4.2 County of Hawaiʻi Officials

- Mayor Harry Kim
- Council Member Valerie T. Poindexter
- Council Member Aaron Chung
- Council Member Sue L.K. Lee Loy
- Council Member Ashley Kierkiewicz
- Council Member Matt Kaneali'i-Kleinfelder
- Council Member Maile Medeiros David
- Council Member Rebecca Villegas
- Council Member Karen Eoff
- Council Member Tim Richards

6.5 Non-Governmental Organizations

The following non-governmental organizations were consulted prior to the preparation of the Draft EA.

- Canada-France-Hawaiʻi Telescope
- UH Institute for Astronomy
- UH 2.2 Meter Telescope
- NASA IRTF
- Gemini Observatory
- East Asian Observatory
- National Astronomical Observatory of Japan/Subaru Telescope
- National Radio Astronomy Observatory
- Harvard Smithsonian Center for Astrophysics
- Smithsonian Submillimeter Array
- Very Long Baseline Array
- UH Hilo, Hōkū Keʻa
- W.M. Keck Observatory
- Hawaiʻi Island Chamber of Commerce
- Kona-Kohala Chamber of Commerce
- Hawaiʻi Leeward Planning Conference
- Hawaiʻi Island Economic Development Board
- Japanese Chamber of Commerce Industry of Hawaiʻi
- Kanoelehua Industrial Area Association
- Arnott's Lodge and Hiking Adventures
- Hawaiian Eyes dba Hawaiian Haoles
- Jack's Tours
- Meridian H.R.T.
- Maunakea Summit Adventures dba Paradise Safaris
- Robert's Hawaiʻi
- Taikobo Hawaiʻi, Inc.
- KAHEA
- Sierra Club – Moku Loa Group
- Waimea Hawaiian Homesteaders' Association
- Keaukaha – Panaʻewa Farmers Association

- Keaukaha Community Association
- Kāʻū Hawaiian Home Lands Association
- Piʻihonua Hawaiian Homes Community Association
- Panaewa Hawaiian Home Lands Community Association
- Association of Hawaiian Civic Clubs
- Moku o Keawe
- ʻAhahui Siwila ʻo Ke Aloha ʻĀina
- Hawaiian Civic Club of Hilo
- Hawaiian Civic Club of Kāʻū
- Hawaiian Civic Club of Laupahoehoe
- Kohala Hawaiian Civic Club
- Kona Hawaiian Civic Club
- Kuakini Hawaiian Civic Club of Kona
- South Kohala Hawaiian Civic Club
- Waimea Hawaiian Civic Club
- Royal Order of Kamehameha
- Royal Order of the Crown of Hawaiʻi
- ʻImiloa Astronomy Center of Hawaiʻi
- PUEO

6.6 Individuals

- Alan Yamamoto
- Alika Desha
- Amy R. Marsh
- Andrew Cooper
- Anya Tagawa
- Barbara Hastings
- Barbara Kossow
- Bill Walter
- Bimo Akiona
- Bob Masuda
- Bob McLaren
- Brad Reil
- Brannon Kamahana Kealoha
- C.M. Kahoʻokahi Kanuha
- Cas Vanderwoude
- Chandell A[illegible]
- Cheryl B[illegible]
- Cheyenne [illegible]
- Chitaranjan Ray
- Chris[illegible] Maumau
- Christina Neal
- Cindy Freitas
- Clarence Kukauakahi Ching
- Clyde Hayashi
- Craig Takamine
- Cynthia Massa
- Dale Hahn
- Dale Suezaki
- Dan Meisenzahl
- Daniel Vest
- Darren Safranek
- Daryn Arai
- David He[illegible]kin
- Deborah [illegible]
- Diana Je[illegible]ovic
- Don[illegible]d Tho[illegible]as
- De[illegible]n D[illegible]la Cruz
- D[illegible]ug[illegible]g
- [illegible]ierre Martin
- Dr. Jesse Eiben
- Dwight Vincente
- Enrico Laos
- Eric Manuel
- Farnaz Khadem
- Fiona Harrison
- Flores-Case ʻOhana
- Gary Sanders
- George Martin
- Glen Kila
- Glennon T. Gingo
- Gordon Squires
- Grant Gerrish
- Greg Chun
- Gunther Hasinger
- Hank Fergerstrom
- Hannah Springer
- Heather Gallo
- Heather Stever
- [illegible]an Cole
- J. Leinaʻala Sleightholm
- Jackson Bauer
- Jacob Lauderdale
- Jay Hatayama
- Jesse Eiben
- Jessica Dempsey
- Jim Kauahikaua
- Joan Yoshioka
- Jose Teran
- Joseph Kualii Lindsey Camara
- Joy S. Yoshina
- Julie Leialoha
- Kai Markell
- Kalani Flores
- Kalepa Baybayan
- Kaliko Kanaele
- Kama Hopkins
- Kathy Svitil
- Keahi Warfield
- Kealoha Pisciotta
- Kehaulani Costa
- Kerry Slater
- Lanny Sinkin
- Laura Aquino
- Lehua Vincent

- Leilani Lindsey-Kaapuni
- Leningrad Elarinoff
- Luis Salaveria
- Lukela Ruddle
- Mamo Bezilla
- Mark Fraser
- Mark Travalino
- Martha Rodillas
- Marti Townsend
- Matthew Grauso
- Mehana Kihoi
- Michael Akau
- Mike Kaleikini
- Mike McCartney
- Miles Miyasato
- Moses Kealamakia Jr.
- Nelson Ho
- Nick Agorastos
- Patrick Kahawaiolaa
- Paul K. Neves
- Peter Young
- Pua Case
- Richard Ha
- Rick Warshauer
- Rob Pacheco
- Robby Robertson
- Roberta Chu
- Rochelle Augustin-Beck
- Roger Imoto
- Ron Terry
- Ross Wilson
- Sage VanKralingen
- Sandra Dawson
- Shane Palacat-Nelsen
- Springer Kaye
- Stephanie Nagata
- Steve Dawe
- Stewart Hunter
- Sunil Gowala
- Susan Cordell
- Thomas Chun
- Tiffnie Kakalia
- Uʻilani Naipo
- Wallace Ishibashi
- Walter Kaneakua
- Wendy Laros
- Whitney Clavin
- Wil Okabe
- William Freitas
- Wilma Holi

7.0 References

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APPENDIX A

Demolition and Site Restoration Plans

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UNIVERSITY OF HAWAI'I at HILO

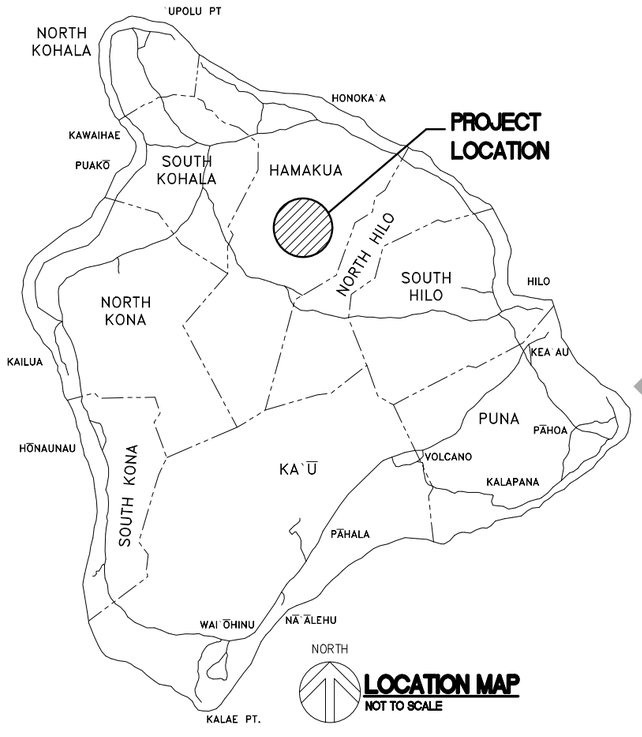
HILO, HAWAI'I

Hōkū Ke'a Decommissioning

PROJECT NO. UHH-16029

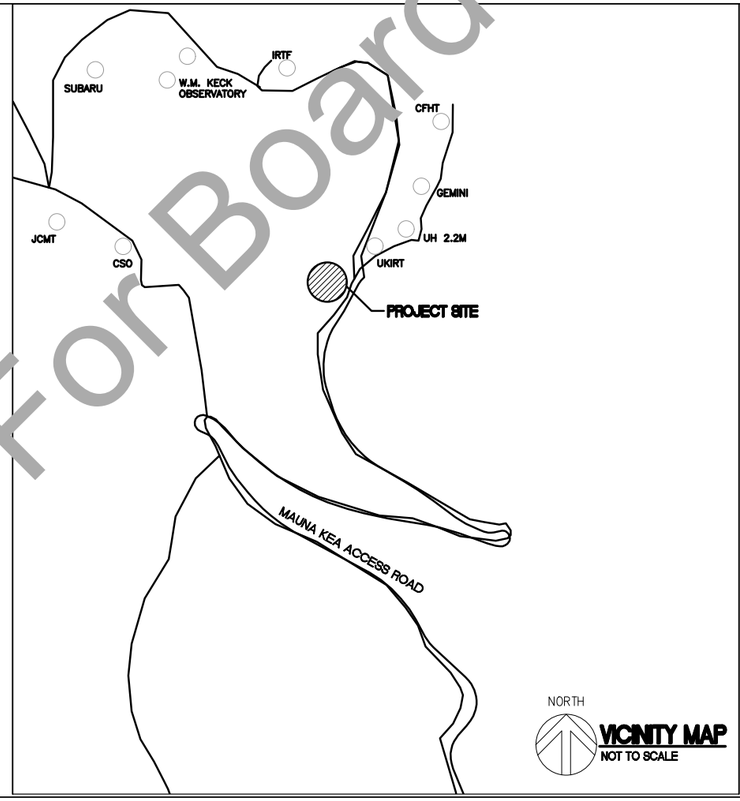
TMK: (3) 4-4-015:009

OWNER:
STATE OF HAWAI'I



LOCATION MAP
NOT TO SCALE

ISLAND OF HAWAII



VICINITY MAP
NOT TO SCALE

PREPARED BY:

PROJECT MANAGER/CIVIL ENGINEER	SSFM INTERNATIONAL, INC. 99 AUPUNI STREET, SUITE 202 HILO, HI 96720
ARCHITECT	FERRARO CHOI AND ASSOCIATES LTD. 1240 ALA MOANA BLVD, SUITE 510 HONOLULU, HI 96814
ELECTRICAL ENGINEER	ENGINEERING PARTNERS, INC. 455 E. LANIKAULA STREET HILO, HI 96720

APPROVED BY:

UNIVERSITY OF HAWAI'I
VICE CHANCELLOR OF ADMINISTRATIVE AFFAIRS

DATE

SCHEMATIC – NOT FOR CONSTRUCTION

PROJECT NO. UHH-16029	SHEET NO. OF	FILE NO.	SHEET T-1

DRAWING NAME: M:\2019\2019_180.000 UHH HOKU KEA DECOMMISSIONING\C DWGS\CIVIL\00 CAD\T-1 TITLE SHEET.DWG EDIT TIME: 05-29-20, 2:14 PM EDITED BY: RITO

DESCRIPTION OF ALTERNATIVES

ALTERNATIVE 1 NO ACTION OR ABANDON IN PLACE (NOT REFLECTED IN THESE DRAWINGS)

ALTERNATIVE 2 **INFRASTRUCTURE CAPPING, PARTIAL (MINIMAL) RESTORATION**

PARTIAL REMOVAL
AREA A:
- REMOVE BOTH BUILDINGS
- REMOVE FOUNDATION TO APPROX. 12 INCHES BELOW GRADE
- REMOVE CABLES FROM CONDUITS BACK TO SOURCE
- CUT AND CAP CONDUIT RISERS AND DIRECT BURY CABLES TO 12" BELOW FINISH GRADE

AREA B (HŌKŪ KE'A INFRASTRUCTURE ONLY):
- REMOVE CABLES FROM CONDUITS
- CUT AND CAP EMPTY CONDUITS

PARTIAL (MINIMAL) RESTORATION
AREA A:
- MAINTAIN EXISTING GRADED AREAS FOR SUNSET VIEWING AND TRAILHEAD USE
- REMNANT FOUNDATION ELEMENTS COVERED WITH NATIVE CINDER AND COMPACTED TO ALLOW FOR CONTINUED VEHICLE ACCESS (THIS WOULD NOT BE SUITABLE ARTHROPOD HABITAT NOR WOULD THE GOAL BE TO APPROXIMATE ORIGINAL VISUAL APPEARANCES)
- CONSTRUCT A PHYSICAL BARRIER SUCH AS LARGE LOCAL BOULDERS OR GUARDRAIL TO PREVENT OFF-ROAD VEHICLE USE AND DEMARCATE AREAS OF SAFE PARKING

AREA B: NO CHANGE

ALTERNATIVE 3 **FULL REMOVAL IN AREA A, PARTIAL REMOVAL IN AREA B, PARTIAL (MINIMAL) RESTORATION**

COMPLETE REMOVAL – AREA A:
- REMOVE BOTH BUILDINGS
- REMOVE ALL FOUNDATIONS AND ALL UTILITIES

PARTIAL REMOVAL – AREA B (HŌKŪ KE'A INFRASTRUCTURE ONLY):
- REMOVE CABLES FROM CONDUITS
- CUT AND CAP EMPTY CONDUITS

PARTIAL (MINIMAL) RESTORATION:
AREA A:
- MAINTAIN EXISTING GRADED AREAS FOR SUNSET VIEWING AND TRAILHEAD USE
- REMNANT FOUNDATION ELEMENTS COVERED WITH NATIVE CINDER AND COMPACTED TO ALLOW FOR CONTINUED VEHICLE ACCESS (THIS WOULD NOT BE SUITABLE ARTHROPOD HABITAT NOR WOULD THE GOAL BE TO APPROXIMATE ORIGINAL VISUAL APPEARANCES)
- CONSTRUCT A PHYSICAL BARRIER SUCH AS LARGE LOCAL BOULDERS OR GUARDRAIL TO PREVENT OFF-ROAD VEHICLE USE AND DEMARCATE AREAS OF SAFE PARKING

AREA B: NO CHANGE

ALTERNATIVE 4 **FULL REMOVAL, FULL RESTORATION**

FULL REMOVAL – AREA A:
- REMOVE BOTH BUILDINGS
- REMOVE ALL FOUNDATIONS AND ALL UTILITIES

FULL REMOVAL – AREA B (HŌKŪ KE'A INFRASTRUCTURE ONLY):
- REMOVE CABLES AND EMPTY CONDUITS

FULL RESTORATION:
AREA A:
- TO THE EXTENT POSSIBLE, RESTORE BIOLOGICAL HABITAT AND ORIGINAL TERRAIN (PRECLUDES FOOT TRAFFIC ON RESTORED AREAS)
- CONSTRUCT A PHYSICAL BARRIER SUCH AS LARGE LOCAL BOULDERS OR GUARDRAIL TO PREVENT VEHICLE AND PEDESTRIAN ACCESS

AREA B: NO CHANGE

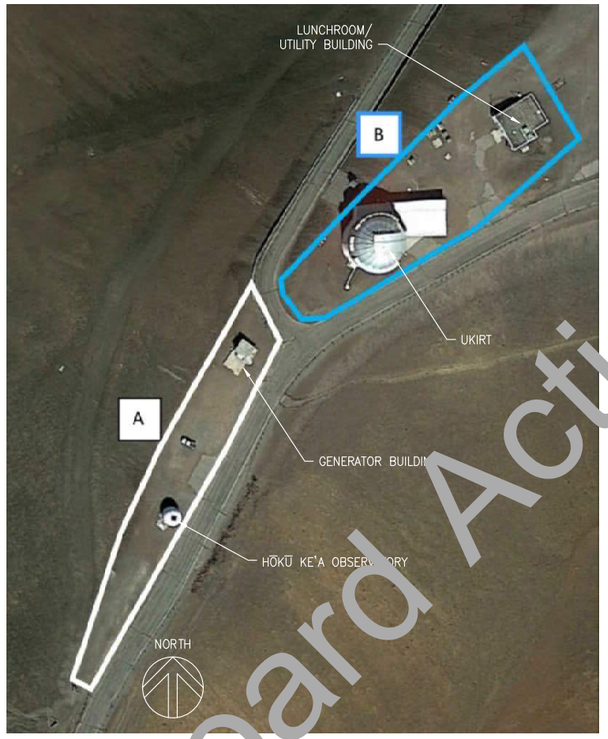
ALTERNATIVE 5 **PARTIAL REMOVAL, PARTIAL (MINIMAL) RESTORATION**

PARTIAL REMOVAL – AREA A:
- REMOVE OBSERVATORY BUILDING ONLY, INCLUDING FOUNDATION AND UTILITIES
- GENERATOR BUILDING AND ASSOCIATED FACILITIES TO REMAIN IN ITS ENTIRETY

PARTIAL REMOVAL – AREA B (HŌKŪ KE'A INFRASTRUCTURE ONLY):
- REMOVE CABLES TO OBSERVATORY BUILDING FROM CONDUITS
- CUT AND CAP EMPTY CONDUITS

PARTIAL (MINIMAL) RESTORATION
AREA A:
- MAINTAIN EXISTING GRADED AREAS FOR SUNSET VIEWING AND TRAILHEAD USE
- BACKFILL EXCAVATED AREAS WITH NATIVE CINDER AND COMPACT TO ALLOW FOR CONTINUED VEHICLE ACCESS (THIS WOULD NOT BE SUITABLE ARTHROPOD HABITAT NOR WOULD THE GOAL BE TO APPROXIMATE ORIGINAL VISUAL APPEARANCES)
- CONSTRUCT A PHYSICAL BARRIER SUCH AS LARGE LOCAL BOULDERS OR GUARDRAIL TO PREVENT OFF-ROAD VEHICLE USE AND DEMARCATE AREAS OF SAFE PARKING

AREA B: NO CHANGE



INDEX OF DRAWINGS

REVISION NO.	SYMBOL	DESCRIPTION	SHT.___ OF___	DATE

UNIVERSITY OF HAWAI`I AT HILO
STATE OF HAWAI`I

Hōkū Ke`a Decommissioning

University of Hawai`i at Hilo

DESCRIPTION OF ALTERNATIVES AND DRAWING INDEX

SSFM INTERNATIONAL, INC.

DESIGNED BY:	CHECKED BY:	PROJECT NO.	SHEET
RRI	XX	UHH-16029	T-2
DRAWN BY: RRI	APPROVED BY:	DATE	
SCALE: AS NOTED		OCT 2020	OF.....SHTS

ABBREVIATIONS

NOTE: NOT ALL ABBREVIATIONS ARE NECESSARILY USED

A	
A.B.	ANCHOR BOLT
A/C	AIR CONDITIONING
ACOUST.	ACOUSTICAL
ADJ.	ADJUSTABLE
A.F.F.	ABOVE FINISH FLOOR
AL.	ALUMINUM
ALT.	ALTERNATE
ANOD.	ANODIZED
A.P.	ACCESS PANEL
APPROX.	APPROXIMATE
ARCH.	ARCHITECTURAL
B	
BD.	BOARD
BLDG.	BUILDING
BLK.	BLOCK
BM.	BEAM
BOT.	BOTTOM
C	
CAB.	CABINET
CEM.	CEMENT
CER.	CERAMIC
C.J.	CONTROL JOINT
CLG.	CEILING
CLKG.	CAULKING
CLR.	CLEAR
C.M.U.	CONCRETE MASONRY UNIT
CNTR.	COUNTER
C.O.	CLEAN OUT
CONC.	CONCRETE
COND.	CONDITION
CONN.	CONNECTION
CONSTR.	CONSTRUCTION
CONT.	CONTINUOUS
CONTR.	CONTRACTOR
CORR.	CORRIDOR
C.P.	CEMENT PLASTER
CPT.	CARPET
C.T.	CERAMIC TILE
CTR.	CENTER
CTSK.	COUNTERSUNK
D	
D.	DEEP/DEPTH
D.A.	DOUBLE ACTING
DBL.	DOUBLE
DEPT.	DEPARTMENT
DET.	DETAIL
D.F.	DRINKING FOUNTAIN
DIA.	DIAMETER
DIM.	DIMENSION
DISP.	DISPENSER
D.O.	DOOR OPENING
DN.	DOWN
DR.	DOOR
DWG.	DRAWING
DWR.	DRAWER
E	
E.	EAST
EA.	EACH
E.F.	EXTERIOR FINISH
E.F.S.	EXTERIOR FINISH SYSTEM
E.J.	EXPANSION JOINT
EL.	ELEVATION
ELEC.	ELECTRICAL
ELEV.	ELEVATOR
EMER.	EMERGENCY
ENCL.	ENCLOSURE
E.P.	ELECTRICAL PANEL
EQ.	EQUAL
EQUIP.	EQUIPMENT
E.W.C.	ELECTRIC WATER COOLER
EXIST.	EXISTING
EXPO.	EXPOSED
EXP.	EXPANSION
EXT.	EXTERIOR
F	
F.A.	FIRE ALARM
F.D.	FLOOR DRAIN
FDN.	FOUNDATION
F.E.	FIRE EXTINGUISHER
F.E.C.	FIRE EXTINGUISHER CABINET
F.F.	FACTORY FINISH
F.F. EL.	FINISH FLOOR ELEVATION
F.H.C.	FIRE HOSE CABINET
FIN.	FINISH
FL.	FLOOR
FLDG.	FOLDING
FLUOR.	FLUORESCENT
F.O.C.	FACE OF CONCRETE
F.O.F.	FACE OF FINISH
F.O.M.	FINISH OF MASONRY
F.O.S.	FACE OF STUD
FRPR.	FIREPROOF(ING)
FR.	FRAME
F.S.	FINISH SYSTEM
FT.	FOOT (OR FEET)
FTG.	FOOTING
FURR.	FURRING
FUT.	FUTURE
G	
GA.	GAUGE
GALV.	GALVANIZED
G.B.	GRAB BAR
GL.	GLASS
GND.	GROUND
GR.	GRADE
GYP.	GYPSUM

H	
H.	HEIGHT/HIGH
H.C.	HOLLOW CORE
HDWD.	HARDWOOD
HDWR.	HARDWARE
H.M.	HOLLOW METAL
HORIZ.	HORIZONTAL
HR.	HOUR
H.V.A.C.	HEATING, VENTILATION & AIR CONDITIONING
H.W.	HOT WATER
I	
I.D.	INSIDE DIAMETER
INCL.	INCLUSIVE OR INCLUDED
INSUL.	INSULATION
INT.	INTERIOR
J	
JAN.	JANITOR
JST.	JOIST
JT.	JOINT
K	
KIT.	KITCHEN
L	
LAB.	LABORATORY
LAM.	LAMINATE
LAV.	LAVATORY
L.F.	LINEAR FEET
LT.	LIGHT
M	
MAT.	MATERIAL
MAX.	MAXIMUM
M.D.	METAL DECK
MECH.	MECHANICAL
MET.	METAL
MFR.	MANUFACTURER
MIN.	MINIMUM
MISC.	MISCELLANEOUS
M.O.	MASONRY OPENING
MTD.	MOUNTED
MTG.	MOUNTING
MUL.	MULLION
N	
N.	NORTH
N.I.C.	NOT IN CONTRACT
NO.	NUMBER
NOM.	NOMINAL
N.T.S.	NOT TO SCALE
O	
OA.	OVERALL
OBS.	OBSCURE
O.C.	ON CENTER
O.D.	OUTSIDE DIAMETER
O.F.C.I.	OWNER FURNISHED CONTRACTOR INSTALLED
O.F.O.I.	OWNER FURNISHED OWNER INSTALLED
OFF.	OFFICE
O.H.	OVERHANG
OPNG.	OPENING
OPP.	OPPOSITE
OVHD.	OVERHEAD
P	
PT.	PAINT
PC.	PIECE
PL.	PLATE
P-LAM.	PLASTIC LAMINATE
PLAS.	PLASTER
PLBG.	PLUMBING
PLYWD.	PLYWOOD
PNL.	PANEL
PR.	PAIR
P.T.D.	PAPER TOWEL DISPENSER
PART.	PARTITION
P.T.R.	PAPER TOWEL RECEPTACLE
R	
R.	RISER
RAD.	RADIUS
REF.	REFERENCE
REFR.	REFRIGERATOR
REINF.	REINFORCED OR REINFORCING
REQD.	REQUIRED
REV.	REVISED
RESIL.	RESILIENT
R.H.	ROBE HOOK
RM.	ROOM
R.O.	ROUGH OPENING

S	
S.	SOUTH
S.A.	SINGLE ACTING
S.C.	SOLID CORE
S.C.D.	SEAT COVER DISPENSER
SCHED.	SCHEDULE
S.D.	SOAP DISPENSER
SECT.	SECTION
SHT.	SHEET
SHWR.	SHOWER
SIM.	SIMILAR
SL.	SLOPE
S.N.D.	SANITARY NAPKIN DISPENSER
S.N.R.	SANITARY NAPKIN RECEPTACLE
SPEC.	SPECIFICATION
SQ.	SQUARE
SST.	STAINLESS STEEL
S. SNK.	SERVICE SINK
STD.	STANDARD
STL.	STEEL
STOR.	STORAGE
STRUCT.	STRUCTURAL
SURR.	SURROUND
SUSP.	SUSPENDED
SYM.	SYMMETRICAL
SYS.	SYSTEM
T	
T.	TREAD
T.B.	TOWEL BAR
TEL.	TELEPHONE
TEMP.	TEMPERED
T&G	TONGUE AND GROOVE
THK.	THICK
TKBD.	TACKBOARD
TOIL.	TOILET
T.P.D.	TOILET PAPER DISPENSER
T.P.H.	TOILET PAPER HOLDER
T.V.	TELEVISION
TYP.	TYPICAL
T	
T.	TREAD
T.B.	TOWEL BAR
TEL.	TELEPHONE
TEMP.	TEMPERED
T&G	TONGUE AND GROOVE
THK.	THICK
TKBD.	TACKBOARD
TOIL.	TOILET
T.P.D.	TOILET PAPER DISPENSER
T.P.H.	TOILET PAPER HOLDER
T.V.	TELEVISION
TYP.	TYPICAL
U	
UNFIN.	UNFINISHED
U.O.N.	UNLESS OTHERWISE NOTED
UR.	URINAL
V	
V.C.T.	VINYL COMPOSITION TILE
VERT.	VERTICAL
VEST.	VESTIBULE
W	
W.	WIDTH
W/	WITH
W.C.	WATER CLOSET
WD.	WOOD
WDW.	WINDOW
W.H.	WATER HEATER
W.O.	WHERE OCCURS
W/O	WITHOUT
WP.	WATERPROOF
W.R.	WATER RESISTANT
WT.	WEIGHT
W.W.M.	WELDED WIRE MESH

ARCHITECTURAL SYMBOLS

SECTION — SECTION IDENTIFICATION; SHEET WHERE SECTION IS DRAWN (A101)

VIEW REFERENCE — VIEW IDENTIFICATION (17); SHEET WHERE VIEW IS DRAWN (A101)

ROOM IDENTIFICATION — ROOM NAME; ROOM BOX (101); ROOM NUMBER

REVISION — REVISION NUMBER (1)

DOOR TYPE — DOOR SYMBOL (10L); DOOR NUMBER

SHEET NUMBER — DISCIPLINE (A-); SEQUENCE (1)

WINDOW TYPE — WINDOW SYMBOL (1L); WINDOW NUMBER

PARTITION TYPE — PARTITION TYPE (P1); PARTITION SYMBOL

GRID BUBBLE — GRID SYMBOL (0); GRID NUMBER

INTERIOR ELEVATION — A, A/B, B, B/C, C, C/D, D, D/A

DATA POINT

NORTH ARROW

&	AND
@	AT
#	NUMBER
∠	ANGLE
℄	CENTER LINE
⊥	PERPENDICULAR
∅	DIAMETER OR ROUND

MATERIAL INDICATIONS

- EARTH
- CONCRETE CAST IN PLACE OR PRECAST
- C.M.U. CONCRETE BLOCK
- PLYWOOD
- GLASS
- ACOUSTIC TILE, BOARD OR PANEL
- GYPSUM BOARD
- INSULATION, BATT
- STONE, MARBLE, SIMULATED MARBLE, TERRAZZO
- STEEL (OMIT INDICATION IN THIN MATERIAL)
- METAL LATH
- WOOD FINISH
- WOOD BLOCKING THROUGH MEMBER
- WOOD FRAMING INTERRUPTED MEMBER
- INSULATION RIGID
- CARPET & PAD
- CERAMIC TILE, QUARRY TILE OR RESILIENT FLOORING (SHOW PROFILE ONLY)
- EXISTING BUILDING SHELL

DEMOLITION NOTES

1. CAREFULLY STUDY CONSTRUCTION DOCUMENTS AND VISIT THE SITE TO VERIFY THE EXTENT AND LOCATION OF DEMOLITION WORK TO BE PERFORMED.
2. ALL ITEMS SCHEDULED TO BE REMOVED BY THE CONTRACTOR SHALL BE CONSIDERED TO BE THE CONTRACTOR'S PROPERTY AND SHALL BE PROMPTLY REMOVED FROM THE SITE (U.O.N.). DEMOLISHED MATERIAL TO BE RECYCLED/REUSED TO THE EXTENT POSSIBLE. FINAL DISPOSAL TBD.
3. PROVIDE ALL LABOR AND MATERIAL/EQUIPMENT AS REQUIRED TO COMPLETE DEMOLITION AND REMOVAL OF ALL ITEMS AS INDICATED AND RESTORE TO ORIGINAL ADJACENT CONDITION.

GENERAL NOTES

1. ALL CONSTRUCTION SHALL CONFORM TO THE 2006 INTERNATIONAL BUILDING CODE, THE LATEST COUNTY OF HAWAII AMENDMENTS AND ORDINANCES.
2. KEEP THE PREMISES FREE FROM ACCUMULATION OF WASTE MATERIALS, CONSTRUCTION DEBRIS, RUBBISH AND DISPOSE OF LAWFULLY AND IN ACCORDANCE WITH THE CONSTRUCTION WASTE MANAGEMENT PLAN.
3. IF THE CONTRACTOR SHALL PERFORM WORK CAUSING UNIQUE NOISE, ODORS OR OTHER DISTURBANCES OUTSIDE OF REGULAR BUSINESS HOURS, SUCH WORK SHALL BE SCHEDULED WITH OWNER AND BUILDING MANAGEMENT.
4. ALL WORK SHALL BE CONFINED TO THE DESIGNATED AREA OF WORK. ANY DAMAGE CAUSED BY THE CONTRACTOR TO THE ADJOINING IMPROVEMENTS SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE UHH.
5. ALL ITEMS INDICATED "TO REMAIN" SHALL BE PROTECTED DURING THE CONSTRUCTION PERIOD.
6. THE INTENT OF THE DRAWINGS IS TO PRODUCE THE INTENDED RESULTS UNDER RECOGNIZED STANDARDS EVEN IF NOT SHOWN, BUT REASONABLY INFERABLE THEREFROM. THE CONTRACTOR SHALL CHECK ALL DRAWINGS FURNISHED TO HIM/HER IMMEDIATELY UPON THEIR RECEIPT AND SHALL PROMPTLY NOTIFY THE ARCHITECTS OF ANY DISCREPANCIES. LARGER SCALE DRAWINGS TAKE PRECEDENCE OVER SMALLER SCALE DRAWINGS, AND DETAILS TAKE PRECEDENT OVER ALL. THE CONTRACTOR SHALL COMPARE ALL DRAWINGS AND VERIFY THE DETAILS BEFORE LAYING OUT THE WORK AND SHALL BE RESPONSIBLE FOR ANY ERRORS WHICH MIGHT HAVE BEEN AVOIDED THEREBY. SPECIFICATIONS SHALL GOVERN OVER DRAWINGS.
7. TO THE BEST OF OUR KNOWLEDGE AND BELIEF, THESE PLANS ARE IN COMPLIANCE WITH THE ACCESSIBILITY GUIDELINES CONTAINED IN THE 2010 ADA STANDARDS FOR ACCESSIBLE DESIGN
8. ALL WORK TO BE IN COMPLIANCE WITH ALL REQUIREMENTS OF LATEST MAUNA KEA COMPREHESIVE MANAGEMENT PLAN, AND OTHER CONSTRUCTION RELATED PLANS.

REVISION NO.	SYMBOL	DESCRIPTION	SHT. OF	DATE

UNIVERSITY OF HAWAI`I AT HILO
STATE OF HAWAI`I

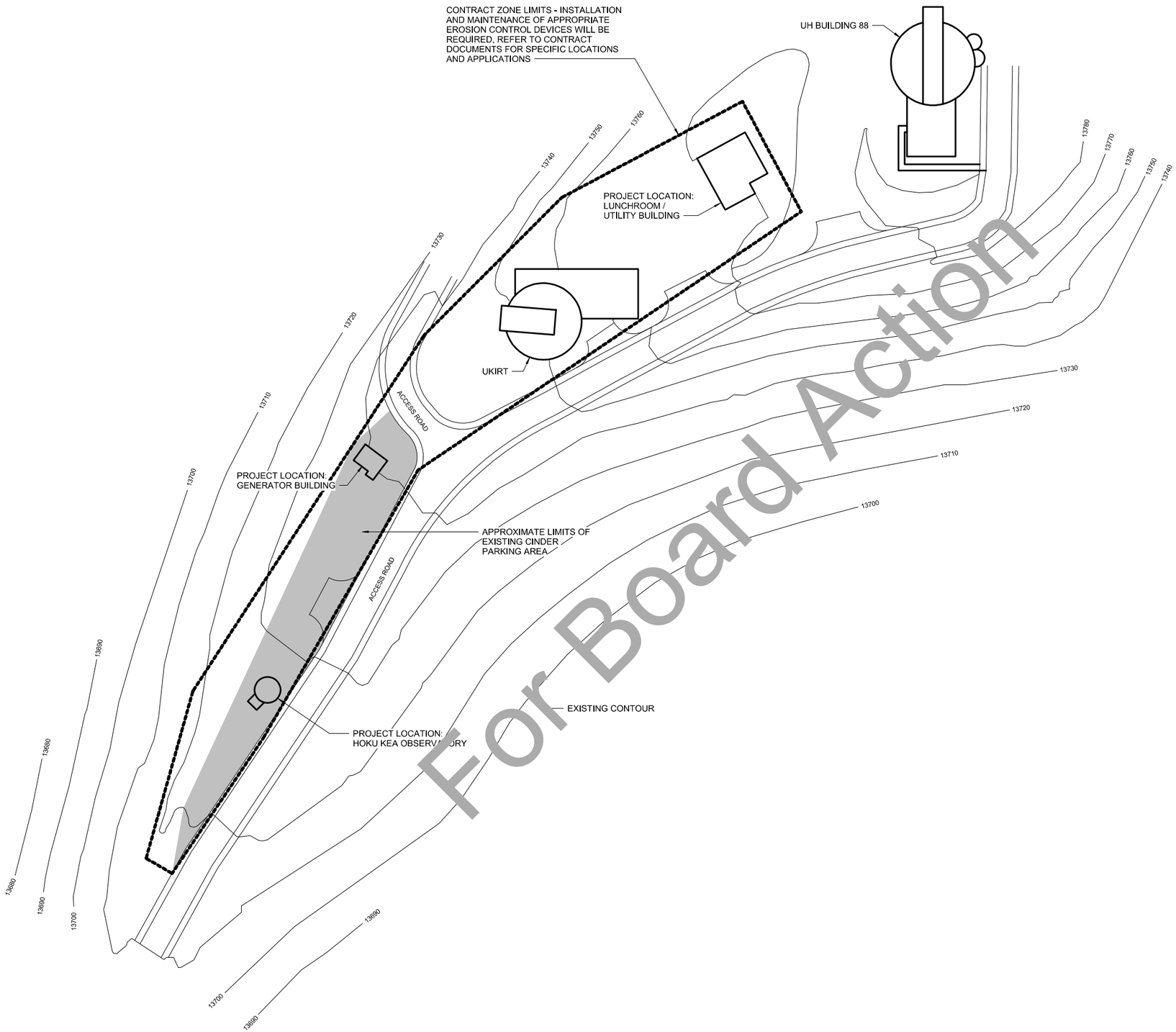
Hōkū Ke`a Decommissioning

University of Hawai`i at Hilo

ABBR., SYMB., INDEX TO SHEET, GENERAL & DEMOLITION NOTES

SSFM INTERNATIONAL, INC.

DESIGNED BY: XX	CHECKED BY:	PROJECT NO. UHH-16029	SHEET A-0.0
DRAWN BY: RB	APPROVED BY:	DATE MAY 2020	OF ____ SHTS
SIGNATURE	EXPIRATION OF LICENSE	SCALE: AS NOTED	04/30/2020



1 A-0.1 EXISTING SITE PLAN

1" = 40'-0"

NOTES:

1. REFER TO OVERALL ELECTRICAL SITE PLAN E-1.0 FOR ELECTRICAL WORK.
2. PROJECT TOPO SURVEY PENDING AT THE TIME OF SCHEMATIC DESIGN SUBMITTAL. THIS SITE PLAN WAS GENERATED FROM MULTIPLE PARTIAL SITE PLANS, PENDING THE PROJECT TOPO SURVEY.

REVISION NO.	SYMBOL	DESCRIPTION	SHT. — OF —	DATE

UNIVERSITY OF HAWAI`I AT HILO
STATE OF HAWAI`I

Hōkū Ke`a Decommissioning

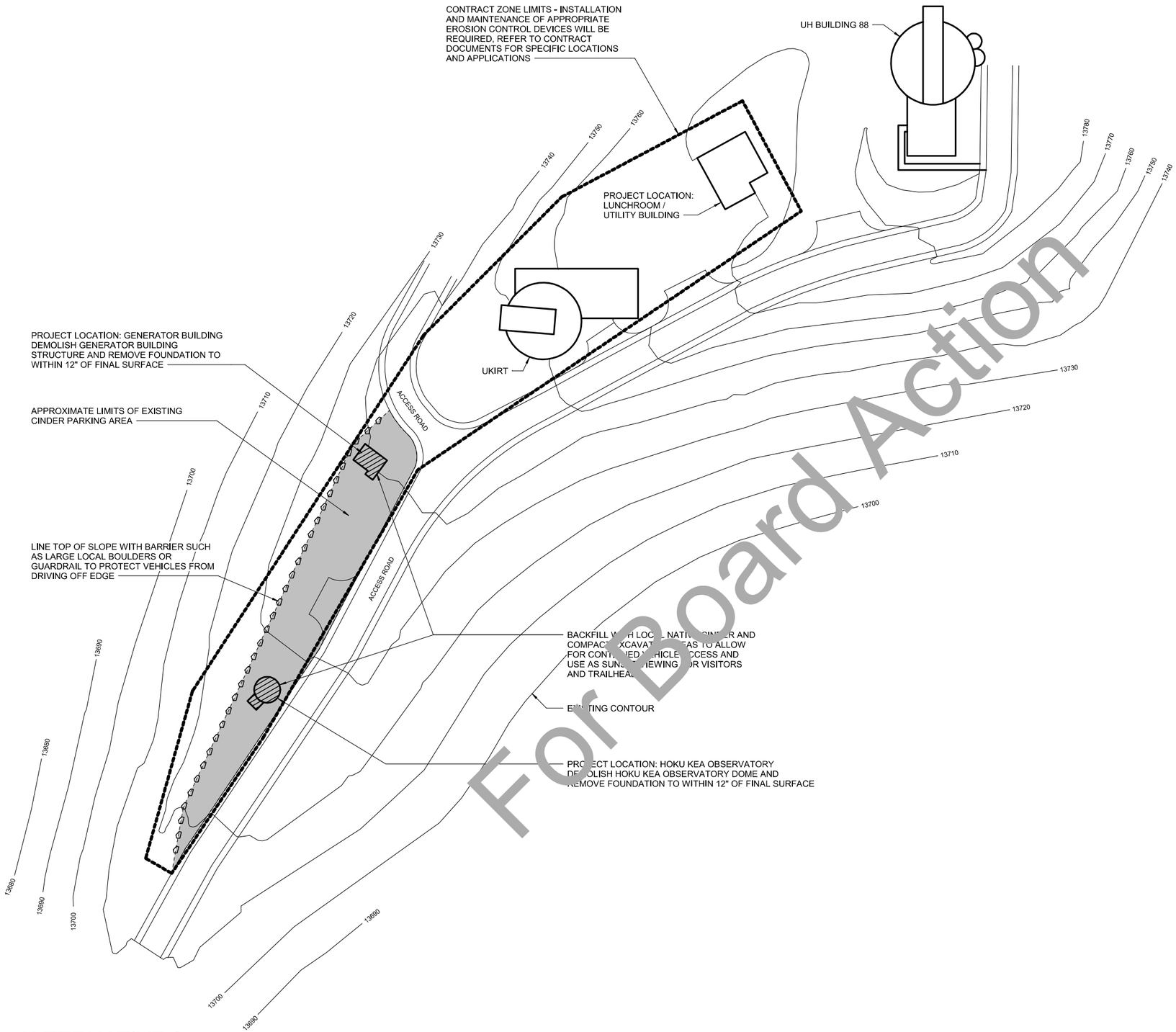
University of Hawai`i at Hilo

EXISTING SITE PLAN

SSFM INTERNATIONAL, INC.

DESIGNED BY: XX	CHECKED BY:	PROJECT NO. UHH-16029	SHEET A-0.1
DRAWN BY: RB	APPROVED BY:	DATE MAY 2020	OF ___ SHTS
SCALE: AS NOTED			

04/30/2022
SIGNATURE EXPIRATION OF LICENSE



1 A-0.2

ALTERNATIVE 2 PROPOSED SITE PLAN

1" = 40'-0"

REVISION NO.	SYMBOL	DESCRIPTION	SHT. — OF —	DATE

UNIVERSITY OF HAWAI`I AT HILO
STATE OF HAWAI`I

Hōkū Ke`a Decommissioning

University of Hawai`i at Hilo

ALTERNATIVE 2 PROPOSED SITE PLAN

SSFM INTERNATIONAL, INC.

DESIGNED BY:	CHECKED BY:	PROJECT NO.	SHEET
XX		UHH-16029	A-0.2
DRAWN BY: Author	APPROVED BY:	DATE MAY 2020	
SIGNATURE	EXPIRATION OF LICENSE	SCALE: AS NOTED	OF ____ SHTS

04/30/2022

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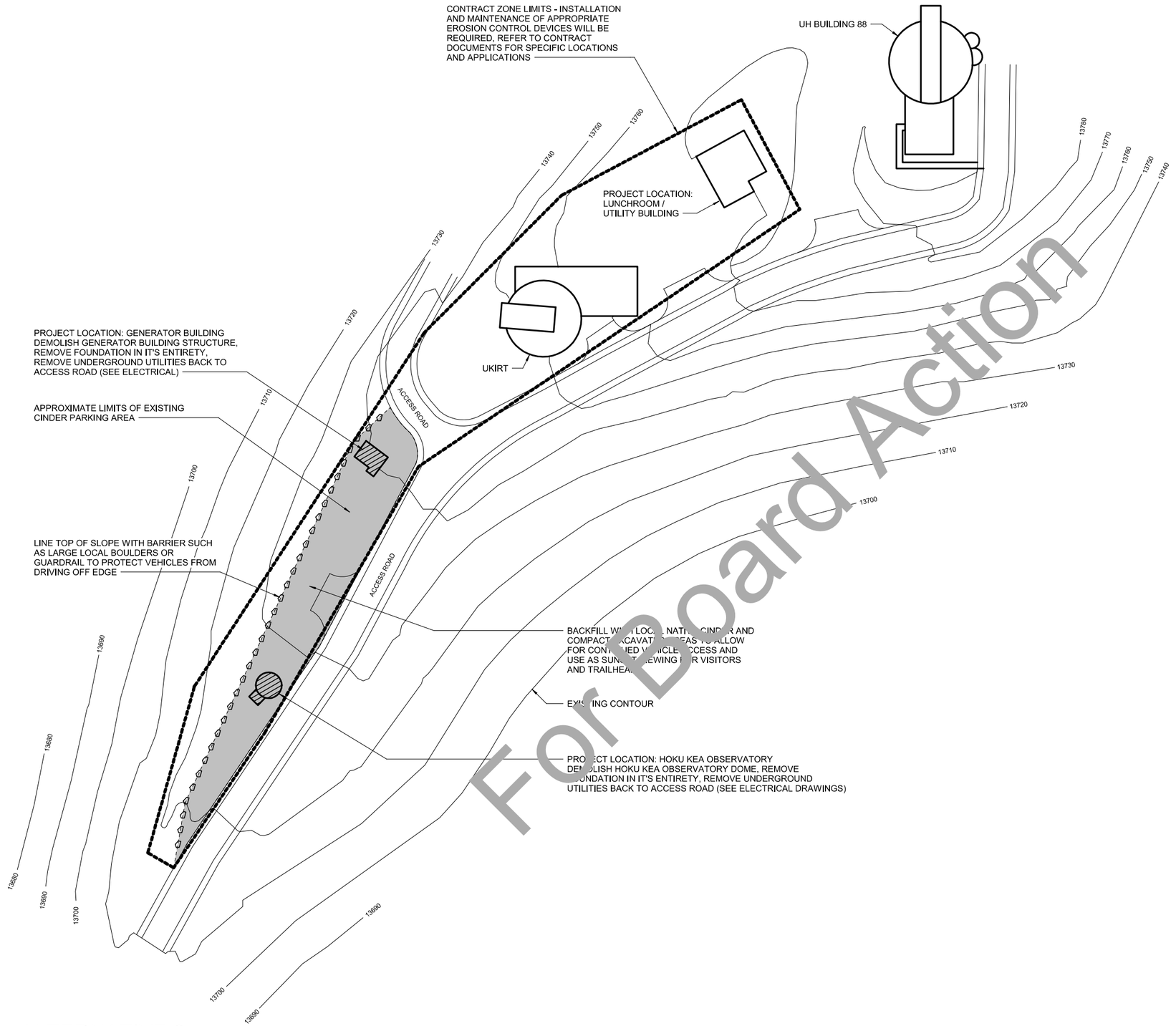

1 A-0.3 ALTERNATIVE 3 PROPOSED SITE PLAN

1" = 40'-0"

REVISION NO.	SYMBOL	DESCRIPTION	SHT — OF —	DATE

UNIVERSITY OF HAWAI`I AT HILO
STATE OF HAWAI`I

Hōkū Ke`a Decommissioning

University of Hawai`i at Hilo

ALTERNATIVE 3 PROPOSED SITE PLAN

SSFM INTERNATIONAL, INC.

