

Exhibit B.10a

Written Direct Testimony of Eric Hansen

In May of 2011 I began working as the field crew leader for the Mauna Kea baseline botanical survey for the Office of Mauna Kea Management. It was my job to lead a field team to conduct intensive botanical surveys of the entire mountain in the alpine and subalpine zones (9,000-13,796 ft elevation). During this time I helped establish vegetation survey transects and create research study design. I also performed data entry for the entire field crew, managed this large botanical transect data sets, along with a GIS database. Furthermore I conducted data analysis, prepared data summaries and displays, provided maps and assisted in writing, reviewing and editing of reports to Office Mauna Kea Management. I did not write the final report for the baseline botanical survey however the data, charts and maps found in that report are products of the work performed by botany crew that I lead.

During the time of the 2011 baseline botanical study, fieldwork for a subcontracted lichen study was conducted in the summer of 2011 (Berryman and Smith 2011; Appendix D of Mauna Kea baseline botanical study) to be included in a survey of the proposed site for the Thirty Meter Telescope (Pacific Analytics 2012).

During this lichen study, my field crew of botanists and botanical technicians, that performed the survey of vascular plants, also recorded lichen species that we could identify within the two meter and six meter plots established in the lichen study. We used photo guides to recognize nine of the more frequent species of lichens found in the summit area after being trained by specialists (B. Perry: mycologist, University of Hawai'i at Hilo Biology Department; and C. W. Smith) to identify these species. Several of the lichen species are distinct and easy to positively identify. Others are very small and often lack fruiting bodies or other distinctive features. Many of these specimen appear to be small and lacking typical visible features due of the extreme environmental conditions of Mauna Kea's summit (C. W. Smith Unpublished; see Appendix D-3 of Mauna Kea baseline botanical study). According to the 2011 Mauna Kea Baseline Botanical report lichen data showing a species as absent should not be considered as confirmation that that species does not occur at the site.

While surveying lichen in the proposed TMT development area on the Mauna, the field crew and I, also documented other non-lichen species found in this region. Documented species include two endemic (only found in Hawai'i) native grasses, *Agrostis sandwicensis* and *Trisetum glomeratum*, along with two endemic ferns, *Cystopteris douglasii* and *Asplenium trichomanes*. The remaining three native plants are the indigenous (naturally arrived to Hawai'i on their own but found in other places) ferns, *Asplenium adiantum-nigrum*, *Dryopteris wallichiana*, and *Pellaea ternifolia*. When viewing from a distance the proposed area for the Thirty Meter Telescope, it looks like it is just rocks. Once you get on your hands and knees and start examining all the rocks you will find unique assemblages of botanical communities.

From the fieldwork my team conducted, we did not find this distinct assemblage of species in other areas at the same or similar elevations of Mauna Kea. What facilitates the organisms found in this area of concern to exist is the presence of big clunky boulders that have small pockets underneath them. This is where moisture can collect. When the snow melts, water gathers in these pockets that are shaded and hold moisture. The microclimates of these pockets are protected from direct exposure from sun and high winds and have lower evapotranspiration rates.

Hawai'i Administrative Rules section 13-5 outlines the eight criteria that must be met before the Board of Land and Natural Resources can allow construction in a conservation district, like Mauna Kea. The TMT needs to meet all eight criteria to obtain a permit development in the conservation district of the mountain. Two of these criteria I clearly do not see the TMT meeting. A) *The proposed land use will not cause substantial adverse impact to the existing natural resources in the surrounding area, community or region.* B) *The existing physical and environmental aspects of the land, such as natural beauty or open space characteristic, will be preserved or improved upon, which ever is applicable.* The proposed area of development will dig into the mountain, move rocks and alter substrate. To say these activities will not affect the botanical communities or that physical and environmental aspects will be preserved or improved upon is false. The development will cause loss of physical and environmental aspects.

When the field crew and I we were on the Mountain five days a week conducting ten-hour field days, we knew we could only do so much. It takes years and years of understanding to gather the complete picture of what is actually occurring on Mauna Kea's environment. It absurd to think about developing something when we do not have a firm understanding of the Mauna Kea's resources; if you cannot understand the resources of which you have, how can you manage and develop areas on the mountain? The answer is you simply cannot.

Mahalo nui loa,



Eric Hansen

Sources Cited:

Berryman, S. and C. W. Smith. 2011. Lichens and Bryophytes of Mauna Kea within the TMT Footprint and Impact Area, Summit of Mauna Kea. Appendix A in Buffer Zone Lichen, Arthropod and Botanical Inventory and Assessment, Thirty Meter Telescope Project, Mauna Kea Science Reserve, Northern Plateau and Hale Pohaku, Hamakua district, Island of Hawaii. Prepared for Parsons Brinckerhoff, Honolulu; Prepared by Pacific analytics, L.L.C., Scio Oregon

Gerrish, G. 2013. Botanical Baseline Survey (2011) of the University of Hawaii's Managed Lands on Mauna Kea. Prepared for Office of Mauna Kea Management; Prepared by Grant Gerrish.

Smith, C. W. unpublished. Preliminary Report of Lichens of the UHH Management Lands on Mauna Kea. Submitted August 9, 2013.