

# Gary H. Sanders, Project Manager The Thirty Meter Telescope (TMT) Observatory Corporation

## **TMT Observatory Corporation**

- ✦ University of California (UC)
- ✦ California Institute of Technology (Caltech)

## **Collaborating Institutions**

- ✦ China, India, Japan, Canada

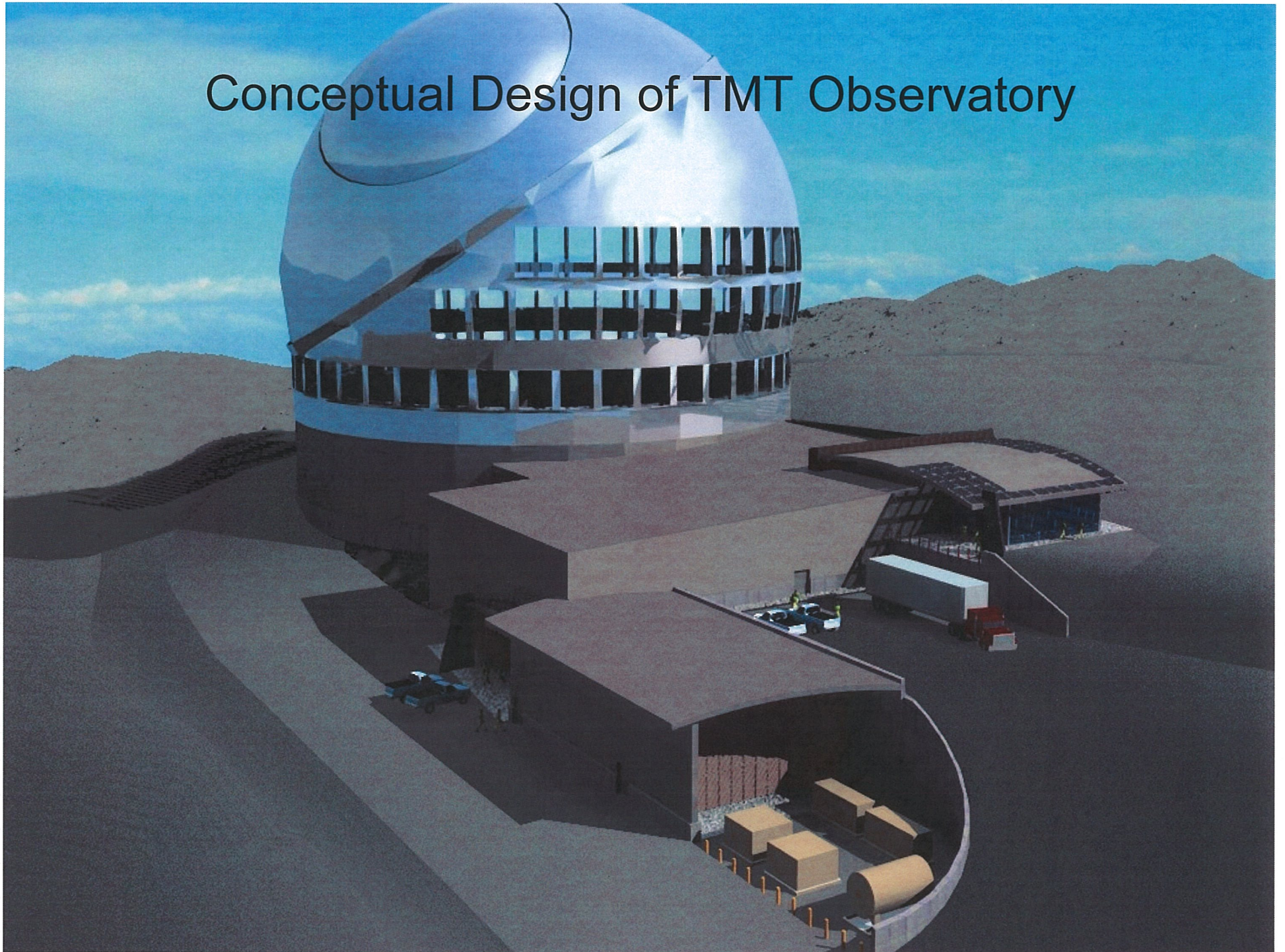
# The Value of the TMT Observatory

- ✦ The critical need for an optical/infrared telescope with a 30-meter primary mirror was both identified by the U.S. scientific community and assigned a priority by the Canadian scientific community.
  - ✦ The TMT Corporation was formed in response to manage initial planning, and then design, build and operate TMT.
  - ✦ The U.S. has been the leader in astronomy research for the last 150 years. Locating TMT in Hawaii will help maintain the U.S. leadership in astronomy research, discovery and innovation.
  - ✦ One Project purpose is to maintain this leadership by leveraging the capacity of existing observatories on Maunakea.
  - ✦ While these observatories are world-leading today, their future scientific productivity could be broadened by co-location with a next generation observatory, such as TMT.
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# TMT Project Components

- ✦ TMT Observatory consisting of the 30-meter telescope, instruments, dome, attached building and parking within Mauna Kea Science Reserve
