KUMU Transmission Tower

BENJAMIN CAYETANO
GOVERNOR

replaced by July 20, 1995 letter.

RECEIVED
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OFC. OF ENVIRONMENTAL QUALITY CONTROL

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
~~SAM CALLEJO~~
GLENN M. OKIMOTO
JERRY M. MATSUDA

IN REPLY REFER TO:
HWY-RM
3.69861

JUL 11 1995

Mr. Gary Gill, Director
Office of Environmental Quality Control (OEQC)
220 South King Street-Fourth Floor
Honolulu, Hawaii 96813

Dear Mr. Gill:

Interstate Highway, FAP No. I-H1-1(82), Keehi Interchange, Proposed KUMU Transmission Tower Negative Declaration, Chapter 343, H.R.S.

We request that you publish a notice of Negative Declaration in the "OEQC Bulletin" for our proposed use of the subject highway by Radio KUMU for a radio transmission tower. Based on the Environmental Assessment submitted by Radio KUMU and in accordance with Chapter 343-5(c), Hawaii Revised Statutes, we have determined that an environmental impact statement is not required.

We enclose four copies of the Environmental Assessment/Negative Declaration and the completed OEQC document transmittal form.

If you have any questions, please call Kats Uyeoka at 587-2027.

Very truly yours,

Kazu Hayashida

KAZU HAYASHIDA
Director of Transportation

Enclosures(4)

c: Department of Land Utilization
KUMU Radio

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NEW KUMU RADIO AM TOWER

NEW KUMU RADIO AM TOWER

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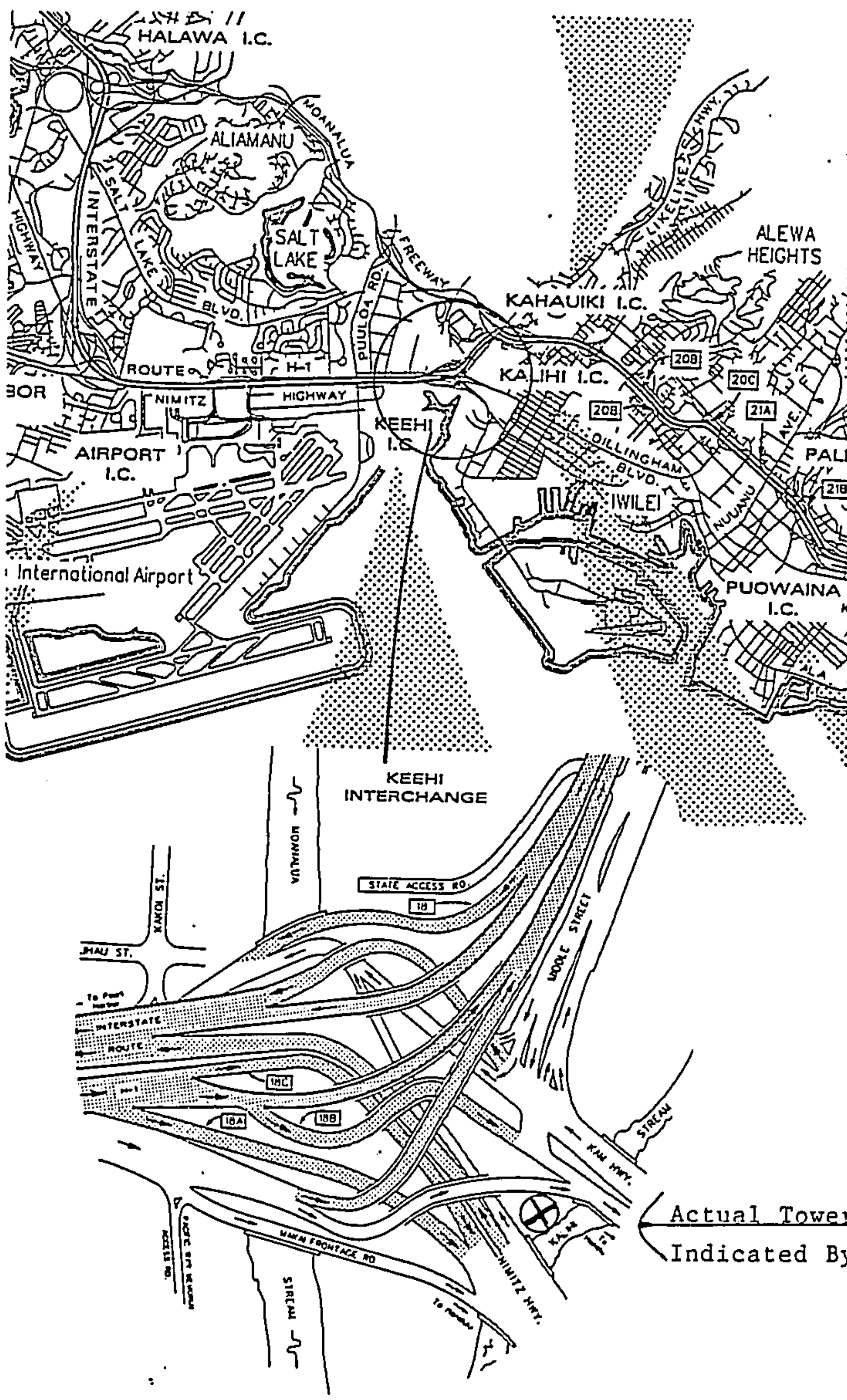
NEW KUMU RADIO AM TOWER

NEW KUMU RADIO AM TOWER

Proposed New KUMU Radio Tower



Actual Tower Location
Indicated By X ⊗

NEGATIVE DECLARATION:
USE OF INTERSTATE HIGHWAY
FAP NO. I-HI-1 (82), KEEHI INTERCHANGE, PORTION OF RIGHT-OF-WAY BETWEEN RAMPS B AND D, DIAMOND HEAD OF MIDDLE STREET, BETWEEN NIMITZ HIGHWAY AND DILLINGHAM BOULEVARD.

This negative declaration is prepared in accordance with the regulations prescribed by the Environmental Quality Commission under Chapter 343 of the Hawaii Revised Statues.

1. Location and Description of Proposed Action

   The proposed action is the use of this area of the Highway Right-of-Way to construct a new 150 foot tall radio tower and small single story transmitter facility adjacent to the tower. When completed the facility would be used by Radio Station KUMU AM. Space on the tower and facility shed would also be reserved for possible future use by the State Department of Transportation (DOT) for the creation of Highway Radio services.

2. Purpose of Proposed Action

   The proposed use of the area is sought by KUMU Radio due to the removal of a broadcast tower in Kaimuki 2 years ago. Over the past 5 years the station has diligently searched for an alternate tower site. All efforts have proven unsuccessful. For the last two years the Station has operated from a temporary site that provides at best 60% of the coverage required by the Federal Communications Commission.

3. Discussion of Environmental Impact

   Significant alteration of the character of the area.
   There will be no significant alteration of the character of the area. The only visible change will be the small triangular based lattice tower (three equal sides of 36 inches) and the small single story transmitter building. No parking stalls or living quarters will be constructed.

   Displacement of People-- There will be no displacement of individuals and /or families resulting from the proposed action.

Social, Economic, and/or Environmental Impact-- The proposed action, utilizing a portion of the Right-of-Way will have no significant effect upon the quality of human environment, nor will it have any detrimental social, economic, and/or environmental effect. Improvements involved will consist of only the tower and transmitter shed.

Effect on Plant, Wildlife or Ecological Balance of the Area-- No significant change in air, water or noise pollution problems will result.

4. Basis for Negative Declaration

By the foregoing presentation, and attached reports, it has been shown that the proposed use of the space will not have a significant effect on the environment, and therefore does not require the presentation of an Environmental Impact Statement.

Jeff J. Coelho
General Manager
Radio Kumu

JJC/cku

ENVIRONMENTAL ASSESSMENT FOR NEGATIVE DECLARATION:

USE OF INTERSTATE HIGHWAY
FAP NO.I-HI-1 (82), KEEHI INTERCHANGE, PORTION OF RIGHT-OF-WAY BETWEEN RAMPS B AND D, DIAMOND HEAD OF MIDDLE STREET, BETWEEN NIMITZ HIGHWAY AND DILLINGHAM BOULEVARD

SPECIFIC PROJECT:
KUMU RADIO TRANSMISSION TOWER

Prepared in fulfillment of the requirements of Chapter 343, Hawaii Revised Statues and Chapter 200, Title 11 Administrative Rules Department of Health, State of Hawaii

Prepared by :
KUMU RADIO
441 N. Nimitz Hwy
Honolulu Hawaii 96817

November 28, 1995

SUMMARY

Environmental Assessment and Summary for Negative Declaration:

Project Location

The project is located at the Keehi Interchange in the Kalihi district of the City and County of Honolulu (City). The site is situated on an undeveloped parcel between Nimitz Highway and the H-1 Freeway's eastbound off-ramp leading onto Dillingham Boulevard. Exhibit A-1 of Appendix A (Land Use Maps) shows the project's location and vicinity.

Land Area:

The project site encompasses about 25,000 square feet of property, and is part of a larger State-owned remnant parcel left over from the Keehi Interchange construction. The actual land developed would involve a much smaller area of about 1,000 square feet primarily for the transmitter tower and facility .

State Land Use:

The project site is designated for Urban use by the State Land Use Commission.

City Development Plan Land Use Map:

The City's Development Plan (DP) Primary Urban Center indicates that portions of the project site are situated within both Residential and Industrial land use designations. Exhibit A-2 shows the current development plan land use designations for the site and surrounding area.

Public Facilities Map:

The City's Development Plan Facilities

Map for the Primary Urban Center indicates that a corridor identified for a possible rapid transit transportation system (HRTP) and transit corridor (TC) are routed through this general area.

City Zoning:

Portion's of the project site extend into both City's Zoning Map Number 5 (Kalihi to Nuuanu) and Zoning Map Number 6 (Red Hill to Fort Shafter). Consequently, the eastern corner of the site is zoned I-2 (Intensive Industrial District) while the remaining portion is zoned R-5 (Residential District). Exhibit A-3 shows the existing zoning designations for the site and surrounding areas.

Existing Conditions On Project site

The undeveloped project site is a somewhat triangular shaped parcel which is part of a larger remnant parcel of land remaining from the previous construction of the Keehi Interchange. Subsequently, this site has been landscaped with grass, a few coconut and smaller trees, and is nearly level except for an open drainage ditch about 5 feet deep on the western end. Several underground irrigation lines with sprinkler fixtures and value boxes are apparent throughout the site it maintain landscaping. A utility pole is located on the eastern border of the site which is connected to underground lines and overhead distribution lines routed across Kalihi Stream. The attached Exhibits show photographs of this project site.

The elevation of the project site is about 5 Feet above the stream which is near sea level. At least part of the project area is known to have been filled in for many years with additional fill added during construction of the interchange and surrounding area in the late 1970s and early 1980s. Most of the fill material appears to be coral dredged from other areas which are substantiated by boring results from a sub surface investigation report prepared by Stewart Engineering, Inc. and included in the attached Exhibit.

Relationship To Surrounding Uses

The project site is located in an industrialized area situated between major roadways connecting to Keehi Interchange. The site is bounded to the north by both the H-1 Freeway and Nimitz Highway's eastbound off-ramp connection to Kamehameha Highway/ Dillingham Boulevard, Nimitz Highway's westbound connection with the interchange to the south, Kalihi Stream to the east, and drainage ditches to the west. A portion of an old asphalt concrete road adjacent to this site runs parallel to the stream. There is presently no vehicular access to this site from the surrounding roadways.

Major Land Uses In The General Area

As indicated by the City's DP Land Use and Zoning maps, the surrounding land uses in the general vicinity of the project site are predominantly industrial-related. Two military reservations are located in the area which include Fort Shafter Military Reservation north of the Keehi Interchange and the U. S. Army Kapalama Military Reservation south of the site along Sand

Island Access Road. (See The Attached Exhibit).

West of the interchange is the Honolulu International Airport and a number of industrial uses surrounding the airport located in the Mapunapuna district. Southeast of the interchange are many industrial-related businesses associated with the Sand Island industrial area along with other similar businesses situated along Nimitz highway. The Oahu Community Correctional Center is also located east of the site.

Land Uses In The Immediate Vicinity

Being situated in an industrial area, most of the uses surrounding the project site are primarily industrial related businesses. Immediately east of the site across Kalihi Stream is Gaspro which includes their main office building, multi level parking structure, and warehouse. North of the site across Kamehameha Highway is the Schuman Used Cars dealership. Southeast of the site across Nimitz Highway are retail outlets and industrial warehouses associated with the Sand Island industrial area. West of the site is an undeveloped area currently used as a stockpiling area for construction activities in the area.

Project Description

A new radio broadcasting tower 150 feet in height would be built on the property along with a small single story transmitter facility adjacent to the tower. These facilities would be used by KUMU radio station for their AM broadcasting activities with unlimited hours of operation. Space on the tower and within the transmitter facility would also be reserved for future possible use by the State Department of Transportation (DOT).

Need For Project

A new broadcasting tower and facilities are needed by KUMU radio station due to the removal of a broadcast tower in Kaimuki that was used by the radio station for many years. The station has subsequently spent many years unsuccessfully searching for another existing AM broadcasting site that is technically and economically feasible for their operations. However, existing sites have been impractical for various reasons such as poor signal performance, insufficient tower height, or presence of other stations transmitting too close to the station's 1500 kilohertz (kHz) frequency. Consequently, the station has had to use a temporary facility over the past two years consisting of a long wire antenna.

Proposed Structures and Physical Alterations

Broadcasting Tower

The light steel frame broadcasting tower would be about 2 feet in diameter, and supported by a single spread foundation with 3 separate anchored guy wire locations for lateral support. The Attached Exhibit *shows the Site Plan for this project and supporting facilities (Note: Full-sized* copies of plans can be made available if needed).

A hinged connection with 360 degrees of rotational freedom would mount the tower to a concrete foundation so that no bending moments can be introduced to the foundation by lateral forces acting on the tower. This tower system would be very tolerant of any ground settlements because of the hinged connection and the adjustable achored guys which can be periodically tightened or loosened to allow for differential ground movements. The attached Exhibit shows the tower details, plan, and elevation specifications.

This tower is intended to meet all City codes for structural and wind loading standards along with related facilities. Structural calculations for this tower were prepared by Robert Englekirk Consulting Structural Engineers, Inc. and are provided in their May 1993 report included in The Attached Exhibit. In addition, the tower would be painted using compatible colors allowing it to blend into the scenery because the usual red and white paint schemes for broadcast towers is not required for a tower this short.

Transmitter Building and Miscellaneous Items

The single-story transmitter building would be approximately 300 square feet and about 10 feet high. this building would consist of a light metal-frame structure or a temporary metal container-type unit built on a concrete foundation adjacent to the tower. The Attached Exhibit shows the building plan, elevation, roof framing and foundation plans. A 6 -foot-high chain link fence with a 10-foot wide gate would be erected around the property. KUMU radio station would also be responsible for periodic maintenance of the lawn area within the property.

Minimal grading of the property is planned for these structures with essentially no changes to the current grades. All costs for the construction of the project would be funded by the KUMU radio station. A traffic control plan was also prepared and is included in the Exhibit.

Preliminary construction cost estimates for the project range from $40,000 to $50,000.

Proposed Operations and Activities

A total of two AM stations would be provided at the proposed facility for KUMU radio station and the State DOT. Additional AM stations would render the tower electronically non-practical due to height restrictions placed on the tower associated with Federal Aviation Administration (FAA) height limitations.

A "type accepted' transmitter would be installed, and operation of this transmitter by remote control has been authorized by the Federal Communications Commission (FCC). Under the FCC permit, KUMU would have unlimited hours of operation for this facility, and would continue transmitting at the 1500 kHz frequency with 10 kilowatts (kW0 of power throughout the day. The fundamental field strength produced by KUMU's operation would not exceed 25 millivolts per meter (mV/m). or 88.0 dBu, as measured from a location near the FCC's Honolulu Office.

The facilities developed at this site would be unmanned, and no vehicular parking would be provided. Upon completion, all periodic maintenance of the radio transmitter facility would be scheduled between the hours of 9:00 p.m. and 5:00a.m. Access to the site would only be allowed by walking to the facility through a provided entrance. As indicated by the applicant, arrangements would be made with Gaspro to allow off-street parking for individuals conducting occasional maintenance activities for the site. In the event that a mass transit system is established requiring the use of the site at a future date, KUMU would remove the tower and building. Thus, the facilities and structures would be designed to be as portable as practical.

General development Standards

The project's compliance with the following applicable general development standards expressed under this article are discussed below:

1. Heights- The broadcasting tower would be well within the 500 foot height limit set for radio antennas described under 3.60(c) (4) dealing with structures exempt from normal zoning district height limits.

2. Off-Street parking- Off-street parking requirements for this project's CUP application falls under the discretion of the Director of the City's Department of Land Utilization (DLU) under Section 3/70-14. No off-street parking is considered necessary for this site because the broadcast tower and building would be unmanned.

Radio Frequency (RF) Radiation*

Within the last several decades, the proliferation of radio frequency (RF) emitters in the environment has spurred extensive and ongoing research efforts to investigate the biological and public health effects of low-level non-ionizing radiation.

It should be emphasized that environmental level of RF radiation routinely encountered by the public are well below hazardous levels. The U.S. Environmental Protection Agency has estimated that 98-99% of the population in seven U.S. urban areas studied is exposed to less than 0.001 miliwatts per centimeter squared.

In the United States, there is currently no official mandatory federal standard for protection of the public or workers from potentially hazardous exposure to RF radiation. Nonetheless, several federal agencies and non-government organizations have adopted general guidelines. The Occupational Safety and Health Administration (OSHA) generated a guideline for workers in 1971 but it was later ruled to be advisory only. The National Institute for Occupational Safety and Health (NIOSH) has been working on a recommended worker standard for some time. However, there is no evidence that NIOSH will issue a recommendation in the near future.

The Center for Devices and Radiological Health (CDRH), a branch of the U.S. Food and Drug Administration, has regulated radiation from microwave ovens since 1971. CDRH has established a radiation performance standard for microwave ovens that allows leakage (measured at five centimeters from the oven surface) of 1 milliwatt (mW) per square centimeter (cm2) at the item of manufacture and a maximum level of 5 mW/cm2 during the lifetime of the oven.

By far the most widely used guideline is from the American National Standards Institute (ANSI), a non-profit organization that develops recommended standards for a variety of applications. In 16982 ANSI issued revised RF protection guidelines (C-95.1, 1982) which were based on more recent data regarding the interaction of RF radiation within the human body. The study showed that the human body absorbs RF energy at some frequencies more efficiently that at others. The most restrictive limits are in the frequency range of 30-300 MHz, where maximum levels of 1 m W/cm2, averaged over any six minute period of exposure, are recommended.

The recommendations were based on a determination that the threshold for hazardous biological effects was approximately 4 watts per kilogram (4W/kg). The W/kg is an expression for the rate of energy absorption in the body given in terms of the "specific absorption rate" or SAR. A safety factor of ten was incorporated to arrive at the final recommended protection guidelines. In other words, the guidelines can be correlated with an SAR threshold of about 0.4 W/kg.

ANSI has been in the process of revising its 1982 standard, and in early 1992, a new standard (C-95.1,1990) was released from committee. The new guideline differentiates between occupational standards for workers and the general public. The occupational standards are 1 mW/cm2 for a 6 minute exposure (no change from the 1982) and 0.2 mW/cm2 for a 30 minute exposure for the general public. It should be noted that the new standard has not yet been generally accepted throughout the industry, including the FCC.

