

OPERATING AND SITE DEVELOPMENT AGREEMENT

BETWEEN

THE NATIONAL ASTRONOMICAL OBSERVATORY OF JAPAN

AND THE

UNIVERSITY OF HAWAII

CONCERNING THE

DESIGN, CONSTRUCTION AND OPERATION

OF THE 8-METER JAPAN NATIONAL LARGE TELESCOPE

ON

MAUNA KEA, HAWAII

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**OSDA ATTACHMENT A: SUBLEASE AND NON-EXCLUSIVE EASEMENT AGREEMENT BETWEEN
THE NATIONAL ASTRONOMICAL OBSERVATORY OF JAPAN 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

OPERATING AND SITE DEVELOPMENT AGREEMENT

THIS AGREEMENT is made this 5th day of June, 1992, by and between the NATIONAL ASTRONOMICAL OBSERVATORY OF JAPAN ("NAOJ") 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, NAOJ has initiated a program to construct a telescope of 8-meter aperture and related facilities dedicated to observations at these wavelengths, and is desirous of locating this telescope and related facilities on Mauna Kea;

WHEREAS, NAOJ and UH believe that the best interests of both parties are to be served through a program of close scientific cooperation centered around this telescope and related facilities;

WHEREAS, the operation of the Japan National Large Telescope on Mauna Kea will greatly benefit the academic and research programs at UH;

WHEREAS, NAOJ and UH have a common interest in insuring that the development of the Mauna Kea site will enhance the effective operation of this telescope;

WHEREAS, NAOJ (formerly Tokyo Astronomical Observatory) and UH executed a Memorandum of Understanding on August 12, 1986, as revised by subsequent amendments, which provides that once NAOJ has identified funds for the construction and operation of astronomical facilities on Mauna Kea, an Operating and Site Development Agreement shall be negotiated between UH and NAOJ, under which NAOJ shall pay a mutually agreed-upon share of (1) the common costs related to the operations of the Mauna Kea Observatory, (2) the construction costs for a commercial electric power line to bring power from the public utility line and for telephone and data communications for use at the Japan National Large Telescope site, and (3) improvement of the road from the Mid-Level Facilities to the Japan National Large Telescope site;

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

I. DEFINITIONS

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

"Base Support Facilities" refer to the headquarters for the Japan National Large Telescope operations in Hawaii.

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

"Demised Premises" refer to the land subleased to NAOJ 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 NAOJ under the terms of the Sublease.

"Facilities" include, but are not limited to, the Telescope and dome; 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.

"JNLT" stands for the Japan National Large Telescope and includes the Telescope and the entire operation in Hawaii to support the Telescope including the Facilities, the NAOJ share of the Mid-Level Facilities, and any Base Support Facilities, or other facilities that may be built or operated in Hawaii on behalf of NAOJ.

"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 W. M. Keck Observatory (Keck I), the VLBA Antenna, Keck II, and the JNLT. Future telescope facilities forming a part of the Mauna Kea Observatories shall 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 at the Mauna Kea Observatories. The committee reviews the activities and management of MKSS and recommends changes to the Director, IfA.

"NAOJ" stands for the "National Astronomical Observatory of Japan", which is the national inter-university research institute for astronomy, located in Mitaka, Tokyo, responsible for construction and operation of the JNLT.

"OSDA" stands for this "Operating and Site Development Agreement Between the National Astronomical Observatory of Japan and the University of Hawaii Concerning the Design, Construction, and Operation of the 8-Meter Japan National Large Telescope 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 NAOJ.

"Principal Parties" are NAOJ and UH, and refer to the Principal Parties of this OSDA.

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

"Telescope" is a reflecting telescope of 8-meter aperture to be located on the Demised Premises, used for astronomical observations.

II. LOCATION OF THE FACILITIES

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

III. INTERACTION BETWEEN NAOJ AND UH

While the Principal Parties to this OSDA are NAOJ and UH, day-to-day interaction between them will usually be carried out by specified representatives of NAOJ and UH. In the case of UH, this will normally be the Director of the IfA and, in the case of NAOJ, this will normally be the Director, NAOJ, during the design, construction, and operation of the Facilities.

IV. 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. NAOJ, as representative of the JNLT, shall be entitled to appoint two 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.

V. SOLE RESPONSIBILITIES OF NAOJ

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

NAOJ shall be solely responsible for securing the funding for the design, fabrication, installation, construction and operation of the Facilities. NAOJ shall ensure that the documentation and user system for the JNLT shall be usable by English-speaking astronomers and technicians.

B. Power and Communications Conduits and Lines

NAOJ shall fund and arrange for the installation of electric power and communications conduits from a handhole near the JNLT site to the Facilities. These conduits shall conform to the standards set for the summit power and communications distribution system (see V.I.E.1.a). NAOJ shall also fund and arrange for connection of commercial power and telephone service via these conduits, both of which shall be individually metered. The extension of the summit power and communications loop to the above-mentioned handhole is discussed in V.I.E.1.c.(iii).

VI. RESPONSIBILITIES SHARED JOINTLY BY NAOJ AND UH

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 man-made light emanating from other areas of the County of Hawaii during nighttime does not over time increase significantly or change in character, so as to interfere with the effectiveness of optical or infrared observations.

2. NAOJ:

NAOJ shall conduct its 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 to the appropriate local authorities, and on behalf of NAOJ or its designee(s), such applications for permits connected with the Facilities as are required and have been prepared by NAOJ for use of State of Hawaii land, including Mid-Level Facilities and Base Support Facilities.

2. NAOJ:

NAOJ or its 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 NAOJ right of access to the Demised Premises, and shall ensure its right to have access to a handhole or handholes for the commercial power, telephone, and data communications described in V.B. and VI.E.1.c.(i), under the conditions described therein. UH shall grant to or use its best efforts to obtain for NAOJ such other rights of access as may be needed by NAOJ for utilities and cableways.

2. NAOJ:

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

D. Access Roads to the Facilities

1. UH:

UH shall provide to NAOJ the use of existing roads, including the unpaved Mauna Kea Detour Road, for access to the Facilities (see Attachment B). Improvement and paving of existing roads is discussed in VI.E.1.a.

2. NAOJ:

NAOJ shall design, construct, and exclusively fund the JNLT Spur Road (Attachment B), which design shall be subject to the approval of UH and BLNR.

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), comprising two conduits containing the electrical cables, and conforming to HELCO standards, 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 connecting roads to the existing facilities at the summit.