    - Observatory in Area E, or northern plateau designated as site for next generation large telescope
  - ✦ Access Way, referring to the road and other infrastructure improvements including a surface roadway and underground utilities
  - ✦ TMT Headquarters located in Hilo including an office building with a parking area
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# Conceptual Design of TMT Observatory



# TMT Observatory Design

- ✦ The TMT Observatory design is being and will continue to be developed in consultation with the Office of Mauna Kea Management through their design review process.
  - ✦ The design details provided here represent the current design.
  - ✦ OMKM design review process is not complete and parallels the Hawaii Revised Statutes (HRS) Chapter 343 EIS process. No significant design changes are anticipated; however, adjustments to finer details could still take place.
  - ✦ The TMT Observatory design includes telescope, instruments mounted around the primary mirror, and the TMT Adaptive Optics (AO) system.
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# TMT Observatory Design

- ✦ The dome housing the telescope will be a Calotte type enclosure with a reflective aluminum-like exterior coating.

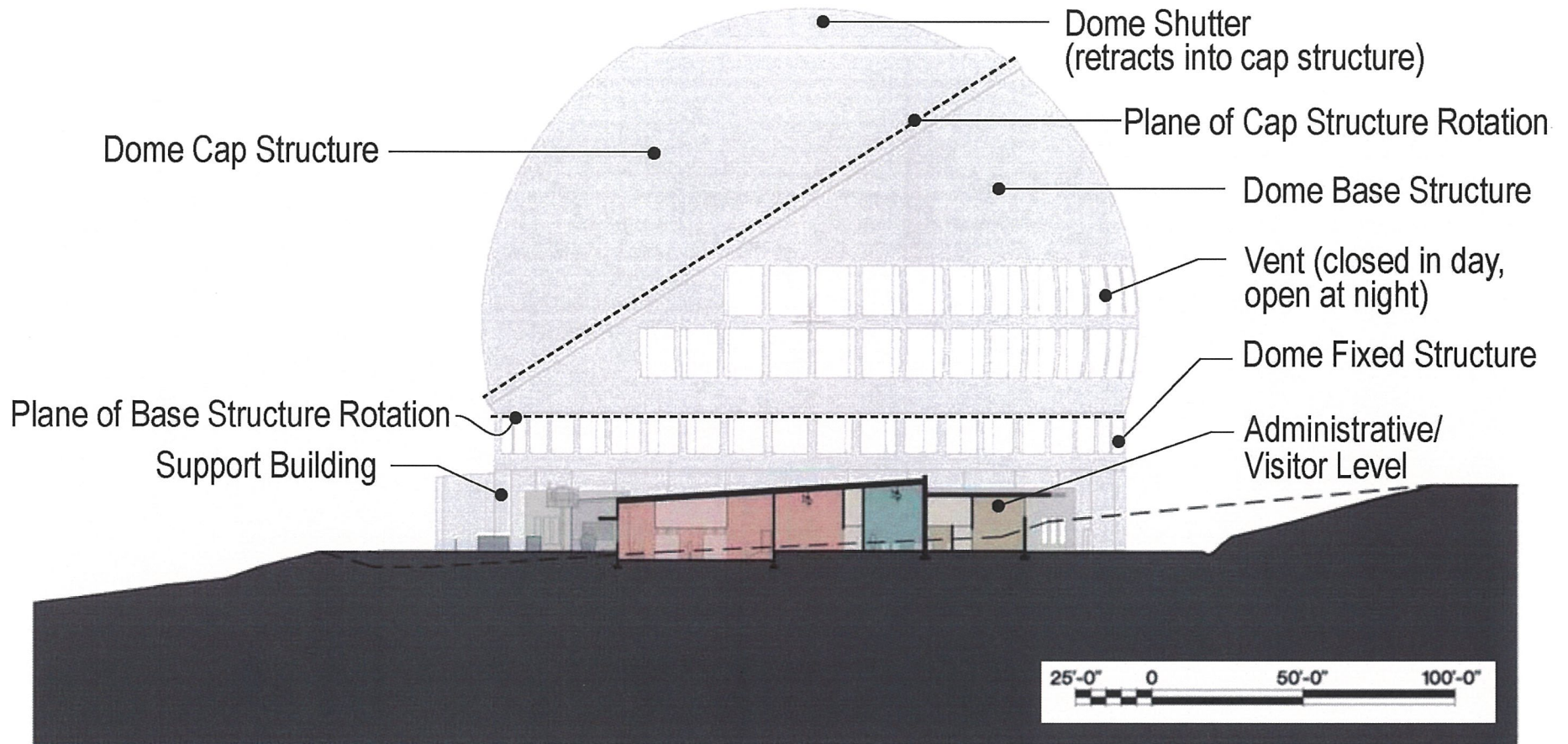
Total height of roughly 180 feet above the current ground surface, with an exterior radius of 108 feet