DESIGNED BY: XX	CHECKED BY:	PROJECT NO. UHH-16029	SHEET A-0.3
DRAWN BY: Author	APPROVED BY:	DATE MAY 2020	OF ____ SHTS
SIGNATURE 04/20/2022 EXPIRATION OF LICENSE	SCALE: AS NOTED		

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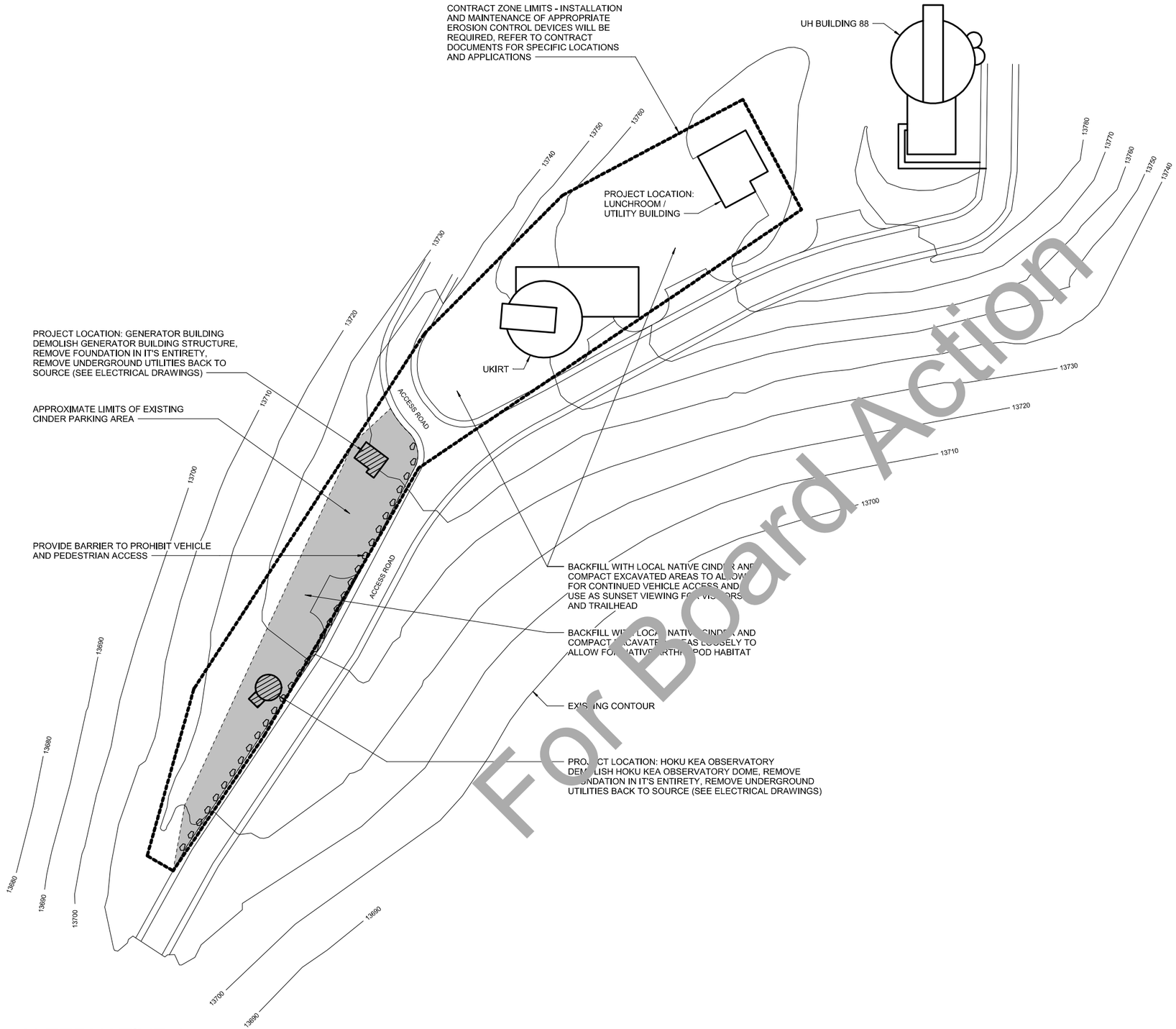


1 A-0.4 ALTERNATIVE 4 PROPOSED SITE PLAN

1" = 40'-0"

REVISION NO.	SYMBOL	DESCRIPTION	SHT OF	DATE

UNIVERSITY OF HAWAI`I AT HILO
STATE OF HAWAI`I

Hōkū Ke`a Decommissioning

University of Hawai`i at Hilo

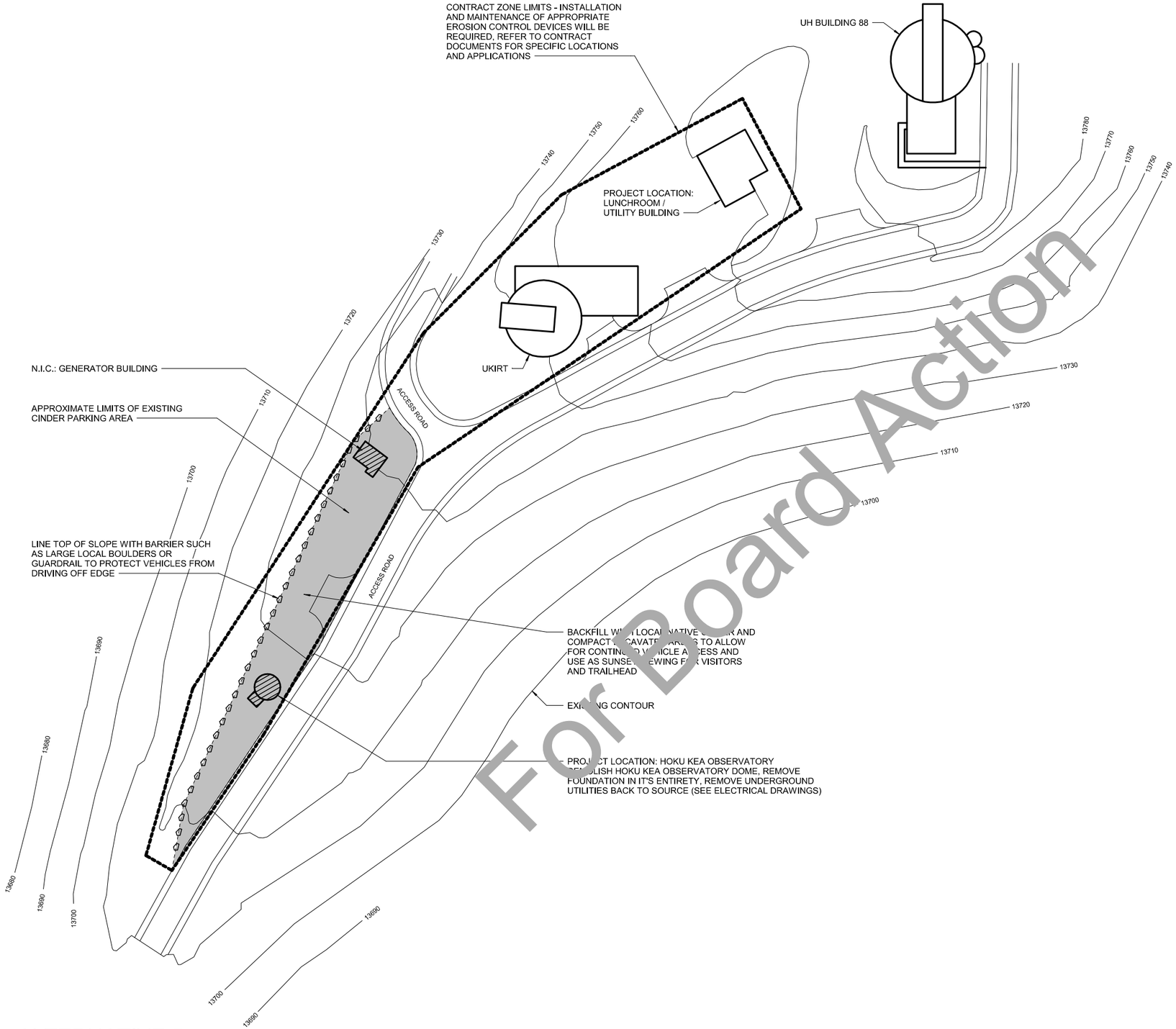
ALTERNATIVE 4 PROPOSED SITE PLAN

SSFM INTERNATIONAL, INC.

DESIGNED BY: XX	CHECKED BY:	PROJECT NO.: UHH-16029	SHEET: A-0.4
DRAWN BY: Author	APPROVED BY:	DATE: MAY 2020	OF ____ SHTS
SCALE: AS NOTED			

SIGNATURE 04/30/2022 EXPIRATION OF LICENSE

F:\PROJ\CURHH HOKU KEA TELESCOPE DECOMMISSIONING\CAD\CAD\X-BDR 24X36.DWG 5/6/2020 9:01 AM REECE



1
A-0.5

ALTERNATIVE 5 PROPOSED SITE PLAN

1" = 40'-0"

F:\PROJECURHH HOKU KEA TELESCOPE DECOMMISSIONING\GADCAD\X-BDR 24X36.DWG 5/6/2020 9:01 AM REECE

REVISION NO.	SYMBOL	DESCRIPTION	SHT OF	DATE

UNIVERSITY OF HAWAI`I AT HILO
STATE OF HAWAI`I

Hōkū Ke`a Decommissioning

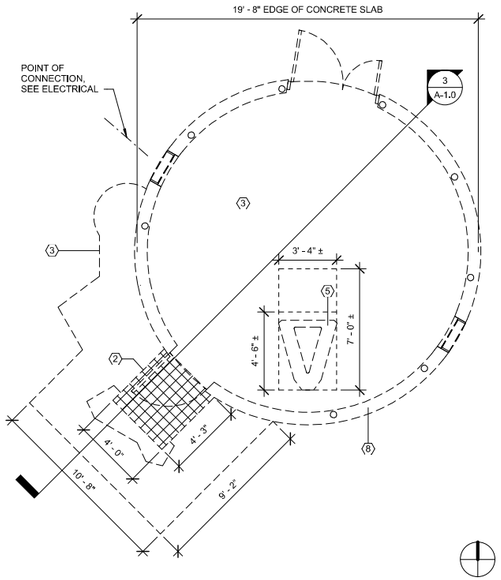
University of Hawai`i at Hilo

ALTERNATIVE 5 PROPOSED SITE PLAN

SSFM INTERNATIONAL, INC.

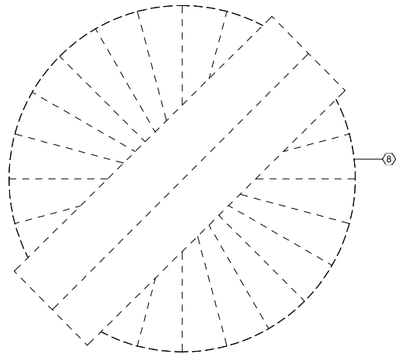
DESIGNED BY: XX	CHECKED BY:	PROJECT NO. UHH-16029	SHEET A-0.5
DRAWN BY: Author	APPROVED BY:	DATE MAY 2020	OF ____ SHTS
SCALE: AS NOTED			

SIGNATURE 04/30/2022 EXPIRATION OF LICENSE



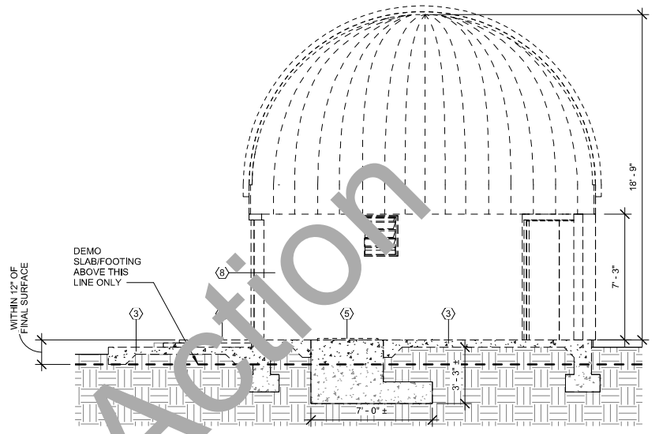
1 A-1.0 DEMOLITION PLAN - OBSERVATORY

1/4" = 1'-0"



2 A-1.0 DEMOLITION ROOF PLAN - OBSERVATORY

1/4" = 1'-0"



3 A-1.0 DEMOLITION BUILDING SECTION - OBSERVATORY

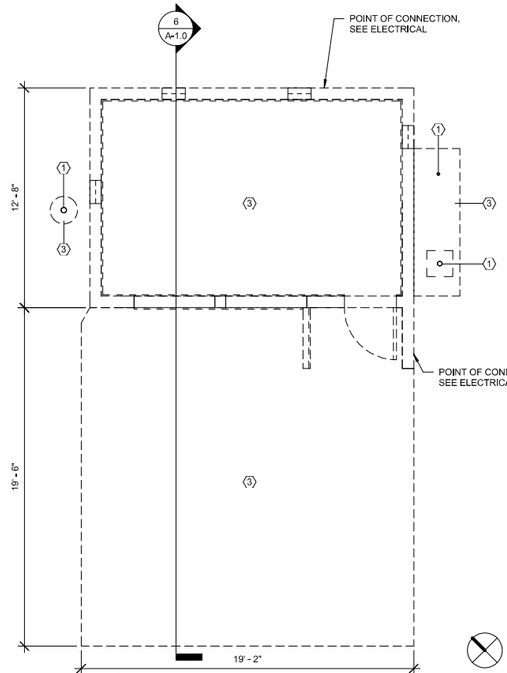
1/4" = 1'-0"

SHEET NOTES

1. WALLS, DOORS, METAL LOUVERS, WALL BASE, WALL WAINSCOT, WALL MOUNTED CABINETRY AND FIRE EXTINGUISHERS TO BE REMOVED UON
2. SEE ELECTRICAL SHEETS FOR ELECTRICAL DEMOLITION INCLUDING UNDERGROUND UTILITIES, AS APPLICABLE
3. REFER TO HAZMAT SURVEY FOR ANY HAZARDOUS MATERIALS IDENTIFIED

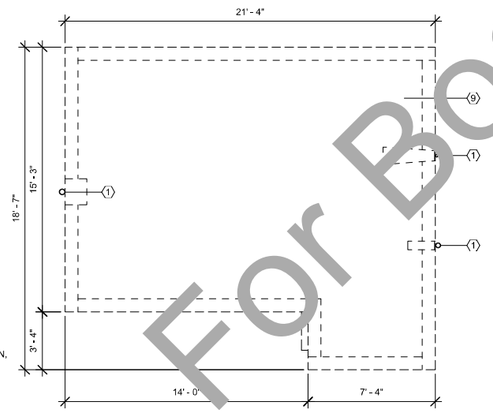
KEYNOTE LEGEND

① ELECTRICAL POLE TO BE REMOVED, TYP.
② STEEL GRATE TO BE REMOVED
③ CONCRETE PAD/FOUNDATION TO BE REMOVED
④ REMOVE EXTERIOR CMU WALL
⑤ STEEL TELESCOPE BASE PLATE TO BE REMOVED AND CONCRETE FOUNDATION
⑥ WAINSCOT TO BE REMOVED
⑧ BUILDING SHELL AND STRUCTURAL COLUMNS TO BE REMOVED UON
⑨ REMOVE EXISTING CONCRETE ROOF COMPLETELY



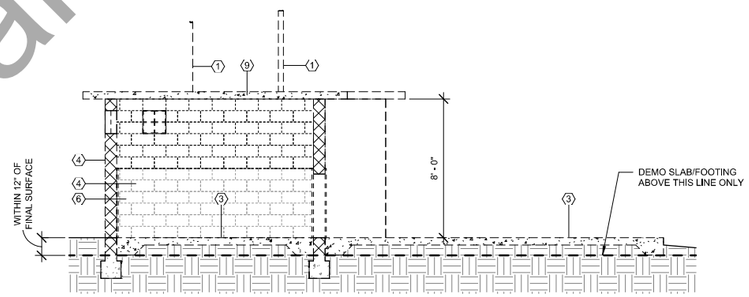
4 A-1.0 DEMOLITION PLAN - GENERATOR BUILDING

1/4" = 1'-0"



5 A-1.0 DEMOLITION ROOF PLAN - GENERATOR BUILDING

1/4" = 1'-0"



6 A-1.0 DEMOLITION BUILDING SECTION - GENERATOR BUILDING

1/4" = 1'-0"

LEGEND

WALL TO REMAIN	DOOR TO BE REMOVED
WALL TO BE REMOVED	CONCRETE SLAB TO BE REMOVED
MISC. ITEMS TO BE REMOVED	NOT IN CONTRACT
UTILITY LINE TO REMAIN	
UTILITY LINE TO BE REMOVED	GLASS BLOCK OR LOUVER TO BE REMOVED

REVISION NO.	SYMBOL	DESCRIPTION	SHT ___ OF ___	DATE

UNIVERSITY OF HAWAI`I AT HILO
STATE OF HAWAI`I

Hōkū Ke`a Decommissioning

University of Hawai`i at Hilo

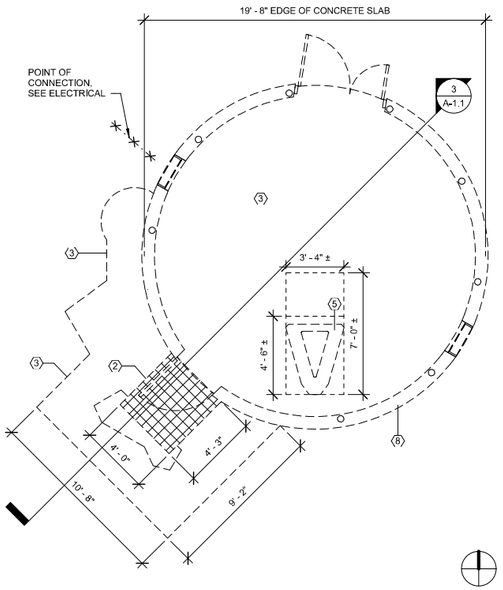
ALTERNATIVE 2 - DEMOLITION PLAN, ROOF AND SECTION

SSFM INTERNATIONAL, INC.

DESIGNED BY: XX	CHECKED BY:	PROJECT NO. UHH-16029	SHEET A-1.0
DRAWN BY: Author	APPROVED BY:	DATE MAY 2020	
SCALE: AS NOTED			OF ___ SHTS

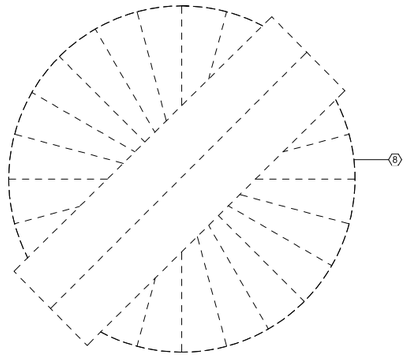
SIGNATURE 04/30/2022 EXPIRATION OF LICENSE

F:\PROJ\OUR\HH HOKU KEA TELESCOPE DECOMMISSIONING\GA\DCA\D:X-BDR 24X36.DWG 5/6/2020 9:01 AM REECE



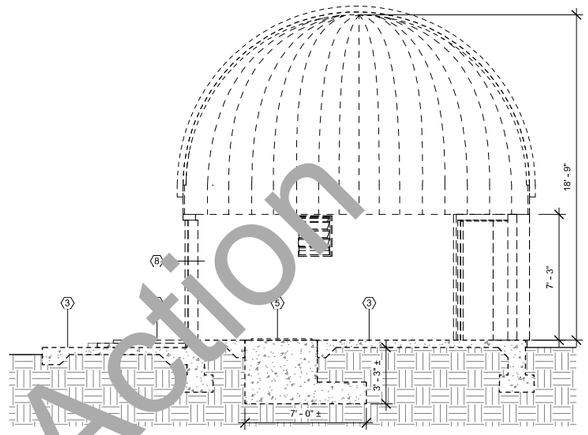
1 A-1.1 DEMOLITION PLAN - OBSERVATORY

1/4" = 1'-0"



2 A-1.1 DEMOLITION ROOF PLAN - OBSERVATORY

1/4" = 1'-0"



3 A-1.1 DEMOLITION BUILDING SECTION - OBSERVATORY

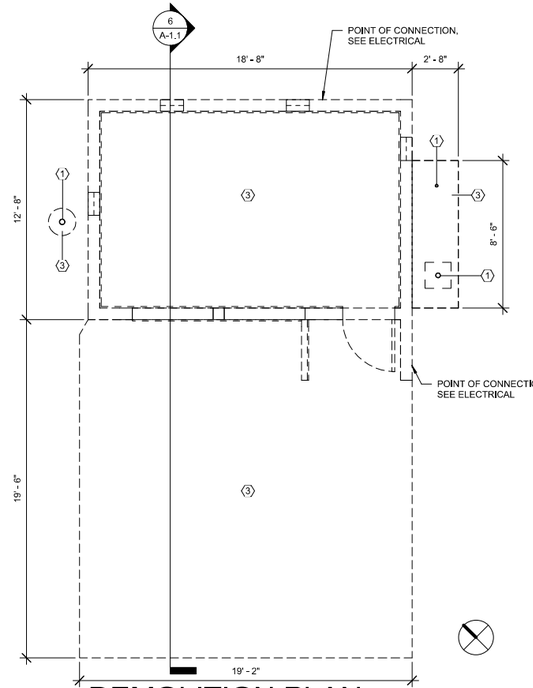
1/4" = 1'-0"

SHEET NOTES

1. WALLS, DOORS, METAL LOUVERS, WALL BASE, WALL WAINSCOT, WALL MOUNTED CABINETRY AND FIRE EXTINGUISHERS TO BE REMOVED UON
2. SEE ELECTRICAL SHEETS FOR ELECTRICAL DEMOLITION INCLUDING UNDERGROUND UTILITIES, AS APPLICABLE
3. REFER TO HAZMAT SURVEY FOR ANY HAZARDOUS MATERIALS IDENTIFIED

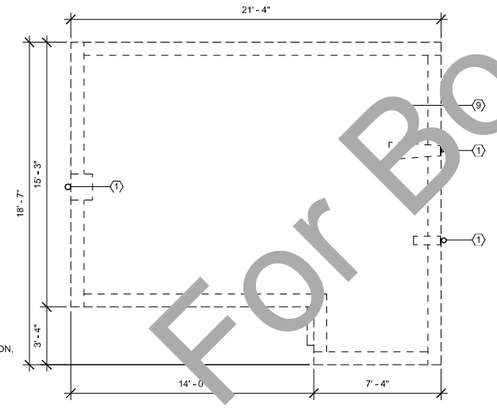
KEYNOTE LEGEND

① ELECTRICAL POLE TO BE REMOVED, TYP.
② STEEL GRATE TO BE REMOVED
③ CONCRETE PAD/FOUNDATION TO BE REMOVED
④ REMOVE EXTERIOR CMU WALL
⑤ STEEL TELESCOPE BASE PLATE TO BE REMOVED AND CONCRETE FOUNDATION
⑥ WAINSCOT TO BE REMOVED
⑧ BUILDING SHELL AND STRUCTURAL COLUMNS TO BE REMOVED UON
⑨ REMOVE EXISTING CONCRETE ROOF COMPLETELY



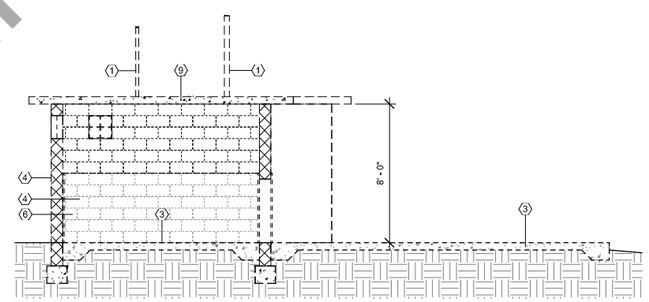
4 A-1.1 DEMOLITION PLAN - GENERATOR BUILDING

1/4" = 1'-0"



5 A-1.1 DEMOLITION ROOF PLAN - GENERATOR BUILDING

1/4" = 1'-0"



6 A-1.1 DEMOLITION BUILDING SECTION - GENERATOR BUILDING

1/4" = 1'-0"

LEGEND

- WALL TO REMAIN
- WALL TO BE REMOVED
- MISC. ITEMS TO BE REMOVED
- UTILITY LINE TO REMAIN
- UTILITY LINE TO BE REMOVED
- DOOR TO BE REMOVED
- CONCRETE SLAB TO BE REMOVED
- NOT IN CONTRACT
- GLASS BLOCK OR LOUVER TO BE REMOVED

REVISION NO.	SYMBOL	DESCRIPTION	SHT. OF	DATE

UNIVERSITY OF HAWAI`I AT HILO
STATE OF HAWAI`I

Hōkū Ke`a Decommissioning

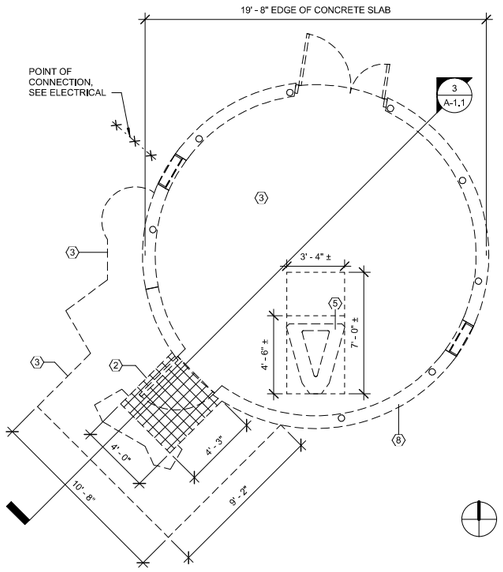
University of Hawai`i at Hilo

ALTERNATIVES 3 & 4 - DEMO PLAN, ROOF, AND SECTION

SSFM INTERNATIONAL, INC.

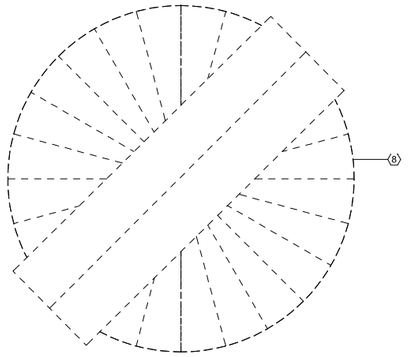
DESIGNED BY: XX	CHECKED BY:	PROJECT NO: UHH-16029	SHEET: A-1.1
DRAWN BY: RB	APPROVED BY:	DATE: MAY 2020	OF ____ SHTS
SIGNATURE	EXPIRATION OF LICENSE	SCALE: AS NOTED	04/30/2022

F:\PROJ\CURRH HOKU KEA TELESCOPE DECOMMISSIONING\CAD\CAD\X-BDR 24X36.DWG 5/6/2020 9:01 AM REECE



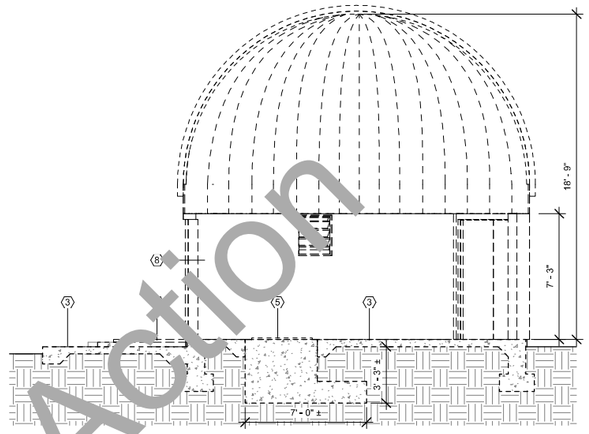
3 A-1.2 DEMOLITION PLAN - OBSERVATORY

1/4" = 1'-0"



2 A-1.2 DEMOLITION ROOF PLAN - OBSERVATORY

1/4" = 1'-0"



1 A-1.2 DEMOLITION BUILDING SECTION - OBSERVATORY

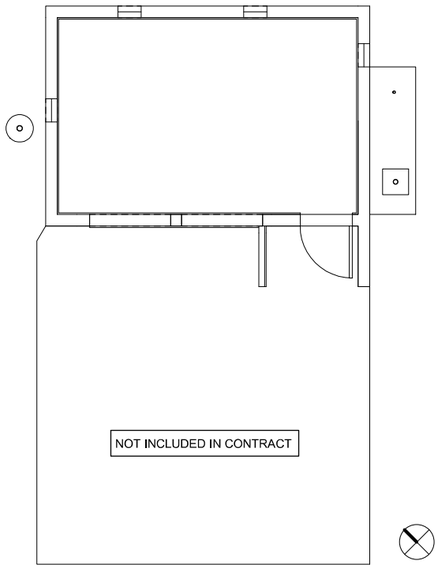
1/4" = 1'-0"

SHEET NOTES

1. WALLS, DOORS, METAL LOUVERS, WALL BASE, WALL MOUNTED CABINETRY AND FIRE EXTINGUISHERS TO BE REMOVED UON
2. SEE ELECTRICAL SHEETS FOR ELECTRICAL DEMOLITION INCLUDING UNDERGROUND UTILITIES, AS APPLICABLE
3. REFER TO HAZMAT SURVEY FOR ANY HAZARDOUS MATERIALS IDENTIFIED

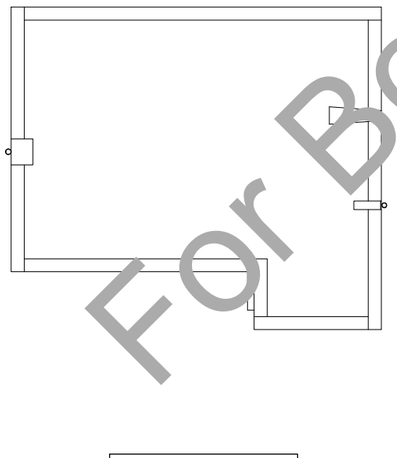
KEYNOTE LEGEND

② STEEL GRATE TO BE REMOVED
③ CONCRETE PAD/FOUNDATION TO BE REMOVED
⑤ STEEL TELESCOPE BASE PLATE TO BE REMOVED AND CONCRETE FOUNDATION
⑧ BUILDING SHELL AND STRUCTURAL COLUMNS TO BE REMOVED UON



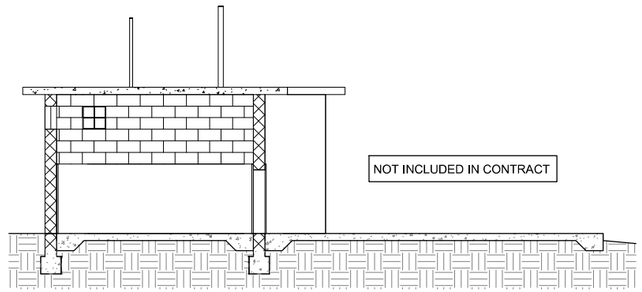
4 A-1.2 EXISTING PLAN - GENERATOR BUILDING

1/4" = 1'-0"



5 A-1.2 EXISTING ROOF PLAN - GENERATOR BUILDING

1/4" = 1'-0"



6 A-1.2 EXISTING BUILDING SECTION - GENERATOR BUILDING

1/4" = 1'-0"

LEGEND

- WALL TO REMAIN
- WALL TO BE REMOVED
- MISC. ITEMS TO BE REMOVED
- UTILITY LINE TO REMAIN
- UTILITY LINE TO BE REMOVED
- DOOR TO BE REMOVED
- CONCRETE SLAB TO BE REMOVED
- NOT IN CONTRACT
- GLASS BLOCK OR LOUVER TO BE REMOVED

REVISION NO.	SYMBOL	DESCRIPTION	SHT. OF	DATE

UNIVERSITY OF HAWAI`I AT HILO
STATE OF HAWAI`I

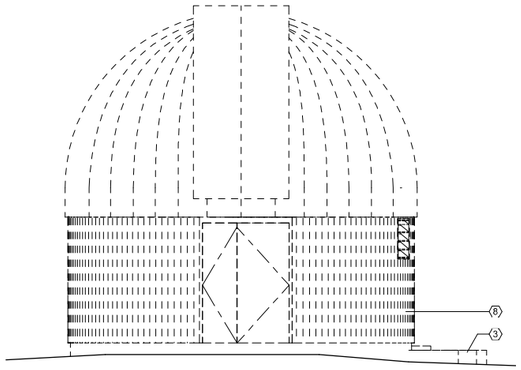
Hōkū Ke`a Decommissioning

University of Hawai`i at Hilo

ALTERNATIVE 5 - DEMOLITION PLAN, ROOF, SECTION

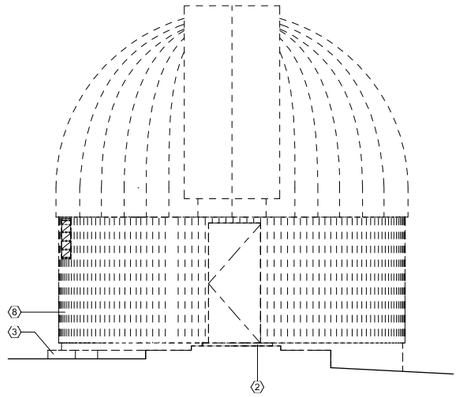
SSFM INTERNATIONAL, INC.

DESIGNED BY: XX	CHECKED BY:	PROJECT NO. UHH-16029	SHEET A-1.2
DRAWN BY: Author	APPROVED BY:	DATE MAY 2020	
SIGNATURE	EXPIRATION OF LICENSE: 04/30/2022	SCALE: AS NOTED	OF ____ SHTS



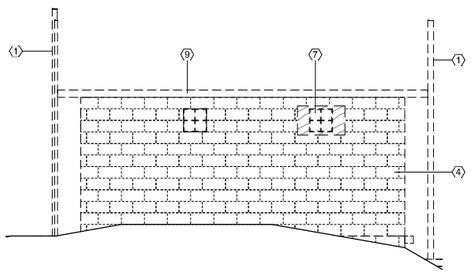
1 A-2.0 EXTERIOR ELEVATION - OBSERVATORY - NORTH

1/4" = 1'-0"



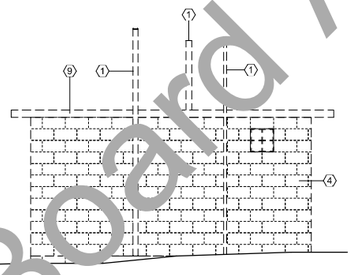
2 A-2.0 EXTERIOR ELEVATION - OBSERVATORY - SW

1/4" = 1'-0"



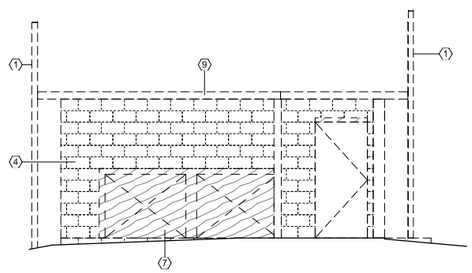
3 A-2.0 EXTERIOR ELEVATION - GENERATOR BUILDING - A

1/4" = 1'-0"



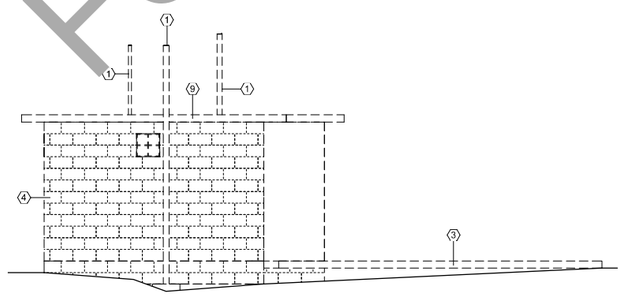
4 A-2.0 EXTERIOR ELEVATION - GENERATOR BUILDING - B

1/4" = 1'-0"



5 A-2.0 EXTERIOR ELEVATION - GENERATOR BUILDING - C

1/4" = 1'-0"



6 A-2.0 EXTERIOR ELEVATION - GENERATOR BUILDING - D

1/4" = 1'-0"

SHEET NOTES

1. WALLS, DOORS, METAL LOUVERS, WALL BASE, WALL WAINSCOT, WALL MOUNTED CABINETRY AND FIRE EXTINGUISHERS TO BE REMOVED UON
2. SEE ELECTRICAL SHEETS FOR ELECTRICAL DEMOLITION INCLUDING UNDERGROUND UTILITIES, AS APPLICABLE
3. REFER TO HAZMAT SURVEY FOR ANY HAZARDOUS MATERIALS IDENTIFIED

KEYNOTE LEGEND

① ELECTRICAL POLE TO BE REMOVED, TYP.
② STEEL GRATE TO BE REMOVED
③ CONCRETE PAD/FOUNDATION TO BE REMOVED
④ REMOVE EXTERIOR CMU WALL
⑦ OPENINGS COVERED BY PLYWOOD TO BE REMOVED
⑧ BUILDING SHELL AND STRUCTURAL COLUMNS TO BE REMOVED UON
⑨ REMOVE EXISTING CONCRETE ROOF COMPLETELY

REVISION NO.	SYMBOL	DESCRIPTION	SHT. OF	DATE

UNIVERSITY OF HAWAI`I AT HILO
STATE OF HAWAI`I

Hōkū Ke`a Decommissioning

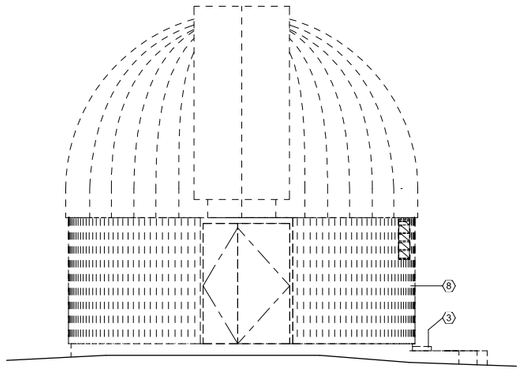
University of Hawai`i at Hilo

ALTERNATIVE 2 - DEMOLITION EXTERIOR ELEVATIONS

SSFM INTERNATIONAL, INC.

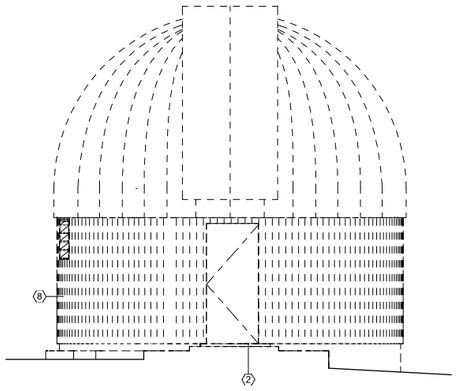
DESIGNED BY: XX	CHECKED BY:	PROJECT NO. UHH-16029	SHEET A-2.0
DRAWN BY: Author	APPROVED BY:	DATE MAY 2020	OF ____ SHTS
SCALE: AS NOTED			

04/30/2022
SIGNATURE EXPIRATION OF LICENSE



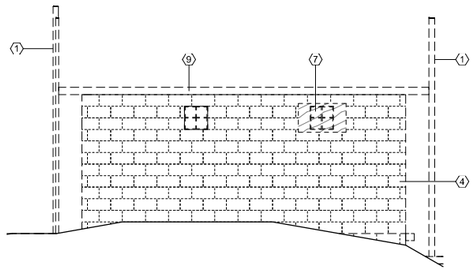
1 A-2.1 EXTERIOR ELEVATION - OBSERVATORY - NORTH

1/4" = 1'-0"



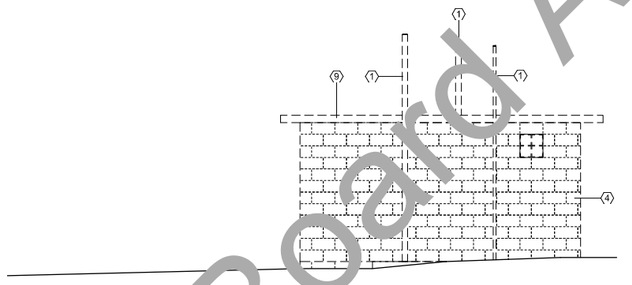
2 A-2.1 EXTERIOR ELEVATION - OBSERVATORY - SW

1/4" = 1'-0"



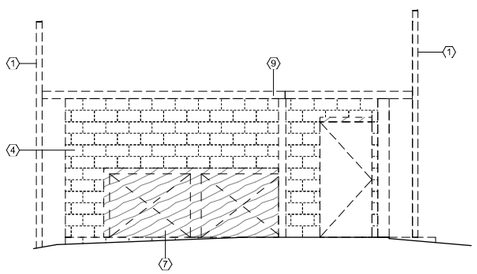
3 A-2.1 EXTERIOR ELEVATION - GENERATOR BUILDING - A

1/4" = 1'-0"



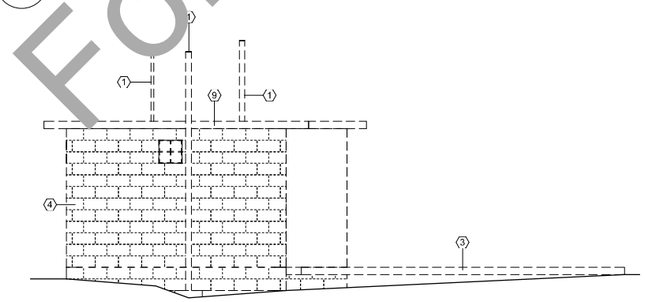
4 A-2.1 EXTERIOR ELEVATION - GENERATOR BUILDING - B

1/4" = 1'-0"



5 A-2.1 EXTERIOR ELEVATION - GENERATOR BUILDING - C

1/4" = 1'-0"



6 A-2.1 EXTERIOR ELEVATION - GENERATOR BUILDING - D

1/4" = 1'-0"

SHEET NOTES

1. WALLS, DOORS, METAL LOUVERS, WALL BASE, WALL WAINSCOT, WALL MOUNTED CABINETRY AND FIRE EXTINGUISHERS TO BE REMOVED UON
2. SEE ELECTRICAL SHEETS FOR ELECTRICAL DEMOLITION INCLUDING UNDERGROUND UTILITIES, AS APPLICABLE
3. REFER TO HAZMAT SURVEY FOR ANY HAZARDOUS MATERIALS IDENTIFIED

KEYNOTE LEGEND

1	ELECTRICAL POLE TO BE REMOVED, TYP.
2	STEEL GRATE TO BE REMOVED
3	CONCRETE PAD/FOUNDATION TO BE REMOVED
4	REMOVE EXTERIOR CMU WALL
7	OPENINGS COVERED BY PLYWOOD TO BE REMOVED
8	BUILDING SHELL AND STRUCTURAL COLUMNS TO BE REMOVED UON
9	REMOVE EXISTING CONCRETE ROOF COMPLETELY

REVISION NO.	SYMBOL	DESCRIPTION	SHT OF	DATE

UNIVERSITY OF HAWAI`I AT HILO
STATE OF HAWAI`I

Hōkū Ke`a Decommissioning

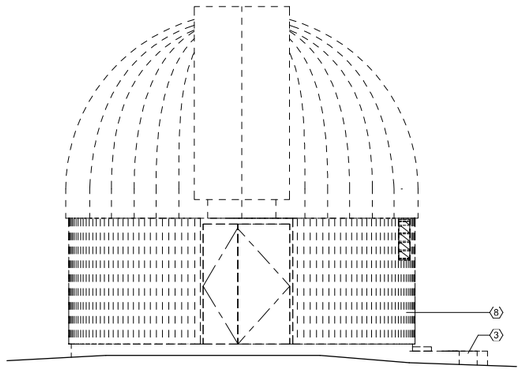
University of Hawai`i at Hilo

ALTERNATIVES 3 & 4 - DEMO EXTERIOR ELEVATIONS

SSFM INTERNATIONAL, INC.

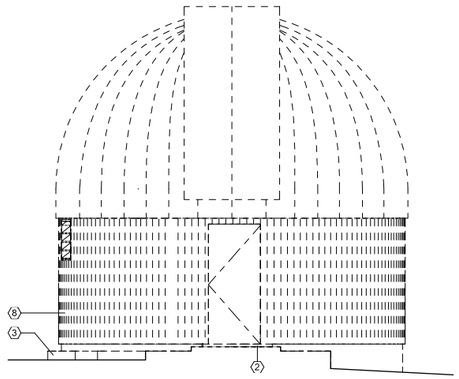
DESIGNED BY:	CHECKED BY:	PROJECT NO.	SHEET
XX		UHH-16029	A-2.1
DRAWN BY: Author	APPROVED BY:	DATE MAY 2020	OF ____ SHTS

04/20/2022
SIGNATURE EXPIRATION OF LICENSE SCALE: AS NOTED



1 A-2.2 EXTERIOR ELEVATION - OBSERVATORY - NORTH

1/4" = 1'-0"



2 A-2.2 EXTERIOR ELEVATION - OBSERVATORY - SW

1/4" = 1'-0"

SHEET NOTES

1. WALLS, DOORS, METAL LOUVERS, WALL BASE, WALL MOUNTED CABINETRY AND FIRE EXTINGUISHERS TO BE REMOVED UON
2. SEE ELECTRICAL SHEETS FOR ELECTRICAL DEMOLITION INCLUDING UNDERGROUND UTILITIES, AS APPLICABLE
3. REFER TO HAZMAT SURVEY FOR ANY HAZARDOUS MATERIALS IDENTIFIED

KEYNOTE LEGEND

② STEEL GRATE TO BE REMOVED
③ CONCRETE PAD/FOUNDATION TO BE REMOVED
⑧ BUILDING SHELL AND STRUCTURAL COLUMNS TO BE REMOVED UON

REVISION NO.	SYMBOL	DESCRIPTION	SHT. OF.	DATE

UNIVERSITY OF HAWAI`I AT HILO
STATE OF HAWAI`I

Hōkū Ke`a Decommissioning

University of Hawai`i at Hilo

ALTERNATIVE 5 - DEMOLITION EXTERIOR ELEVATIONS

SSFM INTERNATIONAL, INC.