UH considers the following two projects related to roads to be essential further improvements to the Mauna Kea infrastructure:

(i) Improvement of the Mauna Kea Access Road from Hale Pohaku to the 11,800 foot elevation so as to allow transportation of 8-meter mirrors.

(ii) Improvement of the Mauna Kea Detour Road, as required, to accommodate 8-meter mirrors.

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

(iii) 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.

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

(v) Improvement and paving of the Mauna Kea Access Road from Hale Pohaku to the 11,800 foot elevation.

Furthermore, UH in consultation with the Mauna Kea Users will continue to evaluate the desirability of paving the Mauna Kea Detour Road.

b. Access to Existing Improvements by NAOJ:

NAOJ shall have access to the infrastructure improvements described in V.I.E.1.a., as follows:

(i) NAOJ shall have access to commercial power for the Facilities to a peak capacity of 600 kVA. The Facilities shall connect to the commercial power and telephone service and to the communications conduits as described in V.B and V.I.E.1.c.(i).

(ii) NAOJ shall have the use of the access roads within the Mauna Kea Science Reserve subject to the conditions given in VI.D.

(iii) NAOJ 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 (see VI.G.2.c.). The costs associated with connecting the Facilities to the network shall be borne by NAOJ.

c. Contribution to Future Infrastructure Improvements by NAOJ:

NAOJ shall contribute a total of TWO MILLION, THREE HUNDRED TEN THOUSAND, NINETY-ONE Dollars (\$2,310,091) (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.

The following items shall have first priority in the use of the funds provided by the NAOJ infrastructure contribution:

(i) Extension of the summit power and communications distribution loop from its current terminus at handhole group 23 near the W. M. Keck Observatory to a handhole near the JNLT site. This extension shall conform to the standards set for the summit power and communications distribution system.

(ii) Improvement of the Mauna Kea Detour Road, as required, to accommodate 8-meter mirrors.

(iii) Improvement of the Mauna Kea Access Road from Hale Pohaku to the 11,800 foot elevation so as to allow transportation of 8-meter mirrors.

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

Should the funds provided by the NAOJ infrastructure contribution be insufficient to complete item (iii) above, UH shall use its best efforts to secure funds for (iii) from the infrastructure contributions of other new 8-meter class facilities also needing to transport large mirrors over the Mauna Kea Access Road.

This infrastructure contribution shall be made within THIRTY (30) days of the execution of this OSDA. The Principal Parties may agree to have NAOJ arrange for some or all of these infrastructure improvements (e.g., extension of distribution loop), 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 NAOJ, UH shall arrange for the expansion of the Mid-Level Facilities to accommodate additional dormitory space for NAOJ subject to separate written agreement negotiated between NAOJ and UH. In the event, however, that agreement cannot be reached, UH shall be under no obligation to provide space for NAOJ at the Mid-Level Facilities.

b. NAOJ:

If NAOJ elects to participate in expansion of the Mid-Level Facilities, this participation shall be governed by the terms of the separate agreement negotiated between NAOJ and UH.

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. NAOJ:

(i) NAOJ shall fund the initial costs of the design and installation of an Information Station display for the JNLT, which display is subject to the approval of UH.

(ii) If a substantial increase in visitors from Japan and elsewhere places increased or specifically Japanese demands on the existing Information Station at Hale Pohaku, then NAOJ shall provide funds for expansion and augmented operation of the Information Station and updating of the displays and materials provided at the Information Station as needed to meet these increased demands. The details of the contribution by NAOJ shall be governed by the terms of a separate agreement to be negotiated between NAOJ and UH.

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 VI.E.1. through VI.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 NAOJ 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 NAOJ shall have access to such improvements, and NAOJ shall be liable to contribute to the cost of such improvements, only if and to the extent that NAOJ and UH have agreed in writing to such access and contributions. If NAOJ elects to participate in any such improvements, NAOJ and UH shall negotiate in good faith to determine the fair share of the cost of such improvements which NAOJ 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 NAOJ of any such improvements. In cases where utilization is not readily quantifiable, the share paid by NAOJ shall not exceed a fraction, the numerator of which is One (1), and the denominator of which is the number of subleases, including the NAOJ Sublease, which have been executed for land within the Science Reserve for separately identified telescope facilities.

F. Base Support Facilities

1. UH:

If NAOJ elects to construct Base Support Facilities on State of Hawaii land, UH shall make every effort to make State land available at a location desired by NAOJ and/or to coordinate the development of common Base Support Facilities. NAOJ participation on State land shall be governed by the terms of separate agreement(s) between UH and NAOJ.

2. NAOJ:

If NAOJ elects to site and operate its Base Support Facilities on land owned by the State of Hawaii, it shall do so in a manner which fosters cooperation with other telescope projects located on the same premises.

G. Operations and Maintenance

1. UH:

a. UH shall provide services on a basis of no profit, no loss to NAOJ 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; NAOJ shall have the right to use these services at an annually negotiated rate.

c. NAOJ shall be represented on the MKSS Oversight Committee which reviews existing activities and recommends changes to the activities of MKSS.

2. NAOJ:

- 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 as described in VI.G.1. and, during the construction of the Facilities, contribute to a separately negotiated share of such costs, including road maintenance and snow removal.
- c. Shall fund the cost of operating and maintaining the power and communications lines from the handhole described in V.B. to the Facilities. In addition, NAOJ shall pay an annually negotiated share of the operational costs of the Mauna Kea Observatories Communications Network should the JNLT 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.

VII. ASSIGNMENT OF RIGHTS AND DELEGATION OF RESPONSIBILITIES BY NAOJ

NAOJ may assign certain of its rights, and delegate certain of its obligations and responsibilities hereunder to other agents. However, it is understood that NAOJ shall be ultimately responsible to UH for the obligations and responsibilities undertaken by them in this OSDA.

Furthermore, immediately upon execution of this OSDA and for so long as it shall remain in force, NAOJ shall fulfill all of its obligations as specified in Attachment A hereto.

VIII. 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. NAOJ undertakes that, if considering any such 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.

