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A Limited Liability Law Partnership

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Attorneys for  
**TMT INTERNATIONAL OBSERVATORY, LLC**

BOARD OF LAND AND NATURAL RESOURCES  
FOR THE STATE OF HAWAI'I

IN THE MATTER OF

A Contested Case Hearing Re Conservation District Use Permit (CDUP) HA-3568 for the Thirty Meter Telescope at the Mauna Kea Science Reserve, Kahohe Mauka, Hamakua District, Island of Hawaii, TMK (3) 4-4-015:009

Case No. BLNR-CC-16-002

**TMT INTERNATIONAL OBSERVATORY, LLC'S  
THIRD AMENDED EXHIBIT LIST and  
ADDITIONAL EXHIBIT C-39; CERTIFICATE OF  
SERVICE**

**PARTY: TMT INTERNATIONAL OBSERVATORY, LLC**

Exhibit No.	Description	Received Into Evidence
C-1	Testimony of Ed Stone	
C-2	Testimony of Gary Sanders	

RECEIVED  
OFFICE OF CONSERVATION  
AND COASTAL LANDS

2016 DEC 30 P 3:06

DEPT. OF LAND &  
NATURAL RESOURCES  
STATE OF HAWAII

Exhibit No.	Description	Received Into Evidence
C-3	Graphic showing Mitigation Measures Reduce Size and Visibility of TMT	
C-4	Testimony of Mike Bolte	
C-5	New York Times article: From Hawaii's Mauna Kea, A Universe of Discoveries (October 3, 2016)	
C-6	Testimony of David M. Callies	
C-7	Testimony of James Hallstrom, including Curriculum Vitae	
C-8	Testimony of Dr. Heather Kaluna	
C-9	Testimony of Naea Stevens	
C-10	Direct Testimony of Amber Imai-Hong	
C-11	Testimony of Robert B. Rechtman	
C-12	Thirty Meter Telescope Archaeological Report, prepared by Genevieve Glennon and Robert Rechtman (October 2013)	
C-13	Letter to Robert Rechtman from DLNR Historic Preservation Division, approving TMT Archaeological Report (December 16, 2013)	
C-14	Thirty Meter Telescope Monitoring Report re: Groundbreaking, prepared by Samuel Plunket and Robert Rechtman (September 2014)	
C-15	Field Reconnaissance of TMT Development Site	
C-16	Updated Field Reconnaissance of TMT Development Site	
C-17	Testimony of Paul Coleman	
C-18	Aerial Graphic showing distances from cultural practice areas to proposed TMT Observatory	
C-19	Aerial Graphic showing that TMT does not block/impinge on view of Haleakala from Poli'ahu	
C-20	Graphic showing TMT and Pu'u Poli'ahu Elevation Difference	

Exhibit No.	Description	Received Into Evidence
C-21	Graphic of Pu'u Wekiu View Plane Cross-Section with Elevation – TMT Not Visible	
C-22	Graphic of Pu'u Wekiu View Plane Cross-Section – TMT Not Visible	
C-23	Graphic of Size Comparison Chart of TMT with other Telescopes	
C-24	Written Direct Testimony of Clarence Kukauakahi Ching (2011)	
C-25	Hearing Testimony of Clarence Ching (2011)	
C-26	Written Direct Testimony of E. Kalani Flores (2011)	
C-27	Hearing Testimony of E. Kalani Flores (2011)	
C-28	Written Direct Testimony of Paul K. Neves (2011)	
C-29	Hearing Testimony of Paul K. Neves (2011)	
C-30	Written Direct Testimony of Hawane Rios (2011)	
C-31	Hearing Testimony of Hawane Rios (2011)	
C-32	Written Direct Testimony of Deborah Ward (2011)	
C-33	Amendment to page 8 of Deborah Ward's Written Direct Testimony (2011)	
C-34	Hearing Testimony of Deborah Ward (2011)	
C-35	Mauna Kea Summit aerial photograph	
C-36	Mauna Kea Summit USGS Map	
C-37	Map of Honokohau Harbor Area	
C-38	8/22/2014 Letter to William Aila (DLNR) from Bob Rechtman	
C-39	TMT International Observatory, LLC Initial Decommissioning Funding Plan (April 2014)	

DATED: Honolulu, Hawaii, December 30, 2016.



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J. DOUGLAS ING  
BRIAN A. KANG  
ROSS T. SHINYAMA  
SUMMER H. KAIawe  
**Attorneys for TMT INTERNATIONAL  
OBSERVATORY, LLC**

# **TMT International Observatory, LLC**

## **Initial Decommissioning Funding Plan (April 2014)**

**Decommissioning Funding Plan**  
**April 2014**

This Decommissioning Funding Plan is submitted on behalf of TMT International Observatory, LLC ("TIO"). TIO has been in negotiation with the University of Hawaii ("UH") for a Sublease to construct and operate the Thirty Meter Telescope ("TMT") on a designated site within the Astronomy Precinct of the Mauna Kea Science Reserve, currently leased by UH from the Board of Land and Natural Resources ("BLNR") under General Lease S-4191. TIO has also negotiated a Scientific Cooperation Agreement regarding the operation of the TMT. The Sublease and Scientific Cooperation Agreement are in the process of final review and approval.

In 2000, UH adopted the Mauna Kea Science Reserve Master Plan, which establishes the management structure for UH's stewardship of the areas it manages on Mauna Kea. In 2009 and 2010, UH adopted, and BLNR approved, the Mauna Kea Comprehensive Management Plan ("CMP") and its subplans the Cultural Resources Plan, Natural Resources Management Plan, Public Access Plan, and Decommissioning Plan. These plans commit UH to exercise responsible stewardship of Mauna Kea and to ensure that astronomical activities are conducted in a manner that respects the cultural significance of Mauna Kea, protects the environment, and is responsible to the needs and concerns of Native Hawaiians and the public.

