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OSDA ATTACHMENT A: SUBLEASE AND NON-EXCLUSIVE EASEMENT AGREEMENT BETWEEN THE CALIFORNIA INSTITUTE OF TECHNOLOGY AND THE UNIVERSITY OF HAWAII

- Exhibit A to Attachment A - General Lease S-4191
- Exhibit B to Attachment A - Consent to Sublease
- Exhibit C to Attachment A - Demised Premises
- Exhibit D to Attachment A - Description of Construction

OSDA ATTACHMENT B: ACCESS ROADS

**RENEGOTIATED
OPERATING AND SITE DEVELOPMENT AGREEMENT**

THIS AGREEMENT is made this 29 day of June, 1992 (hereinafter referred to as the "Effective Date"), by and between the **CALIFORNIA INSTITUTE OF TECHNOLOGY ("Caltech")**, **THE REGENTS OF THE UNIVERSITY OF CALIFORNIA ("UC")** and the **UNIVERSITY OF HAWAII ("UH")**.

WITNESSETH:

WHEREAS, the optical and infrared regions of the electromagnetic spectrum have shown great scientific potential for contributing to our understanding of the astronomical universe;

WHEREAS, the summit area of Mauna Kea is exceptionally well-endowed as a site for observations in these wavelengths;

WHEREAS, it is the desire of the astronomers at Caltech, UC and the University of Hawaii to carry on cooperative research programs;

WHEREAS, the first 10-meter optical/infrared telescope (hereinafter Keck I) of the W. M. Keck Observatory and associated facilities are expected to be fully operational in 1992 and substantial funds have been secured toward the construction of a second telescope of the same aperture and concept;

WHEREAS, it is recognized that a second telescope was anticipated in the Operating and Site Development Agreement entered into on October 30, 1985 and subsequently amended on January 24, 1986 (hereinafter referred to as "Keck I OSDA"), for the W. M. Keck Observatory and referred to therein as a Sister Telescope;

WHEREAS, Caltech and UC have initiated a program to construct this second telescope of 10-meter aperture (hereinafter "Keck II") and related facilities dedicated to observations at these wavelengths, and are desirous of locating this telescope and related facilities on Mauna Kea;

WHEREAS, Caltech, UC and UH believe that the best interests of all parties are to be served through a program of close scientific cooperation centered around these telescopes and related facilities;

WHEREAS, the operation of both the Keck I and Keck II Telescopes on Mauna Kea will greatly benefit the academic and research programs at UH;

WHEREAS, Caltech, UC and UH have a common interest in insuring that the development of the Mauna Kea site will enhance the effective operation of these telescopes;

WHEREAS, Caltech, UC and UH executed a Memorandum of Understanding on October 14, 1991, which provides that once Caltech and UC have identified funds for the construction and operation of the Keck II telescope on Mauna

Kea, the OSDA would be renegotiated between UH and Caltech and UC under which Caltech and UC would pay "a mutually agreed-upon share of (1) the common costs related to operating telescope facilities on Mauna Kea, (2) the costs associated with the infrastructure, and (3) other site improvements and common-purpose expenses and facilities".

NOW, THEREFORE, in consideration of the mutual agreements herein contained, Caltech, UC and UH agree as follows:

I. AGREEMENT.

Pursuant to paragraph IV.3. of the Keck I OSDA, the Principal Parties are entering into this Renegotiated Agreement which, as of the Effective Date, supersedes in its entirety the Keck I OSDA. Caltech, UC, and UH hereby mutually agree that the Keck I OSDA shall no longer be in effect for the period on and after the effective date of this Renegotiated OSDA.

II. DEFINITIONS.

For purposes of construing the provisions of this Amended and Restated Operating and Site Development Agreement, the following definitions apply:

"Base Support Facilities" refer to the headquarters for the W. M. Keck Observatory operations in Hawaii.

"BLNR" stands for the Board of Land and Natural Resources of the State of Hawaii.

"CARA" stands for the California Association for Research in Astronomy, a non-profit corporation jointly established and controlled by Caltech and UC to provide technical direction of the design and construction of, and to operate the W. M. Keck Observatory.

"Demised Premises" refer to the land subleased to Caltech by UH with the approval of the BLNR. The Demised Premises are a portion of that certain land area leased to UH by BLNR and described in General Lease S-4191, Exhibit A of Attachment A hereto, and more specifically identified in Exhibit C of Attachment A hereto; both Exhibits A and C are incorporated herein by reference.

"Easement" is that non-exclusive easement granted by UH to Caltech under the terms of the Sublease.

"Facilities" include, but are not limited to, the two telescopes and domes; the building (the space necessary to support scientific observers and technical personnel while at the summit); together with instruments, electrical conductors, cableways and tunnels; driveways and parking lots; power, telephone and communications conduits and lines; and access roads within the border of the Demised Premises. "Facilities" does not include the Mid-Level Facilities, the Base Support Facilities, or any other facilities located outside the Mauna Kea Science Reserve.

"IfA" stands for the Institute for Astronomy and refers to that unit within UH which is responsible for conducting a research program in astronomy, and for representing the interests of UH on UH-leased land in the Mauna Kea Science Reserve.

"Information Station" is the building and associated infrastructure (access, parking, utilities) near the Mid-Level Facilities which is used as a public information building.

"Infrastructure Improvements" are any capital improvements made for the common good of the Mauna Kea Observatories including, but not limited to, roads, power, telephone and communications installations, and the Mid-Level Facilities.

"Instruments" include cameras, photometers, spectrometers, and other special-purpose equipment used to detect and analyze radiation; together with computers, test equipment, and tools required to equip the Facilities.

"Interferometry" is the class of observations where the two telescopes are pointed to the same field and the signals from them are combined in such a way as to achieve enhanced angular resolution.

"Keck I OSDA" is the OSDA entered into by Caltech, UC and UH on October 30, 1985 and subsequently amended on January 24, 1986 concerning the construction of the initial phase of the W. M. Keck Observatory on Mauna Kea.

"Keck I Telescope" is a telescope of approximately 10-meter aperture located on the Demised Premises, whose principal application is for astronomical observations at optical and infrared wavelengths.

"Keck II Telescope" is a telescope of the same aperture, telescope design concept, and dome design concept (as opposed to telescope detailed design and dome detailed design) as Keck I. The Keck II will be located on land within the Demised Premises and will be attached to the Facilities.

"Major Astronomical Facility" includes the UH 88-inch Telescope, the Canada-France-Hawaii Telescope, the NASA Infrared Telescope Facility, the United Kingdom Infrared Telescope, the James Clerk Maxwell Telescope, the Caltech Submillimeter Observatory, the Keck I and Keck II Telescopes of the W. M. Keck Observatory, the Japan National Large Telescope, and the VLBA Antenna. Future telescope facilities forming a part of the Mauna Kea Observatories shall each be considered Major Astronomical Facilities unless otherwise agreed in writing by UH.

"Mauna Kea Observatories" includes, but is not limited to, the Mauna Kea Science Reserve, the astronomical facilities and infrastructure improvements on Mauna Kea, and UH operations which support the astronomical facilities on Mauna Kea.

"Mauna Kea Science Reserve" is the land in the summit area of Mauna Kea consisting generally of that land above 12,000 feet altitude and specifically that which is leased by UH from the BLNR under General Lease S-4191.

"Mid-Level Facilities" include, but are not limited to, the bedrooms, laboratories, common areas, and offices at Hale Pohaku on Mauna Kea.

"MKSS" stands for Mauna Kea Observatories Support Services, which is operated by UH through the IfA, and is responsible for providing services to support the Mauna Kea Observatories.

"MKSS Oversight Committee" is the committee comprised of members representing each of the telescopes in operation or under construction at the Mauna Kea Observatories. The committee reviews the activities and management of the Mauna Kea

Observatories Support Services and recommends changes to the Director, IfA.

"OSDA" stands for this "Renegotiated Operating and Site Development Agreement Between Caltech, UC and UH Concerning the Design, Construction, and Operation of the W. M. Keck Observatory on Mauna Kea, Hawaii," and to which is attached the Sublease and Non-Exclusive Easement. The rights and responsibilities of this OSDA shall not concern any other astronomical facilities on Mauna Kea which may involve Caltech or UC singly, together or as part of a larger consortium.

"Principal Parties" are Caltech, UC and UH, and refer to the principal parties of this OSDA.

"Pu'u Hau Oki" is the cinder cone in the Mauna Kea Science Reserve which contains the Demised Premises.

"Sublease and Non-Exclusive Easement" is that agreement between Caltech and UH, and approved by BLNR, dated October 30, 1985, attached hereto as Attachment A, including the exhibits thereto.

"Telescope" is a reflecting telescope of approximately 10-meter aperture to be located on the Demised Premises, used for astronomical observations.

"W. M. Keck Observatory" or "Observatory" includes the entire operation in Hawaii to support the Keck I and II Telescopes, including the Facilities, the Caltech and UC share(s) of the Mid-Level Facilities, and Base Support Facilities, or other facilities, if any, that may be built or operated in Hawaii on behalf of Caltech and UC.

III. LOCATION OF THE FACILITIES:

The Sublease (Attachment A) specifies the location of the Facilities on Mauna Kea.

IV. INTERACTION AMONG THE PRINCIPAL PARTIES:

While the Principal Parties to this OSDA are Caltech, UC and UH, day-to-day interaction between them will usually be carried out by specified representatives of the Principal Parties. In the case of UH, this will normally be the Director of the IfA. Caltech and UC have jointly assigned and delegated responsibility and authority for the technical direction of the design and construction, and for the operation of the Facilities to CARA (VIII and IX.). CARA will designate a single person to speak for the W. M. Keck Observatory in Hawaii, and will notify UH, in advance, of this designation.