DESIGNED BY: XX	CHECKED BY:	PROJECT NO. UHH-16029	SHEET A-2.2
DRAWN BY: Author	APPROVED BY:	DATE MAY 2020	OF ____ SHTS
SCALE: AS NOTED			

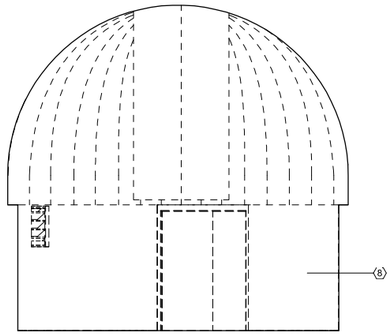
SIGNATURE 04/30/2022 EXPIRATION OF LICENSE

SHEET NOTES

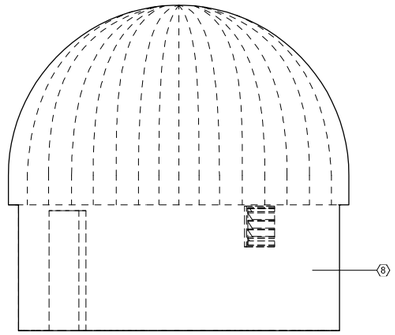
1. WALLS, DOORS, METAL LOUVERS, WALL BASE, WALL WAINSCOT, WALL MOUNTED CABINETRY AND FIRE EXTINGUISHERS TO BE REMOVED UON
2. SEE ELECTRICAL SHEETS FOR ELECTRICAL DEMOLITION INCLUDING UNDERGROUND UTILITIES, AS APPLICABLE
3. REFER TO HAZMAT SURVEY FOR ANY HAZARDOUS MATERIALS IDENTIFIED

KEYNOTE LEGEND

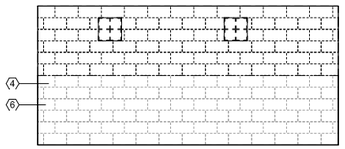
⟨4⟩ REMOVE EXTERIOR CMU WALL
⟨6⟩ WAINSCOT TO BE REMOVED
⟨8⟩ BUILDING SHELL AND STRUCTURAL COLUMNS TO BE REMOVED UON



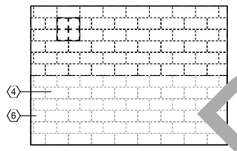
1 A-3.0 INTERIOR ELEVATION OBSERVATORY - A
1/4" = 1'-0"



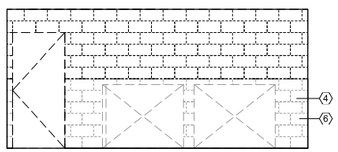
2 A-3.0 INTERIOR ELEVATION OBSERVATORY - D
1/4" = 1'-0"



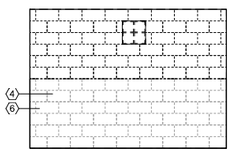
3 A-3.0 INTERIOR ELEVATION GENERATOR BUILDING - A
1/4" = 1'-0"



4 A-3.0 INTERIOR ELEVATION GENERATOR BUILDING - B
1/4" = 1'-0"



5 A-3.0 INTERIOR ELEVATION GENERATOR BUILDING - C
1/4" = 1'-0"



6 A-3.0 INTERIOR ELEVATION GENERATOR BUILDING - D
1/4" = 1'-0"

REVISION NO.	SYMBOL	DESCRIPTION	SHT. OF.	DATE

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STATE OF HAWAI`I

Hōkū Ke`a Decommissioning
University of Hawai`i at Hilo

ALTERNATIVES 2, 3, & 4 - DEMO INTERIOR ELEVATIONS

SSFM INTERNATIONAL, INC.

DESIGNED BY:	CHECKED BY:	PROJECT NO.	SHEET
XX		UHH-16029	A-3.0
DRAWN BY:	APPROVED BY:	DATE	
RB		MAY 2020	

SIGNATURE 04/30/2022 EXPIRATION OF LICENSE SCALE: AS NOTED OF ____ SHTS

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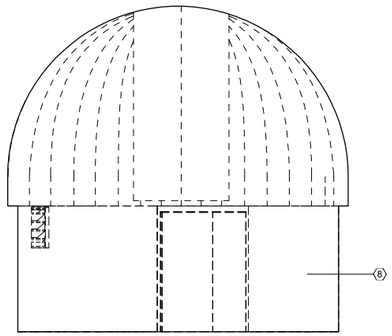
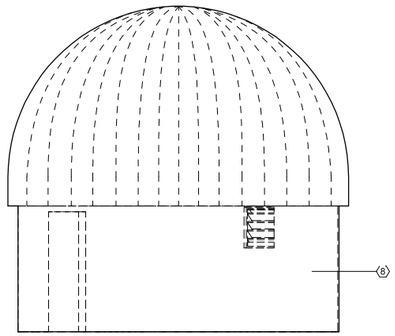


1 A-3.1 INTERIOR ELEVATION OBSERVATORY - A

1/4" = 1'-0"



2 A-3.1 INTERIOR ELEVATION OBSERVATORY - D

1/4" = 1'-0"

SHEET NOTES

1. WALLS, DOORS, METAL LOUVERS, WALL BASE, WALL MOUNTED CABINETRY AND FIRE EXTINGUISHERS TO BE REMOVED UON
2. SEE ELECTRICAL SHEETS FOR ELECTRICAL DEMOLITION INCLUDING UNDERGROUND UTILITIES, AS APPLICABLE
3. REFER TO HAZMAT SURVEY FOR ANY HAZARDOUS MATERIALS IDENTIFIED

KEYNOTE LEGEND

8 BUILDING SHELL AND STRUCTURAL COLUMNS TO BE REMOVED UON

REVISION NO.	SYMBOL	DESCRIPTION	SHT. OF.	DATE

UNIVERSITY OF HAWAI`I AT HILO
STATE OF HAWAI`I

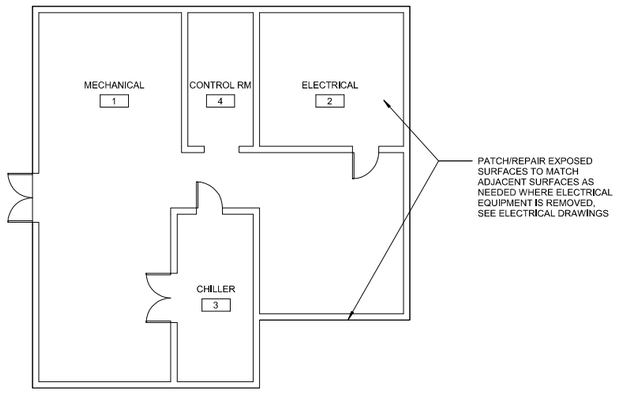
Hōkū Ke`a Decommissioning

University of Hawai`i at Hilo

ALTERNATIVE 5 - DEMOLITION INTERIOR ELEVATIONS

SSFM INTERNATIONAL, INC.

DESIGNED BY: XX	CHECKED BY:	PROJECT NO. UHH-16029	SHEET A-3.1
DRAWN BY: Author	APPROVED BY:	DATE MAY 2020	OF ____ SHTS
SIGNATURE	EXPIRATION OF LICENSE: 04/30/2022	SCALE: AS NOTED	



1
A-4.0

LUNCHROOM/UTILITY BUILDING PLAN

1/8" = 1'-0"

REVISION NO.	SYMBOL	DESCRIPTION	SHT. OF.	DATE

UNIVERSITY OF HAWAI`I AT HILO
STATE OF HAWAI`I

Hōkū Ke`a Decommissioning

University of Hawai`i at Hilo

LUNCHROOM/UTILITY BUILDING PLAN

SSFM INTERNATIONAL, INC.

DESIGNED BY: XX	CHECKED BY:	PROJECT NO. UHH-16029	SHEET A-4.0
DRAWN BY: Author	APPROVED BY:	DATE MAY 2020	OF ____ SHTS
SIGNATURE	EXPIRATION OF LICENSE	SCALE: AS NOTED	

04/30/2022

F:\PROJ\CURRH HOKU KEA TELESCOPE DECOMMISSIONING\CAD\CAD'x-BDR 24X36.DWG 5/6/2020 9:01 AM REECE

GENERAL ELECTRICAL SPECIFICATIONS

1. DO NOT SCALE DRAWINGS. VERIFY DIMENSIONS IN FIELD PRIOR TO COMMENCEMENT OF WORK.
2. THE ELECTRICAL DRAWINGS ARE DIAGRAMMATIC IN NATURE. DEMOLISH CONDUIT RUNS AS SPECIFIED WITH SCHEMATIC REPRESENTATION INDICATED ON THE DRAWINGS AND AS SPECIFIED.
3. CONTRACTOR SHALL REVIEW ARCHITECTURAL, STRUCTURAL, MECHANICAL AND OTHER DRAWINGS PRIOR TO BID.
4. CONTRACTOR SHALL VISIT SITE PRIOR TO BID AND VERIFY THAT CONDITIONS ARE AS INDICATED. CONTRACTOR SHALL REPORT DISCREPANCIES TO THE CONTRACTING OFFICER AND INCLUDE IN ITS BID ALL COSTS REQUIRED TO MAKE HIS WORK MEET EXISTING CONDITIONS.
5. WORK SHALL BE PERFORMED IN A WORKMANLIKE MANNER TO THE SATISFACTION OF THE CONTRACTING OFFICER.
6. WORK, MATERIALS AND EQUIPMENT SHALL CONFORM TO THE LATEST EDITIONS OF LOCAL, STATE AND NATIONAL CODES AND ORDINANCES.
7. PROVIDE PERMITS AND INSPECTIONS REQUIRED.
8. PROVIDE AS-BUILT DRAWINGS TO THE CONTRACTING OFFICER. DRAWINGS SHALL INCLUDE ALL ADDENDUM ITEMS, CHANGE ORDERS, ALTERATIONS, ETC.
9. PRESENT SUBMITTAL DATA AT ONE TIME BOUND IN PDF FORMAT OR PER THE STATE'S REQUIREMENTS. SUBMITTALS SHALL BE INDEXED IN A NEAT AND ORDERLY MANNER. PARTIAL SUBMITTALS WILL NOT BE ACCEPTED. SUBMITTALS SHALL INCLUDE ALL EQUIPMENT SPECIFIED UNDER THIS PROJECT. SHOULD CONTRACTOR FAIL TO PROVIDE SUBMITTALS, CONTRACTOR PROCEEDS AT ITS OWN RISK AND ANY COST FOR CORRECTIVE WORK WILL BE BORNE BY THE CONTRACTOR.
10. PENETRATIONS EXPOSED BY ELECTRICAL DEMOLITION IN FIRE RATED WALLS OR FLOORS SHALL BE SEALED BY A FIRESTOPPING SYSTEM UL LISTED FOR THE APPLICATION. INSTALL PENETRATION SEAL MATERIALS IN ACCORDANCE WITH PRINTED INSTRUCTIONS OF THE UL FIRE RESISTANCE DIRECTORY AND MANUFACTURERS INSTRUCTIONS. FIRESTOPPING SYSTEM SHALL BE EQUAL TO 3M FIRE BARRIER. FIRESTOPPING MATERIAL SHALL BE CAULK OR PUTTY TYPE. FIRESTOP ALL PENETRATIONS THROUGH FIRE RATED WALLS AS REQUIRED TO PRESERVE THE FIRE RATING OF THE STRUCTURE.

ELECTRICAL SYMBOLS

(D) or —x—x—x—x—x— ELECTRICAL DEMOLITION. REMOVE EQUIPMENT AND APPURTENANCES IN THEIR ENTIRETY U.N.O. COORDINATE WORK RESTRICTIONS PRIOR TO DEMOLITION.

HOMERUN CONDUIT – STROKES INDICATE QUANTITY OF CONDUCTORS

CONDUIT/WIRE CONCEALED IN WALL OR ABOVE CEILING EXCEPT IN EXPOSED STRUCTURE AREAS 1/2"-2 #12 & 1 #12 GND THWN U.N.O.

CONDUIT AND/OR WIRE BELOW FLOOR OR GRADE 3/4"-2 #12 & 1 #12 GND THWN UNLESS NOTED

EXISTING CONDUIT AND/OR CONDUCTORS TO REMAIN (SHOWN LIGHT)

—OH—OH— OVERHEAD POWER LINES

CONDUIT RISER UP/DOWN

CONDUIT STUB OUT

S_b^a SINGLE POLE SWITCH @ +48" TO TOP UNLESS NOTED
a = DEVICE SWITCH IDENTIFICATION (LOWERCASE)
IF b:

F =	3 SPEED SWITCH	D =	DIMMER SWITCH
2 =	2 POLE SWITCH	K =	KEY OPERATED SWITC
3 =	3-WAY SWITCH	M =	MOTION SENSOR SW CH
4 =	4-WAY SWITCH	T =	THERMAL OVERLOAD ITCH
L =	BACKLIT SWITCH	TM =	SWITC DIGITAL

S_A SWITCH BANK (IDENTIFIED WITH UPPERCASE)

SINGLE RECEPTACLE @ +18" TO CE TER UNLESS NOTED

WALL MOUNTED DUPLEX RECEPTACLE 8" TO CENTER U.N.O.
= GFCI RECEPTACLE
= DOUBLE DUPLEX R CEPTACLE
= 1/2 SWITCHE (BO M HALF) DUPLEX RECEPTACLE

IF a:
C = RECEPTACLE INSTA D ABOVE COUNTER
H = RECEPTAC TALLE HORIZONTALLY
IF b:
MOUNTING H GHT IN ES TO TOP OF RECEPTACLE

SPECIAL TACLE @ +1 TO CENTER UNLESS NOTED

IF a:

R	CB = CIRCUIT BREAKER
= CONTACTOR	TC = TIME CLOCK
= POWER SUPPLY	PB = PUSH BUTTON TYPE CONTROL STATION

TE HONE/DATA OUTLET
4-PAIR CAT-6 CABLES (TYPE 'H')
PROVIDE CORRESPONDING FACEPLATE WITH QTY OF PORTS AS REQUIRED, WHERE "X" INDICATED NUMBER OF PORTS.

LUMINAIRE IDENTIFICATION
A = LUMINAIRE DESIGNATION (UPPERCASE)
a = SWITCH DESIGNATION (LOWERCASE)

SURFACE MOUNT TROFFER

LUMINAIRE ON EMERGENCY CIRCUIT OR INTEGRAL BATTERY BACK-UP

SUSPENDED LUMINAIRE

DOWNLIGHT LUMINAIRE

WALL MOUNTED LUMINAIRE

EMERGENCY BATTERY LIGHTING UNIT WITH TWIN HEADS

EMERGENCY ATTERY LIGHTING UNIT WITH TWIN HEADS AND EXIT SIGN

SURFA MOUNTED NELBOARD

MOU D PANELBOARD

MAIN SW CHBOARD, MOTOR CONTROL CENTER R DISTRIBUTION BOARD

CONCRETE PULLBOX WITH HEAVY DUTY STEEL TRAFFIC COVER

UTILITY PULLBOX

T1 TRANSFORMER (SIZE AND CLEARANCES BASED ON KVA RATING)

METER

N NON-FUSED DISCONNECT SWITCH

F FUSED DISCONNECT SWITCH

J JUNCTION BOX, IF a:
DO = DOOR HOLD OPEN
S = SIGNAGE
CF = CEILING FAN

COMBINATION METER/MAIN

FUSIBLE SWITCH

M SINGLE METER WITH CT,

CIRCUIT BREAKER

TRANSFORMER

HP MOTOR LOAD

AUTOMATIC TRANSFER SWITCH

GROUND BUS & GROUND ELECTRODES

ELECTRICAL ABBREVIATIONS

AF	AMP FUSE (FOR FUSES), AMP FRAME (FOR CIRCUIT BREAKERS)
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHJ	LOCAL AUTHORITY HAVING JURISDICTION
AT	AMP TRIP
ATS	AUTOMATIC TRANSFER SWITCH
MTS	MANUAL TRANSFER SWITCH
C	CONDUIT
CONT	CONTINUATION
CU	COPPER
CW	COLD WATER PIPE
AFCI	INDICATES ARC FAULT CIRCUIT INTERRUPTER WITH DEDICATED NEUTRAL
GFCI	GROUND FAULT CIRCUIT INTERRUPTER WITH DEDICATED NEUTRAL
GFI	GROUND FAULT CIRCUIT INTERRUPTER WITH DEDICATED NEUTRAL
GFP	GROUND FAULT PROTECTION
GND	GROUND
HELCO	ELECTRICAL UTILITY COMPANY
IWP	IN-USE WEATHER-PROOF (NEMA 3R)
LO	LUGS ONLY (SEE ALSO MLO)
MCB	MAIN CIRCUIT BREAKER
MLO	MAIN LUGS ONLY
NEC	NATIONAL ELECTRICAL CODE, AS ADOPTED BY THE AHJ
P	POLE
PH	PHASE
PNL	INDICATES PANEL
S/N	SOLID NEUTRAL
TYP	TYPICAL
UPS	UNINTERRUPTIBLE POWER SYSTEM
WP	WEATHER-PROOF (NEMA 3R)
XFMR	TRANSFORMER
UNO	UNLESS NOTED OTHERWISE
(D)	DEMOLITION
(E)	EXISTING
(N)	NEW
(R)	RELOCATE/RELOCATED
+18"	INDICATES MOUNTING HEIGHTS ARE TO CENTERLINE OF DEVICE AFF OR AFG

REVISION NO.	SYMBOL	DESCRIPTION	SHT.___ OF___	DATE

ELI B. WALTZ
LICENSED PROFESSIONAL ENGINEER
Exp. 04/30/22
No. 18572-E
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION, CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION.

SIGNATURE

UNIVERSITY OF HAWAI`I AT HILO
STATE OF HAWAI`I

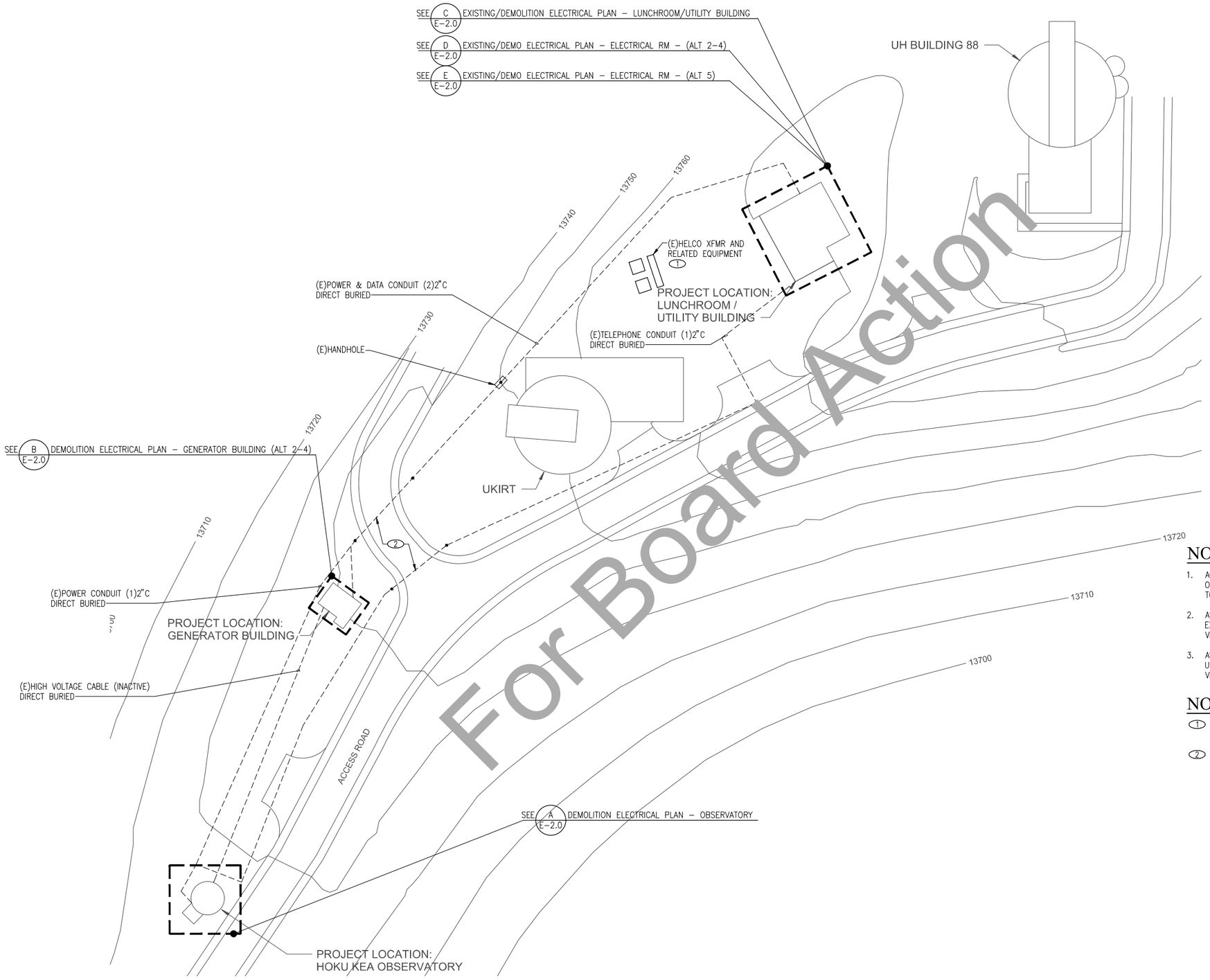
Hōkū Ke`a Decommissioning

University of Hawai`i at Hilo

ELECTRICAL SYMBOLS, IECC & ABBREVIATIONS

SSFM INTERNATIONAL, INC.

DESIGNED BY: CF	CHECKED BY: EW	PROJECT NO. UHH-16029	SHEET E-0.0
DRAWN BY: CF	APPROVED BY: EW	DATE MAY 2020	OF___SHTS
SCALE: AS NOTED			



NOTICES

1. ACCURACY OF UTILITY LINES FOR DIAGRAMMATIC PURPOSES ONLY. ACTUAL LOCATIONS TO BE DETERMINED THROUGH TONING AND ON SITE VERIFICATION.
2. ASSUME DEPTH OF 18" DIRECT BURIED CONDITION UNDER EXISTING GRADE FOR BIDDING PURPOSES. CONTRACTOR TO VERIFY IN FIELD.
3. ASSUME DEPTH OF 24" CONCRETE ENCASED CONDITION UNDER ROADWAY FOR BIDDING PURPOSES. CONTRACTOR TO VERIFY IN FIELD.

NOTES

(1) TRANSFORMER POWERS UH88 AND MUST REMAIN IN PLACE.

(2) CONDUIT IS CONCRETE ENCASED BENEATH ROADWAY.

A OVERALL ELECTRICAL SITE PLAN
SCALE: 1" = 30' 0 30' 60'

REVISION NO.	SYMBOL	DESCRIPTION	SHT.___ OF___	DATE

ELI B. WALTZ
LICENSED PROFESSIONAL ENGINEER
Exp. 04/30/22
No. 18572-E
HAWAII, U.S.A.

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SIGNATURE

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STATE OF HAWAI`I

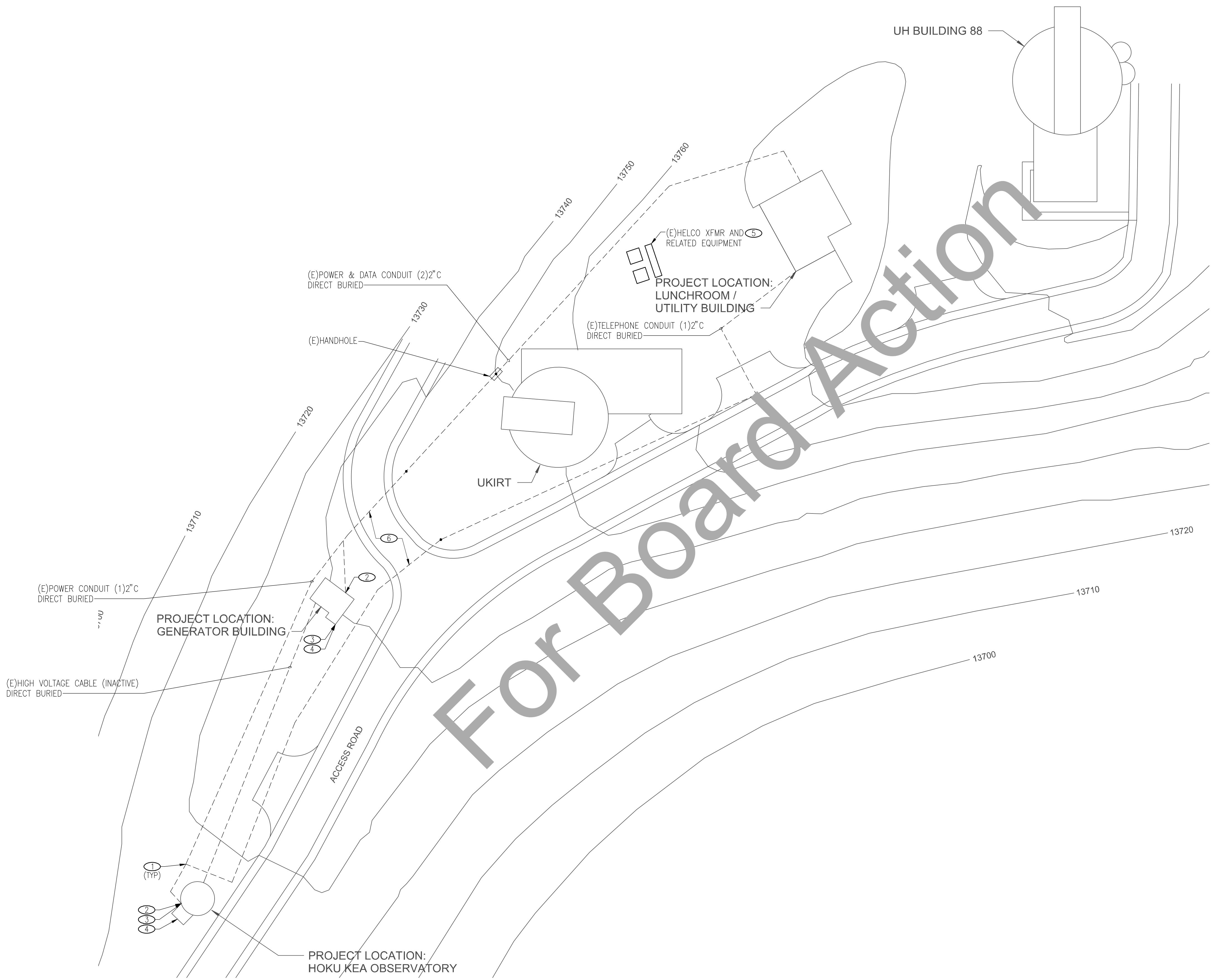
Hōkū Ke`a Decommissioning

University of Hawai`i at Hilo

OVERALL ELECTRICAL SITE PLAN

SSFM INTERNATIONAL, INC.

DESIGNED BY: CF	CHECKED BY: EW	PROJECT NO. UHH-16029	SHEET E-1.0
DRAWN BY: CF	APPROVED BY: EW	DATE MAY 2020	OF___SHTS
SCALE: AS NOTED			



A EXISTING/DEMOLITION ELECTRICAL PLAN SITE - ALTERNATIVE 2

SCALE: 1" = 30'

0 30' 60'

NOTICES

1. ASSUME DEPTH OF 18" DIRECT BURIED CONDITION UNDER EXISTING GRADE FOR BIDDING PURPOSES. CONTRACTOR TO VERIFY IN FIELD.
2. ASSUME DEPTH OF 24" CONCRETE ENCASED CONDITION UNDER ROADWAY FOR BIDDING PURPOSES. CONTRACTOR TO VERIFY IN FIELD.

NOTES

(1) REMOVE CONDUCTORS INSIDE CONDUIT FROM OBSERVATORY AND GENERATOR BUILDING BACK TO SOURCE.

(2) CUT AND CAP CONDUIT RISERS AND DIRECT BURIED CABLES EMERGING FROM GRADE AT 12" BELOW FINISH GRADE.

(3) REMOVE CONDUITS AND GROUND WIRE EMBEDDED IN FOUNDATION.

(4) SEE ARCHITECTURAL DRAWINGS FOR BUILDING AND FOUNDATION DEMOLITION.

(5) TRANSFORMER POWERS UH88 AND MUST REMAIN IN PLACE.

(6) CONDUIT IS CONCRETE ENCASED BENEATH ROADWAY.

REVISION NO.	SYMBOL	DESCRIPTION	SHT. OF	DATE

UNIVERSITY OF HAWAI`I AT HILO
STATE OF HAWAI`I

ELI B. WALTZ · LICENSED PROFESSIONAL ENGINEER · Exp. 04/30/22 · No. 18572-E · HAWAII, U.S.A.

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SIGNATURE

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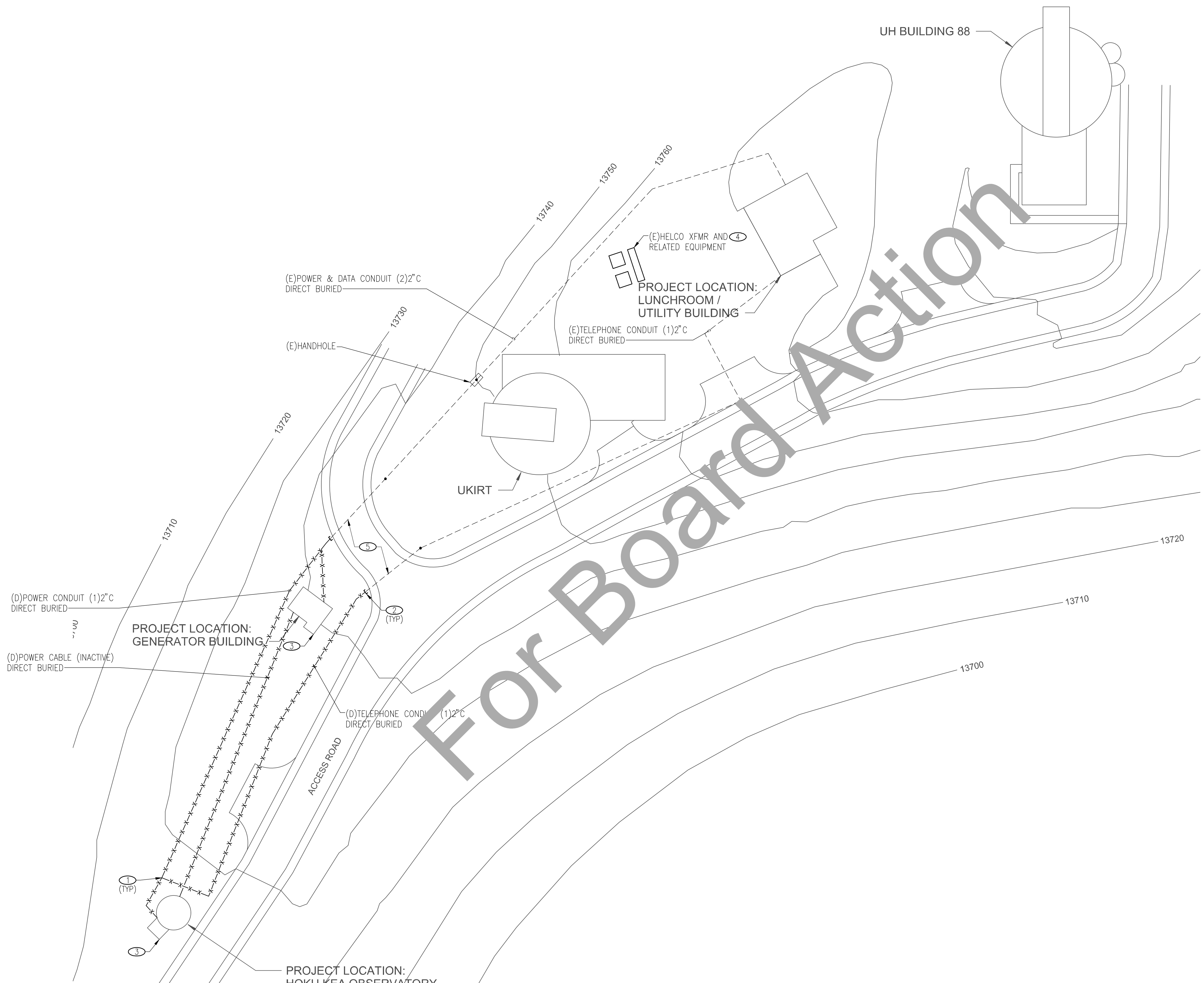
University of Hawai`i at Hilo

EXISTING/DEMOLITION ELECTRICAL PLAN SITE - ALT. 2

SSFM INTERNATIONAL, INC.

DESIGNED BY: CF	CHECKED BY: EW	PROJECT NO. UHH-16029	SHEET E-1.1
DRAWN BY: CF	APPROVED BY: EW	DATE MAY 2020	
SCALE: AS NOTED			OF ___ SHTS



A EXISTING/DEMOLITION ELECTRICAL PLAN SITE - ALTERNATIVE 3

SCALE: 1" = 30'

0 30' 60'

N

NOTICES

1. ASSUME DEPTH OF 18" DIRECT BURIED CONDITION UNDER EXISTING GRADE FOR BIDDING PURPOSES. CONTRACTOR TO VERIFY IN FIELD.
2. ASSUME DEPTH OF 24" CONCRETE ENCASED CONDITION UNDER ROADWAY FOR BIDDING PURPOSES. CONTRACTOR TO VERIFY IN FIELD.

NOTES

1. REMOVE CONDUCTORS INSIDE CONDUIT FROM OBSERVATORY AND GENERATOR BUILDING BACK TO SOURCE.
2. DEMOLISH CONDUIT AND DIRECT BURIED CABLES FROM OBSERVATORY TO ROADWAY. CAP EXISTING CONDUIT TO REMAIN IN PLACE.
3. SEE ARCHITECTURAL DRAWINGS FOR BUILDING AND FOUNDATION DEMOLITION.
4. TRANSFORMER POWERS UH88 AND MUST REMAIN IN PLACE.
5. CONDUIT IS CONCRETE ENCASED BENEATH ROADWAY.

REVISION NO.	SYMBOL	DESCRIPTION	SHT.___ OF___	DATE

UNIVERSITY OF HAWAI`I AT HILO
STATE OF HAWAI`I

Hōkū Ke`a Decommissioning

University of Hawai`i at Hilo

ELI B. WALTZ LICENSED PROFESSIONAL ENGINEER Exp. 04/30/22 No. 18572-E HAWAII, U.S.A.

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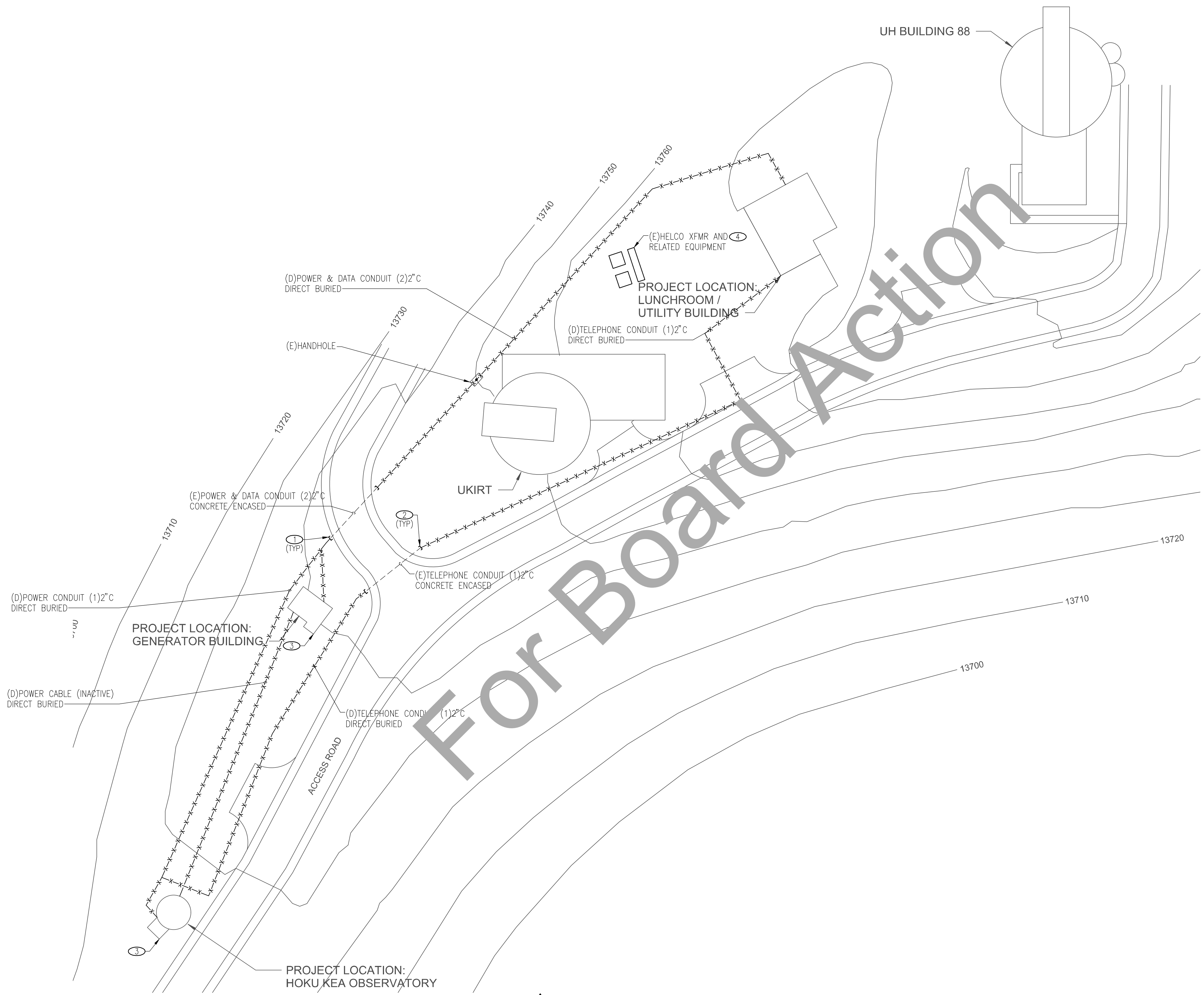
EXISTING/DEMOLITION ELECTRICAL PLAN SITE - ALT. 3

SSFM INTERNATIONAL, INC.

DESIGNED BY: CF	CHECKED BY: EW	PROJECT NO. UHH-16029	SHEET E-1.2
DRAWN BY: CF	APPROVED BY: EW	DATE MAY 2020	OF____SHTS
SCALE: AS NOTED			



NOTICES

1. ASSUME DEPTH OF 18" DIRECT BURIED CONDITION UNDER EXISTING GRADE FOR BIDDING PURPOSES. CONTRACTOR TO VERIFY IN FIELD.
2. ASSUME DEPTH OF 24" CONCRETE ENCASED CONDITION UNDER ROADWAY FOR BIDDING PURPOSES. CONTRACTOR TO VERIFY IN FIELD.

NOTES

1. DEMOLISH CONDUIT AND DIRECT BURIED CABLES FROM OBSERVATORY AND GENERATOR BUILDING TO ROADWAY. CAP EXISTING CONDUIT BENEATH ROADWAY TO REMAIN IN PLACE.
2. DEMOLISH CONDUIT AND DIRECT BURIED CABLES FROM ROADWAY TO LUNCHROOM/UTILITY BUILDING. CAP EXISTING CONDUIT BENEATH ROADWAY TO REMAIN IN PLACE.
3. SEE ARCHITECTURAL DRAWINGS FOR BUILDING AND FOUNDATION DEMOLITION.
4. TRANSFORMER POWERS UH88 AND MUST REMAIN IN PLACE.

A EXISTING/DEMOLITION ELECTRICAL PLAN SITE - ALTERNATIVE 4

SCALE: 1" = 30'

0 30' 60'

N

REVISION NO.	SYMBOL	DESCRIPTION	SHT.___ OF___	DATE

UNIVERSITY OF HAWAI`I AT HILO
STATE OF HAWAI`I

ELI B. WALTZ — LICENSED PROFESSIONAL ENGINEER — Exp. 04/30/22 — No. 18572-E — HAWAII, U.S.A.

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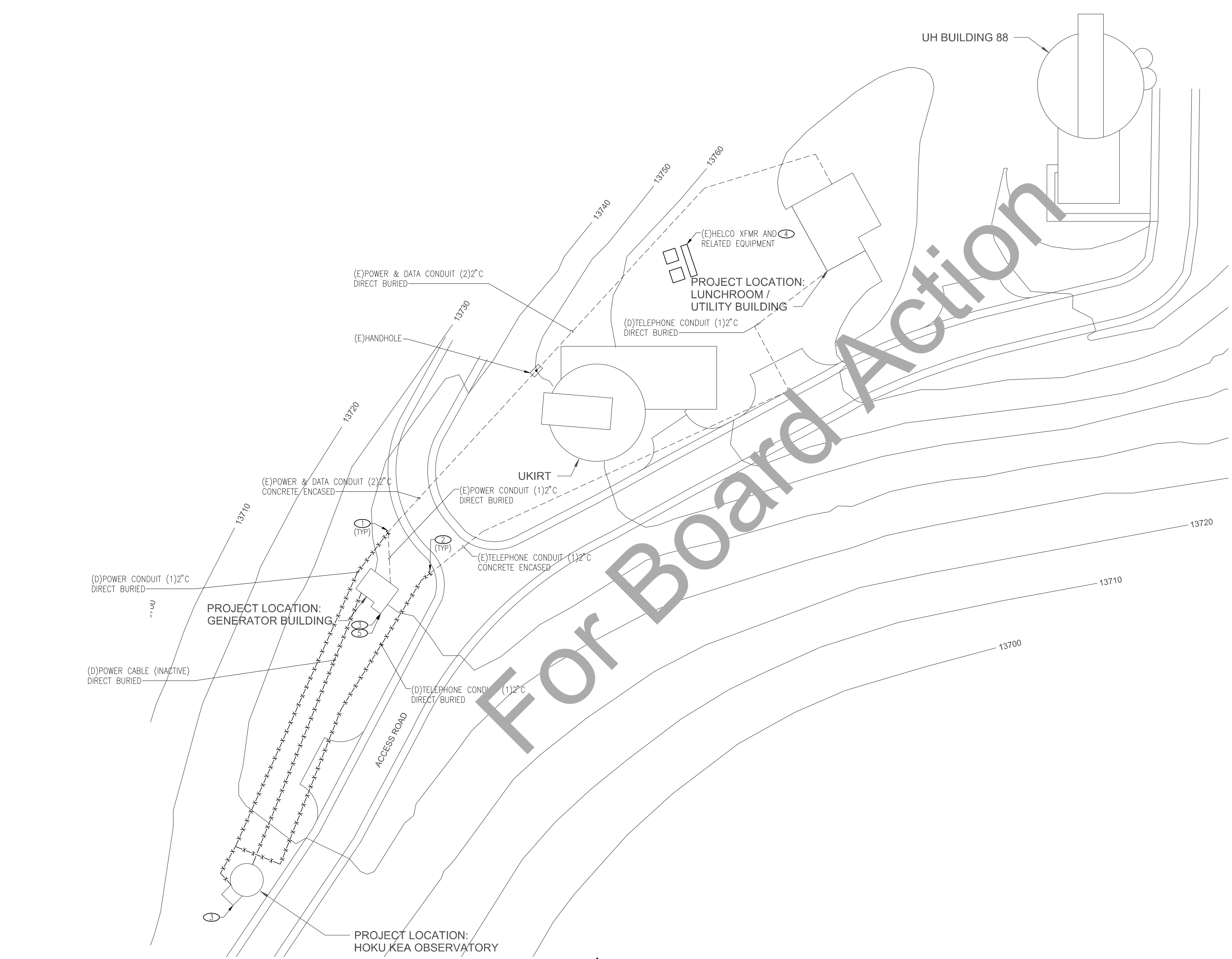
University of Hawai`i at Hilo

EXISTING/DEMOLITION ELECTRICAL PLAN SITE - ALT. 4

SSFM INTERNATIONAL, INC.

DESIGNED BY: CF	CHECKED BY: EW	PROJECT NO. UHH-16029	SHEET E-1.3
DRAWN BY: CF	APPROVED BY: EW	DATE MAY 2020	OF____SHTS
SCALE: AS NOTED			



A EXISTING/DEMOLITION ELECTRICAL PLAN SITE - ALTERNATIVE 5

SCALE: 1" = 30'

0 30' 60'

N

NOTICES

1. ASSUME DEPTH OF 18" DIRECT BURIED CONDITION UNDER EXISTING GRADE FOR BIDDING PURPOSES. CONTRACTOR TO VERIFY IN FIELD.
2. ASSUME DEPTH OF 24" CONCRETE ENCASED CONDITION UNDER ROADWAY FOR BIDDING PURPOSES. CONTRACTOR TO VERIFY IN FIELD.

NOTES

(1) DEMOLISH CONDUIT AND DIRECT BURIED CABLES FROM OBSERVATORY TO GENERATOR BUILDING. CAP EXISTING CONDUIT AT DIVERGENCE TO OBSERVATORY TO REMAIN IN PLACE.

(2) DEMOLISH CONDUIT AND DIRECT BURIED CABLES FROM OBSERVATORY TO ROADWAY. CAP EXISTING CONDUIT TO REMAIN IN PLACE.

(3) SEE ARCHITECTURAL DRAWINGS FOR BUILDING AND FOUNDATION DEMOLITION.

(4) TRANSFORMER POWERS UH88 AND MUST REMAIN IN PLACE.

(5) NO ELECTRICAL WORK TAKES PLACE WITHIN GENERATOR BUILDING.

REVISION NO.	SYMBOL	DESCRIPTION	SHT.____ OF____	DATE

UNIVERSITY OF HAWAI`I AT HILO
STATE OF HAWAI`I

ELI B. WALTZ — LICENSED PROFESSIONAL ENGINEER — Exp. 04/30/22 — No. 18572-E — HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION, CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION.

SIGNATURE

Hōkū Ke`a Decommissioning

University of Hawai`i at Hilo

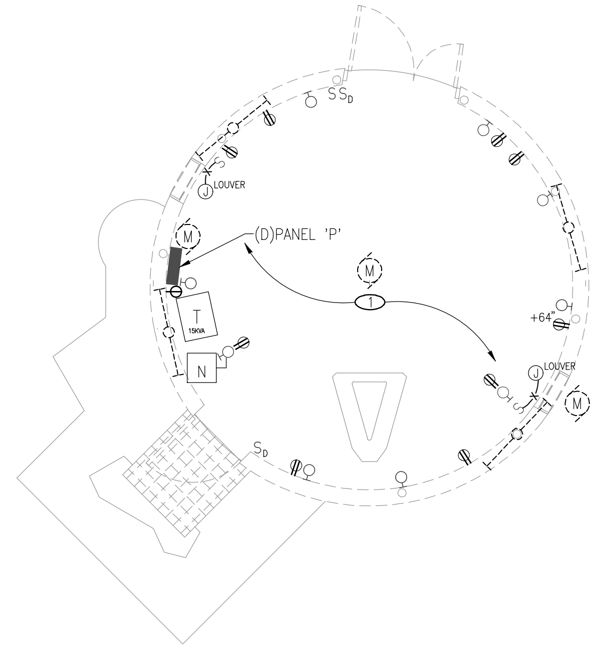
EXISTING/DEMOLITION ELECTRICAL PLAN SITE - ALT. 5

SSFM INTERNATIONAL, INC.