IX. SCIENTIFIC COOPERATION

In recognition of the potential for scientific interaction between NAOJ and UH which the Facilities offer, and of the contribution of UH in making the site available to NAOJ, NAOJ and UH 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. Observing time shall be allocated on the basis of scientific merit and technical feasibility.

b. The JNLT shall be scheduled in blocks of no more than Six (6)-month intervals. During any such Six (6)-month interval, 26 observing nights of observing time, equitably distributed over the phases of the moon, shall be allocated to UH. Averaged over any consecutive Twelve (12)-month period, a total of 52 observing nights shall be allocated to UH and shall be equitably distributed over the seasons of the year. For these purposes, an observing night is the normally scheduled period beginning some time after 12:00 noon on one day and ending before 12:00 noon on the next day. In the event of a catastrophic failure of the JNLT, UH will, if appropriate, agree to temporarily reduce its entitlement to observing time during the period of impact of such failure.

c. Recognizing the need for additional engineering time in the two years following first light, UH will instead receive 15% of the time remaining after up to 70% engineering time is deducted in the first year and up to 30% engineering time in the second year.

d. Only proposals having a UH-affiliated 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 included in the UH allocation of time. 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 NAOJ Director and shall be performed by a single individual designated to perform this function for the JNLT.

f. In the event that NAOJ and UH both forward proposals for the same time-critical observation, the NAOJ Director or individual scheduling the Facilities shall attempt to achieve a resolution satisfactory to NAOJ and UH. If this cannot be achieved, selection between the proposals shall be done by the NAOJ Director on the basis of scientific merit.

g. NAOJ and UH recognize that, in order to achieve the full scientific potential of the JNLT, it may be necessary to adopt innovative and flexible approaches to the scheduling of the facility. Subject to operational constraints, both NAOJ 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 reschedules time allocated to UH and time allocated to NAOJ requires the prior agreement of the directors of both the NAOJ and the IfA.

2. UH-sponsored observers shall receive technical and logistic support while at the Facilities and shall have access to the Facilities, all on the same basis as NAOJ-sponsored observers.

3. UH will be entitled to use its own instrumentation on the Telescope provided that such usage does not involve major scheduling problems or compromise the safety of the Telescope. The JNLT will provide a normal level of technical support to assist in the mounting and operation of such instruments.

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

B. UH Participation in JNLT Instrument Development

Recognizing that UH is well-qualified to make valuable contributions to the complement of instruments available for general user observing with the JNLT, NAOJ and UH agree to negotiate in good faith a separate agreement to allow for UH participation in development of instruments for the JNLT on an equal basis with University research groups in Japan.

C. UH Participation in JNLT Committee Structure

In order to encourage productive interaction between NAOJ and UH, UH shall be represented on JNLT committees as follows:

1. UH Representation on the JNLT Board

In order to facilitate NAOJ-UH interaction at all of the management, scientific and engineering levels, UH shall be entitled to nominate one scientist, with suitable management and technical qualifications, as UH member of the JNLT Board or its equivalent. The nominee shall be appointed to the Board or equivalent by the NAOJ Director. The Board shall meet at least twice a year, and one of these meetings will be held in Hawaii. In the event that UH's member is unable to attend a meeting, UH may designate an alternate. Recognizing the responsibility of the University in the management of Mauna Kea, NAOJ and UH agree to negotiate in good faith a separate agreement to allow for participation by UH Regents and administration in meetings and associated activities of the JNLT Board.

2. UH Participation on the Technical Committee for JNLT Instrument Development

UH shall have the right to nominate one member of the Technical Committee for JNLT Instrument Development or its equivalent. The nominee shall be appointed to the committee by the NAOJ Director. In the event that UH's member is unable to attend a meeting, UH may designate an alternate. The Technical Committee or equivalent shall meet at least once a year in Hawaii.

3. JNLT Time Allocation Committee (TAC)

Although the selection of the UH allocated time will not be done by this Committee (see IX.A.1.d.), a UH observer may be invited to attend JNLT TAC meetings, for purposes of developing close scientific cooperation.

4. English Translation

UH recognizes that the Board and committees mentioned above may need to conduct routine business in the Japanese language. NAOJ agrees that, in such circumstances, it will provide simultaneous English translation so as to permit UH

representatives attending the meeting to participate. NAOJ further agrees to provide UH with an English translation of minutes and proceedings of meetings.

D. Commercial Use of Images

Images obtained with the use of the JNLT shall not be used for commercial purposes without the prior written approval of the NAOJ Director, who shall insure that the implementation of this policy does not impede publication of scientific results or scientific communications. Copyright to all such images shall vest in the agency 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, JNLT shall be given appropriate credit and shall be referred to as the "Japan National Large Telescope of the National Astronomical Observatory of Japan." 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.

F. Interaction with U.S. and Japanese News Media

Except for the publication of scientific results, UH shall not initiate interactions with non-U.S. media in Japan or with Japanese media. Interactions with non-Japanese media in the United States and with United States media shall be coordinated between NAOJ and UH. UH and/or NAOJ may request one another to coordinate specific media events. Each party shall keep the other informed of press releases, filming and live television transmissions.

G. Interaction with UH-Manoa Academic Program

NAOJ shall fund a scientific staff position stationed at UH. This person shall be appointed by the NAOJ Director after consultation with the IfA Director. The appointee shall be fluent in both Japanese and English, and shall be available to serve as a scientific and technical liaison between the IfA and NAOJ. The individual will be located at the IfA UH-Manoa headquarters, or at some other location subject to the approval of the IfA Director, and will be entitled to apply for telescope time in the same way as other IfA scientific staff members.

X. INDEMNIFICATION/INSURANCE

NAOJ 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 on the Demised Premises and roadways adjacent thereto which arises from any act or omission of NAOJ, its officers, agents, employees, or invitees, or occasioned by any failure on the part of NAOJ 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, NAOJ shall be responsible for maintaining liability insurance for personal injury or death and property damage in the minimum amounts of ONE MILLION DOLLARS/U.S. (\$1,000,000.00/U.S.) per person and FIVE MILLION DOLLARS/U.S. (\$5,000,000.00/U.S.) per occurrence for personal injury or death, and FIVE HUNDRED THOUSAND DOLLARS/U.S. (\$500,000.00/U.S.) 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 UH and 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.

XI. ATTORNEY'S FEES

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

XII. SERVICE OF PROCESS

NAOJ shall designate a representative within the State of Hawaii duly authorized to accept service of process on its behalf.

XIII. 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 any provision of this OSDA shall be held by a court of competent jurisdiction to be contrary to law, the remaining provision of this OSDA shall remain in full force and effect.

XIV. AMENDMENTS TO THIS OSDA

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

XV. TERM OF THIS OSDA

This OSDA shall become effective on the date first above written to execute this document or the effective date of the Sublease, whichever is later, and shall terminate as provided in XVII.