V. SOLE RESPONSIBILITIES OF UH:

A. Management of the Mauna Kea Observatories

UH shall provide a forum to allow the astronomical facilities which form a part of the Mauna Kea Observatories to discuss, on an equal footing, aspects of the management of the Mauna Kea Observatories. Such a forum currently exists and is referred to as the Mauna Kea Users' Committee. Caltech and UC, as representatives of the W. M. Keck Observatory, shall be entitled to appoint four representatives to the

Mauna Kea Users' Committee. Since UH is the primary lessee with the State of Hawaii, it is recognized that final responsibility for management of the Mauna Kea Science Reserve resides with UH.

VI. SOLE RESPONSIBILITIES OF CALTECH AND/OR UC:

Caltech and UC have entered into a long-term scientific cooperative agreement to construct and operate the Facilities. Under that agreement, Caltech and UC each assume certain specific responsibilities with regard to the construction and operation of the Facilities. In some instances responsibilities are joint. Caltech and UC agree, and hereby represent to UH, that the separate and joint responsibilities assumed by and between Caltech and UC, taken together, include responsibilities for the items discussed in VI. and VII.

A. Design, Fabrication, Installation, Construction and Operation of the Facilities

Caltech and/or UC shall be solely responsible for securing the funding for the design, fabrication, installation, construction and operation of the Facilities.

B. Keck Spur Road

Caltech and/or UC shall design, construct and exclusively fund the cost of an unpaved spur road, known as the Keck Spur Road (see Attachment B), which design shall be subject to the approval of the UH and BLNR. The Principal Parties recognize that this Keck Spur Road was constructed by Caltech and/or UC and is now paved as noted in VII.E.1.a.

C. Power and Communications Conduits and Lines

Caltech and/or UC shall fund and arrange for the installation of electric power and communications conduits from a nearby handhole to the Facilities. These conduits will conform to the standards set for the remainder of the summit power and communications distribution system. Caltech and/or UC shall also fund and arrange for connection of commercial power and telephone service via these conduits, both of which shall be individually metered.

VII. RESPONSIBILITIES SHARED JOINTLY BY THE PRINCIPAL PARTIES:

A. Research Environment

Under General Lease S-4191 between UH and BLNR (Exhibit A of Attachment A), UH is to use the Mauna Kea Science Reserve as a scientific complex and as a buffer zone to prevent the intrusion of activities inimical to said scientific complex. UH, in its role as custodian of the Mauna Kea Science Reserve, carries the responsibility also to protect the site from interference that may emanate from within or from outside the Mauna Kea Science Reserve.

1. UH:

a. UH shall continue to protect the interests of the astronomical facilities in the Mauna Kea Science Reserve from interference emanating from within the Mauna Kea Science Reserve which would affect the scientific integrity of the sites on which the astronomical facilities are located.

b. UH shall continue to pursue actively the initiation and/or improvement of existing local and county laws and ordinances as are necessary to assure that the nighttime level and character of man-made light emanating from other areas of the County of Hawaii does not increase significantly over time, so as to interfere with the effectiveness of optical or infrared observations.

2. Caltech and UC:

Caltech and UC shall conduct their activities in the Mauna Kea Science Reserve in a manner compatible with and not inimical to the activities of other astronomical facilities located there, and shall conform to applicable regulations established by UH, by the State of Hawaii, and by the United States of America for the preservation of the environmental quality and the scientific integrity of the Mauna Kea Science Reserve.

B. Permits:

1. UH:

UH shall submit on behalf of Caltech and UC or their designee(s) such applications for permits connected with the Facilities as are required and have been prepared by Caltech and UC for use of State of Hawaii land, including Mid-Level Facilities and Base Support Facilities.

2. Caltech and UC:

Caltech and UC or their designee(s) shall prepare such applications for permits connected with the Facilities as are required for use of State of Hawaii land, including Mid-Level Facilities and Base Support Facilities.

C. Rights of Access

1. UH:

UH shall ensure Caltech and UC right of access to the Demised Premises, and shall ensure their right to have access to a handhole or handholes for the commercial power, telephone, and data communications described in VI.C., under the conditions described therein. UH shall grant to or use its best efforts to obtain for Caltech and UC such other rights of access as may be needed by Caltech and UC for utilities and cableways.

2. Caltech and UC:

Caltech and UC shall pay any costs, fees and other charges associated with the rights of access described in VII.C.1.

D. Access Roads to the Facilities

1. UH:

UH shall provide to Caltech and UC the use of existing roads for access to the Facilities (see Attachment B).

2. Caltech and UC:

Caltech and UC shall design and construct any changes to existing roads which may be required for the realization of Keck II. The design of any such road changes shall be subject to the approval of UH and BLNR. The siting of the Facilities and any changes to the access roads shall be done so as to maintain the unpaved Detour Road which lies to the North of the Facilities and provides a secondary means of access to/from the summit area (see Attachment B). The Principal Parties concur that some realignment, embankment reinforcement, or other modification to the existing Detour Road may be necessary to satisfy this requirement. As described in VII.E.1.d.(i), a portion of the Keck II infrastructure contribution, up to a specified limit, shall be used to pay for changes which are necessary to maintain the Detour Road.

E. Infrastructure Improvements Shared in Common with Other Astronomical Facilities at the Mauna Kea Observatories

UH has taken responsibility to fully or partially fund and arrange for infrastructure improvements to the Mauna Kea Observatories which are and will be of common benefit to all the astronomical facilities which operate there. All such infrastructure improvements are subject to State and County permits, approvals, and funding.

1. Commercial Power, Data Communications Conduits and Lines, and Road Improvements

a. Description of Improvements:

UH has completed the installation of commercial electric power to Hale Pohaku and to the Mauna Kea summit. At the summit, the power is distributed by means of a distribution loop (not yet complete), which passes near each of the existing astronomical facilities and also near some of the sites proposed for future facilities. Each facility accesses the commercial power by connecting to the distribution loop at a suitable handhole near its location. UH has also provided two communications conduits from Hale Pohaku to a central point at the summit, and from there to a distribution system which generally follows the same path as that used for the power. UH has installed fiber-optic cable in one of these conduits. This cable is part of the Mauna Kea Observatories Communications Network, a high-bandwidth communications system which is intended to link the facilities of the Mauna Kea Observatories with each other, with base facilities, and with commercial carriers which can provide links to home institutions and other institutions around the world. UH has completed improvement and paving of the upper section of the Mauna Kea access road (above elevation 11,800 feet) and of the spur roads to the existing facilities at the summit.

UH considers a number of additional projects related to power, communications, roads, and long-range planning to be desirable further improvements to the Mauna Kea infrastructure. These include:

(i) Completion of the summit power and communications distribution loops in order to reach all the sites proposed for future facilities and also so as to provide redundancy.

(ii) Completion of the Mauna Kea Observatories Communications Network.

(iii) Improvement and paving of the main access road from Hale Pohaku to the 11,800 foot elevation.

(iv) Extension of the Mauna Kea Science Reserve Complex Development Plan for the period beyond the year 2000.

b. Access to Existing Improvements by Caltech and UC:

Caltech and UC shall have access to the infrastructure improvements described in VII.E.1.a., as follows:

(i) The W. M. Keck Observatory shall connect to the commercial power and telephone service and to the communications conduits as described in VI.C.

(ii) The W. M. Keck Observatory shall have the use of the access roads within the Mauna Kea Science Reserve subject to the conditions given in VII.D.

(iii) The W. M. Keck Observatory shall have the right to join the Mauna Kea Observatories Communications Network and to participate in the network on the same terms as other network members. In particular, Caltech and UC shall pay their share of the operation and management costs for the network, as described in VII.F.2.c. The costs associated with connecting the Facilities to the network shall be borne by Caltech and UC.

c. Contribution to Existing Infrastructure Improvements by Caltech and UC:

On behalf of the Keck I Telescope, Caltech and/or UC shall contribute a total of ONE MILLION FOUR HUNDRED SIXTY-TWO THOUSAND TWO HUNDRED FIFTY Dollars (\$1,462,250.00) (in 1982 dollars, with escalation following the State of Hawaii construction index) toward the cost of improvements to the main access road and to the summit spur roads on the condition that UH secures, at the same time, from sources other than Caltech and UC, a contribution of at least TWO MILLION NINE HUNDRED TWENTY-FOUR THOUSAND FIVE HUNDRED Dollars (\$2,924,500.00) (in 1982 dollars with escalation following the State of Hawaii construction index) towards the cost of such improvements. These contributions are both due at the time the first contract for road improvements is let. If UH fails, or is not able, to secure the amount specified on the date indicated, then Caltech and/of UC shall contribute an amount equal to one-half the lesser contribution secured by UH, provided that Caltech and/or UC agree that the improvements to be constructed will benefit the Facilities. The Principal Parties recognize that the above-mentioned contributions by Caltech and/or UC and by UH have been fulfilled.

d. Contribution to Future Infrastructure Improvements by Caltech and UC:

On behalf of the Keck II Telescope, Caltech and UC shall contribute a total of TWO MILLION TWO HUNDRED FOURTEEN THOUSAND, FOUR HUNDRED FIFTY Dollars (\$2,214,450) (in July 1992 dollars, with escalation following the most recently published State of Hawaii All Urban Consumers Price Index), toward the cost of continued development of the Mauna Kea Infrastructure. A portion of this Caltech/UC infrastructure contribution is intended to fund four specific improvements, in order of priority:

(i) Modifications to the Detour Road which are necessary in order to maintain this road in approximately its current alignment and condition. Caltech/UC shall arrange for the design and construction of these modifications, the design being subject to approval by UH and BLNR. UH shall use a portion of the infrastructure contribution to reimburse Caltech/UC for the cost of the modifications, as specified in invoices submitted to UH, up to a maximum of TWO HUNDRED FIFTY THOUSAND DOLLARS (\$250,000).

(ii) The provision of high-bandwidth communications to base facilities in Waimea. The Principal Parties may also agree to use a portion of the Caltech/UC infrastructure contribution towards other elements of the Mauna Kea Observatories Communications Network.