DESIGNED BY: CF	CHECKED BY: EW	PROJECT NO. UHH-16029	SHEET E-1.4
DRAWN BY: CF	APPROVED BY: EW	DATE MAY 2020	OF____SHTS
SCALE: AS NOTED			

NOTES

1. REMOVE ALL EXISTING ELECTRICAL CONDUIT, LIGHT FIXTURES, OUTLETS, WIRING, EQUIPMENT AND WIRING DEVICES IN THIS BUILDING. REMOVE ALL FEEDERS COMPLETE BACK TO MAIN SERVICE DISCONNECT



A DEMOLITION ELECTRICAL PLAN - OBSERVATORY
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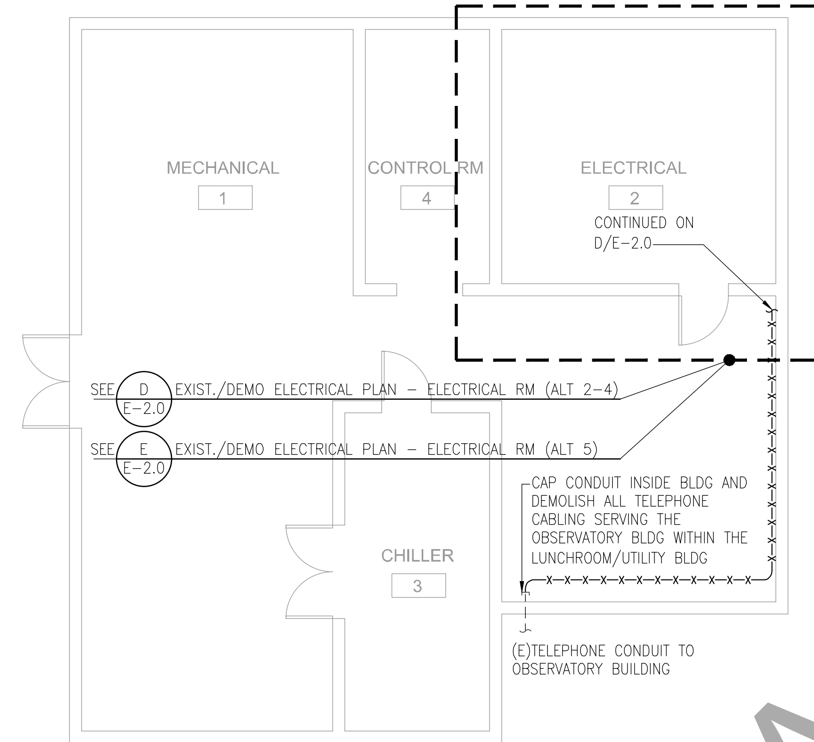
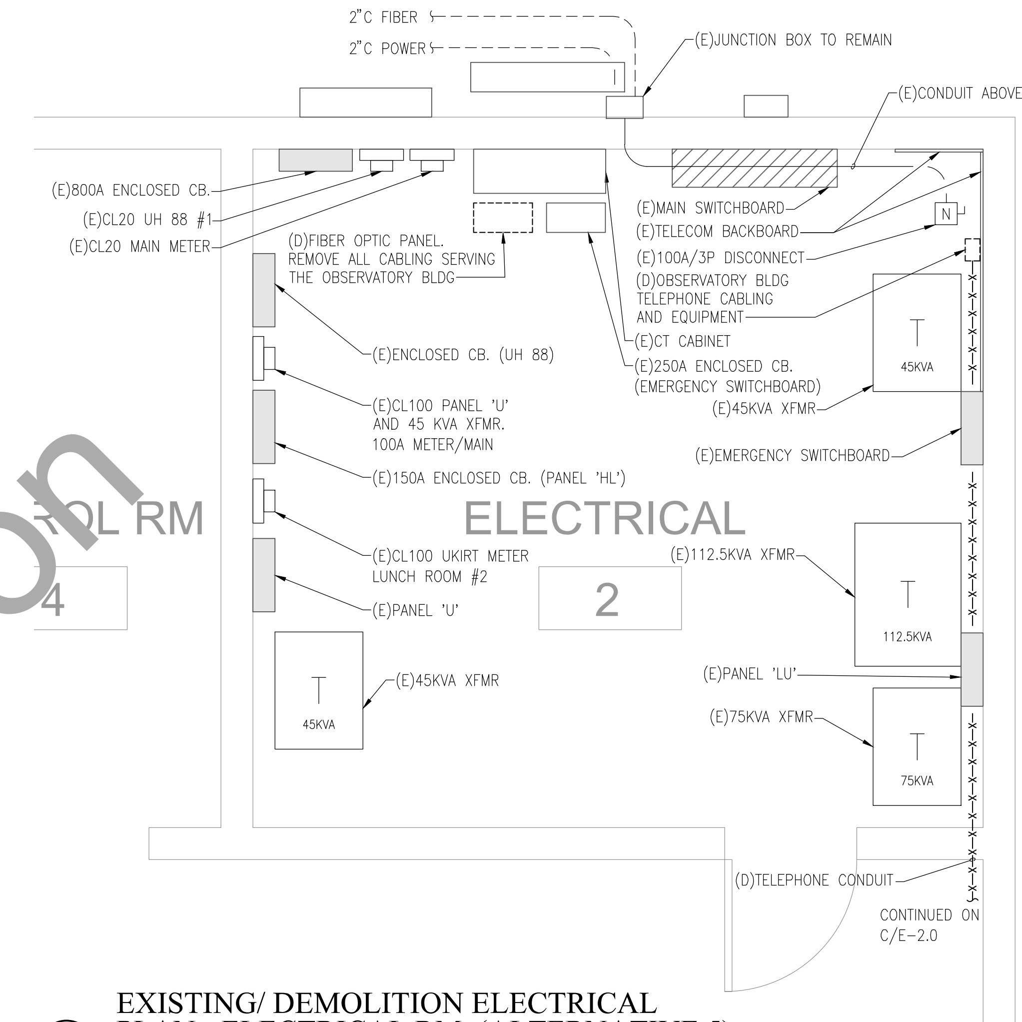


C EXISTING/ DEMOLITION ELECTRICAL PLAN - LUNCHROOM/UTILITY BUILDING
SCALE: 3/16" = 1'-0"



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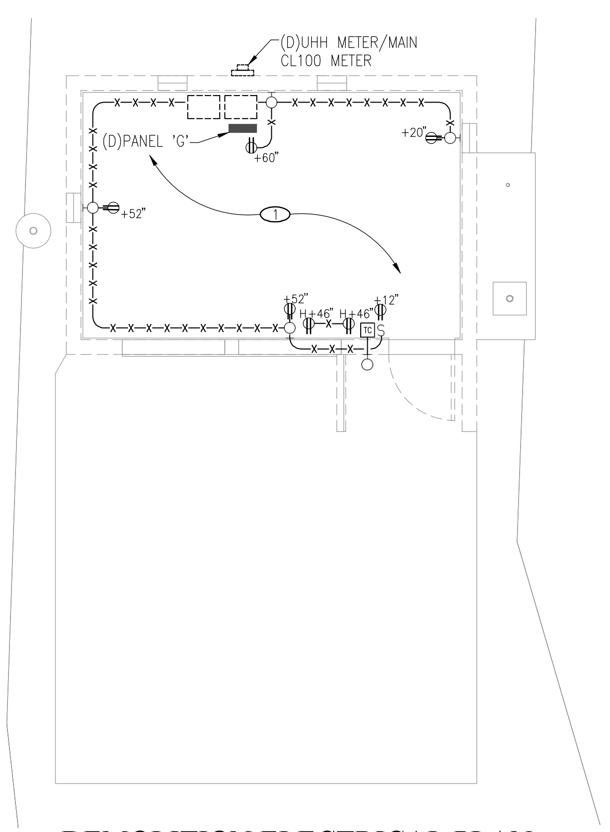

B DEMOLITION ELECTRICAL PLAN - GENERATOR BUILDING (ALTERNATIVES 2-4)
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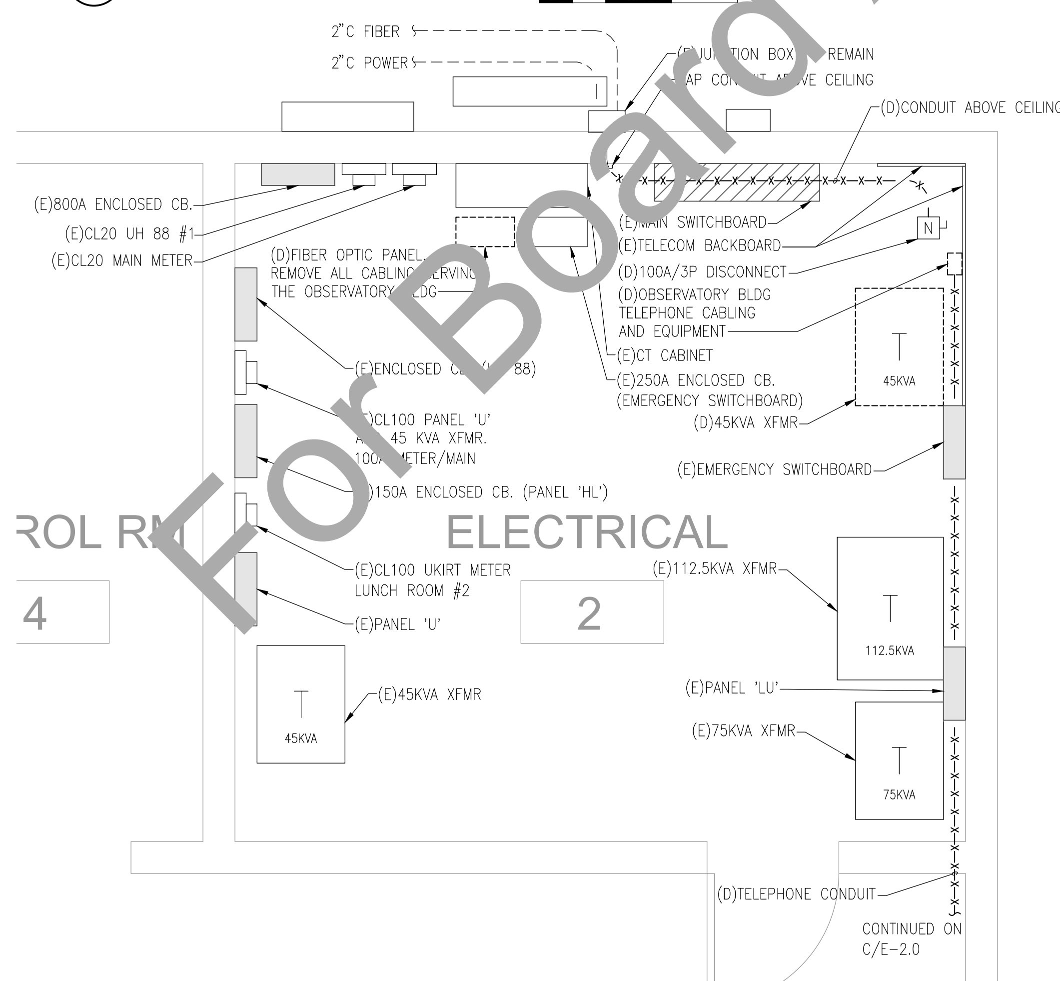

D EXISTING/ DEMOLITION ELECTRICAL PLAN - ELECTRICAL RM (ALTERNATIVES 2-4)
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LEGEND

Symbol	Description
(dashed box)	ELECTRICAL DEMOLITION. REMOVE EQUIPMENT AND APPURTENANCES IN THEIR ENTIRETY U.N.O. DENOTED WITH (D).
–x–x–x–	DEMOLISH CONDUIT AND/OR CONDUCTORS. DENOTED WITH (D).
(light line)	EXISTING CONDUIT AND/OR CONDUCTORS TO REMAIN. DENOTED WITH (E). (SHOWN LIGHT)
(heavy line)	CONDUIT/WIRE CONCEALED IN WALL OR ABOVE CEILING
(dashed line)	CONDUIT AND/OR WIRE BELOW FLOOR OR GRADE

REVISION NO.	SYMBOL	DESCRIPTION	SHT. ___ OF ___	DATE

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STATE OF HAWAI`I

Hōkū Ke`a Decommissioning

University of Hawai`i at Hilo

DEMOLITION ELECTRICAL PLANS

SSFM INTERNATIONAL, INC.

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DRAWN BY: CF	APPROVED BY: EW	DATE MAY 2020	
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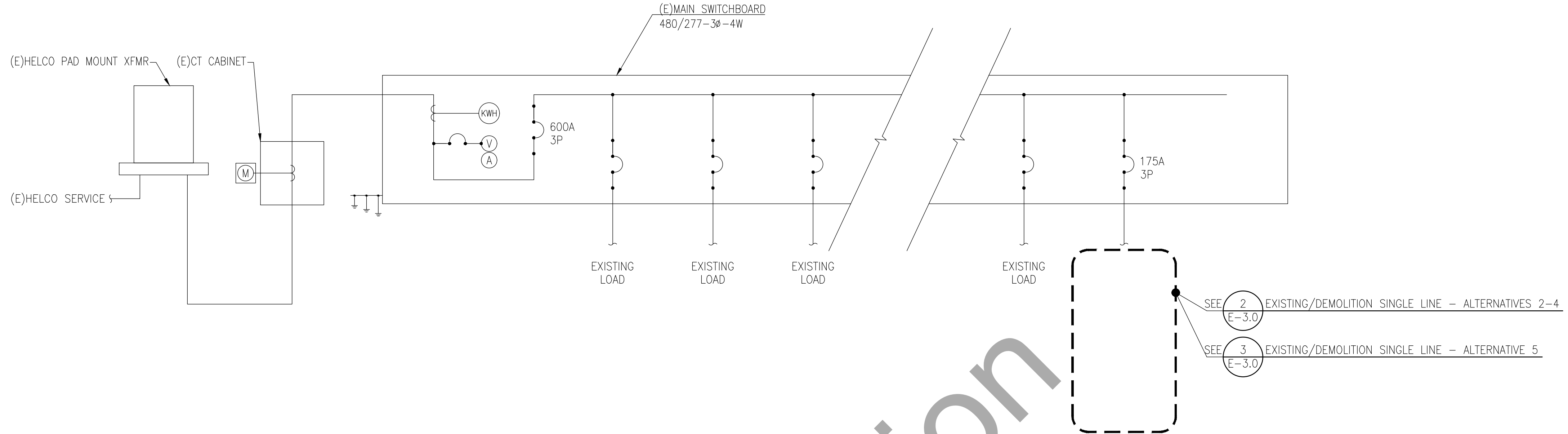

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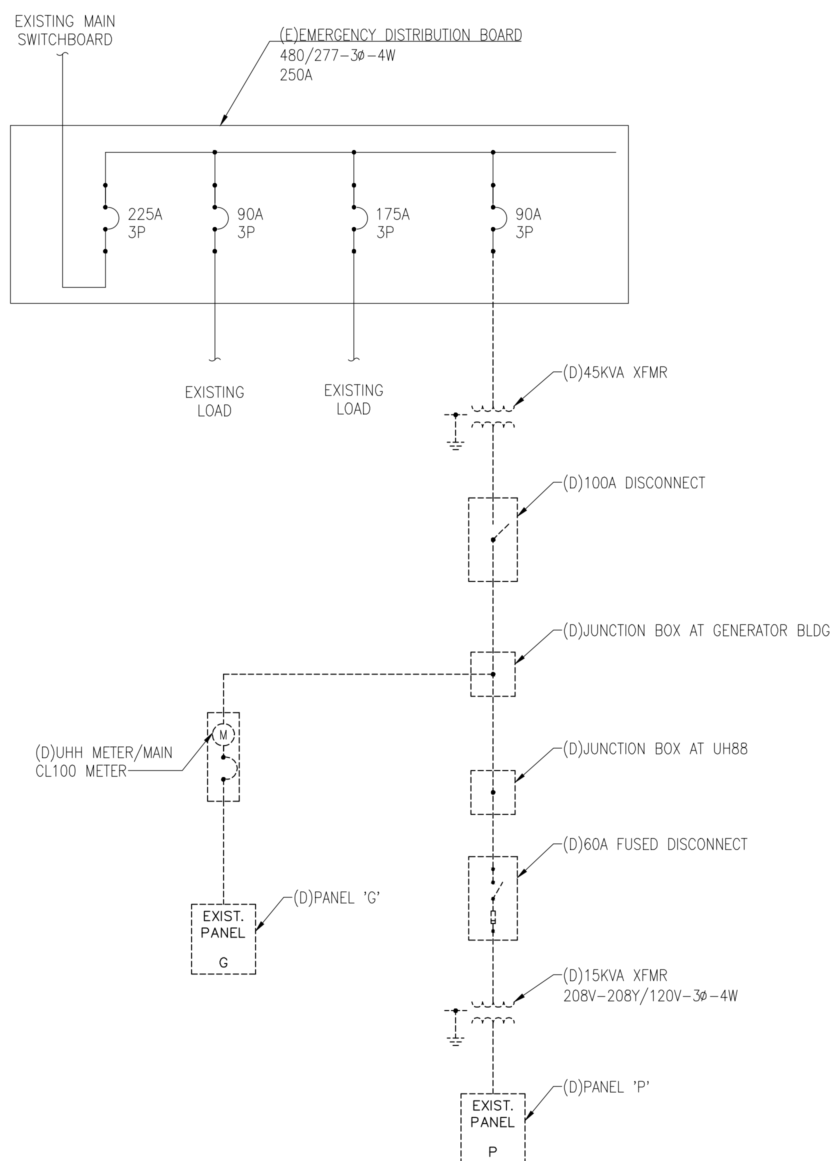
NO SCALE



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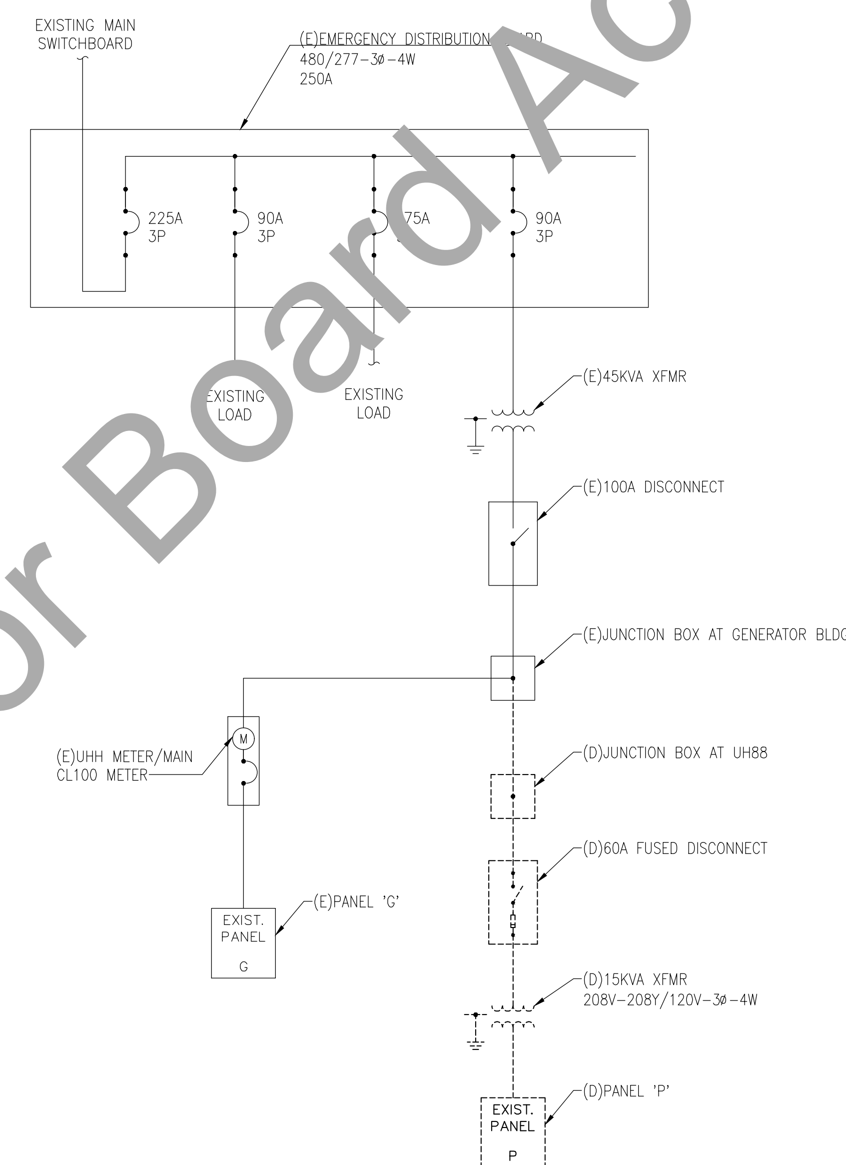
NO SCALE



3 EXISTING/DEMOLITION SINGLE LINE - ALTERNATIVE 5

NO SCALE

REVISION NO.	SYMBOL	DESCRIPTION	SHT. OF	DATE

UNIVERSITY OF HAWAI'I AT HILO
STATE OF HAWAI'I

Hōkū Ke`a Decommissioning

University of Hawai`i at Hilo

DETAILS AND SINGLE LINES

ELI B. WALTZ
LICENSED PROFESSIONAL ENGINEER
Exp. 04/30/22
No. 18572-E
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION. CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION.

SIGNATURE

SSFM INTERNATIONAL, INC.

DESIGNED BY: CF	CHECKED BY: EW	PROJECT NO. UHH-16029	SHEET E-3.0
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APPENDIX B

Cultural Setting Report

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REVISED PRELIMINARY DRAFT REPORT
Cultural Setting Report in Support of the Hōkū Keʻa Decommissioning Project, Mauna Kea, Hawaiʻi Island, Hawaiʻi

TMK: (3) 4-4-015:009 por

Prepared For:
SSFM International
99 Aupuni Street, Suite 202
Hilo, Hawaii 96720

Prepared By:
Pacific Consulting Services, Inc.
720 Iwilei Road, Suite 424
Honolulu, HI 96817

December 2020

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MANAGEMENT SUMMARY

Document Title:	Cultural Setting Report Assessment in Support of the Hōkū Keʻa Decommissioning Project, Mauna Kea, Hawaiʻi Island
Date/Revised Date:	Preliminary Draft: July 2020; draft December 2020
Archaeological Permit #:	SHPD Permit No. 20-29
Project Location:	Mauna Kea Science Reserve, Kaʻohe Ahupuaʻa, Hāmākua District, Island of Hawaiʻi
Project TMK:	TMK (3) 4-4-015:009 por.
Land Owner:	State of Hawaiʻi
Project Proponents:	University of Hawaii-Hilo
Project Tasks:	Cultural Setting Report; Architectural Assessment
Project Acreage:	2,178 square ft (.05 acres).
Principal Investigator:	Dennis Gosser, M.A.
Regulatory Oversight:	Hawaii Revised Statutes (HRS) Chapter 343 and 6E-7 and 6E-8, and Hawaii Administrative Rules (HAR), Chapter 275
Project Background:	The project scope of work includes the removal of the Hōkū Keʻa Observatory and Generator Buildings and subsurface utilities
SIHP #:	50-10-23-21438 (Kūkahauʻula, Traditional Cultural Property; 50-10-23-26869 Maunakea Summit Historic District
Findings:	Archaeological investigations have documented four historic properties within a 500-meter radius of the project area; 50-10-23-21438 (TCP), 50-10-23-26224 (USGS marker), and 50-10-23-21209 (possible burial, deconstructed).
Human Skeletal Remains:	None identified within the project area.
Recommendations:	**Architecture** **Recommended effect determination:** No historic properties affected **Archaeology:** **Recommended effect determination:** No historic properties affected **Recommended commitments:** Because the project will occur within a TCP (Kūkahauʻula) and a non-site portion of the Maunakea Summit Historic District, archaeological monitoring of ground-disturbing activities (with an SHPD-approved monitoring plan) is recommended Implement a Site Restoration Plan in accordance with the 2010 Decommissioning Plan for the Mauna Kea Observatories (a sub-plan of the Mauna Kea Comprehensive Management Plan).

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1.0 INTRODUCTION

Under contract to SSFM, International (SSFM), Pacific Consulting Services, Inc. (PCSI) has prepared this Cultural Setting Report (CSR) in support of the Hōkū Keʻa Decommissioning Project in the 525-acre Astronomy Precinct, which is located within the approximately 11,288-acre University of Hawaiʻi-leased (Lease No. S-419) Mauna Kea Science Reserve (MKSR) on Mauna Kea[1], Kaʻohe Ahupuaʻa, Hāmākua District, Island of Hawaiʻi (TMK [3] 4-4-015:009 por.). The project proponent is the University of Hawaiʻi-Hilo (UHH), and the land owner is the State of Hawaiʻi. The location of the proposed project is shown in Figures 1 and 2. The overall project goals are to remove the Hōkū Keʻa Observatory and Generator buildings (Figure 3), including foundations and associated subsurface utilities, and restore the approximately 2,178-square foot (0.05 acres) site. The Architectural Reconnaissance Level Survey (RLS) undertaken by MASON is included as Appendix A.

1.1 Project Purpose, Regulatory Guidance, and Area of Potential Effect (APE)

The objective of developing this CSR is to gather together information concerning historic properties, cultural resources, and traditional practices that may be impacted by the proposed Hōkū Keʻa Decommissioning project. The report is similar in scope to and serves the same purpose as a Cultural Impact Assessment (CIA), which is to "…ensure that environmental concerns are given appropriate consideration in decision making…" (Hawaii Revised Statutes [HRS] Chapter 343-1). In other sections of HRS 343 (the Statute providing regulatory oversight for environmental impact statements), it is clear that environmental concerns include historic sites and cultural practices. It is beyond the scope of the current document to address concerns unrelated to historic properties and cultural resources.

In addition to the applicable sub chapters of HRS 343, the current study draws upon and is in compliance with HRS Chapter 6E-8 as well as Title 13 of the Hawaii Administrative Rules (HAR), Subtitle 13 (State Historic Preservation Division Rules), Chapter 275: (Rules Governing Procedures for Historic Preservation Review for Governmental Projects).

The proposed project activities include:

- Deconstruction and removal of the Hōkū Keʻa Observatory and Generator Building;
- Exposure and removal of subsurface utilities between the observatory and the generator buildings; and
- Restoration of the site landscape

The Area of Potential Effect is approximately 0.25 acres bounded on the north, south, and east by a paved road and on the west by a steep slope (see Figure 2).

1.2 Methods

Understanding the cultural setting of an area includes compiling and analyzing archival, historical, and traditional information from many sources. In addition to written or published sources, identifying and inviting individuals and groups to share their knowledge relating to traditional practices and beliefs is important to developing a well-rounded, informed, understanding of a proposed project's cultural setting.

Prior to contacting and consulting[2] with interested parties familiar with and knowledgeable of Maunakea's cultural traditions, PCSI staff conducted a historical and archaeological literature review of the Hōkū Keʻa Decommissioning project area in order to assess any potential effect on

[1] Where applicable, geographic names follow the Hawaii Geographic Names Board Place Names (October 2018).

[2] Because of State and County imposed restrictions due to the COVID-19 pandemic, consultation for this project relied solely on USPS mail, email, and other electronic means.

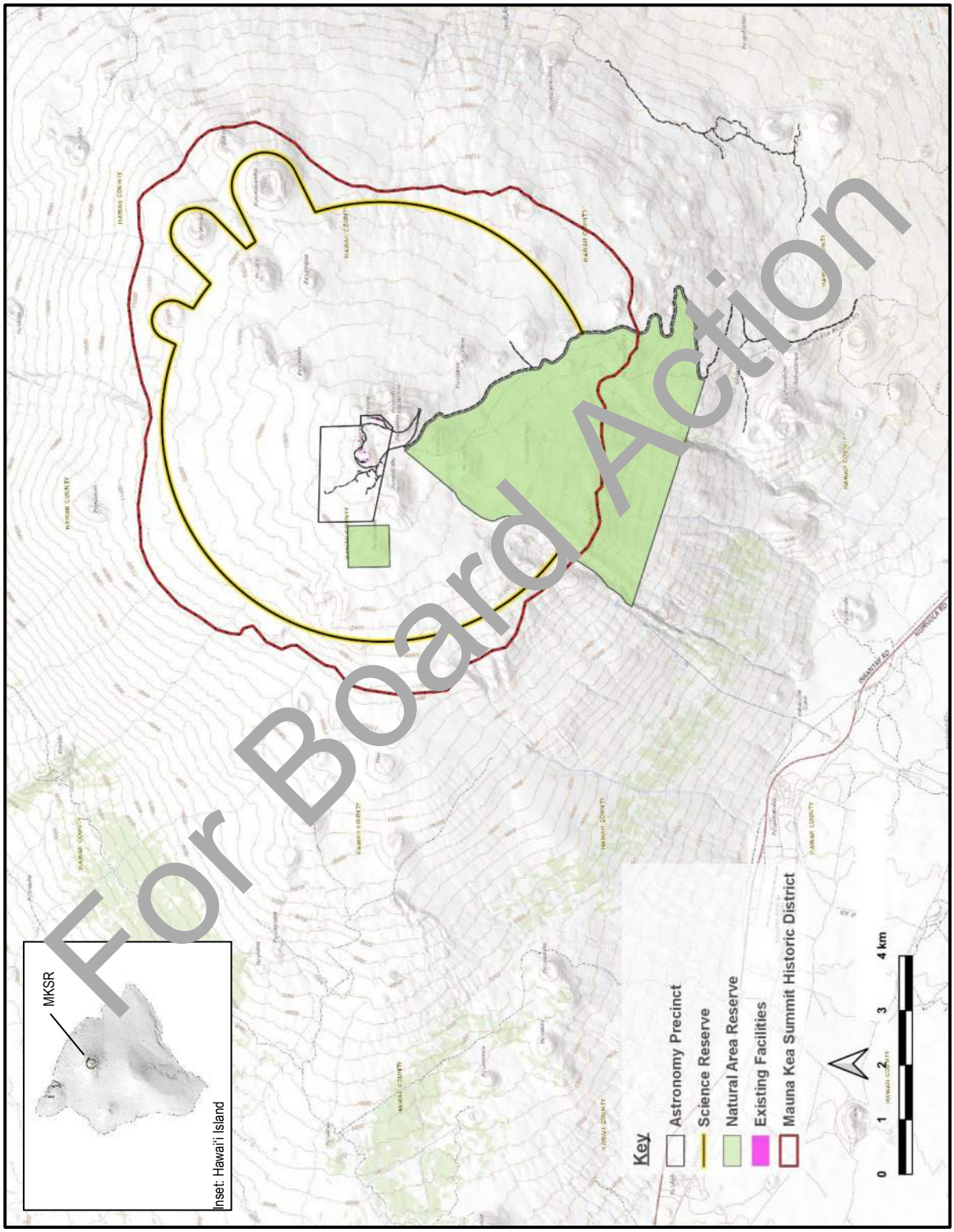

Figure 1. Mauna Kea Science Reserve Shown on the USGS 1:250,000 Topographic Sheet (1975).

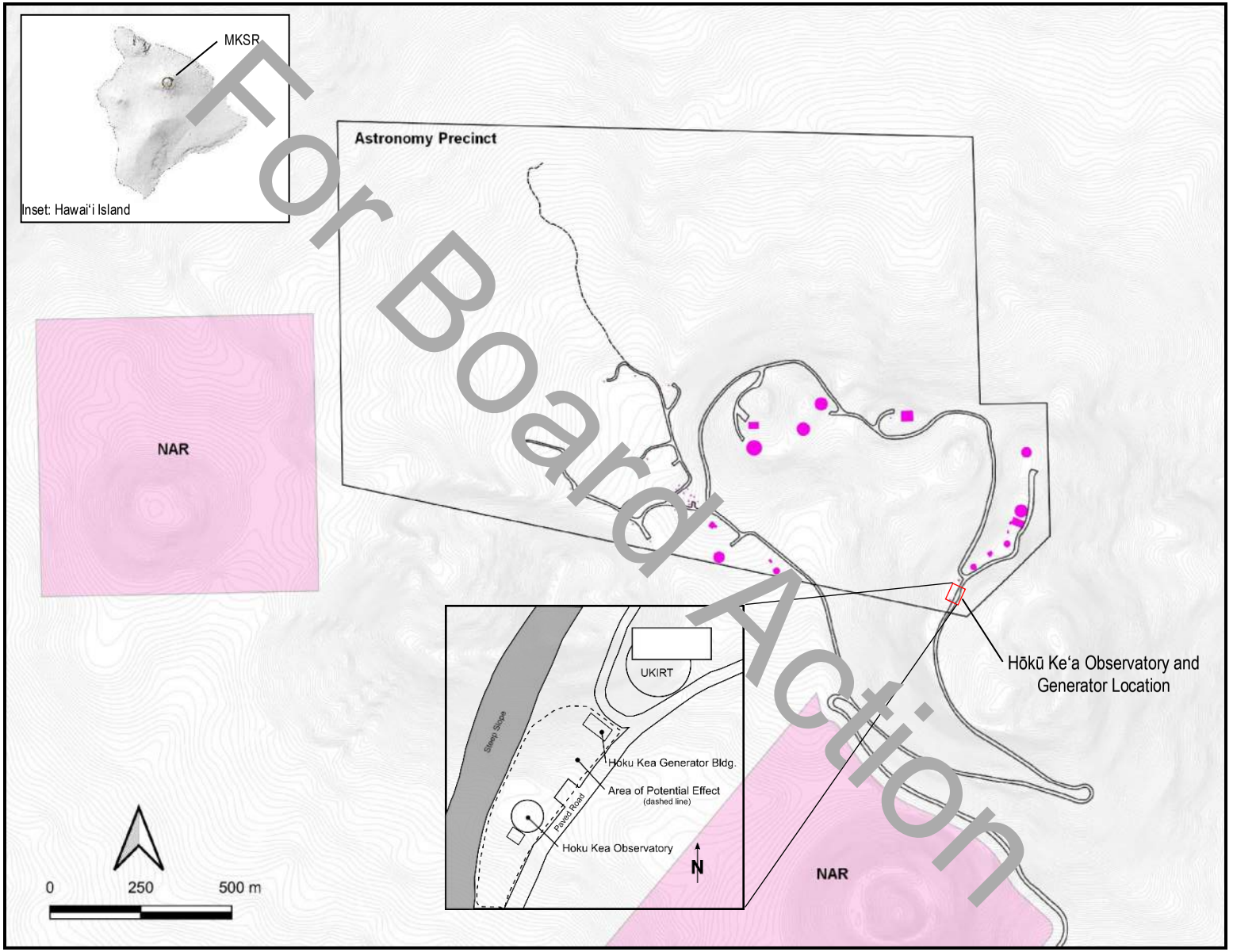

Figure 2. Mauna Kea Summit Region and Astronomy Precinct Showing the Location of the Hōkū Ke'a Observatory and Generator Buildings and APE.

1

Figure 3. Top: Hōkū Keʻa Observatory, View to the South.
Bottom: Hōkū Keʻa Generator Building, View to the West.

historic properties or other cultural resources. The background research was completed using various documentary and archival resources, including the State Historic Preservation Division's (SHPD) database of archaeological reports, the SHPD report library, a Land Commission Awards (LCA) review via the Bureau of Conveyances, a review of historic maps, and a review of Mauna Kea reports on file at PCSI. Because the project area has been the subject of several archaeological studies, including an SHPD-approved archaeological inventory survey (AIS; McCoy and Nees 2010), no ground-disturbing archaeological activities (e.g., archaeological excavations) have been undertaken or are being considered as part of the current project.

Finally, consultation letters for this CSR were sent to a broad spectrum of the community (e.g., organizations, government agencies, and individuals) for input. The results of the consultation are presented in the Project Impact Assessment section. The full list of contacts and respondents are presented in Appendix B.

2.0 BACKGROUND

2.1 SETTING

Mauna Kea is the highest (4,205 m[3] [13,796 ft] above sea level [asl]) and second largest of the five shield volcanoes forming the island of Hawai'i and is between 600,000 and 1.5 million years old (DePaolo and Stolper 1996; Moore and Clague 1992; Sharp and Renne 2005; Wolfe et al. 1997;). The oldest stage of volcanism consists of a basaltic shield called the Hāmākua Volcanic Series (Stearns and Macdonald [1946]) or the Hāmākua Group (Porter 1979a). The most recent stage of volcanism consists of andesitic lavas (Macdonald and Abbott 1970:142; Sherrod et al. 2007; Wolfe and Morris 1996; Wolfe et al. 1997) called the Laupāhoehoe Volcanic Series (Stearns and Macdonald [1946]) or the Laupāhoehoe Group (Porter 1979a) (Figure 4). Even though the last eruption occurred sometime between 4,580 and 8,200 years ago (Sherrod et al. 2007:470), the U.S. Geological Survey (USGS) considers Mauna Kea to be an active post-shield volcano (U.S. Geological Survey 2002).

There are numerous cinder cones and associated lava flows on what is commonly known as the summit plateau (Figure 5). Wentworth and Powers (1941:1197) described the plateau as "a rudely circular dome 5 or 6 miles in diameter rising between 500 and 1000 feet per mile to a central area above 13,000 feet."

The remnants of three or four glacial drift sheets, located above approximately 2,750 m asl [9,000 ft], are present on Mauna Kea (Porter 1972, 1975; Wolfe et al. 1997). Porter (1972, 1975:247) describes the effects of glaciation on the topography of the summit plateau:

> Behind the belt of end moraines lies a broad zone of dominantly erosional topography irregularly mantled by thin patches of drift. Within this zone, lava-flow surfaces have been abraded into stoss-and-lee forms ["whaleback ridges] or *roches moutonnees*] and are extensively striated, and the flanks of cinder cones have been oversteepened by glacial erosion so they stand at angles of 30 to 34, instead of the more typical 24 to 26.

2.2 CLIMATE, HYDROLOGY, FAUNA, AND FLORA

The summit region is dry and cold with little difference in the mean minimum and mean maximum temperature ranges throughout the year. Precipitation at the summit averages approximately 204 mm (8.0 inches) per year (Giambelluca et al. 2014). Prevailing winds at the summit are from the east-northeast.

[3] Metric abbreviation use and style follow the Society for American Archaeology American Antiquity Style Guide (2018).

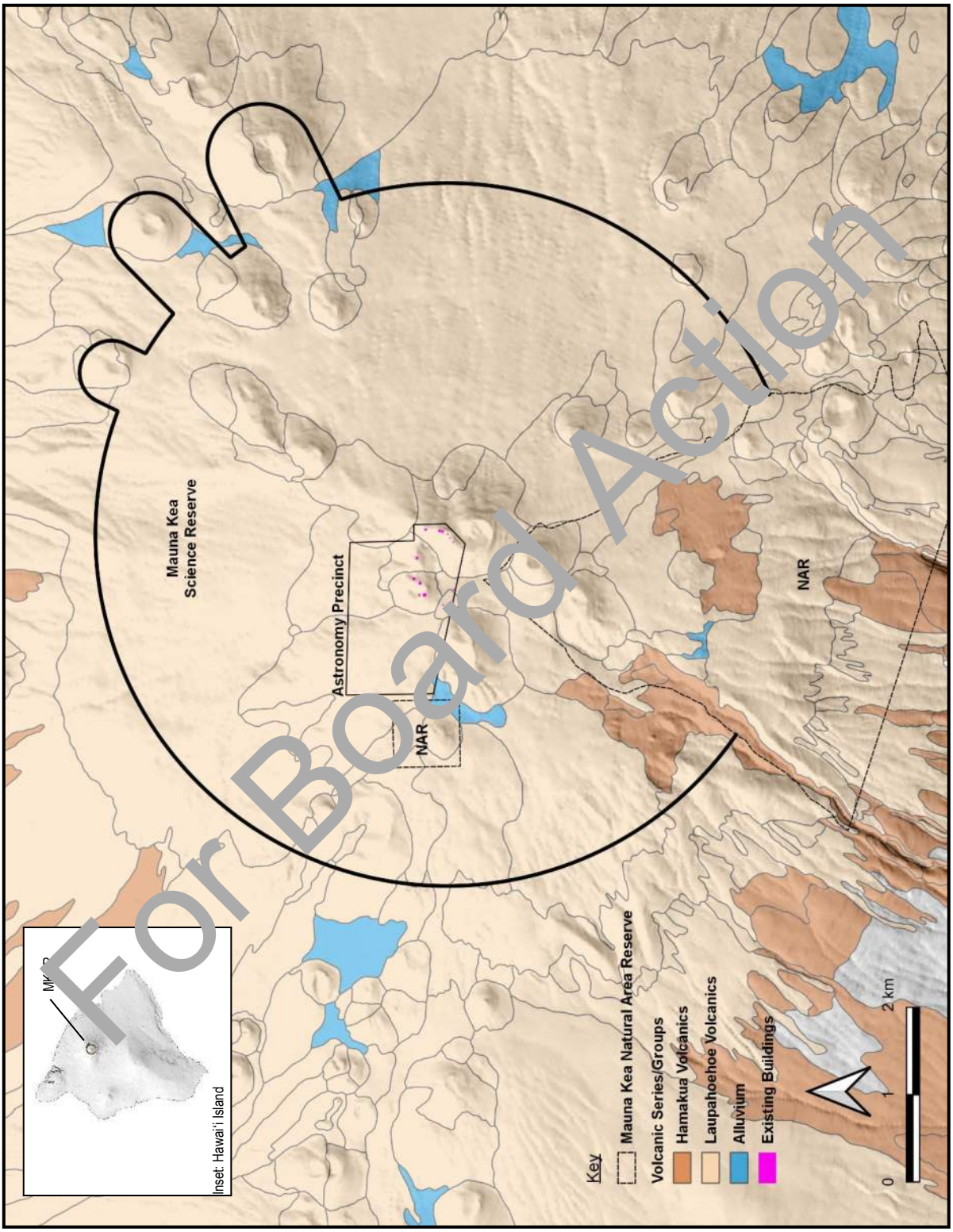

Figure 4. Mauna Kea Summit Region Showing Volcanic Series.

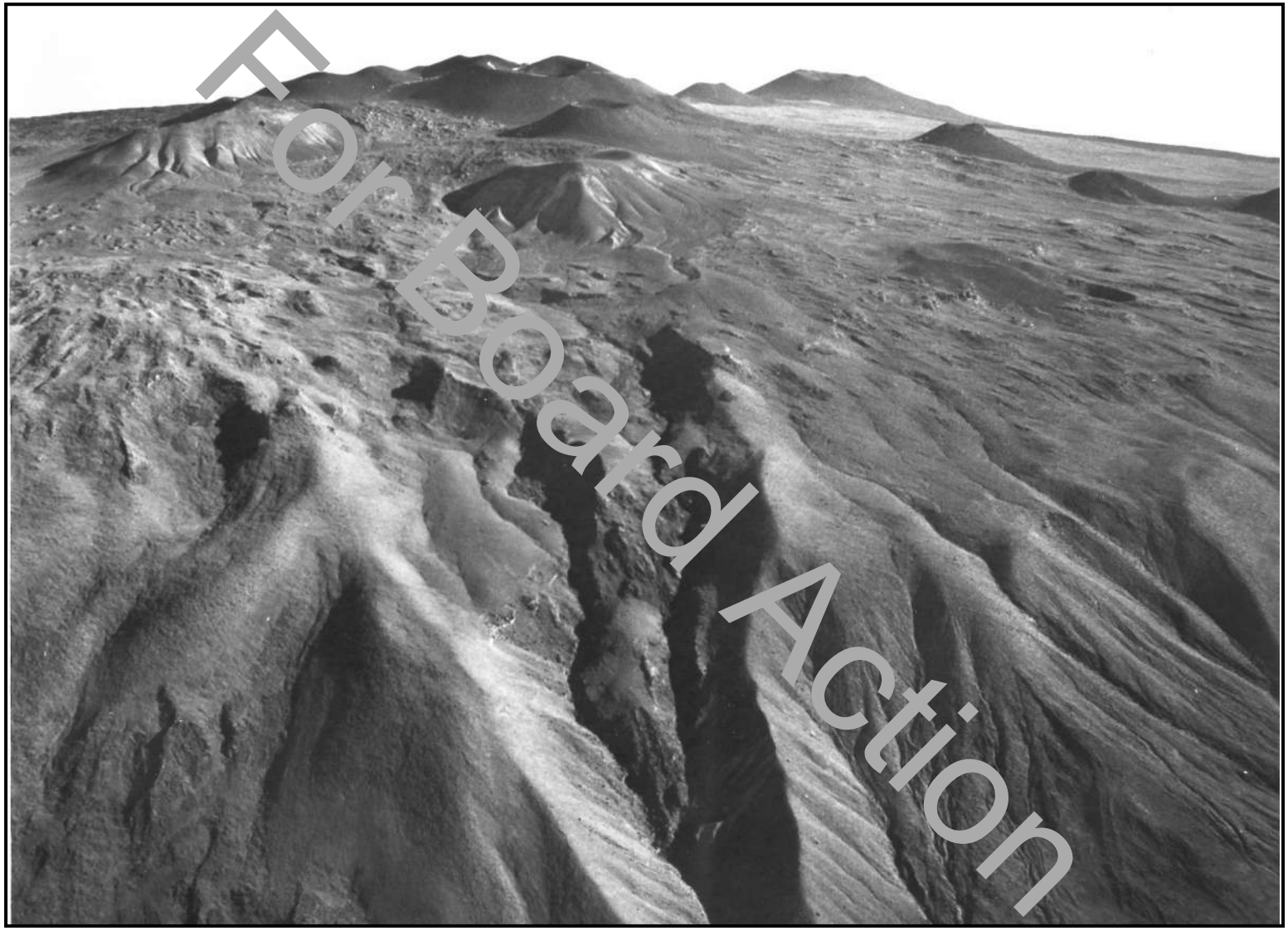

Figure 5. The Summit Plateau Looking Northeast with Pōhakoloa Gulch in the Foreground, Puʻu Kūkahauʻula (summit) at the top center, and Puʻu Makanaka in the Distance.

Lake Waiau, to the southwest of the summit, is the only permanent body of water on the summit plateau (Maciolek 1982). Two intermittent streams, Pōhakuloa Gulch and Waikahalulu Gulch, originate near the lake.

Vegetation above the 3,000 m (9,842 ft) elevation is classified as a semiarid, barren alpine tundra (Krajina 1963) consisting of lichens, mosses, and bunch grasses such as *Trisetum glomeratum* and *Agrostis sandwichensis* (Hartt and Neal 1940; Krajina 1963; Mueller-Dombois and Krajina 1968; Smith, Hoe and O'Connor 1982). A lower xerophytic scrub zone, extending down to 2,100 m (6,890 ft) elevation, is characterized by the presence of *Styphelia douglasii, Vaccinium peleanum* and *Coprosma* spp., in addition to the higher elevation species.

In the summit region there is an "aeolian zone" occupied by a variety of insects (Howarth and Montgomery 1980; Papp 1981) that are believed to have been the only resident fauna in the alpine desert prior to European contact.

2.3 HISTORICAL BACKGROUND

McEldowney (1982), Langlas (Langlas et al. 1997; Langlas 1999), Maly (Maly 1998, 1999; Maly and Maly 2005), and McCoy and Nees (2010) have summarized the traditional culture history, traditions, historical accounts, oral histories, and spiritual significance of Mauna Kea's summit region through early journal accounts, maps, ethnographic collections, Boundary Commission testimonies, and oral interviews. McCoy and Nees (2010) summarized the cultural history and previous archaeological work on Mauna Kea. The overview that follows is based on these studies, which should be consulted for more detail.