XVI. 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 NAOJ and UH agree to negotiate in

good faith any revisions thereto proposed at the time by either NAOJ or UH.

XVII. TERMINATION

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

1. Mutual written agreement of NAOJ and UH.
2. Termination of the Sublease.
3. Termination of management or operation of the Facilities by NAOJ.
4. December 31, 2033, when General Lease No. S-4191 terminates, unless a suitable extension or new lease as allowed for in XVI has been negotiated.

XVIII. DISPOSITION OF FACILITIES ON TERMINATION

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

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 6/5/92
Donald N. B. Hall Date
Its Director

By Ralph T. Horii, Jr. 6/5/92
Ralph T. Horii, Jr. Date
Its Vice President
for Finance and Operations

By Albert J. Simone 6/5/92
Albert J. Simone Date
Its President

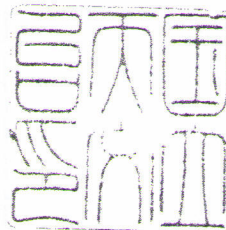
Approved as to form:

By Harriet Y. Lewis 5/20/92
Harriet Y. Lewis Date
Its Deputy Attorney General

FOR THE NATIONAL ASTRONOMICAL OBSERVATORY OF JAPAN:

By Harushige Nagasue 6/2/92
Harushige Nagasue Date
Its Chief of Administration
and Obligating Officer

By Yoshihide Kozai 6/2/92
Yoshihide Kozai Date
Its Director



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

OSDA ATTACHMENT A

By [Signature]
Donald N. B. Hall
In Director

SUBLEASE AND NON-EXCLUSIVE EASEMENT AGREEMENT

By [Signature]
Albert I. Shapiro
In President

BETWEEN

THE NATIONAL ASTRONOMICAL OBSERVATORY OF JAPAN

By [Signature]
Takashi Y. Iwano
In Deputy Attorney General

AND

THE UNIVERSITY OF HAWAII

By [Signature]
Hiroshi Kozu
In Chief of Administration and Obliging Officer

By [Signature]
Takashi Kozu
In Director

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SUBLEASE AND NON-EXCLUSIVE EASEMENT AGREEMENT

^{5th} THIS Sublease and accompanying non-exclusive Easement is made this day of June, 1992, by and between the UNIVERSITY OF HAWAII, hereinafter called "Sublessor," and the NATIONAL ASTRONOMICAL OBSERVATORY OF JAPAN, 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.

WITNESSETH THAT:

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 Between The National Astronomical Observatory of Japan and the University of Hawaii Concerning the Design, Construction and Operation of the 8-Meter Japan National Large Telescope on Mauna Kea, Hawaii" (hereinafter "OSDA").

Construction will include the Japan National Large Telescope (hereinafter "JNLT") building and dome, its optical/infrared telescope having an effective diameter of approximately 8 meters, related equipment and instrumentation and related support facilities and infrastructure improvements required on the Demised Premises to support the operations of the JNLT (collectively "Facilities").

I. GENERAL

A. Location/Area

The location/area comprises a portion of that certain land area, described in General Lease S-4191 and its Exhibit A, and more specifically identified in Exhibit C attached hereto.

B. Non-Exclusive Easement

Sublessee shall have the right of access to and egress from the Demised Premises over and across the Mauna Kea Science Reserve, utilizing the common entrances and rights of way, together with others entitled thereto under such rules and regulations as may be established by and amended from time to time by Sublessor.

C. Survey/Specific Description

The site designated in Exhibit C is subject to survey by Sublessee within SIX (6) months from the date of this Sublease. The exact area covered by this Sublease shall

be more specifically described and agreed to by Sublessor and Sublessee after the aforesaid survey has been completed, and is subject to approval by the County of Hawaii. Such description shall be binding upon Sublessor, Sublessee and the State of Hawaii.

D. Term of Sublease

The term of this Sublease shall be from the date first above written and shall expire on December 31, 2033, unless sooner terminated or extended, as respectively provided for in IV.F and II.C.

E. Rental Charge

Sublessee hereby covenants and agrees to pay rental for the Demised Premises at ONE DOLLAR (\$1.00) per year in legal tender of the United States of America for the duration of the Sublease. Said fee shall be paid to the University of Hawaii, Vice President for Finance and Operations, 2444 Dole Street, Honolulu, Hawaii 96822, U.S.A.

F. Fire or Destruction of Facilities

If all three of the following events occur: (1) the Facilities are destroyed by fire or other causes rendering the same unsuitable for purposes of optical and infrared astronomy, (2) Sublessee elects not to restore the Facilities, and (3) this Sublease is terminated as provided for in IV.F.6., 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 unreasonably withheld.

G. Controlling Lease

Sublessee shall observe and comply with all terms and conditions of General Lease S-4191.

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 the Sublessee to maintain the Demised Premises in a safe condition or to observe or perform any of the terms and conditions herein or any regulation, ordinances and laws of the Federal, State, Municipal or County governments.

Additionally, Sublessee shall be responsible for maintaining liability insurance for personal injury or death and property damage in the minimum amounts of ONE MILLION DOLLARS (\$1,000,000.00) per person and FIVE MILLION DOLLARS (\$5,000,000.00) per occurrence for personal injury or death, 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, U.S.A.

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 the 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 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 the 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 other similar 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, however, that such consent shall not be arbitrarily or capriciously withheld or delayed, and that this provision shall not operate to prevent Sublessee from making the Demised Premises available to invitees for the purposes permitted hereunder.

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 agreements which may be agreed to by Sublessor and Sublessee.

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.

H. Improvements and Alterations

Sublessee shall, at the Sublessee's sole cost and expense, construct the Facilities or cause them to be constructed on the Demised Premises.

In the event that Sublessee desires to make a substantive structural alteration of or addition to the Facilities, which will significantly alter the external appearance or structure of the Facilities, Sublessee first must seek and obtain written approval of Sublessor prior to commencing work on such structural alteration or addition, which approval shall not be withheld unreasonably.

Sublessor shall use its best efforts to secure Lessor's consent and to provide its own approval or objection within SIXTY (60) days after receipt by Sublessor of any request for approval for such structural alteration or addition.

I. Laws, Rules and Regulations, etc.

Sublessee shall observe and comply with Chapter 2 of Title 13, Administrative Rules of the Department of Land and Natural Resources (formerly Regulation 4), and with all other laws, ordinances, rules and regulations of the Federal, State, Municipal or County governments affecting the Demised Premises or the Facilities.