(iii) Extension of the Mauna Kea Science Reserve Complex Development Plan for the period beyond the year 2000.

(iv) An Earth Station for high-bandwidth communications by satellite link.

If funds remain after items (i) through (iv) are accomplished, UH shall use such funds for other infrastructure improvements.

This infrastructure contribution shall be made within THIRTY (30) days of the execution of this OSDA and shall be deposited into a UH account. Interest earned on the funds in this account shall be used for infrastructure improvements on the same terms and conditions as apply to the original contribution.

The Principal Parties may agree to have Caltech and/or UC contract directly for some of these infrastructure improvements, in addition to the Detour Road, in which case actual costs up to an agreed-upon limit will be reimbursed by UH.

2. Mid-Level Facilities Expansion

a. UH:

If desired by Caltech and UC, UH shall arrange for a further expansion of the Mid-Level Facilities to accommodate additional dormitory space for Caltech and UC subject to separate written agreement negotiated between the Principal Parties. In the event, however, that agreement cannot be reached, UH shall be under no obligation to provide space for Caltech and UC at the Mid-Level Facilities beyond that already agreed to by the Principal Parties.

b. Caltech and UC:

If Caltech and UC elect to participate in further expansion of the Mid-Level Facilities, this participation shall be governed by the terms of the separate agreement negotiated between the Principal Parties.

3. Information Station Expansion

a. UH:

UH expects that it may be in the best interests of the astronomical facilities forming a part of the Mauna Kea Observatories to expand the Information Station at some future time. UH shall consider this possibility and pursue it if this becomes appropriate.

b. Caltech and UC:

(i) Caltech and UC shall fund the costs of the design, installation, and maintenance of an Information Station display for the W. M. Keck Observatory, which display is subject to reasonable acceptance by UH. Once the display has been accepted by UH, UH shall be responsible for the safekeeping of the display.

(ii) As part of a community of astronomical facilities forming a part of the Mauna Kea Observatories, Caltech and/or UC shall in the future consider making a fair-share contribution on behalf of the Facilities to the cost of an expansion of the Information Station. The details of the contribution by Caltech and/or UC shall be governed by the terms of a separate agreement to be negotiated between the Principal Parties.

4. Other Infrastructure Improvements to the Mauna Kea Observatories

It may become necessary or desirable for the greater benefit of the astronomical facilities that form a part of the Mauna Kea Observatories to construct infrastructure improvements beyond those described in VII.E.1. through VII.E.3. If such infrastructure improvements are funded entirely by contributions from new funding sources (e.g., new astronomical facilities which join the Mauna Kea Observatories) and/or UH, then Caltech and UC shall enjoy access to such improvements on an equal footing with the other astronomical facilities. If such infrastructure improvements require contributions from some or all of the astronomical facilities for which there are signed Operating and Site Development Agreements with UH, then Caltech and UC shall have access to such improvements, and Caltech and UC shall be liable to contribute to the cost of such improvements, only if and to the extent that the Principal Parties have agreed in writing to such access and contributions. If Caltech and UC elect to participate in any such improvements, the Principal Parties shall negotiate in good faith to determine the fair share of the cost of such improvements which Caltech and UC shall contribute. The amount of this fair share shall be set forth in separate written agreements and normally shall be based on the fractional utilization by Caltech and UC of any such improvements. In cases where utilization is not readily quantifiable, the share paid by Caltech and UC shall not exceed a fraction, the numerator of which is TWO (2), and the denominator of which is the number of Major Astronomical Facilities, with Keck I and Keck II counted as two facilities, which have been, or are being, constructed on land within the Science Reserve.

F. Operations and Maintenance

1. UH:

a. UH shall provide services on a basis of no profit, no loss to Caltech and UC through MKSS. Such services may include, but shall not be limited to: food and lodging under conditions to be established; utilities, transportation; library and auxiliary services; road maintenance and snow removal; access control and public information services; and general administration.

b. The cost of all MKSS services shall be shared among the astronomical facilities operating or under construction at the time the costs are incurred; Caltech and UC shall have the right to use these services at an annually negotiated rate.

c. Caltech and UC shall represent the interests of the W. M. Keck Observatory on the MKSS Oversight Committee, which reviews existing activities and recommends changes to the activities of MKSS.

2. Caltech and/or UC:

a. Shall provide the funds necessary to operate and maintain the Facilities.

b. Shall contribute an annually negotiated share of common costs for services provided by MKSS to Keck I, and after completion, Keck II, as described in VII.F.1. During the construction of Keck II, Caltech and/or UC shall contribute to a separately negotiated share of such costs, including road maintenance, snow removal, and emergency services.

c. Shall fund the cost of operating and maintaining the power and communications lines from the handhole described in VI.C. to the Facilities. In addition, Caltech and UC shall pay an annually negotiated share of the operational costs of the Mauna Kea Observatories Communications Network should the W. M. Keck Observatory choose to participate in the network. The sharing of these costs shall be governed by a separate agreement negotiated between UH and all other participants in the network.

VIII. **ASSIGNMENT OF RIGHTS AND DELEGATION OF RESPONSIBILITIES BY CALTECH AND UC**

Caltech and UC may assign certain of their rights, and delegate certain of their obligations and responsibilities hereunder to CARA, or to other agents, for the purpose of constructing or operating the W. M. Keck Observatory. However, it is also understood and agreed that Caltech or UC, or both (in accordance with the arrangement between them) shall be ultimately responsible to UH for the obligations and responsibilities undertaken by them in this OSDA.

IX. **ASSIGNMENT OF RIGHTS**

Any assignment of rights to the facility shall be bound by paragraph III.F of the Sublease and Non-exclusive Easement Agreement. In particular, Caltech may sublease the Demised Premises to CARA for the purpose of constructing and operating

the Facilities according to the terms and conditions set out in said paragraph III.F.

Caltech/UC undertake that, if considering any other assignment of an interest in the Facilities or subleasing of the Facilities, it will so notify UH so as to provide adequate time for UH to review the proposed assignment of rights, secure a consent agreement from the new party or parties and to obtain the necessary prior written consent approval by the UH Board of Regents, the State of Hawaii Board of Land Natural Resources, and any other bodies whose consent is required under the terms of the lease, the sublease, or other agreements and documents.

X. SCIENTIFIC COOPERATION

In recognition of the potential for scientific interaction among the Principal Parties which the Facilities offer, and of the contribution of UH in making the site available to Caltech and UC, the Principal Parties agree on the following matters with regard to the operational phase of the Facilities.

A. UH Use of the Facilities

1. The UH observing time on the Facilities shall be allocated to proposals sponsored by UH under the following guidelines:

a. Telescope time shall first be allocated to the Observatory Director for engineering purposes. "Engineering purposes" is defined as development, modification, improvement, or maintenance of the Facilities, other than instruments and interferometric capability.

b. Caltech and/or UC shall guarantee observing time on the W. M. Keck Observatory to UH as follows:

i) Keck I Telescope: Ten percent (10%) of the remaining observing time shall then be allocated to UH.

ii) Keck II Telescope: Fifteen percent (15%) of the remaining observing time shall then be allocated to UH.

iii) Observing time shall be averaged over each allocation period and shall be equitably distributed over the seasons of the year and phases of the moon.

c. Observing time shall be allocated on the basis of scientific merit and technical feasibility.

d. Only proposals having a UH staff member, student, or bona-fide visitor as Principal Investigator, and forwarded by the IfA Director, shall be considered in scheduling the UH allocation of observing time. UH shall be solely responsible for evaluation and selection of proposals to be allocated time from the UH allocation. There will be no restrictions on the eligibility of co-investigators to collaborate on observing programs utilizing the UH telescope time.

e. Detailed scheduling of observing time is the responsibility of the Observatory Director and shall be performed by a single individual designated to perform this function for the Observatory.

f. In the event that more than one proposal for the same time-critical observation is forwarded by Caltech, UC and UH, the Observatory Director or individual scheduling the Facilities shall attempt to achieve a resolution satisfactory to Caltech, UC and UH. If this cannot be achieved, selection among the proposals shall be done by the Observatory Director on the basis of scientific merit. Such UH time-critical observations shall be included as part of the total UH observing time allocated under X.A.1.b.

g. Caltech, UC and UH recognize that, in order to achieve the full scientific potential of the W. M. Keck Observatory, it may be necessary to adopt innovative and flexible approaches to the scheduling of the facility. Subject to operational constraints, Caltech, UC and UH are entitled to re-allocate observing time between their own approved programs so as to maximize the scientific return. Any re-allocation which affects both time allocated to UH and time allocated to Caltech/UC requires the prior agreement of the directors of both the W. M. Keck Observatory and UH-IfA.

h. Upon availability to Caltech and UC users of interferometric use of the two Keck telescopes, UH shall be eligible for this same use within the UH observing time guaranteed in X.A.1.b.

2. UH shall receive technical and logistic support while at the Facilities and shall have access to the Facilities, all on the same basis as Caltech and UC scientists.

3. UH may elect to use its own instrumentation to carry out portions of its own observing programs, provided that such instrumentation meets the same requirements as are imposed on Caltech and UC user-provided instruments.

4. UH-sponsored personnel shall be subject to the authority of the Observatory Director when using the Facilities.

B. UH Participation in W. M. Keck Observatory Instrument Development

UH shall not be entitled to compete to develop instruments funded by the Keck Foundation or NASA as part of the construction of the W. M. Keck Observatory unless such development is opened up to open competition. UH shall be entitled to submit to any potential funding source proposals for the development of instruments for use within the UH observing time on the W. M. Keck Observatory. Any UH proposal for the development of instruments intended for use within the Caltech or UC time shall be coordinated with CARA.