2.3.1 Summit Place Names, Myths, Legends, and Traditional Histories

Place names in the Mauna Kea summit region are a mix of traditional and modern nomenclature. Mauna Kea has been interpreted literally as White (Kea) Mountain (Mauna), but also as a reference to the union between the gods Wākea and Papa that formed the mountain (Ellis 1979:292). In an account and *mele* of Queen Emma's trip to Lake Waiau in 1881 or 1882, de Silva and de Silva (2007) present details about the names of the mountain and Lake Waiau:

> Although Maunakea is popularly translated as "white mountain," Kea is also an abbreviated form of Wakea, the sky father who, with Papa, the earth mother, stands at the apex of Hawaiian genealogy. Mauna Wakea is thus viewed traditionally as the sacred meeting point of sky and earth, father and mother, Wakea and Papa. Emma's poets were well-acquainted with the older name and its lasting significance they refer to Waiau as "ka piko on Wakea"—as the mountain's navel/genital/umbilical/connecting-point/center (de Silva and de Silva 2007: footnote 7).

The currently used name for the summit is Kūkahauʻula ("Kūkahauʻula of the red-hewed dew / snow," instead of the formerly used Puʻu Wekiu, and refers to the legendary husband of Līlīnoe and an *ʻaumakua* (family deity) of fishermen (Hibbard 1999). Maly and Maly (2005:vi) give the name as Puʻu o Kūkahauʻula, which they say was "named for a form of the god Ku, where the *piko* of new-born children were taken to insure long life and safety." According to Maly and Maly (2005:vi):

> The name Puʻu of Kukahauʻula is the traditional name of the summit cluster of cones on Mauna Kea, appearing in native accounts and cartographic resources until c. 1932. The recent names, Puʻu Wekiu, Puʻu Hauʻoki and Puʻu Haukea, have…been used since the 1960s (since the development of astronomy on Mauna Kea), and have displaced the significant spiritual and cultural values and sense of place associated with the traditional name, Puʻu o Kukahauʻula.

The names Kūkahauʻula and Līlīnoe are both attributed to cinder cones in the summit region: Kūkahauʻula at the summit and Līlīnoe immediately southeast of the summit cluster. These

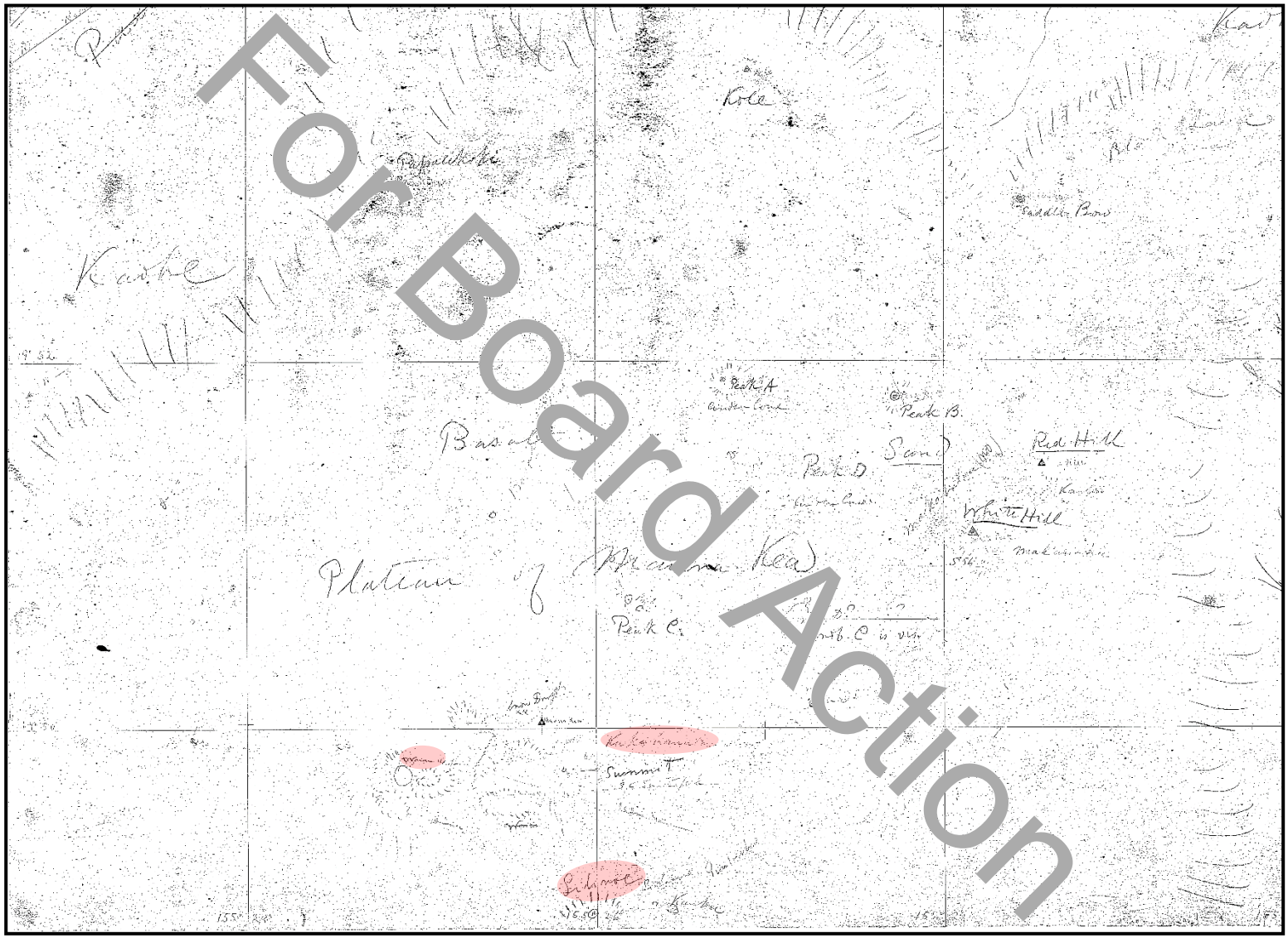

Figure 6. Portion of C.J. Lyons 1884 Map Titled *North Side of Mauna Kea Information Sketch*, with Kūkahau'ula, Līlīnoe, and Waiau Highlighted (Hawaii State Archives Registered Map 1210).

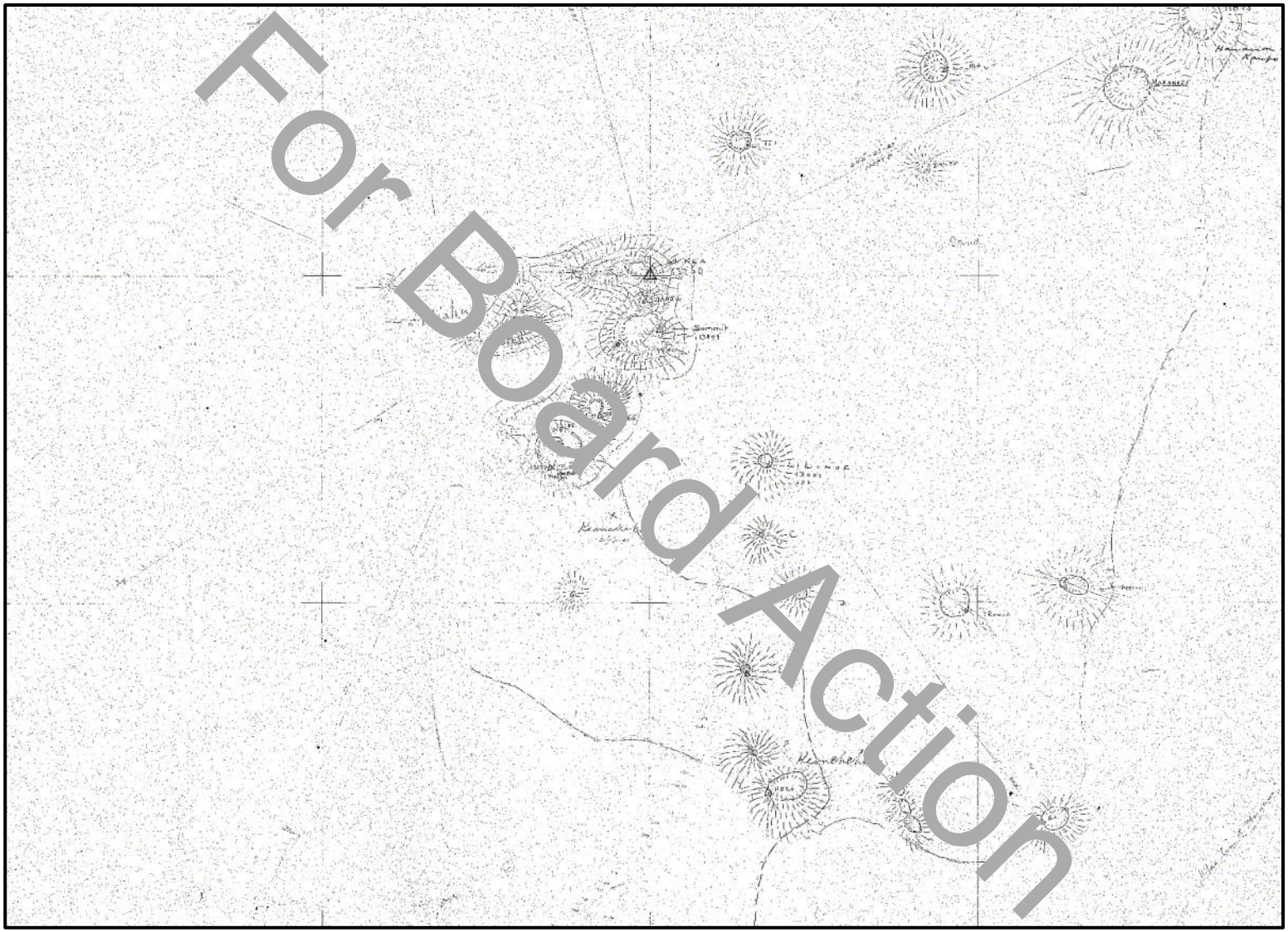

Figure 7. Portion of Map Titled *Summit Peaks of Mauna Kea Surveyed by W.D. Alexander* (Hawaii State Archives Registered Map 1860).

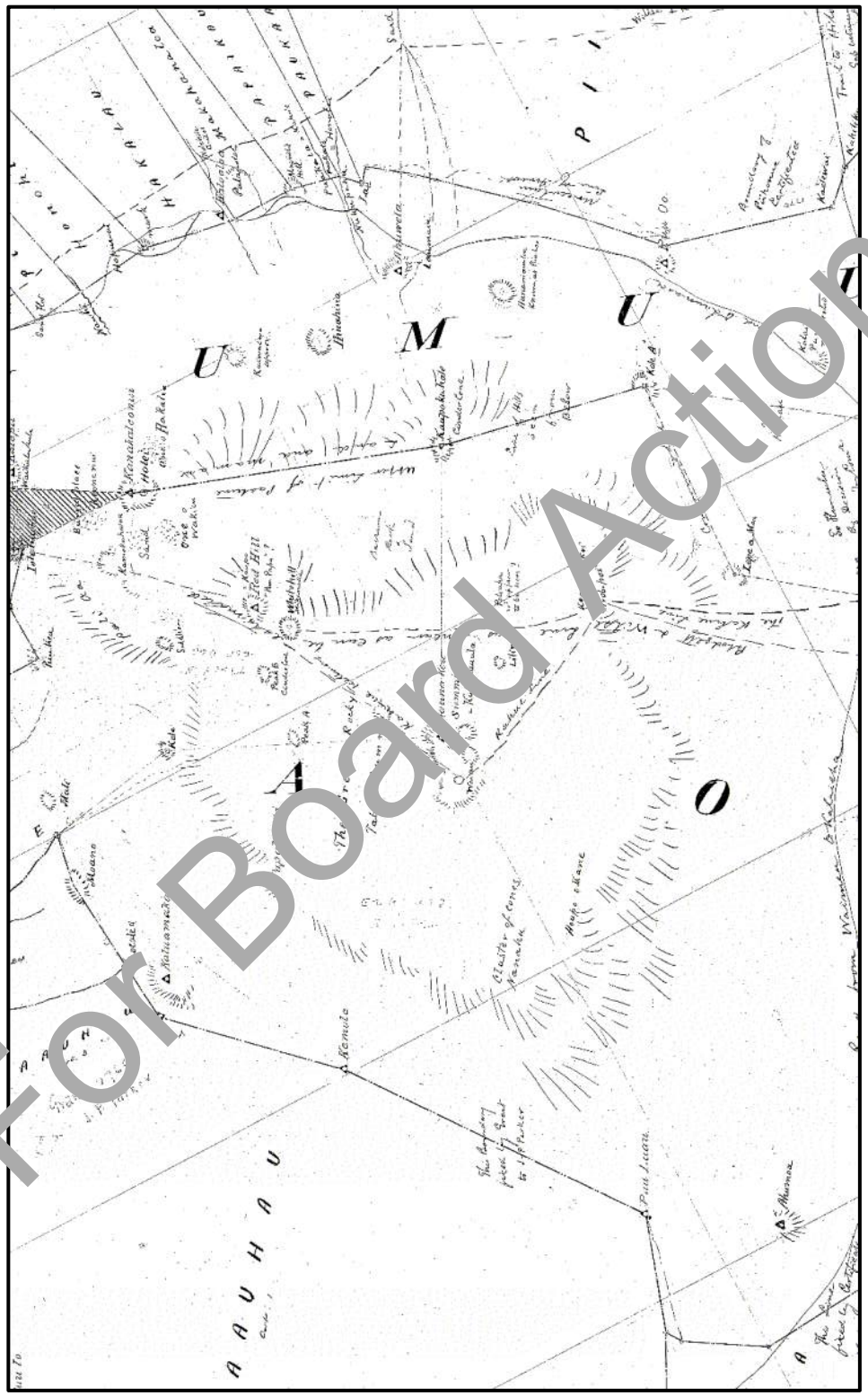

Figure 8. Portion of Map Titled *Kaohe and Humuula Hawaii Government Survey Map by C.J. Lyons 18[illegible]* (Hawaii State Archives Registered Map 1641).

names, along with that of Waiau, appear on Lyon's 1884 sketch map (Figure 6) and Līlīnoe and Waiau are repeated in the next survey of the summit region in 1892 by Alexander (Figure 7). Kūkahau'ula is given as the name of "the highest peak" even earlier in 1873 land boundary testimonies. Of the place names in the summit region, these three are applied the earliest and most consistently to specific landmarks on the mountain. In compiling the 1892 map of Mauna Kea, W.D. Alexander refers to these as "genuine native names." Lyons' 1891 map (Figure 8) shows "Poliahu?" located east of Līlīnoe, however this location likely refers to a feature other than a peak or cinder cone.

According to Pukui and Elbert (1986:377) Waiau means "swirling water of a current." Maly and Maly (2005:vi) give the following account of Waiau:

> Waiau, named for the mountain goddess, Waiau (Ka piko o Waiau), and home of the *mo'o* (water-form) goddess Mo'o-i-nanea. Place where piko of newborn children were taken to ensure long life; and from which "ka wai kapu on Kane" (the sacred water of Kane) was collected. These practices are still participated in at the present time.

Native Hawaiian traditions state that ancestral *akua* (gods, goddesses, deities) reside within the summit area, physically manifested in earthly form as *pu'u*, and as the waters of Waiau. Native Hawaiian genealogical *mele* (poems, chants) explain the centrality of Mauna Kea within Hawaiian genealogy and cultural geography. *Mele* recount that as a result of the union of Papa and Wākea, who are considered the ancestors of Native Hawaiians, the island of Hawai'i was birthed. In the *Mele a Paku'i*, a chant describing the formation of the earth, Mauna Kea is likened as the first-born of the island children of Papa and Wākea, who also gave rise to Hāloa, the first man from whom all Hawaiians are descended (Kamakau 1991:126 in Maly and Maly 2005:7-8). A *mele hānau* (birth chant) for Kamehameha III, who was born in 1814, describes the origins of Mauna Kea:

> *Born of Kea was the mountain,*
> *The mountain of Kea budded forth.*
> *Wākea was the husband, Papa*
> *Walinu'u was the wife*
> *Born was Ho'oniuku, a daughter,*
> *Born was Hāloa, a chief,*
> *Born was the mountain, a mountain-son of Kea*
> (Pukui and Korn 1973:13-28 in Maly and Maly 2005:9).

Some contemporary Native Hawaiian cultural practitioners continue to view Mauna Kea as a first-born child of Papa and Wākea, and thus, the mountain is revered as "the *hiapo*, the respected older sibling of all Native Hawaiians" (Kanahele and Kanahele 1997 in Langlas 1999:7). Cultural practitioner Kealoha Pisciotta explains that this link to Papa and Wākea "is the connection to our ancestral ties of creation" (Orr 2004:61). Pualani Kanaka'ole Kanahele states that "the very fact that it is the 'Mauna a Wākea' tells you that it is the *mauna* that is meeting Wākea" (Maly 1999:A-368).

Traditional genealogical *mele* and *mo'olelo* (stories, traditions) recount associations between Mauna Kea and Poli'ahu, Līlīnoe, Waiau, and Kahoupakane. In a *mo'olelo* recounting the travels of Pūpū-kani-'oe, it was said that Mauna Kea was a mountain "on which dwell the women who wear the *kapa hau* (snow garments)" (Maly and Maly 2005:31). Another *mo'olelo*, which dates to the 1300s, explains that Ka-Miki was sent atop Mauna Kea's summit to the royal compound of Poli'ahu, Līlīnoe, and their ward, Ka-piko-o-Waiau, to fetch water for use in an '*ai-lolo* ceremony (Maly and Maly 2005:42-43).

In 1931, Emma Ahu'ena Taylor, a historian of Hawaiian descent with genealogical ties to the lands of Waimea and Mauna Kea, reported on Poli'ahu's residence at Mauna Kea, but also described the creation of Lake Wai'au. She wrote:

> Poliahu, the snow-goddess of Mauna-kea, was reared and lived like the daughter of an ancient chief of Hawaii. She was restricted to the mountain Mauna-kea by her godfather Kane. She had a nurse Lihau who never left her for a moment. Kane created a silvery swimming pool for his daughter at the top of Mauna-kea. The pool was named Wai-au. The father placed a supernatural guard [Mo`o-i-nanea] at that swimming pool so that Poliahu could play at leisure without danger of being seen by a man… (Maly and Maly 2005:53).

According to Taylor, on Mauna Kea, Poli'ahu's attendants Līlīnoe, Lihau, and Kipu'upu'u drove away her suitor, Kūkahau'ula (the pink-tinted snow god). But Mo'o-i-nanea allowed the snow god to embrace Poli'ahu, and to this day, Taylor reports, "Ku-kahau-ula, the pink snow god, and Poli'ahu of the snow white bosom, may be seen embracing on Mauna-kea" (Maly and Maly 2005:53).

2.3.2 Land Use

The summit of Mauna Kea is located in Ka'ohe Ahupua'a, Hāmākua District. Ka'ohe is a large *ahupua'a* found in what Lyons referred to as the "almost worthless wastes of interior Hawaii:"

> Then there are the large ahupuaas which are wider in the open country than the others, and on entering the woods expand laterally so as to cut off the smaller ones, and extend toward the mountain till they emerge into the open interior country; not however to converge to a point at the tops of the respective mountains. Only a rare few reach those elevations, sweeping past the upper ends of all the others, and by virtue of some privilege in bird-catching or some analogous right, taking the whole mountain to themselves... The whole main body of Mauna Kea belongs to one land from Hamakua, viz., Kaohe, to whose owners belonged the sole privilege of capturing the *ua`u*, a mountain-inhabiting but sea-fishing bird.
>
> These same lands generally had the more extended sea privileges. While the smaller ahupuaas had to contend themselves with the immediate shore fishery extending out not further than a man could touch bottom with his toes, the larger ones swept around outside of these, taking to themselves the main fisheries much in the same way as that in which the forests were appropriated. Concerning the latter, it should here be remarked that it was by virtue of some valuable product of said forests that the extension of territory took place. For instance, out of a dozen lands, only one possessed the right to *kalai wa`a*, hew out canoes from the koa forest. Another land embraced the *wauke* and *olona* grounds, the former for kapa, the latter for fish-line (Lyons 1875:111).

The boundaries of Ka'ohe, as shown on modern maps, are open to question. A map of the adjoining Humu'ula Ahupua'a made by S.C. Wiltse in 1862 (Hawaii State Archives Register Map No. 66[illegible]) included the adze quarry and Lake Waiau, which was labeled on the map as "Pond Poliahu." Maly and Maly (2005:280-287) note that

> By the time the Commissioners of Boundaries were authorized to certify the boundaries for lands brought before them in 1874, disputes over the boundary of Humu'ula and Ka'ohe had arisen…[and]…by the time of settlement in 1891, the boundary of Humu'ula was taken down to around the 9,000 foot elevation, with Ka'ohe taking in the entire summit region.

The testimony of Kahue of Humu'ula, presented in Maly and Maly (2005:287), mentions the boundary running from a gulch called Kahawai Koikapue, where *mele* were sung, to Waiau and then to the summit which was called Pu'uokūkahau'ula. Parenthetically, there is a note that "half of the water in the gulch belonging to Ka'ohe and half to Humu'ula."

In addition to the district and *ahupua'a* system of land tenure, there were other traditional land classifications, including one that employed the term *wao* for a series of natural and cultural

zones (Malo 1951:16-18). According to some descriptions, the *wao kanaka* was a low-lying coastal area where the *maka'āinana* were free to move and inhabit. The *wao kele* was the upland forested area that the *maka`āinana* could only access for gathering purposes. The *wao akua*, which was believed to be inhabited by *akua*, was the subalpine desert region above the tree line. The *maka`āinana* were hesitant to venture into the *wao akua* and could do so only by offering prayer and displaying great respect (NASA 2005:3-18, 3-19).

The Mauna Kea summit region is commonly described today as lying within the *wao akua,* which is different, however, from Malo's description of this zone which placed it at a lower elevation in forested lands (Malo 1951:17). As noted in the footnotes to Malo's *Hawaiian Antiquities* (Malo 1951:18), *wao akua* can also be understood to mean "a remote desolate location where spirits, benevolent or malevolent, lived and people did not live. Usually these places were deep interior regions, inhospitable places such as high mountains, deserts and deep jungles. These areas were not necessarily *kapu* but were places generally avoided out of fear or respect" (PHRI 1999, 24). When Rev. William Ellis toured Hawai'i Island in 1823, he noted the reluctance of native Hawaiians to venture into the summit areas of Mauna Kea:

> …numerous fabulous tales relative to its being the abode of the gods, and none ever approach the summit---as, they say, some who have gone there have been turned to stone. We do not know that any have been frozen to death, but neither Mr. Goodrich, nor Dr. Blatchely and his companion, could persuade the natives, whom they engaged as guides up the side of the mountain, to go near its summit (Ellis 1979:292).

Although the *ahupua`a* system (including *kapu* restrictions) of land and resource management no longer exists legally, knowledge of some traditional *kapu* have been passed down and endure. In Maly (1999: A-371), Pualani Kanaka'ole Kanahele stated that she learned from her *kūpuna* that the forested regions are not the realm of humans but rather that the forest's *kupa* (citizens) are the trees. Kanahele notes that "when I go *maha`oi* [intrude] in their realm, I have to ask permission to be up there." Likewise, Irene Lindsey-Fergerstrom indicated that in the context of taking *piko* up to the Mauna Kea summit, that her *tūtū* (grandmother) had knowledge of the *kapu* restriction that only *ali`i* were permitted on the summit (Maly 1999:A-390).

During pre-Contact times the slopes of Mauna Kea, above the limits of agriculture and permanent settlement, were a vast mountain "wilderness" probably known to only a small number of Hawaiians engaged in primarily "special purpose" activities such as bird-catching, canoe making, stone-tool manufacture, or burial of the dead (McEldowney 1982); ethnographic information relating to specific activity localities is generally lacking although archaeological evidence provides some evidence of past land use in the form of adze production (primarily at the Mauna Kea Adze Quarry but elsewhere as well), human burial, and the erection of shrines.

Early post-Contact ascents of Mauna Kea by Europeans and Hawaiians occurred throughout the nineteenth century, including Queen Emma's famous visit to Lake Waiau in 1881 or 1882 (de Silva and de Silva 2007). de Silva and de Silva (2007:5) note that

> the historical record of pilgrimages to Maunakea is not limited to Emma's mele and Phillips's mo'olelo. Steve Desha writes, that as a young man, Kamehameha Pai`ea went to Waiau to pray and leave an offering of 'awa. Kamakau tells us that Ka'ahumanu made the same journey in 1828 in an unsuccessful attempt to retrieve the iwi of her ancestress Lilinoe. Kauikeaouli visited Waiau and the summit in 1830, Alexander Liloliho in 1849 and Peter Young Ka'eo in 1854.

2.3.3 Cultural Practices and Belief

Cultural practices and beliefs involving Mauna Kea have been changing since the arrival of the earliest Polynesian settlers, an evolutionary process that continues today. Absent a written language, Hawaiian practices and beliefs were originally recorded in chants and oral histories that were passed on from generation to generation for over 1,000 years. The earliest written records

of native Hawaiian beliefs and practices were created by European explorers and settlers in the late eighteenth century.

A variety of cultural and religious beliefs and practices pertain to and are occurring on the mountain today. Whereas some traditional and customary Hawaiian practices and beliefs have survived and have gained wider practice in recent generations, other traditional and customary cultural practices and beliefs appear not be in practice. In addition, recent archaeological and ethnographic studies of Mauna Kea show that contemporary practices and beliefs have developed based on modern beliefs or have evolved from a traditional practice or belief. The difficulty in thoroughly documenting cultural practices is increased by the reluctance of some cultural practitioners to describe their practices and beliefs to researchers.

Traditional and customary cultural practices and beliefs have been defined as "those beliefs, customs, and practices of a living community of people that have been passed down through generations, usually orally or through practice" (Parker and King 1998:1; PHRI 1999:1). Traditional and customary cultural practices and beliefs contribute to the maintenance of a community's cultural identity and demonstrate historical continuity through the present. This is demonstrated through actual practice or through historical documentation of the practice or belief, including both written and oral historical sources (Parker and King 1998:1; PHRI 1999:2).

Contemporary cultural practices and beliefs have been defined as "those current practices and beliefs for which no clear specific basis in traditional culture can be clearly established or demonstrated – for example, the conducting of ritual ceremonies at sites or features for which no such prior traditional use and associated beliefs can be demonstrated. In some cases, however, it may be possible to demonstrate the reasonable evolutionary development of a contemporary practice from an earlier traditional practice" (PHRI 1999:3).

Modern-day oral history interviewees have described their knowledge concerning the presence of and meaning of *ahu* and burials in the summit region as well as other cultural practices such as the construction and maintenance of *kūahu* (family shrine), the scattering of cremated remains, *piko* deposition in Wai`au, as well as navigation and orienteering. Other cultural practices are described in more detail in Maly (1999), Maly and Maly (2005), and Orr (2004), and summarized in McCoy and Nees (2010).

2.3.3.1 Ahu and Kūahu

Morphologically, *ahu* are a pile or mound of stones that may have served historically as altars or shrines, markers signifying burial locales, *ahupua`a* boundaries, or trail routes; the term *kūahu* refers more specifically to a shrine or alter maintained by a family. In the 1880s and 1890s, two surveyors, J.S. Emerson and E.D. Baldwin, independently denoted various *ahu* located upon *pu'u* in the lowlands surrounding Mauna Kea and the presence of "a pile of stones on the highest point of Mauna Kea" (Maly and Maly 2005:494-502, 505). While Emerson and Baldwin's observations confirm the presence of *ahu* as they are defined morphologically, the surveyors did not specifically assign functional meanings for the *ahu* on Mauna Kea.

Oral history consultants have noted the presence of *ahu* in the summit region and their general function (as described above) without necessarily identifying the specific function of specific *ahu* (Orr 2004:47; Maly 1999:A-134, -372; Maly and Maly 2006:A-183, -335, -349, -565). In 2004 (Orr 2004), Kealoha Piscotta described erecting a *kūahu* on Mauna Kea that consisted of a stone from her family, noting that "it [the place] was very beautiful and I was always attracted to that place. I prayed at that place all the time" (Orr 2004:52). Piscotta also noted that "some of the shrines mark the birth stars of certain *ali`i*…and also birth and death" (Orr 2004:47).

In 1998 the Royal Order of Kamehameha I erected a *lele* (altar) on the summit near Site 26224 (USGS benchmark). While maintaining the same approximate location, the *lele* has been extensively modified over time. The lele is approximately 330 m southeast of the Hōkū Ke'a Observatory.

2.3.3.2 Piko Beliefs and Practices

The cultural weight that Mauna Kea carries within the Hawaiian community is also evident in the phrase, "*piko kaulana o ka `āina*," which translates as "the famous summit of the land" and is used as a term of endearment (Maly 1999:A-3). However, the phrase also expresses the belief that the mountain is a *piko* (the navel, the umbilical cord) of the island and for this reason it is sacred (Maly 1999:D-20). In this context, the significance of the cultural practice of transporting and depositing a baby's *piko* on Mauna Kea can be understood to connect a child to her family as well as to the land. As noted in Maly (1999) and Maly and Maly (2006), families may entrust a family member to collect *piko* and deposit them in specific locations on Mauna Kea including Lake Waiau, the summit, and springs.

2.3.3.3 Burial

Some cultural practitioners have knowledge of burials located at a number of *pu'u* on Mauna Kea's western and eastern slopes, including Ahumoa, Kemole, Papalekoki, Makanaka, Kihe, Kanakaleonui, Kaupō, and Pu'u O'o (Maly 1999:A-22, -48, -75, -165, -250, -279, -351, -395, -397) and even connect family and ancestral burials to the mountain (Maly 1999:A-40).

Scattering cremated ashes today is a contemporary cultural practice that has taken the place of traditional interment practices. Traditionally, cremation was not a common practice in Hawaiian culture, and when it was done it was a punishment and meant to defile the dead person. Writing in the 1830s, native Hawaiian historian David Malo stated that the punishment inflicted on those who violated the tabu of the chiefs was to be burned with fire until their bodies were reduced to ashes" and that cremation was practiced on "the body of anyone who had made himself an outlaw beyond the protection of the tabu" (Malo 1951:57, 20).

Native Hawaiian historian and ethnologist Mary Kawena Pukui explains why cremation was a defilement "…if the bones were destroyed, the spirit would never be able to join its '*aumakua*" (Pukui et al. 1972:109). Contemporary thoughts concerning cremation, however, may be changing. Pualani Kanaka'ole Kanahele explained in 1999 that while the scattering of cremation remains on Mauna Kea may be viewed by some as non-traditional, she notes that "…it may not be the *iwi* [bones] itself, but the ashes are the essence of what is left of the *iwi*. It doesn't matter, it's going back" (Maly 1999:A-377).

2.3.3.4 Navigation/Orientation

Maly and Maly (2005:95) speculate that it is likely that *kilo hōkū* (observing and discerning the nature of the stars) was practiced on Mauna Kea, as the gods and deities associated with the mountain are also embodied in the heavens, but such accounts are absent from the historical literature. One oral history consultant believed that a platform ("navigational *heiau*") was present on the Mauna Kea summit before the observatories (Maly 1999:A-349).

Another cultural consultant, Kealoha Piscotta, stated that "the lake [Wai'au] is like the navigation gourd," a concept which she learned from her auntie (Orr 2004:45). Piscotta also stated that *mo'olelo* passed down from her auntie describe solstice alignments with Mauna Kea and that the solstices were marked from the Mauna Kea summit. Piscotta is interested in understanding how the solstice alignments work and has concerns that the view plane from Mauna Kea has been diminished and obstructed by the leveling of *pu'u* and the erection of observatory domes (Orr 2004:54-55).

3.0 PREVIOUS ARCHAEOLOGY

A number of research and cultural resource management studies have been undertaken in the University of Hawai'i-managed areas of Mauna Kea. Within the MKSR, which includes the Astronomy Precinct and the Hōkū Ke'a project area, the first systematic archaeological investigations were carried out in 1975-76 in the context of a National Science Foundation funded research project on the Mauna Kea Adze Quarry (McCoy 1977, 1990; Cleghorn 1982; Allen 1981;

Williams 1989). Between 1976 and 2005, several site-specific reconnaissance surveys were undertaken (Table 1). Between 2005 and 2010, OMKM undertook a comprehensive archaeological inventory survey (AIS) of the MKSR, recording or re-recording 263 historic properties as summarized in Table 2. Figure 9 shows the location of previous archaeological studies in the Astronomy Precinct.

In addition to the above and in accordance with the Mauna Kea Comprehensive Management Plan (CMP 2009) and Mauna Kea Cultural Resource Management Plan (McCoy et al. 2009), OMKM developed a Burial Treatment Plan (Collins et al. 2014) and a Long-Term Historic Properties Monitoring Plan (Gosser et al. 2014) based on the results of the AIS (McCoy and Nees 2010). Since 2012, OMKM has implemented the monitoring program outlined in Gosser et al. (2014). A traditional cultural property assessment (Langlas et al. 1997) has also been conducted in the MKSR.

Table 1. Previous Archaeological Studies in the Mauna Kea Science Reserve

Year	Project	Survey Type	Reference
1975-76	NSF Research Project on the Mauna Kea Adze Quarry	Reconnaissance and inventory	McCoy 1976, 1977; Cleghorn 1982
1981[a]	**Kitt Peak National Observatory**	**Reconnaissance**	**McCoy 1981**
1982	**Hawaii Institute for Astronomy**	**Reconnaissance**	**McCoy 1982a and McEldowney 1982**
1982	**Caltech Telescope**	**Reconnaissance**	**McCoy 1982b**
1983	Mauna Kea Observatory Power Line	Reconnaissance	Kam and Ota 1983
1984	NSF Grant-in-Aid Survey	Reconnaissance	McCoy 1984
1987	Summit Road Improvement	Reconnaissance	Williams 1987; McCoy 1999
1988	VLBA Telescope	Reconnaissance	Hammatt and Borthwick 1990
1990	**Subaru Telescope**	**Reconnaissance**	**Robins and Hammatt 1990**
1990	**Gemini Telescope**	**Reconnaissance**	**Borthwick and Hammatt 1990**
1991	Pu`u Makanaka	Reconnaissance	McCoy 1999a
1995	SHPD site relocation and GPS recording	Reconnaissance	McCoy 1999a
1997	SHPD transect survey	Reconnaissance	McCoy 1999a
1997	TCP Assessment	Assessment	Langlas et al. 1997
1999	SHPD survey of Pu'u Wekiu	Reconnaissance	McCoy 1999a
2005-2009	OMKM Archaeological Inventory Survey of MKSR	AIS	McCoy and Nees 2010
2012-present	OMKM Assessment of Historic Properties in the MKSR	Assessment	Gosser and Nees 2014, 2015, 2016, 2017, 2018, 2019

[a] Bolded entries are archaeological projects within the Astronomy Precinct and shown in Figure 9.

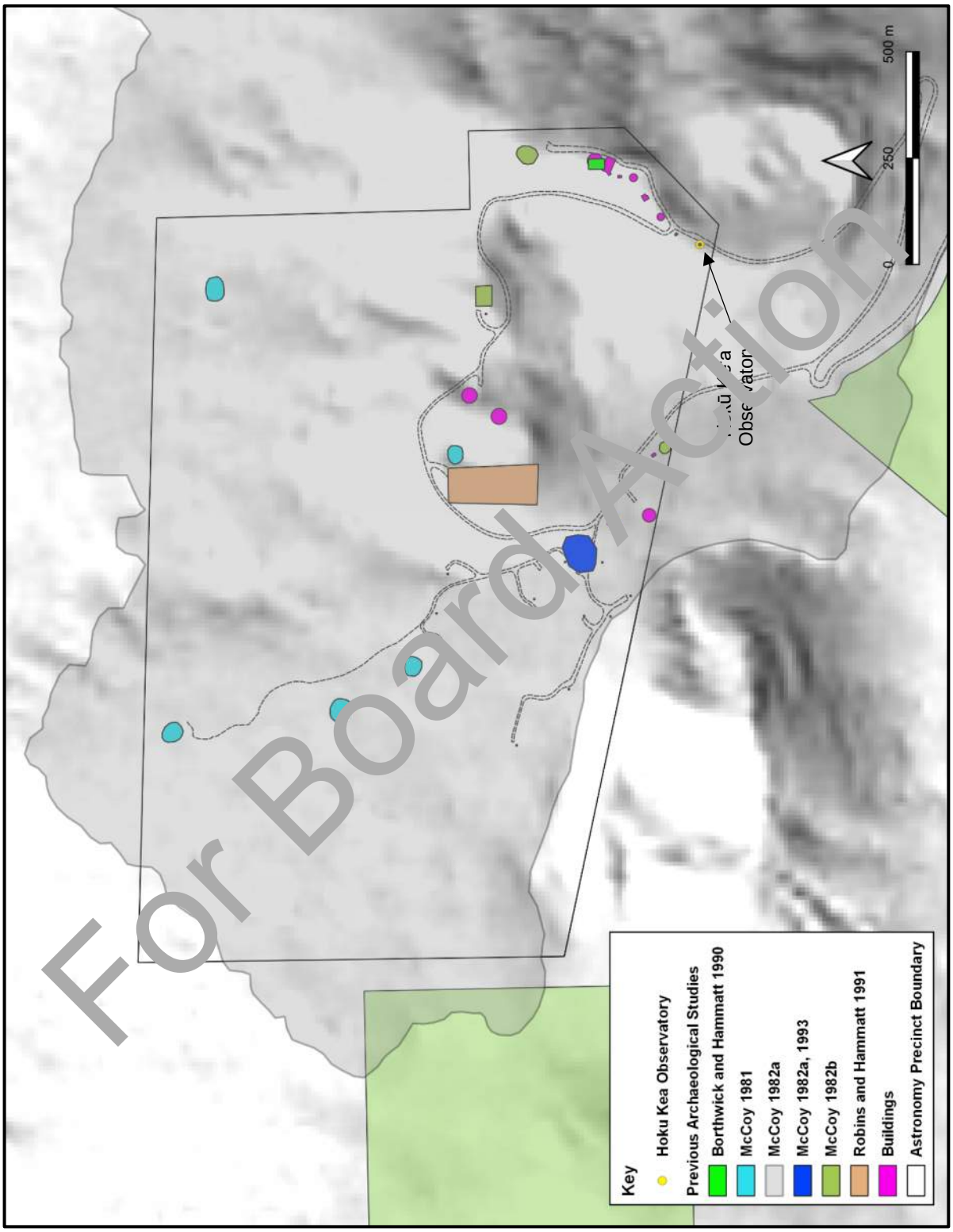

Figure 9. Mauna Kea Summit Region Showing Previous Archaeological Studies Conducted in the Astronomy Precinct.

3.1 Summary Description of Historic Properties

While no above-ground archaeological sites have been recorded within the Hōkū Keʻa Observatory project area, four primary types of historic properties have been recorded in the MKSR: (1) shrines; (2) adze manufacturing "workshops"; (3) burials; (4) and probable survey markers. Each type of property is briefly described below. Table 2 summarizes the number and variety of historic property types found in the Science Reserve. The summary includes two previously identified traditional cultural properties, and 261 examples of what are commonly called archaeological sites.

Table 2.. Historic Property Types in the MKSR

Site Type	Number	Percent Total
Traditional Cultural Properties	2	0.76
Shrines and Possible Shrines	141	53.41
Mauna Kea Adze Quarry Complex Sites	67	25.38
Burials and Possible Burials	29	10.98
Stone Markers/Memorials	15	5.68
Temporary Shelters	3	1.14
Historic Campsites	2	0.76
Historic Transportation Route	1	0.38
Maunakea Summit Region Historic District	1	0.38
Unknown Function	3	1.14
TOTAL	**264**	**100%**

3.1.1 Traditional Cultural Properties

Traditional cultural properties (TCP) are a type of historic property formally defined for the first time in 1998 in National Register Bulletin 38 (*Guidelines for Evaluating and Documenting Traditional Cultural Properties*). A TCP

> …can be defined generally as one that is eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community (Parker and King:1998:1).

Parker (1998) notes that an important difference between TCP and other kinds of historic properties is that the significance of TCP "cannot be determined solely by historians, ethnographers, ethnohistorians, ethnobotanists, and other professionals. The significance of traditional cultural properties must be determined by the community that values them" (Parker 1998:5).

Dr. Charles Langlas of the University of Hawaii at Hilo conducted a TCP assessment of Mauna Kea in 1997 as part of the cultural resource management studies for the Hawaii Defense Access Road and Saddle Road Project. In 1999-2000, SHPD designated three areas as TCP because of their association with legendary figures and on-going cultural practices. Two TCP (Kūkahau`ula [the summit] and Puʻu Līlīnoe) are in the MKSR; the Hōkū Keʻa Observatory and Generator buildings are within the Kūkahauʻula TCP. A third TCP, Lake Waiau, is located in the Mauna Kea Ice Age Natural Area Reserve.

The cultural significance of Kūkahauʻula was highlighted in a Chapter 6E-8 and Section 106 review letter of the proposed Keck Outrigger project by SHPD in 1999 (Hibbard to McLaren 1999). Relevant portions of the review letter (which is included in the CRMP [McCoy 2009: Appendix B]) are presented below:

Several lines of evidence lead us to the conclusion that the cluster of cones is an historic property… The first line of evidence indicating the cultural and historical importance of the summit is that, at a minimum, some portion of the summit cluster bore the name Kukahau`ula who appears as a character in recorded Hawaiian traditions and as a figure in legends about Mauna Kea. As a character in traditional histories and genealogies, he is the husband of Lilinoe and is named as an `*aumakua* (family deity) of fishermen. A descendant, Pae, was known as an exceptional fisherman whose bones were coveted for fishhooks by the paramount chief Umi. In one legend, Kukahau‘ula is cast in a more fanciful role as the suitor or husband of Poliahu, the deity of snow and, poetically, his name is said to allude to the pink hue that can be seen reflecting from the snow-covered summit. Lilinoe plays a similar role in the mountain's traditions in that she appears both as a traditional character and a mythical figure. She is, however, even more frequently associated with the summit region of Mauna Kea. In addition to being the wife of Kukahau‘ula in some traditions, she is said to have been buried near the summit and is called the "woman of the mountain." One tradition has her being a dancer or of the illustrious Mahi family who served as warriors and attendants to the paramount *ali‘i* of Hawaii Island. In legends, Lilinoe becomes the embodiment of fine mist, the literal meaning of her name, and as such is the companion or sister of Poliahu.

While the association between the summit and Kukahau‘ula is sufficiently clear, it is not as clear which specific topographic features in the summit the name encompasses. The conclusions drawn here that Kukahau‘ula, and thus its association with a significant individual and character, probably applied to the entire summit cluster relies on a couple of arguments. First, use of the name Pu‘u o Kukahau‘ula in the boundary testimonies and in subsequent notes of field surveys indicates that the name was applied, at a minimum, to the cinder cone (i.e., *pu‘u*) as a whole and not just to the highest peak or what would generally be considered the summit in English usage. Second, on the early survey maps (i.e., 1884 to 1891 and 1891), the name Kukahau‘ula is written to the east of the cluster of cones and is not immediately associated with a particular point. In contrast, the highest point on the mountain on these maps is labeled the "summit" and "summit cone" and the triangulation marker on the northeastern peak of the cluster is labeled "Mauna Kea."

At this time, it cannot be known with certainly how Hawaiians during the early historic period and their predecessors would have viewed the cluster or what purposes they may have had to make and name particular distinctions within the cluster. Given the unified appearance of the cluster and the prominence of the name Kukahau‘ula, however, it seems reasonable, if not probable, that this name applied to this entire landscape feature, including that which is now called Pu‘u Hau Oki.

3.1.2 Shrines and Possible Shrines

Shrines are the most common site type in the MKSR. The primary characteristic of all the sites on Mauna Kea that have been interpreted as shrines is the presence of one or more upright stones that the Hawaiians called ‘*eho* or *pohaku ‘eho*, which translates as “god-stone” (cf. Andrews 2003; Pukui and Elbert 1971; Buck 1957; Emory 1938). The conventional view of these and other kinds of Polynesian “god-stones” is that they were “places for the gods to inhabit,” or “abodes of the gods,” as opposed to icons or actual representations of the gods (Best 1976; Buck 1957; Handy 1927).

A number of shrines consist of just a single upright, while others are characterized by multiple uprights arranged in different patterns on a variety of different kinds of foundations.

Kenneth Emory, who was the first one to describe the shrines on Mauna Kea and note their East Polynesian affinities, was of the opinion that the uprights represented or symbolized separate gods.

3.1.3 Mauna Kea Adze Quarry Complex

The Mauna Kea Adze Quarry Complex consists of two physically discrete but functionally interrelated parts: (1) the quarry proper, which is defined as the source areas of tool-quality basalt, and (2) diverse activity remains located outside of the quarry proper as just defined. These include isolated adze manufacturing by-products (e.g., cores, flakes), hammerstones and unfinished adzes in various stages of completion found by themselves and also found with shrines and possible burials. The Mauna Kea Adze Quarry is also a National Historic Landmark.

3.1.4 Burials and Possible Burials

Prior to the 2005-2009 survey (McCoy and Nees 2010), the only positively identified human remains in the MKSR were located on the summit of Pu‘u Mākanaka. Jerome Kimmartin, a surveyor with the United States Geological Survey, noted the presence of human remains on this prominent cinder cone in 1925. The 2005-2009 survey identified 29 sites with a total of 48 features in the MKSR that have been interpreted as burials or possible burials. Of the 48 features, five are confirmed burials and 43 are possible burials. Sites classified as possible burials lack the physical evidence of human bone, but include other physical factors common to burial sites on Mauna Kea including topographic location and architectural characteristics.

3.1.5 Historic Transportation Route

The only direct evidence of the Umi Koa Trail is a single horseshoe found in close proximity to the route shown on the USGS Mauna Kea Quadrangle maps.

3.1.6 Stone Markers/Memorials

One of the more ambiguous classes of sites are piles or stacks of rocks believed to be a marker of some kind or a memorial to some person or event. In all but a couple of cases the actual function is unclear. There are 15 sites that may have been survey markers, piles of stones left by unknown visitors as memorials of their visit to the top of a cinder cone or way-markers along an unmarked trail. The stacked cairns are unlike the piled mounds that have been interpreted as burials. Two of the 15 sites are USGS survey markers, one on the Kūkahau‘ula summit, and one on Pu‘u Poli‘ahu.

3.1.7 Temporary Shelters

The evidence for “habitation” in the MKSR is meager. Crude stone walls have been recorded at various localities in the MKSR, usually in association with other features such as lithic scatters. One walled overhang shelter was found directly below a ridge-top shrine. All of these remains are interpreted as temporary shelters based on their morphology and environmental setting.