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 the 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 Finance and Operations

If to Sublessee: National Astronomical Observatory
Osawa 2-21-1
Mitaka, Tokyo
Japan PC 181
Attn: Chief of Administration

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 1999, unless otherwise agree 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' prior 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 Demised 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 be substantially equivalent to those of the OSDA.

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

SUBLESSOR:

FOR THE UNIVERSITY OF HAWAII:

By Donald N. B. Hall 6/5/92
Donald N. B. Hall Date
Its Director, Institute
for Astronomy

By Ralph T. Horii, Jr. 6/5/92
Ralph T. Horii, Jr. Date
Its Vice President for
Finance and Operations

By Albert J. Simone 6/5/92
Albert J. Simone Date
Its President

APPROVED AS TO FORM:

By Harriet G. Lewis 5/20/92
Its Deputy Attorney Date
General, University
of Hawaii

SUBLESSEE:

FOR THE NATIONAL
ASTRONOMICAL
OBSERVATORY OF JAPAN:

By Harushige Nagasue 6/2/92
Harushige Nagasue Date
Its Chief of Administration
and Obligating Officer


By Yoshihide Kozai 6/2/92
Yoshihide Kozai Date
Its Director



EMBASSY
~~CONSULATE~~ OF THE UNITED STATES OF AMERICA
TOKYO, JAPAN

)
)
) ss.

On this 2nd day of June, 1992, before me appeared
Harushige NAGASUE and Yoshihide KOZAI,
personally known to me, who, being by me duly sworn, did say that they are Chief of
Administration and Obligating Officer and Director
respectively, of the National Astronomical Observatory of Japan; that the seal affixed
to the foregoing instrument is the official seal of said institution; that said instrument
was signed and sealed on behalf of said institution; and said
Harushige NAGASUE and Yoshihide KOZAI
acknowledged the instrument to be the free act and deed of said institution.


~~Notary Public, Consulate of the U.S.A.~~
~~Tokyo, Japan~~ Nancy Corbett
Vice Consul of the United States of America
duly commissioned and qualified
~~My commission expires.~~

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

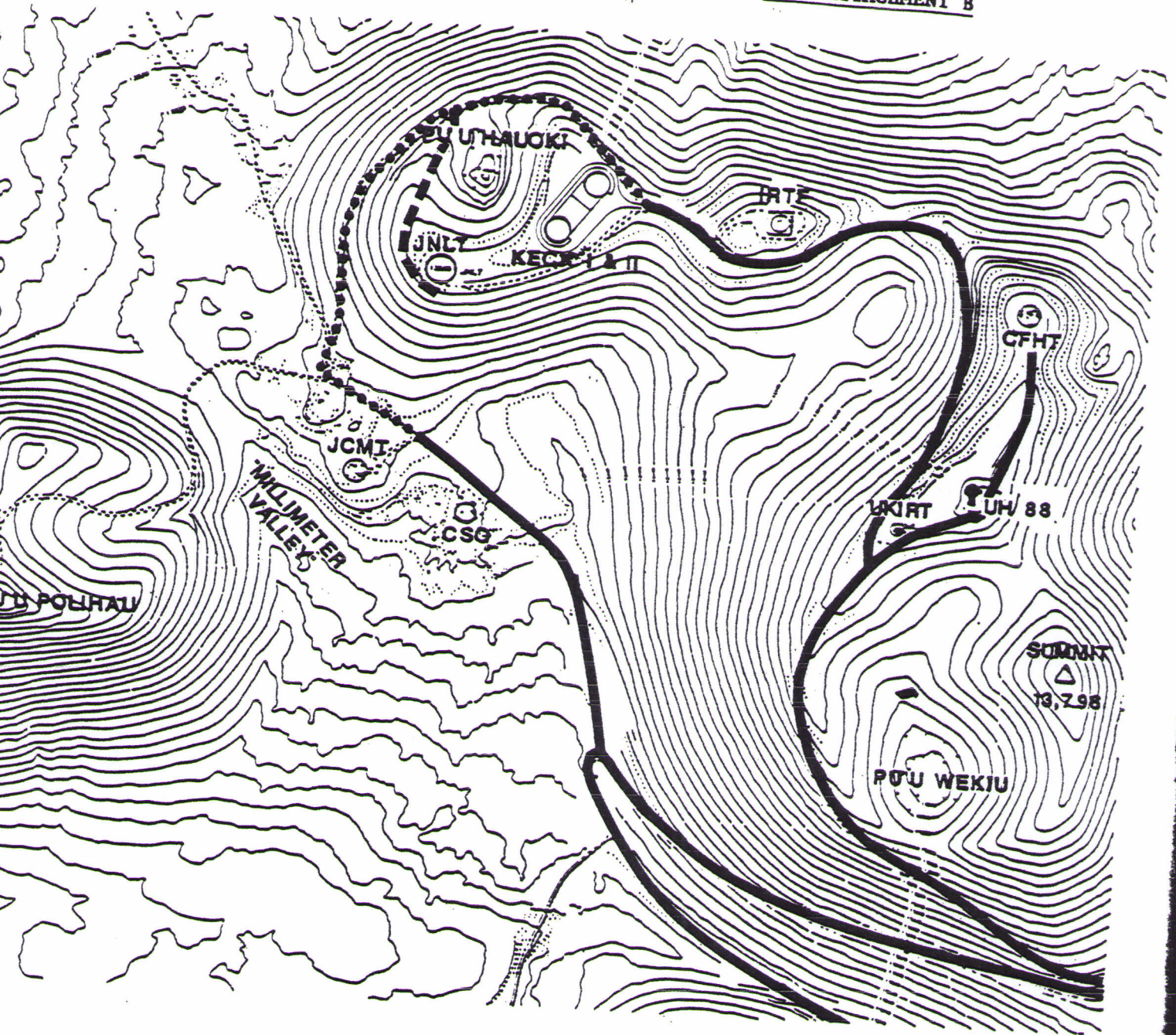
On this 5 day of June, 1992, before me appeared Donald N. B. Hui, Ralph T. Horii Jr. and Albert J. Simone, personally known to me, who, being by me duly sworn, did say that they are DIRECTOR, V.P. Finance & Operations and President, respectively, of the University of Hawaii, a Hawaii corporation; that 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 they and _____ acknowledged the instrument to be the free act and deed of said corporation.