C. UH Participation in W. M. Keck Observatory Committee Structure

In order to encourage productive interaction among the Principal Parties, UH shall be represented on W. M. Keck Observatory committees as follows:

1. UH Representation on the Science Steering Committee (SSC).

In order to facilitate Caltech-UC-UH interaction at both the engineering and scientific levels, UH shall be entitled to appoint an individual to participate in the SSC or its replacement. The UH participant shall be invited to all meetings of the SSC and shall have the right to participate in discussions and debates of

the SSC, but shall have no right to make or second motions, nor to vote.

2. W. M. Keck Observatory Time Allocation Committee (TAC).

If a Time Allocation Committee (TAC) is established to judge proposals and allocate observing time on the Facilities, UH shall be entitled to appoint one (1) voting member to the TAC.

3. CARA Board of Directors.

So long as the CARA Board of Directors remains as presently constituted (i.e., three voting members each from Caltech and UC together with a non-voting member from the Keck Foundation), UH shall not be represented on the CARA Board of Directors. If CARA proposes representation on the CARA Board of Directors by any other entity, then Caltech and UC will give full consideration to adding a non-voting UH member to the CARA Board of Directors. UH's consideration of any assignment of interest in the W. M. Keck Observatory will take into account such representation on the CARA Board of Directors.

D. Commercial Use of Images

Images obtained with the use of the Facilities shall not be used for commercial purposes without the prior written approval of the W. M. Keck Observatory Director, who shall ensure that the implementation of this policy does not impede publication of scientific results or scientific communications. Copyright to all such images shall vest solely with the Principal Party under whose observing time allocation the images were acquired, or in its designee.

E. Facilities Attribution

In all publications and news releases regarding results obtained from work performed at the Facilities, the W. M. Keck Observatory shall be given appropriate credit and shall be referred to as the "W. M. Keck Observatory, jointly operated by the California Institute of Technology and the University of California", or as the "W. M. Keck Observatory, jointly operated by the University of California and the California Institute of Technology". Results obtained at the Facilities by IfA faculty or on IfA-developed instruments shall have credit for these results also given to "the University of Hawaii, Institute for Astronomy" in any publications or news releases.

XI. INDEMNIFICATION/INSURANCE

Caltech and UC collectively, either directly or through CARA (see IV), shall indemnify, defend and hold harmless UH and the State of Hawaii, their officers, agents, employees or any person acting on their behalf from and against any claim or demand for loss, liability or damages, including, but not limited to, claims for property damage, personal injury or death, based upon any accident, fire, or other incident connected with the W. M. Keck Observatory which arises from any act or omission of Caltech and/or UC, their officers, agents, employees, or invitees, or occasioned by any failure on the part of Caltech and/or UC to maintain the Demised Premises and the Facilities in a safe condition or to observe or perform any of the terms and conditions herein or any regulations, ordinances and laws of the Federal, State, Municipal or County governments.

Caltech and UC collectively, either directly or through CARA (see IV), shall (during the term of this OSDA) at their own cost and expense, maintain liability insurance for personal injury or death and property damage in the minimum amounts of ONE MILLION DOLLARS (\$1,000,000.00) per person for personal injury or death, and FIVE MILLION DOLLARS (\$5,000,000.00) for any one occurrence, and FIVE HUNDRED THOUSAND DOLLARS (\$500,000.00) against claims for property damage for any one occurrence, subject to revision every FIVE (5) years in writing. Said policy or policies shall name UH and the State of Hawaii as additional insureds. A Certificate of Insurance evidencing that said insurance is in full force and effect shall be deposited with the Director of Procurement and Property Management, University of Hawaii, 1400 Lower Campus Road, Room 15, Honolulu, Hawaii 96822, U.S.A.

XII. ATTORNEY'S FEES

Caltech, UC and UH shall each pay their own attorney's fees and any other legal expenses.

XIII. SERVICE OF PROCESS

Caltech and UC shall designate a representative within the State of Hawaii duly authorized to accept service of process on their behalf.

XIV. GOVERNING LAW: SEVERABILITY

The validity, construction and performance of this OSDA and the legal relations among the parties to this OSDA shall be governed by and construed in accordance with the laws of the State of Hawaii, excluding that body of law applicable to choice of law. In the event that any provision of this OSDA shall be held by a court of competent jurisdiction to be contrary to law, the remaining provisions of this OSDA shall remain in full force and effect.

XV. AMENDMENTS TO THIS OSDA

This OSDA may be amended in writing at any time by mutual agreement of Caltech, UC and UH.

XVI. TERM OF THIS OSDA

This OSDA shall become effective on the date first above written to execute this document and shall terminate as provided in XVIII.

XVII. RENEGOTIATION OR EXTENSION OF THIS OSDA

If UH and the BLNR either renegotiate or extend General Lease S-4191 beyond December 31, 2033, or if UH obtains a lease providing the same general terms and conditions as General Lease S-4191 for a period beyond December 31, 2033, UH shall extend this OSDA accordingly, except that the Principal Parties agree to negotiate in good faith any revisions thereto proposed at the time by any of the Principal Parties.

XVIII. TERMINATION

This OSDA shall be terminated upon the first of any of the following events to occur:

1. Mutual written agreement of Caltech, UC and UH.
2. Termination of the Sublease.
3. Termination of management or operation of the Facilities by Caltech and UC (directly or through CARA), unless Caltech or UC find a party or parties acceptable to UH to take over the rights and responsibilities of this OSDA. Caltech may assume UC's rights and responsibilities hereunder, or UC may likewise assume Caltech's rights and responsibilities hereunder, without the approval of UH and without effecting a termination of this OSDA.
4. December 31, 2033, when General Lease No. S-4191 terminates, unless a suitable extension or new lease as allowed for in XVII has been negotiated.

XIX. DISPOSITION OF FACILITIES ON TERMINATION

Disposition of the Facilities on termination shall be conducted pursuant to the provisions of the Sublease.

XX. MISCELLANEOUS

UH shall import into the County of Hawaii, State of Hawaii, the Keck Telescopes I and II, together with all equipment, instruments, machines, domes, and any and all ancillary parts thereof produced outside the State of Hawaii necessary to operate the W. M. Keck Observatory.

UH and the State of Hawaii shall not be responsible for and shall not assume the risks of loss or damage to the Keck Telescopes and the ancillary equipment, instruments, machines, domes, and other parts, during the transportation and installation thereof and during the entire time the Keck Telescopes I and II and such ancillary parts are deemed to be in the possession of UH or the State of Hawaii.

IN WITNESS WHEREOF, the parties hereto have executed these presents on the day and year first above written.

FOR THE UNIVERSITY OF HAWAII:

By Donald N. B. Hall 6/29/92
Donald N. B. Hall Date
Its Director

By Ralph T. Horii, Jr. 6/29/92
Ralph T. Horii, Jr. Date
Its Vice President
for Finance and Operations

By Albert J. Simone 6/29/92
Albert J. Simone Date
Its President

Approved as to form:

By Harriet Y. Lewis 6/16/92
Harriet Y. Lewis Date
Deputy Attorney General
State of Hawaii

FOR THE CALIFORNIA INSTITUTE OF TECHNOLOGY:

By Thomas E. Everhart 6/22/92
Thomas E. Everhart Date
Its President

FOR THE REGENTS OF THE UNIVERSITY OF CALIFORNIA:

By David P. Gardner 6/26/92 By Anne Shaw 6/26/92
David P. Gardner Date Anne Shaw Date
Its President of the University Assistant Secretary of The Regents

Approved as to form:

By James D. Agate 6-25-92
~~James D. Agate~~ James D. Agate Date
University Counsel for the
Regents of the University
of California

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ATTACHMENT A

SUBLEASE AND NON-EXCLUSIVE EASEMENT AGREEMENT BETWEEN
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 AND
 THE UNIVERSITY OF HAWAII

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Recordation Requested by:

After Recordation, Return to:

When completed: Mail ()
Pick up () Phone:

SUBLEASE AND NON-EXCLUSIVE EASEMENT AGREEMENT

THIS SUBLEASE and accompanying non-exclusive Easement is made this 30th day of October, 1985, by and between the UNIVERSITY OF HAWAII, hereinafter called "SUBLESSOR," and THE CALIFORNIA INSTITUTE OF TECHNOLOGY, Pasadena, California, 91125, hereinafter called "SUBLESSEE." This SUBLEASE and Easement is approved pursuant to General Lease S-4191, dated June 21, 1968, between SUBLESSOR and the State of Hawaii, Board of Land and Natural Resources, hereinafter called "LESSOR." A copy of said General Lease S-4191 and "Consent to Sublease of General Lease S-4191," are attached hereto as Exhibits A and B, respectively, and are incorporated herein by reference.

W I T N E S S E T H T H A T:

SUBLESSOR, in consideration of the rent hereinafter reserved and upon the conditions, covenants and agreements hereinafter expressed, does hereby demise and let to SUBLESSEE the parcel of land described in Exhibit C, attached hereto and incorporated herein by reference, and SUBLESSEE does hereby sublease from SUBLESSOR said parcel for the purpose of erecting a telescope facility to be constructed and operated by and at the expense of SUBLESSEE through a contractual arrangement set forth in a separate "Operating and Site Development Agreement Among the California Institute of Technology, the Regents of the University of California and the University of Hawaii Concerning the Design, Construction and Operation of the W. M. Keck Observatory on Mauna Kea, Hawaii" (hereinafter "OSDA").

Construction will include the W.M. Keck Observatory building and dome, its optical/infrared telescope having an effective diameter of approximately 10 meters, related equipment and instrumentation, and related support facilities and infrastructure improvements required on the demised premises to support the operations of the Observatory (collectively "Facilities").

SUBLESSEE contemplates the possible construction of a second observatory building, dome, and telescope (hereinafter "second facility") on the demised premises, subject to III.G.

SUBLESSEE shall have such unsuitable damaged property or debris removed within ONE (1) year, after written notice to remove, and shall restore the property or any portion affected thereby to even grade. In the event SUBLESSEE fails to remove such damaged property or debris and restore the land within ONE (1) year, such property may be removed and the land affected thereby restored to even grade by SUBLESSOR at the expense of SUBLESSEE.