In May 2010, UH completed an Environmental Impact Statement for the TMT. In September 2010, UH filed an Application for a Conservation District Use Permit to construct the TMT. Conservation District Use Permit HA-3568 was approved by the BLNR in April 2013.

A Decommissioning Funding Plan (DFP) is a requirement of the Office of Mauna Kea Management's ("OMKM's") Decommissioning Plan, a sub-plan to the CMP approved by the BLNR. The DFP contains a cost estimate for decommissioning, a description of the method for assuring that funds are available, the method for adjusting the cost estimate and funding level over the life of the sublease. The DFP describes and documents the sublessee's assurance that a prescribed amount of funding is secured for decommissioning and site restoration. Initially this is based on a conceptual cost estimate and plan to fulfill these requirements.

This shall serve as TIO's initial and conceptual DFP. The DFP and its associated cost estimate shall be reviewed and updated not less than every fifteen (15) years.

A number of different types of financial instruments may be used for a DFP. These include trusts, letters of credit, performance bonds and other guarantees. TIO has selected a sinking fund approach. This method allows the TIO to gradually prepay the cost of decommissioning and restoration and shall be implemented over the term of the sublease commencing with the first year of operations. The amount of funds set aside and the annual payments shall be adjusted prospectively based on updated cost estimates or as otherwise required.

**Conceptual Cost Estimate**

Based upon an independent study, TIO has a 'conceptual' cost estimate of \$17.1M (in 2013 dollars) to decommission observatory and restore the site. This would include the removal of all of improvements made to the site including the facilities, dome and all components internal to the observatory. In addition all material foreign to the site will be removed and the site would be restored as closely as possible to what existed prior to construction. A copy of this cost estimate is attached.

**Sinking Fund**

TIO shall establish a sinking fund which would fully fund the cost of decommissioning the TMT Observatory before the end of its expected life. Funding shall commence with \$1M per year payments beginning with the first year of operations. The fund would be maintained for the 50-year life of the observatory and payments would be adjusted annually for inflation. The following table provides an initial conceptual plan for the funding. This conceptual plan assumes annual inflation at 3%. The inflation amount used would be the actual inflation. As the estimates are updated, the then current dollars would be used as the basis for the estimate.

Dated: \_\_\_\_\_

TMT INTERNATIONAL OBSERVATORY, LLC ("TIO")

\_\_\_\_\_  
Gary Sanders  
Project Manager

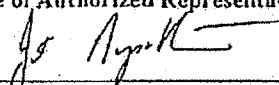
# **Sinking Fund Plan**

Sinking Fund Decommissioning  
Funding Plan – Operations

		A	B	C	
	Year	Decommissioning Costs (2013 Economics)	Decommissioning Costs with 3% Inflation/Year	Decommissioning Fund with 3% Inflation/Year	Fund - Cost (B - A)
Operations	1	\$17.100	\$20.537	\$1.000	-\$19.537
Operations	2	\$17.100	\$21.153	\$2.030	-\$19.123
Operations	3	\$17.100	\$21.787	\$3.091	-\$18.697
Operations	4	\$17.100	\$22.441	\$4.184	-\$18.257
Operations	5	\$17.100	\$23.114	\$5.309	-\$17.805
Operations	6	\$17.100	\$23.808	\$6.468	-\$17.339
Operations	7	\$17.100	\$24.522	\$7.662	-\$16.859
Operations	8	\$17.100	\$25.258	\$8.892	-\$16.365
Operations	9	\$17.100	\$26.015	\$10.159	-\$15.856
Operations	10	\$17.100	\$26.796	\$11.464	-\$15.332
Operations	11	\$17.100	\$27.600	\$12.808	-\$14.792
Operations	12	\$17.100	\$28.428	\$14.192	-\$14.236
Operations	13	\$17.100	\$29.280	\$15.618	-\$13.663
Operations	14	\$17.100	\$30.159	\$17.086	-\$13.073
Operations	15	\$17.100	\$31.064	\$18.599	-\$12.465
Operations	16	\$17.100	\$31.996	\$20.157	-\$11.839
Operations	17	\$17.100	\$32.955	\$21.762	-\$11.194
Operations	18	\$17.100	\$33.944	\$23.414	-\$10.530
Operations	19	\$17.100	\$34.962	\$25.117	-\$9.846
Operations	20	\$17.100	\$36.011	\$26.870	-\$9.141
Operations	21	\$17.100	\$37.092	\$28.676	-\$8.415
Operations	22	\$17.100	\$38.204	\$30.537	-\$7.668
Operations	23	\$17.100	\$39.350	\$32.453	-\$6.898
Operations	24	\$17.100	\$40.531	\$34.426	-\$6.105
Operations	25	\$17.100	\$41.747	\$36.459	-\$5.288
Operations	26	\$17.100	\$42.999	\$38.553	-\$4.446
Operations	27	\$17.100	\$44.289	\$40.710	-\$3.580
Operations	28	\$17.100	\$45.618	\$42.931	-\$2.687
Operations	29	\$17.100	\$46.987	\$45.219	-\$1.768
Operations	30	\$17.100	\$48.396	\$47.575	-\$0.821
Operations	31	\$17.100	\$49.848	\$49.903	\$0.055
Operations	32	\$17.100	\$51.343	\$51.400	\$0.056
Operations	33	\$17.100	\$52.884	\$52.942	\$0.058
Operations	34	\$17.100	\$54.470	\$54.530	\$0.060
Operations	35	\$17.100	\$56.104	\$56.166	\$0.062
Operations	36	\$17.100	\$57.787	\$57.851	\$0.063
Operations	37	\$17.100	\$59.521	\$59.586	\$0.065
Operations	38	\$17.100	\$61.307	\$61.374	\$0.067
Operations	39	\$17.100	\$63.146	\$63.215	\$0.069
Operations	40	\$17.100	\$65.040	\$65.112	\$0.071
Operations	41	\$17.100	\$66.992	\$67.065	\$0.073
Operations	42	\$17.100	\$69.001	\$69.077	\$0.076
Operations	43	\$17.100	\$71.071	\$71.149	\$0.078
Operations	44	\$17.100	\$73.203	\$73.284	\$0.080
Operations	45	\$17.100	\$75.400	\$75.482	\$0.083
Operations	46	\$17.100	\$77.662	\$77.747	\$0.085
Operations	47	\$17.100	\$79.991	\$80.079	\$0.088
Operations	48	\$17.100	\$82.391	\$82.482	\$0.090
Operations	49	\$17.100	\$84.863	\$84.956	\$0.093
Operations	50	\$17.100	\$87.409	\$87.505	\$0.096