Nancy S. Little
Notary Public, First Circuit
State of Hawaii

My commission expires: 4/4/96

ACCESS ROADS

OSDA ATTACHMENT B



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

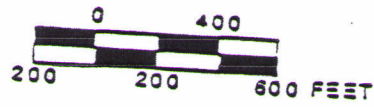


EXHIBIT "A"

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:-

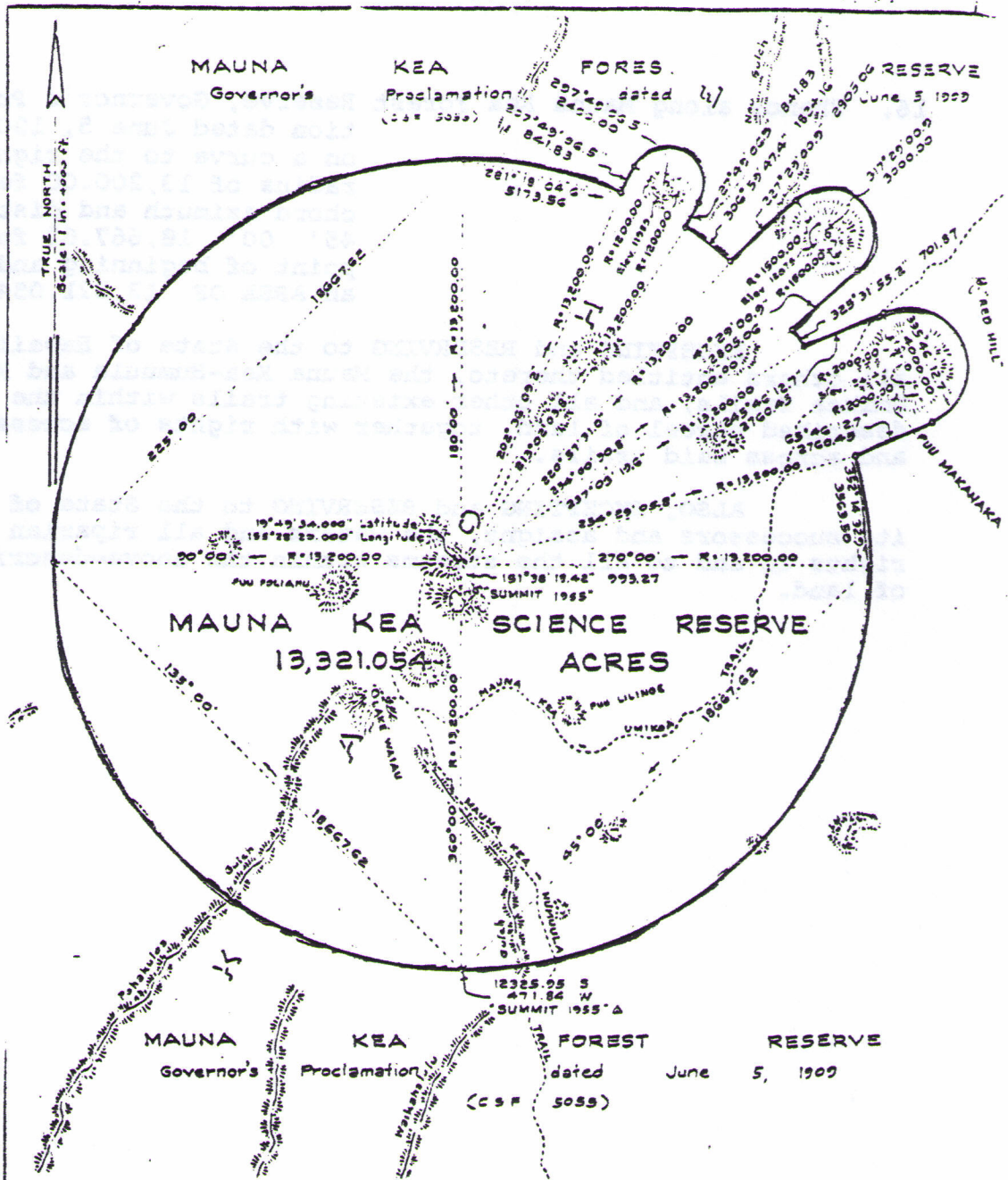
1. Along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, on a curve to the right with a radius of 13,200.00 feet, the chord azimuth and distance being: 135° 00' 18,667.62 feet;
2. Thence along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, still on a curve to the right with a radius of 13,200.00 feet, the chord azimuth and distance being: 225° 00' 18,667.62 feet;
3. 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: 281° 18' 04.6" 5173.56 feet;
4. 207° 49' 06.5" 841.83 feet along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909;
5. Thence along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, on a curve to the right with a radius of 1200.00 feet, the chord azimuth and distance being: 297° 49' 06.5" 2400.00 feet;

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° 14' 32.9" 3563.50 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.



MAUNA KEA SCIENCE RESERVE

Kaohae, Hamakua, Island of Hawaii, Hawaii

Scale: 1 inch = 4000 feet

JOB 4-3878
C. BK 1951-Hawaii, 5/2/51

TAX MAP 4-4-15

SURVEY DIVISION
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
STATE OF HAWAII

C. S. P. No. 5344

1951 Sept 10 1951

SUBLEASE EXHIBIT B

LAND COURT SYSTEM

REGULAR SYSTEM

Return by Mail () Pickup () To:

Total Number of Pages:

Tax Map Key No. (3)4-4-15:09

CONSENT TO SUBLEASE OF GENERAL LEASE NO. S-4191

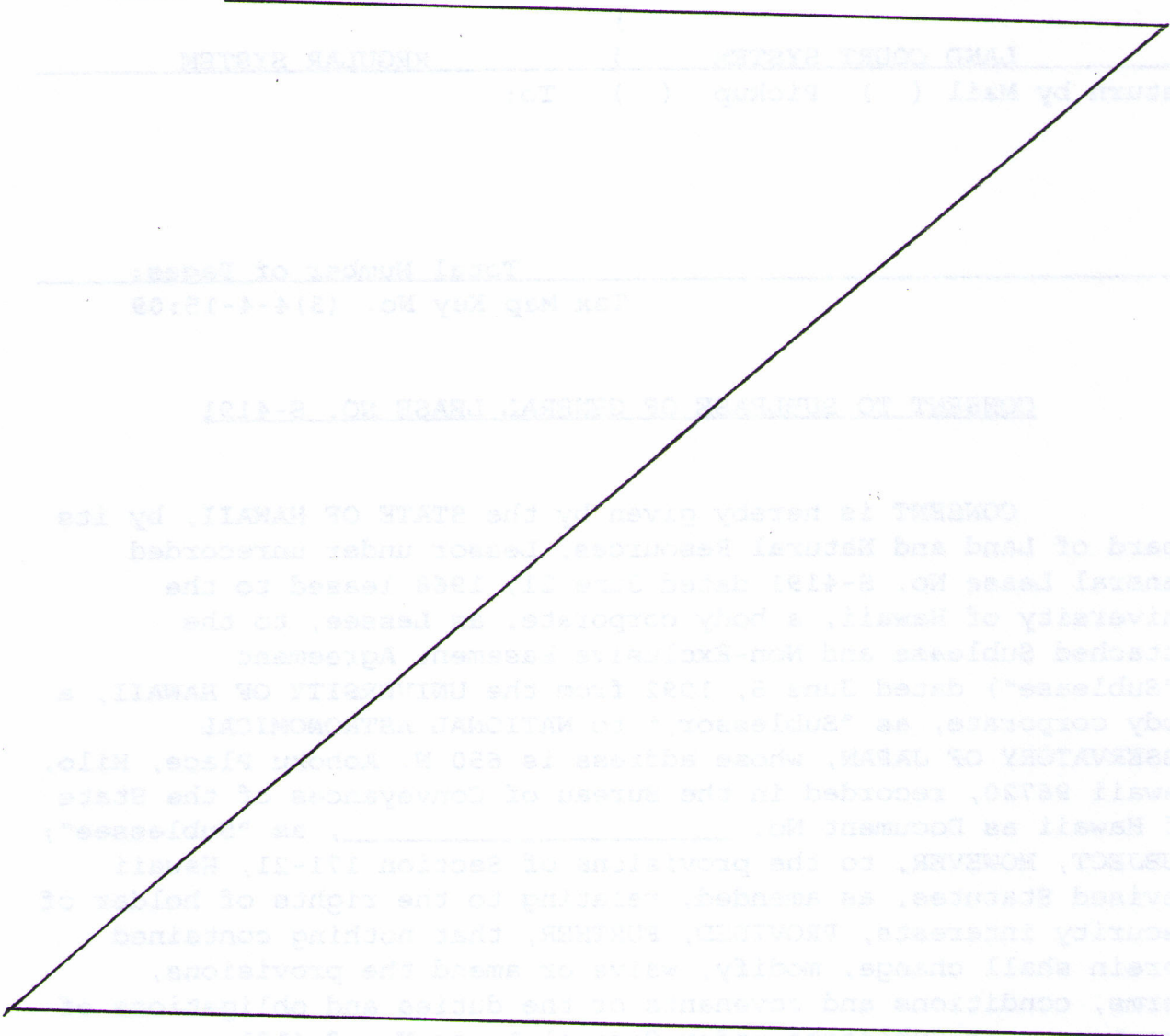
CONSENT is hereby given by the STATE OF HAWAII, by its Board of Land and Natural Resources, Lessor under unrecorded General Lease No. S-4191 dated June 21, 1968 leased to the University of Hawaii, a body corporate, as Lessee, to the attached Sublease and Non-Exclusive Easement Agreement ("Sublease") dated June 5, 1992 from the UNIVERSITY OF HAWAII, a body corporate, as "Sublessor," to NATIONAL ASTRONOMICAL OBSERVATORY OF JAPAN, whose address is 650 N. Aohoku Place, Hilo, Hawaii 96720, recorded in the Bureau of Conveyances of the State of Hawaii as Document No. _____, as "Sublessee"; SUBJECT, HOWEVER, to the provisions of Section 171-21, Hawaii Revised Statutes, as amended, relating to the rights of holder of security interests, PROVIDED, FURTHER, that nothing contained herein shall change, modify, waive or amend the provisions, terms, conditions and covenants or the duties and obligations of the Lessee or Sublessee under General Lease No. S-4191.

PRELIM. APPR'D.
Department of the
Attorney General

SEARCHED
SERIALIZED
INDEXED
FILED

IT IS UNDERSTOOD that except as provided herein, should there be any conflict between the terms of General Lease No. S-4191 and the terms of the Sublease, the former shall control; and that no further sublease or assignment of any interest of the premises or any portion thereof shall be made without the prior written consent of the Board of Land and Natural Resources.

FURTHERMORE, Lessee hereby acknowledges that the Lessor's consent to sublease under General Lease No. S-4191, does not release the Lessee of any and all responsibilities, obligations, liabilities, and claims respecting or arising under or out of said General Lease prior to the effective date of this 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 20th day of July, 1997.

STATE OF HAWAII

Approved by the Board of Land and Natural Resources at its meeting held on August 21, 1997.

By *Janet E Kawoos*
Chairperson and Member
Board of Land and
Natural Resources

LESSOR

UNIVERSITY OF HAWAII, a body corporate

By *Eugene S. Imai*
Eugene S. Imai
Its Senior Vice President for Administration

By _____
Its _____

APPROVED AS TO FORM:

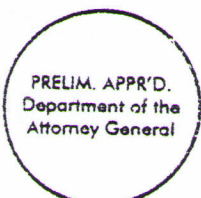
[Signature]
Deputy Attorney General

Dated: 7/13/99

By *Kenneth P. Mortimer*
Kenneth P. Mortimer
Its President, University of Hawaii and
Chancellor, University of Hawaii at
Manoa

LESSEE

2692 (5)
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STATE OF HAWAII)
CITY AND COUNTY OF HONOLULU)

SS.

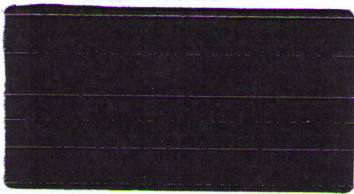
On this 19th day of April, 1999,
before me appeared KENNETH P. MORTIMER and
EUGENE S. IMAI, to me personally
known, who, being by me duly sworn, did say that they are the
President, University of Hawai'i and Chancellor, University of
Hawai'i at Mānoa and Senior Vice President for
Administration, respectively, of the UNIVERSITY OF HAWAI'I, a
body corporate, and that seal affixed to the foregoing instrument
is the corporate seal of said University and that the foregoing
instrument was signed and sealed in behalf of said University by
authority of its Board of Regents, and the said KENNETH P.
MORTIMER and EUGENE S. IMAI acknowledged said instrument to
be the free act and deed of said University.