If the Facilities or a portion thereof are restored, such restoration shall be subject to approval by SUBLESSOR, and shall be in keeping with III.H. Such approval by the SUBLESSOR will not be withheld unreasonably.

G. Controlling Lease

In the event that any term or condition contained herein is inconsistent with or contrary to General Lease S-4191, said General Lease shall be controlling.

H. Operation of the Facilities

Neither SUBLESSEE nor its successor or assigns shall operate or permit to be operated the aforementioned Facilities for purposes of research without an effective OSDA. The Facilities may be operated by SUBLESSEE in the absence of the aforesaid OSDA only when necessary to ensure the safety of personnel or of the Facilities.

I. Indemnity/Insurance

SUBLESSEE shall indemnify, defend and hold harmless LESSOR and SUBLESSOR, their officers, agents, employees or any person acting on their behalf from and against any claim or demand for loss, liability or damages (including, but not limited to, claims for property damage, personal injury or death, based upon any accident, fire, or other incident on the demised premises and roadways adjacent thereto) which arises from any act or omission of SUBLESSEE, its officers, agents, employees, or invitees, or occasioned by any failure on the part of SUBLESSEE to maintain the demised premises in a safe condition or to observe or perform any of the terms and conditions herein or any regulations, ordinances and laws of the Federal, State, Municipal or County governments.

Additionally, SUBLESSEE shall at its own cost and expense, maintain liability insurance for personal injury or death and property damage in the minimum amounts of ONE MILLION DOLLARS (\$1,000,000.00) per person for personal injury or death, and FIVE MILLION DOLLARS (\$5,000,000.00) for any one occurrence, and FIVE HUNDRED THOUSAND DOLLARS (\$500,000.00) against claims for property damage for any one occurrence, subject to revision every FIVE (5) years in writing. Said insurance is subject to the approval of LESSOR and SUBLESSOR and shall name LESSOR and SUBLESSOR as additional insureds. A certificate of insurance evidencing that said insurance is in full force and effect shall be deposited with the Director of Procurement and Property Management, 1400 Lower Campus Road, Room 15, Honolulu, Hawaii 96822.

II. SUBLESSOR HEREBY COVENANTS WITH SUBLESSEE AS FOLLOWS:

A. Peaceful Enjoyment

Upon provision to SUBLESSOR of the rights (in lieu of rent) provided in the aforesaid OSDA and upon observance and performance of all the terms, covenants and conditions contained herein, SUBLESSEE shall peaceably hold and enjoy the demised premises during the term hereof without hindrance or interruption. Any proposed use of the demised premises by SUBLESSOR or LESSOR, their successors or assigns, as contemplated in, but not limited to, those paragraphs entitled "Hunting Recreation Rights" and "Right to Use Demised Land" as set forth in General Lease S-4191, shall be subject to coordination with LESSOR, SUBLESSOR and SUBLESSEE; such proposed use shall not interfere unreasonably with SUBLESSEE's use of the demised premises.

B. Covenant Against Contingent Fees

SUBLESSEE warrants that no person or selling agency has been employed or retained to solicit or secure this SUBLEASE upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by SUBLESSEE for the purpose of securing business. For breach or violation of this warranty, SUBLESSOR shall have the right to annul this SUBLEASE without liability or, in its discretion, to deduct from said SUBLEASE price or consideration, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

C. Renewal

At least SIX (6) months prior to the expiration of General Lease S-4191 on the 31st day of December 2033, SUBLESSOR shall seek to negotiate a renewal of said General Lease with LESSOR or its successor. In the event of renewal, SUBLESSOR shall renew or extend this SUBLEASE, or shall negotiate in good faith a new SUBLEASE with SUBLESSEE, if so desired by SUBLESSEE, and under such terms and conditions as may then be mutually acceptable. SUBLESSOR and LESSOR shall make every effort to ensure renewal, extension, or renegotiation of said General Lease.

D. Faithful Performance

SUBLESSOR and SUBLESSEE recognize that in reliance upon the faithful performance by SUBLESSOR of its obligations hereunder and under the terms of General Lease S-4191, SUBLESSEE has agreed to make a substantial commitment of financial and human resources. In view of this reliance and commitment by SUBLESSEE, SUBLESSOR agrees to perform faithfully its obligations under General Lease S-4191 and this SUBLEASE so that neither of these agreements is terminated earlier than its natural expiration date.

III. SUBLESSEE HEREBY COVENANTS WITH SUBLESSOR AS FOLLOWS:

A. Right of Entry

SUBLESSEE shall allow SUBLESSOR or its agent(s) known to SUBLESSEE or carrying suitable identification, free access at all reasonable times to the demised premises for the purpose of examining the same and determining whether the covenants herein are being fully observed and performed.

B. Janitorial and Other Services

SUBLESSEE shall provide janitorial, custodial, and security services to the demised premises, including sewerage and sanitation facilities and services.

C. Repairs and Maintenance

At all times during the term of this SUBLEASE, SUBLESSEE shall, at SUBLESSEE's own cost and expense, keep and maintain the demised premises and the Facilities in good order and repair and in a clean condition. This obligation shall include, but not be limited to, the obligation to paint the Facilities as appropriate and to make any modification or alteration thereof when necessary.

D. Utilities and Other Charges

Except as may be agreed in the aforesaid OSDA, SUBLESSEE shall pay for or shall cause to be paid when due all charges associated with the Facilities and all charges, duties and rates of every description, including electricity, water, communications, sewer, gas, refuse collection or any similar other charges, as to which said demised premises, or any part thereof, or any improvements thereon, or which SUBLESSOR or SUBLESSEE in respect thereof, may during said term become liable, whether assessed to or payable by SUBLESSOR or SUBLESSEE.

E. Taxes and Assessments

If, at any time in the future, government taxes or assessments are made, SUBLESSEE shall pay or cause to be paid when due, the amount of all taxes, rates, assessments, and other outgoings of every description as to which said demised premises or any part thereof, or any improvements thereon, or SUBLESSOR or SUBLESSEE in respect thereof, are now or may be assessed or become liable by authority of law during the term of this SUBLEASE.

F. Assignment and Subleasing

Neither SUBLESSEE nor its successors or assigns shall, without the prior written consent of LESSOR and SUBLESSOR, assign, sublease or mortgage this SUBLEASE or any interest therein, or sublet the demised premises, in

whole or in part; provided that SUBLESSEE may, without the consent of LESSOR or SUBLESSOR, sublease the demised premises to the nonprofit corporation, CALIFORNIA ASSOCIATION FOR RESEARCH IN ASTRONOMY (CARA), for the specific purpose of operating the Facilities to be built on the demised premises. In this case, CARA shall be required by SUBLESSEE to abide by the applicable terms and conditions of the aforesaid OSDA. Consent of LESSOR or SUBLESSOR to sublease the demised premises to any other party or parties shall only be granted if the terms of the aforesaid OSDA are honored by said party or parties, or a new OSDA between SUBLESSOR and said party or parties is executed.

G. Use of Demised Premises

1. SUBLESSEE shall use the demised premises exclusively for the Facilities, which are to be constructed and operated by and at the expense of SUBLESSEE or others working in cooperation with SUBLESSEE through the aforesaid OSDA and through any other written agreements which may be agreed to by SUBLESSOR and SUBLESSEE. If SUBLESSEE wishes to use the demised premises for a second facility this use shall be subject to the successful renegotiation of the OSDA to which this SUBLEASE is attached. UH shall use its best efforts to secure the necessary permits for this second facility.

2. All goods, wares, merchandise, equipment or other property of SUBLESSEE shall be kept on the demised premises at the sole risk of SUBLESSEE.

3. SUBLESSEE shall not permit or make any waste or strip, or make any unlawful, improper or abusive use of the demised premises or any part thereof, and SUBLESSEE shall be liable to SUBLESSOR for all damages beyond reasonable wear and tear. As used in this SUBLEASE, the term "reasonable wear and tear" shall include without limitation such grading, excavation and filling of the demised premises as may be reasonably required for the construction of the improvements contemplated by this SUBLEASE. Such grading, excavation and filling shall not be deemed to constitute strip or waste. SUBLESSEE shall make reasonable effort to minimize grading, excavation and filling.

IV. AND THE PARTIES MUTUALLY COVENANT AS FOLLOWS:

A. Service of Process

SUBLESSEE shall designate a representative within the State of Hawaii duly authorized to accept service of process on its behalf. In the event that SUBLESSEE fails to so designate such a representative or such designated representative is unavailable, SUBLESSEE consents that service of any notice or process issued against it may be served upon it by filing the same with the Director of Commerce and Consumer Affairs, State of Hawaii or, in his/her absence, with the Deputy Director. SUBLESSOR shall forward by certified mail to SUBLESSEE a copy of any such notice or process served on the Director of Commerce and Consumer Affairs.

B. Governing Law; Severability

The validity, construction and performance of this SUBLEASE, and the legal relations among the parties to this SUBLEASE shall be governed by and construed in accordance with the laws of the State of Hawaii, excluding that body of law applicable to choice of law. Should any provision of this SUBLEASE be held by a court of competent jurisdiction to be either invalid, void, or unenforceable, the remaining provisions of this SUBLEASE shall remain in full force and effect.

C. Binding on Successors

This SUBLEASE shall be binding on and inure to the benefit of the successors of the parties hereto.

D. Final Agreement

This SUBLEASE constitutes the final agreement between SUBLESSOR and SUBLESSEE regarding the SUBLEASE of the demised premises and the grant of Easement to SUBLESSEE for purposes of SUBLESSEE's construction of the Facilities. All prior discussions and/or agreements among the parties concerning the subject matter addressed in this SUBLEASE shall have no force and effect.