- ✦ Support building attached to the dome. Since the Draft EIS, this building has been reduced; now one level at 21,000 sq. feet, a smaller footprint.

Support building will include work spaces for mirror coating and staging area; laboratory and shop spaces; utility spaces; administration; visitor and public spaces including lobby, restroom and viewing platform

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# TMT Observatory Design

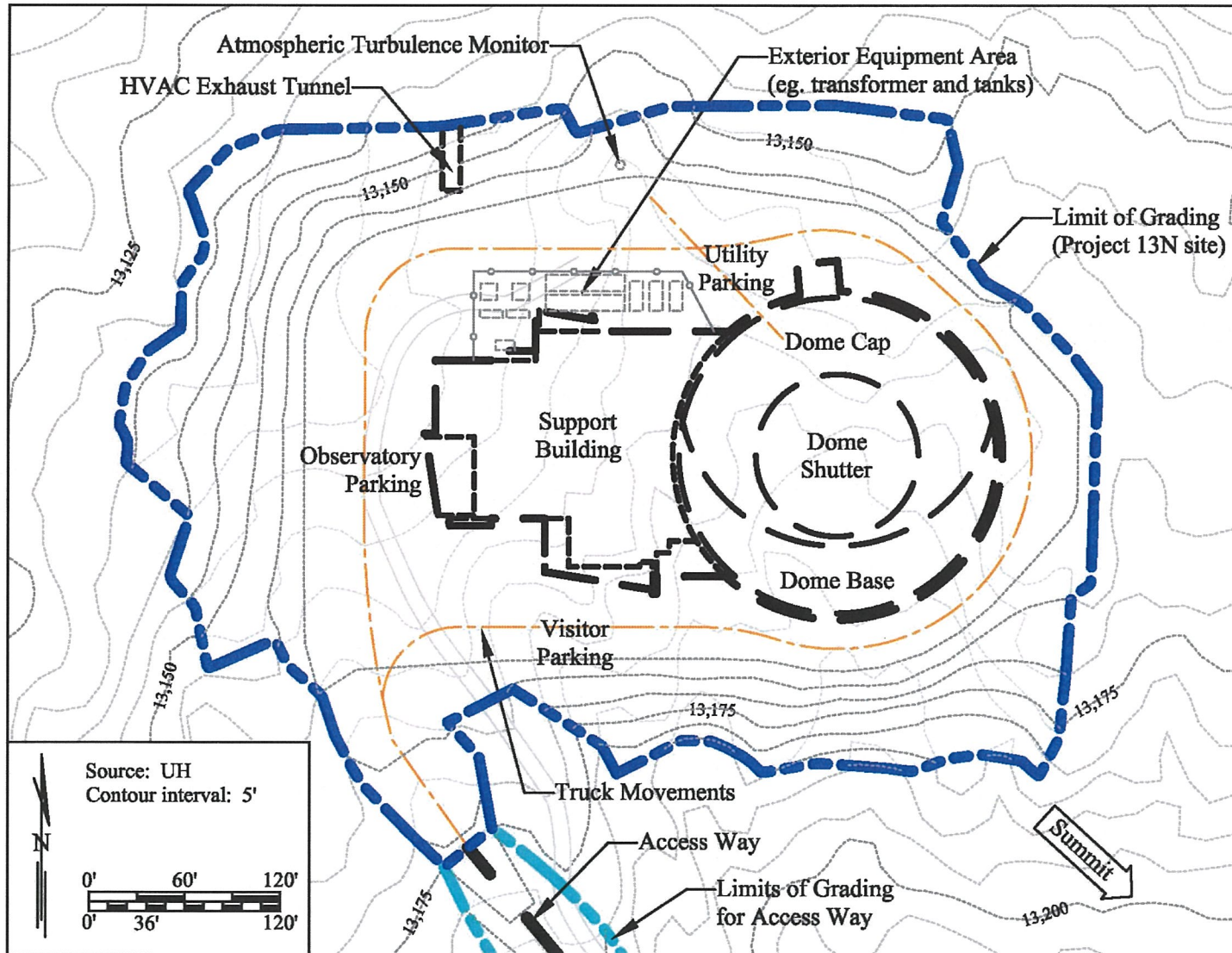


# TMT Observatory Design

- ✦ Approximately 6,000 sq feet of exterior equipment area on the north side of the support building.
  - ✦ The footprint of the TMT Observatory dome, support building, parking area and area disturbed during construction will be roughly five acres.
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# TMT Observatory Design



# TMT Access Way

- ✦ The access way will include a road and utility services to the TMT Observatory from existing services.
  - ✦ The proposed TMT Access Way route follows and goes over an existing single-lane, 4-wheel drive road that was previously developed for access and testing of the 13N site in the 1960s. A portion of the route was graded during construction of the SMA facility.
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# HELCO Compound at Hale Pohaku

- ✦ Two transformers will be upgraded, placed in the same location as the existing transformers and the existing compound will not be expanded.
- ✦ Electrical service will be upgraded by removing existing conducting wire and placing new electric conducting wire in existing underground conduits.
- ✦ Installing new wire in the conduit will not result in any new disturbance. Local utility company will need to access the pull boxes to install the new cable.

## Construction Areas

- ✦ Port staging area where Project components are received.
  - ✦ Batch Plant staging area, used for storing bulk materials and a concrete batch plant
  - ✦ Project area not occupied by structure will also be utilized as staging areas.
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# TMT Project Phases