# **Financial Assurance Statements of Intent**

## STATEMENT OF INTENT

<b>I. Facility Identification</b>	
<b>Business Name:</b>	TMT International Observatory, LLC
<b>Type of Operation:</b>	Thirty Meter Telescope on a designated site within the Astronomy Precinct of the Mauna Kea Science Reserve
<b>II. Estimated Closure Costs</b>	
The conceptual cost estimate for decommissioning the observatory and restoring the site is approximately \$17.1 million (in 2013 dollars).	
<b>III. Closure Financial Assurance Mechanism</b>	
<b>Mechanism Type:</b>	Statement of Intent
<b>Organization/Institution:</b>	The Regents of the University of California
<b>Address:</b>	1111 Franklin Street, 12 <sup>th</sup> Floor
<b>City/State/Zip code:</b>	Oakland, California 94607
<b>IV. Certification</b>	
As an authorized representative of The Regents of the University of California ("UC"), I hereby certify that UC intends to provide decommissioning funds to satisfy its obligation to contribute sufficient cash in a timely manner to fund its share of Decommissioning Costs for the TMT Observatory Project as described in the TMT Decommissioning Funding Plan.	
<b>Signature of Authorized Representative:</b> 	<b>Date:</b> MAY 6, 2014
<b>Printed Name:</b> Janet Napolitano	<b>Title:</b> President, University of California

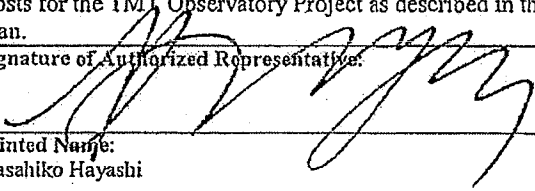
## STATEMENT OF INTENT

<b>I. Facility Identification</b>	
<b>Business Name:</b>	TMT International Observatory, LLC
<b>Type of Operation:</b>	Thirty Meter Telescope on a designated site within the Astronomy Precinct of the Mauna Kea Science Reserve
<b>II. Estimated Closure Costs</b>	
The conceptual cost estimate for decommissioning the observatory and restoring the site is approximately \$17.1 million (in 2013 dollars).	
<b>III. Closure Financial Assurance Mechanism</b>	
<b>Mechanism Type:</b>	Statement of Intent
<b>Organization/Institution:</b>	California Institute of Technology
<b>Address:</b>	1200 E California Blvd, MC 204-31
<b>City/State/Zip code:</b>	Pasadena, California 91125
<b>IV. Certification</b>	
As an authorized representative of the California Institute of Technology ("Caltech"), I hereby certify that Caltech intends to provide decommissioning funds to satisfy its obligation to contribute sufficient cash in a timely manner to fund its share of Decommissioning Costs for the TMT Observatory Project as described in the TMT Decommissioning Funding Plan.	
<b>Signature of Authorized Representative:</b>  <i>Edward M. Stolper</i>	<b>Date:</b>  MAY 6, 2014
<b>Printed Name:</b> Edward M. Stolper	<b>Title:</b> Interim President, California Institute of Technology

## STATEMENT OF INTENT

<b>I. Facility Identification:</b>	
Business Name:	TMT International Observatory, LLC
Type of Operation:	Thirty Meter Telescope on a designated site within the Astronomy Precinct of the Mauna Kea Science Reserve
<b>II. Estimated Closure Costs:</b>	
The conceptual cost estimate for decommissioning the observatory and restoring the site is approximately \$17.1 million (in 2013 dollars).	
<b>III. Closure Financial Assurance Mechanism:</b>	
Mechanism Type:	Statement of Intent
Organization/Institution:	National Astronomical Observatories of the Chinese Academy of Sciences
Address:	A20 Datum Road, Chaoyang District
City/State/Zip code:	Beijing 100012
Country:	China
<b>IV. Certification:</b>	
As an authorized representative of the National Astronomical Observatories of the Chinese Academy of Sciences ("NAOC"), I hereby certify that NAOC intends to provide decommissioning funds to satisfy its obligation to contribute sufficient cash in a timely manner to fund its share of Decommissioning Costs for the TMT Observatory Project as described in the TMT Decommissioning Funding Plan.	
Signature of Authorized Representative:	Date:
<i>Jun Yan</i>	MAY 6, 2014
Printed Name:	Title:
YAN Jun	Director General