E. Notices

All notices required or permitted to be given hereunder by SUBLESSOR to SUBLESSEE, or SUBLESSEE to SUBLESSOR, shall be in writing and sent to the following addresses:

If to SUBLESSOR: University of Hawaii
2444 Dole Street
Honolulu, Hawaii 96822
Attn: Vice President for Administration

If to SUBLESSEE: California Institute of Technology
Pasadena, California 91125

Attn: Vice President for Business and Finance

SUBLESSOR and SUBLESSEE may change the address of the recipient of notices by sending a written notice of each such change to the last designated address of the addressee.

F. Termination

This SUBLEASE shall terminate upon the occurrence of any of the following events:

1. If the planned construction of the Facilities as described in Exhibit D is not substantially completed by the 31st of December 1990, unless otherwise agreed to in writing between SUBLESSOR and SUBLESSEE.

2. Termination of the aforesaid OSDA unless a new OSDA between UH and another party or parties is executed and LESSOR, SUBLESSOR, and SUBLESSEE agree in writing to a continuation of this SUBLEASE.

3. The expiration of General Lease No. S-4191 on December 31, 2033 without renewal, extension or renegotiation. If said General Lease is renewed, extended or renegotiated, then this SUBLEASE shall be renewed, extended or renegotiated at that time in accordance with II.C.

4. If SUBLESSEE fails to observe or comply with any of the terms or conditions herein within Sixty (60) days after being notified in writing by SUBLESSOR of such failure. In the event that more than Sixty (60) days are reasonably required to observe or perform, SUBLESSEE shall in good faith and within said Sixty (60) days, initiate action and provide a plan for observance or performance, and shall diligently prosecute the same to completion.

5. If SUBLESSEE peaceably surrenders or abandons the demised premises.

6. Destruction of the Facilities by fire or other causes rendering the same unsuitable for purposes of optical and infrared astronomy, unless SUBLESSEE notifies SUBLESSOR in writing within Six (6) months of the date of casualty of its intention to restore the Facilities to their prior condition as specified in I.F.

7. By SUBLESSEE upon Six (6) months' notice in writing, in the event SUBLESSEE's contemplated sources of funding become unavailable and, after diligent effort, SUBLESSEE is unable to procure alternate sources of funding which, in SUBLESSEE's good-faith judgment, are adequate.

8. By SUBLESSEE, if SUBLESSEE gives SUBLESSOR Two (2) years' written notice.

9. Mutual agreement in writing between SUBLESSOR and SUBLESSEE.

G. Title to the Facilities, Alterations, Additions, and Improvements, and Disposition in Event of Termination or Expiration

1. Title to the Facilities, alterations, additions, and improvements (collectively referred to herein as "Property") on, affixed or installed in, or placed on the demised premises by SUBLESSEE shall, at all times, remain in the name of SUBLESSEE.

2. If this SUBLEASE terminates or expires, and SUBLESSOR has neither voluntarily terminated General Lease S-4191, nor defaulted on either this SUBLEASE nor on General Lease S-4191, SUBLESSEE shall be responsible for removal of the Property from the demised premises within ONE (1) year of the termination or expiration of this SUBLEASE, unless agreed to in writing between SUBLESSOR and SUBLESSEE. If LESSOR and SUBLESSOR grant written approval, which approval shall not be arbitrarily or capriciously withheld, said Property can be sold, abandoned, or surrendered in whole or in part and the following conditions shall apply:

a. Sale. SUBLESSEE may sell the Property to SUBLESSOR and/or to a third party acceptable to SUBLESSOR. Such sale by SUBLESSEE to a party other than SUBLESSOR shall be contingent upon the execution of a new Sublease and Operating and Site Development Agreement between the new party and SUBLESSOR.

b. Surrender. SUBLESSEE may peaceably surrender all or part of the Property in place and good repair, order, and clean condition, reasonable wear and tear excepted.

3. Unless otherwise agreed in writing by SUBLESSOR, the following conditions shall apply if all or part of the Property is removed under this Section IV.G:

a. Said removal will be at the expense of SUBLESSEE;

b. SUBLESSEE shall restore the demises premises, or any portion affected thereby, to even grade to the extent that Property is removed, and shall repair any damage done to the Property not removed in the event that equipment is removed.

c. In the event that SUBLESSEE fails to remove such Property or debris and restore the demised premises within Twelve (12) months, such Property may be removed and the land restored as described above by SUBLESSOR at the expense of SUBLESSEE.

4. If this Sublease terminates or expires, and SUBLESSOR has either voluntarily surrendered General Lease S-4191, or defaulted on either this SUBLEASE or General Lease S-4191, and if SUBLESSEE is allowed its continued right to quiet enjoyment of the Property and the demised premises under the terms of the Consent to Sublease as stated in Exhibit B, then SUBLESSEE agrees to honor the terms of this SUBLEASE.

If said surrender or default results in SUBLESSOR'S rights of General Lease S-4191 being (a) returned to LESSOR, then SUBLESSEE agrees to negotiate in good faith a new operating agreement with LESSOR on the terms and conditions of SUBLESSEE'S continued use of the demised premises; or (b) transferred to an organization other than SUBLESSOR, then SUBLESSEE agrees to negotiate in good faith a new operating agreement with the new sublessor of the demised premises, and to honor the terms and conditions of said superseding operating agreement with said new sublessor. Continued right to quiet enjoyment of the Property and the demised premises is contingent upon satisfactory negotiation of an operating agreement with LESSOR or said new sublessor, the terms of which shall in no event be less favorable to SUBLESSEE than the terms of the OSDA.

IN WITNESS WHEREOF, the parties hereto have executed these presents the day and year first written above.

SUBLESSOR:

SUBLESSEE:

FOR THE UNIVERSITY OF HAWAII:

FOR THE CALIFORNIA INSTITUTE OF TECHNOLOGY:

By Albert J. Simone
 Albert J. Simone
 President

By Marvin L. Goldberger
 Marvin L. Goldberger
 President

Dated 25 1985

Dated August 2, 1985

By Harold S. Masumoto
 Harold S. Masumoto
 Vice-President for Administration

By David W. Morrisroe
 David W. Morrisroe
 Vice-President for Business and Finance
 and Treasurer

Dated September 19, 1985

Dated August 2, 1985

Approved as to Form:

By Harriet Yoshida Lewis
 Deputy Attorney General
 University of Hawaii

Notary Public, First Circuit
 State of Hawaii
 My commission expires: 09-30-86

As required by the terms of Item 5 of General Lease S-4191 between LESSOR and SUBLESSOR herein, the terms and conditions of this SUBLEASE are hereby approved.

LESSOR:

STATE OF HAWAII
BOARD OF LAND AND NATURAL RESOURCES

By *L. Ono*
Chairman and Member

Dated October 30, 1985

By *J. Douglas*
Member

Dated 10/29/85

Approved as to Form:

By *Philip H. ...*
Deputy Attorney General
Department of Land and Natural Resources

Dated October 15, 1985

STATE OF CALIFORNIA)
) ss.
COUNTY OF LOS ANGELES)

On this 2nd day of August, 1985, before me appeared Marvin L. Goldberger and David W. Morrisroe, personally known to me, who, being by me duly sworn, did say that they are President and Vice President for Business and Finance and Treasurer, respectively, of the California Institute of Technology, a non-profit, public-benefit corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; that said instrument was signed and sealed on behalf of said corporation; and said Marvin L. Goldberger and David W. Morrisroe acknowledged the instrument to be the free act and deed of said corporation.

WITNESS my hand and official seal.



Susan Ruth Martin
Notary Public
State of California

My commission expires: 9-22-86

STATE OF HAWAII)
) ss.
CITY AND COUNTY OF HONOLULU)

On this 25th day of September, 1985, before me appeared Albert J. Simone and Harold S. Masumoto, personally known to me, who, being by me duly sworn, did say that they are President and Vice President for Administration, respectively, of the University of Hawaii, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; that said instrument was signed and sealed on behalf of said corporation by the authority of its Board of Regents; and said Albert J. Simone and Harold S. Masumoto acknowledged the instrument to be the free act and deed of said corporation.

[Signature]
Notary Public, First Circuit
State of Hawaii

My commission expires: 09-30-86

GENERAL LEASE NO. S-4191

THIS INDENTURE OF LEASE, made this 21st day of June, 1968, by and between the STATE OF HAWAII, by its Board of Land and Natural Resources, pursuant to the provisions of Section 103A-90(b), Revised Laws of Hawaii 1955, as amended, hereinafter referred to as the "LESSOR", and the UNIVERSITY OF HAWAII, a body corporate, whose post office address is 2444 Dole Street, Honolulu, City and County of Honolulu, State of Hawaii, hereinafter referred to as the "LESSEE",

WITNESSETH THAT:

FOR and in consideration of the mutual promises and agreements contained herein, the Lessor does hereby demise and lease unto the said Lessee and the said Lessee does hereby rent and lease from the Lessor, all of that certain parcel of land situate at Kaohē, Hamakua, County and Island of Hawaii, State of Hawaii, and more particularly described in Exhibit "A", hereto attached and made a part hereof.

TO HAVE AND TO HOLD, all and singular the said premises, herein mentioned and described, unto the said Lessee, for and during the term of sixty-five (65) years, to commence from the 1st day of January, 1968, and to terminate on the 31st day of December, 2033.

RESERVING UNTO THE LESSOR THE FOLLOWING:

1. Water Rights. All surface and ground waters appurtenant to the demised premises, together with the right to enter and to capture, divert or impound water; provided, that the Lessor shall exercise such rights in such manner as not to interfere unreasonably with the Lessee's use of the demised premises; provided, further, that the Lessee shall have the right to use the waters of Lake Waiau for any purpose necessary or incidental to the use permitted by this lease on the following conditions:

a. No drilling or disturbance of Lake Waiau's bottom, banks or areas adjacent thereto shall be permitted;

b. No activity shall be permitted which will result in the pollution of the waters of Lake Waiau;

c. Lessee shall not take or divert any of the waters arising from springs which furnish the water supply for Pohakuloa, and no alterations to said springs shall be made by Lessee.