The most used guideline in the industry today is the ANSI< C-95. I adopted in 1982. The guideline is applied in the following calculations for radiation exposure levels. ANSI exposure levels which are applicable for KUMU AM frequency are shown In The Attached Exhibit .

The intensity of the radiation depends on the source, the distance from the source, and the radiation pattern. Given the source level and any given distance, the field intensity can be calculated fairly accurately, usually in fractions of a watt such as a milliwatt or microwatts that pass through a unit area of square centimeter.

Radiated RF energy from a given source decreases rapidly as distance is increased. In fact, the level decreases according to the inverse square law, the is, RF energy is inversely proportional to the square of the distance. Simply stated, as the distance doubles, the level of radiation decreases by a factor of four. (See The Attached RF Energy Publication)

Conditional and Site Plan Review Uses

Under Table 4.2 (Conditional Uses) of the LUO, a Conditional Use Permit (CUP), Type 2, is required for broadcasting antennas. The project's facilities would satisfy and be developed in accordance with the Minimum Development Standards for Broadcasting Antennas (Article 4.40-4) as expressed in the LUO. Pertinent standards under this Article which are applicable to the project are discussed below.

Setback Requirement From Property Line

Under Section 4.40-4 (c) (2), the broadcast tower needs to be set back a minimum of 150 feet from all property lines (one foot for every foot of tower height). The project would meet this minimum setback requirement since the broadcast tower would be situated on a remnant parcel of the much larger State-owned property used for the Keehi Interchange and H-1 Freeway. As a result, surrounding property lines would be well away from the tower's 150 foot setback.

Setback Requirements From Residential District

Under Section 4.40-4(c)(3), the AM broadcast antenna would need to be set back at least 500 feet from Residential or Apartment zoned districts. The project would meet this minimum setback requirement since most adjacent properties are presently zoned for industrial uses (I-2).

A zoning adjustment would also be enacted by DLU upon submittal of this CUP application to rezone portions of the Keehi Interchange and H-1 Freeway area which are currently zoned R-5 (Residential). Portions of these areas needed to provide a 500 foot setback from the broadcast tower would be rezoned to a suitable district. Consequently, the broadcast tower would meet the minimum 500 foot setback required under this Section.

Previous discussions with DLU staff concluded that the existing zoning (R-5) for this interchange area is generally inappropriate since residences would not likely be developed there. Hence, a zoning adjustment, as stipulated under Section 8.50 of the LUO, is warranted and would be initiated and processed by DLU.

Other Requirements

The following approvals have already been obtained from various Federal agencies and are included in The Attached Exhibit.

1. A letter from the FCC, dated January 25, 1993 and included in Exhibit D-1 of Appendix D (Federal Approvals), provides a copy of a No Hazard determination from the FAA. This statement from the FAA provides evidence that the project would not be a hazard to air navigation.
2. A "modification of Construction Permit" was granted to the John Hutton Corporation (KUMU radio station) on November 15, 1994 from the FCC and ANSI RF guidelines which shows the project's compliance with the Commission's regulations. Approval by FCC was initially granted on March 11, 1993 and subsequently extended due to project delays.

Applicant's Justifications

Compliance With Section 4.30 (a) General Requirements

This section provides the applicant's justification for a Conditional Use Permit, Type 2, for their project which meets the four criteria described under the General Requirements.

Permitted Conditional Use

The proposed use, Broadcasting Antennas, is listed as a permitted Conditional Use under Table 4.2 of the LUO for areas zoned I-2. A portion of the project site is presently zoned I-2, and the remaining portion of the site currently zoned R-5 will be changed to the I-2 district by a Zoning Adjustment initiated upon the filing of this application. Therefore, the entire project site will be zoned I-2 permitting the use of Broadcasting Antennas. Furthermore, the project and related facilities would conform to the requirements expressed under this Article.

Suitable Site for Proposed Use

The project site is suitable for the broadcasting tower and related facilities because it is appropriately located away from other industrial uses in the area. This parcel further represents a remnant piece of a larger property associated with the Keehi Interchange construction which isn't suitable for most industrial uses due to its small size, unusual triangular shape, and restricted vehicular access. There are no natural features creating restrictions for the proposed use, the topography is flat, the site would be unmanned, and no infrastructure improvements would be necessary. Therefore, the tower and related facilities would be an appropriate use for this unique site.

Compatibility with Surrounding Area

The project would not alter the character of the surrounding area in a manner significantly impairing or limiting other industrial uses permitted within the I-2 zoning. Present industrial uses near the site would be able to continue their normal activities and operations without disruptions from the project.

Contributes To The General Welfare Of Community

The broadcasting tower and transmitter building would provide KUMU radio station with a needed facility to continue providing their radio broadcasting services and entertainment to the public. Furthermore, under agreement with the State DOT, additional space and facilities would be provided for the transportation department's future use. This would allow the department to provide additional traffic monitoring or broadcasting services which contribute to the general welfare of the surrounding communities and public.

Other Considerations Expressed Under Section 4.30(d)

As described under this Section, the Director will consider infrastructure and other environmental areas in determining whether the project meets the requirements of Section 4030(a) and 4030(b). The proposed broadcasting tower and operations would not cause significant environmental concerns, require major infrastructure improvements, cause significant demands on public services, or differ from the general or minimum development standards expressed under the LUO. The following section provides a greater discussion addressing the project's compliance with applicable environmental, infrastructure, and public service requirements.

Environmental Concerns

This section addresses the applicable environmental requirements, infrastructure requirements, impacts on public services, and social concerns associated with the project.

Applicable Environmental Requirements

Historic Archaeological Sites

There are no historic or archaeological sites presently known to be situated on the project site. Furthermore, no archaeological sites are expected given that the project site was identified as Fill Land (FL) by the U.S. Soil Conservation Service's Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii (1972), and substantiated by sub surface investigation study results.

Infrastructure Requirements

Water Supply

The project would not create any additional demand on the current potable water supply nor require improvements to existing water facilities since the site would essentially be uninhabited except for the periodic maintenance of its facilities.

Waste water Disposal

The project would not create any additional demand on the existing waste water system serving the area because there would be no potable water demand created or restroom facilities provided on the site. As a result, no improvements to existing waste water facilities are necessary.

Drainage Facilities

The project site is located in a Flood Fringe area which is designated as Zone AE under the Flood Insurance Rate Map, Community Panel Number 150001 0112 c. Since minimal grading activities are required for this site, there should be no major change or impact to the existing drainage conditions. Subsequently, pertinent engineering studies are being conducted to ensure suitable development of facilities on the site. Compliance with all regulatory requirements for this project site will be performed, and necessary permits and approvals will be obtained before construction activities commence.

Transportation Facilities

The project would not create additional traffic on the surrounding roadways since it would essentially be uninhabited except for the periodic maintenance of the transmitter facility. As previously discussed, access to the site for periodic maintenance would be conducted by walking onto the site. Therefore, no improvements to transportation facilities in the immediate area are necessary.

Refuse Collection

The operations associated with the broadcasting tower and transmitter facility would not generate any solid wastes requiring either private or City collection services because the site would be uninhabited.

Solid wastes generated during construction activities are expected to be insignificant since minimal grading activities are expected due to the nature of the project. Disposal of these wastes will be carried out using normal construction practices in accordance with City regulations.

Fire Protection

The project is not expected to create additional demands on the City's fire department since only a broadcasting tower and transmitter facility would be located on the site.

Police Protection

The project site would be uninhabited and surrounded with a chain-link fence to keep out trespassers. As a result, no additional demands on the City's police department are expected.

Educational Facilities

The project would not increase the residential population in the surrounding area since no residential units are planned. Therefore, there would be no impact or additional demands placed on educational facilities or personnel serving the area.

Housing and Population

The project would not create additional housing demands nor increase the resident population in the area since only a broadcasting tower and transmitter facility would be constructed.

Employment

There would be no increase in permanent jobs created by the project because the transmitter facility would be used for current operations replacing the temporary wire antenna facility. However, there would be a few short-term jobs created for construction of the facilities which may last about three weeks.

Parks and Recreation

The project site is presently not used for any recreational activity, therefore, the construction of the broadcasting tower and transmitter facility would not impact recreational activities. Furthermore, there would be no additional demands for park facilities by the project..

Day Care Facilities

The project would not increase the residential population in the surrounding area and therefore have no impact or demand created for day care facilities.

Community Concerns

There are no community concerns presently known associated with the proposed project.

Comments received to the published draft ES are attached along with the respective responses.

du Treil, Lundin & Rackley, Inc.
A Subsidiary of A. D. Ring, P. C.

TECHNICAL EXHIBIT
MODIFICATION OF APPLICATION
FOR CONSTRUCTION PERMIT
JOHN HUTTON CORPORATION
RADIO STATION KUMU
HONOLULU, HAWAII

October 20, 1992

1500 KHZ 10 KW U

TECHNICAL

du Treil, Lundin & Rackley, Inc.
A Subsidiary of A. D. Ring, P. C.

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TECHNICAL EXHIBIT
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JOHN HUTTON CORPORATION
HONOLULU, HAWAII
1500 KHZ 10 KW U

Technical Narrative

The technical exhibit of which this narrative is part was prepared on behalf of the John Hutton Corporation, licensee of AM broadcast station KUMU Honolulu, Hawaii. Station KUMU is licensed for operation on 1500 kHz with power of 10 kilowatts, unlimited time. The station was asked to vacate its transmitter site and due to the unavailability of other potential transmitter sites in or near Honolulu, proposed operation on the nearby island of Molokai. At that proposed location, operation would continue on 1500 kHz, but power would be increased to 50 KW, and a two element directional antenna installed in order to enhance the proposed coverage of Honolulu. Even with the higher power and directional antenna, a request for waiver of principal community coverage, 47CFR73.24(i), was needed. The pending application was assigned File No. BP-920605AF.

It was recently learned by the John Hutton Corporation that the City of Honolulu would make available a parcel of land near a traffic interchange. The site was studied for suitability and it was determined that operation from this site with power of 10 KW would provide better service to Honolulu and vicinity, than would the proposed higher power directional operation on Molokai. Due to the location of the site and the size of Honolulu, a waiver of the principal community coverage requirement is still required. In addition, the proposed signal level in excess of 10 mV/m at the FCC Waipahu monitoring station must be addressed. Communication with the Field Operations Bureau of the FCC will commence with filing of the application.

With the exceptions listed in the preceding paragraph, the application complies with the rules and regulations of the Federal Communications Commission.

Proposed Transmitter Location

The proposed transmitter site is located at the Keehi Interchange near the Kamehameha Highway and Kalihi Stream, in Honolulu County, Hawaii. The geographic coordinates for the site were scaled from a U.S.G.S. topographic quadrangle map entitled "HONOLULU, HAWAII". They are:

21° 20' 10" North Latitude

157° 53' 33" West Longitude.

A map showing the transmitter location is included herein as Figure 1. Photographs of the transmitter location are included as Figure 4.

There are five AM stations licensed to Honolulu located within 3 kilometers of the proposed site. Three of the stations, KNDI (1270 kHz), KCCN (1420 kHz) and KISA (1540 kHz) operate from the same tower located 1.9

kilometers on a bearing of 135.8 degrees true from proposed KUMU. The other two stations, KSSK (590 kHz) and KIKI (830 kHz) operate from a tower 2.2 kilometers on a bearing of 127.8 degrees true from proposed KUMU. Due to the difference in frequency and the physical separation, no interaction or pattern distortion problems are anticipated.

There is one FM broadcast stations located within 3 kilometers of proposed KUMU. Station KIKI-FM operates at a site 2.2 kilometers from KUMU collocated with KIKI (AM).

There are no TV stations within three miles of the proposed KUMU site.

No adverse reaction with any of these relatively close stations is anticipated.

Proposed Antenna System

The antenna system to be employed by KUMU will consist of a series fed vertical tower 46 meters in height. The overall height of the tower above ground will be 47 meters. Aeronautical lighting is not proposed. A sketch of the tower is shown on Figure 3.

The ground system will consist of 120 copper wire radials each 60.1 meters in length, except where terminated at property boundaries as indicated on Figure 2, a plat of the transmitter site. The antenna system is expected to produce 933 mV/m at one kilometer from the antenna with input power of 10 KW. This radiation value includes minor losses expected due to the restricted ground system.

Allocation Studies

As there are no AM stations on frequencies from 1470 kHz to 1530 kHz in Hawaii except for KUMU, there is no possibility of a daytime allocation problem.

A tabulation showing the permissible radiation during nighttime hours is shown in Figure 7. The actual radiation proposed by KUMU is substantially less than that permitted.

The nighttime interference free contour for KUMU is calculated to be 2.1 mV/m as shown on Sheet 3 of Figure 7.

The proposed KUMU operation will produce an estimated field strength of 18.2 mV/m at the FCC Monitoring Station at Waipahu. As this value exceeds the threshold value of 10 mV/m by a relatively small amount, the matter will be brought to the attention of the Field Operations Bureau of the FCC. It is possible that this increase in field strength as compared with the existing KUMU operations will not present a problem for the monitoring station.

Coverage Contours

Coverage contours are shown on Figure 5. The proposed 5 mV/m contour provides coverage to 77 percent of the city of Honolulu, only 3 percent below the acceptable value of 80 percent. As the availability of alternative transmitter sites is virtually non existent, waiver of this minor infraction is requested. Information employed in determining the location of contours is shown on Figure 6.

Environmental Considerations

The proposed KUMU operation was evaluated for potential exposure of the general public and workers to electromagnetic radiation in accordance with OST Bulletin No. 65, "Evaluating Compliance With FCC-Specified Guidelines for Human Exposure to Radiofrequency Radiation." Based on Table 1 of Appendix D, for a 10 KW operation, the minimum "worst-case" distance at which the electric and magnetic fields are predicted to fall below the ANSI standards is 7 meters. Consequently, the applicant proposed to install a fence at least 7 meters around the tower and to post appropriate warning signs. Should it be necessary for workers or other authorized personnel to enter the restricted area or climb the tower, the applicant verifies that the power will be reduced or the station taken off the air to insure no exposure to radiofrequency radiation in excess of the guidelines.

The proposal appears to be categorically excluded from environmental processing, as it meets all of the criteria for such an exclusion in 47CFR1.1306. The proposal does not involve construction at a site location specified under 47CFR1.1307(a)(1)-(7), is not expected to require tower lighting and the potential for human

RADIATION

exposure to radiofrequency radiation is predicted to be within the standards specified in 47CFR1.1307(b)

Louis R du Treil

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October 20, 1992

Office of Engineering and Technology
Spectrum Engineering Division
Federal Communications Commission

QUESTIONS AND ANSWERS ABOUT BIOLOGICAL EFFECTS AND POTENTIAL HAZARDS OF RADIOFREQUENCY RADIATION

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INTRODUCTION

The Federal Communications Commission (FCC) is responsible for licensing or authorizing many of the transmitting devices in the United States that use radiofrequency (RF) radiation to provide a variety of important telecommunications services. Because of its responsibilities in this regard the FCC often receives inquiries concerning potential health risks from exposure to the RF radiation emitted by these transmitters.

Recent years have witnessed increasing interest and concern on the part of the public with respect to this issue. The expanding use of RF technology has resulted in speculation concerning the alleged "electromagnetic pollution" of the environment and the potential dangers of exposure to non-ionizing radiation. This publication is designed to provide factual information to the public by answering some of the most commonly asked questions about this complex and often misunderstood topic.

WHAT IS RADIOFREQUENCY RADIATION?

Radiofrequency (RF) radiation is one of several types of electromagnetic radiation. Electromagnetic radiation consists of waves of electric and magnetic energy moving together through space. These waves are generated by the movement of electrical charges. For example, the movement of charge in a transmitting radio antenna, i.e., the alternating current, creates electromagnetic waves that radiate away from the antenna and can be picked up by a receiving antenna.

Electromagnetic waves travel through space at the speed of light. Each electromagnetic wave has associated with it a wavelength and frequency which are inversely related by a simple mathematical formula: (frequency) times (wavelength) = the speed of light. Since the speed of light is a fixed number, electromagnetic waves with high frequencies have short wavelengths and waves with low frequencies have long wavelengths.

The electromagnetic "spectrum" includes all of the various forms of electromagnetic radiation ranging from extremely low frequency (ELF) radiation (with very long wavelengths) to X-rays and gamma rays which have very high frequencies and correspondingly short wavelengths. In between these extremes lie radio waves, microwaves, infrared radiation, visible light, and ultraviolet radiation. The RF part of the electromagnetic spectrum is generally defined as electromagnetic radiation with frequencies in the range from about 3 kilohertz to 300 gigahertz. One "hertz" equals one cycle per

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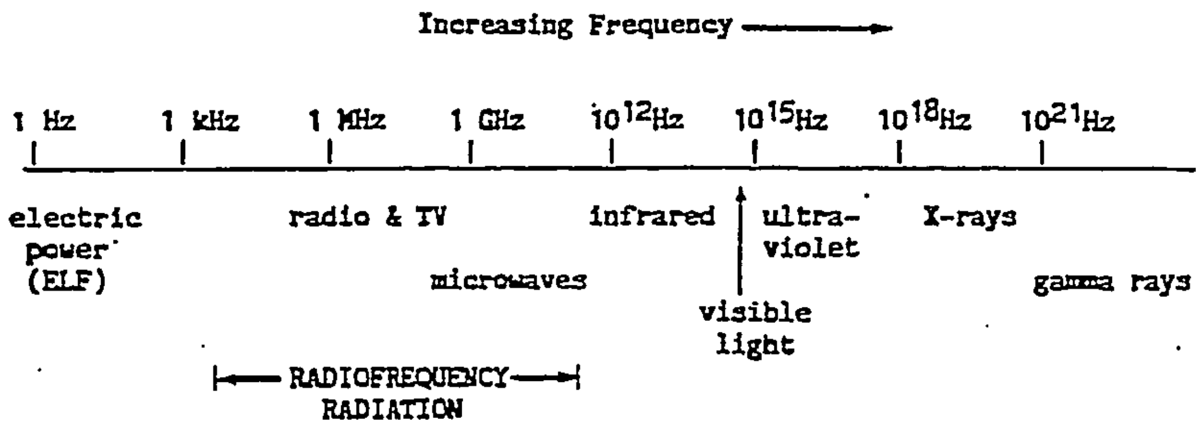
second. A kilohertz (kHz) is one thousand hertz, a megahertz (MHz) is one million hertz, and a gigahertz is one billion hertz. The diagram below illustrates the electromagnetic spectrum and the approximate relationship between the various forms of electromagnetic radiation.



WHAT IS MICROWAVE RADIATION?

Microwave radiation is a high-frequency form of RF radiation. Microwave frequencies occupy the upper part of the RF electromagnetic spectrum, usually defined as the frequency range from about 300 MHz to 300 GHz. The most familiar use of microwave radiation is in household microwave ovens which rely on the principle that microwaves generate heat throughout an object rather than just at the surface. Therefore, microwave ovens can cook food more rapidly than conventional ovens. Other uses of microwaves are: the transmission of telephone and telegraph messages through low-power microwave relay antennas, military and civilian radar systems, the transmission of signals between ground stations and satellites, and the transmission of signals in certain broadcasting operations. Certain medical devices use microwave frequencies in therapeutic applications of RF radiation.

WHAT ARE TYPICAL USES OF RADIOFREQUENCY RADIATION?