## STATEMENT OF INTENT

<b>I. Facility Identification</b>	
<b>Business Name:</b>	TMT International Observatory, LLC
<b>Type of Operation:</b>	Thirty Meter Telescope on a designated site within the Astronomy Precinct of the Mauna Kea Science Reserve
<b>II. Estimated Closure Costs</b>	
The conceptual cost estimate for decommissioning the observatory and restoring the site is approximately \$17.1 million (in 2013 dollars).	
<b>III. Closure Financial Assurance Mechanism</b>	
<b>Mechanism Type:</b>	Statement of Intent
<b>Organization/Institution:</b>	National Institutes of Natural Sciences
<b>Address:</b>	2-21-1 Osawa, Mitaka
<b>City/State/Zip code:</b>	Tokyo, 181-8588
<b>Country:</b>	Japan
<b>IV. Certification</b>	
As an authorized Member Representative of the National Institutes of Natural Sciences ("NINS"), I hereby certify that NINS intends to provide decommissioning funds to satisfy its obligation to contribute sufficient cash in a timely manner to fund its share of Decommissioning Costs for the TMT Observatory Project as described in the TMT Decommissioning Funding Plan.	
<b>Signature of Authorized Representative:</b>	<b>Date:</b>
	MAY 6, 2014
<b>Printed Name:</b> Masahiko Hayashi	<b>Title:</b> Director General National Astronomical Observatory

# **Decommissioning Cost Estimate**

**TMT Decommissioning Estimate**  
 Estimate September 2013: Sub-Estimate 3

Elements Summary

Rates Current At September 2013

Description	Percentage	Total Cost
F2010 Building Elements Demolition	37.1 %	\$6,343,250
F2020 Demolition of existing Mechanical & Electrical Installation - Dome	1.2 %	\$201,475
F2030 Demolition of existing Mechanical & Electrical Installation - Base & Support Facilities	7.4 %	\$1,261,249
G1030 Site Earthwork	5.9 %	\$1,015,000
G9090 Other Site Systems & Equipment	11.8 %	\$2,013,000
<b>ESTIMATED NET COST</b>		<b>\$10,833,974</b>
<b>MARGINS &amp; ADJUSTMENTS</b>		
General Conditions	15.0 %	\$1,625,096
Bond & Insurance	5.0 %	\$622,954
Overhead & Profit	12.0 %	\$1,569,843
State Tax	4.2 %	\$610,397
Estimating Contingency	12.0 %	\$1,837,736
<b>ESTIMATED TOTAL COST</b>		<b>\$17,100,000</b>

**TMT Decommissioning Estimate**  
 Estimate September 2013: Sub-Estimate 3

Elements/Item

Rates Current At September 2013

Description	Unit	Qty	Rate	Total Cost
<b>F2010 Building Elements Demolition</b>				
1 Demolish Enclosure Ribs/Ties Structural Steel	T	514.40	150.00	77,160
2 Demolish Azimuth Rig Girder Structural Steel	T	254.46	150.00	38,169
3 Demolish Structure Base Interface Ring Girder structural steel	T	168.26	150.00	25,239
4 Demolish Structure Cap Interface Ring Girder structural steel	T	342.61	150.00	51,392
5 Demolish Structure Aperture Ring Girder Structural Steel	T	79.09	150.01	11,864
6 Demolish metal cladding to Enclosure outer skin	SF	83,002	10.00	830,020
7 Demolish flashing/cover plates to Enclosure Outer Skin	LF	3,724	15.00	55,860
8 Demolish 10" alum/EPS insulated panel to Enclosure Outer skin	SF	92,808	10.00	928,080
9 Demolish Aluminum/EPS insulated panel to shutter plug	SF	9,064	10.00	90,640
10 Demolish Azimuth ring girder detail structural steel	T	67.74	150.00	10,161
11 Demolish Azimuth bogies and lateral restraints	EA	20	8,000.00	160,000
12 Demolish Azimuth drive bogie	EA	12	5,000.00	60,000
13 Demolish Azimuth Seals Structural Steel	T	5.05	150.10	758
14 Demolish Azimuth mechanical Seals	LF	4,309	2.50	10,773
15 Demolish Cap/base interface bogies & brakes	EA	8	3,000.00	24,000
16 Demolish Cap/base interface bogies	EA	28	500.00	14,000
17 Demolish Cap/base interface drive rack & associated bolts etc	T	28.46	150.00	4,269
18 Demolish Enclosure Cap/Base Interface Mechanical Structural Steel	T	9.24	150.00	1,386
19 Demolish Enclosure Cap/Base Interface Mechanical seals	LF	4,410	10.00	44,100
20 Demolish Structure Shutter Support Frame Structural Steel	T	129.92	150.00	19,488
21 Demolish Structure Shutter Plug Structural Steel	T	33.40	150.00	5,010
22 Demolish Shutter bogies	EA	16	5,000.00	80,000
23 Demolish Shutter drives & brakes	EA	4	5,000.00	20,000
24 Demolish Shutter Drive Rack Structure	T	15.65	150.03	2,348
25 Demolish Shutter Aperture Flaps Structure	T	54.79	150.01	8,219
26 Demolish Shutter Lock Mechanism Structure	T	1.18	150.00	177
27 Demolish Shutter Seals Structure	T	5.20	150.00	780
28 Demolish Ventilation Doors (Large)	EA	94	500.00	47,000
29 Demolish Ventilation Interior Doors (Double)	SF	185	10.00	1,850
30 Demolish Ventilation Unit Frame Structures	T	25.38	150.00	3,807
31 Demolish Enclosure Nasmyth Crane 20t	EA	1	20,000.00	20,000
32 Demolish Enclosure Top-end Service Platform Structure	T	7.20	150.00	1,080
33 Demolish Enclosure Top-end Service Platform Railing	LF	89	10.00	890
34 Demolish Enclosure Top end 20t crane	EA	1	15,000.00	15,000
35 Demolish staircases to walkways/platforms	FT/R	1,605	15.00	24,075
36 Demolish railing to walkways/platforms	LF	1,843	5.00	8,215
37 Demolish concrete footings	CY	1,429	200.00	285,800