2. Access. All rights to cross the demised premises for inspection or for any government purposes.

3. Hunting and Recreation Rights. All hunting and recreation rights on the demised lands, to be implemented pursuant to rules and regulations issued by said Board in discharging its fish and game or state parks responsibilities; provided, however, that such hunting and recreation activities shall be coordinated with the activities of the Lessee on the demised lands; and provided, further, that such hunting and

4. Right to use Demised Lands. The right for itself, and its successors, lessees, grantees and permittees, to use any portion of the lands demised and the right to grant to others rights and privileges affecting said land; provided, however, that, except as otherwise provided herein, no such use shall be permitted or rights and privileges granted affecting said lands, except upon mutual determination by the parties hereto that such use or grant will not unreasonably interfere with the Lessee's use of the demised premises; provided, further, that such agreement shall not be arbitrarily or capriciously withheld.

THE LESSEE, IN CONSIDERATION OF THE PREMISES, COVENANTS WITH THE LESSOR AS FOLLOWS:

1. Surrender. The Lessee shall, at the expiration or sooner termination of this lease, peaceably and quietly surrender and deliver possession of the demised premises to the Lessor in good order and condition, reasonable wear and tear excepted.
2. Maintenance of the Premises. The Lessee shall keep the demised premises and improvements in a clean, sanitary and orderly condition.
3. Waste. The Lessee shall not make, permit or suffer, any waste, strip, spoil, nuisance or unlawful, improper or offensive use of the demised premises.
4. Specified Use. The land hereby leased shall be used by the Lessee as a scientific complex, including without limitation thereof an observatory, and as a scientific reserve being more specifically a buffer zone to prevent the intrusion

Red
P

~~during hours of darkness~~ and certain types of electric or electronic installation on the demised lands, but shall not necessarily be limited to the foregoing.

5. Assignments. The Lessee shall not sublease, subrent, assign or transfer this lease or any rights thereunder without the prior written approval of the Board of Land and Natural Resources.

6. Improvements. The Lessee shall have the right during the existence of this lease to construct and erect buildings, structures and other improvements upon the demised premises; provided, that plans for construction and plot plans of improvements shall be submitted to the Chairman of the Board of Land and Natural Resources for review and approval prior to commencement of construction. The improvements shall be and remain the property of the Lessee, and shall be removed or disposed of by the Lessee at the expiration or sooner termination of this lease; provided, that with the approval of the Chairman such improvements may be abandoned in place. The Lessee shall, during the term of this lease, properly maintain, repair and keep all improvements in good condition.

7. Termination by the Lessee. The Lessee may terminate this lease at any time by giving thirty (30) days' notice in writing to the Lessor.

8. Termination by the Lessor. In the event that (1) the Lessee fails to comply with any of the terms and conditions of this lease, or (2) the lessee abandons or fails to use the demised lands for the use specified under paragraph 4 of these covenants for a period of two years, the Lessor may terminate this lease by giving six months' notice in writing to the Lessee.

policy which discriminates against anyone based upon race, creed, color or national origin.

10. General Liability. The Lessee shall at all times, with respect to the demised premises, use due care for safety, and the Lessee shall be liable for any loss, liability, claim or demand for property damage, personal injury or death arising out of any injury, death or damage on the demised premises caused by or resulting from any negligent activities, operations or omissions of the Lessee on or in connection with the demised premises, subject to the laws of the State of Hawaii governing such liability.

11. Laws, Rules and Regulations, etc. The Lessee shall observe and comply with Regulation 4 of the Department of Land and Natural Resources and with all other laws, ordinances, rules and regulations of the federal, state, municipal or county governments affecting the demised lands or improvements.

12. Objects of Antiquity. The Lessee shall not appropriate, damage, remove, excavate, disfigure, deface or destroy any object of antiquity, prehistoric ruin or monument of historical value.

13. Undesirable Plants. In order to prevent the introduction of undesirable plant species in the area, the Lessee shall not plant any trees, shrubs, flowers or other plants in the leased area except those approved for such planting by the Chairman.

IN WITNESS WHEREOF, the STATE OF HAWAII, by its Board of Land and Natural Resources, has caused the seal of the Department of Land and Natural Resources to be hereunto

day of June, 1968, and the UNIVERSITY OF HAWAII, by its Acting President and VP for Business Affairs has caused these presents to be duly executed this 17th day of June, 1968, effective as of the day and year first above written.

STATE OF HAWAII

By: *James Fido*
 Acting Chairman and Member
 Board of Land and
 Natural Resources

And By: *Merwin Mayes*
 Member
 Board of Land and
 Natural Resources

UNIVERSITY OF HAWAII

By: *Robert W. Smith*
 Its Acting President

And By: *Arthur I. ...*
 Its

APPROVED AS TO FORM:

Deputy Attorney General
 Dated: 5-8-68

mm
 Proofed by:

EXHIBIT "A"

MAUNA KEA SCIENCE RESERVE

Kaohē, Hamakua, Island of Hawaii, Hawaii

Being a portion of the Government Land of Kaohē

Beginning at a point on the south boundary of this parcel of land, the coordinates of said point of beginning referred to Government Survey Triangulation Station "SUMMIT 1955" being 12,325.95 feet South and 471.84 feet West, as shown on Government Survey Registered Map 2789, thence running by azimuths measured clockwise from True South:-

1. Along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, on a curve to the right with a radius of 13,200.00 feet, the chord azimuth and distance being: 135° 00' 18,667.62 feet;
2. Thence along Mauna Kea Forest Reserve, Governor's Proclamation

6. 27° 49' 06.5" 841.83 feet along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909;
7. Thence along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, on a curve to the right with a radius of 13,200.00 feet, the chord azimuth and distance being: 306° 59' 47.4" 1824.16 feet;
8. 227° 29' 00.9" 2805.06 feet along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909;
9. Thence along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, on a curve to the right with a radius of 1500.00 feet, the chord azimuth and distance being: 317° 29' 00.9" 3000.00 feet;
10. 47° 29' 00.9" 2805.06 feet along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909;
11. Thence along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, on a curve to the right with a radius of 13200.00 feet, the chord azimuth and distance being: 325° 31' 55.2" 701.87 feet;
12. 245° 46' 12.7" 2760.45 feet along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909;
13. Thence along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, on a curve to the right with a radius of 2000.00 feet, the chord azimuth and distance being: 335° 46' 12.7" 4000.00 feet;
14. 65° 46' 12.7" 2760.45 feet along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909;
15. Thence along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, on a curve to the right with a radius of 13,200.00 feet, the chord azimuth and distance being: 352° 00' 00.0" 1824.16 feet;

16. Thence along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, still on a curve to the right with a radius of 13,200.00 feet, the chord azimuth and distance being: 45' 00' 18,667.62 feet to the point of beginning and containing an AREA OF 13,321.054 ACRES.

EXCEPTING and RESERVING to the State of Hawaii and to all others entitled thereto, the Mauna Kea-Humuula and Mauna Kea-Umikoia Trails, and all other existing trails within the above-described parcel of land, together with rights of access over and across said trails.

ALSO, EXCEPTING and RESERVING to the State of Hawaii, its successors and assigns, the waters and all riparian and other rights in and to all the streams within the above-described parcel of land.

16. Thence along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, still on a curve to the right with a radius of 13,200.00 feet, the chord azimuth and distance being: 45' 00' 18,667.62 feet to the point of beginning and containing an AREA OF 13,321.054 ACRES.

EXCEPTING and RESERVING to the State of Hawaii and to all others entitled thereto, the Mauna Kea-Humuula and Mauna Kea-Umikoia Trails, and all other existing trails within the above-described parcel of land, together with rights of access over and across said trails.

ALSO, EXCEPTING and RESERVING to the State of Hawaii, its successors and assigns, the waters and all riparian and other rights in and to all the streams within the above-described parcel of land.

CONSENT TO SUBLEASE OF
GENERAL LEASE NO. S-4191

CONSENT is hereby given by the STATE OF HAWAII, by its Board of Land and Natural Resources, LESSOR under General Lease No. S-4191, dated June 21, 1968, to the attached Sublease of General Lease No. S-4191, dated _____, by and between the UNIVERSITY OF HAWAII, as SUBLESSOR, and the California Institute of Technology, as SUBLESSEE;

PROVIDED, HOWEVER that this consent shall not in any manner be construed as varying in any respect the terms and conditions of said General Lease No. S-4191; and PROVIDED, FURTHER, that no further assignment or sublease of any interest under said General Lease No. S-4191 shall be made without the written consent of the Board of Land and Natural Resources, State of Hawaii, being first obtained and endorsed thereon.

IT IS UNDERSTOOD that should there be any conflict between the terms and conditions of said General Lease No. S-4191, dated June 21, 1968, and the terms and conditions of the attached SUBLEASE dated _____, the former shall control.

IT IS FURTHER UNDERSTOOD AND AGREED by the STATE OF HAWAII, by its Board of Land and Natural Resources, that in the event said General Lease No. S-4191 is surrendered or defaulted upon by LESSEE, UNIVERSITY OF HAWAII, prior to the expiration of the term thereof, the attached SUBLEASE dated _____, shall remain in full force and effect for the remainder of the term thereof, and SUBLESSEE, CALIFORNIA INSTITUTE OF TECHNOLOGY, shall be allowed its continued right to quiet enjoyment of the demised premises, upon and subject to the terms, conditions and covenants of General Lease No. S-4191, including, but not limited to, the payment of

all lease rentals, taxes, rates, assessments, duties, charges and other outgoings of every description as to which the premises under said SUBLEASE or any improvements thereon, now or may be assessed or become liable by authority of law during the remainder of the term of said SUBLEASE.

IN WITNESS WHEREOF, the STATE OF HAWAII by its Board of Land and Natural Resources has caused the seal of the Department of Land and Natural Resources to be hereunto affixed and these presents to be duly executed this 30th day of October, 1985.