## ✦ **Planning and Design**

TMT conducted an extensive worldwide study. Based on testing results, Maunakea was identified as the preferred site.

### ✦ Those characteristics that make Mauna Kea such a good site are:

- ✦ Fraction of clear nights
  - ✦ Stability of the Atmosphere above the Site
  - ✦ Mean Temperature and Temperature Variability
  - ✦ Precipitable Water Vapor
  - ✦ Latitude
  - ✦ Importance of Particular Physical Characteristics
  - ✦ Scientific Productivity and Synergy
  - ✦ Feasibility, Administration, and Policy
  - ✦ Environmental Considerations
  - ✦ Site-dependent Construction Costs
  - ✦ Operating Costs of the Observatory
  - ✦ Site-dependent Ability to Attract and Retain Staff
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# TMT Project Phases

HRS Chapter 343 environmental review process for the Project at the Maunakea site is completed.

The design of TMT Observatory has been ongoing, including design of the telescope, instruments, and the dome and attached building.

## ✦ **Construction and Testing**

Project pre-construction activities could begin in 2012, with construction to follow and take approximately seven years to complete.

The construction crew will average 50 to 60 crew members.

Winter weather conditions are expected to interrupt construction at times.

First light is expected no earlier than 2019. Tests will then be conducted and adjustments made for a period of time to gain optimum efficiency and seeing.

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# TMT Project Phases

## ✦ Operation

First scientific results using the TMT Observatory are expected in 2020

During the life of the TMT Observatory astronomical observations will be made by scientists from around the world.

Staff of up to 140 people will be necessary to operate and maintain TMT.

## ✦ Decommissioning

The TMT Observatory and the extend of the Access Way exclusively used to access the Observatory will be dismantled and the site restored at the end of the TMT Observatory's life in compliance with the Decommissioning Plan for the Mauna Kea Observatories, a Sub-Plan of the Mauna Kea Comprehensive Management Plan.

