

Appendix E. Arthropod Access Way Monitoring Plan

The Final Environmental Impact Statement, Thirty Meter Telescope Project, dated May 8, 2009, (page 3-76 and page 3-195) commits the TMT Observatory Corporation to monitoring arthropods in the area of the Access Way on the alpine cinder cone habitat before, during, and for two years after construction of that portion of the Access Way. The purpose of monitoring in that area of the Access Way is to provide baseline data regarding the presence of arthropods, including wēkiu bugs and potential invasive species prior to, during, and after construction. The proposed monitoring plan laid out below is subject to modification by OMKM and DLNR.

The extent of Access Way construction activities within the alpine cinder cone habitat extend from the southern end of the Access Way (at the existing electrical panel across from the SMA building) and extends roughly 760 feet to the north (Figure E-1) where the Access Way enters a lava flow habitat.

Biologists will be hired to conduct arthropod surveys in the vicinity of the Access Way construction activities and nearby areas relatively undisturbed by Access Way construction.

Monitoring Tasks, Locations, and Schedule

This section generally describes the tasks to be performed during the monitoring, the locations in the field where monitoring will occur, and the schedule for monitoring activities. The monitoring methods, the methods to be used in the field at each monitoring location, are detailed in a separate section below. Access Way monitoring will consist of the following tasks:

- Perform a single arthropod monitoring event prior to the start of construction activities. Timing of monitoring will be coordinated with OMKM's ongoing survey schedule. Monitoring will take place at the following general locations:
 - Three locations above the 4-wheel drive road, the alignment of the proposed TMT Access Way, and electrical boxes across from the SMA building (Figure E-1: Extent of Access Way Work on Cinder Cone Habitat
 - Figure E-2). The elevation of these monitoring points varies, but average roughly 13,400 feet.
 - Three locations between the 4-wheel drive road, the alignment of the proposed TMT Access Way, and the lower SMA road (Figure E-1: Extent of Access Way Work on Cinder Cone Habitat
 - Figure E-2). The elevation of these monitoring points varies, but average roughly 13,375 feet.
 - Three nearby locations:

A location between the Mauna Kea Loop Road to Subaru and Keck observatories and the Subaru Observatory, at an elevation of roughly 13,500 feet (Figure E-1: Extent of Access Way Work on Cinder Cone Habitat

- Figure E-2). This location is roughly 300 feet from the Access Way construction area.

A location on the lower, northern slope of Pu‘u Poli‘ahu. This location is at an elevation of roughly 13,350 feet and roughly 1,000 feet from the Access Way construction area (Figure E-1: Extent of Access Way Work on Cinder Cone Habitat

- Figure E-2).