STATE OF HAWAII

By S. Ono
Chairman and Member
Board of Land and Natural Resources

And By J. Douglas Fry
Member
Board of Land and Natural Resources

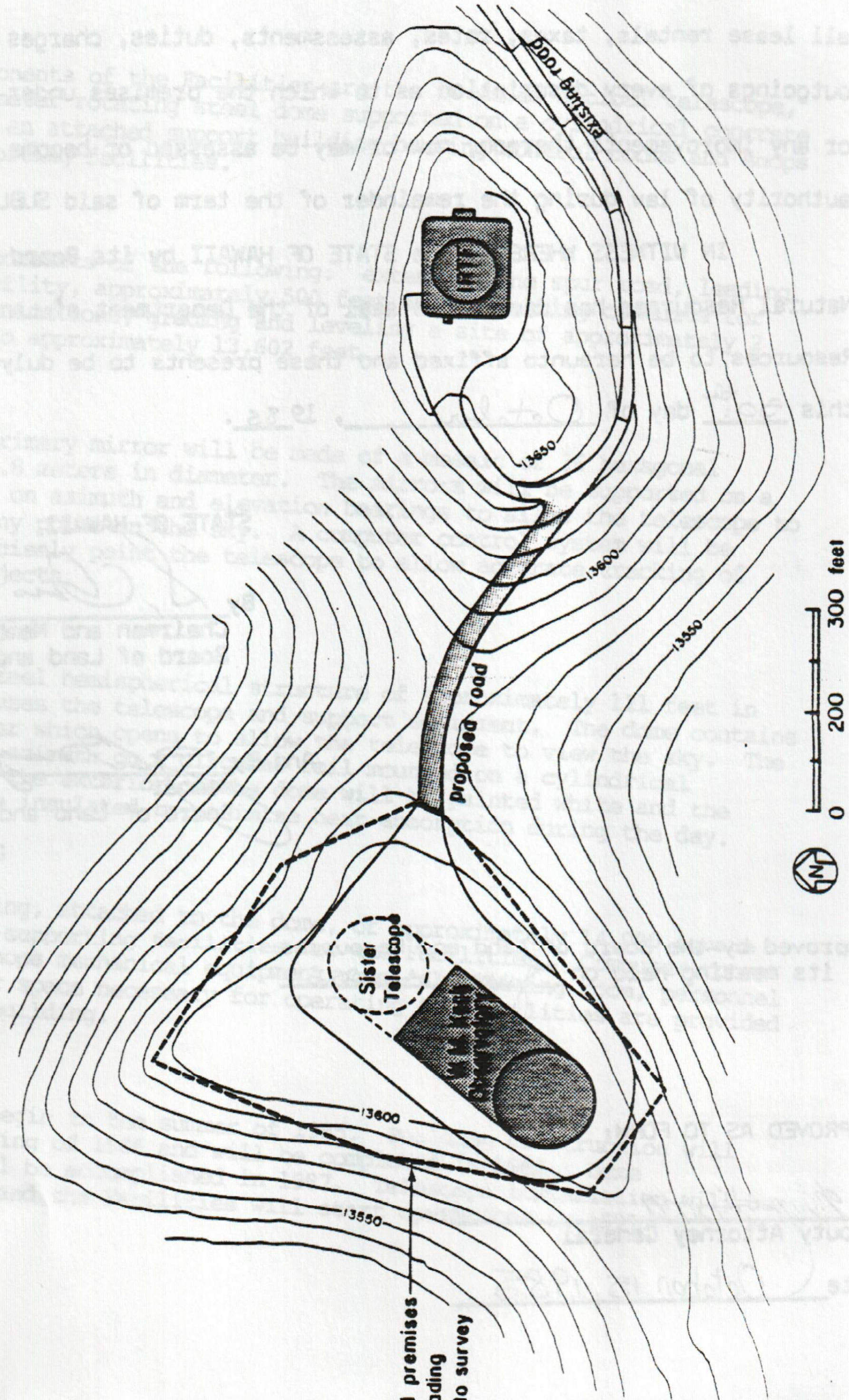
Approved by the Board of Land and Resources at its meeting held on June 14, 1985

APPROVED AS TO FORM:

Philip H. ...
Deputy Attorney General

Date October 15, 1985

DEMISED PREMISES



DESCRIPTION OF THE CONSTRUCTION

THE FACILITIES

The major components of the Facilities are the 10-meter optical telescope, a 121-foot diameter rotating steel dome supported on a cylindrical concrete foundation and an attached support building housing control rooms and shops and other supporting facilities.

SITE WORK

The site work consists of the following: extending the spur road, leading to the IRTF facility, approximately 500 feet and installing conduits for power and communications; grading and leveling a site of approximately 2 acres in area to approximately 13,602 feet.

TELESCOPE

The telescope primary mirror will be made of a mosaic of 36 hexagonal mirrors, each 1.8 meters in diameter. The mirrors will be supported on a steel structure on azimuth and elevation bearings to allow the telescope to be pointed to any point in the sky. A computer control system will be provided to precisely point the telescope to allow accurate tracking of astronomical objects.

DOME

The dome is a steel hemispherical structure of approximately 121 feet in diameter and houses the telescope and support equipment. The dome contains a movable shutter which opens to allow the telescope to view the sky. The dome rotates in azimuth on a circular rail mounted on a cylindrical concrete base. The exterior on the dome will be painted white and the interior will be insulated to minimize heat absorption during the day.

SUPPORT BUILDING

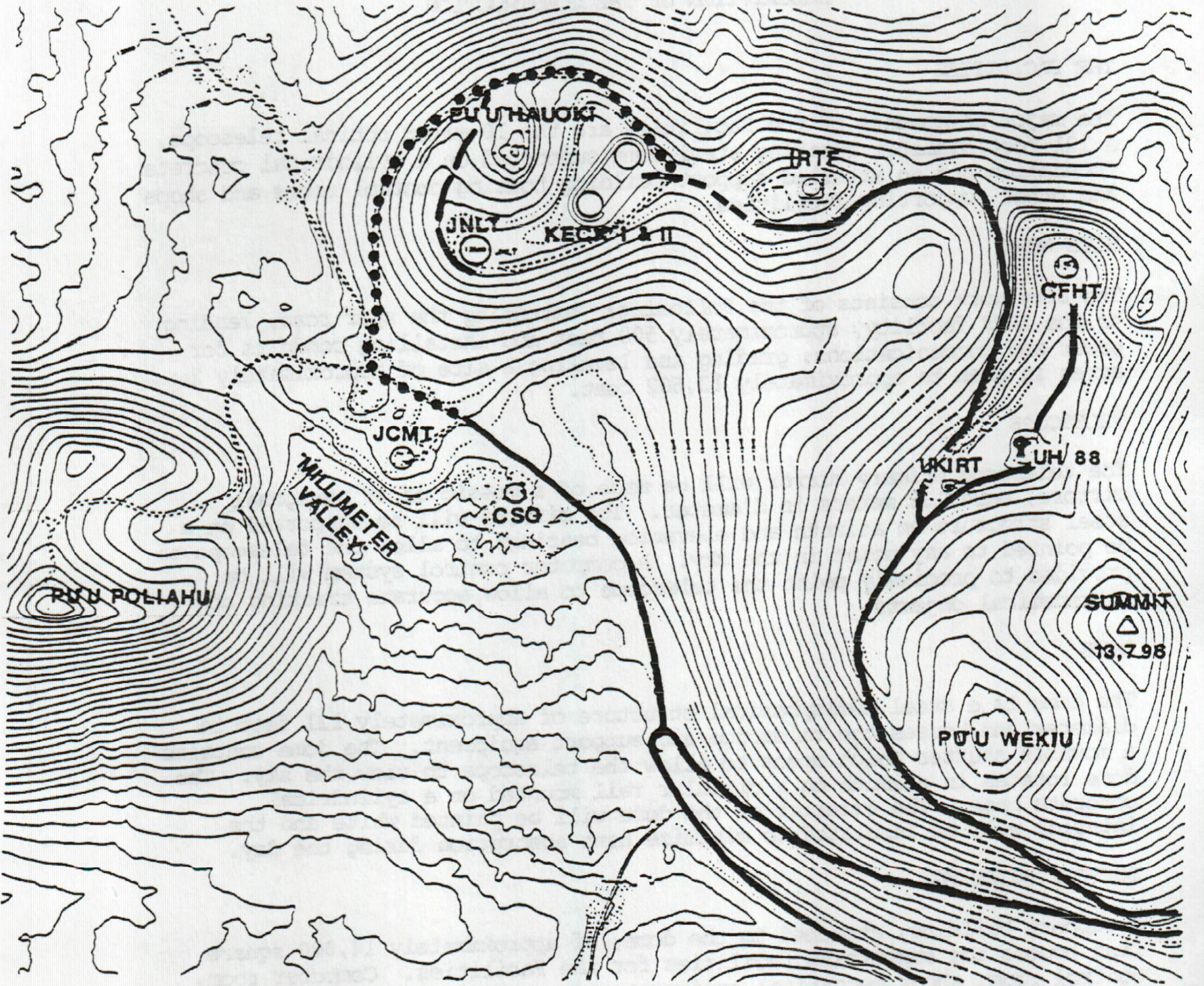
A support building, attached to the dome, of approximately 14,000 square feet houses the supporting facilities for the Facilities. Computer room, control room, shops mechanical equipment room, aluminizing room, personnel lounge and other space necessary for operating the Facilities are provided in the support building.

SCHEDULE

Site work will begin in the summer of 1985. Building construction will begin in the spring of 1986 and will be completed in 1988. Dome installation will be accomplished in 1987. Telescope installation will be started in 1988 and the Facilities will start operations in 1991.

ACCESS ROAD

OSDA ATTACHMENT B



LEGEND

- EXISTING PAVED ROADS
- MAUNA KEA DETOUR ROAD
- JNLT SPUR ROAD
- KECK SPUR ROAD