Many uses have been developed for RF energy. Familiar applications involving telecommunications include AM and FM radio, television, citizens band (CB) radio, hand-held walkie-talkies, amateur radio, short-wave radio, cordless telephones, and microwave point-to-point and ground-to-satellite telecommunications links. Non-telecommunications applications include microwave ovens and radar, as mentioned above. Also important are devices that use RF energy in industrial heating and sealing operations. The latter devices generate RF radiation that rapidly heats the material being processed in the same way that a microwave oven cooks food. These RF heaters and sealers have many uses in industry, including molding plastic materials, gluing wood products, sealing items, such as shoes and pocketbooks, and processing food products. Medical applications of RF radiation include a technique called diathermy that takes advantage of RF energy's ability to heat tissue below the body's surface rapidly. The term "hyperthermia" is used in reference to therapeutic RF heating of cancerous tumors. RF energy is also used in the stimulation of bone healing.

WHAT IS NON-IONIZING RADIATION, AND HOW DOES IT DIFFER FROM IONIZING RADIATION?

The energy associated with electromagnetic radiation depends on its frequency (or wavelength); the greater the frequency (and shorter the wavelength), the higher the energy. Therefore, x-radiation and gamma radiation, which have extremely high frequencies, have relatively large amounts of energy; while, at the other end of the electromagnetic spectrum, ELF radiation is less energetic by many orders of magnitude. In between these extremes lie ultraviolet radiation, visible light, infrared radiation, and RF radiation (including microwaves), all differing in energy content.

Of the various forms of electromagnetic radiation, x-radiation and gamma radiation represent the greatest relative hazard because of their greater energy content and correspondingly greater potential for damage. In fact, X-rays and gamma rays are so energetic that they can cause ionization of atoms and molecules and thus are classified as "ionizing" radiation. Ionization is a process by which electrons are stripped from atoms and molecules, producing molecular changes that can lead to significant genetic damage in biological tissue. Less energetic forms of electromagnetic radiation, such as RF and microwave radiation, lack the ability to ionize atoms and molecules and are classified as "non-ionizing" radiation. It is important that the terms, "ionizing" and "non-ionizing," not be confused when referring to electromagnetic radiation, since their mechanisms of interaction with the human body are quite different. Biological effects of (non-ionizing) RF radiation are discussed in a later section.

HOW IS RADIOFREQUENCY RADIATION MEASURED?

Since radiofrequency radiation has both an electric and a magnetic component, it is often convenient to express intensity of a radiation field in terms of units specific to each component. The unit "volts per meter" (V/m) is used for the electric component, and the unit "amperes per meter" (A/m) is used for the magnetic component. We often speak of an electromagnetic "field," and these units are used to provide information about the levels of electric and magnetic "field strength" at a measurement location.

Another commonly used unit for characterizing an RF electromagnetic field is "power density." Power density is most accurately used when the point of measurement is far enough away from the RF emitter to be located in what is referred to as the "far field" zone of the radiation pattern. In closer proximity to the transmitter, i.e., in the "near field" zone, the physical relationships between the electric and magnetic components of the field can be complex, and it is best to use the field strength units discussed above. Power density is measured in terms of power per unit area, for example, milliwatts per square centimeter (mW/cm^2). When speaking of frequencies in the microwave range and higher, power density is usually used to express intensity since exposures that might occur would likely be in the far field zone. A detailed discussion of the physics of RF fields and their measurement can be found in Reference 1.

WHAT BIOLOGICAL EFFECTS CAN BE CAUSED BY RF RADIATION?

There is a relatively extensive body of published literature concerning the biological effects of RF radiation. The following discussion only provides highlights of current knowledge in this area. Detailed information on this topic can be found in References 2-14.

It has been known for some time that high intensities of RF radiation can be harmful due to the ability of RF energy to heat biological tissue rapidly. This is the principle by which microwave ovens cook food, and exposure to high RF power densities, i.e., on the order of 100 mW/cm^2 or more, can result in heating of the human body and an increase in body temperature. Tissue damage can result primarily because of the body's inability to cope with or dissipate the excessive heat. Under certain conditions, exposure to RF power densities of about 10 mW/cm^2 or more could result in measurable heating of biological tissue. The extent of heating would depend on several factors including frequency of the radiation; size, shape, and orientation of the exposed object; duration of exposure; environmental conditions; and efficiency of heat dissipation. Biological effects that result from heating of tissue by RF energy are often referred to as "thermal" effects.

Two areas of the body, the eyes and the testes, can be particularly susceptible to heating by RF energy because of the relative lack of available blood flow to dissipate the excessive heat load. Laboratory experiments have shown that short-term exposure to high levels of RF radiation (100-200 mW/cm^2) can cause cataracts in rabbits. Temporary sterility, caused by such effects as changes in sperm count and in sperm motility, is possible after exposure of the testes to high-level RF radiation.

It should be emphasized that environmental levels of RF radiation routinely encountered by the public are far below the levels necessary to produce significant heating and increased body temperature. In fact, the U.S. Environmental Protection Agency has estimated that 98-99% of the population in seven U.S. urban areas studied is exposed to less than 0.001 mW/cm^2 (Reference 15). However, there may be situations, particularly workplace environments, where RF safety standards are exceeded and people could be exposed to potentially harmful levels of RF radiation.

In addition to intensity, the electromagnetic frequency of RF radiation is important in determining the relative hazard. At a distance of several wavelengths from a source of RF radiation, whole-body absorption of RF energy by humans will occur at a maximum rate when the frequency of the radiation is between about 30 and 300 MHz. Because of this "resonance" phenomenon, RF safety standards take this frequency dependence into account. Therefore, as discussed in a later section, the most stringent standards are in this frequency range of maximum absorption.

At relatively low levels of exposure to RF radiation, i.e., field intensities lower than those that would produce significant and measurable heating, the evidence for production of harmful biological effects is less clear. A number of reports have appeared in the Russian and East European literature claiming a wide range of low-level biological effects. The low-level effects on animals and humans reported in the Soviet and East European literature have included behavioral modifications, effects on the blood-forming and immunological system, reproductive effects, changes in hormone levels, headaches, irritability, fatigue, and cardiovascular effects. However, further research is needed to confirm the existence of these effects and to determine whether they might constitute a health hazard, particularly with regard to long-term exposure.

In recent years some Western scientists have also reported biological effects after exposure of animals and animal tissue to relatively low levels of RF radiation. These effects, often referred to as "non-thermal" effects, have included changes in the immune system, neurological effects, behavioral effects, evidence for a link between microwave exposure and the action of certain drugs and compounds, and a "calcium efflux" effect in brain tissue (discussed below). Experimental results have also suggested that microwaves might be involved in cancer "promotion" under certain conditions. However, contradictory experimental results have also been reported in many of these cases, and further experiments are needed to determine the generality of these effects and whether they constitute a threat to human health. It is possible that "non-thermal" mechanisms exist that could cause harmful biological effects in animals and humans exposed to RF radiation. However, whether this is the case remains to be proven.

One of the "non-thermal" biological effects that appears to be reproducible is the "calcium efflux" effect. This effect can be described as the observation that the release of calcium ions from animal brain tissue is enhanced after exposure to certain low intensities of RF radiation under discrete conditions of frequency and signal modulation. This effect has been observed at RF levels well below those necessary to produce heating of tissue. The extent to which this effect might indicate a hazard is not presently known, and further research is needed to determine the relevance, if any, of this phenomenon to human health.

Another RF biological effect that has received attention is the so-called microwave "hearing" effect. Under certain specific conditions of frequency, signal modulation, and intensity, it has been shown that animals and humans can perceive an RF signal as a buzzing or clicking sound. Although a number of theories have been advanced to explain this effect, the most widely-accepted hypothesis is that the microwave signal produces thermoelastic pressure within the head that is perceived as sound by the auditory apparatus within the ear. It is important to emphasize that the conditions under which this effect occurs would not normally be encountered by members of the general public.

WHAT ARE SAFE LEVELS FOR EXPOSURE TO RADIOFREQUENCY/MICROWAVE RADIATION?

There is disagreement over exactly what levels of RF radiation are "safe," particularly with regard to low levels of exposure. In the Soviet Union and several Eastern European countries occupational and population exposure standards are generally more restrictive than existing or proposed standards in most Western countries. This discrepancy may be due, at least in part, to the likelihood that Russian and East European standards are based on levels where it is believed no biological effects of any sort would occur, rather than where recognized hazards exist. Western standards generally are based on levels where hazards are known to exist, and a safety factor is then incorporated to provide sufficient protection.

In the United States there is currently (early 1989) no official, mandatory federal standard for protection of the public or workers from potentially hazardous exposure to RF radiation. There is a performance standard established by the U.S. Food and Drug Administration for microwave ovens, but that standard is an emission standard (as opposed to an exposure standard) that only defines acceptable levels of RF energy that can be radiated from microwave ovens. Until recently the U.S. Environmental Protection Agency (EPA) was developing federal guidelines ("Federal Guidance") for exposure of the public to RF radiation. However, the EPA recently stated its intention to defer that activity indefinitely.

A federal RF radiation protection guide for workers was issued by the Occupational Safety and Health Administration (OSHA) in 1971 but it was later ruled to be advisory only. This protection guide was based on an earlier RF exposure standard recommended by the American National Standards Institute (ANSI), a non-government organization that develops recommended standards for a variety of applications. To date, OSHA has not updated its 1971 guideline, although its sister agency, the National Institute for Occupational Safety and Health (NIOSH), has been working on a recommended worker standard for RF exposure for several years. There is currently no indication that NIOSH will issue a recommendation in the near future.

In 1982, ANSI issued revised RF protection guidelines based on more recent data on the interaction of RF radiation with the human body. The ANSI protection guide is probably the most widely used and technically supportable exposure standard available today. As discussed in a later section of this bulletin, the FCC now uses the ANSI protection guides for purposes of evaluating environmental impact from the RF transmitters it regulates.

The 1982 ANSI guidelines recommend frequency-dependent exposure limits covering RF frequencies from 300 kHz to 100 GHz (Reference 16). The guidelines incorporate data showing that the human body absorbs RF energy at some frequencies more efficiently than at others. The most restrictive limits are in the frequency range of 30-300 MHz where maximum levels of 1 mW/cm^2, as averaged over any six minute period of exposure, are recommended.

The ANSI standard was developed over a period of several years by scientists and engineers with considerable experience and knowledge in the area of RF biological effects and related issues. The recommendations were based on a determination that the threshold for hazardous biological effects was approximately 4 watts per kilogram (4 W/kg) ["W/kg" is an expression for the rate of energy absorption in the body given in terms of the "specific absorption rate" or "SAR"]. A safety factor of ten was then incorporated to arrive at the final recommended protection guidelines. In other words, the protection guides can be correlated with an SAR threshold of about 0.4 W/kg.

The guidelines are intended to apply to non-occupational as well as to occupational exposures. However, ANSI states that because of "limitations in the biological effects data base" the guide indicates upper limits of safe exposure, particularly for the general public. It should be noted that ANSI is currently (early 1989) in the process of revising its 1982 standard in light of more recent data on biological effects. Therefore, a new ANSI recommendation may be forthcoming in the next one or two years that could be more restrictive with respect to some exposure situations. In particular, the new guidelines could differentiate between exposure of workers and exposure of the general public using an approach similar to that followed by other standard-setting organizations (see later discussion).

The 1982 ANSI guidelines are summarized in the following table. Note that recommended exposure levels are given in terms of the squares of the electric and magnetic field strengths as well as in terms of power density. For the lower frequencies listed, intensities are best expressed in terms of field strength values, and the indicated power density is essentially a "far field equivalent" power density. At higher frequencies, and when one is in the "far field" of a radiation source at any frequency, the actual power density is an appropriate unit to use. It is important to remember that the ANSI standard is a "time-averaged" standard, i.e., it is permissible to exceed the recommended limits for short periods of time as long as the average exposure (over 6 minutes) does not exceed the limits.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
1982 RADIOFREQUENCY PROTECTION GUIDE

Frequency Range (MHz)	Electric Field Strength E^2 (V^2/m^2)	Magnetic Field Strength H^2 (A^2/m^2)	Power Density (mW/cm^2)
0.3-3	400,000	2.5	100
3-30	4,000 ($900/f^2$)	0.025 ($900/f^2$)	$900/f^2$
30-300	4,000	0.025	1.0
300-1500	4,000 (f/300)	0.025 (f/300)	f/300
1500-100,000	20,000	0.125	5.0

<u>NOTE:</u> f = frequency in megahertz (MHz)
E^2 = electric field strength squared
H^2 = magnetic field strength squared
V^2/m^2 = volts squared per meter squared
A^2/m^2 = amperes squared per meter squared
mW/cm^2 = milliwatts per centimeter squared

The 1982 ANSI RF protection guide excludes radiating devices with input powers of seven watts or less that operate at frequencies between 300 kHz and 1000 MHz (1 GHz). The guidelines also state that the exposure limits may be exceeded if exposure conditions can be shown to produce specific absorption rates below 0.4 W/kg, as averaged over the whole body, or below 8 W/kg, as averaged over any one gram of tissue.

Other organizations besides ANSI have issued health and safety standards for RF radiation. The National Council on Radiation Protection and Measurements (NCRP) is a nonprofit corporation chartered by the U.S. Congress to develop information and recommendations concerning radiation protection, radiation measurements, and related issues. In 1986, the NCRP issued a report (Reference 11) that contained a review of the literature on biological effects of radiofrequency radiation as well as specific recommendations for exposure of workers and the general public.

The NCRP exposure guidelines differ from the 1982 ANSI protection guide in that separate exposure levels are recommended for workers and for the general public. The NCRP recommendations for worker exposure are essentially the same as the ANSI recommendations. However, NCRP recommended that the average exposure limits for the public be generally one-fifth that of the limits recommended for workers, although the averaging time specified for public exposure was 30 minutes rather than the 6-minute period for worker exposure. The NCRP noted that its two-tiered recommendation was more traditional and consistent with past NCRP practice in differentiating between occupational and public exposure by providing for a greater margin of safety for the general public.

Exposure guidelines have also been issued by the International Radiation Protection Association (IRPA) and by the American Council of Governmental Industrial Hygienists (ACGIH). The IRPA guidelines (Reference 17) are similar to the NCRP recommendations in that a greater degree of protection is recommended for the general public than for workers. The ACGIH guidelines (Reference 18) are basically a modified version of the 1982 ANSI guidelines and only apply to workers.

Largely because of the lack of guidelines from the Federal Government, some local and state jurisdictions have adopted, or have considered adopting, population and/or occupational standards for RF radiation. Local or state RF standards have been established or proposed in Oregon, Washington, Massachusetts, New York and New Jersey. Many of these standards are more restrictive than the 1982 ANSI standard for exposure of the general public.

HOW SAFE ARE MICROWAVE OVENS?

The Center for Devices and Radiological Health (CDRH), a part of the U.S. Food and Drug Administration, has regulated radiation from microwave ovens since 1971. CDRH has established a radiation performance standard for microwave ovens that allows leakage (measured at five centimeters from the oven surface) of 1 mW/cm^2 at the time of manufacture and a maximum level of 5 mW/cm^2 during the lifetime of the oven. The standard also requires ovens to have two independent interlock systems that prevent the oven from generating microwaves the moment that the latch is released or the door of the oven is opened. On the basis of current knowledge about microwave radiation, CDRH believes that ovens that meet its standards and are used according to the manufacturer's recommendations are safe for use.

IS IT SAFE TO USE AN ELECTRONIC CARDIAC PACEMAKER NEAR A RADIOFREQUENCY DEVICE SUCH AS A MICROWAVE OVEN?

In the past there may have been occasional problems due to signals from RF devices interfering with the proper operation of certain implanted electronic pacemakers. Because pacemakers are electronic devices, they can be susceptible to electromagnetic signals that could cause them to malfunction and thereby incorrectly regulate a user's heartbeat. However, it is doubtful that signals from a microwave oven would be strong enough to cause such interference.

This situation has now been largely remedied by the incorporation of electromagnetic shielding into the design of modern pacemakers. This shielding prevents undesirable RF signals from being picked up by the electronic circuitry in the pacemaker. The potential for the "leads" of pacemakers to pick up RF radiation has also been of some concern, but this does not appear to be a serious problem. Patients with pacemakers should consult their physician if they believe that they may have a problem related to RF interference. However, there should be no problem of electromagnetic interference from a properly maintained and operated microwave oven.

HOW SAFE IS THE RADIOFREQUENCY RADIATION EMITTED BY RADIO AND TELEVISION BROADCASTING ANTENNAS?

Radio and television broadcast stations transmit their signals via RF electromagnetic waves. These signals can be a significant source of RF energy in the environment since there are currently over 11,000 radio and TV stations on the air in the United States. Broadcast stations transmit at various RF frequencies, depending on the channel, ranging from about 550 kHz for AM radio up to about 800 MHz for some UHF television stations. Frequencies for FM radio and VHF television lie in between these two extremes.

Ground-level intensities of the RF electromagnetic fields resulting from broadcast transmissions depend on several factors, including the type of station, design characteristics of the antenna being used, power transmitted to the antenna, height of the antenna, and distance from the antenna. Calculations can be performed to predict what field intensity levels would exist at various distances from an antenna. Since energy at some frequencies is absorbed by the human body more readily than energy at other frequencies, the existence of a possible hazard would depend on the frequency of the transmitted signal as well as the intensity.

Public access to broadcasting antennas is normally restricted so that individuals cannot be exposed to high-level fields that might exist near an antenna. Measurements made by EPA and others (References 15 and 19) have shown that RF radiation levels in inhabited areas near broadcasting facilities are generally well below levels believed to be hazardous. There have been a few situations around the country where exposure levels have been found to be higher than those recommended by applicable safety standards (e.g., Reference 20). But such cases are relatively rare, and few members of the general public are likely to be routinely exposed to excessive levels of RF radiation from broadcast towers.

In unusual cases where exposure levels pose a problem, there are various steps a broadcast station can take to ensure compliance with safety standards. For example, high-intensity areas could be posted and access to them could be restricted by fencing or other appropriate means. In some cases more drastic measures might have to be considered, such as redesigning an antenna, reducing power, or station relocation.

Maintenance workers are occasionally required to climb antenna structures for such purposes as painting, repairs, or beacon replacement. Both the EPA and OSHA have reported that in these cases it is possible for a worker to be exposed to hazardous levels of RF radiation if work is performed on an active tower or in areas immediately surrounding a radiating antenna (References 21 and 22). Therefore, precautions should be taken to ensure that maintenance personnel are not exposed to hazardous field intensities. Such precautions could include temporarily lowering power levels while work is being performed, having work performed only when the station is not broadcasting, using auxiliary antennas while work is performed on the main antenna, and establishing work procedures that would specify the minimum distance that a worker should maintain from an energized antenna.

IS THERE ANY DANGER FROM POINT-TO-POINT MICROWAVE RELAY ANTENNAS? WHAT ABOUT DISH ANTENNAS USED FOR SATELLITE-EARTH COMMUNICATION?

Point-to-point microwave relay antennas transmit and receive microwave signals across relatively short distances. These antennas are usually rectangular or circular in shape and are normally found mounted at the top or midway up a supporting tower. These antennas have a variety of uses such as transmitting telephone and telegraph messages and serving as links between broadcast or cable-TV studios and their broadcast antennas.

The microwave signals from these antennas travel in a directed beam from a transmitting antenna to a receiving antenna, and dispersion of microwave energy outside of the relatively narrow beam is minimal or insignificant. In addition, these antennas transmit using very low power levels, usually on the order of a few watts or less. Such levels are much lower than power levels used, for example, by broadcast stations. Measurements have shown that ground-level power densities due to microwave directional antennas are normally a thousand times or more below recommended safety limits. In fact, an individual would likely have to stand directly in front of such an antenna for a significant period of time in order to be exposed to microwave levels that might be considered harmful. In addition, as an added margin of safety, microwave tower sites are normally made inaccessible to the general public.