Figure E-1: Extent of Access Way Work on Cinder Cone Habitat

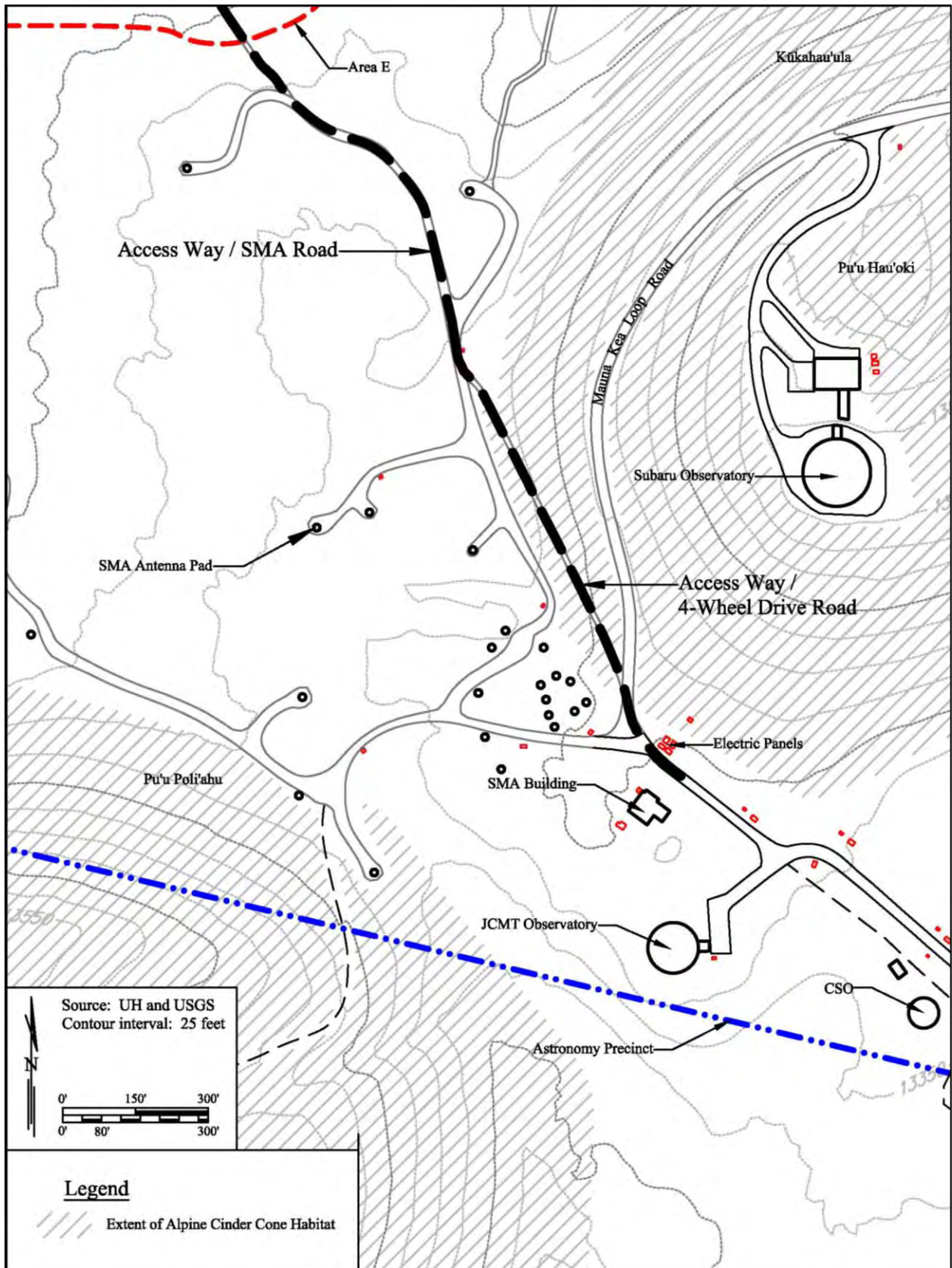
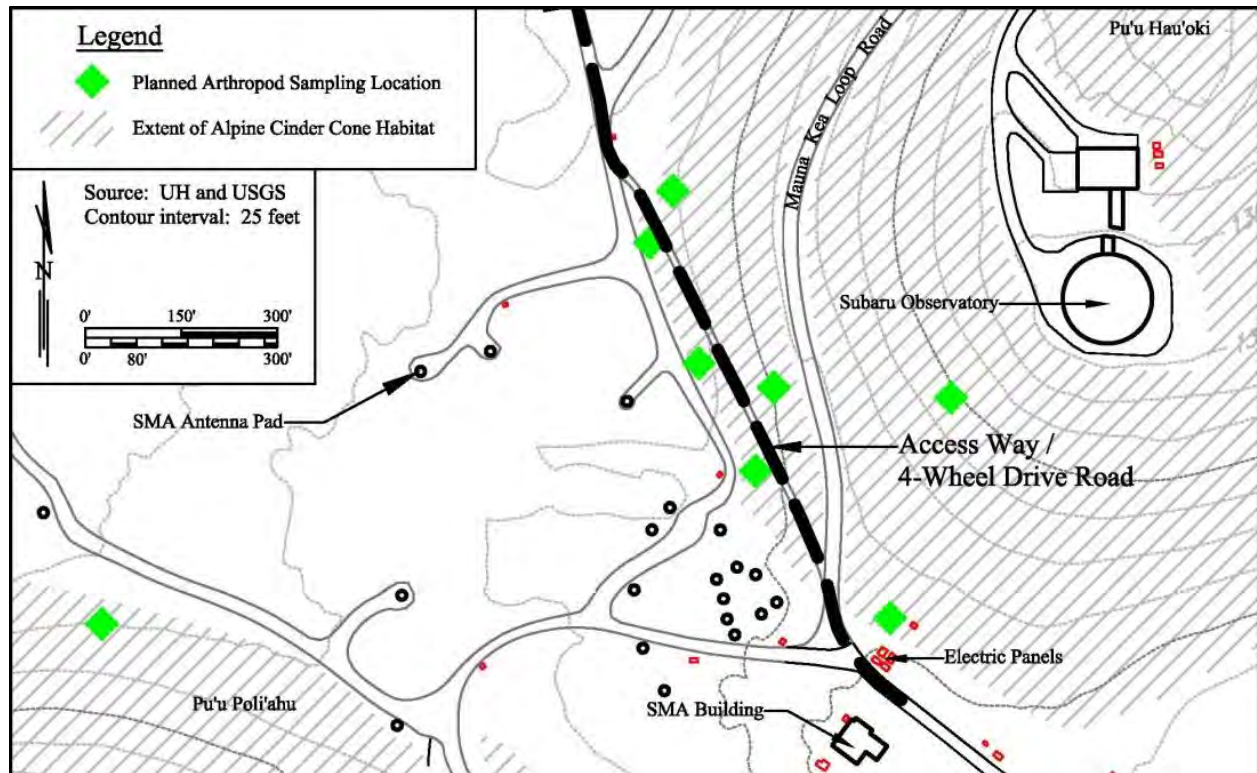


Figure E-2: Arthropod Monitoring Locations in Vicinity of Access Way



A brief report summarizing the results of the monitoring will be produced and shared with OMKM, the wēkiu bug working group, DLNR, and USFWS.