Helen J. Nakamura

Notary Public, State of Hawai'i

HELEN T. NAKAMURA

My Commission expires: 3-27-2005 ✓



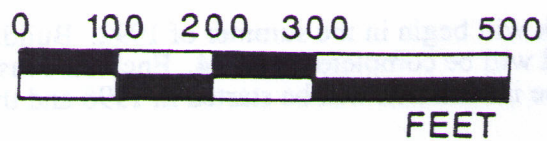
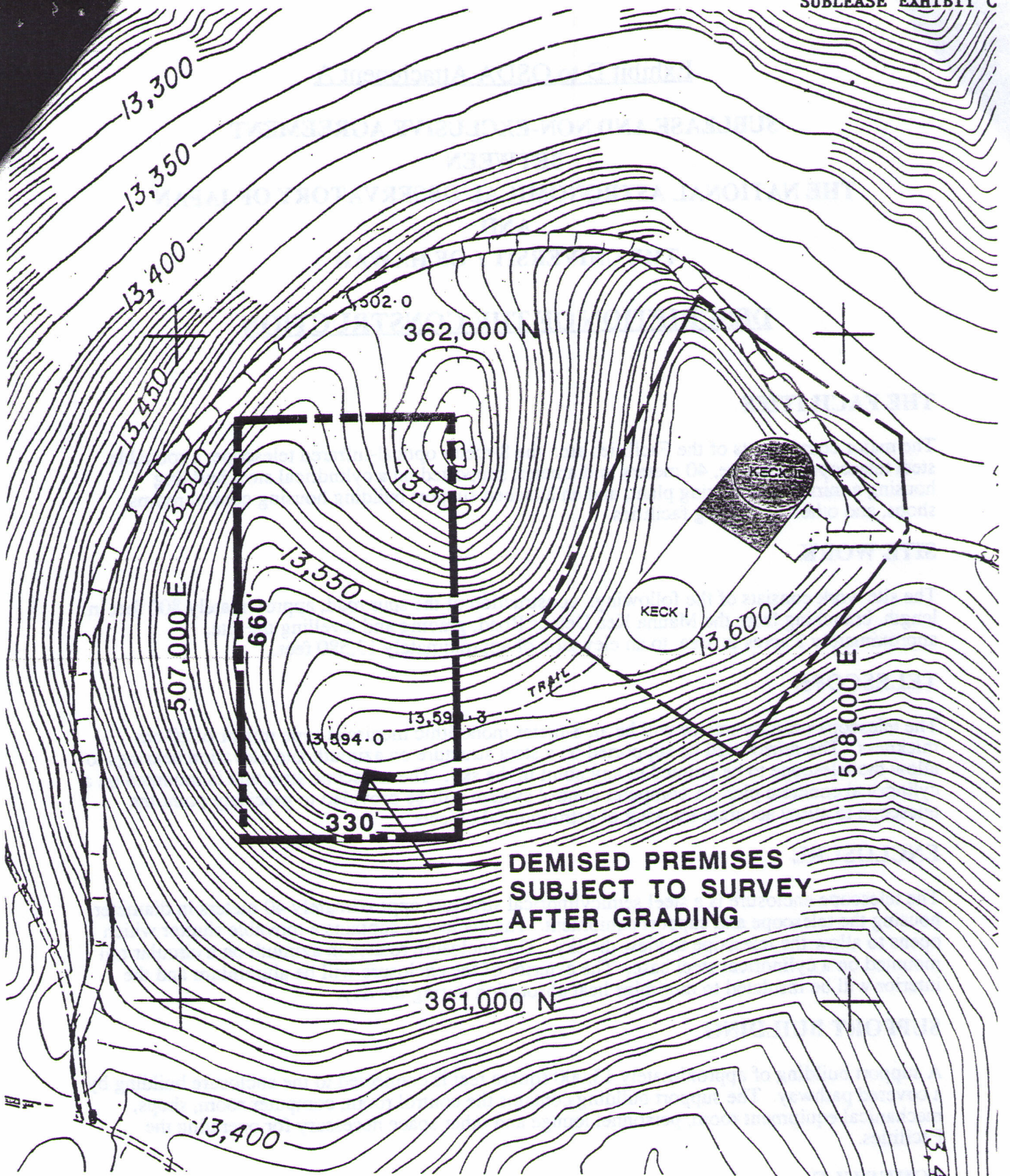


Exhibit D to OSDA Attachment A

SUBLEASE AND NON-EXCLUSIVE AGREEMENT BETWEEN THE NATIONAL ASTRONOMICAL OBSERVATORY OF JAPAN AND THE UNIVERSITY OF HAWAII

DESCRIPTION OF THE CONSTRUCTION

THE FACILITIES

The major components of the Facilities are: the 8-meter optical-infrared telescope; a rotatable steel telescope enclosure, 40 meters in diameter, supported on a cylindrical steel building housing a mirror aluminizing plant; and an attached support building housing control rooms, shops, and other supporting facilities.

SITE WORK

The site work consists of the following: construction of the spur road, approximately 800 feet in length, branching from the Mauna Kea Detour Road; grading and levelling the site, approximately 2 acres in area, to an elevation of approximately 13,580 feet.

TELESCOPE

The telescope primary mirror will be an 8-meter monolithic meniscus-type mirror of 20 cm thickness. The mirror 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. The telescope structure is mounted on a cylindrical concrete pier. A computer control system will be provided to precisely point the telescope to allow accurate tracking of astronomical objects.

ENCLOSURE

The telescope enclosure is a steel semicylindrical structure approximately 40 meters in diameter housing the telescope and support equipment. The enclosure contains a movable shutter which opens to allow the telescope to view the sky. The enclosure rotates in azimuth on a circular rail mounted on a cylindrical steel base. The exterior of the enclosure will be aluminium and the interior will be insulated to minimize heat absorption during the day.

SUPPORT BUILDING

A support building of approximately 13,000 square feet is connected to the enclosure building by a covered pathway. The support building contains the control room, computer room, shops, mechanical equipment room, personnel lounge and other space necessary for operating the Facilities.

SCHEDULE

Site work will begin in the summer of 1992. Building construction will begin in the spring of 1993 and will be completed in 1994. Enclosure installation will be accomplished in 1996. Telescope installation will be started in 1996 and the Facilities will start operations in 1999.