3.1.8 Historic Camp Sites

Possibly two camps occupied by the United States Geological Survey (USGS) survey team in 1925 were found on the northern and northeastern slope of the mountain near Pu‘u Māhoe and Pu‘u Mākanaka. McCoy and Nees (2010) provide additional information concerning the historic camps.

3.1.9 Historic Districts

During the preparation of the 1999 Master Plan for Mauna Kea, SHPD proposed that the cultural landscape on the top of Mauna Kea be recognized as the Mauna Kea Summit Region

Historic District (see Figure 1). The historic district proposal was summarized in the cultural impact assessment for the Master Plan (PHRI 1999:30-32) and discussed in more depth as part of the Keck Outrigger project (Hibbard 1999; NASA 2005). The Institute for Astronomy (IfA), NASA, and other parties agreed that the proposed district, which includes all of the Mauna Kea Science Reserve, the DLNR Natural Area Reserve, and additional areas lower on the mountain, meets the eligibility criteria for inclusion on the National Register of Historic Places. The district is now listed in the Statewide Inventory of Historic Places as Site 50-10-23-26869.

3.2 Historic Properties Within 500 m of the Hōkū Ke‘a Observatory

While there is no formal declaration on how far from a proposed project a project proponent must extend a search for historic properties, a radius of 500 meters was selected for the current project due to the nature of the proposed work, the local landscape, and the abundance of publicly-available supporting literature concerning historic properties in the summit region. Figure 10 identifies historic properties within or near the Hōkū Ke‘a project area.

3.2.1 Site 50-10-23-26224

Site 26224 is a USGS marker located on the summit of Kūkahau‘ula (Pu‘u Wekiu). The marker is a brass disc cemented to a metal pole, roughly 10.0 cm in diameter. The marker was unearthed and displaced on the east slope of the pu‘u sometime after 2012. The marker was located approximately 2.0 m northwest of a modern shrine commonly referred to as the “lele,” discussed above (Figure 10).

3.2.2 Site 50-10-23-21209

Site 21209 was not officially recorded until 1999 (McCoy 1999), but has been known since at least 1935 (Bryan 1979:35). Since 1999, the site has been altered to the point that none of the original features (a mound and an oval alignment) are extant. Photographs from the mid 2000s suggest that rock removed from Site 21209 and surrounding areas has possibly been incorporated into the nearby “lele.” (Figure 10)

Described as a possible burial, there is no evidence of a subsurface interment in the absence of the above-ground features. However, over time, charred bone fragments (possibly cremated remains) have been observed between the summit USGS marker and Site 21209.

3.2.3 Site 50-10-23-2143

As shown in Figure 10, Kūkahau‘ula has a large, irregular boundary, which was determined based on the geological extent of the three *pu‘u* that comprise the summit; there are no human-made above-ground historic properties directly associated with Kūkahau‘ula, although the sites noted above are within its boundaries. The northwestern portion of Kūkahau‘ula extends into the Astronomy Precinct. All of the observatories at the summit, except for the Caltech Submillimeter Observatory, the James Clerk Maxwell Telescope, and the Submillimeter Array, are within Kūkahau‘ula.

3.2.4 Site 50-10-23-26869

As noted above, the Mauna Kea Summit Region Historic District includes all historic properties within the Mauna Kea Science Reserve plus additional properties outside the management control of OMKM. Other than the sites listed above, there are no additional contributing historic properties of SIHP-26869 within 500 m of the proposed project area.

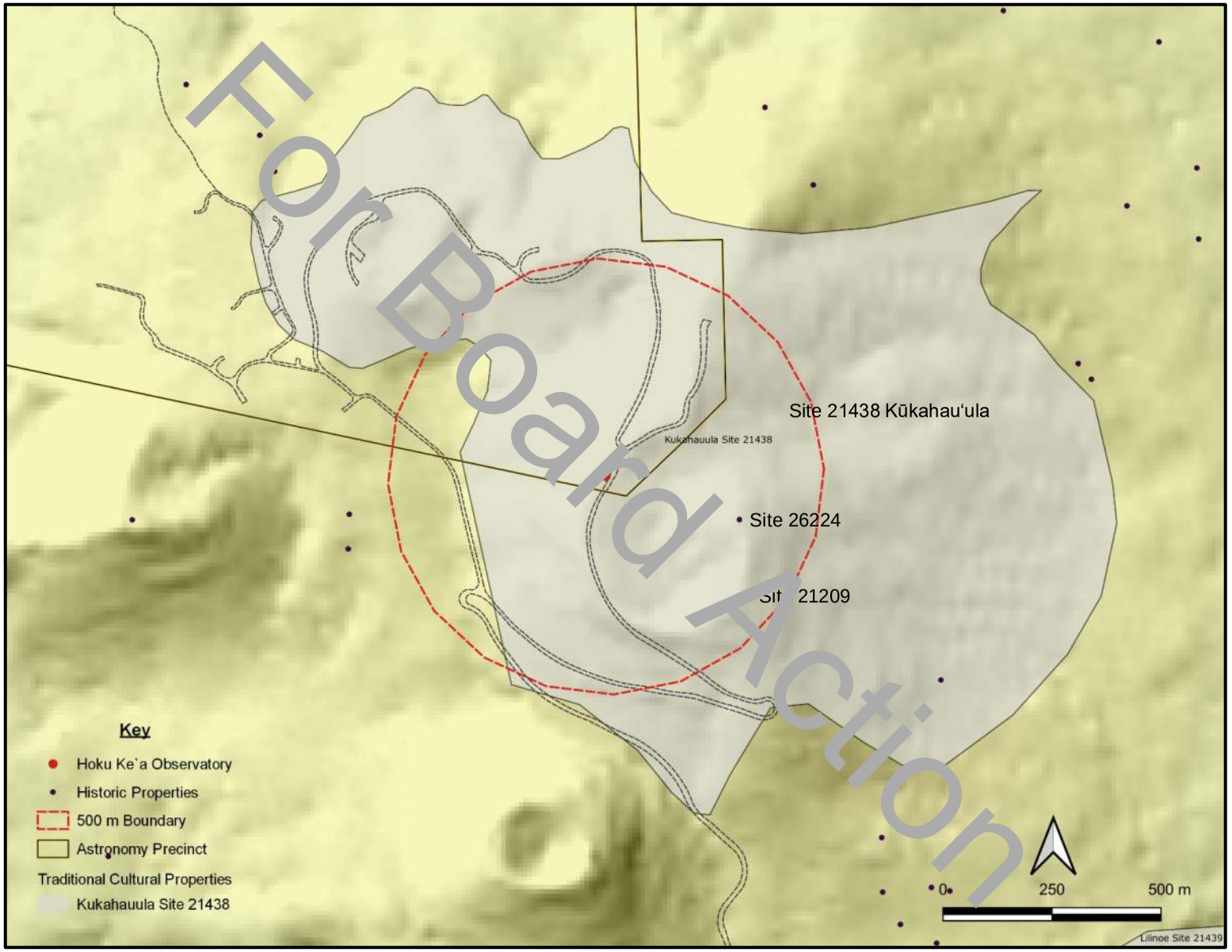

Figure 10. Mauna Kea Summit Region Showing Traditional Cultural Properties and Historic Properties in Relation to the Hōkū Ke'a Observatory, the Astronomy Precinct, and a 500 meter Buffer around Hōkū Ke'a.

4.0 ANTICIPATED FINDS

Based on the archival background, past land use, and previous archaeological studies, it is anticipated that no above-ground or subsurface archaeological resources will be recorded during the Hōkū Keʻa Observatory Decommissioning project. It is likely that ground-disturbing activities associated with the original construction of the observatory and auxiliary buildings sufficiently altered the original ground surface that any historic properties, if they were present, have been destroyed.

5.0 PROJECT IMPACT ASSESSMENT

5.1 ARCHITECTURE

5.1.1 Identification and Inventory of Historic Properties (HAR §13-275-5)

Two buildings on site are over 50 years in age:

- Observatory – Built 1968
- Generator Building – Built ca. 1968

5.1.1.1 Evaluation of Significance (HAR §13-275-6) and Integrity

Neither of the buildings are evaluated as eligible for the Hawai'i State Register of Historic Places under any criteria established in HAR §13-275-6(b). Despite significance relating to its role as the first telescope put into use at the Mauna Kea Stellar Observatory, and as a component of the "highest stellar observatory in the world", the Observatory has lost integrity due to replacement of the dome, wood interior walls, metal exterior walls, the installation of a new doorway opening, a replaced original door, and removal of both the original (and a second) telescope. (see 5.3 Consultation Responses for information concerning an astronomical project using the Hōkū Keʻa Observatory.

Likewise, the Generator Building that supported the observatory function is also evaluated as not eligible for the Hawai'i State Register of Historic Places under any criteria established in HAR §13-275-6(b). It lacks integrity of association, setting, and feeling due to the modifications to the building it originally supported. On its own, and without an eligible property to anchor its significance, it does not have sufficient significance or integrity for listing on the state or national registers.

5.2 ARCHAEOLOGY

While no above-ground archaeological properties will be impacted by the decommissioning project, there will likely be a short-term impact to Kūkahauʻula while the structures and subsurface utilities are removed. Those effects may include ground disturbance, temporary noise impacts, and temporarily restricted access to the site area.

However, following the removal of the existing structures and subsurface utilities, a mandated Site Restoration Plan will be implemented to restore the site area. Hence, there will be no long-term impact of the decommissioning project on Kūkahauʻula. Likewise, the project, while not considering the entire Kūkahauʻula TCP or the Mauna Kea Summit Historic District, will serve to enhance or bolster the Hawaii Register of Historic Places integrity of setting as previously determined by the SHPD.

5.3 CONSULTATION RESPONSES

In an effort to more completely understand the cultural and historical background within and around the project area and bring as much information to bear on the decision-making process

for this project, PCSI sought community input. Sixty-eight entities (community members, community groups, and State agencies) were sent letters (66 by email and two by post) asking for input concerning historic sites located in or near the project area, as well as cultural traditions, legends, and traditional cultural places and practices pertaining to the area. In addition, the letter provided a link to a website where more background information was provided. The 68 entities were identified by OMKM primarily through interactions as part of previous undertakings within University of Hawaii managed lands on Mauna Kea (see Appendix B).

Six responses were returned. None of the responses provided specific information concerning historic properties, cultural resources, or traditional practices within the project area but did provide commentary and recommendations to strengthen the CSR:

- The Office of Hawaiian Affairs (OHA) requested methodological and regulatory clarification for the CSR as well as clarification concerning the project area's restoration plan and status within the HRS 6e process.
- The State Historic Preservation Division (SHPD) had no substantive comments but did provide several historic preservation-related reports pertinent to the Mauna Kea summit region.
- The University of Hawaii-Hilo Hanakahi Council (UHH Native Hawaiian Faculty Advisory Group) requested a presentation (scope and delivery to be determined); and
- One anonymous member of the American Astronomical Society, Historical Astronomy Division provided the following comment:

About 1968 there were two 24-inch telescopes installed in domes on the summit ridge of Mauna Kea. In 1970 or so the 88-inch telescope came online. One of the 24-inch telescopes was moved to Leeward Community College on Oahu in the 1980's. What this project is about is the removal of the second telescope [Hōkū Keʻa]*, which has been operated by University of Hawaii, Hilo for some time. I used this telescope quite a bit from 19__ to early 1996 and helped establish the existence of a new class of non-radially pulsating stars. The prototype is gamma Doradus.*

- One community member (Mr. Leningrad Elarianoff) provided information concerning Hawaiian origins passed down to him from his mother who "…was a story teller who spent many hours with the old folks in Kau trading stories that were passed down for generations."
- One community member (Mr. Chad Baybayan) expressed willingness to discuss historic sites on the summit (pending)

6.0 RECOMMENDATIONS

6.1 Architecture: Determining Effects to Significant Historic Properties (HAR §13-275-7)

Both buildings will be demolished as part of the decommissioning project. Since they are evaluated as not eligible, the Proposed Effect is "No historic properties affected".

6.2 Archaeology: Determining Effects to Significant Historic Properties (HAR §13-275-7)

Based on the results of research and consultation, it is recommended that the effect determination for this project is "No historic properties affected." However, because the project will occur within a TCP (Kūkahauʻula), it is recommended that a commitment be made to monitor (with an SHPD-approved monitoring plan) ground-disturbing activities during the Hōkū Keʻa Decommissioning project and to implement a Site Restoration Plan in accordance with the 2010 Decommissioning Plan for the Mauna Kea Observatories (a sub-plan of the Mauna Kea Comprehensive Management Plan).

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APPENDIX A
Architectural Reconnaissance Level Survey

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MASON

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June 11, 2020

Tanya Gumapac-McGuire
State Historic Preservation Division
Kakuhihewa Building
601 Kamokila Blvd., Suite 555
Kapolei, HI 96707

Re: Reconnaissance Level Survey for Environmental Assessment and HRS 6E-8 Review – Decommissioning Hōkū Ke'a Educational Observatory, Mauna Kea Science Reserve, Hawai'i, Hawai'i, TMK: [3] 4-4-015:009

Dear Tanya,

MASON was hired by PCSI, who is under contract to the USFM and the University of Hawai'i, to evaluate the effects of work proposed as part of the decommissioning of the two Hōkū Ke'a Observatory and Generator Building at Mauna Kea, Hawai'i. To follow is a summary of our findings in support that we prepared to support the project's Environmental Assessment (EA) and HRS 6E-8 Review requirements. Attached is the Reconnaissance Level Survey (RLS) our office prepared.

Identification and Inventory of Historic Properties (HAR §13-275-5)
Two buildings on site are over 50 years in age:

- Observatory – Built 1968
- Generator Building – Built ca. 1968

Evaluation of Significance (HAR §13-275-6) and Integrity
Neither of the buildings are evaluated as eligible for the Hawai'i State Register of Historic Places. Despite significance relating to its role as the first telescope put in use at the Mauna Kea Stellar Observatory, and as a component of the "highest stellar observatory in the world", the Observatory has lost integrity due to replacement of the dome, wood interior walls, metal exterior walls, the installation of a new doorway opening, a replaced original door, and removal of both the original (and a second) telescope.

Likewise, the Generator Building that supported the observatory function is also evaluated as not eligible for the Hawai'i State Register of Historic Places. It lacks integrity of association, setting, and feeling due to the modifications to the building it originally supported. On its own, and without an eligible property to anchor its significance, it does not have sufficient significance or integrity for listing on the state or national registers.

Determining effects to significant historic properties (HAR §13-275-7)
Both buildings will be demolished as part of the decommissioning project. Since they are evaluated as not eligible, the Proposed Effect is "No historic properties affected".

MASON

(Proposed) Mitigation (§13-275-8)
No mitigation is proposed at this time, as no historic architectural properties are affected.

PCSI, SSFM, and the University of Hawai'i at Hilo's Office of Mauna Kea Management are seeking the State Historic Preservation Division's (SHPD) concurrence on these findings. Thank you for your assistance.

Sincerely,

Polly Tice
Research Section Director
Enclosures

State Historic Preservation Division
Reconnaissance Level Survey – Survey Form

Instructions: Submit this completed form with the completed SIHP request form and 6E Filing Fee Form **electronically** to: dlnr.intake.shpd@hawaii.gov

For additionally guidance on completing this form, please see the Architecture Branch Survey Guidelines available on the SHPD website.

---

1. **Review Type: Indicate which review process this survey was requested under**

   HRS 6E-08, HAR 13-275 HRS 6E-42, HAR 13-284

2. **Project Information: Indicate the document in which this survey was requested**

   2.1) Log No. [e.g. 2017.1234]

   2.2) Doc No. [e.g. 1708MB27]

   2.3) Other:

3. **Contact Information:**

   3.1) Name: Dennis Gosser 3.2) Company: PCSI, Inc.

   3.3) Street Address: 720 Iwilei Road

   3.4) County: Honolulu 3.5) State: HI 3.6) Zip Code:

   3.7) Phone: 222-0209 3.8) Email: dennis@pcsihawaii.com

4. **Property Location:**

   4.1) TMK [e.g. (3) 1-2-005:004]: (3) 4-4-015:009

   4.2) Street Address: Mauna Kea Access Road

   4.3) County: HI 4.4) State: HI 4.5) Zip Code:

5. **Property Classification:**

   5.1) Ownership:

   Private Public

   5.2) Classification

   Building District Site Structure Object

6. **Property Function:**

   6.1) Current: Observatory and Generator Building (vacant)

   6.2) Historic: Air Force observatory and generator building

7. Property Description:

7.1) Date of Construction: 1968/ca. 1968

7.2) Provide a description of the property, including the character defining features, summarize alterations to the property, and provide an evaluation of the property's integrity of materials, design, feeling, location, association, workmanship, and setting.

The two structures associated with the facility that will be decommissioned are an Observatory (1968), and a cinder block Generator Building (date unknown, but likely ca. 1968). The observatory is a small, one-story structure with a dome roof, set on a slab foundation. Its circular plan measures approximately 20' in diameter, and the apex of the dome is about 19 feet in height. The observatory's interior wood walls, exterior siding, doors, and dome roof were replaced in 2008, and the original 24" telescope was removed that same year. In 2010, a new telescope was installed but was later removed in 2018.

Integrity
Observatory: Integrity of location and setting are retained. Integrity of design is mostly retained. However, integrity of materials, workmanship, feeling, and association are impaired since historic character-defining features and materials were removed and replaced, including the original fiberglass dome, wood walls, and the telescope itself.
Generator Building: Integrity of location, design, materials, workmanship are retained. However, integrity of setting, feeling, and association are impaired because of the reconstruction of the associated dome observatory.

Historical Background:
The structures were built as components of the "Mauna Kea Stellar Observatory," an approximately $2.5 million observatory complex centered around an 88-inch telescope, along with two smaller, 20-foot auxiliary dome observatories, each with 24-inch telescopes. Once completed, the overall Mauna Kea complex was known as the "world's highest major astronomical observatory" ("Workmen on Mauna Kea race with winter weather"). One of the smaller, 20-foot dome observatories built as part of the complex is what is known today as "Hoku Kea." (the other was operated by the National Aeronautics and Space Administration (NASA). The Air Force facility was actually the first observatory component completed as part of the Mauna Kea Stellar Observatory. Put into intermittent operation in 1968 before the other telescopes, it initially relied on auxiliary generators for power. (Construction of a permanent access road had delayed installation of a permanent electrical utility.) It is not known exactly when the extant, supporting Generator Building was completed or put into use. By 1970, the Air Force telescope was equipped with a unique device "said to be the best infra-red radiation detector in the world [that] can measure wavelengths down to one millimeter" ("A Worthwhile Visit With The Mauna Kea Stargazers").

The Mauna Kea Stellar Observatory project was spearheaded by Dr. John Jefferies, Director of the Hawaii Institute for Astronomy, and Dr. William M. Sinton, professor of physics and astronomy of the University of Hawaii. It was built with NASA funding. John Jefferies explained how the Air Force project on Mauna Kea came about by saying, "In 1967 the US Air Force contacted Bill Sinton with the request that he submit a proposal to build a 24-inch telescope on Mauna Kea for infrared work. They wanted to map the sky so as to be able to differentiate between man-made and astronomical sources and decided that Mauna Kea would be the best site to do this. The instrument became the first regularly scheduled telescope on Mauna Kea and was in great demand" (https://www.ifa.hawaii.edu/history/jefferies/24inch.shtml). Later, the Air Force gave the 24 inch telescope to UH.

However, by the early 2000s, the 24-inch telescope was rarely being used by UH Hilo students. It was considered small and by 2008 had fallen into disrepair (Henderson, "A scope for the students.") The University of Hawaii's Institute for Astronomy gave the site to UH-Hilo. In 2002, UH Hilo received a $650,000 grant from the National Science Foundation for a new telescope and spent an additional $650,000, mainly to renovate the Observatory building where the telescope would be housed. A 2008 newspaper article reported, "The first telescope placed on the top of Mauna Kea was removed Monday in order to make way for a new, bigger scope that will allow students and researchers to peer even further into space" ("UH-Hilo telescope is down from the Mountain").

The new 36 inch telescope was designed to be operated remotely from UH-Hilo, and was named "Hōkū Keʻa", the Hawaiian navigational name for the "Southern Cross." The Observatory renovations were completed in 2008, and the 36 inch telescope was installed in 2010. Its purpose was for research and education of both UH graduate and undergraduate students and area high school students (Henderson, "A scope for the students"). However, the Observatory and telescope were beset by numerous problems and never became fully operable. Plans for decommissioning were made in 2015, and the telescope was removed in 2018 (Brestovansky, "Removal on Track).

8. Eligibility Recommendation:

8.1) Provide a recommendation of eligibility to the Hawai‘i Register of Historic Places including applicable criteria and areas of significance.

Recommendation of eligibility
The Observatory is evaluated as not eligible for the Hawaii State Register of Historic Places. Despite significance relating to its role as the first telescope put into use at the Mauna Kea observatory, and as a component of the "highest stellar observatory in the world" ("Plans Near Completion for Mauna Kea"), it has lost integrity due to replacement of the dome, wood interior walls, modified exterior walls, installation of a new doorway opening, and replaced original door, and removal of both the original and a second telescope.

The Generator Building is also evaluated as not eligible for the Hawaii State Register of Historic Places. It lacks integrity of association, setting, and feeling due to the modifications to the observatory it originally supported. On its own, and without an eligible property to anchor its significance, it does not have sufficient significance or integrity for listing on the State or National Registers.

Sources

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Henderson, Terrie. "A scope for the students", Hawaii Tribune-Herald, March 8, 2008. P. 1

Hurley, Timothy. "UH plans to take down small telescope," Honolulu Star-Advertiser. July 1[illegible] 2015. P-A23.

Ketchum, Larry. "24-Inch Scopes Summit-Bound," Hawaii Tribune-Herald, August 4[illegible] 1968. P. 1.

"Plans Near Completion for Mauna Kea." Honolulu Star-Bulletin. January 19[illegible] 1967.

"UH-Hilo telescope is down from the Mountain." Hawaii Tribune Herald, August 15, 2008, P. 1

University of Hawaii. John Jefferies: Astronomy in Hawaii 1964-1970, accessed May 2020, at: https://www.ifa.hawaii.edu/history/jefferies/24inch.shtml

"Workmen on Mauna Kea race with winter weather." Honolulu Star-Bulletin. Dec 5, 1968. Page F-9.

9. Attach Photographs: provide sufficient photographs to illustrate the property's main features. At a minimum provide the following:

Quantity	Description
1-2	Street view(s) of the resource and setting
1-2	Main Facades
1-2	interior photos(s) if applicable

10. Attach Map showing the location of the property

CHECKLIST

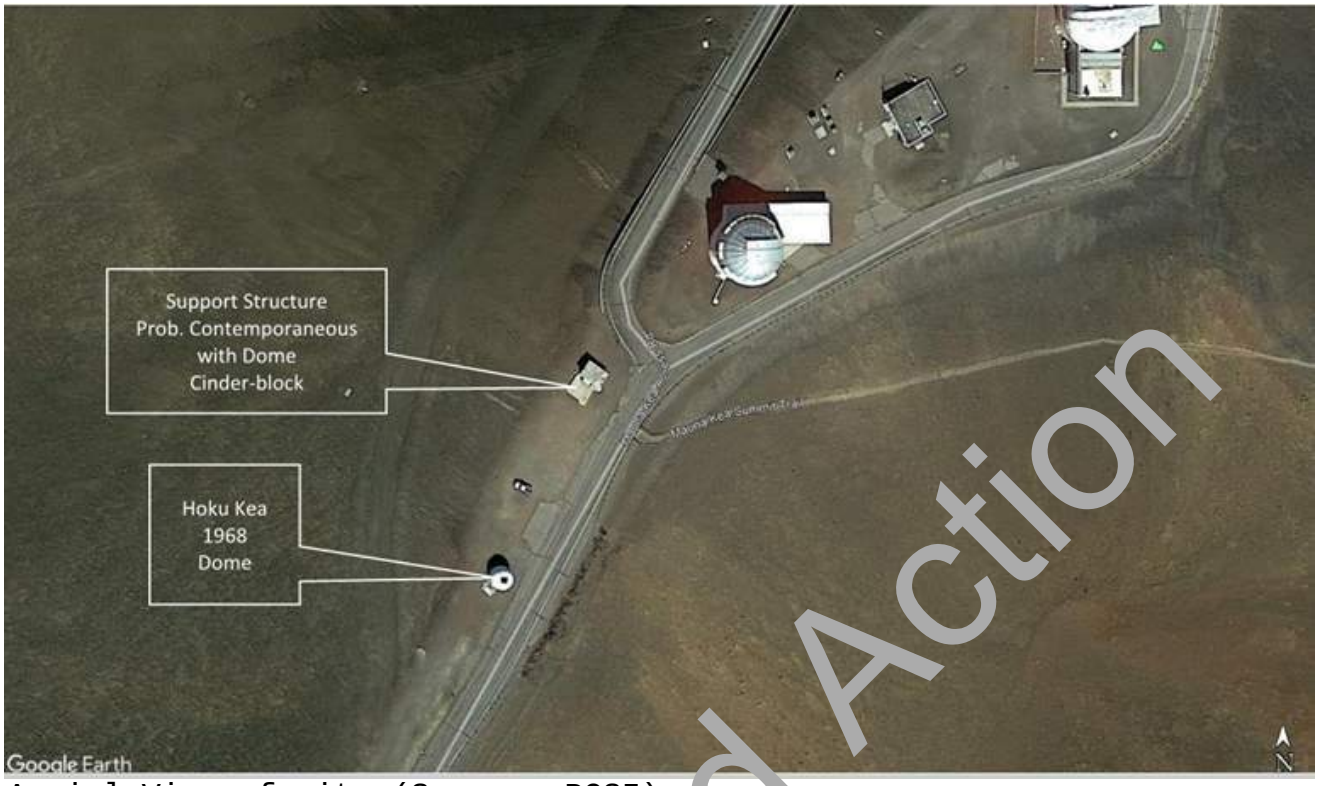
☑ **Reconnaissance Level Survey Form** (this form)

☑ **Photographs**

☑ **Map**

☐ **Filing Fee Form**

☐ **SIHP Request Form**



Aerial View of site (Source: PCSI)

"Air Force 24-Inch", ca. 1970 (Source: John Jefferies: Astronomy in Hawaii 1964-1970)

View of original 24-inch Air Force telescope (Source: Boller & Chivens website.)

Dale Cruikshank observing with the Air Force 24-in telescope at Mauna Kea, Aug., 1975

View of original 24-inch Air Force telescope at work (Source: Boller & Chivens website.)

Removal of the original telescope and original dome, August of 2008 (Source: "UH-Hilo telescope is down from the Mountain." Hawaii Tribune Herald, August 15, 2008, P. 1)

Present-day view of original door location in Observatory. (Source: PCSI)

Present day view of door opening added to Observatory in 2008.(Source: PCSI)

Present day view of Observatory interior. (Source: PCSI)

Present day view of Observatory interior showing door opening installed in 2008 (Source: PCSI)

Rear view of Generator Building. (Source: PCSI)

Front view of Generator Building (Source: PCSI)

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APPENDIX B
Community Consultation List

STATE GOVERNMENT	
Entity	**Responded to Request**
Department of Hawaiian Home Lands	No
DLNR State Historic Preservation Division	Yes
Office of Hawaiian Affairs	Yes
Hawaii State Aha Moku Advisory Committee	No
COMMUNITY GROUPS	
KAHEA	No
Nā ʻAhahui: Moku o Keawe -- Kohala Hawaiian Civic Club	No
Royal Order of Kamehameha	No
Royal Order of the Crown of Hawai`i	No
Perpetuating Unique Educational Opportunities (P.U.E.O)	No
Queen Liliʻuokalani Trust	No
Nā Wahine O Kamehameha	No
Kailapa Community Association	No
Piʻihonua Hawaiian Homestead Community Association	No
Laʻi ʻŌpua Association	No
Waimea Hawaiian Homesteaders' Association	No
Keaukaha Community Association	No
EDUCATION GROUPS	
American Astronomical Society, Executive Office	No
American Astronomical Society, Historical Astronomy Division	Yes
Hanakahi Council--UHH Native Hawaiian Faculty Advisory Group	Yes
INDIVIDUALS	
Bimo Akiona	No
Brannon Kamahana Kealoh	No
C.M. Kahoʻokahi Kanuha	No
Cheyenne Perry	No
Cindy Freitas	No
Clarence Kukauakahi Ching	No
Dr. Kamana'opono Crabbe	No
Dwight Vicente	No
Flores Case ʻOhana	No
Hank Fergerstrom	No
Hannah Springer	No
J. Keina‘ala Sleightholm	No
Jim Kauahikaua	No
Joseph Kualii Lindsey Camara	No
Kalani Flores	No
Kala Asing	No
Kaliko Kanaele	No
Kama Hopkins	No
Keahi Warfield	No
Kealoha Pisciotta	No
Kehaulani Costa	No

Kimo Lee	No
Lanny Sinkin	No
Lehua Vincent	No
Leilani Lindsey-Kaapuni	No
Mamo Bezilla	No
Mehana Kihoi	No
Michael Akau	No
Mike Kaleikini	No
Mike McCartney	No
Moses Kealamakia Jr.	No
Nelson Ho	No
Patrick Kahawaiolaa	No
Paul K. Neves	No
Pua Case	No
Richard Ha	No
Thomas Chun	No
Tiffnie Kakalia	No
Walter Kaneakua	No
William Freitas	No
Wilma Holi	No
Shane Palacat-Nelsen	No
Leningrad Elarianoff	Yes*
U'ilani Naipo	No
Kālepa Baybayan	Yes
Kimo Lee	No
Wally Lau	No
Nakoolani Warrington	No
Wally Ishibashi	No

*Mr. Elarianoff provided a response in conjunction with the proposed new telescope at Halepohaku.

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APPENDIX C

Archaeological Literature Review and Architectural Evaluation

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REVISED PRELIMINARY DRAFT REPORT

Archaeological Literature Review with Field Inspection and Architectural Evaluation in Support of the Hōkū Keʻa Decommissioning Project, Mauna Kea, Hawaiʻi Island, Hawaiʻi

TMK: (3) 4-4-015:009 por

Prepared For:
SSFM International
99 Aupuni Street, Suite 202
Hilo, Hawaii 96720

Prepared By:
Pacific Consulting Services, Inc.
720 Iwilei Road, Suite 424
Honolulu, HI 96817

December 2020

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MANAGEMENT SUMMARY

Document Title:	Archaeological Literature Review with Field Inspection and Architectural Evaluation in Support of the Hōkū Keʻa Decommissioning Project, Mauna Kea, Hawaiʻi Island
Date/Revised Date:	Preliminary Draft: July 2020; draft December 2020
Archaeological Permit #:	SHPD Permit No. 20-29
Project Location:	Mauna Kea Science Reserve, Kaʻohe Ahupuaʻa, Hāmākua District, Island of Hawaiʻi
Project TMK:	TMK (3) 4-4-015:009 por.
Land Owner:	State of Hawaiʻi
Project Proponents:	University of Hawaii-Hilo
Project Tasks:	Archaeological Literature Review with Field Inspection and Architectural Evaluation
Project Acreage:	2,178 square ft (.05 acres).
Principal Investigator:	Dennis Gosser, M.A.
Regulatory Oversight:	Hawaii Revised Statutes (HRS) Chapter 6E-7 and 6E-8, and Hawaii Administrative Rules (HAR) Chapter 275
Project Background:	The project scope of work includes the removal of the Hōkū Keʻa Observatory and Generator Buildings and subsurface utilities
SIHP #:	50-10-23-21438 (Kūkahauʻula) Traditional Cultural Property; 50-10-23-26869 Mauna Kea Summit Historic District
Findings:	Archaeological investigations have documented four historic properties within a 500-meter radius of the project area; 50-10-23-21438 (TCP), 50-10-23-26224 (USGS marker), and 50-10-23-21209 (possible burial, deconstructed).
Human Skeletal Remains:	None identified within the project area.
Recommendations:	**Architecture:** **Recommended effect determination:** No historic properties affected **Archaeology:** **Recommended effect determination:** No historic properties affected **Recommended commitments:** Because the project will occur within a TCP (Kūkahauʻula) and a non-site portion of the Maunakea Summit Historic District, archaeological monitoring of ground-disturbing activities (with an SHPD-approved monitoring plan) is recommended Implement a Site Restoration Plan in accordance with the 2010 Decommissioning Plan for the Mauna Kea Observatories (a sub-plan of the Mauna Kea Comprehensive Management Plan).

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1.0 INTRODUCTION

Under contract to SSFM, International (SSFM), Pacific Consulting Services, Inc. (PCSI) has prepared this Archaeological Literature Review with Field Inspection (ALRFI) and Architectural Evaluation in support of the Hōkū Keʻa Decommissioning Project in the 525-acre Astronomy Precinct, which is located within the approximately 11,288-acre University of Hawaiʻi-leased (Lease No. S-419) Mauna Kea Science Reserve (MKSR) on Mauna Kea[1], Kaʻohe Ahupuaʻa, Hāmākua District, Island of Hawaiʻi (TMK [3] 4-4-015:009 por.). The project proponent is the University of Hawaiʻi-Hilo (UHH), and the land owner is the State of Hawaiʻi. The location of the proposed project is shown in Figures 1 and 2. The overall project goals are to remove the Hōkū Keʻa Observatory and Generator buildings (Figure 3), including foundations and associated subsurface utilities, and restore the approximately 2,178-square foot (0.05 acres) site. The Architectural Reconnaissance Level Survey (RLS) undertaken by MASON is included as Appendix A.

1.1 Project Purpose, Regulatory Guidance, and Area of Potential Effect (APE)

The objective of developing this ALRFI is to gather together information concerning historic properties, cultural resources, and traditional practices that may be impacted by the proposed Hōkū Keʻa Decommissioning project. The current study draws upon and is in compliance with Hawaii Revised Statutes Chapter 6E-8 as well as Title 13 of the Hawaii Administrative Rules (HAR), Subtitle 13 (State Historic Preservation Division [SHPD] Rules), Chapter 275: (Rules Governing Procedures for Historic Preservation Review for Governmental Projects). The ALR will be submitted to SHPD in order to obtain a "determination letter" for the project (HAR §13-275-3). The determination letter will provide a response to the recommended actions (with regards to historic preservation) set forth in this document.

The proposed project activities include:

- Deconstruction and removal of the Hōkū Keʻa Observatory and Generator Building;
- Exposure and removal of subsurface utilities between the observatory and the generator buildings; and
- Restoration of the site landscape.

The Area of Potential Effect is approximately 0.25 acres bounded on the north, south, and east by a paved road and on the west by a steep slope (see Figure 2).

1.2 Methods

Understanding the cultural setting of an area includes compiling and analyzing archival, historical, and traditional information from many sources. In addition to written or published sources, identifying and inviting individuals and groups to share their knowledge relating to traditional practices and beliefs is important to developing a well-rounded, informed, understanding of a proposed project's cultural setting.

Prior to contacting and consulting[2] with interested parties familiar with and knowledgeable of Mauna Kea's cultural traditions, PCSI staff conducted a historical and archaeological literature review of the Hōkū Keʻa Decommissioning project area in order to assess any potential effect on

[1] Where applicable, geographic names follow the Hawaii Geographic Names Board Place Names (October 2018).

[2] Because of State and County imposed restrictions due to the COVID-19 pandemic, consultation for this project relied solely on USPS mail, email, and other electronic means.

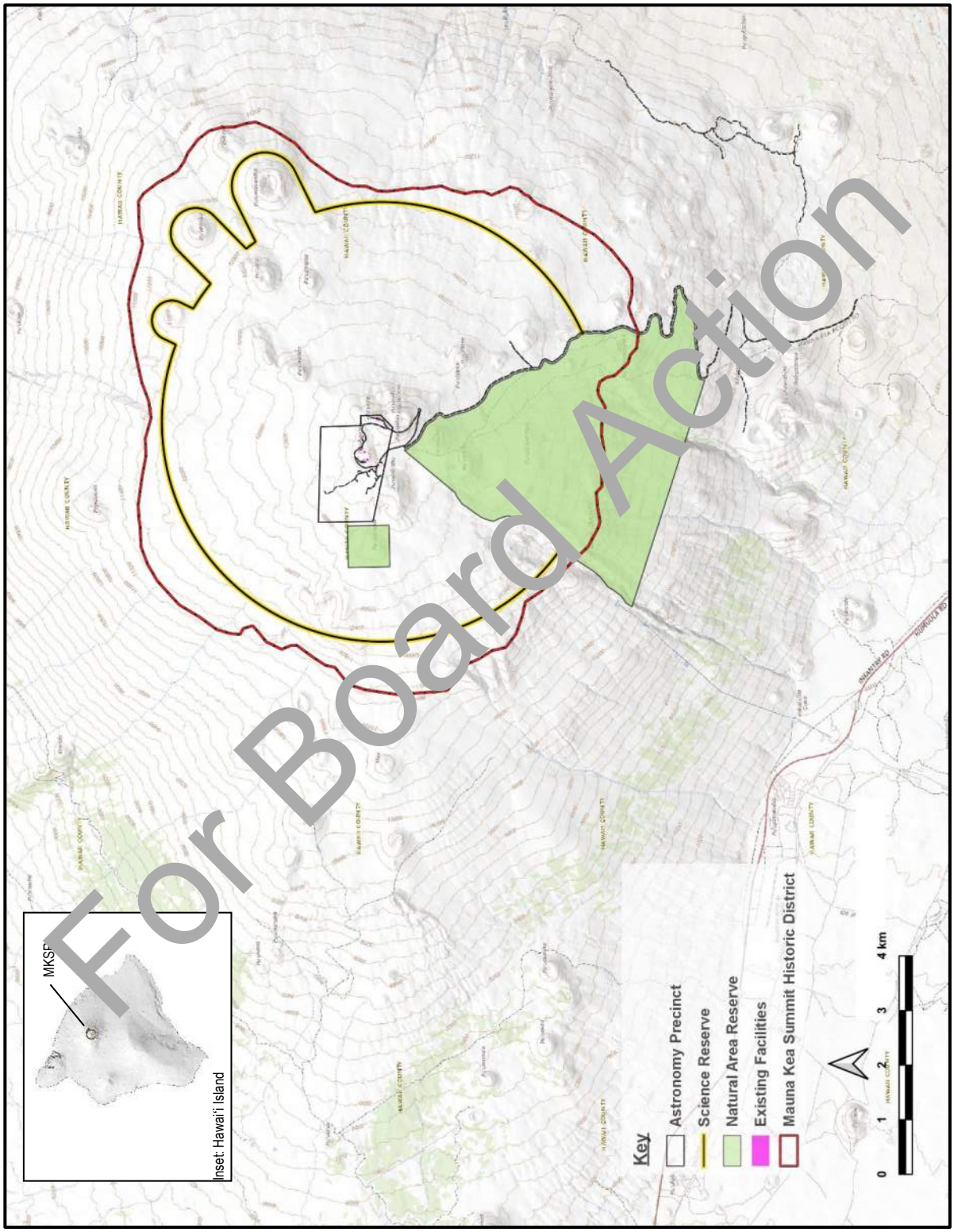

Figure 1. Mauna Kea Science Reserve Shown on the USGS 1:250,000 Topographic Sheet (1975).

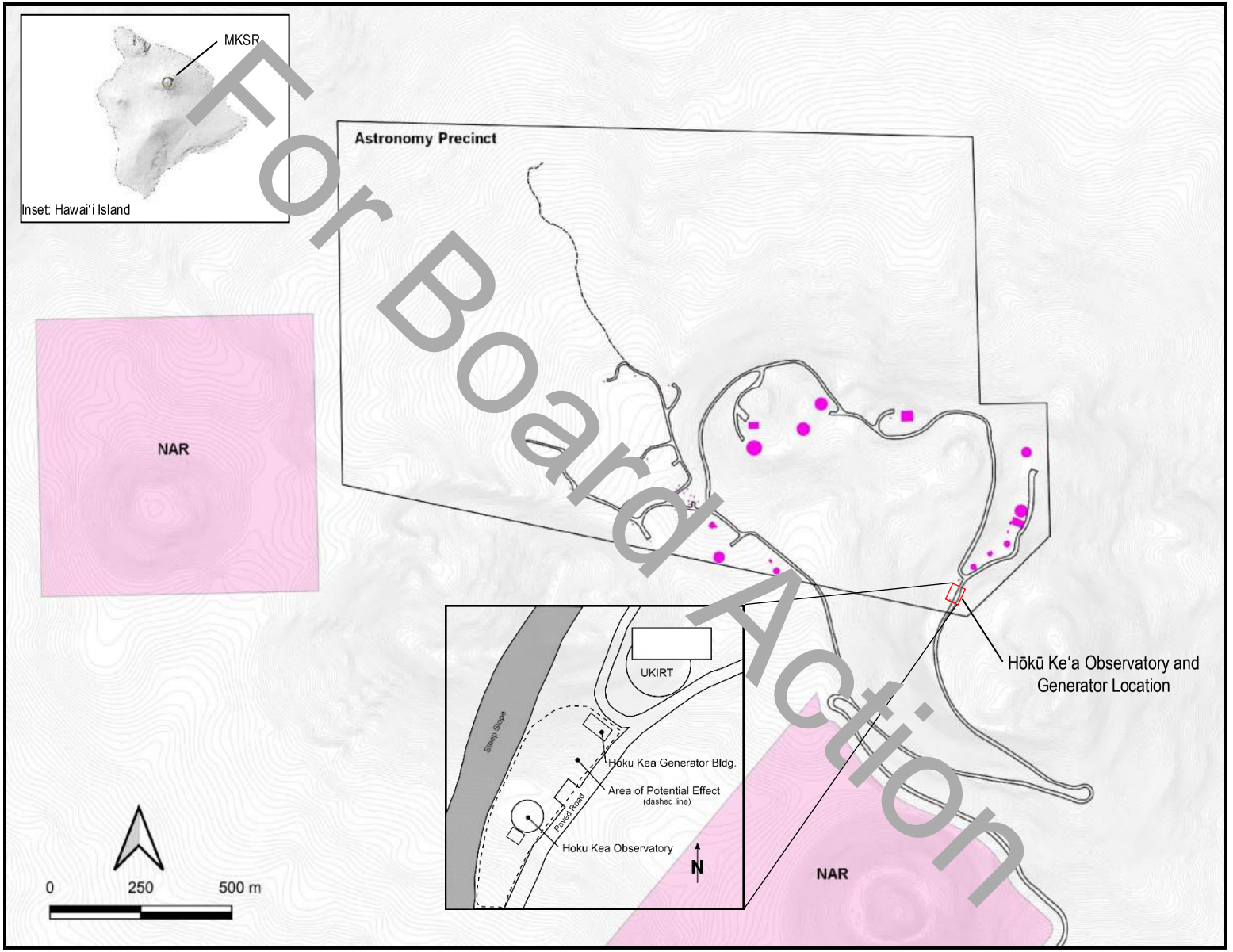

Figure 2. Mauna Kea Summit Region and Astronomy Precinct Showing the Location of the Hōkū Ke'a Observatory and Generator Buildings and APE.

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Figure 3. Top: Hōkū Keʻa Observatory, View to the South.
Bottom: Hōkū Keʻa Generator Building, View to the West.

historic properties or other cultural resources. The background research was completed using various documentary and archival resources, including the State Historic Preservation Division's (SHPD) database of archaeological reports, the SHPD report library, a Land Commission Awards (LCA) review via the Bureau of Conveyances, a review of historic maps, and a review of Mauna Kea reports on file at PCSI. Because the project area has been the subject of several archaeological studies, including an SHPD-approved archaeological inventory survey (AIS; McCoy and Nees 2010), no ground-disturbing archaeological activities (e.g., archaeological excavations) have been undertaken or are being considered as part of the current project.

As part of a HRS 343 environmental impact assessment for the project, community consultation was initiated with community members and groups. The results of the consultation are summarized below.

2.0 BACKGROUND

2.1 SETTING

Mauna Kea is the highest (4,205 m[3] [13,796 ft] above sea level [asl]) and second largest of the five shield volcanoes forming the island of Hawai'i and is between 600,000 and 1.5 million years old (DePaolo and Stolper 1996; Moore and Clague 1992; Sharp and Renne 2005; Wolfe et al. 1997;). The oldest stage of volcanism consists of a basaltic shield called the Hāmākua Volcanic Series (Stearns and Macdonald [1946]) or the Hāmākua Group (Porter 1979a). The most recent stage of volcanism consists of andesitic lavas (Macdonald and Abbott 1970:142; Sherrod et al. 2007; Wolfe and Morris 1996; Wolfe et al. 1997) called the Laupāhoehoe Volcanic Series (Stearns and Macdonald [1946]) or the Laupāhoehoe Group (Porter 1979a) (Figure 4). Even though the last eruption occurred sometime between 4,580 and 8,200 years ago (Sherrod et al. 2007:470), the U.S. Geological Survey (USGS) considers Mauna Kea to be an active post-shield volcano (U.S. Geological Survey 2002).

There are numerous cinder cones and associated lava flows on what is commonly known as the summit plateau (Figure 5). Wentworth and Powers (1941:1197) described the plateau as "a rudely circular dome 5 or 6 miles in diameter rising between 500 and 1000 feet per mile to a central area above 13,000 feet."

The remnants of three or four glacial drift sheets, located above approximately 2,750 m asl [9,000 ft], are present on Mauna Kea (Porter 1972, 1975; Wolfe et al. 1997). Porter (1972, 1975:247) describes the effects of glaciation on the topography of the summit plateau:

> Behind the belt of end moraines lies a broad zone of dominantly erosional topography irregularly mantled by thin patches of drift. Within this zone, lava-flow surfaces have been abraded into stoss-and-lee forms ["whaleback ridges] or *roches moutonnées*] and are extensively striated, and the flanks of cinder cones have been oversteepened by glacial erosion so they stand at angles of 30 to 34, instead of the more typical 24 to 26.

2.2 CLIMATE, HYDROLOGY, FAUNA, AND FLORA

The summit region is dry and cold with little difference in the mean minimum and mean maximum temperature ranges throughout the year. Precipitation at the summit averages approximately 204 mm (8.0 inches) per year (Giambelluca et al. 2014). Prevailing winds at the summit are from the east-northeast.

[3] Metric abbreviation use and style follow the Society for American Archaeology American Antiquity Style Guide (2018).