**TMT Decommissioning Estimate**  
 Estimate September 2013; Sub-Estimate 3

Elements/Item

Rates Current At September 2013

Description	Unit	Qty	Rate	Total Cost
38 Demolish Rebar to footings	Lb	123,817	1.00	123,817
39 Demolish SOG	SF	50,815	10.00	508,150
40 Demolish Concrete walls	CY	1,219	200.00	243,800
41 Demolish Rebar to concrete walls	Lb	85,757	1.00	85,757
42 Demolish Enclosure Maintenance Walkways / Platforms Structure	T	45.63	150.01	6,845
43 Demolish wall to Outer & Inner Pier	CY	1,219	200.00	243,800
44 Demolish rebar to concrete	Lb	85,757	1.00	85,757
45 Demolish 6" Suspended slab to Telescope Pier	SF	2,065	15.00	30,975
46 Demolish 8" Slab over tunnel	SF	1,050	20.00	21,000
47 Demolish beams below Telescope pier slab/tunnel	CY	7	200.00	1,400
48 Demolish concrete pilasters at Telescope Pier	CY	26	200.00	5,200
49 Demolish steel roof structure	T	148.94	150.00	22,341
50 Demolish 1.5" 18Ga Roof deck per GSN	SF	22,480	1.50	33,720
51 Demolish steel exterior wall structure	T	860.75	150.00	129,113
52 Demolish metal plate to exterior wall	SF	73,280	2.00	146,560
53 Demolish concrete exterior walls	CY	61	200.00	12,200
54 Demolish insulated exterior walls	SF	35,338	8.00	282,704
55 Demolish exterior metal stud wall	SF	1,690	2.50	4,225
56 Demolish Lava veneer	SF	1,251	5.00	6,255
57 Demolish exterior windows and storefronts	SF	1,077	15.00	16,155
58 Demolish exterior doors	EA	8	100.00	800
59 Demolish exterior overhead doors	EA	3	1,500.00	4,500
60 Demolish metal roof sheeting	SF	22,814	2.00	45,628
61 Demolish interior walls	SF	21,800	4.00	87,200
62 Demolish interior doors	EA	34	100.00	3,400
63 Demolish interior overhead doors	EA	2	1,500.00	3,000
64 Demo 6" High Chainlink Fence	LF	320	5.00	1,600
65 Remove misc fixtures	EA	82	100.00	8,200
66 Demolish cabinetry	LF	233	5.00	1,165
67 Demolish steel staircase	T	6.90	150.00	1,035
68 Demolish 4' Wainscot - Pebbled FRP Panel	SF	181	5.00	905
69 Demolish Carpet	SF	2,195	1.00	2,195
70 Demolish Sheet Vinyl	SF	553	1.00	553
71 Demolish Raised Computer Flooring	SF	591	5.00	2,955
72 Demolish insulated panel to soffit of walkway	SF	4,990	5.00	24,950
73 Demolish Guardrail	LF	643	5.00	3,215
74 Demolish Asphalt pavement	SF	72,035	1.00	72,035
75 Demolish Concrete Pavement	SF	488	2.00	976
76 Demolish Concrete Curb	LF	121	6.00	726
77 Demolish Concrete Curb & Swale	LF	4,364	8.00	34,912

**TMT Decommissioning Estimate**  
 Estimate September 2013: Sub-Estimate 3

Elements/Item

Rates Current At September 2013

Description	Unit	Qty	Rate	Total Cost
78 Demolish Snow Marker	EA	33	50.00	1,650
79 Demolish Security Fence	LF	2,768	8.00	22,144
80 Demolish double Access Gate	EA	3	200.00	600
81 Demolish concrete slab	SF	3,149	6.00	18,894
82 Remove snow melting pad	SF	1,438	6.00	8,628
278 Allowance for demolition of mirror structure complete	LS	1	1,000,000.00	1,000,000
<i>Building Elements Demolition</i>				<b>\$6,343,250</b>
<b>F2020 Demolition of existing Mechanical &amp; Electrical Installation - Dome</b>				
83 Main MCC Panel - 2000A, 42kA, 600V, 12 disc., 4 sections	LS	1	2,300.00	2,300
84 Base MCC #1 -4	LS	4	435.00	1,740
85 Cap MCC(Aperture flag, Shutter lock motor starter)	EA	1	435.00	435
86 Shutter MCC	EA	1	290.00	290
87 Main Control Panel	EA	1	1,740.00	1,740
88 Main PLC Enclosure(PLC, Ethernet SW, 24V power, safety relay)	EA	1	145.00	145
89 Base Control Panel	EA	1	1,740.00	1,740
90 Base PLC Enclosure(PLC, Ethernet SW, 24V power, safety relay)	EA	1	145.00	145
91 Cap Control Panel	EA	1	1,740.00	1,740
92 Cap PLC Enclosure(PLC, Ethernet SW, 24V power, safety relay)	EA	1	145.00	145
93 Shutter Control Panel	EA	1	1,740.00	1,740
94 Shutter PLC Enclosure(PLC, Ethernet SW, 24V power, safety relay)	EA	1	145.00	145
95 Vent Door Control Panel	EA	1	580.00	580
96 Lighting Control Panel	EA	1	290.00	290
97 Lighting Control Enclosure(PLC, Ethernet SW, 24V power, relay)	EA	1	290.00	290
98 Base Load Centre	EA	1	290.00	290
99 Cap Load Centre	EA	1	290.00	290
100 Azimuth drive enclosure and motor	EA	12	290.00	3,480
101 Cap drive enclosure and motor	EA	8	290.00	2,320
102 Shutter drive enclosure and motor	EA	4	290.00	1,160
103 Azimuth barcode reader	EA	1	290.00	290
104 Barcode tape(200meter)	EA	1	145.00	145
105 Reader cable	LF	164	2.00	328
106 Interior Door open/close sensor	EA	35	145.00	5,075
107 Local Disc Sw. -- aperture flaps	EA	22	36.00	792
108 Local Disc Sw -- shutter lock	EA	10	36.00	360
109 Main section HMI port	EA	16	36.00	576
110 Vent HMI ports	EA	47	36.00	1,692