Satellite-earth stations consist of parabolic "dish" antennas, some as large as 10 to 30 meters in diameter, that are used to transmit or receive microwave signals via satellites in orbit around the earth. The satellites receive the signals beamed up to them and, in turn, retransmit the signals back down to an earthbound receiving station. These signals allow a variety of communications services to be performed, including long distance telephone service.

Since earth-station antennas are directed toward satellites above the earth, the transmitted beams point skyward at various angles of inclination, depending on the particular satellite being used. Because of the longer distances involved, power levels used to transmit these signals are relatively great when compared to those used for the microwave point-to-point relay links discussed above. However, as with the microwave relay links, the beams used for transmitting earth-to-satellite signals are relatively narrow and highly directional. In addition, public access to a station site would normally be restricted. For these reasons it would be unlikely that a transmitting earth-station antenna could expose members of the public to hazardous levels of microwaves. Some earth station antennas are used only to receive RF signals. Since these antennas do not transmit any signals, there would, of course, be no danger of exposure from them.

WHAT ABOUT PORTABLE RADIO TRANSMITTERS? IS THERE ANY RISK FROM EXPOSURE TO RF RADIATION FROM HAND-HELD WALKIE-TALKIES, CELLULAR TELEPHONES, VEHICLE-MOUNTED ANTENNAS, OR CORDLESS TELEPHONES?

"Land-mobile" communication refers to a variety of communications systems which involve the use of portable RF transmitters. Police radio, business radio, and cellular radio are a few examples of these communications systems. They have the advantage of providing communications links between various fixed and mobile locations. Cordless telephones are consumer products that also make mobility possible in communication, although over shorter distances.

There are basically three types of RF transmitters associated with land-mobile systems: base-station transmitters, vehicle-mounted transmitters, and hand-held transmitters. The antennas used for these various transmitters are adapted for their specific purpose. For example, a base-station transmitter must transmit to a relatively large area, and, therefore, its antenna would generally be more powerful than a vehicle-mounted or hand-held radio transmitter.

Although base-station antennas usually operate with higher power levels than the other types of land-mobile antennas, their powers are still quite a bit lower than high-powered transmitters such as most radio and television broadcast stations. Land-mobile base-station antennas are normally inaccessible to the public since they must be mounted at significant heights above ground to provide for adequate signal coverage. Also, many of these antennas transmit only intermittently. For these reasons, base-station antennas have generally not been of concern with regard to possible hazardous exposure to RF radiation.

Transmitting power levels for vehicle-mounted antennas are generally less than those used by base-station antennas but higher than those used for hand-held units. At least one manufacturer recommends that users and other nearby individuals maintain a distance of a few feet from a vehicle-mounted antenna during transmission. However, studies have shown that this is probably a conservative precaution, particularly when the "duty factor" (percentage of time the antenna is actually transmitting) is taken into account since safety standards are "time-averaged." The extent of any possible exposure would also depend on the actual power level and frequency used by the vehicle-mounted antenna. In general, there is no evidence that there is any safety hazard associated with RF exposure from vehicle-mounted antennas.

Hand-held portable radios such as walkie-talkies and cellular radios are generally low-powered devices used to transmit and receive messages over relatively short distances. Because of the low power levels used (usually only a few watts or less) these radios would normally not be considered as possible sources of hazardous exposure to RF fields. However, questions relating to the safety of these devices have arisen because the RF signal is emitted in the immediate vicinity of the user's head and some of these radios use microwave frequencies.

At least one manufacturer has conducted extensive tests of hand-held radios operating at various frequencies in order to determine the amount of RF energy that might be absorbed in the head of an individual using one of these devices. The only potential hazard found could occur in the unlikely event that the antenna tip was placed directly at the surface of the eye. Other studies (e.g., Reference 23) have concluded that during routine use of hand-held radios exposures would normally be in compliance with accepted safety guidelines. Significant absorption might occur if the transmitting antenna of the radio were placed within a distance of about 1-2 centimeters (less than an inch) from the head or eye. However, this would be a very unlikely user position, and even if it occurred the overall time-averaged exposure would probably be acceptable. Therefore, if hand-held radios are used properly there is no evidence that they could cause hazardous absorption of RF energy.

Cordless telephones are consumer products that use RF energy to communicate with a telephone "base" unit. These devices operate at very low power levels, and there is no evidence that users experience any significant RF exposure.

WHICH FEDERAL AGENCIES HAVE RESPONSIBILITIES RELATED TO HEALTH EFFECTS OF RADIOFREQUENCY RADIATION?

Several agencies in the Federal Government have been involved to various degrees in investigating or controlling human exposure to RF radiation. By authority of the Radiation Control for Health and Safety Act of 1968, the Center for Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration (FDA) develops performance standards for the emission of radiation from electronic products including X-ray equipment and other medical devices, television sets, microwave ovens, and sunlamps. As discussed previously, CDRH has established a radiation safety standard for microwave ovens that limits the amount of radiation that an oven can leak throughout its lifetime. However, leakage standards have not been issued for other RF-emitting devices.

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor is responsible for protecting workers from exposure to hazardous chemical and physical agents. In 1971, OSHA issued a protection guide for exposure of workers to RF radiation [29 CFR 1910.97]. The guide, covering the frequency range between 10 MHz and 100 GHz, stated that exposure of workers should not exceed a power density of ten milliwatts per square centimeter (10 mW/cm^2) as averaged over any 6-minute period of the workday. However, this guide was later ruled to be only advisory and not mandatory. Moreover, it was based on an earlier (1966) American National Standards Institute (ANSI) RF protection guide that has been superseded by revised versions in 1974 and 1982 (see previous discussion of standards).

The National Institute for Occupational Safety and Health (NIOSH) of the U.S. Department of Health and Human Services has for some years been considering issuing a recommendation for occupational exposure to RF radiation that would be transmitted to OSHA for consideration in establishing an exposure standard for workers. However, at the present time (early 1989) there is no indication from NIOSH as to when such an official recommendation might be forthcoming.

There is currently no official federal standard for exposure of the general public to RF radiation. It is generally agreed that federal responsibility for developing national guidelines for public exposure to non-ionizing radiation rests with the U.S Environmental Protection Agency (EPA). Until recently, EPA was developing "Federal Guidance" for RF radiation that would have recommended safe levels of exposure for the public. If approved, such a recommendation would have been transmitted to other federal agencies for implementation. However, as noted previously, EPA has apparently decided to abandon that effort and to "defer" indefinitely its program dealing with non-ionizing electromagnetic radiation due to budgetary constraints and a lack of resources. At press time it was unclear whether that decision might be reversed.

WHAT IS THE ROLE OF THE FCC IN EVALUATING POTENTIAL RADIOFREQUENCY HAZARDS?

The FCC licenses and approves equipment and facilities that generate RF and microwave radiation. Although the FCC would not knowingly authorize a facility or device that resulted in a health hazard, the FCC's primary jurisdiction does not lie in the health and safety area. Therefore, the FCC must rely on other agencies and organizations for guidance in these matters.

The issue of potential hazards due to RF radiation emitted by FCC-regulated facilities was first addressed by the Commission in a 1979 Notice of Inquiry. Subsequently, several other items related to RF radiation hazards have been approved by the Commission. The FCC's basic policy was outlined in a 1985 Report and Order [50 Fed. Register 11151, 1985].

As an agency of the Federal Government, the FCC has certain responsibilities under the National Environmental Policy Act of 1969 (NEPA) to consider whether its actions will "significantly affect the quality of the human environment." Therefore, FCC approval and licensing of facilities and operations must be evaluated for significant impact on the environment. The 1985 FCC Order made clear that human exposure to RF radiation emitted by FCC-regulated entities is one of several factors that must be considered in such environmental evaluations.

In making the determination that environmental RF radiation would be evaluated, the Commission decided to specify the 1982 ANSI RF radiation protection guides (see earlier discussion of standards) for use in determining safe levels of exposure for the public and for workers. It was decided that, in view of the lack of an official standard issued by a federal agency such as EPA, the FCC must use what it considered to be the best available standard at the time. The 1982 (non-government) ANSI standard was chosen because it was considered to be widely accepted and technically supportable.

Because of the 1985 FCC Order and subsequent adopted items, major RF transmitting facilities under the jurisdiction of the FCC, such as radio and television broadcast stations, satellite-earth stations, and experimental radio stations, are subject to environmental evaluation for compliance with the identified RF health and safety guidelines. Failure to comply with these guidelines could lead to preparation of a formal Environmental Impact Statement and possible rejection of an application for a transmitting facility. Facilities and operations that operate with lower power levels or are judged to offer insignificant environmental risk from RF radiation have been categorically exempted from these requirements.

The FCC's rules on evaluation of environmental RF radiation are found in Section 1.1307(b) of the FCC's Rules and Regulations [47 CFR 1.1307(b)]. Guidelines for compliance with the FCC's rules can be found in an FCC technical bulletin (OST Bulletin No. 65, Reference 24). Subsequent FCC items adopted since the first Order have dealt primarily with which RF sources are subject to the RF environmental rule and which are excluded [52 Federal Register 13240, 1987; 52 Federal Register 49032, 1987; 53 Federal Register 28223, 1988; 53 Federal Register 40918, 1988].

WHERE CAN FURTHER INFORMATION BE OBTAINED REGARDING RADIOFREQUENCY RADIATION AND RELATED MATTERS?

Within the Federal Government the number of individuals assigned to this area is relatively small, and some agencies are reducing or eliminating personnel in this field. Nevertheless, it is usually possible to obtain at least some basic information concerning RF transmitters or problems. The following federal agencies should be able to provide some information and assistance in this area.

FDA: Questions about radiation from microwave ovens and other consumer and industrial products can be directed to: Center for Devices and Radiological Health (CDRH), Food and Drug Administration, Rockville, MD 20857.

EPA: The Environmental Protection Agency's Office of Radiation Programs (401 M. St., S.W., Washington, D.C. 20460 or P.O. Box 98517, Las Vegas, Nevada 89193-8517) studies exposure of the public to RF radiation. However, at the present time (early 1989) EPA has apparently decided to phase out the Washington office that deals with RF exposure and to limit future EPA activities in this area to its Las Vegas office.

OSHA/NIOSH: The Occupational Safety and Health Administration's (OSHA) Health Response Team (390 Wakara Way, P.O. Box 8137, Salt Lake City, Utah 84108) has been involved in studies related to occupational exposure to RF radiation in the past. However, OSHA has limited involvement in this area at the present time. The National Institute for Occupational Safety and Health (NIOSH) maintains a limited program for studying exposure of workers to non-ionizing radiation. The address is: NIOSH, Physical Agents Branch, 4676 Columbia Parkway, Cincinnati, Ohio 45226.

FCC: The FCC maintains a limited program in this area. Questions regarding potential RF hazards from FCC-regulated transmitters can be directed to the Spectrum Engineering Division, Office of Engineering and Technology, FCC, Washington, D.C. 20554.

In addition to federal agencies, there are other sources of information and possible assistance regarding environmental RF energy. A few states maintain non-ionizing radiation programs or, at least, some expertise in this field. These state activities are usually part of a department of public health or environmental control. Also, the list of references at the end of this bulletin should be consulted for detailed information on specific topics related to RF exposure.

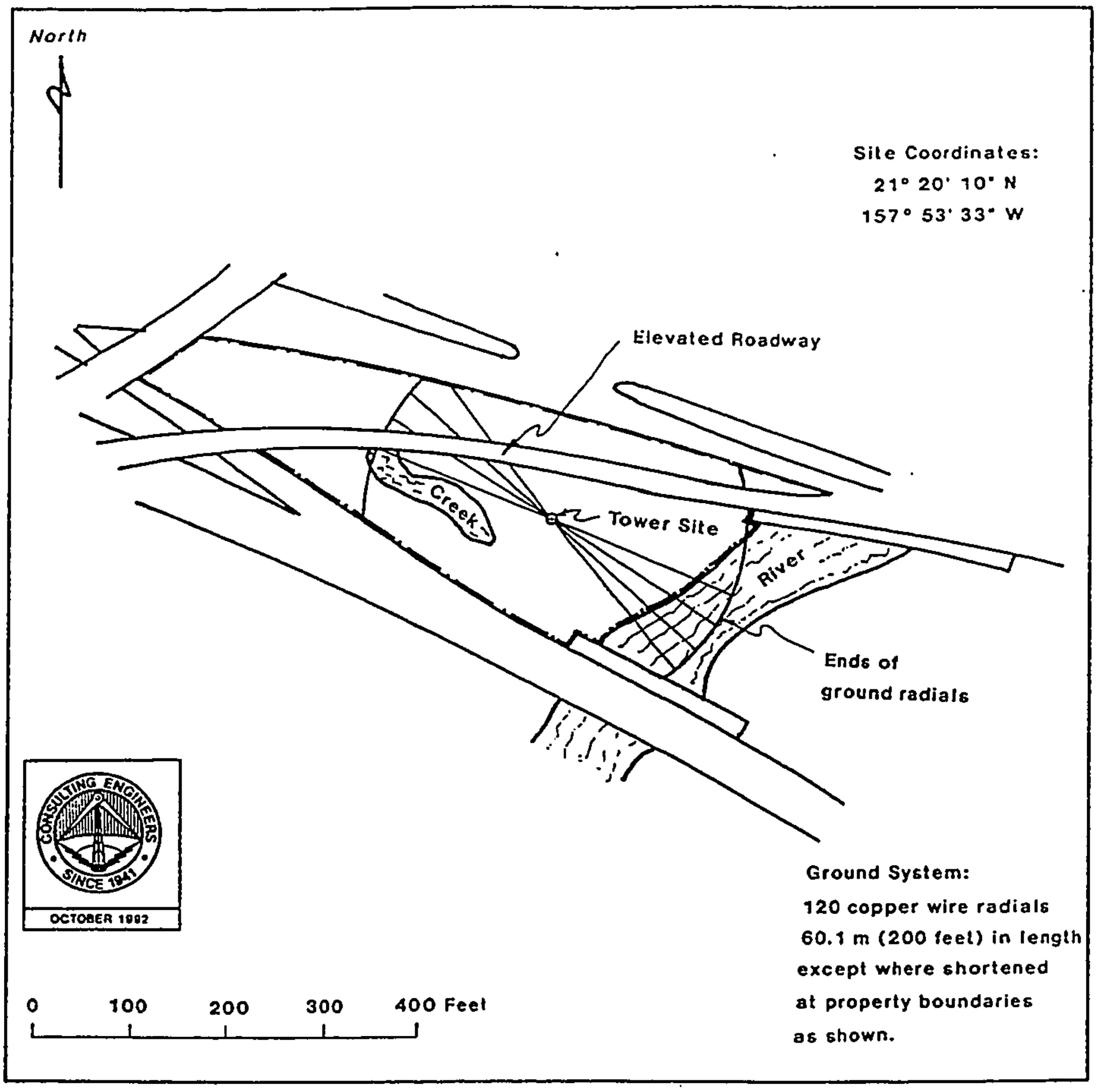
A non-government source of information on RF energy is the Electromagnetic Energy Policy Alliance (EEPA), an organization that provides educational and other services in this field. EEPA is an association of manufacturers and users of electronic and electrical systems. The group's self-described purpose is "to work for a responsible and rational public policy regarding electromagnetic energy." EEPA's address is: 1255 23rd St., N.W., Washington, D.C. 20037.

REFERENCES

[Reports with NTIS Order Numbers are U.S. Government publications and can be ordered for a fee from the National Technical Information Service, U.S. Department of Commerce, (800) 336-4700]

(1) "Radiofrequency Electromagnetic Fields; Properties, Quantities and Units, Biophysical Interaction, and Measurements," NCRP Report No. 67, 1981. National Council on Radiation Protection and Measurements. Purchasing information: NCRP Publications, 7910 Woodmont Ave., Suite 1016, Bethesda, MD 20814; (301) 657-2652.

Figure 2

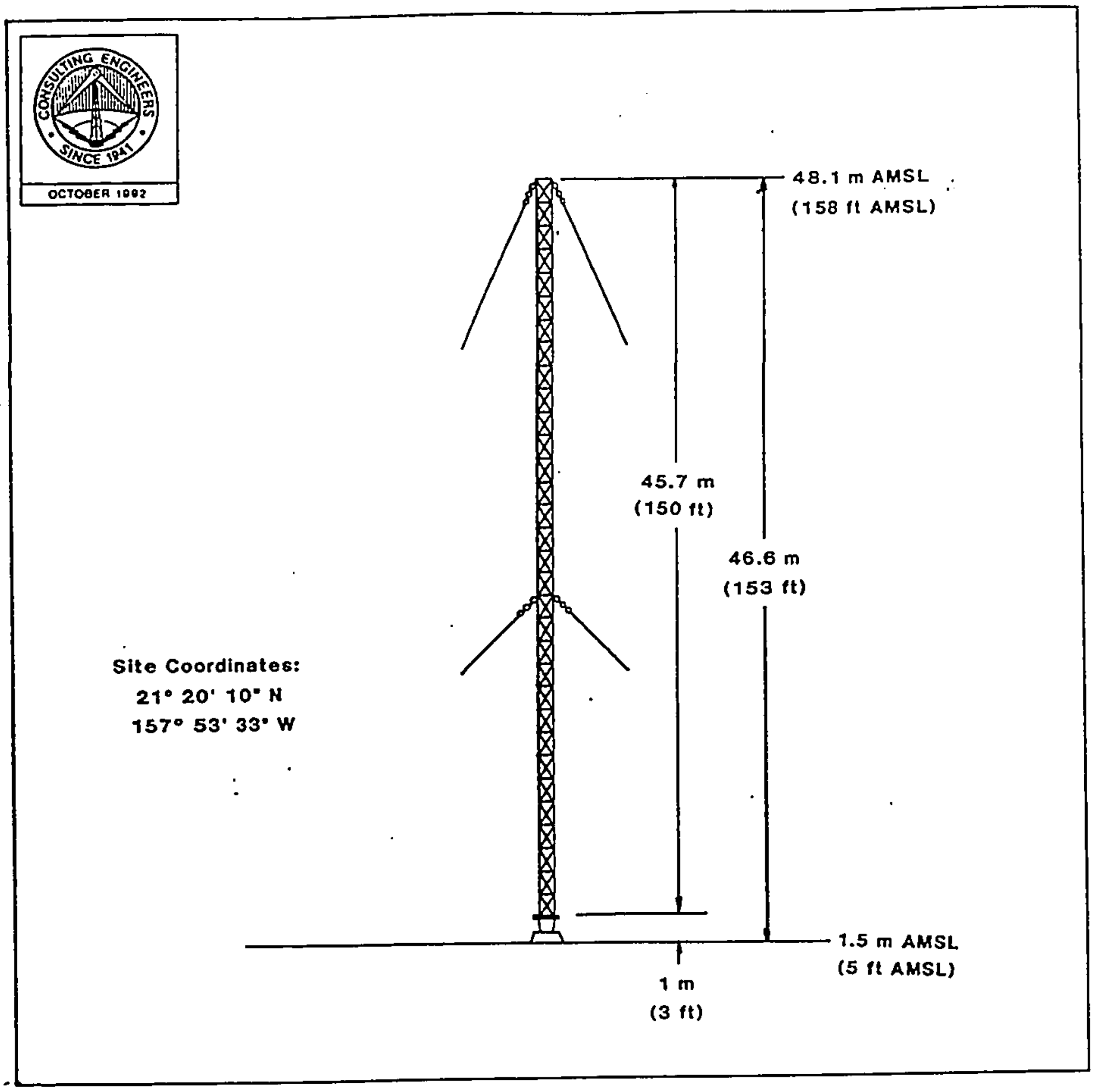


PLAT OF TRANSMITTER SITE

JOHN HUTTON CORPORATION
RADIO STATION KUMU
HONOLULU, HAWAII
1500 KHZ   10 KW   U

duTreil, Lundin & Rackley, Inc.   Washington, D.C.