- Perform arthropod monitoring according to a schedule approved by OMKM, during the period of construction within the alpine cinder cone habitat. Monitoring will take place at the general locations outlined above with two traps deployed per location.

Brief reports summarizing the results of each monitoring event will be produced and shared with OMKM, the wēkiu bug working group, DLNR, and USFWS. The reports will include the results of all previous monitoring events.

- Perform arthropod monitoring twice a year according to a schedule approved by OMKM; for a period of two years after completion of construction in that area. Monitoring will take place at the general locations outlined above with two traps deployed per location.

Brief reports summarizing the results of each monitoring event will be produced and shared with OMKM, the wēkiu bug working group, DLNR, and USFWS. The reports will include the results of all previous monitoring events.

- Prepare a final report that (a) summarizes the results of the surveys, and (b) discusses the presence/introduction of new arthropod species (invasive or otherwise) during the monitoring period.

The following provides an example of a possible monitoring schedule, if construction were to start in the beginning of the summer:

Table E-2: Example Monitoring Schedule

Task	Event Date						
	Start	Finish					
Construction in Alpine Cinder Cone Habitat	Jul-Y1	Nov-Y1					
Before Construction Monitoring Event	June-Y1						
During Construction Monitoring Events	June, Jul, Aug, Sep, Oct (monthly until first significant snow)-Y1						
After Construction Monitoring Events			Apr-Y2	Sept-Y2	Apr-Y3	Sep-Y3	
Report Distributed	July-Y1	Aug, Sep, Oct, Nov-Y1		May-Y2	Oct-Y2	May-Y3	Oct-Y3

Y1 = Year 1.

Monitoring Methods

At each monitoring location, two pitfall live-traps will be placed within roughly 10 feet of each other. The two traps will be placed in different microhabitat types (ex. large rock jumble vs. ash layer near the surface) to attempt to sample the diversity of the habitat at each location. A live-trap design very similar to that employed by Jesse Eiben in 2007 and 2008 and Mr. Eiben and Greg Brenner in 2008 and 2009 for the TMT Project will be used to trap wēkiu bugs and other arthropods. The trap was successful during those studies and is described in the “Arthropod and Botanical Inventory and Assessment” included as Appendix K of the Final Environmental Impact Statement, Thirty Meter Telescope Project (dated May 8, 2009).

The trap includes two 10-ounce clear plastic cups with the upper cup punctured with one small hole in the bottom center through which a small absorbent wick made of tissue is pushed. A small amount of water is placed in the bottom of the lower reservoir cup. Attractant shrimp paste is placed in the upper cup contacting the wick, on a few small pieces of rock in the cup, smeared on the side of the cup, and on a cap rock.

The traps are dug into the available ground substrate with a goal of achieving a depth where moisture was present (if moisture is available) in the ash layer. The lip of the cup needs to be placed flush with the ash layer, but there does not have to be wire mesh surround to provide structure surrounding the cups. A cap rock is placed over the traps and elevated above the ground approximately 0.5-inch with smaller rocks.

The traps will be checked daily for three consecutive days after installation. Wēkiu bugs and other arthropods captured will be removed for the duration of the sampling period to prevent recounts. Wēkiu bugs and other native species will be held for up to three days in captivity with food and water sources. Any introduced species will be euthanized so as to prevent introduction to another habitat. After sampling is complete, all wēkiu bugs and other native species will be released near the trap in which they were captured. Non-native species will be catalogued for future reference.

In addition to the pitfall live-traps, each day the traps are maintained there will be a 20 minute visual search for native and non-native arthropods at each monitoring location. The search will be conducted in a way to minimize impact of the substrate by visually searching the substrate surface, and by occasionally lifting rocks and searching below the surface for arthropods. Cinder

rocks will be placed back in their original positions. The biologist will have an aspirator and aerial net available for collecting arthropods observed either on the ground or in the air. Other types of traps may be employed in an effort to survey other kinds of arthropods that do not respond to or get trapped in the live pitfall traps; examples of potential traps include peanut butter covered sticks for surveying for ants. Arthropods encountered will be field identified and recorded, or if the identity is undetermined, one to five individuals of that morphospecies will be collected for identification purposes.