**TMT Decommissioning Estimate**  
 Estimate September 2013: Sub-Estimate 3

Elements/Item

Rates Current At September 2013

Description	Unit	Qty	Rate	Total Cost	
111	CBI HMI port	EA	16	36.00	576
112	Aperture HMI port	EA	8	36.00	288
113	Tablet PC	EA	2	36.00	72
114	Wall pack	EA	81	36.00	2,916
115	Fluo. Fixture	EA	550	36.00	19,800
116	Emergency lighting	EA	50	36.00	1,800
117	Grounding components and cable	LS	1	580.00	580
118	Grounding Bus Bar System for continuous path to ground	LS	1	435.00	435
119	4/0 cable	EA	600	1.30	780
120	4/0 bare cable	EA	16,404	1.00	16,404
121	Grounding components	LS	1	1,450.00	1,450
122	Grounding tool/ crimping	LS	1	290.00	290
123	Cable tray	LF	754	7.50	5,655
124	Cable support	LS	1	435.00	435
125	MMCC to Azimuth Drive Enclosure(1-12)	LF	1,969	1.60	3,150
126	Main HMI ethernet port, e-stop	LF	1,969	0.35	689
127	BMCC1 to vent exterior door	LF	2,624	1.60	4,198
128	Vent door panel to interior door open/close sensors	LF	3,281	0.35	1,148
129	Vent door panel to door motors/panels	LF	9,843	1.60	15,749
130	BMCC2 to vent exterior doors	LF	1,640	1.60	2,624
131	Light panels	LF	42,650	0.35	14,928
132	Base HMI ethernet port, e-stop	LF	3,281	0.35	1,148
133	BMCC to Cap Drive Enclosure	LF	328	1.60	525
134	BMCC1 to Cranes(20T,10T, Top-end platform)	LF	656	1.60	1,050
135	BCP to Cranes	LF	656	1.60	1,050
136	Base receptacles	LF	3,280	1.60	5,248
137	Cap lock actuator	LF	197	1.60	315
138	Cap HMI Ethernet port, e-stop	LF	984	0.35	344
139	Cap receptacles	LF	984	1.60	1,574
140	CMCC to Aperture flap actuators	LF	984	1.60	1,574
141	CMCC to Shutter lock actuator	LF	656	1.60	1,050
142	SMCC to Shutter Drive Enclosure	LF	328	1.60	525
143	Shutter hoist	LF	164	1.60	262
144	PDC to main current connectors	LF	984	1.60	1,574
145	PDC to MMCC	LF	328	1.60	525
146	Base conductor bar to BMCC	LF	984	1.60	1,574
147	BMCC to base current collector	LF	328	1.60	525
148	Cap conductor bar to CMCC	LF	164	1.60	262
149	Cap to Shutter(Flexible cable)	LF	16	2.00	32
150	Busyway - main/base - various	LF	3,085	18.50	57,073

**TMT Decommissioning Estimate**  
 Estimate September 2013: Sub-Estimate 3

Elements/Item

Rates Current At September 2013

Description	Unit	Qty	Rate	Total Cost
151 Vent Door Control Enclosure(PLC, Ethernet SW, 24V power, relay)	EA	7	145.00	1,015
<i>Demolition of existing Mechanical &amp; Electrical Installation - Dome</i>				<b>\$201,475</b>
<b>F2030 Demolition of existing Mechanical &amp; Electrical Installation - Base &amp; Support Facilities</b>				
152 Demolish existing plumbing fixtures	EA	42	270.00	11,340
153 Water heater electric, 208/1, 80gal, 4500W WH01, 02	EA	2	540.00	1,080
154 Water filtration and softener	EA	1	810.00	810
155 Hot water reirculation pump 5gpm, 1/40hp, 120/1 PP07	EA	1	135.00	135
156 Hose bibb and vacuum breaker	EA	4	135.00	540
157 Trap primer complete	EA	5	205.00	1,025
158 Domestic water piping various sizes	LF	1,651	10.00	16,510
159 Reverse osmosis water piping 1/2" including pipe, valves, fittings, hangers and supports, insulation, etc	SF	262	7.50	1,965
160 Reverse osmosis system 1000gpd, 4 stage\par	EA	1	2,165.00	2,165
161 Circulation pump DI water 7gpm, 1/2hp, 120/1 PP05\par	EA	1	135.00	135
162 Deionized water system	EA	1	1,490.00	1,490
163 Deionized water piping 1" including pipe, valves, fittings, hangers and supports, insulation, etc	LF	250	9.50	2,375
164 Floor drain & sinks FD02	EA	20	45.00	900
165 Wall& Floor cleanouts	EA	24	25.00	600
166 Submersible sump pump 85gpm	EA	2	405.00	810
167 Sanitary waste piping below grade	LF	1,006	20.00	20,120
168 Sanitary waste and vent piping above grade	LF	1,253	10.00	12,530
169 Sanitary waste connections to plumbing fixtures and drains	EA	62	135.00	8,370
170 Air compressor	EA	1	800.00	800
171 Compressed air station	EA	13	100.00	1,300
172 Compressed air isolation valve	EA	4	20.00	80
173 Compressed air piping including pipe, valves, fittings, hangers and supports, etc	LF	720	6.00	4,320
174 Generator fuel tank double wall above ground 2,000gal & leak detector	EA	1	2,165.00	2,165
175 Fuel oil supply and return piping 1" including double containment pipe, fittings, supports, etc	LF	92	7.00	644
176 Heating water boiler 124mbh, 45kW, 460/3, 15gpm EB-01	EA	1	2,300.00	2,300
177 Chiller 29T, 82gpm, & 33T, 75gpm. (460/3 CH01, 02 & 460/3 CH04,05)	EA	4	13,195.00	52,780
178 Chiller 40T, 72gpm, 460/3 CH03	EA	1	17,025.00	17,025
179 Heat exchanger 222mbh, plate and frame HX-01	EA	1	7,020.00	7,020
180 Exhaust fan	EA	6	245.00	1,470
181 Louver extruded aluminum	SF	846	20.00	16,920
182 Supply diffuser & grille	EA	75	25.00	1,875