Figure 3



PROPOSED ANTENNA AND SUPPORTING STRUCTURE

JOHN HUTTON CORPORATION

RADIO STATION KUMU

HONOLULU, HAWAII

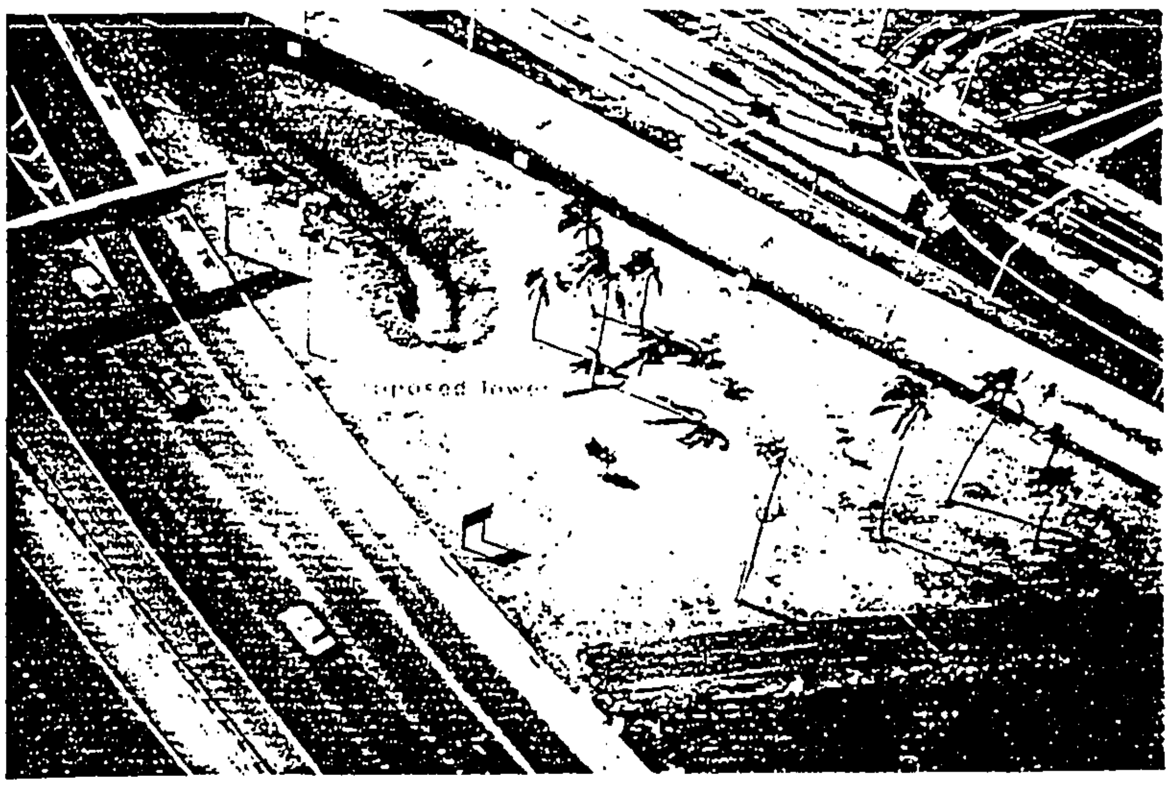
1500 KHZ 10 KW U

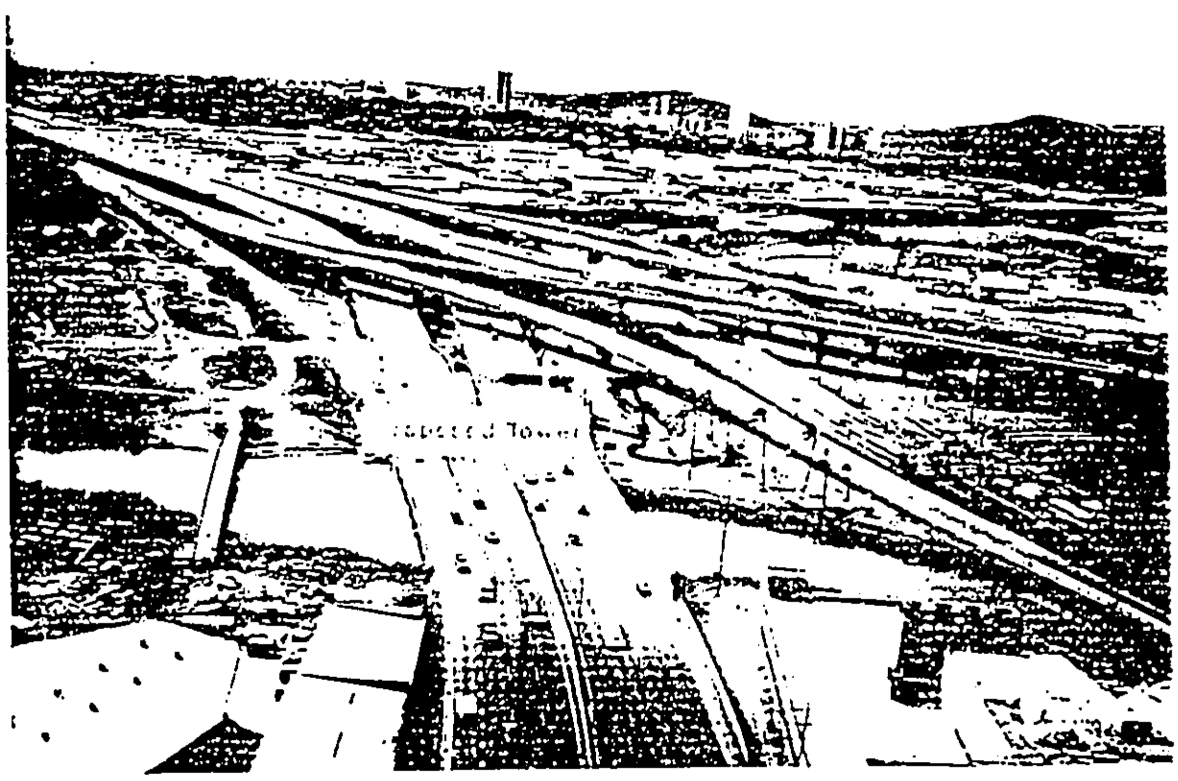
duTreil, Lundin & Rackley, Inc. Washington, D.C.

Figure 4

CONSULTING ENGINEERS
SINCE 1941

OCTOBER [illegible]



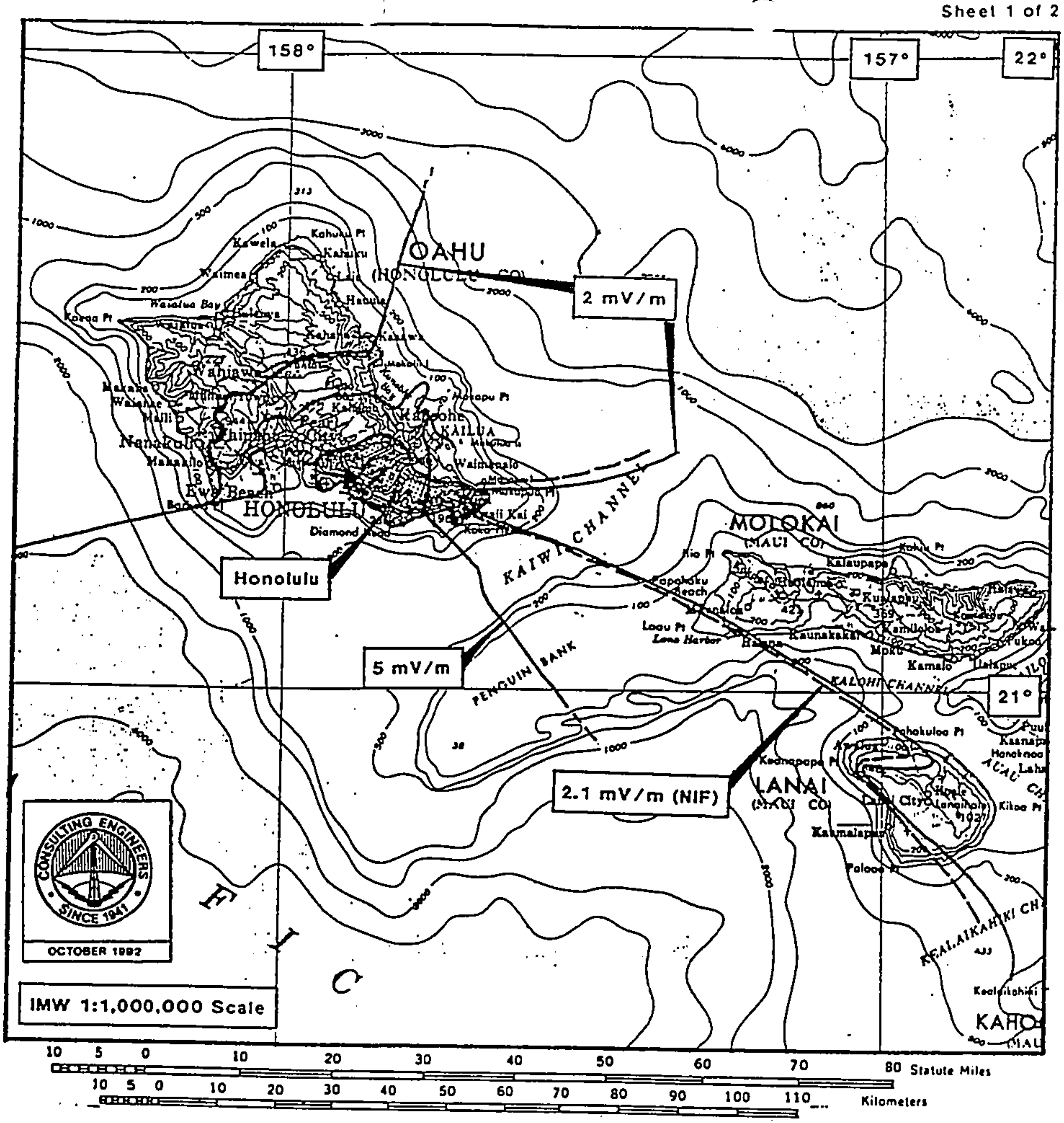


[illegible]

[illegible]
RADIO STATION [illegible]
[illegible]
[illegible]

[illegible]

Figure 5
Sheet 1 of 2



PROPOSED FIELD STRENGTH CONTOURS

JOHN HUTTON CORPORATION
RADIO STATION KUMU
HONOLULU, HAWAII
1500 KHZ 10 KW U

duTreil, Lundin & Rackley, Inc. Washington, D.C.

Figure 5
Sheet 2 of 2

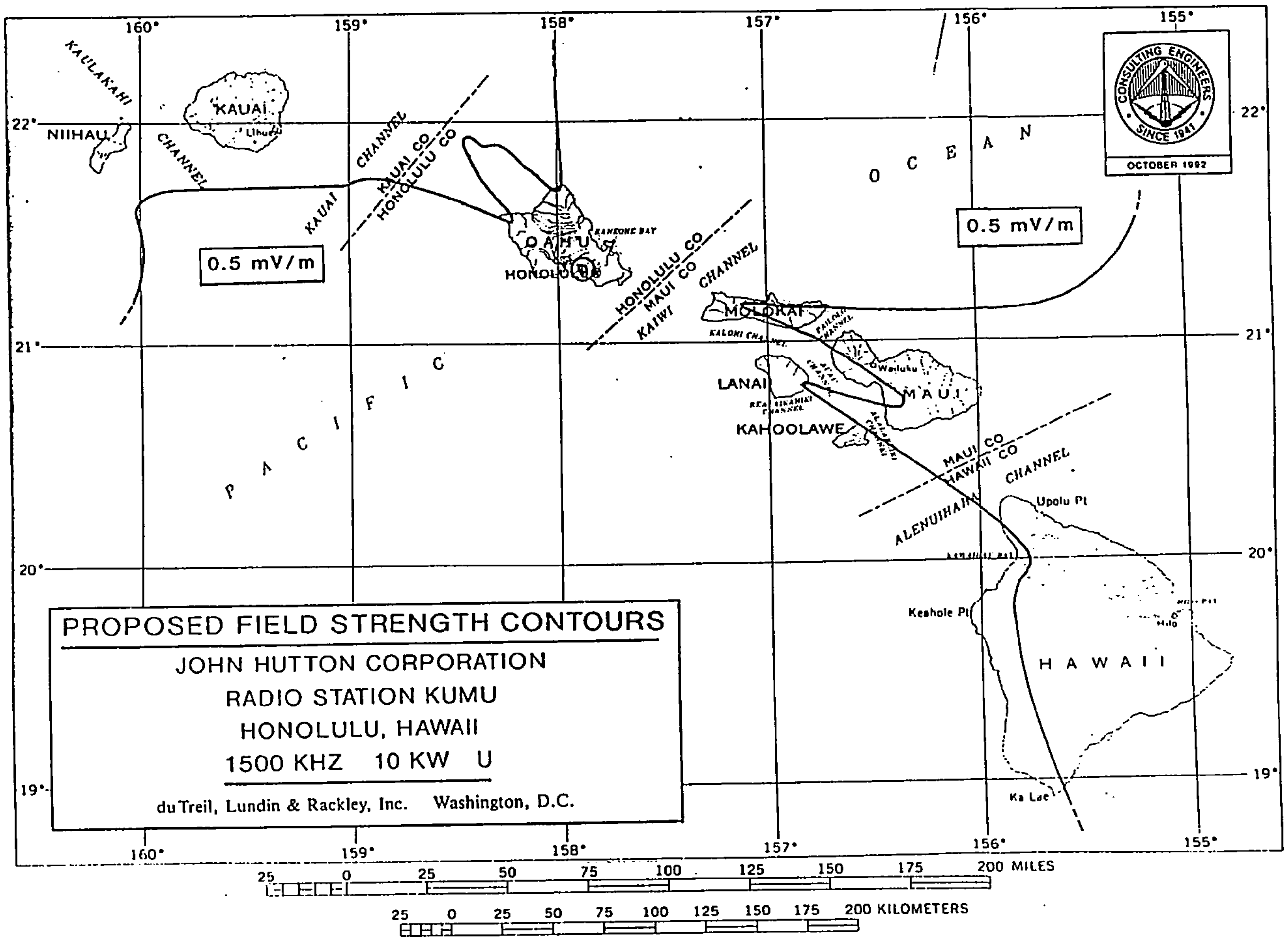


Figure 6
Sheet 1 of 2

TECHNICAL EXHIBIT
APPLICATION FOR CONSTRUCTION PERMIT
JOHN HUTTON CORPORATION
RADIO STATION KUMU
HONOLULU, HAWAII
1500 KHZ 10 KW U

Tabulation of Data Employed
in Calculation of Groundwave Contours

Azimuth (deg)	1 km Field (mV/m)	Segment Conductivity-Distance (mS/m)-(km)
0.0	933.	2-28.2,5000-remainder (R)
5.0	933.	2-24.8,5000-R
10.0	933.	2-24,5000-R
15.0	933.	2-17.8,5000-2.3,2-1.1,5000-R
20.0	933.	2-15.2,5000-R
25.0	933.	2-14.9,5000-R
30.0	933.	2-14.9,5000-R
35.0	933.	2-14.3,5000-R
40.0	933.	2-13.9,5000-R
45.0	933.	2-14.3,5000-2.8,2-2.7,5000-R
50.0	933.	2-13.9,5000-3.8,2-3.3,5000-R
55.0	933.	2-18.6,5000-0.2,2-0.4,5000-R
60.0	933.	2-17.5,5000-R
65.0	933.	2-17.5,5000-R
70.0	933.	2-18.9,5000-R
75.0	933.	2-19.4,5000-R
80.0	933.	2-18.8,5000-R
85.0	933.	2-19.2,5000-R
90.0	933.	2-20.2,5000-R
95.0	933.	2-22.8,5000-R
100.0	933.	2-24.3,5000-71,2-4.1,5000-9.6,2-R
105.0	933.	2-22.6,5000-45.6,2-R
110.0	933.	2-17.4,5000-2.5,2-1.3,5000-44.5,2-13.1,5000-53.3,2-R
115.0	933.	2-15.5,5000-93.1,2-8.8,5000-48.1,2-R
120.0	933.	2-14.1,5000-86,2-R
125.0	933.	2-13.5,5000-139,2-6.7,5000-1,2-R
130.0	933.	2-13.2,5000-246,2-R
135.0	933.	2-3.3,5000-0.2,2-8.6,5000-276,2-1.6,5000-1.9,2-R
140.0	933.	2-3.2,5000-0.6,2-2.7,5000-317,2-10.6,5000-R
145.0	933.	2-2.2,5000-0.4,2-0.6,5000-1.2,2-1.5,5000-R
150.0	933.	2-2.1,5000-3.2,2-0.2,5000-R
155.0	933.	2-2,5000-R

Tabulation of Data Employed
in Calculation of Groundwave Contours
Honolulu, Hawaii

Azimuth (deg)	1 km Field (mV/m)	Segment Conductivity-Distance (mS/m)-(km)
160.0	933.	2-2,5000-R
165.0	933.	2-2,5000-R
170.0	933.	2-2,5000-R
175.0	933.	2-2,5000-R
180.0	933.	2-2,5000-R
185.0	933.	2-1.6,5000-R
190.0	933.	2-1.2,5000-R
195.0	933.	2-1,5000-R
200.0	933.	2-0.9,5000-R
205.0	933.	2-0.8,5000-R
210.0	933.	2-0.7,5000-R
215.0	933.	2-0.6,5000-R
220.0	933.	2-0.6,5000-R
225.0	933.	2-0.6,5000-R
230.0	933.	2-0.5,5000-R
235.0	933.	2-0.5,5000-R
240.0	933.	2-0.5,5000-1.8,2-2.7,5000-R
245.0	933.	2-0.5,5000-0.9,2-4.2,5000-R
250.0	933.	2-0.5,5000-0.5,2-5.3,5000-R
255.0	933.	2-0.5,5000-0.3,2-6.5,5000-R
260.0	933.	2-0.5,5000-0.3,2-6.9,5000-1.4,2-14,5000-R
265.0	933.	2-0.5,5000-0.2,2-7.3,5000-0.4,2-15.3,5000-R
270.0	933.	2-8.2,5000-0.7,2-15.5,5000-R
275.0	933.	2-8.3,5000-1.3,2-15.4,5000-R
280.0	933.	2-8.4,5000-0.4,2-0.5,5000-2.7,2-14.6,5000-R
285.0	933.	2-7.8,5000-1,2-3.2,5000-2,2-16.8,5000-R
290.0	933.	2-5.8,2-4.8,2-2.7,5000-0.8,2-18.6,5000-R
295.0	933.	2-6.7,5000-2.8,2-0.2,5000-1.6,2-26.6,5000-R
300.0	933.	2-6.6,5000-3.2,2-1.2,5000-0.3,2-29.1,5000-R
305.0	933.	2-6.6,5000-3.5,2-R
310.0	933.	2-6.6,5000-1.2,2-34.8,5000-R
315.0	933.	2-38.7,5000-R
320.0	933.	2-36.4,5000-R
325.0	933.	2-37.4,5000-R
330.0	933.	2-38.1,5000-R
335.0	933.	2-40.2,5000-R
340.0	933.	2-41.7,5000-R
345.0	933.	2-R
350.0	933.	2-41.3,5000-R
355.0	933.	2-32.4,5000-1.8,2-0.4,5000-R

Figure 7
Sheet 1 of 3

TECHNICAL EXHIBIT
APPLICATION FOR CONSTRUCTION PERMIT
JOHN HUTTON CORPORATION
RADIO STATION KUMU
HONOLULU, HAWAII
1500 KHZ 10 KW U