Deconstruction and site restoration efforts will be managed by TMT project staff with oversight by OMKM.

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# Community Benefits Package

- ✦ TMT has committed to a CBP, funded by the TMT Observatory Corp. Administered via The Hawaii Island New Knowledge (THINK) Fund Board of Advisors, consisting of local Hawaii Island community representatives.

Funding for the THINK fund will commence upon the start of Project construction, continuing throughout the TMT Observatories presence. TMT will provide \$1 million annually to the THINK Fund

THINK Fund purposes could include scholarships and mini-grants; educational programs specific to Hawaiian culture, astronomy and math and science; college awards; and community outreach.

Educational initiatives will focus on K-5; 6-8; 9-12; and college.

- ✦ Workforce Pipeline Program (WPP)

Partner with UH Hilo, HCC and the DOE to help develop, implement and sustain a comprehensive, proactive, results-oriented WPP that will lead to a highly qualified pool of local workers who could be considered for hire into most job classes and salary levels.

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# Mitigation Measures in the FEIS and CDUA

- ✦ The Project will (a) design its facilities to comply and/or facilitate compliance, and (b) develop and implement a range of plans and programs outlined in the Final EIS.
  - ✦ Design considerations include limiting the observatory's visual impact and other potential impacts and providing a zero-discharge wastewater system at the TMT Observatory.
  - ✦ Plans and programs will include a Cultural and Natural Resources Training Program, Invasive Species Prevention and Control Program, Waste Minimization Plan, and Materials Storage/Waste Management Plan with component Spill Prevention and Response Plan.
  - ✦ Additional proposed mitigation measures include furnishing Project facilities with items that invoke a sense of place, 'Imiloa program partnership including exhibit development, ride-sharing program, and dust control measures
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# Additional Mitigation Measures in the FEIS and CDUA

- ✦ The TMT Observatory has been sited at the 13N site, within Area E, north and below the summit. Therefore, the TMT Observatory:

- Will not be visible from culturally sensitive locations, such as summits of Kūkahau'ula, Lake Waiau, and Pu'u Līlīnoe;

- Is more than 200 feet from known historic properties;

- Will not be visible from Hilo and the southern portion of the island; and

- Is outside of the wēkiu bug's preferred habitat.

- ✦ TMT Access Way Design

- Designed to reduce the potential for both physical and visual impacts to the historic properties and potential impacts to natural resources known to be in the vicinity.

- Limiting the southern 750 foot long portion to a single-lane even though such a configuration is not desirable from an operational standpoint.

- Aligning the bulk of the Access Way to follow an existing single-lane, 4-wheel drive road that was built in the 1960s for access and testing of the 13N site.

- Coloring the pavement and guardrail a reddish color blending with surrounding area.

- Placing the utilities to the TMT Observatory within the Access Way and beneath the paved roadway instead of on a different or parallel alignment that would cause more ground disturbance.

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# Additional Mitigation Measures in the FEIS and CDUA

## ✦ Restoration of Pu'u Poliahu

TMT will fund the restoration of the closed access road on Pu'u Poli'ahu per a plan submitted by the Institute for Astronomy and approved by DLNR (SPA HA-10-04).

## ✦ Camouflage Utility Boxes

TMT will camouflage utility boxes that are visually distracting in the Astronomy Precinct and key locations visible from other portions of Kūkahau'ūla. The method of camouflage will be determined through consultation with Kahu Kū Mauna

## ✦ Develop and Implement Invasive Species Prevention and Control Program

## ✦ Wastewater Treatment

A zero-discharge wastewater system will be installed at the TMT Observatory. All wastewater generated at the Observatory will be transported to an approved treatment facility for treatment and disposal. The discharge of wastewater within the summit region has been identified as an impact on cultural resources and is one of the reasons for this measure.

## ✦ Implement a Materials Storage/Waste Management Plan, including a Spill Prevention and Response Plan, requiring:

Daily inspections of equipment handling hazardous materials.

Mandatory training of all personnel handling hazardous materials and wastes.

Regular inspections by a Safety and Health Officer.

That all solid waste be collected in secured and covered storage containers.

That all wastes be transported down the mountain for proper disposal at an off-site disposal facility.

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