## TMT Decommissioning Estimate

Estimate September 2013: Sub-Estimate 3

Elements/Item

Rates Current At September 2013

Description	Unit	Qty	Rate	Total Cost
183 Pump & Circulation heater	EA	19	130.00	2,470
184 Unistruct supports for pipe & conduit (tunnel)	EA	270	55.00	14,850
185 Sheet metal duct	Lb	30,961	4.50	139,325
186 Duct insulation	SF	19,388	0.65	12,602
187 Hydronic piping including pipe, valves, fittings, hangers and supports, insulation, etc, & Condensate drain piping	LF	4,852	24.50	118,874
188 Air handling unit	EA	7	1,515.00	10,605
189 Fan coil unit 10,000cfm, 7.5hp, heating coil, 460/3 FCU-04	EA	1	3,830.00	3,830
190 Horizontal unit heater 300cfm, 1.4mbh, 1/30hp, 120/1 UH-01 &02	EA	2	115.00	230
191 Fan coil unit 2,900cfm, 1.5hp, cooling coil, heating coil, 460/3 FCU-07	EA	1	1,110.00	1,110
192 DDC System	Pt	254	92.50	23,495
194 Fire sprinkler system -	SF	24,079	1.35	32,507
195 Clean agent fire suppression system	SF	789	3.60	2,840
196 Switchboard 2000A & 1600A ( MLO, 480Y/277V, 3ph, 4W, 66kAIC NEMA 3R MDS1)	EA	2	2,755.00	5,510
197 Power conditioner 300kVA, 480V-208/120V PC-1	EA	1	4,715.00	4,715
198 Panelboard 400-1200A, MCB, 480Y/277V, 3ph, 4W ENCL-H	EA	4	1,635.00	6,540
199 Panelboard 100A, MLO, 480Y/277V LP	EA	2	580.00	1,160
200 Motor control center 400A, 480Y/277V, 3ph, 4W, 42kAIC MCC-1	EA	1	1,740.00	1,740
201 Transformer 150kVA & 225kVA, 480V-208/120V T-1	EA	2	1,050.00	2,100
202 Panelboard	EA	10	645.00	6,450
203 Disconnect switch - 600A	EA	4	580.00	2,320
204 Disconnect switch - 400A	EA	1	400.00	400
205 Disconnect switch -30- 200A	EA	63	95.00	5,985
206 Combination starter - 480V, 3 pole & Manual mortor switch	EA	9	75.00	675
207 Equipment connection	EA	2	290.00	580
208 Wireway NEMA 1, 12" x 12" x 3' with multitap insulated terminal block	EA	6	1,160.00	6,960
209 24" x 24" x 6" Pull box for fire pump feeder	EA	1	290.00	290
210 Normal power feeders	EA	1	69,670.00	69,670
211 Light fixtures & exit sign	EA	267	37.00	9,879
212 Lighting tye contactor	EA	3	290.00	870
213 Occupancy sensor -	EA	2	55.00	110
214 Switches & boxes	EA	517	55.00	28,435
215 Buried branch circuit to tank submersible pump	LF	74	1.00	74
216 Snow melting mats	SF	1,637	4.50	7,367
217 Conduit and wire to fixtures and devices	LF	10,320	4.50	46,440
218 Fire alarm panel	EA	2	580.00	1,160
219 Fire alarm pull station, detector, junction box, outlets etc	EA	159	29.00	4,611