Nighttime Allocation Study

Proposed KUMU, Honolulu, HI
1500 kHz, 10 kW, U
G=82.4°, E=933 mV/m/km
21°20'10"N/157°53'33"W

Toward Station	Freq. (kHz)	GC Dist. (km)	Bear. (degT)	Angles Min (deg)	Angles Max (deg)	Skywav Mult. (uV/m)	50 % Ex-RSS (mV/m)	25 % Ex-RSS (mV/m)	Reqd. Prot. (mV/m)	Permisbl Vert-Rad mV/m@1km
KRCK	1500	4116.1	60.9	.0	.0	5.14	9.31	10.39	2.60	2528.3
KSJX	1500	3886.4	54.7	.0	.0	5.54	5.49	6.45	1.60	1447.5
WTOP1B	1500	7767.4	54.8	.0	.0	.58	2.64	4.00	.50	4278.3
WKIZ	1500	7700.2	70.8	.0	.0	1.19	11.89	11.89	2.97	12516.9
KUMU	1500	10.9	121.0	.0	.0	.00	2.15	2.40	.00	.0
WLQV	1500	7198.6	52.2	.0	.0	.71	3.72	4.23	1.06	7404.9
KSTP1B	1500	6393.0	49.3	.0	.0	1.06	2.40	3.14	.50	2359.3
KANI	1500	6208.1	68.3	.0	.0	2.01	8.16	9.69	2.41	5978.4
WMNT	1500	9409.4	72.3	.0	.0	.72	18.03	22.05	5.51	38448.0
CKAY	1500	4290.6	36.5	.0	.0	1.62	5.98	6.45	2.99	9237.6
XEEBC	1500	4237.4	65.2	.0	.0	1.65	42.57	42.57	21.29	64310.7
XERH	1500	6095.7	80.8	.0	.0	.78	15.39	16.35	7.41	47189.2
XEFL	1500	5837.3	79.3	.0	.0	.85	18.99	23.25	9.49	55515.0
XENP	1500	5697.5	80.5	.0	.0	.90	25.65	28.37	12.83	71470.7
MELCHO	1500	5819.8	83.3	.0	.0	.86	43.36	43.36	21.68	>100000
XEUV	1500	6765.2	80.7	.0	.0	.64	23.15	24.32	11.57	90099.6
XEGN	1500	6411.4	80.7	.0	.0	.71	31.62	31.62	15.81	>100000
HIPA	1500	9185.4	72.9	.0	.0	.15	4.68	5.56	2.20	73949.2
HISD	1500	8945.0	72.4	.0	.0	.16	4.83	5.67	2.37	76266.7
HIDE	1500	9154.6	72.5	.0	.0	.15	4.64	5.59	2.26	75511.9
4VBD	1500	8796.3	72.9	.0	.0	.16	4.04	4.82	1.93	60468.7
ANGUIL	1500	9757.7	71.3	.0	.0	.14	2.79	3.17	1.27	47110.7
HJLJ	1500	8975.3	89.8	.0	.0	.15	4.76	5.22	2.38	76988.1
HJTW	1500	9164.3	88.3	.0	.0	.15	4.75	5.07	2.37	79423.4
HJZH	1500	8954.2	86.8	.0	.0	.16	4.75	5.19	2.37	76429.6
TILQA	1500	7890.5	86.1	.0	.0	.19	2.41	2.85	1.20	31191.6
HCRO1	1500	8922.0	93.6	.0	.0	.16	4.46	4.46	2.20	70500.1
WTOP-P	1500	7767.4	54.8	.0	.0	.58	2.64	4.00	.50	4278.3
WLQV-P	1500	7198.6	52.2	.0	.0	.71	3.72	4.23	1.06	7404.9
KSTP-P	1500	6393.0	49.3	.0	.0	1.06	2.40	3.14	.50	2359.3

Nighttime Allocation Study
Honolulu, Hawaii

Figure 7
Sheet 2 of 3

Toward Station	Freq. (kHz)	GC Dist. (km)	Bear. (degT)	Angles Min (deg)	Max (deg)	Skywav Mult. (uV/m)	50 % Ex-RSS (mV/m)	25 % Ex-RSS (mV/m)	Reqd. Prot. (mV/m)	Permisbl Vert-Rad mV/m@1km
XEJQ-O	1500	5666.1	73.9	.0	.0	.91	10.36	13.44	4.80	26422.8
XEYQ-O	1500	5635.9	77.0	.0	.0	.92	15.54	17.27	7.77	42370.0
CMKR-B	1500	8354.7	73.0	.0	.0	.17	3.64	4.24	1.82	52043.7
CMEH-B	1500	7941.1	72.5	.0	.0	.19	3.44	3.89	1.72	45091.4
4VMD-P	1500	8758.2	73.3	.0	.0	.16	3.88	4.98	1.94	60214.9
HJMP-B	1500	9082.8	84.3	.0	.0	.15	5.06	5.06	2.53	83304.8
YSDA-B	1500	7290.8	84.3	.0	.0	.22	5.61	6.25	2.52	56693.2
PJC9-B	1500	9406.4	79.0	.0	.0	.14	3.20	4.23	1.60	55862.5
KNSE	1510	4179.0	61.4	.0	.0	4.98	8.25	8.54	2.13	21448.1
KDKO	1510	5369.3	55.4	.0	.0	2.27	5.47	5.97	1.49	32858.3
WNLC	1510	8114.6	51.5	.0	.0	.39	10.92	11.26	2.74	>100000
WSSH	1510	8165.4	50.3	.0	.0	.34	7.46	7.46	1.87	>100000
WLAC1B	1510	6975.2	59.1	.0	.0	1.05	1.46	2.11	.50	23775.3
KGA-1B	1510	4640.9	41.2	.0	.0	2.83	1.10	1.30	.50	8828.7
WAVB	1510	9367.3	72.9	.0	.0	.75	9.05	9.78	2.44	>100000

Nighttime Allocation Study
Honolulu, Hawaii

Figure 7
Sheet 3 of 3

Proposed KUMU Nighttime Limitation

From Station (Call)	KRCK	KSJX	KSTP1B	KSTP-P	XERH	YNPT-B
Frequency (kHz)	1500	1500	1500	1500	1500	1500
G. C. Distance (km)	4116.096	3886.364	6393.042	6393.042	6095.720	7635.563
Slant Distance (km)	4120.952	3891.507	6396.169	6396.169	6099.000	7638.182
Bearing,degrees True	260.079	252.956	268.439	268.439	282.942	288.390
Mid-Pt Latitude(deg)	29.258	30.584	37.658	37.658	23.068	20.351
Geomag. MP Lat.(deg)	32.509	33.409	42.386	42.386	28.530	27.107
Min-Angle (degrees)	.000	.000	.000	.000	.000	.000
Max-Angle (degrees)	.000	.000	.000	.000	.000	.000
Horizontal-Rad(mV/m)	1538.477	1248.606	4449.352	4449.352	1080.562	879.870
Max-Vert-Rad. (mV/m)	1538.477	1248.606	4449.352	4449.352	1080.562	879.870
Skywave Mult. (uV/m)	5.226	5.659	1.194	1.194	2.712	1.756
Night Limit (mV/m)	1.608	1.413	1.063	1.063	.586	.309

From Station (Call)	CKAY	KGA-1B	XENP	PJC9-B	MELCHO	XEFL
Frequency (kHz)	1500	1510	1500	1500	1500	1500
G. C. Distance (km)	4290.631	4640.910	5697.503	9406.421	5819.764	5837.281
Slant Distance (km)	4295.290	4645.217	5701.012	9408.547	5823.200	5840.707
Bearing,degrees True	237.056	245.369	281.524	290.701	283.473	281.338
Mid-Pt Latitude(deg)	36.226	36.144	23.246	22.858	21.993	23.748
Geomag. MP Lat.(deg)	38.408	38.880	28.353	30.986	27.222	28.971
Min-Angle (degrees)	.000	.000	.000	.000	.000	.000
Max-Angle (degrees)	.000	.000	.000	.000	.000	.000
Horizontal-Rad(mV/m)	404.538	3650.710	305.780	978.600	281.640	278.420
Max-Vert-Rad. (mV/m)	404.538	3650.710	305.780	978.600	281.640	278.420
Skywave Mult. (uV/m)	3.702	3.048	3.139	.921	3.117	2.924
Night Limit (mV/m)	.300	.223	.192	.180	.176	.163

From Station (Call)	KANI	XEEBC	XEGN	XEUV	YSDA-B	TILQA
Frequency (kHz)	1500	1500	1500	1500	1500	1500
G. C. Distance (km)	6208.110	4237.360	6411.438	6765.227	7290.848	7890.480
Slant Distance (km)	6211.331	4242.077	6414.557	6768.183	7293.591	7893.014
Bearing,degrees True	277.074	264.375	283.867	284.888	287.540	289.172
Mid-Pt Latitude(deg)	28.882	28.140	23.037	22.957	20.860	19.474
Geomag. MP Lat.(deg)	34.259	31.630	28.775	28.999	27.341	26.423
Min-Angle (degrees)	.000	.000	.000	.000	.000	.000
Max-Angle (degrees)	.000	.000	.000	.000	.000	.000
Horizontal-Rad(mV/m)	361.848	140.820	281.640	281.640	309.500	309.500
Max-Vert-Rad. (mV/m)	361.848	140.820	281.640	281.640	309.500	309.500
Skywave Mult. (uV/m)	2.055	5.093	2.416	2.135	1.927	1.673
Night Limit (mV/m)	.149	.143	.136	.120	.119	.104

RSS Night Limit to Station KUMU
50 % Exclusion = 2.141 mV/m from : KRCK KSJX
25 % Exclusion = 2.390 mV/m from : KRCK KSJX KSTP1B
0 % Exclusion = 2.785 mV/m from All Stations

FOR COMMISSI... USE ONLY
File No.
ASB Referral Date
Referred by

Section V-A - AM BROADCAST ENGINEERING DATA

Name of Applicant JOHN HUTTON CORPORATION

. Purpose of Application: *(check all appropriate boxes)*

[ ] Construct new station

[X] Make changes in authorized/existing station — Call Sign KUMU

- [ ] Principal authorized/licensed community
- [ ] Frequency
- [ ] Power
- [ ] Main studio location
- [ ] Hours of operation
- [X] Transmitter location
- [ ] Filed in compliance with an Allotment Plan to migrate to the expanded band

  Allotment Number ______

- [X] Antenna system *(including increase in height by addition of FM or TV antenna)*
  - [X] New antenna construction
  - [ ] Alteration of existing structure
    - [ ] Increase height
    - [X] Decrease height
    - [ ] Non-DA to DA
    - [ ] DA to Non-DA

[X] Other *(Summarize briefly the nature of the changes proposed)*
Modification of pending application BP - 920605AF

2. Principal community to be served:

State	County	City or Town
HI	HONOLULU	HONOLULU

3. Facilities requested:

Frequency: 1500 kHz

Hours of Operations

Power: Night: 10 kW Day: 10 kW Critical hours N/A kW

Class of Station (A,B,C or D) B

[ ] Stereo [X] Monaural

4. Transmitter location:

State	County	City or Town
HI	HONOLULU	HONOLULU

Exact antenna location *(street address)*. If outside city limits, give name of nearest town and distance *(in kilometers)*, and direction of antenna from town. Kamehameha Hwy at Kalihi Stream.

Geographical coordinates *(to nearest second)*. For directional antenna give coordinates of center of array. For single vertical radiator give tower location. Specify South Latitude or East Longitude where applicable; otherwise, North Latitude or West Longitude will be presumed.

Latitude	°	'	"	Longitude	°	'	"
	21	20	10		157	53	33

SECTION V-A – AM BROADCAST ENGINEERING DATA (Page 2)

1. Is the proposed site the same transmitter-antenna site of other stations authorized by the Commission or specified in another application pending before the Commission? [ ] Yes [X] No

If Yes, indicate call sign or application file number: NA

3. Antenna system *(including ground or counterpoise system)*

Non-Directional [X] Day [X] Night [ ] Critical Hours

Estimated efficiency 295 mV/m per kW at one kilometer

If antenna is either top loaded or sectionalized, describe fully in an Exhibit. *(Include apparent electrical height.)* Exhibit No. N/A

Directional [ ] Day only (DA-D) [ ] Night only (DA-N)

[ ] Same constants and power day and night (DA-1)

[ ] Different constants and/or power day and night (DA-2)

[ ] Different constants and/or power day, critical hours and night (DA-3)

Submit complete engineering data in accordance with 47 C.F.R. Section 73.150 for each Directional antenna pattern proposed.

Non-directional/Directional

If antenna(s) is/are either top loaded or sectionalized, describe fully in an Exhibit. *(Include apparent electrical height.)* Exhibit No. N/A

Type of feed circuits (excitation) [X] Series Feed [ ] Shunt Feed

[ ] Folded Unipole [ ] Other (explain)

TOWERS *(in meters, rounded to nearest meter)*	1	2	3	4	5	6
Overall height of radiator above base insulator, or above base, if grounded	46					
Overall height above ground *(without obstruction lighting)*	47					
Overall height above ground *(include obstruction lighting)*	47					
Overall height above mean sea level *(include obstruction lighting)*	48					

If additional towers, attach information exactly as it appears above.

. Has the FAA been notified of the proposed construction? [X] Yes [ ] No

If Yes, give date and office where notice was filed and attach as an Exhibit a copy of FAA determination, if available. Exhibit No. N/A

Date Oct 20, 1992 Office where filed Western-Pacific Region

SECTION V-A – AM BROADCAST ENGINEERING DATA (Page 3)

8. List all landing areas within 8 kilometers of antenna site. Give distances and direction to the nearest boundary of each landing area from the antenna site.

Landing Area	Distance (km)	Direction
(a) MOANALUA MED. CTR.	3.6	344.2
(b) HONOLULU INTL	3.7	245.1
(c) THE QUEEN'S MED. CTR.	4.6	125.0
(d) HON. MUNICIPAL BLDG.	4.7	132.2
(e) KUAKINI MED. CTR.	4.9	116.2
(f)		

9. Attach as an Exhibit a description and vertical plan sketch *(including supporting buildings, if any)* of the proposed structure, giving heights above ground, in meters, for all significant features. Clearly indicate existing portions, noting lighting, and distinguishing between the skeletal or other main supporting structure and the antenna elements. If a directional antenna, give spacing and orientation of towers. — Exhibit No. Tech.

If not fully described above, attach as an Exhibit further details and dimensions, including any other antennas mounted on tower and associated isolation circuits. — Exhibit No. N/A

Attach as an Exhibit, a plat of the transmitter site clearly showing boundary lines, roads, railroads, other obstructions, and the ground system or counterpoise. Show number and dimensions of ground radials or, if a counterpoise is used, show heights and dimensions. — Exhibit No. Tech.

10. Will the main studio be located within the station's principal community contour as defined by 47 C.F.R. Section 73.24(i)? [X] Yes [ ] No

If No, attach as an Exhibit a Justification pursuant to 47 C.F.R. Section 73.1125. — Exhibit No. N/A

11. Is there a remote control location or is one to be established in accordance with 47 C.F.R. Section 73.1400? [X] Yes [ ] No

If yes, submit the following:

State	County	City or Town
HI	HONOLULU	HONOLULU
Street address *(or other identification)* 441 North Nimitz Hwy		

12. Attach as an Exhibit a sufficient number of aerial photographs taken in clear weather at appropriate altitudes and angles to permit identification of all structures in the vicinity. The photographs must be marked so as to show compass directions, exact boundary lines of the proposed site, and locations of the proposed 1000 mV/m contour for both day and night operation. Photographs taken in eight different directions from an elevated position on the ground will be acceptable in lieu of the serial photographs if the data referred to can be clearly shown. — Exhibit No. Tech.

13. Is the population within the 1 V/m (1000 mV/m) contour less than 300 persons or less than 1.0 percent of the population within the 25 mV/m contour? [X] Yes [ ] No

If No, attach as an Exhibit a Justification pursuant to 47 C.F.R. Section 73.24(g). — Exhibit No. N/A

14. Environmental Statement. *(See 47 C.F.R. Section 1.1301 et seq.)*

(a) Would a Commission grant of this application come within 47 C.F.R. Section 1.1307, such that it may have a significant environmental impact? [ ] Yes [X] No

If you answer Yes, submit as an Exhibit an Environmental Assessment required by 47 C.F.R. Section 1.1311. — Exhibit No. N/A

If No, explain briefly why not. See Technical Narrative

(b) Distance from tower(s) to the nearest point of the fence enclosing the tower(s) in meters. 7 Meters

SECTION V-A – AM BROADCAST ENGINEERING DATA (Page 4)

16. Allocation Studies

A. Daytime (For assistance, see 47 C.F.R. Section 73.37)

(1) For daytime operation, attach as an exhibit map(s) having appropriate scales, showing the 1000, 5, 2 and 0.5 (0.1, if Class A station) daytime contours in mV/m for both existing and proposed operations. On the map(s) showing the 5 mV/m contours CLEARLY INDICATE THE LEGAL BOUNDARIES OF THE PRINCIPAL COMMUNITY TO BE SERVED.

Exhibit No. Tech.

(2) Does the daytime 5 mv/m contour encompass the legal boundaries of the principal community to be served?

☐ Yes ☒ No

If No, attach as an Exhibit a justification for waiver of 47 C.F.R. Section 73.24(i).

Exhibit No. Tech.

(3) For daytime operation, for stations on a frequency between 535 kHz and 1605 kHz, attach as an Exhibit an allocation study utilizing Figure M-3 (Figure R-3 47 C.F.R. Section 73.190) or an accurate full scale reproduction thereof and using pertinent field strength measurement data where available, a full scale exhibit of the entire pertinent area to show the following:

Exhibit No. Tech.

(a) Normally protected and the interfering contours for the proposed operation along all azimuths.

(b) Normally protected and interfering contours of existing stations and other proposed stations in pertinent areas with which prohibited overlap would result as well as those existing stations and other proposals which require study to clearly show absence of prohibited overlap. If prohibited overlap were to occur as a result of the proposal, appropriate justification for waiver of 47 C.F.R. Section 73.37 is to be included.

(c) Plot of the transmitter location of each station or proposal requiring investigation, with identifying call letters, file numbers, and operating or proposed facilities.

(d) Properly labeled longitude and latitude degree lines, shown across entire Exhibit.

(4) For daytime operation, attach as an Exhibit a tabulation of the following:

Exhibit No. Tech.

(a) Azimuths along which the groundwave contours were calculated for all stations or proposals shown on allocation study exhibits required by (3)(a).

(b) Inverse distance field strength used along each azimuth.

(c) Basis for ground conductivity utilized along each azimuth specified in (4)(a). If field strength measurements are used, submit copies of the analyzed measurements. If measurement data are taken from Commission records identify the source of the measurements in the Commission's files.

(d) Calculated distances.

B. Critical Hours (If applicable, see 47 C.F.R. Section 73.187)

(1) For critical hour operation, attach as an Exhibit map(s) having appropriate scales, showing the 1000, 5 and 0.5 critical hours contours in mV/m for both existing and proposed operations. On the map(s) showing the 5 mV/m contours CLEARLY INDICATE THE LEGAL BOUNDARIES OF THE PRINCIPAL COMMUNITY TO BE SERVED.

Exhibit No. N/A

(2) Does the critical hours 5 mV/m contour encompass the legal boundaries of the principal community be served?

☐ Yes ☐ No

If No, attach as an Exhibit justification for waiver of 47 C.F.R. Section 73.24(i).

Exhibit No.