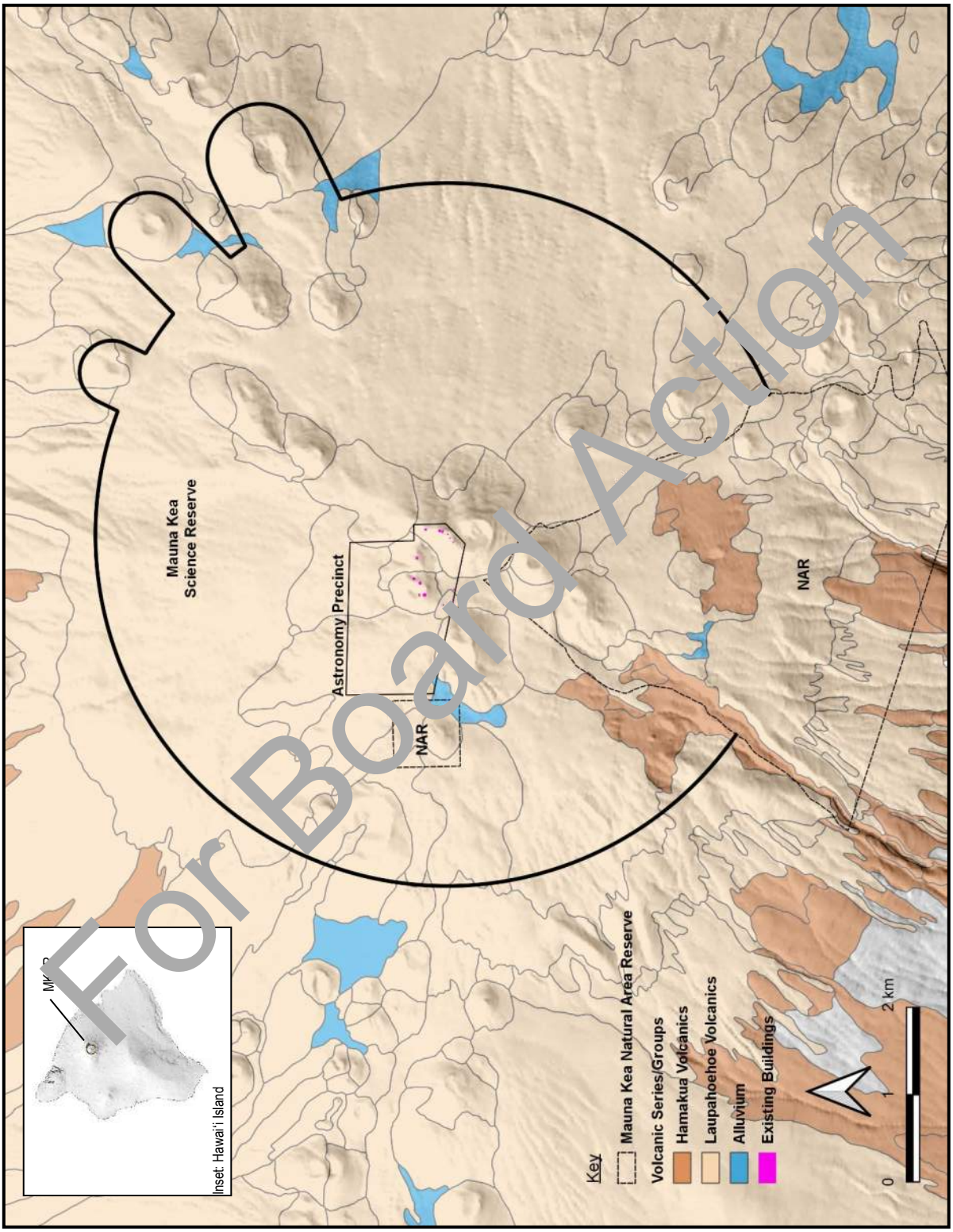

Figure 4. Mauna Kea Summit Region Showing Volcanic Series.

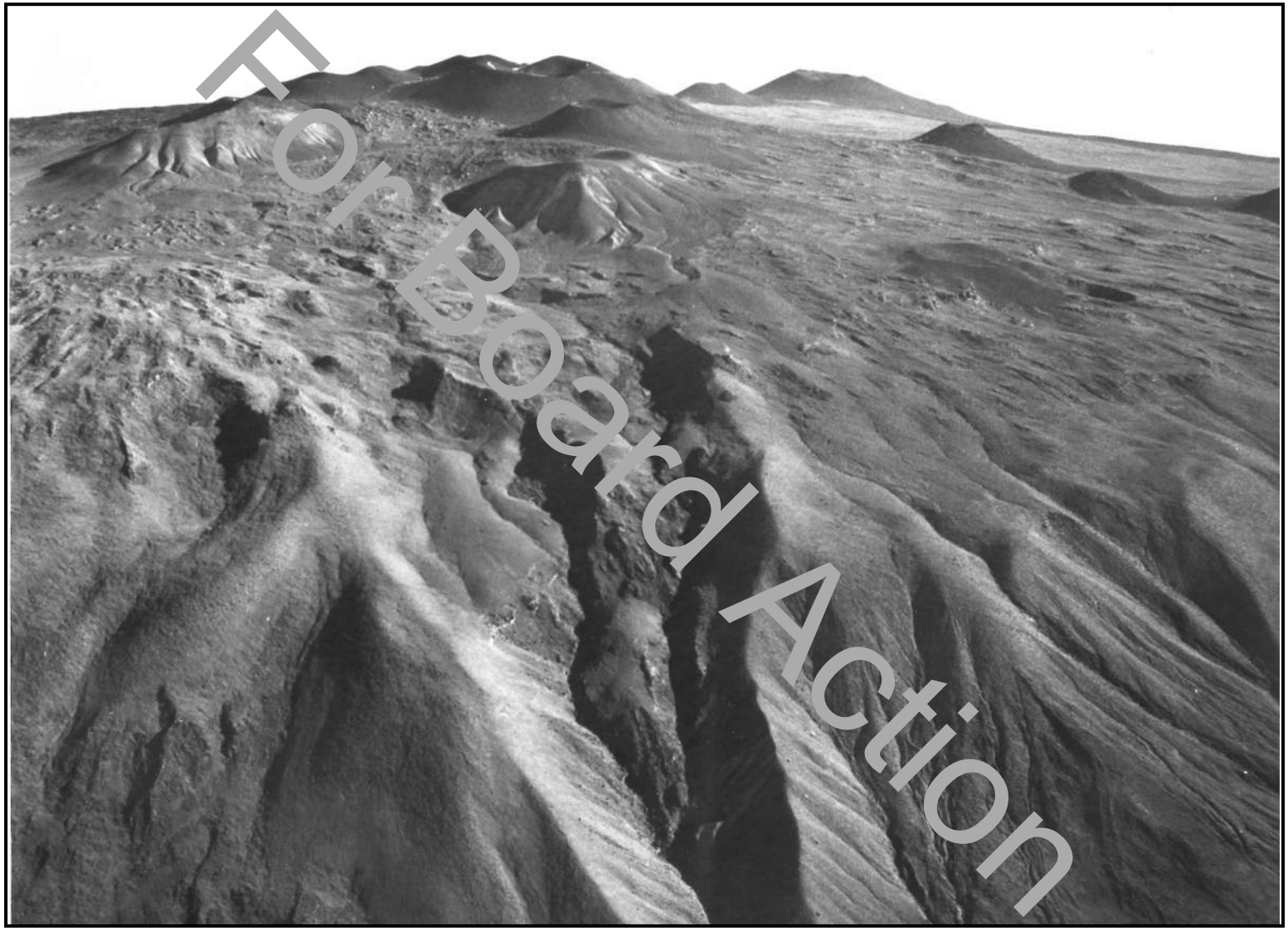

Figure 5. The Summit Plateau Looking Northeast with Pōhakoloa Gulch in the Foreground, Puʻu Kūkahauʻula (summit) at the top center, and Puʻu Makanaka in the Distance.

Lake Waiau, to the southwest of the summit, is the only permanent body of water on the summit plateau (Maciolek 1982). Two intermittent streams, Pōhakuloa Gulch and Waikahalulu Gulch, originate near the lake.

Vegetation above the 3,000 m (9,842 ft) elevation is classified as a semiarid, barren alpine tundra (Krajina 1963) consisting of lichens, mosses, and bunch grasses such as *Trisetum glomeratum* and *Agrostis sandwichensis* (Hartt and Neal 1940; Krajina 1963; Mueller-Dombois and Krajina 1968; Smith, Hoe and O'Connor 1982). A lower xerophytic scrub zone, extending down to 2,100 m (6,890 ft) elevation, is characterized by the presence of *Styphelia douglasii, Vaccinium peleanum* and *Coprosma* spp., in addition to the higher elevation species.

In the summit region there is an "aeolian zone" occupied by a variety of insects (Howarth and Montgomery 1980; Papp 1981) that are believed to have been the only resident fauna in the alpine desert prior to European contact.

2.3 HISTORICAL BACKGROUND

McEldowney (1982), Langlas (Langlas et al. 1997; Langlas 1999), Maly (Maly 1998, 1999; Maly and Maly 2005), and McCoy and Nees (2010) have summarized the traditional culture history, traditions, historical accounts, oral histories, and spiritual significance of Mauna Kea's summit region through early journal accounts, maps, ethnographic collections, Boundary Commission testimonies, and oral interviews. McCoy and Nees (2010) summarized the cultural history and previous archaeological work on Mauna Kea. The overview that follows is based on these studies, which should be consulted for more detail.

2.3.1 Summit Place Names, Myths, Legends, and Traditional Histories

Place names in the Mauna Kea summit region are a mix of traditional and modern nomenclature. Mauna Kea has been interpreted literally as White (Kea) Mountain (Mauna), but also as a reference to the union between the gods Wākea and Papa that formed the mountain (Ellis 1979:292). In an account and *mele* of Queen Emma's trip to Lake Waiau in 1881 or 1882, de Silva and de Silva (2007) present details about the names of the mountain and Lake Waiau:

> Although Maunakea is popularly translated as "white mountain," Kea is also an abbreviated form of Wakea, the sky father who, with Papa, the earth mother, stands at the apex of Hawaiian genealogy. Mauna Wakea is thus viewed traditionally as the sacred meeting point of sky and earth, father and mother, Wakea and Papa. Emma's poets were well-acquainted with the older name and its lasting significance; they refer to Waiau as "ka piko on Wakea"—as the mountain's navel/genital/umbilical/connecting-point/center (de Silva and de Silva 2007: footnote 7).

The currently used name for the summit is Kūkahauʻula ("Kūkahauʻula of the red-hewed dew" snow), instead of the formerly used Puʻu Wekiu, and refers to the legendary husband of Līlīnoe and an *ʻaumakua* (family deity) of fishermen (Hibbard 1999). Maly and Maly (2005:vi) give the name as Puʻu o Kūkahauʻula, which they say was "named for a form of the god Ku, where the *piko* of new-born children were taken to insure long life and safety." According to Maly and Maly (2005:vi):

> The name Puʻu of Kukahauʻula is the traditional name of the summit cluster of cones on Mauna Kea, appearing in native accounts and cartographic resources until c. 1932. The recent names, Puʻu Wekiu, Puʻu Hauʻoki and Puʻu Haukea, have…been used since the 1960s (since the development of astronomy on Mauna Kea), and have displaced the significant spiritual and cultural values and sense of place associated with the traditional name, Puʻu o Kukahauʻula.

The names Kūkahauʻula and Līlīnoe are both attributed to cinder cones in the summit region: Kūkahauʻula at the summit and Līlīnoe immediately southeast of the summit cluster. These

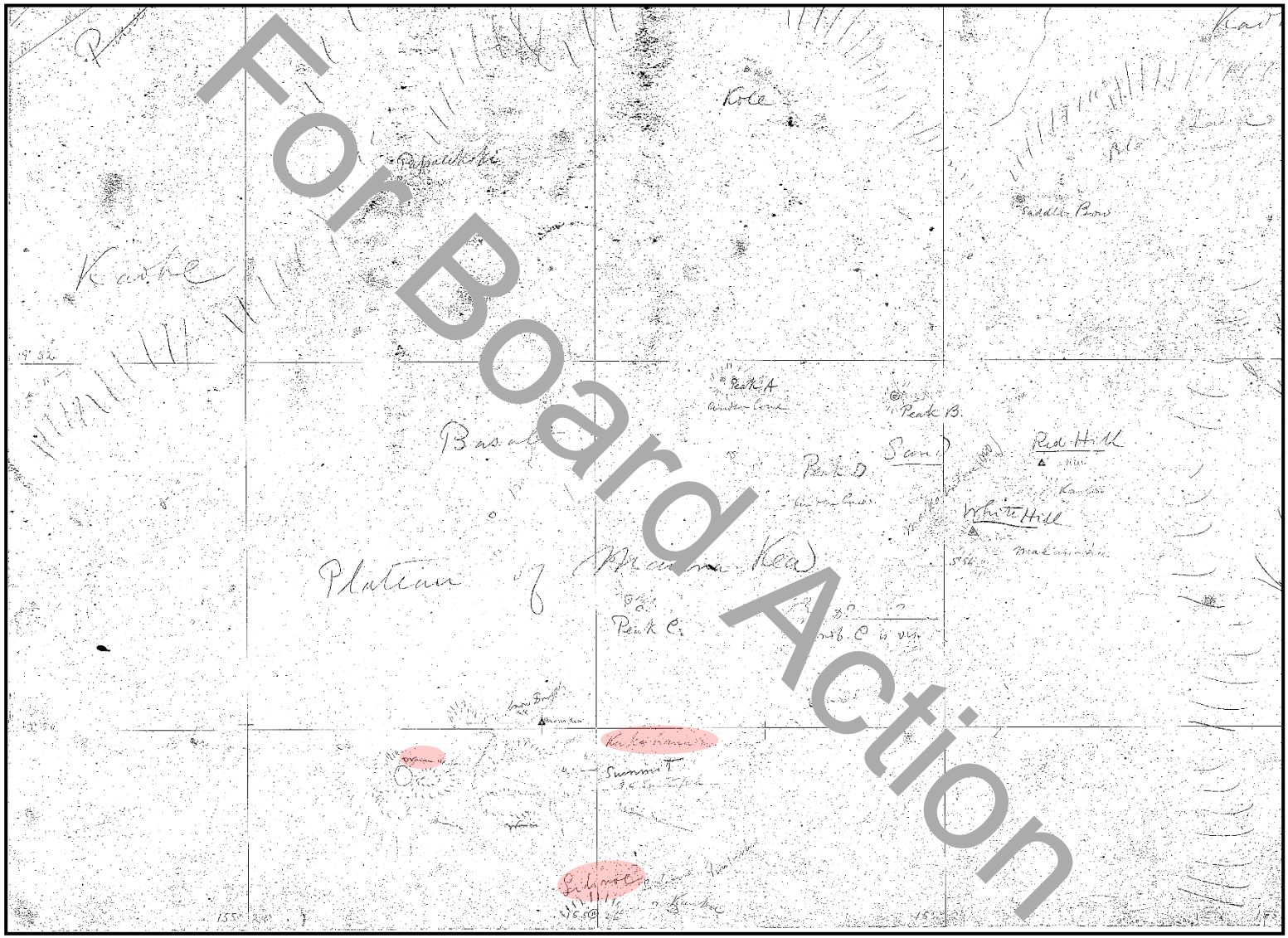

Figure 6. Portion of C.J. Lyons 1884 Map Titled *North Side of Mauna Kea Information Sketch*, with Kūkahau‘ula, Līlīnoe, and Waiau Highlighted (Hawaii State Archives Registered Map 1210).

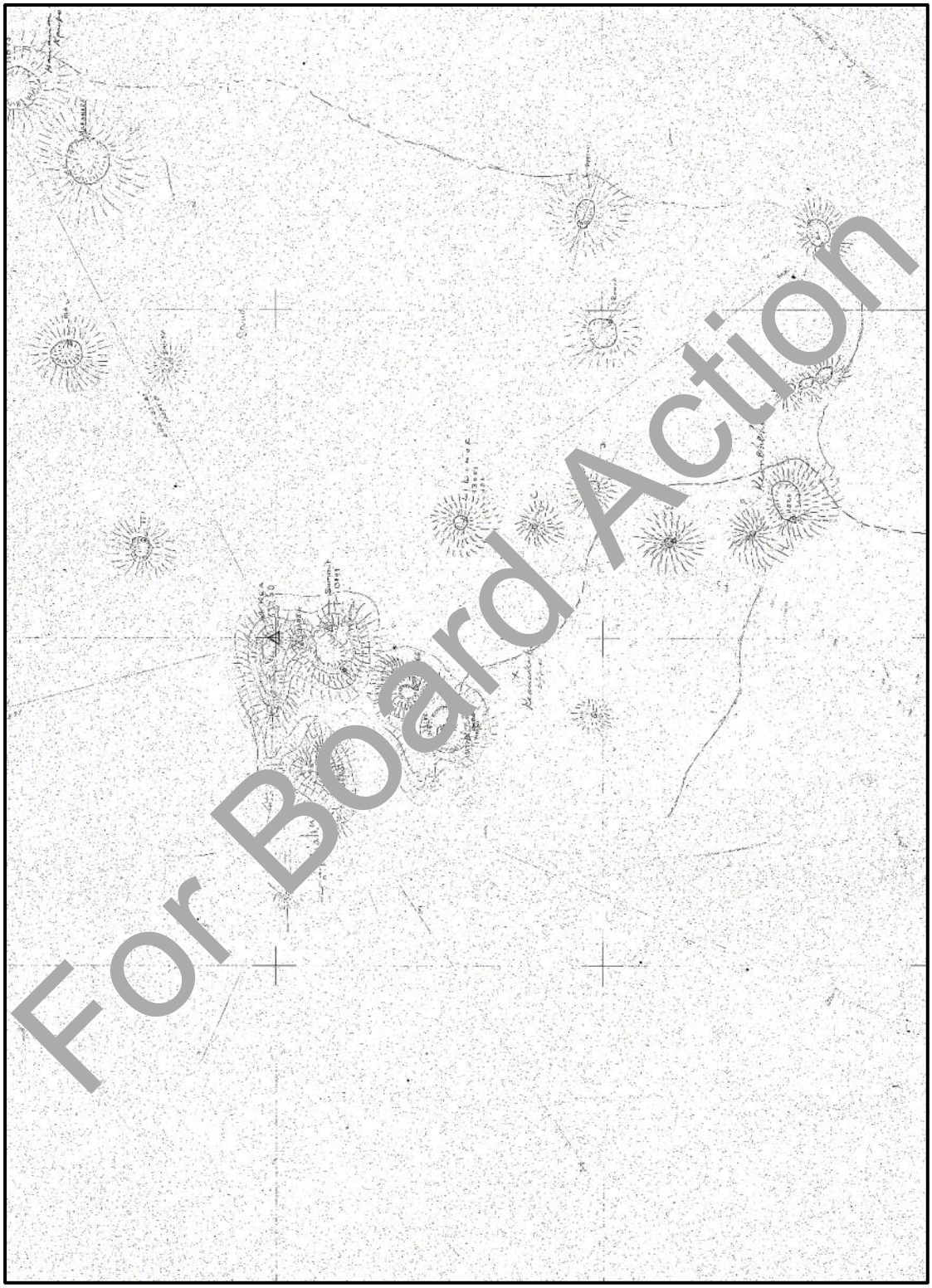

Figure 7. Portion of Map Titled *Summit Peaks of Mauna Kea Surveyed by W.D. Alexander* (Hawaii State Archives Registered Map 1860).

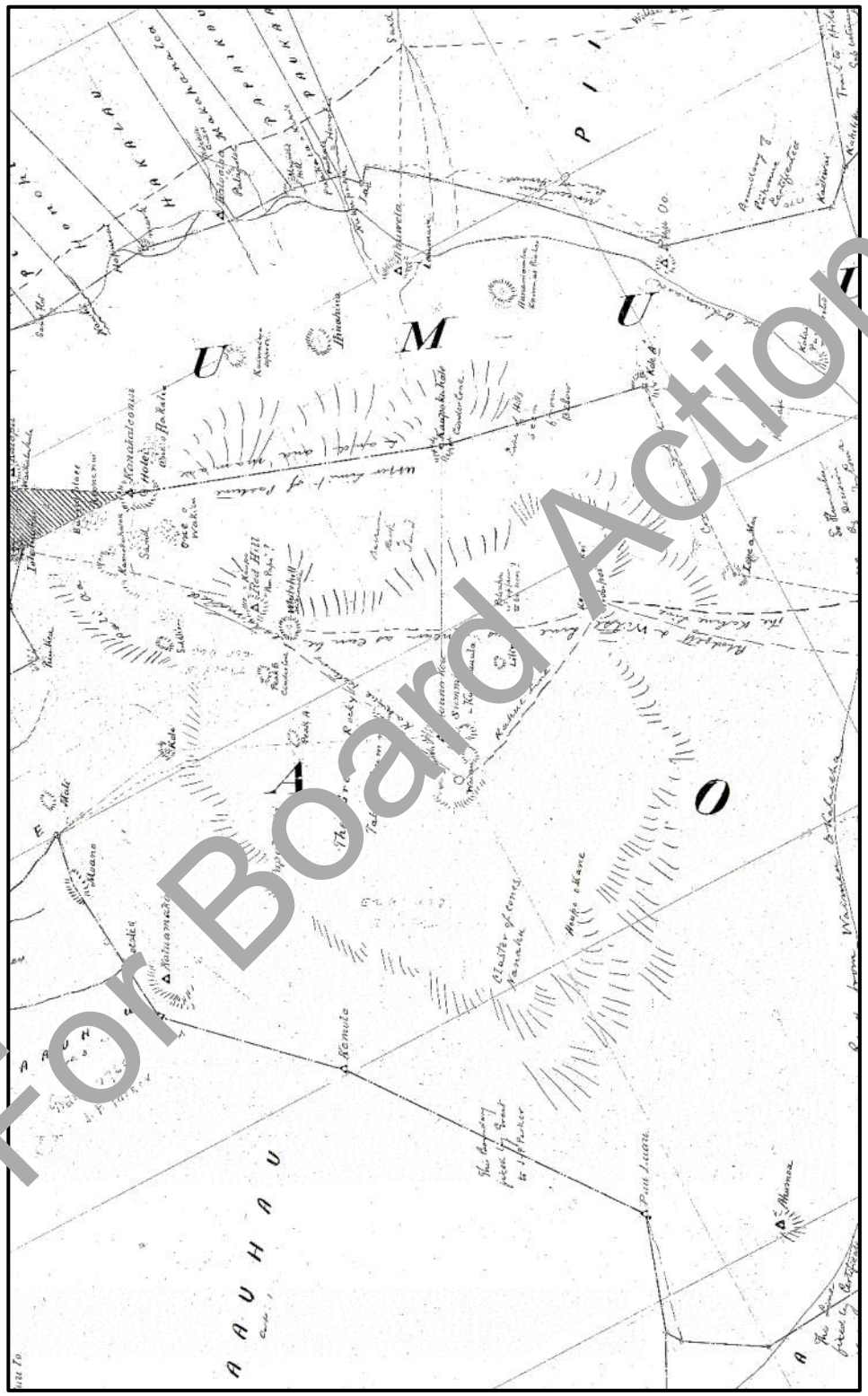

Figure 8. Portion of Map Titled *Kaohe and Humuula Hawaii Government Survey Map by C.J. Lyons 18[illegible]* (Hawaii State Archives Registered Map 1641).

names, along with that of Waiau, appear on Lyon's 1884 sketch map (Figure 6) and Līlīnoe and Waiau are repeated in the next survey of the summit region in 1892 by Alexander (Figure 7). Kūkahau'ula is given as the name of "the highest peak" even earlier in 1873 land boundary testimonies. Of the place names in the summit region, these three are applied the earliest and most consistently to specific landmarks on the mountain. In compiling the 1892 map of Mauna Kea, W.D. Alexander refers to these as "genuine native names." Lyons' 1891 map (Figure 8) shows "Poliahu?" located east of Līlīnoe, however this location likely refers to a feature other than a peak or cinder cone.

According to Pukui and Elbert (1986:377) Waiau means "swirling water of a current." Maly and Maly (2005:vi) give the following account of Waiau:

> Waiau, named for the mountain goddess, Waiau (Ka piko o Waiau), and home of the *mo'o* (water-form) goddess Mo'o-i-nanea. Place where piko of newborn children were taken to ensure long life; and from which "ka wai kapu on Kane" (the sacred water of Kane) was collected. These practices are still participated in at the present time.

Native Hawaiian traditions state that ancestral *akua* (gods, goddesses, deities) reside within the summit area, physically manifested in earthly form as *pu'u*, and as the waters of Waiau. Native Hawaiian genealogical *mele* (poems, chants) explain the centrality of Mauna Kea within Hawaiian genealogy and cultural geography. *Mele* recount that as a result of the union of Papa and Wākea, who are considered the ancestors of Native Hawaiians, the island of Hawai'i was birthed. In the *Mele a Paku'i*, a chant describing the formation of the earth, Mauna Kea is likened as the first-born of the island children of Papa and Wākea, who also gave rise to Hāloa, the first man from whom all Hawaiians are descended (Kamakau 1991:126 in Maly and Maly 2005:7-8). A *mele hānau* (birth chant) for Kamehameha III, who was born in 1814, describes the origins of Mauna Kea:

> *Born of Kea was the mountain,*
> *The mountain of Kea budded forth.*
> *Wākea was the husband, Papa*
> *Walinu'u was the wife*
> *Born was Ho'oniuku, a daughter,*
> *Born was Hāloa, a chief,*
> *Born was the mountain, a mountain-son of Kea*
> (Pukui and Korn 1973:13-28 in Maly and Maly 2005:9).

Some contemporary native Hawaiian cultural practitioners continue to view Mauna Kea as a first-born child of Papa and Wākea, and thus, the mountain is revered as "the *hiapo*, the respected older sibling of all Native Hawaiians" (Kanahele and Kanahele 1997 in Langlas 1999:7). Cultural practitioner Kealoha Pisciotta explains that this link to Papa and Wākea "is the connection to our ancestral ties of creation" (Orr 2004:61). Pualani Kanaka'ole Kanahele states that "the very fact that it is the 'Mauna a Wākea' tells you that it is the *mauna* that is meeting Wākea" (Maly 1999:A-368).

Traditional genealogical *mele* and *mo'olelo* (stories, traditions) recount associations between Mauna Kea and Poli'ahu, Līlīnoe, Waiau, and Kahoupakane. In a *mo'olelo* recounting the travels of Pūpū-kani-'oe, it was said that Mauna Kea was a mountain "on which dwell the women who wear the *kapa hau* (snow garments)" (Maly and Maly 2005:31). Another *mo'olelo*, which dates to the 1300s, explains that Ka-Miki was sent atop Mauna Kea's summit to the royal compound of Poli'ahu, Līlīnoe, and their ward, Ka-piko-o-Waiau, to fetch water for use in an '*ai-lolo* ceremony (Maly and Maly 2005:42-43).

In 1931, Emma Ahu'ena Taylor, a historian of Hawaiian descent with genealogical ties to the lands of Waimea and Mauna Kea, reported on Poli'ahu's residence at Mauna Kea, but also described the creation of Lake Wai'au. She wrote:

> Poliahu, the snow-goddess of Mauna-kea, was reared and lived like the daughter of an ancient chief of Hawaii. She was restricted to the mountain Mauna-kea by her godfather Kane. She had a nurse Lihau who never left her for a moment. Kane created a silvery swimming pool for his daughter at the top of Mauna-kea. The pool was named Wai-au. The father placed a supernatural guard [Mo`o-i-nanea] at that swimming pool so that Poliahu could play at leisure without danger of being seen by a man… (Maly and Maly 2005:53).

According to Taylor, on Mauna Kea, Poli'ahu's attendants Līlīnoe, Lihau, and Kipu'upu'u drove away her suitor, Kūkahau'ula (the pink-tinted snow god). But Mo'o-i-nanea allowed the snow god to embrace Poli'ahu, and to this day, Taylor reports, "Ku-kahau-ula, the pink snow god, and Poli'ahu of the snow white bosom, may be seen embracing on Mauna-kea" (Maly and Maly 2005:53).

2.3.2 Land Use

The summit of Mauna Kea is located in Ka'ohe Ahupua'a, Hāmākua District. Ka'ohe is a large *ahupua'a* found in what Lyons referred to as the "almost worthless wastes of the interior Hawaii:"

> Then there are the large ahupuaas which are wider in the open country than the others, and on entering the woods expand laterally so as to cut off the smaller ones, and extend toward the mountain till they emerge into the open interior country; not however to converge to a point at the tops of the respective mountains. Only a rare few reach those elevations, sweeping past the upper ends of all the others, and by virtue of some privilege in bird-catching or some analogous right, taking the whole mountain to themselves... The whole main body of Mauna Kea belongs to one land from Hamakua, viz., Kaohe, to whose owners belonged the sole privilege of capturing the *ua`u*, a mountain-inhabiting but sea-fishing bird.
>
> These same lands generally had the more extended sea privileges. While the smaller ahupuaas had to contend themselves with the immediate shore fishery extending out not further than a man could touch bottom with his toes, the larger ones swept around outside of these, taking to themselves the main fisheries much in the same way as that in which the forests were appropriated. Concerning the latter, it should here be remarked that it was by virtue of some valuable product of said forests that the extension of territory took place. For instance, out of a dozen lands, only one possessed the right to *kalai wa`a*, hew out canoes from the koa forest. Another land embraced the *wauke* and *olona* grounds, the former for kapa, the latter for fish-line (Lyons 1875:111).

The boundaries of Ka'ohe, as shown on modern maps, are open to question. A map of the adjoining Humu'ula and Ahupua'a made by S.C. Wiltse in 1862 (Hawaii State Archives Register Map No. 66[illegible]) included the adze quarry and Lake Waiau, which was labeled on the map as "Pond Poliahu." Maly and Maly (2005:280-287) note that

> By the time the Commissioners of Boundaries were authorized to certify the boundaries for lands brought before them in 1874, disputes over the boundary of Humu'ula and Ka'ohe had arisen…[and]…by the time of settlement in 1891, the boundary of Humu'ula was taken down to around the 9,000 foot elevation, with Ka'ohe taking in the entire summit region.

The testimony of Kahue of Humu'ula, presented in Maly and Maly (2005:287), mentions the boundary running from a gulch called Kahawai Koikapue, where *mele* were sung, to Waiau and then to the summit which was called Pu'uokūkahau'ula. Parenthetically, there is a note that "half of the water in the gulch belonging to Ka'ohe and half to Humu'ula."

In addition to the district and *ahupua'a* system of land tenure, there were other traditional land classifications, including one that employed the term *wao* for a series of natural and cultural

zones (Malo 1951:16-18). According to some descriptions, the *wao kanaka* was a low-lying coastal area where the *maka'āinana* were free to move and inhabit. The *wao kele* was the upland forested area that the *maka`āinana* could only access for gathering purposes. The *wao akua*, which was believed to be inhabited by *akua*, was the subalpine desert region above the tree line. The *maka`āinana* were hesitant to venture into the *wao akua* and could do so only by offering prayer and displaying great respect (NASA 2005:3-18, 3-19).

The Mauna Kea summit region is commonly described today as lying within the *wao akua,* which is different, however, from Malo's description of this zone which placed it at a lower elevation in forested lands (Malo 1951:17). As noted in the footnotes to Malo's *Hawaiian Antiquities* (Malo 1951:18), *wao akua* can also be understood to mean "a remote desolate location where spirits, benevolent or malevolent, lived and people did not live. Usually these places were deep interior regions, inhospitable places such as high mountains, deserts and deep jungles. These areas were not necessarily *kapu* but were places generally avoided out of fear or respect" (PHRI 1999, 24). When Rev. William Ellis toured Hawai'i Island in 1823, he noted the reluctance of native Hawaiians to venture into the summit areas of Mauna Kea:

> …numerous fabulous tales relative to its being the abode of the gods, and none ever approach the summit---as, they say, some who have gone there have been turned to stone. We do not know that any have been frozen to death, but neither Mr. Goodrich, nor Dr. Blatchely and his companion, could persuade the natives, whom they engaged as guides up the side of the mountain, to go near its summit (Ellis 1979:292).

Although the *ahupua`a* system (including *kapu* restrictions) of land and resource management no longer exists legally, knowledge of some traditional *kapu* have been passed down and endure. In Maly (1999: A-371), Pualani Kanaka'ole Kanahele stated that she learned from her *kūpuna* that the forested regions are not the realm of humans but rather that the forest's *kupa* (citizens) are the trees. Kanahele notes that "when I go *maha`oi* [intrude] in their realm, I have to ask permission to be up there." Likewise, Irene Lindsey-Fergerstrom indicated that in the context of taking *piko* up to the Mauna Kea summit, that her *tūtū* (grandmother) had knowledge of the *kapu* restriction that only *ali`i* were permitted on the summit (Maly 1999:A-390).

During pre-Contact times the slopes of Mauna Kea, above the limits of agriculture and permanent settlement, were a vast mountain "wilderness" probably known to only a small number of Hawaiians engaged in primarily "special purpose" activities such as bird-catching, canoe making, stone-tool manufacture, or burial of the dead (McEldowney 1982); ethnographic information relating to specific activity localities is generally lacking although archaeological evidence provides some evidence of past land use in the form of adze production (primarily at the Mauna Kea Adze Quarry but elsewhere as well), human burial, and the erection of shrines.

Early post-Contact ascents of Mauna Kea by Europeans and Hawaiians occurred throughout the nineteenth century, including Queen Emma's famous visit to Lake Waiau in 1881 or 1882 (de Silva and de Silva 2007). de Silva and de Silva (2007:5) note that

> the historical record of pilgrimages to Maunakea is not limited to Emma's mele and Phillips's mo'olelo. Steve Desha writes, that as a young man, Kamehameha Pai`ea went to Waiau to pray and leave an offering of 'awa. Kamakau tells us that Ka'ahumanu made the same journey in 1828 in an unsuccessful attempt to retrieve the iwi of her ancestress Lilinoe. Kauikeaouli visited Waiau and the summit in 1830, Alexander Liloliho in 1849 and Peter Young Ka'eo in 1854.

2.3.3 Cultural Practices and Belief

Cultural practices and beliefs involving Mauna Kea have been changing since the arrival of the earliest Polynesian settlers, an evolutionary process that continues today. Absent a written language, Hawaiian practices and beliefs were originally recorded in chants and oral histories that were passed on from generation to generation for over 1,000 years. The earliest written records

of native Hawaiian beliefs and practices were created by European explorers and settlers in the late eighteenth century.

A variety of cultural and religious beliefs and practices pertain to and are occurring on the mountain today. Whereas some traditional and customary Hawaiian practices and beliefs have survived and have gained wider practice in recent generations, other traditional and customary cultural practices and beliefs appear not be in practice. In addition, recent archaeological and ethnographic studies of Mauna Kea show that contemporary practices and beliefs have developed based on modern beliefs or have evolved from a traditional practice or belief. The difficulty in thoroughly documenting cultural practices is increased by the reluctance of some cultural practitioners to describe their practices and beliefs to researchers.

Traditional and customary cultural practices and beliefs have been defined as "those beliefs, customs, and practices of a living community of people that have been passed down through generations, usually orally or through practice" (Parker and King 1998:1; PHRI 1999:1). Traditional and customary cultural practices and beliefs contribute to the maintenance of a community's cultural identity and demonstrate historical continuity through the present. This is demonstrated through actual practice or through historical documentation of a practice or belief, including both written and oral historical sources (Parker and King 1998:1; PHRI 1999:2).

Contemporary cultural practices and beliefs have been defined as "those current practices and beliefs for which no clear specific basis in traditional culture can be clearly established or demonstrated – for example, the conducting of ritual ceremonies at sites or features for which no such prior traditional use and associated beliefs can be demonstrated. In some cases, however, it may be possible to demonstrate the reasonable evolutionary development of a contemporary practice from an earlier traditional practice" (PHRI 1999:3).

Modern-day oral history interviewees have described their knowledge concerning the presence of and meaning of *ahu* and burials in the summit region as well as other cultural practices such as the construction and maintenance of *kūahu* (family shrine), the scattering of cremated remains, *piko* deposition in Wai`au, *as* well as navigation and orienteering. Other cultural practices are described in more detail in Maly (1999), Maly and Maly (2005), and Orr (2004), and summarized in McCoy and Nees (2010).

2.3.3.1 Ahu and Kūahu

Morphologically *ahu* are a pile or mound of stones that may have served historically as altars or shrines, markers signifying burial locales, *ahupua`a* boundaries, or trail routes; the term *kūahu* refers more specifically to a shrine or alter maintained by a family. In the 1880s and 1890s, two surveyors, J.S. Emerson and E.D. Baldwin, independently denoted various *ahu* located upon *pu'u* in the lowlands surrounding Mauna Kea and the presence of "a pile of stones on the highest point of Mauna Kea" (Maly and Maly 2005:494-502, 505). While Emerson and Baldwin's observations confirm the presence of *ahu* as they are defined morphologically, the surveyors did not specifically assign functional meanings for the *ahu* on Mauna Kea.

Oral history consultants have noted the presence of *ahu* in the summit region and their general function (as described above) without necessarily identifying the specific function of specific *ahu* (Orr 2004:47; Maly 1999:A-134, -372; Maly and Maly 2006:A-183, -335, -349, -565). In 2004 (Orr 2004), Kealoha Piscotta described erecting a *kūahu* on Mauna Kea that consisted of a stone from her family, noting that "it [the place] was very beautiful and I was always attracted to that place. I prayed at that place all the time" (Orr 2004:52). Piscotta also noted that "some of the shrines mark the birth stars of certain *ali`i*…and also birth and death" (Orr 2004:47).

In 1998 the Royal Order of Kamehameha I erected a *lele* (altar) on the summit near Site 26224 (USGS benchmark). While maintaining the same approximate location, the *lele* has been extensively modified over time. The lele is approximately 330 m southeast of the Hōkū Ke'a Observatory.

2.3.3.2 Piko Beliefs and Practices

The cultural weight that Mauna Kea carries within the Hawaiian community is also evident in the phrase, "*piko kaulana o ka `āina*," which translates as "the famous summit of the land" and is used as a term of endearment (Maly 1999:A-3). However, the phrase also expresses the belief that the mountain is a *piko* (the navel, the umbilical cord) of the island and for this reason it is sacred (Maly 1999:D-20). In this context, the significance of the cultural practice of transporting and depositing a baby's *piko* on Mauna Kea can be understood to connect a child to her family as well as to the land. As noted in Maly (1999) and Maly and Maly (2006), families may entrust a family member to collect *piko* and deposit them in specific locations on Mauna Kea including Lake Waiau, the summit, and springs.

2.3.3.3 Burial

Some cultural practitioners have knowledge of burials located at a number of *pu'u* on Mauna Kea's western and eastern slopes, including Ahumoa, Kemole, Papalekoki, Makanaka, Kihe, Kanakaleonui, Kaupō, and Pu'u O'o (Maly 1999:A-22, -48, -75, -165, -250, -279, -351, -395, -397) and even connect family and ancestral burials to the mountain (Maly 1999:A-40).

Scattering cremated ashes today is a contemporary cultural practice that has taken the place of traditional interment practices. Traditionally, cremation was not a common practice in Hawaiian culture, and when it was done it was a punishment and meant to defile the dead person. Writing in the 1830s, native Hawaiian historian David Malo stated that the punishment inflicted on those who violated the tabu of the chiefs was to be burned with fire until their bodies were reduced to ashes" and that cremation was practiced on "the body of anyone who had made himself an outlaw beyond the protection of the tabu" (Malo 1951:57, 20).

Native Hawaiian historian and ethnologist Mary Kawena Pukui explains why cremation was a defilement "…if the bones were destroyed, the spirit would never be able to join its '*aumakua*" (Pukui et al. 1972:109). Contemporary thoughts concerning cremation, however, may be changing. Pualani Kanaka'ole Kanahele explained in 1999 that while the scattering of cremation remains on Mauna Kea may be viewed by some as non-traditional, she notes that "…it may not be the *iwi* [bones] itself, but the ashes are the essence of what is left of the *iwi*. It doesn't matter, it's going back" (Maly 1999:A-377).

2.3.3.4 Navigation/Orientation

Maly and Maly (2005:95) speculate that it is likely that *kilo hōkū* (observing and discerning the nature of the stars) was practiced on Mauna Kea, as the gods and deities associated with the mountain are also embodied in the heavens, but such accounts are absent from the historical literature. One oral history consultant believed that a platform ("navigational *heiau*") was present on the Mauna Kea summit before the observatories (Maly 1999:A-349).

Another cultural consultant, Kealoha Piscotta, stated that "the lake [Wai'au] is like the navigation gourd," a concept which she learned from her auntie (Orr 2004:45). Piscotta also stated that *mo'olelo* passed down from her auntie describe solstice alignments with Mauna Kea and that the solstices were marked from the Mauna Kea summit. Piscotta is interested in understanding how the solstice alignments work and has concerns that the view plane from Mauna Kea has been diminished and obstructed by the leveling of *pu'u* and the erection of observatory domes (Orr 2004:54-55).

3.0 PREVIOUS ARCHAEOLOGY

A number of research and cultural resource management studies have been undertaken in the University of Hawai'i-managed areas of Mauna Kea. Within the MKSR, which includes the Astronomy Precinct and the Hōkū Ke'a project area, the first systematic archaeological investigations were carried out in 1975-76 in the context of a National Science Foundation funded research project on the Mauna Kea Adze Quarry (McCoy 1977, 1990; Cleghorn 1982; Allen 1981;

Williams 1989). Between 1976 and 2005, several site-specific reconnaissance surveys were undertaken (Table 1). Between 2005 and 2010, OMKM undertook a comprehensive archaeological inventory survey (AIS) of the MKSR, recording or re-recording 263 historic properties as summarized in Table 2. Figure 9 shows the location of previous archaeological studies in the Astronomy Precinct.

In addition to the above and in accordance with the Mauna Kea Comprehensive Management Plan (CMP 2009) and Mauna Kea Cultural Resource Management Plan (McCoy et al. 2009), OMKM developed a Burial Treatment Plan (Collins et al. 2014) and a Long-Term Historic Properties Monitoring Plan (Gosser et al. 2014) based on the results of the AIS (McCoy and Nees 2010). Since 2012, OMKM has implemented the monitoring program outlined in Gosser et al. (2014). A traditional cultural property assessment (Langlas et al. 1997) has also been conducted in the MKSR.

Table 1. Previous Archaeological Studies in the Mauna Kea Science Reserve

Year	Project	Survey Type	Reference
1975-76	NSF Research Project on the Mauna Kea Adze Quarry	Reconnaissance and inventory	McCoy 1976, 1977; Cleghorn 1982
1981[a]	**Kitt Peak National Observatory**	**Reconnaissance**	**McCoy 1981**
1982	**Hawaii Institute for Astronomy**	**Reconnaissance**	**McCoy 1982a and McEldowney 1982**
1982	**Caltech Telescope**	**Reconnaissance**	**McCoy 1982b**
1983	Mauna Kea Observatory Power Line	Reconnaissance	Kam and Ota 1983
1984	NSF Grant-in-Aid Survey	Reconnaissance	McCoy 1984
1987	Summit Road Improvement	Reconnaissance	Williams 1987; McCoy 1999
1988	VLBA Telescope	Reconnaissance	Hammatt and Borthwick 1990
1990	**Subaru Telescope**	**Reconnaissance**	**Robins and Hammatt 1990**
1990	**Gemini Telescope**	**Reconnaissance**	**Borthwick and Hammatt 1990**
1991	Pu`u Makanaka	Reconnaissance	McCoy 1999a
1995	SHPD site relocation and GPS recording	Reconnaissance	McCoy 1999a
1997	SHPD transect survey	Reconnaissance	McCoy 1999a
1997	TCP Assessment	Assessment	Langlas et al. 1997
1999	SHPD survey of Pu'u Wekiu	Reconnaissance	McCoy 1999a
2005-2009	OMKM Archaeological Inventory Survey of MKSR	AIS	McCoy and Nees 2010
2012-present	OMKM Assessment of Historic Properties in the MKSR	Assessment	Gosser and Nees 2014, 2015, 2016, 2017, 2018, 2019

[a] Bolded entries are archaeological projects within the Astronomy Precinct and shown in Figure 9.

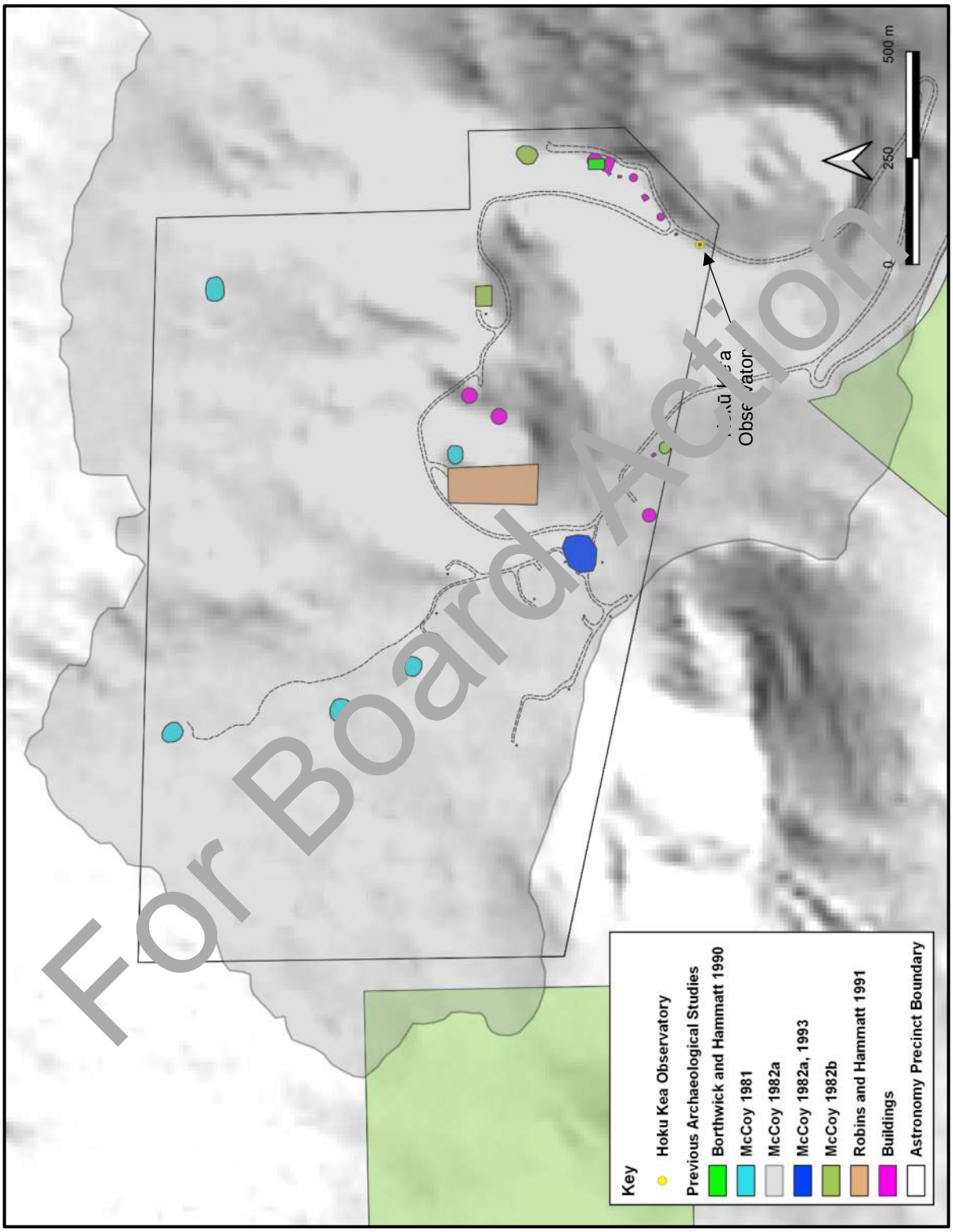

Figure 9. Mauna Kea Summit Region Showing Previous Archaeological Studies Conducted in the Astronomy Precinct.