**TMT Decommissioning Estimate**  
 Estimate September 2013: Sub-Estimate 3

Elements/Item

Rates Current At September 2013

Description	Unit	Qty	Rate	Total Cost
220 Fire alarm system cabling	LF	4,850	0.50	2,425
221 36" & 18" W x 4" H Cable tray	LF	453	9.00	4,077
222 Communications cabling	LF	1,360	0.90	1,224
223 3/0 Bare copper grounding conductor	LF	6,743	1.00	6,743
224 16' x 26' Prefabricated signal reference ground mat including connections	SF	416	0.70	291
225 3/0 Down lead conductor through sch. 40 PVC conduit w/ 20ft pig tail	EA	8	3.50	28
226 3/4" x 10' Copper clad steel ground rod	EA	12	145.00	1,740
227 3/4" x 1/4" x 12 Ground bus bar	EA	12	75.00	900
228 Extra flexible braided copper cable in 2" PVC	LF	261	3.50	914
229 Ground ring well with 3/4" x 10' ground rod	EA	4	290.00	1,160
230 24" High solid aluminum air terminal	EA	18	36.00	648
231 Through roof assembly with 2/0 down lead conductor to grounding system, & wall penetration to bond conductor to down lead	EA	6	73.00	438
232 Lightning protection conductor aluminum	LF	424	0.90	382
233 Emergency power generator 750kW	EA	1	8,700.00	8,700
234 Emergency power automatic transfer switch 1200A	EA	1	1,700.00	1,700
235 Emergency power automatic transfer switch 100A	EA	1	350.00	350
236 Fire pump controller with disconnect	EA	1	435.00	435
237 Emergency power distribution switchboard & panel boards	EA	4	1,600.00	6,400
238 Emergency power transformer 225kVA, 480V-208/120V, K13 rated T-UPS1 & 75kVA	EA	2	1,050.00	2,100
239 Uninterruptible power supply 225kVA	EA	1	1,450.00	1,450
240 Uninterruptible power supply battery bank	EA	1	2,900.00	2,900
241 Emergency power feeders	EA	1	25,400.00	25,400
242 Guard rail	LF	643	10.00	6,430
243 Asphalt & concrete pavement	SF	72,523	1.00	72,523
244 Concrete Curb & Swale	LF	4,485	10.00	44,850
245 Snow marker	EA	33	50.00	1,650
246 Security Fence	LF	2,768	10.00	27,680
247 Double Access Gate	EA	3	150.00	450
248 4" Concrete SOG - 3000 PSI	SF	2,259	0.50	1,130
249 Concrete Equipment Pad	SF	890	10.00	8,900
250 6" Dia removable pipe bollard\par	EA	49	50.00	2,450
251 Submersible well pump 60gpm, 5hp, 480/3 PP03, 04\par	EA	2	815.00	1,630
252 Submersible well pump 3gpm, 1/2hp, 208/1 PP06	EA	1	270.00	270
253 Domestic water tank 5,000gal, 8'D x 17'9"L TK04	EA	1	4,060.00	4,060
254 Fire protection water tank 20,000gal, 10'4"D x 38'L TK03	EA	1	8,120.00	8,120
255 Sanitary/chemical waste tank 5,000gal, 8'D x 17'9"L TK01	EA	2	7,450.00	14,900
256 Switchboard 2500A, 480Y/277V, 3ph, 4W. 66kAIC NEMA 3R SES 1 & 2	EA	2	5,080.00	10,160

**TMT Decommissioning Estimate**  
 Estimate September 2013: Sub-Estimate 3

Elements/Item

Rates Current At September 2013

Description	Unit	Qty	Rate	Total Cost
257 Electrical duct bank 6" conduit - conductors by HELCO	LF	24,981	1.80	44,966
258 Electrical duct bank concrete encasement	CY	51	200.00	10,200
259 Electrical duct bank trenching	LF	4,454	14.50	64,583
260 Electrical pull box including excavation and backfill	LF	13	2,600.00	33,800
261 Fiber optic conduit including trenching - cabling by others	LF	3,986	9.00	35,874
262 Communications pull box including excavation and backfill	EA	12	2,320.00	27,840
<i>Demolition of existing Mechanical &amp; Electrical Installation - Base &amp; Support Facilities</i>				<b>\$1,261,249</b>
<b>G1030 Site Earthwork</b>				
279 Grading to restore existing slopes	SF	290,000	1.00	290,000
280 Renaturalization of site	SF	290,000	2.50	725,000
<i>Site Earthwork</i>				<b>\$1,015,000</b>
<b>G9090 Other Site Systems &amp; Equipment</b>				
263 Rental of crane for demolition	Mth	6	48,000.00	288,000
264 Maintenance/Fuel for cranes	Mth	6	57,500.00	345,000
265 Clothing for Operators and Maintenance	LS	1	15,000.00	15,000
266 Shipping cranes Honolulu to Hilo	LS	1	50,000.00	50,000
267 Trucks to ship Crane from Hilo to Summit to Hilo	LS	2	40,000.00	80,000
268 Construction Crew (Ironworkers)	LS	1	500,000.00	500,000
269 Airfare (Ironworkers)	LS	1	20,000.00	20,000
270 Daily Travel - wages (Ironworkers)	LS	1	100,000.00	100,000
271 Clothing for Crew (Ironworkers)	LS	1	20,000.00	20,000
272 Subsistence allowance	LS	1	50,000.00	50,000
273 Mid-Day Meal for Crew	LS	1	10,000.00	10,000
274 Supervision Crew and others	LS	1	400,000.00	400,000
275 Rental of Yard in Hilo	Mth	3	25,000.00	75,000
276 Electrical consumption - Hilo Yard	Mth	3	10,000.00	30,000
277 Security at TMT Yard in Hilo	Mth	3	10,000.00	30,000
<i>Other Site Systems &amp; Equipment</i>				<b>\$2,013,000</b>
<b>ESTIMATED NET COST</b>				<b>\$10,833,974</b>

BOARD OF LAND AND NATURAL RESOURCES

STATE OF HAWAII

Contested Case Hearing Re Conservation  
District Use Application (CDUA) HA-3568  
for the Thirty Meter Telescope at the Mauna  
Kea Science Reserve, Ka'ohē Mauka,  
Hāmākua, Hawai'i, TMK (3) 4-4-015:009

BLNR Contested Case HA-16-002

**CERTIFICATE OF SERVICE**

**CERTIFICATE OF SERVICE**

The undersigned hereby certifies that the attached document was served upon the following parties by the means indicated:

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