(3) For critical hours operation, attach as an Exhibit an allocation study utilizing Figure M-3 (Figure R-3 47 C.F.R. Section 73.190) or an accurate full scale reproduction thereof and using pertinent field strength measurement data where available, a full scale exhibit of the entire pertinent area to show the following: The 0.1 mV/m groundwave contour pertinent arcs of Class A stations and appropriate studies to establish compliance with 47 C.F.R. Section 73.187 when operation is proposed on a U.S. Class A channel.

Exhibit No. N/A

C. Nighttime. *(For assistance, see 47 C.F.R. Section 73.182)*

(1) For nighttime operation, attach as an Exhibit map(s) having appropriate scales, showing the 1000 mV/m and coverage contours (appropriate minimum protected value for proposed class of station, or RSS nighttime interference-free contour; whichever is the greater value) for both existing and proposed operations. On the map(s) showing the interference-free contours, CLEARLY INDICATE THE LEGAL BOUNDARIES OF THE PRINCIPAL COMMUNITY TO BE SERVED.

Exhibit No. Tech.

(2) Does the nighttime 5 mV/m or nighttime interference free contour (which ever is higher) encompass 80% of the principal community to be served (50% for expanded band 1605-1705 kHz stations?

☐ Yes ☒ No

If No, attach as an Exhibit justification for waiver of, or exemption pursuant to 47 C.F.R. Section 73.24(i).

Exhibit No. Tech.

(3) For nighttime operation, for stations on a frequency between 535 kHz and 1605 kHz, attach as an Exhibit allocation data including the following:

Exhibit No. Tech.

(a) Proposed nighttime limitation to other existing or proposed stations with which objectionable interference could result, as well as those other proposals and existing stations which require study to show clearly absence of objectionable interference.

(b) All existing or proposed nighttime limitations which enter into the nighttime RSS limitation of each of the existing or proposed facilities investigated under (3)(a) above.

(c) All existing and proposed limitations which contribute to the RSS nighttime limitation of the proposed operation, together with those limitations which must be studied before being excluded.

(d) A detailed interference study plotted upon an appropriate scale map if a question exists with respect to nighttime interference to other existing or proposed facilities along bearing other than on a direct line toward the facility considered. (Clipping study)

(e) The detailed basis for each nighttime limitation calculated under (3)(a), (b), (c) and (d) above.

16. Attach as an Exhibit a map *(7.5 minute U.S. Geological Survey topographic quadrangles, if available)* of the proposed antenna location showing the following information:

Exhibit No. Tech.

A. Proposed transmitter location accurately plotted with the latitude and longitude lines clearly marked and showing a scale in kilometers.

B. Heights of buildings or other structures and terrain elevations in the vicinity of the antenna, indicating the location thereof.

C. Transmitter location and call signs of non-broadcast radio stations *(except amateur and citizens band)*, established commercial and government receiving stations in the general vicinity which may be adversely affected by the proposed operation.

D. Transmitter location and call letters of all AM, FM and TV broadcast stations within three (3) kilometers of the proposed antenna location.

CERTIFICATION

certify that I have prepared this Section of this application on behalf of the applicant, and that after such preparation, have examined and found it to be accurate and true to the best of my knowledge and belief.

Name *(Typed or Printed)*	Relationship to Applicant *(e.g., Consulting Engineer)*
LOUIS R. du TREIL	Technical Consultant
Signature: Louis R du Treil	Address *(Include ZIP Code)* du Treil, Lundin & Rackley, Inc. 1019 19th Street, N.W., Third Floor Washington, D.C. 20036
Date: October 20, 1992	Telephone No. *(Include Area Code)* (202) 223-6700

DOCUMENT CAPTURED AS RECEIVED

JAN 22 '93 14:11 FROM AWP-530 PAGE.002

5

DO NOT REMOVE CARBONS

U.S. Department of Transportation Federal Aviation Administration

NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION

Aeronautical Study Number: 92-AWP-1158-OE

1. Nature of Proposal

A. Type: X New Construction ☐ Alteration

B. Class: X Permanent ☐ Temporary (Duration ____ months)

C. Work Schedule Dates: Beginning Subject to End FCC Approval

3A. Name and address of individual, company, corporation, etc. proposing the construction or alteration. (Number, Street, City, State and Zip Code)

(808) 531-4511
area code Telephone Number

John Hutton Corporation DLR:0311
c/o Mr. John Weiser, Jr.
441 N. Nimitz Hwy.
Honolulu, HI 96817

2. Complete Description of Structure

A. Include effective radiated power and assigned frequency of all existing, proposed or modified AM, FM, or TV broadcast stations utilizing this structure.

B. Include size and configuration of power transmission lines and their supporting towers in the vicinity of FAA facilities and public airports.

C. Include information showing site orientation, dimensions, and construction materials of the proposed structure.

Change of transmitter site for KUMU, operation to continue on 1500 kHz with power of 10 kW.

(If more space is required, continue on a separate sheet.)

B. Name, address and telephone number of proponent's representative if different than 3 above.

Louis R. du Treil
du Treil, Lundin & Rackley, Inc.
240 NORTH WASHINGTON BLVD. STE 700
SARASOTA, FLA. 34236

4. Location of Structure			5. Height and Elevation	
A. Coordinates (To nearest second)	B. Nearest City or Town, and State: Honolulu, HI	C. Name of nearest airport, heliport, flightpark: Moanalua Med. Ctr.	A. Elevation of site above mean sea level	5 (1.5 m)
21 20 10 Latitude	(1) Distance to 4B: Within City	(1) Distance from structure to nearest point of nearest runway: 3.6 km	B. Height of structure including all appurtenances and lighting above ground, or water if so situated	153 (46.6 m)
157 53 33 Longitude	(2) Direction to 4B: Limits	(2) Direction from structure to airport: 245.1° T	C. Overall height above mean sea level (A + B)	158 (48.1 m)

Kamehameha Highway at Kalihi Stream.

I HEREBY CERTIFY that all of the above statements made by me are true, complete, and correct to the best of my knowledge. In addition, I agree to obstruction mark and/or light the structure in accordance with established marking & lighting standards if necessary.

Date	Typed Name/Title of Person Filing Notice	Signature
Oct. 20, 1992	Louis R. du Treil/Technical Consultant	[signature]

FOR FAA USE ONLY NAD83 21-20-58.66 157-53-33.12 FAA will either return this form or issue a separate acknowledgement.

The Proposal:

☐ Does not require a notice to FAA.

X Is not identified as an obstruction under any standard of FAR, Part 77, Subpart C, and would not be a hazard to air navigation.

☐ Is identified as an obstruction under the standards of FAR, Part 77, Subpart C, but would not be a hazard to air navigation.

☐ Should be obstruction ☐ marked, ☐ lighted, per FAA Advisory Circular 70/7460-1, Chapter(s)

X Obstruction marking and lighting are not necessary.

Supplemental Notice of Construction FAA Form 7460-2 is required ☐ At least 48 hours before the start of construction. ☐ Within five days after the construction reaches its greatest height.

This determination expires on July 22 1993 unless: (a) extended, revised or terminated by the issuing office; (b) the construction is subject to the licensing authority of the Federal Communications Commission and an application for a construction permit is made to the FCC on or before the above expiration date. In such case the determination expires on the date prescribed by the FCC for completion of construction, or on the date the FCC denies the application.

NOTE: Request for extension of the effective period of this determination must be postmarked or delivered to the issuing office at least 15 days prior to the expiration date.

If the structure is subject to the licensing authority of the FCC, a copy of this determination will be sent to that Agency.

ANY FUTURE CHANGE IN FREQUENCY, RADIATED POWER OR ANTENNA CHARACTERISTICS SHALL BE FILED AS NOTICE TO THE FAA ON FORM 7460-1

Remarks: Based on aeronautical study that the structure be maintained [illegible]

Issued in	Signature	Date
[illegible]	[signature]	[illegible] 1993

FAA Form 7460-1

DO NOT REMOVE CARBONS

FAA

du Treil, Lundin & Rackley, Inc.
A Subsidiary of A. D. Ring, P.C.

January 25, 1993

Secretary, Federal Communications Commission
Washington, D. C. 20554

Re: John Hutton Corporation
Honolulu, Hawaii
File No. BP-920605AF

Gentlemen:

In reference to the above pending application, I am enclosing a copy of the FAA determination of No Hazard regarding the proposed tower to be erected in Honolulu.

Kindly contact the undersigned if there is any question regarding this matter.

Best Wishes

Very truly yours,

Louis R. du Treil

cc: Mr. John Weiser, Jr.
Leonard Joyce, Esq.

DUT\ew

240 N. Washington Blvd.
Suite 700
Sarasota, Florida 34236
(813) 366-2611
(813) 366-5533 FAX

Call Sign - KUMU File No. - BP-920605AF

THE AUTHORITY GRANTED IS SUBJECT TO THE FOLLOWING CONDITIONS:

Operation by remote control authorized.

Antenna obstruction markings not required.

Permittee shall install a type accepted transmitter, or submit application (FCC Form 301) along with data prescribed in Section 73.1660(b) should non-type accepted transmitter be proposed.

The fundamental field strength produced by KUMU's operation as determined by measurements at a point 22 feet east and 105 feet south of the southeast corner of the main building at the Commission's Honolulu Office, shall not exceed 25 mV/m (88.0 dBu) at any time.

In the event of interference to the monitoring station's operations, which is in any way related to this station's facilities or transmissions, the licensee shall take such corrective action as is necessary to eliminate the interference. Corrective action shall include the provision, installation, and adjustments of suitable transmitter filter circuits, shielding, or other appropriate devices at this and other stations which may be required to eliminate the interference. If these or other measures do not eliminate the interference, the licensee shall reduce power to comply or cease transmissions.

Any all spurious emissions, other than on frequencies contained within the AM Broadcast band, that are in any way related to this stations's facilities or transmission, as detected by the monitoring equipment at the Commission's Honolulu Office, shall be no greater than 0.71 uV/m (-3 dBu).

UNITED STATES OF AMERICA
FEDERAL COMMUNICATIONS COMMISSION

File No. BMP-950510DA

Call Sign KUMU (AM)

Modification No.

MODIFICATION OF CONSTRUCTION PERMIT

AM
(Class of station)

John Hutton Corporation
441 North Nimitz Highway
Honolulu, Hawaii 96817

Permittee: John Hutton Corporation

Station location: Honolulu, Hawaii

Associated Broadcast station:

The Authority Contained in Authorization File No. BP-941018DB as modified dated November 15, 1994 granted to the Permittee listed above is hereby modified in part as follows:

DATE OF REQUIRED COMPLETION OF CONSTRUCTION: DEC 2 1995

This modification of construction permit shall be attached to and be made a part of the construction permit of this station.

Except as herein expressly modified, the above-mentioned construction permit, subject to all modifications heretofore granted by the Commission, is to continue in full force and effect in accordance with the terms and conditions thereof and for the period therein specified.

Dated: JUN 2 1995
MDH:rao

FEDERAL
COMMUNICATIONS
COMMISSION

FCC Form 361
October 1978

F. C. C. - WASHINGTON, D. C.

FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

IN REPLY REFER TO:
8910

NOTICE TO PERMITTEE/LICENSEE

It is important that you read the enclosed instrument of authorization carefully, noting especially any condition(s) and the expiration date.

In the event of any questions, communicate with the Commission immediately.

Address communications to:

Federal Communications Commission
Audio Services Division
AM Branch, Room 342
Mass Media Bureau
Washington, DC 20554

Telephone Number:

(202) 632-7010 or 254-9572

FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

IN REPLY REFER TO:
8910

NOTICE TO PERMITTEE/LICENSEE

It is important that you read the enclosed instrument of authorization carefully, noting especially any condition(s) and the expiration date.

In the event of any questions, communicate with the Commission immediately.

Address communications to:

Federal Communications Commission
Audio Services Division
AM Branch, Room 342
Mass Media Bureau
Washington, DC 20554

Telephone Number:

(202) 632-7010 or 254-9572

THIS IS TO NOTIFY YOU THAT YOUR
APPLICATION FOR
CONSTRUCTION PERMIT

WAS GRANTED ON 03/11/93.

FREQUENCY: 1500KHZ

LOCATION: HONOLULU, HI

YOUR AUTHORIZATION WILL BE ISSUED IN THE NEAR FUTURE. POST THIS CARD PENDING ITS RECEIPT.

ALL INQUIRIES CONCERNING THIS APPLICATION SHOULD REFER TO FILE NUMBER BP -920605AF.

96817-5063

FCC 372 (7/87) NOTIFICATION

FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

U.S. MAIL

POSTAGE AND FEES PAID
FEDERAL COMMUNICATIONS COMMISSION
FCC 615

JOHN HUTTON CORP.
KUMU AM STATION
C/O 441 N. NIMITZ HIGHWAY
HONOLULU,, HI 96817

ENVIRONMENTAL CONCERNS

This section addresses the applicable environmental requirements, infrastructure requirements, impacts on public services, and social concerns associated with the project.

4.1 Applicable Environmental Requirements

Historic/Archaeological Sites

There are no historic or archaeological sites presently known to be situated on the project site. Furthermore, no archaeological sites are expected given that the project site was identified as Fill Land (FL) by the U.S. Soil Conservation Service's Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii (1972), and substantiated by subsurface investigation study results.

4.2 Infrastructure Requirements

Water Supply

The project would not create any additional demand on the current potable water supply nor require improvements to existing water facilities since the site would essentially be uninhabited except for the periodic maintenance of its facilities.

Wastewater Disposal

The project would not create any additional demand on the existing wastewater system serving the area because there would be no potable water demand created or restroom facilities provided on the site. As a result, no improvements to existing wastewater facilities are necessary.

Drainage Facilities

The project site is located in a Flood Fringe area which is designated as Zone AE under the Flood Insurance Rate Map, Community Panel Number 150001 0112 C. Since minimal grading activities are required for this site, there should be no major change or impact to the existing drainage conditions. Subsequently, pertinent engineering studies are being conducted to ensure suitable development of facilities on this site. Compliance with all regulatory requirements for this project site will be performed, and necessary permits and approvals will be obtained before construction activities commence.

Transportation Facilities

The project would not create additional traffic on the surrounding roadways since it would essentially be uninhabited except for the periodic maintenance of the transmitter facility. As previously discussed under Section 2.1, access to the site for periodic maintenance would be conducted by walking onto the site. Therefore, no improvements to transportation facilities in the immediate area are necessary.

4.3 Public Services

Refuse Collection

The operations associated with the broadcasting tower and transmitter facility would not generate any solid wastes requiring either private or City collection services because the site would be uninhabited.

Solid wastes generated during construction activities are expected to be insignificant since minimal grading activities are expected due to the nature of the project. Disposal of these wastes would be carried out using normal construction practices in accordance with City regulations.

Fire Protection

The project is not expected to create additional demands on the City's fire department since only a broadcasting tower and transmitter facility would be located on the site.

Police Protection

The project site would be uninhabited and surrounded with a chain-link fence to keep out trespassers. As a result, no additional demands on the City's police department are expected.

Educational Facilities

The project would not increase the residential population in the surrounding area since no residential units are planned. Therefore, there would be no impact or additional demands placed on educational facilities or personnel serving the area.

4.4 Housing And Population

The project would not create additional housing demands nor increase the resident population in the area since only a broadcasting tower and transmitter facility would be constructed.

4.5 Employment

There would be no increase in permanent jobs created by the project because the transmitter facility would be used for current operations replacing the temporary wire antenna facility. However, there would be a few short-term jobs created for construction of the facilities which may last about three weeks.

4.6 Parks And Recreation

The project site is presently not used for any recreational activity, therefore, the construction of the broadcasting tower and transmitter facility would not impact recreational activities. Furthermore, there would be no additional demands for park facilities created by the project.

4.7 Day Care Facilities

The project would not increase the residential population in the surrounding area and therefore have no impact or demands created for day care facilities.

4.3 Community Concerns

There are no community concerns presently known associated with the proposed project.

PHASE I REPORT
PROPERTY ENVIRONMENTAL ASSESSMENT
INSTERSTATE HIGHWAY FAP #IH1-1 (82)
KEEHI INTERSTATE
HONOLULU, HAWAII 96816

Prepared for:

KUMU RADIO
c/o JEFF COELHO
441 NORTH NIMITZ HIGHWAY
HONOLULU, HAWAII 96817

Prepared by:

MURANAKA ENVIRONMENTAL CONSULTANTS, INC.
1130 NORTH NIMITZ HIGHWAY, SUITE A-221
HONOLULU, HAWAII 96817

ENVIRO 2

PHASE I REPORT
PROPERTY ENVIRONMENTAL ASSESSMENT

INTERSTATE HIGHWAY FAP # IH1-1 (82)
KEEHI INTERCHANGE
HONOLULU, HAWAII 96819

Prepared for:

KUMU RADIO
441 NORTH NIMITZ HIGHWAY
HONOLULU, HAWAII 96817

Prepared by:

MURANAKA ENVIRONMENTAL CONSULTANTS, INC.
1130 NORTH NIMITZ HIGHWAY, SUITE A-221
HONOLULU, HAWAII 96817
(808) 531-8877

Project No. 92981

December 18, 1992

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1.0 EXECUTIVE SUMMARY

Muranaka Environmental Consultants, Inc. (MEC), has completed the site inspection and research for a Phase I Environmental Assessment of a parcel located at the Keehi interchange, Interstate FAP # IH1-1 (82), between Nimitz Highway and Kamehameha Highway at the Dillingham off ramp in Honolulu, Hawaii. The area investigated is approximately 38,000 square feet (ft^2). The site had no address or tax map key number. However, the eastern portion is designated as tax map key number (1) 1-2-13:22, which is owned by the State of Hawaii. There were no structural buildings located on-site.

MEC performed the assessment to determine the presence and the extent of potential conditions or situations at the site which may result in present real, or potential hazards, or environmental liabilities as dictated by federal, state, and local statutes or regulations. Specific areas investigated include: historical uses, obvious surface and published subsurface contamination, polychlorinated biphenyl-containing switches, transformers, and capacitors (PCBs), underground storage tanks (USTs), hazardous materials and hazardous wastes, and suspect asbestos-containing building materials (ACBMs).

At the time of the inspection, MEC personnel did not observe any visible evidence of obvious surface contamination at the site, and did not find any direct evidence of published subsurface contamination. The State of Hawaii Department of Health (DOH) Hazard Evaluation Emergency Response (HEER) has no records of past releases of hazardous materials on the site. Presently, there are no Comprehensive Environmental

Response Compensation and Liability Act (CERCLA or Superfund) sites or National Priority List (NPL) sites, within one-quarter mile of investigated site. However, there is one Comprehensive Environmental Response Compensation Liability Information System (CERCLIS) site within one-quarter mile of the site at Gaspro, 2305 Kamehameha Highway.

On December 15, 1992, MEC requested records of any past or pending environmental regulatory actions at the subject site from the DOH Department of Environmental Management. In addition, on December 15, 1992, MEC requested a listing of any hazardous material spills which have occurred within approximately one-quarter mile of the site from the Honolulu Fire Department (HFD). The DOH and the HFD generally respond within forty-five days. MEC will forward a copy of their responses as soon as they are available.

During the inspection, MEC personnel did not observe UST indicators, such as: fill pipes, dispenser pumps, vent pipes, and concrete caps. The DOH has records of eighteen USTs within approximately one-quarter mile of the site, four of which have been recorded as leaking USTs (LUSTs). Information on the exact location of five UST and two LUST sites, located at Fort Shafter, is not readily available to MEC and they may be located greater than one-quarter mile from the investigated site.

While inspecting the site, MEC personnel did not observe any United States Environmental Protection Agency (USEPA) regulated Resource Conservation and Recovery Act (RCRA) hazardous waste generated, treated, stored or disposed on-site. In addition, MEC personnel did not discover any evidence of PCB or asbestos mineral fiber materials on the property.