3.1 Summary Description of Historic Properties

While no above-ground archaeological sites have been recorded within the Hōkū Keʻa Observatory project area, four primary types of historic properties have been recorded in the MKSR: (1) shrines; (2) adze manufacturing "workshops"; (3) burials; (4) and probable survey markers. Each type of property is briefly described below. Table 2 summarizes the number and variety of historic property types found in the Science Reserve. The summary includes two previously identified traditional cultural properties, and 261 examples of what are commonly called archaeological sites.

Table 2.. Historic Property Types in the MKSR

Site Type	Number	Percent Total
Traditional Cultural Properties	2	0.76
Shrines and Possible Shrines	141	53.41
Mauna Kea Adze Quarry Complex Sites	67	25.38
Burials and Possible Burials	29	10.98
Stone Markers/Memorials	15	5.68
Temporary Shelters	3	1.14
Historic Campsites	2	0.76
Historic Transportation Route	1	0.38
Maunakea Summit Region Historic District	1	0.38
Unknown Function	3	1.14
TOTAL	**264**	**100%**

3.1.1 Traditional Cultural Properties

Traditional cultural properties (TCP) are a type of historic property formally defined for the first time in 1998 in National Register Bulletin 38 (*Guidelines for Evaluating and Documenting Traditional Cultural Properties*). A TCP

> …can be defined generally as one that is eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community (Parker and King:1998:1).

Parker (1998) notes that an important difference between TCP and other kinds of historic properties is that the significance of TCP "cannot be determined solely by historians, ethnographers, ethnohistorians, ethnobotanists, and other professionals. The significance of traditional cultural properties must be determined by the community that values them" (Parker 1998:5).

Dr. Charles Langlas of the University of Hawaii at Hilo conducted a TCP assessment of Mauna Kea in 1997 as part of the cultural resource management studies for the Hawaii Defense Access Road and Saddle Road Project. In 1999-2000, SHPD designated three areas as TCP because of their association with legendary figures and on-going cultural practices. Two TCP (Kūkahau`ula [the summit] and Puʻu Līlīnoe) are in the MKSR; the Hōkū Keʻa Observatory and Generator buildings are within the Kūkahauʻula TCP. A third TCP, Lake Waiau, is located in the Mauna Kea Ice Age Natural Area Reserve.

The cultural significance of Kūkahauʻula was highlighted in a Chapter 6E-8 and Section 106 review letter of the proposed Keck Outrigger project by SHPD in 1999 (Hibbard to McLaren 1999). Relevant portions of the review letter (which is included in the CRMP [McCoy 2009: Appendix B]) are presented below:

Several lines of evidence lead us to the conclusion that the cluster of cones is an historic property… The first line of evidence indicating the cultural and historical importance of the summit is that, at a minimum, some portion of the summit cluster bore the name Kukahau`ula who appears as a character in recorded Hawaiian traditions and as a figure in legends about Mauna Kea. As a character in traditional histories and genealogies, he is the husband of Lilinoe and is named as an `*aumakua* (family deity) of fishermen. A descendant, Pae, was known as an exceptional fisherman whose bones were coveted for fishhooks by the paramount chief Umi. In one legend, Kukahau‘ula is cast in a more fanciful role as the suitor or husband of Poliahu, the deity of snow and, poetically, his name is said to allude to the pink hue that can be seen reflecting from the snow-covered summit. Lilinoe plays a similar role in the mountain's traditions in that she appears both as a traditional character and a mythical figure. She is, however, even more frequently associated with the summit region of Mauna Kea. In addition to being the wife of Kukahau‘ula in some traditions, she is said to have been buried near the summit and is called the "woman of the mountain." One tradition has her being attendants or of the illustrious Mahi family who served as warriors and attendants to the paramount *ali‘i* of Hawaii Island. In legends, Lilinoe becomes the embodiment of fine mist, the literal meaning of her name, and as such is the companion or sister of Poliahu.

While the association between the summit and Kukahau‘ula is sufficiently clear, it is not as clear which specific topographic features in the summit the name encompasses. The conclusions drawn here that Kukahau‘ula, and thus its association with a significant individual and character, probably applied to the entire summit cluster relies on a couple of arguments. First, use of the name Pu‘u o Kukahau‘ula in the boundary testimonies and in subsequent notes of field surveys indicates that the name was applied, at a minimum, to the cinder cone (i.e., *pu‘u*) as a whole and not just to the highest peak or what would generally be considered the summit in English usage. Second, on the early survey maps (i.e., 1884 to 1891 and 1891), the name Kukahau‘ula is written to the east of the cluster of cones and is not immediately associated with a particular point. In contrast, the highest point on the mountain on these maps is labeled the "summit" and "summit cone" and the triangulation marker on the northeastern peak of the cluster is labeled "Mauna Kea."

At this time, it cannot be known with certainly how Hawaiians during the early historic period and their predecessors would have viewed the cluster or what purposes they may have had to make and name particular distinctions within the cluster. Given the unified appearance of the cluster and the prominence of the name Kukahau‘ula, however, it seems reasonable, if not probable, that this name applied to this entire landscape feature, including that which is now called Pu‘u Hau Oki.

3.1.2 Shrines and Possible Shrines

Shrines are the most common site type in the MKSR. The primary characteristic of all the sites on Mauna Kea that have been interpreted as shrines is the presence of one or more upright stones that the Hawaiians called ‘*eho* or *pohaku ‘eho*, which translates as “god-stone” (cf. Andrews 2003; Pukui and Elbert 1971; Buck 1957; Emory 1938). The conventional view of these and other kinds of Polynesian “god-stones” is that they were “places for the gods to inhabit,” or “abodes of the gods,” as opposed to icons or actual representations of the gods (Best 1976; Buck 1957; Handy 1927).

A number of shrines consist of just a single upright, while others are characterized by multiple uprights arranged in different patterns on a variety of different kinds of foundations.

Kenneth Emory, who was the first one to describe the shrines on Mauna Kea and note their East Polynesian affinities, was of the opinion that the uprights represented or symbolized separate gods.

3.1.3 Mauna Kea Adze Quarry Complex

The Mauna Kea Adze Quarry Complex consists of two physically discrete but functionally interrelated parts: (1) the quarry proper, which is defined as the source areas of tool-quality basalt, and (2) diverse activity remains located outside of the quarry proper as just defined. These include isolated adze manufacturing by-products (e.g., cores, flakes), hammerstones and unfinished adzes in various stages of completion found by themselves and also found with shrines and possible burials. The Mauna Kea Adze Quarry is also a National Historic Landmark.

3.1.4 Burials and Possible Burials

Prior to the 2005-2009 survey (McCoy and Nees 2010), the only positively identified human remains in the MKSR were located on the summit of Pu‘u Mākanaka. Jerome Kimmartin, a surveyor with the United States Geological Survey, noted the presence of human remains on this prominent cinder cone in 1925. The 2005-2009 survey identified 29 sites with a total of 48 features in the MKSR that have been interpreted as burials or possible burials. Of the 48 features, five are confirmed burials and 43 are possible burials. Sites classified as possible burials lack the physical evidence of human bone, but include other physical factors common to burial sites on Mauna Kea including topographic location and architectural characteristics.

3.1.5 Historic Transportation Route

The only direct evidence of the Umi Koa Trail is a single horseshoe found in close proximity to the route shown on the USGS Mauna Kea Quadrangle maps.

3.1.6 Stone Markers/Memorials

One of the more ambiguous classes of sites are piles or stacks of rocks believed to be a marker of some kind or a memorial to some person or event. In all but a couple of cases the actual function is unclear. There are 15 sites that may have been survey markers, piles of stones left by unknown visitors as memorials of their visit to the top of a cinder cone or way-markers along an unmarked trail. The stacked cairns are unlike the piled mounds that have been interpreted as burials. Two of the 15 sites are USGS survey markers, one on the Kūkahau‘ula summit, and one on Pu‘u Poli‘ahu.

3.1.7 Temporary Shelters

The evidence for “habitation” in the MKSR is meager. Crude stone walls have been recorded at various localities in the MKSR, usually in association with other features such as lithic scatters. One walled overhang shelter was found directly below a ridge-top shrine. All of these remains are interpreted as temporary shelters based on their morphology and environmental setting.

3.1.8 Historic Camp Sites

Possibly two camps occupied by the United States Geological Survey (USGS) survey team in 1925 were found on the northern and northeastern slope of the mountain near Pu‘u Māhoe and Pu‘u Mākanaka. McCoy and Nees (2010) provide additional information concerning the historic camps.

3.1.9 Historic Districts

During the preparation of the 1999 Master Plan for Mauna Kea, SHPD proposed that the cultural landscape on the top of Mauna Kea be recognized as the Mauna Kea Summit Region

Historic District (see Figure 1). The historic district proposal was summarized in the cultural impact assessment for the Master Plan (PHRI 1999:30-32) and discussed in more depth as part of the Keck Outrigger project (Hibbard 1999; NASA 2005). The Institute for Astronomy (IfA), NASA, and other parties agreed that the proposed district, which includes all of the Mauna Kea Science Reserve, the DLNR Natural Area Reserve, and additional areas lower on the mountain, meets the eligibility criteria for inclusion on the National Register of Historic Places. The district is now listed in the Statewide Inventory of Historic Places as Site 50-10-23-26869.

3.2 Historic Properties Within 500 m of the Hōkū Ke‘a Observatory

While there is no formal declaration on how far from a proposed project a project proponent must extend a search for historic properties, a radius of 500 meters was selected for the current project due to the nature of the proposed work, the local landscape, and the abundance of publicly-available supporting literature concerning historic properties in the summit region. Figure 10 identifies historic properties within or near the Hōkū Ke‘a project area.

3.2.1 Site 50-10-23-26224

Site 26224 is a USGS marker located on the summit of Kūkahau‘ula (Pu‘u Wekiu). The marker is a brass disc cemented to a metal pole, roughly 10.0 cm in diameter. The marker was unearthed and displaced on the east slope of the pu‘u sometime after 2012. The marker was located approximately 2.0 m northwest of a modern shrine commonly referred to as the “lele,” discussed above (Figure 10).

3.2.2 Site 50-10-23-21209

Site 21209 was not officially recorded until 1999 (McCoy 1999), but has been known since at least 1935 (Bryan 1979:35). Since 1999, the site has been altered to the point that none of the original features (a mound and an oval alignment) are extant. Photographs from the mid 2000s suggest that rock removed from Site 21209 and surrounding areas has possibly been incorporated into the nearby “lele.” (Figure 10)

Described as a possible burial, there is no evidence of a subsurface interment in the absence of the above-ground features. However, over time, charred bone fragments (possibly cremated remains) have been observed between the summit USGS marker and Site 21209.

3.2.3 Site 50-10-23-2143

As shown in Figure 10, Kūkahau‘ula has a large, irregular boundary, which was determined based on the geological extent of the three *pu‘u* that comprise the summit; there are no human-made above-ground historic properties directly associated with Kūkahau‘ula, although the sites noted above are within its boundaries. The northwestern portion of Kūkahau‘ula extends into the Astronomy Precinct. All of the observatories at the summit, except for the Caltech Submillimeter Observatory, the James Clerk Maxwell Telescope, and the Submillimeter Array, are within Kūkahau‘ula.

3.2.4 Site 50-10-23-26869

As noted above, the Mauna Kea Summit Region Historic District includes all historic properties within the Mauna Kea Science Reserve plus additional properties outside the management control of OMKM. Other than the sites listed above, there are no additional contributing historic properties of SIHP-26869 within 500 m of the proposed project area.

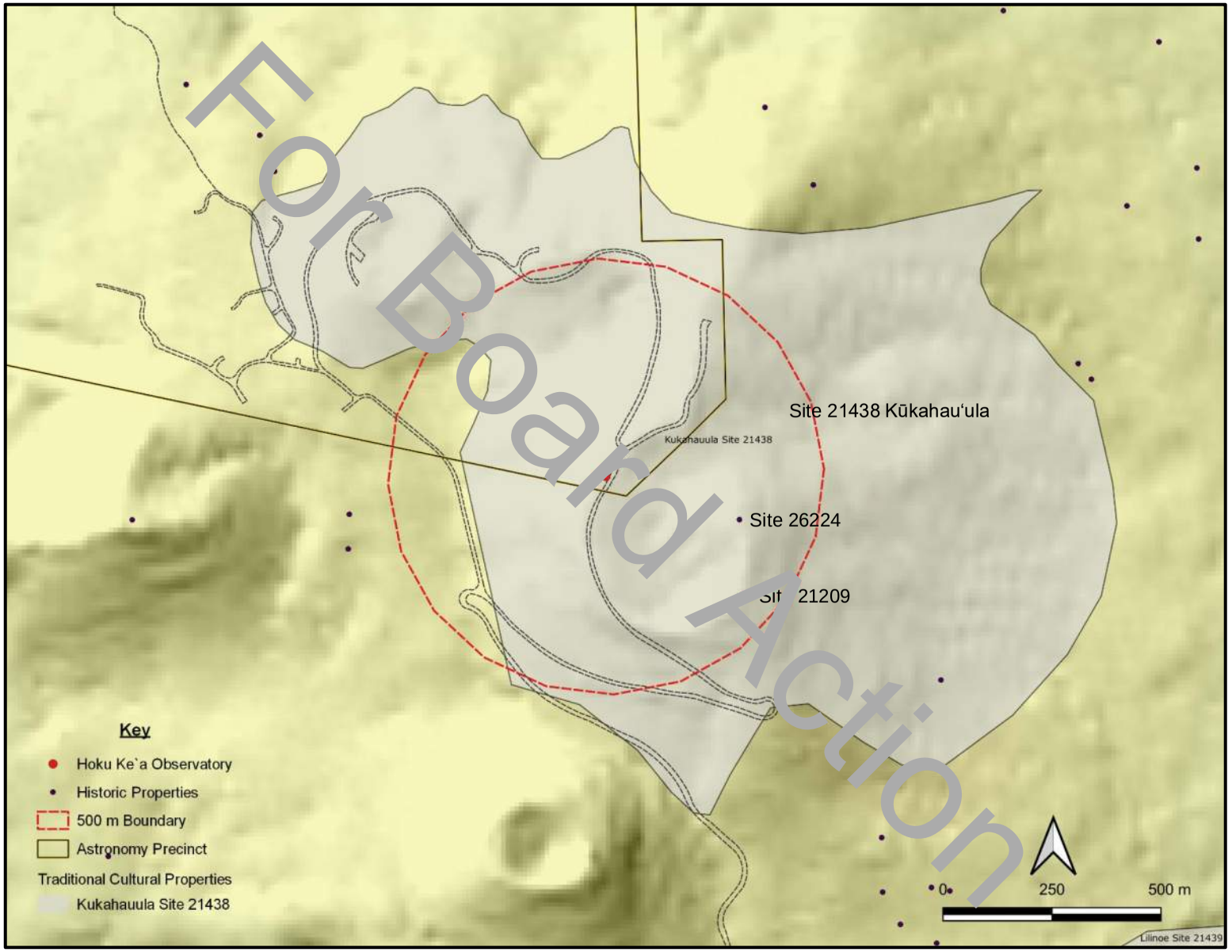

Figure 10. Mauna Kea Summit Region Showing Traditional Cultural Properties and Historic Properties in Relation to the Hōkū Ke'a Observatory, the Astronomy Precinct, and a 500 meter Buffer around Hōkū Ke'a.

4.0 ANTICIPATED FINDS

Based on the archival background, past land use, and previous archaeological studies, it is anticipated that no above-ground or subsurface archaeological resources will be recorded during the Hōkū Keʻa Observatory Decommissioning project. It is likely that ground-disturbing activities associated with the original construction of the observatory and auxiliary buildings sufficiently altered the original ground surface that any historic properties, if they were present, have been destroyed.

5.0 FIELD INSPECTION

On 17 April 2020 PCSI conducted a field inspection of the Hōkū Keʻa project area. As well, the project has been inspected yearly since 2012 by PCSI as part of OMKM's ongoing monitoring of historic properties within the UH-managed areas on Mauna Kea. Other than the Hōkū Keʻa Observatory and generator buildings (see Figure 3), no above-ground historic properties or surface archaeological deposits were identified or recorded.

6.0 PROJECT IMPACT ASSESSMENT

6.1 ARCHITECTURE (SEE APPENDIX A)

6.1.1 IDENTIFICATION AND INVENTORY OF HISTORIC PROPERTIES (HAR §13-275-5)

Two buildings on site are over 50 years in age:

- Observatory – Built 1968
- Generator Building – Built ca. 1968

6.1.1.1 Evaluation of Significance (HAR §13-275-6) and Integrity

Neither of the buildings are evaluated as eligible for the Hawaiʻi State Register of Historic Places under any criteria established in HAR §13-275-6(b). Despite significance relating to its role as the first telescope put in use at the Mauna Kea Stellar Observatory, and as a component of the "highest stellar observatory in the world", the Observatory has lost integrity due to replacement of the dome, wood interior walls, metal exterior walls, the installation of a new doorway opening, a replaced original door, and removal of both the original (and a second) telescope. (see 5.3 Consultation Responses for information concerning an astronomical project using the Hōkū Keʻa Observatory.

Likewise, the Generator Building that supported the observatory function is also evaluated as not eligible for the Hawaiʻi State Register of Historic Places under any criteria established in HAR §13-275-6(b) but lacks integrity of association, setting, and feeling due to the modifications to the building it originally supported. On its own, and without an eligible property to anchor its significance, it does not have sufficient significance or integrity for listing on the state or national registers.

6.2 ARCHAEOLOGY

While no above-ground archaeological properties will be impacted by the decommissioning project, there will likely be a short-term impact to Kūkahauʻula while the structures and subsurface utilities are removed. Those effects may include ground disturbance, temporary noise impacts, and temporary restricted access to the site area.

However, following the removal of the existing structures and subsurface utilities, a mandated Site Restoration Plan will be implemented to restore the site area. Hence, there will be

no long-term impact of the decommissioning project on Kūkahau'ula. Likewise, the project, while not considering the entire Kūkahau'ula TCP or the Mauna Kea Summit Historic District, will serve to enhance or bolster the Hawaii Register of Historic Places integrity of setting as previously determined by the SHPD.

6.3 Consultation Responses

In an effort to more completely understand the cultural and historical background within and around the project area and bring as much information to bear on the decision-making process for this project, PCSI sought community input. Sixty-eight entities (community members, community groups, and State agencies) were sent letters (66 by email and two by post) asking for input concerning historic sites located in or near the project area, as well as cultural traditions, legends, and traditional cultural places and practices pertaining to the area. In addition, the letter provided a link to a website where more background information was provided. The 68 entities were identified by OMKM primarily through interactions as part of previous undertakings within University of Hawaii managed lands on Mauna Kea (see Appendix B).

Six responses were returned. None of the responses provided specific information concerning historic properties, cultural resources, or traditional practices within the project area but did provide commentary and recommendations to strengthen the CSR.

- The Office of Hawaiian Affairs (OHA) requested methodological and regulatory clarification for the CSR as well as clarification concerning the project area's restoration plan and status within the HRS 6E process.
- The State Historic Preservation Division (SHPD) had no substantive comments but did provide several historic preservation-related reports pertinent to the Mauna Kea summit region.
- The University of Hawaii-Hilo Hanakahi Council (UHH Native Hawaiian Faculty Advisory Group) requested a presentation (scope and delivery to be determined); and
- One anonymous member of the American Astronomical Society, Historical Astronomy Division provided the following comment:

> *About 1968 there were two 24-inch telescopes installed in domes on the summit ridge of Mauna Kea. In 1970 or so the 88-inch telescope came online. One of the 24-inch telescopes was moved to Leeward Community College on Oahu in the 1980's. What this project is about is the removal of the second telescope* [Hōkū Ke'a]*, which has been operated by University of Hawaii, Hilo for some time. I used this telescope quite a bit from 1992 to early 1996 and helped establish the existence of a new class of non-radially pulsating stars. The prototype is gamma Doradus.*

- One community member (Mr. Leningrad Elarianoff) provided information concerning Hawaiian origins passed down to him from his mother who "…was a story teller who spent many hours with the old folks in Kau trading stories that were passed down for generations."
- One community member (Mr. Chad Baybayan) expressed willingness to discuss historic sites on the summit (pending)

7.0 RECOMMENDATIONS

7.1 Architecture: Determining Effects to Significant Historic Properties (HAR §13-275-7)

Both buildings will be demolished as part of the decommissioning project. Since they are evaluated as not eligible, the Proposed Effect is "No historic properties affected".

7.2 Archaeology: Determining effects to significant historic properties (HAR §13-275-7)

Based on the results of research and consultation, it is recommended that the effect determination for this project is "No historic properties affected." However, because the project will occur within a TCP (Kūkahauʻula), it is recommended that a commitment be made to monitor (with an SHPD-approved monitoring plan) ground-disturbing activities during the Hōkū Keʻa Decommissioning project and to implement a Site Restoration Plan in accordance with the 2010 Decommissioning Plan for the Mauna Kea Observatories (a sub-plan of the Mauna Kea Comprehensive Management Plan).

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APPENDIX A
Architectural Reconnaissance Level Survey

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MASON

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Suite 501
Honolulu, HI 96813
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June 11, 2020

Tanya Gumapac-McGuire
State Historic Preservation Division
Kakuhihewa Building
601 Kamokila Blvd., Suite 555
Kapolei, HI 96707

Re: Reconnaissance Level Survey for Environmental Assessment and HRS 6E-8 Review – Decommissioning Hōkū Ke'a Educational Observatory, Mauna Kea Science Reserve, Hawai'i, Hawai'i, TMK: [3] 4-4-015:009

Dear Tanya,

MASON was hired by PCSI, who is under contract to the USFM and the University of Hawai'i, to evaluate the effects of work proposed as part of the decommissioning of the two Hōkū Ke'a Observatory and Generator Building at Mauna Kea, Hawai'i. To follow is a summary of our findings in support that we prepared to support the project's Environmental Assessment (EA) and HRS 6E-8 Review requirements. Attached is the Reconnaissance Level Survey (RLS) our office prepared.

Identification and Inventory of Historic Properties (HAR §13-275-5)
Two buildings on site are over 50 years in age:

- Observatory – Built 1968
- Generator Building – Built ca. 1968

Evaluation of Significance (HAR §13-275-6) and Integrity
Neither of the buildings are evaluated as eligible for the Hawai'i State Register of Historic Places. Despite significance relating to its role as the first telescope put in use at the Mauna Kea Stellar Observatory, and as a component of the "highest stellar observatory in the world", the Observatory has lost integrity due to replacement of the dome, wood interior walls, metal exterior walls, the installation of a new doorway opening, a replaced original door, and removal of both the original (and a second) telescope.

Likewise, the Generator Building that supported the observatory function is also evaluated as not eligible for the Hawai'i State Register of Historic Places. It lacks integrity of association, setting, and feeling due to the modifications to the building it originally supported. On its own, and without an eligible property to anchor its significance, it does not have sufficient significance or integrity for listing on the state or national registers.

Determining effects to significant historic properties (HAR §13-275-7)
Both buildings will be demolished as part of the decommissioning project. Since they are evaluated as not eligible, the Proposed Effect is "No historic properties affected".

MASON

(Proposed) Mitigation (§13-275-8)
No mitigation is proposed at this time, as no historic architectural properties are affected.

PCSI, SSFM, and the University of Hawai'i at Hilo's Office of Mauna Kea Management are seeking the State Historic Preservation Division's (SHPD) concurrence on these findings. Thank you for your assistance.

Sincerely,

Polly Tice
Research Section Director
Enclosures

State Historic Preservation Division
Reconnaissance Level Survey – Survey Form

Instructions: Submit this completed form with the completed SIHP request form and 6E Filing Fee Form **electronically** to: dlnr.intake.shpd@hawaii.gov

For additionally guidance on completing this form, please see the Architecture Branch Survey Guidelines available on the SHPD website.

---

1. **Review Type: Indicate which review process this survey was requested under**

   HRS 6E-08, HAR 13-275 HRS 6E-42, HAR 13-284

2. **Project Information: Indicate the document in which this survey was requested**

   2.1) Log No. [e.g. 2017.1234]

   2.2) Doc No. [e.g. 1708MB27]

   2.3) Other:

3. **Contact Information:**

   3.1) Name: Dennis Gosser 3.2) Company: PCSI, Inc.

   3.3) Street Address: 720 Iwilei Road

   3.4) County: Honolulu 3.5) State: HI 3.6) Zip Code:

   3.7) Phone: 222-0209 3.8) Email: dennis@pcsihawaii.com

4. **Property Location:**

   4.1) TMK [e.g. (3) 1-2-005:004]: (3) 4-4-015:009

   4.2) Street Address: Mauna Kea Access Road

   4.3) County: HI 4.4) State: HI 4.5) Zip Code:

5. **Property Classification:**

   5.1) Ownership:

   Private Public

   5.2) Classification

   Building District Site Structure Object

6. **Property Function:**

   6.1) Current: Observatory and Generator Building (vacant)

   6.2) Historic: Air Force observatory and generator building

7. Property Description:

7.1) Date of Construction: 1968/ca. 1968

7.2) Provide a description of the property, including the character defining features, summarize alterations to the property, and provide an evaluation of the property's integrity of materials, design, feeling, location, association, workmanship, and setting.

The two structures associated with the facility that will be decommissioned are an Observatory (1968), and a cinder block Generator Building (date unknown, but likely ca. 1968). The observatory is a small, one-story structure with a dome roof, set on a slab foundation. Its circular plan measures approximately 20' in diameter, and the apex of the dome is about 19 feet in height. The observatory's interior wood walls, exterior siding, doors, and dome roof were replaced in 2008, and the original 24" telescope was removed that same year. In 2010, a new telescope was installed but was later removed in 2018.

Integrity
Observatory: Integrity of location and setting are retained. Integrity of design is mostly retained. However, integrity of materials, workmanship, feeling, and association are impaired since historic character-defining features and materials were removed and replaced, including the original fiberglass dome, wood walls, and the telescope itself.
Generator Building: Integrity of location, design, materials, workmanship are retained. However, integrity of setting, feeling, and association are impaired because of the reconstruction of the associated dome observatory.

Historical Background:
The structures were built as components of the "Mauna Kea Stellar Observatory," an approximately $2.5 million observatory complex centered around an 88-inch telescope, along with two smaller, 20-foot auxiliary dome observatories, each with 24-inch telescopes. Once completed, the overall Mauna Kea complex was known as the "world's highest major astronomical observatory" ("Workmen on Mauna Kea race with winter weather"). One of the smaller, 20-foot dome observatories built as part of the complex is what is known today as "Hoku Kea." (the other was operated by the National Aeronautics and Space Administration (NASA). The Air Force facility was actually the first observatory component completed as part of the Mauna Kea Stellar Observatory. Put into intermittent operation in 1968 before the other telescopes, it initially relied on auxiliary generators for power. (Construction of a permanent access road had delayed installation of a permanent electrical utility.) It is not known exactly when the extant, supporting Generator Building was completed or put into use. By 1970, the Air Force telescope was equipped with a unique device "said to be the best infra-red radiation detector in the world [that] can measure wavelengths down to one millimeter" ("A Worthwhile Visit With The Mauna Kea Stargazers").

The Mauna Kea Stellar Observatory project was spearheaded by Dr. John Jefferies, Director of the Hawaii Institute for Astronomy, and Dr. William M. Sinton, professor of physics and astronomy of the University of Hawaii. It was built with NASA funding. John Jefferies explained how the Air Force project on Mauna Kea came about by saying, "In 1967 the US Air Force contacted Bill Sinton with the request that he submit a proposal to build a 24-inch telescope on Mauna Kea for infrared work. They wanted to map the sky so as to be able to differentiate between man-made and astronomical sources and decided that Mauna Kea would be the best site to do this. The instrument became the first regularly scheduled telescope on Mauna Kea and was in great demand" (https://www.ifa.hawaii.edu/history/jefferies/24inch.shtml). Later, the Air Force gave the 24 inch telescope to UH.

However, by the early 2000s, the 24-inch telescope was rarely being used by UH Hilo students. It was considered small and by 2008 had fallen into disrepair (Henderson, "A scope for the students.") The University of Hawaii's Institute for Astronomy gave the site to UH-Hilo. In 2002, UH Hilo received a $650,000 grant from the National Science Foundation for a new telescope and spent an additional $650,000, mainly to renovate the Observatory building where the telescope would be housed. A 2008 newspaper article reported, "The first telescope placed on the top of Mauna Kea was removed Monday in order to make way for a new, bigger scope that will allow students and researchers to peer even further into space" ("UH-Hilo telescope is down from the Mountain").

The new 36 inch telescope was designed to be operated remotely from UH-Hilo, and was named "Hōkū Keʻa", the Hawaiian navigational name for the "Southern Cross." The Observatory renovations were completed in 2008, and the 36 inch telescope was installed in 2010. Its purpose was for research and education of both UH graduate and undergraduate students and area high school students (Henderson, "A scope for the students"). However, the Observatory and telescope were beset by numerous problems and never became fully operable. Plans for decommissioning were made in 2015, and the telescope was removed in 2018 (Brestovansky, "Removal on Track).

8. Eligibility Recommendation:

8.1) Provide a recommendation of eligibility to the Hawai‘i Register of Historic Places including applicable criteria and areas of significance.

Recommendation of eligibility
The Observatory is evaluated as not eligible for the Hawaii State Register of Historic Places. Despite significance relating to its role as the first telescope put into use at the Mauna Kea observatory, and as a component of the "highest stellar observatory in the world" ("Plans Near Completion for Mauna Kea"), it has lost integrity due to replacement of the dome, wood interior walls, modified exterior walls, installation of a new doorway opening, and replaced original door, and removal of both the original and a second telescope.

The Generator Building is also evaluated as not eligible for the Hawaii State Register of Historic Places. It lacks integrity of association, setting, and feeling due to the modifications to the observatory it originally supported. On its own, and without an eligible property to anchor its significance, it does not have sufficient significance or integrity for listing on the State or National Registers.

Sources

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9. Attach Photographs: provide sufficient photographs to illustrate the property's main features. At a minimum provide the following:

Quantity	Description
1-2	Street view(s) of the resource and setting
1-2	Main Facades
1-2	interior photos(s) if applicable

10. Attach Map showing the location of the property

CHECKLIST

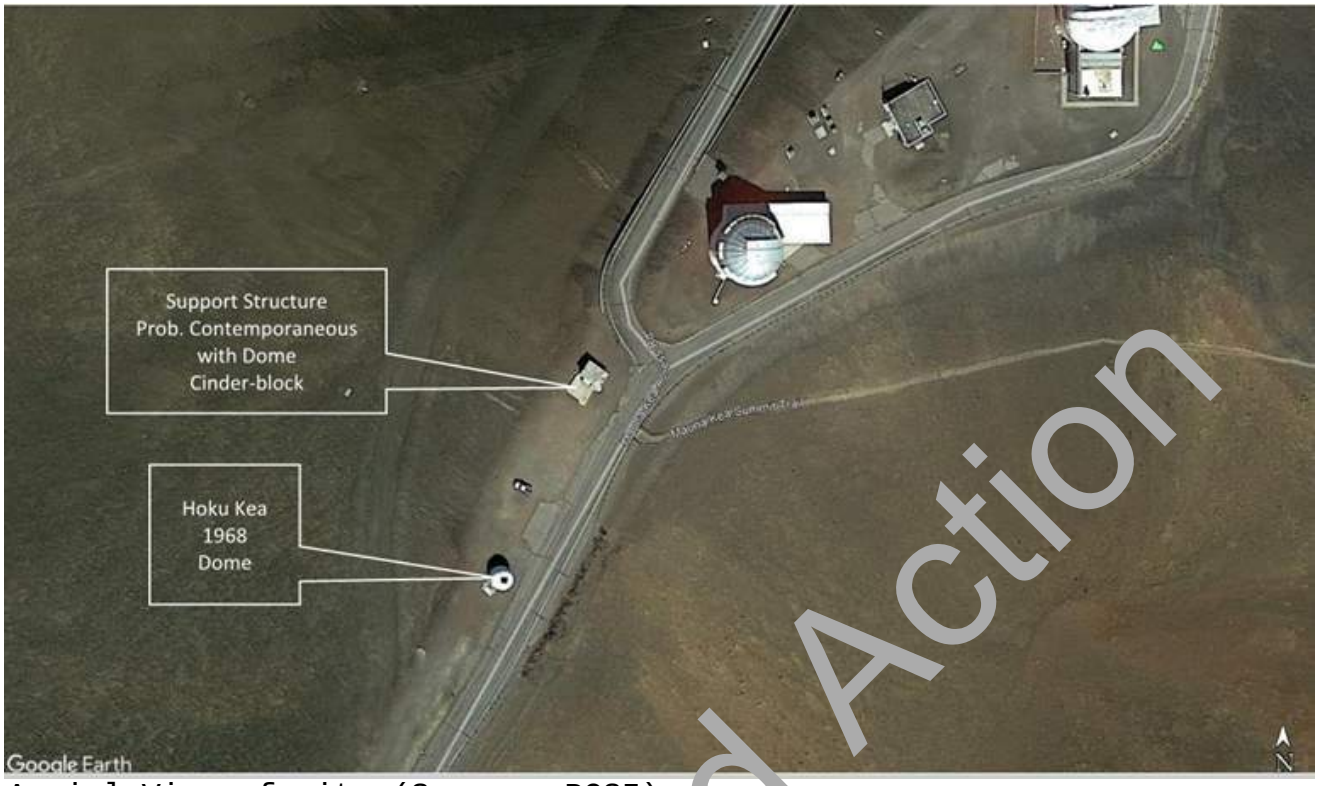
☑ **Reconnaissance Level Survey Form** (this form)

☑ **Photographs**

☑ **Map**

☐ **Filing Fee Form**

☐ **SIHP Request Form**



Aerial View of site (Source: PCSI)

"Air Force 24-Inch", ca. 1970 (Source: John Jefferies: Astronomy in Hawaii 1964-1970)

View of original 24-inch Air Force telescope (Source: Boller & Chivens website.)

Dale Cruikshank observing with the Air Force 24-in telescope at Mauna Kea, Aug., 1975

View of original 24-inch Air Force telescope at work (Source: Boller & Chivens website.)

Removal of the original telescope and original dome, August of 2008 (Source: "UH-Hilo telescope is down from the Mountain." Hawaii Tribune Herald, August 15, 2008, P. 1)

Present-day view of original door location in Observatory. (Source: PCSI)

Present day view of door opening added to Observatory in 2008.(Source: PCSI)

Present day view of Observatory interior. (Source: PCSI)

Present day view of Observatory interior showing door opening installed in 2008 (Source: PCSI)

Rear view of Generator Building. (Source: PCSI)

Front view of Generator Building (Source: PCSI)

1
2

APPENDIX B
Community Consultation List

STATE GOVERNMENT	
Entity	**Responded to Request**
Department of Hawaiian Home Lands	No
DLNR State Historic Preservation Division	Yes
Office of Hawaiian Affairs	Yes
Hawaii State Aha Moku Advisory Committee	No
COMMUNITY GROUPS	
KAHEA	No
Nā ʻAhahui: Moku o Keawe -- Kohala Hawaiian Civic Club	No
Royal Order of Kamehameha	No
Royal Order of the Crown of Hawai`i	No
Perpetuating Unique Educational Opportunities (P.U.E.O)	No
Queen Liliʻuokalani Trust	No
Nā Wahine O Kamehameha	No
Kailapa Community Association	No
Piʻihonua Hawaiian Homestead Community Association	No
Laʻi ʻŌpua Association	No
Waimea Hawaiian Homesteaders' Association	No
Keaukaha Community Association	No
EDUCATION GROUPS	
American Astronomical Society, Executive Office	No
American Astronomical Society, Historical Astronomy Division	Yes
Hanakahi Council--UHH Native Hawaiian Faculty Advisory Group	Yes
INDIVIDUALS	
Bimo Akiona	No
Brannon Kamahana Kealoh	No
C.M. Kahoʻokahi Kanuha	No
Cheyenne Perry	No
Cindy Freitas	No
Clarence Kukauakahi Ching	No
Dr. Kamana'opono Crabbe	No
Dwight Vicente	No
Flores Case ʻOhana	No
Hank Fergerstrom	No
Hannah Springer	No
J. Keinaʻala Sleightholm	No
Jim Kauahikaua	No
Joseph Kualii Lindsey Camara	No
Kalani Flores	No
Kala Asing	No
Kaliko Kanaele	No
Kama Hopkins	No
Keahi Warfield	No
Kealoha Pisciotta	No
Kehaulani Costa	No

Kimo Lee	No
Lanny Sinkin	No
Lehua Vincent	No
Leilani Lindsey-Kaapuni	No
Mamo Bezilla	No
Mehana Kihoi	No
Michael Akau	No
Mike Kaleikini	No
Mike McCartney	No
Moses Kealamakia Jr.	No
Nelson Ho	No
Patrick Kahawaiolaa	No
Paul K. Neves	No
Pua Case	No
Richard Ha	No
Thomas Chun	No
Tiffnie Kakalia	No
Walter Kaneakua	No
William Freitas	No
Wilma Holi	No
Shane Palacat-Nelsen	No
Leningrad Elarianoff	Yes*
U'ilani Naipo	No
Kālepa Baybayan	Yes
Kimo Lee	No
Wally Lau	No
Nakoolani Warrington	No
Wally Ishibashi	No

*Mr. Elarianoff provided a response in conjunction with the proposed new telescope at Halepohaku.

APPENDIX D

Phase I Environmental Site Assessment

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Phase I
Environmental Site Assessment Report for Hōkū Keʻa Observatory and Generator Building TMK (3) 4-4-015:009 (Por.) Maunakea Science Reserve Hāmākua, Island of Hawaiʻi

Approx. 0.05-acre portion of
TMK (3) 4-4-015:009, 11,216 acres

MNA Project 2870_2

September 24, 2020

Myounghee Noh & Associates

Environmental Studies and Consulting Services

16-643 Kipimana Street, Suite 12, Keaʻau, Hawaiʻi, USA 96720 • 808.769-4221
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This Phase I ESA report is prepared for:

SSFM International, Inc.
99 Aupuni Street, Suite 202
Hilo, Hawaiʻi 96720

PHASE I
ENVIRONMENTAL SITE ASSESSMENT REPORT
FOR
HŌKŪ KEʻA OBSERVATORY AND GENERATOR BUILDING
TMK (3) 4-4-015:009 (POR.)
MAUNAKEA SCIENCE RESERVE
HĀMĀKUA, ISLAND OF HAWAIʻI

Approx. 0.05-acre portion of
TMK (3) 4-4-015:009, 11,216 acres

MNA Job No. 2870_2

September 24, 2020

I declare that, to the best of my professional knowledge and belief, I meet the definition of *Environmental professional* as defined in §312.10 of 40 CFR 312.

I have the specific qualifications based on education, training, and experience to assess a *property* of the nature, history, and setting of the *subject property*. I have developed and performed the all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR 312.

Myounghee Noh
Environmental Professional

Myounghee Noh & Associates, L.L.C.
Environmental Studies and Consulting Services
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Technical Editor	Jessica Walsh
Quality Assurance	Myounghee Noh

LIST OF ABBREVIATIONS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CESQG	Conditionally Exempt Small Quantity Generators
CFHT	Canada-France-Hawai'i Telescope
CORRACTS	RCRA Facilities that are undergoing "corrective action"
EC	Engineering Control
EPA	Environmental Protection Agency
ERNS	Emergency Response Notification System
ESA	Environmental Site Assessment
HDOH	Hawai'i Department of Health
HEER	Hazard Evaluation and Emergency Response
HELCO	Hawai'i Electric Light Company
HFD	County of Hawai'i Fire Department
HREC	Historical Recognized Environmental Condition
IC	Institutional Control
LQG	Large Quantity Generator
MNA	Myounghee Noh & Associates, L.L.C.
MSL	Mean Sea Level
NFA	No Further Action
NFRAP	No Further Remedial Action Planned
NLR	No Longer Regulated Generators
NPL	National Priorities List
RCRA	Resource Conservation and Recovery Act
REC	Recognized Environmental Condition
SCC	Site Cleanup Complete
SHWB	Solid and Hazardous Waste Branch
SHWS	State Hazardous Waste Sites
SQG	Small Quantity Generator
TMK	Tax Map Key
TSD	Treatment, Storage, and Disposal
UIC	Underground Injection Control
UST	Underground Storage Tank
VRP	Voluntary Response Program
WWB	Waste Water Branch

EXECUTIVE SUMMARY

Myounghee Noh & Associates, L.L.C. (MNA), was retained in February 2020 to conduct a Phase I Environmental Site Assessment (ESA) for the Hōkū Keʻa subject property, approximately 0.05-acre portion of the 11,216-acre parcel on Maunakea[1], Island of Hawaiʻi, identified by the Tax Map Key (TMK) of Island 3, Zone 4, Section 4, Plat 015, and Parcel 009 (TMK [3] 4-4-015:009). At the time of this Phase I ESA, the subject property was owned by the State of Hawaiʻi. This Phase I ESA is being conducted for the University of Hawaiʻi (UH) at Hilo, for the decommissioning and removal of the Observatory and Generator Building located on the subject property.

The purpose of this Phase I ESA is to identify *recognized environmental conditions* (RECs) at the Hōkū Keʻa subject property, with respect to the range of contaminants within the scope of the Comprehensive Environmental Response, Compensation and Liability Act and petroleum products. Findings from the Phase I ESA will aid in determining necessary and appropriate actions during demolition of the Observatory and Generator Building. A Phase I ESA consists of four parts. Three of those parts are intended to collect information that will aid in the identification of RECs at the subject property. The information collection parts of the Phase I ESA are a review of state, federal, and local environmental records; a site reconnaissance; and interviews with key site personnel and other individuals with knowledge of the subject property. The fourth part of the Phase I ESA is a report that documents the collection of information about the subject property and evaluation of that information towards determining the presence of RECs at the subject property.

Sites immediately adjoining the Hōkū Keʻa subject property include the United Kingdom Infrared Telescope (UKIRT) and unused land. The surrounding area contains 12 observatories within the Maunakea Science Reserve in the summit area and located on a ridgeline on the southeastern side of the 528-acre Astronomy Precinct. The subject property was accessed from Maunakea Access Road.

FINDINGS

No records of State Sites of Interest, delisted National Priorities List sites, Comprehensive Environmental Response, Compensation, and Liability Information System sites, Resource Conservation and Recovery Act non-Corrective Action Treatment, Storage, and Disposal facilities, State or Federal Brownfield sites, landfill or solid waste disposal sites, State Voluntary Cleanup sites, institutional controls/engineering controls registries, State Hazardous Waste Sites, or Federal Emergency Response Notification System list sites were identified at the subject property or in the adjacent areas of the subject property.

During the site reconnaissance, MNA observed no indication of *recognized environmental conditions* (REC) at the Hōkū Keʻa subject property.

[1]The University of Hawaiʻi at Hilo has requested the use of the spelling "Maunakea". Maunakea is spelled as one word in this document because it is considered the traditional Hawaiian spelling (Ka Wai Ola, Vol. 25 No. 11). Maunakea is a proper noun, therefore spelled as one word in Hawaiian. This spelling is found in original Hawaiian language newspapers dating back to the late 1800s when the Hawaiian language was the medium of communication. In more recent years Maunakea has been spelled as two words, which literally mean "white Mountain". Spelled as two words it is a common noun that could refer to any white mountain versus the proper name of this particular mountain on Hawaii Island. The common "Mauna Kea" spelling is only used in this document where Mauna Kea is used in published or public documents, such as the "Mauna Kea Science Reserve".

MNA interviewed Dr. Pierre Martin, UH Associate Professor of Astronomy, David Lonborg with the UH Institute for Astronomy, Ligaya Hill with UH Hilo Facilities Planning & Coordination, Bruce Teramoto of UH Manoa Construction Management, Stewart Hunter of Maunakea Observatories Support Services, and Frederick Klasner, Natural Resource Program Manager for the Office of Maunakea Management (OMKM). No RECs were identified based on information provided in the interviews. At the time of this writing, responses to inquiries were pending from the State of Hawai'i Department of Land and Natural Resources Land Division and Office of Conservation and Coastal Lands.

Limitations/Data Gaps/Deviations

This Phase I site assessment involved review of the 2016 Phase I Site Assessment Report and records request for the subject property. MNA requested records from the Hawai'i Electric & Light Company and the State of Hawai'i Department of Health Hazard Evaluation and Emergency Response Office, Solid and Hazardous Waste Branch, and the Wastewater Branch. Due to the COVID-19 pandemic, records were unavailable at the time of this writing. MNA requested information about any releases of hazardous materials or petroleum products, as well as other environmental hazards, on or near the subject property from the County of Hawai'i Fire Department (HFD). HFD had not responded at the time of this writing. Per project submittal requirement, MNA proceeded with the preparation of this Phase I ESA and an update to this report will occur upon receipt of requested records.

Subject Property

No potential RECs were identified at the subject property, the Hōkū Ke'a Observatory, during this Phase I ESA.

Surrounding Area

Non-REC

No RECs were confirmed at the subject site, immediately adjoining sites, or surrounding areas[2]. Additional information regarding these sites and areas are provided in Appendix A – Environmental Data Resources (EDR) Reports and Maps.

RECOGNIZED ENVIRONMENTAL CONDITIONS

Myounghee Noh & Associates, L.L.C., conducted a *Phase I Environmental Site Assessment* in conformance with the scope and limitations of ASTM E 1527-13 of the subject property Hōkū Ke'a Observatory in a portion of TMK (3) 4-4-015:009 located on Maunakea, Island of Hawai'i. Any exceptions to, or deletions from, this practice are described in Section 7.0 of this report. This assessment has revealed no evidence of *recognized environmental conditions*.

[2]At the time of the Phase I site reconnaissance, the UH 88" Telescope (Facility ID 9-603620) was located approximately 264 feet to the east northeast. At this site, one 4,000-gallon diesel underground storage tank (UST) had been removed and is permanently out of use. There was no release documented in association with this tank removal, and therefore it is not considered a REC.
The Canada-France-Hawai'i Telescope Observatory (Facility ID 9-603457) was located approximately 417 feet to the northeast. One 5,000-gallon diesel UST is reported to be present. There were no violations associated with the currently-in-use UST, and therefore it is not considered a REC.
A failure of hydraulic line released hydrocarbons to the concrete slab inside of the Caltech Submillimeter Observatory in May 2009 (NRC-HEER 20090527-1500). Contaminated soil was limited to the sub-slab fill and was excavated to the extent possible. During a Phase I ESA, CSO determined the release to be a REC; however, due to the distance from the subject property, approximately 1/4-mile to the northeast, and the removal of impacted soil in 2009, it is not considered a REC associated with the site of the Hōkū Ke'a decommissioning project.