In conclusion, at this time, MEC does not recommend any additional investigation of the site.

2.0 INTRODUCTION

Muranaka Environmental Consultants, Inc. (MEC), has completed a Phase I Environmental Assessment of a parcel located at the Keehi Interchange, Interstate Highway FAP # IH1-1, between Nimitz Highway and Kamehameha Highway at the Dillingham off ramp in Honolulu, Hawaii. The area investigated is approximately 38,000 square feet (ft^2). The site had no address or tax map key number. However, the eastern portion is part of a lot designated as tax map key number (1) 1-2-13:22, which is owned by the State of Hawaii. There were no structural buildings located on-site.

This assessment was performed to determine the presence and the extent of potential conditions or situations at the site which may result in present real, or potential hazards, or environmental liabilities as dictated by federal, state, and local statutes or regulations. Specific areas investigated include: historical uses, obvious surface and published subsurface contamination, polychlorinated biphenyl (PCB) items, underground storage tanks (USTs), hazardous materials and wastes, and suspect asbestos-containing building materials (ACBMs).

The Phase I assessment consisted of a visual inspection of present surface conditions, a review of plans and maps of the site, a review of pertinent historical records kept by private sources as well as the Department of Health (DOH) and the United States Environmental Protection Agency (USEPA), and interviews with people knowledgeable of the site.

3.0 MATERIALS AND METHODS

Introduction

MEC personnel performed the Phase I Environmental Assessment to investigate potential environmental liabilities associated with the property. Methods used to perform the assessment were: a site reconnaissance visit, a review of historical data, interviews with people knowledgeable with the site, and preparation of a written report. Particular areas investigated included past historical uses, PCB containing items, USTs, hazardous materials and wastes, obvious surface and published subsurface contamination, and suspect ACBMs. A discussion of each method used, and each area investigated follows.

Site Reconnaissance

MEC personnel visually inspected all grounds and tenant spaces of the project area for evidence of: past releases of oil or hazardous material or any other condition that may constitute a threat of release of oil or hazardous material, items which were suspected to contain PCBs, suspect ACBMs, surface evidence of USTs, on-site hazardous material use and storage practices, and hazardous waste handling and disposal practices. Any observable evidence of soil or water contamination, PCB items, USTs, hazardous materials and wastes, or suspect ACBMs were documented through written notes as well as photographs.

Review of Historical Data

The historical records review focused on identifying previous landowners and their land uses. This information is usually acquired through a search of historic tax records, DOH records, historic cartography, and interviews. Specific areas of interest included: past and present on-site manufacturing and operating practices, facility development plans, and adjacent land uses from the initial utilization of the site to the present day.

Historic tax records indicate past owners and lessors of the site. Information (if available) provided by the DOH, Division of Environmental Management, consists of known environmental incidents (solid and hazardous waste, waste water discharges, chemical spills, citations or inspections by the regulatory authorities), and current operating permits. Historic cartography (if available) presents graphic illustrations of past site uses. Finally, other resources such as past environmental audits, maintenance records for existing underground storage tanks, and any other documents which could give a more detailed picture of current and potential liabilities for the client were reviewed.

Interviews

Oral interviews with people knowledgeable of the site are valuable sources of past and present site uses; some of which may not be contained in municipal records.

Areas of Investigation

Obvious Surface Contamination

Obvious surface contamination is often an indication of an ongoing or past release of oil or hazardous materials and may only indicate a small fraction of surface or subsurface soil and/or water contamination. Obvious surface contamination is usually observed in the field as stained or discolored soils, stressed vegetation, or unusual odors.

Published Subsurface Contamination

To further investigate possible contamination of soil and ground water on the site and within one-quarter mile of the area, MEC reviewed the following Federal and State databases:

i) USEPA Comprehensive Environmental Response Compensation Liability Act (CERCLA or Superfund) list of uncontrolled hazardous waste sites to be remediated with federal funds

ii) USEPA National Priorities List (NPL) of hazardous waste sites to be considered for remediation with federal funds

iii) USEPA Comprehensive Environmental Response Compensation Liability Information System (CERCLIS) list of Superfund activities

iv) Hawaii Department of Health (DOH), Hazard Evaluation and Emergency Response (HEER) list of hazardous material releases.

PCB Items

Polychlorinated biphenyls (PCBs) are synthetic chemicals which were frequently used in the past as an additive to insulating and heat transfer fluids in electric equipment, particularly liquid-cooled electrical transformers. In 1979, the EPA banned the commerce of PCBs and passed the Toxic Substance Control Act (TSCA) to regulate the use and disposal of PCB items. As part of the assessment, an inventory of all electrical transformers, switches, and capacitors on the subject site was made.

Underground Storage Tank Systems

Underground storage tank system management is strictly regulated by the U.S. EPA under 40 CFR Part 280, and by the State of Hawaii under Section 42-62 of the Hawaii Revised Statutes. Regulations include registering all underground storage tank systems with the DOH and the City and County Fire Department. Underground storage tanks currently in use must meet rigorous leak detection, corrosion protection, and spill and overfill prevention performance standards. In addition, tank systems which are abandoned or no longer to be used in their present capacity must undergo a proper closure; upon closure, an assessment of soil or ground water contamination must be performed.

Hazardous Materials

Proper use and storage of hazardous materials is necessary to ensure a safe work place and to prevent possible environmental damage due to spills or leaks of hazardous materials to the environment. Material Safety Data Sheets (MSDSs) for all hazardous materials provide information about the material pertaining to its chemical composition, storage recommendations, and first aid for human exposure. MSDSs are required to prepare a Hazard Communication Program for all people working with or around hazardous materials. As part of an assessment, inventories of all hazardous materials are compiled and methods of uses and storage are also noted.

Hazardous Wastes

Hazardous waste is strictly regulated by the EPA under the Resource Conservation and Recovery Act (RCRA). Waste generators are responsible for determining whether their waste is a hazardous waste as defined by 40 CFR Part 261, and the degree to which a generator is regulated is dependent upon the type and amount of waste generated. Firms that improperly generate, treat, store, dispose, or transport hazardous waste may be subject to large fines imposed by the State of Hawaii and the EPA. In addition, poor management of hazardous waste can also contribute to contamination of the air, soil, surface water, and groundwater of the generator's site and surrounding sites. Clean-up of uncontrolled hazardous waste sites can be a costly and lengthy process.

In the course of a site reconnaissance, waste management practices are inspected. In addition, available records from the EPA pertaining to permitted hazardous waste generators within the project area and in the surrounding area were reviewed.

Asbestos-Containing Building Materials

Asbestos-containing building materials (ACBMs) were commonly incorporated into structures built prior to 1982. The presence of ACBMs does not necessarily imply that building occupants will experience any health hazard. Most misconceptions about ACBMs and the potential for increased health risk are a result of poorly presented information and the general public's anxiety arising from a misunderstanding of such information. In addition, no regulations exist which require ACBM removal from buildings in use. Federal regulations require that for buildings to be demolished, or in areas of a building that will be demolished through renovation, amounts of friable material greater than 160 ft^2 of surfacing or 260 lineal feet of pipe covering must be removed prior to demolition. The State of Hawaii Division of Occupational Safety and Health (DOSH) requires personal air monitoring whenever asbestos-containing material is disturbed.

Measuring fibers in air to quantify exposure to asbestos is the only objective method. This approach as been criticized for measuring only current conditions and gives no information about fiber release potential and future air levels. However, when combined with an assessment of conditions, it provides a technically sound determination of ambient air levels and therefore potential risk.

Disclaimer

Conclusions reached, and observations and recommendations made in this report are based upon the conditions of the property at the time of the inspection. MEC disclaims any and all liability for any representation, whether expressed or implied, or for omissions or inaccuracies in any part of this report which may be attributable to inaccessible, not readily accessible, or obscured areas, or from incomplete or inaccurate information provided by personnel and/or owners of the site, or from missing or unobtainable information beyond our control. Please note that any negative findings developed during this survey cannot absolutely confirm the absence of environmental contamination.

4.0 SITE SPECIFIC OBSERVATIONS AND RESULTS

Property Description

The project area is approximately a 38,000 ft^2 parcel of land located at the Keehi Interchange, Interstate FAP # IH1-1 (82), between Nimitz Highway and Kamehameha Highway at the Dillingham off ramp in Honolulu, Hawaii. The investigated area had no address or tax map key number. However, the eastern section of the site is designated as tax map key number (1) 1-2-13:22. No structural buildings were located on-site at the time of inspection. Observable items on the property consisted of several palm trees, an asphalt road, a drainage canal, a sprinkler system and a telephone pole.

The parcel is located in the Kalihi-Kai neighborhood of Oahu, and the land surrounding the site is utilized for commercial and industrial purposes. The site borders Kalihi Stream to the southeast, Nimitz Highway to the southwest side and the Dillingham off ramp of Kamehameha Highway to the North. Other surroundings businesses included Schuman's Used Cars to the North, Canon to the northwest, a vehicle storage lot to the southwest and an Industrial warehouses to the southeast.

The soil at the subject site is classified by the United States Department of Agriculture (USDA) as "Fill Land, mixed". This land type consists of areas filled with material from dredging, excavation from adjacent uplands, garbage, and bagasse slurry from the sugar mills.

This type of land is mostly near Pearl Harbor and in Honolulu, adjacent to the Ocean. It consists of areas filled with material dredged from the ocean or hauled from nearby areas, garbage, and general material from other sources. This land type is used for urban development including airports, housing areas, and industrial facilities, nut is not a capability classification.

Property History

Historical maps of the site, historic tax records, and interviews with people knowledgeable with the site, were used to compile a brief history of past operations of the project site and the surrounding area.

MEC was unable to provide a specific description of the historical uses of the property since Sanborn Fire Insurance Maps, providing historic cartography of the site, were nonexistent. However, MEC personnel, Rick Ravelo, talked with Mike Amuro at the Department of Transportation and confirmed that the land has not been utilized for any other purpose other than a highway parcel.

Tax records available from the City and County of Honolulu tax map office indicate that the investigated site has not been issued a tax map key number. However, a 18,077 ft^2 parcel with tax map key number (1) 1-2-13:22, overlies the designated site on the eastern side. In 1952, this parcel was considered the territory of Hawaii and was 10,890 ft^2. Then, in the same year, the parcel was extended to 79,052 ft^2 and later reduced to 18,077 ft^2. In

1961, the State of Hawaii became the owner of the 18,077 ft^2 parcel. The status of the parcel remains the same to date.

Obvious Surface and Published Subsurface Contamination

At the time of the inspection, MEC personnel did not observe any indications of obvious surface contamination, such as stained soil, stressed vegetation, or unusual odors on the property.

On December 15, 1992, MEC made a request to the DOH for any public records pertaining to past or pending environmental regulatory actions within the project boundaries and to the Honolulu Fire Department (HFD) for a listing of any hazardous material spills which have occurred within approximately one-quarter mile of the site. The DOH and the HFD generally responds within forty-five days; MEC will forward a copy of their responses as soon as they are available.

To investigate the possibility of subsurface contamination of soil and ground water of the site and the area, MEC reviewed the following Federal and State data bases: Comprehensive Environmental Response Compensation and Liability Act (CERCLA or Superfund) list, National Priority List (NPL), Comprehensive Environmental Response Compensation Liability Information System (CERCLIS) list, and the Hazard Evaluation and Emergency Response (HEER) list. Presently, there are no CERCLA or Superfund sites on the island of Oahu. However, there is one CERCLIS sites within a one-quarter mile of the

property located at 2305 Kamehameha Highway, where a Gaspro does business. This site was discovered on January 1, 1980, by the Environmental Protection Agency (EPA); a preliminary assessment was done by the State of Hawaii on May 1, 1985; and a site inspection on June 1, 1988 was performed by the EPA.

In addition, the DOH HEER list has documented four hazardous material release within one-quarter mile of the site. Table 4.1 below lists the dates, locations and the type of spills that occurred.

TABLE 4.1

Hazardous Material Spills within One-quarter Mile of the Site

Date	Location	Description
01/14/88	Nimitz Highway*	A broken pipeline released 1,200 gallons of oil, diesel on the ground.
03/09/91	Kalihi Stream behind Gaspro	Potential oil release from Gaspro oil sump drain pipe.
06/10/91	2305 Kamehameha Hwy	Two gas cylinders were found in a stream. The cylinders were empty.
06/19/91	Dillingham and Nimitz Hwy, behind Gaspro	Workers received chemical burns at construction site. The alkaline level in the water was high. There were no indication of any actions taken.

* = Exact address not reported. Spill may have occurred further than one-quarter mile from the site.

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06/19/91	Dillingham and Nimitz Hwy, behind Gaspro	Workers received chemical burns at construction site. The alkaline level in the water was high. There were no indication of any actions taken.

* = Exact address not reported. Spill may have occurred further than one-quarter mile from the site.

TABLE 4.2

USTs Located within One-quarter Mile of the Site

Owner\Location	Number	Volume (gal)	Age (yrs)	Contents
*Ameron H. C. & D. Ltd.	1	6,100	25	gasoline
811 Middle Street	1	6,100	25	diesel
	1	10,000	25	diesel
Div. Automotive Equip. Serv. Keehi Transfer Station 606 Middle Street	1	5,000	14	diesel
F.T. Opperman & Company 2340-B Kamehameha Hwy	2	970	32	gasoline
*Foremost Dairies-Hawaii	1	10,000	35	#5 fuel oil
2277 Kamehameha Hwy	1	4,000	3	gasoline
	1	8,000	3	diesel
	1	3,000	35	gasoline
	1	4,000	35	gasoline
	1	4,000	35	#5 fuel oil
Gaspro	1	6,000	10	diesel
2305 Kamehmeha Hwy	1	7,000	24	gasoline
Granger Pacific, Inc. 611 Middle Street	1	1,000	25	gasoline
Harders Company 2312 Kam Hwy Building H-2	1	1,000	17	gasoline
Hawaii Meat Company, Ltd	1	500	40	water
711 Middle Street	1	1,000	40	gasoline
	1	1,000	45	#5 bunker

TABLE 4.2 Continued

USTs Located within One-quarter Mile of the Site

Owner\Location	Number	Volume (gal)	Age (yrs)	Contents
Island Wide Towing 611 Middle Street	1 1	6,000 4,000	18 18	diesel gasoline
Kems, Inc. 2234 Hoonee Place	1	1,000	12	gasoline
Oahu Bindery, Inc. 2278 Hoonee Place	1	500	25	gasoline
U.S. Army Support Command Fort Shafter Building Number 420	1	unk	unk	used oil
U.S Army Support Command Fort Shafter Building Number 1535	1	280	6	used oil
U.S. Army Support Command Fort Shafter Building Number 1528	1	1,000	unk	used oil
U.S. Army Support Command Fort Shafter Building Number 535	5 1	10,000 500	unk unk	gasoline used oil
*U.S. Army Support Command Fort Shafter Building Number 422	1 1	2,000 2,000	12 12	diesel kerosene

TABLE 4.2 Continued

USTs Located within One-quarter Mile of the Site

Owner\Location	Number	Volume (gal)	Age (yrs)	Contents
*U.S. Army Support Command Fort Shafter Building Number 1527	1 2	10,000 10,000	unk unk	diesel kerosene
U.S. Army Support Command Fort Shafter Building Number 1605A	2 1	1,000 1,000	45 6	diesel diesel

unk = unknown
* = LUST
note = Exact location of Fort Shafter Buildings may be further than one-quarter mile.

Hazardous Materials and Hazardous Wastes

During the inspection, MEC personnel did not observe USEPA regulated Resource Conservation and Recovery Act (RCRA) hazardous waste generated, treated, disposed, or stored on-site. Hazardous waste is strictly regulated by the USEPA under the RCRA. Hazardous waste generators are responsible for determining whether their waste is hazardous waste. Firms that improperly manage hazardous waste may be subject to large fines. Table 4.3 lists the seven hazardous waste generators, registered with the USEPA, located within approximately a one-quarter mile radius of the subject site.

TABLE 4.3

Hazardous Waste Generators Located within One-quarter Mile of the Site

Facility ID #	Facility Name\Address	Generator Type
HID981656945	Consumer Tire Warehouse 733 Middle Street	SQG
HID981613144	Hawaiian Marines Sales and Service 223 Hoonee Place	SQG
HID980893119	IMPS, Inc. 2298 Alahao Place	-N-
HID981440241	Keehi Transfer Station 606 Middle Street	SQG
HID981629314	Keico Pacific Inc. Fort Shafter Building No. 1528	SQG
HID982487209	M.T.L., Inc. 811 Middle Street	LQG
HID982459950	Trane Pacific Service 2298 D Alahao Place	SEQ

LQG = Large quantity generator (more than 1000 kg per month)
SQG = Small quantity generator (100-1000 kg per month)
-N- = Facility notified for that activity but is not now engaged in that activity.
note = Exact location of Fort Shafter Buildings may be further than one-quarter mile.

Asbestos-Containing Building Materials

In the past, asbestos mineral fibers were commonly incorporated into building materials, such as insulation, fire proofing, floor tile, and roofing materials. During the inspection, MEC searched for debris, that may have been left on-site which may have contained asbestos mineral fibers. The property did not contain any extensive amounts of debris, only a few pies of rubbish. There were no visible signs of any ACBMs on-site.

5.0 FINDINGS AND RECOMMENDATIONS

A number of published subsurface contamination areas have been identified within one-quarter mile of the site. MEC has identified four leaking underground storage tanks and one CERCLIS site within approximately one-quarter mile of the site. Therefore, if there are plans to develop the site which include excavation, trenching, or dewatering, MEC recommends that a soil and ground water study be performed. The study would address the presence and extent of soil or ground water contamination, and the effects that any contamination would have on the proposed construction design and methods.

In conclusion, at this time, MEC does not recommend any additional investigation of the site.

6.0 REFERENCES

The following documents were examined during the course of this assessment. Copies were not retained nor included herein:

City and County of Honolulu, Real Property Assessment Division. Field Book, Real Property Ownership Records Tax Map (1) 1-2-13:22, First Tax Division, City and County of Honolulu. 1992.

Foote, Donald E., et al. 1972. Soil Survey of Island of Hawaii, State of Hawaii. United States Department of Agriculture, Soil Conservation Service, in cooperation with the University of Hawaii.

State of Hawaii Department of Health, Leaking Underground Storage Tank Section. State of Hawaii. UST Leak Log. January 21, 1992.

State of Hawaii Department of Health, Underground Storage Tank Program. State of Hawaii. Underground Storage Tank Registration List. March 11, 1990.

U.S. Department of Interior Geological Survey. State of Hawaii Department of Health Underground Injection Control Program. 1981. Honolulu Quadrangle. 7.5 Minute Series (Topographic Map).

State of Hawaii Department of Health, HEER Data Base List. December 3, 1991.

U.S. Environmental Protection Agency. August 17, 1992. EPA National Priority List. Title 40 CFR Part 00, Appendix B. Washington, D.C.

U.S. Environmental Protection Agency. August 17, 1992. EPA Superfund/CERCLA List. Title 40 CFR Part 00, Appendix B. Washington, D.C.

U.S. Environmental Protection Agency. May 1, 1992. EPA Region IX RCRA Database.

U.S. Environmental Protection Agency. September 2, 1992. Superfund Program CERCLIS Site/Event listing.

7.0 SIGNATURES

This document was prepared by me and by personnel under my supervision during the period November 30, 1992 to December 18, 1992.

Darrell R. Robertson
Project Manager/Geologist

Rick C. Ravelo, B.S.
Environmental Specialist

John C. Marshall
Environmental Engineer

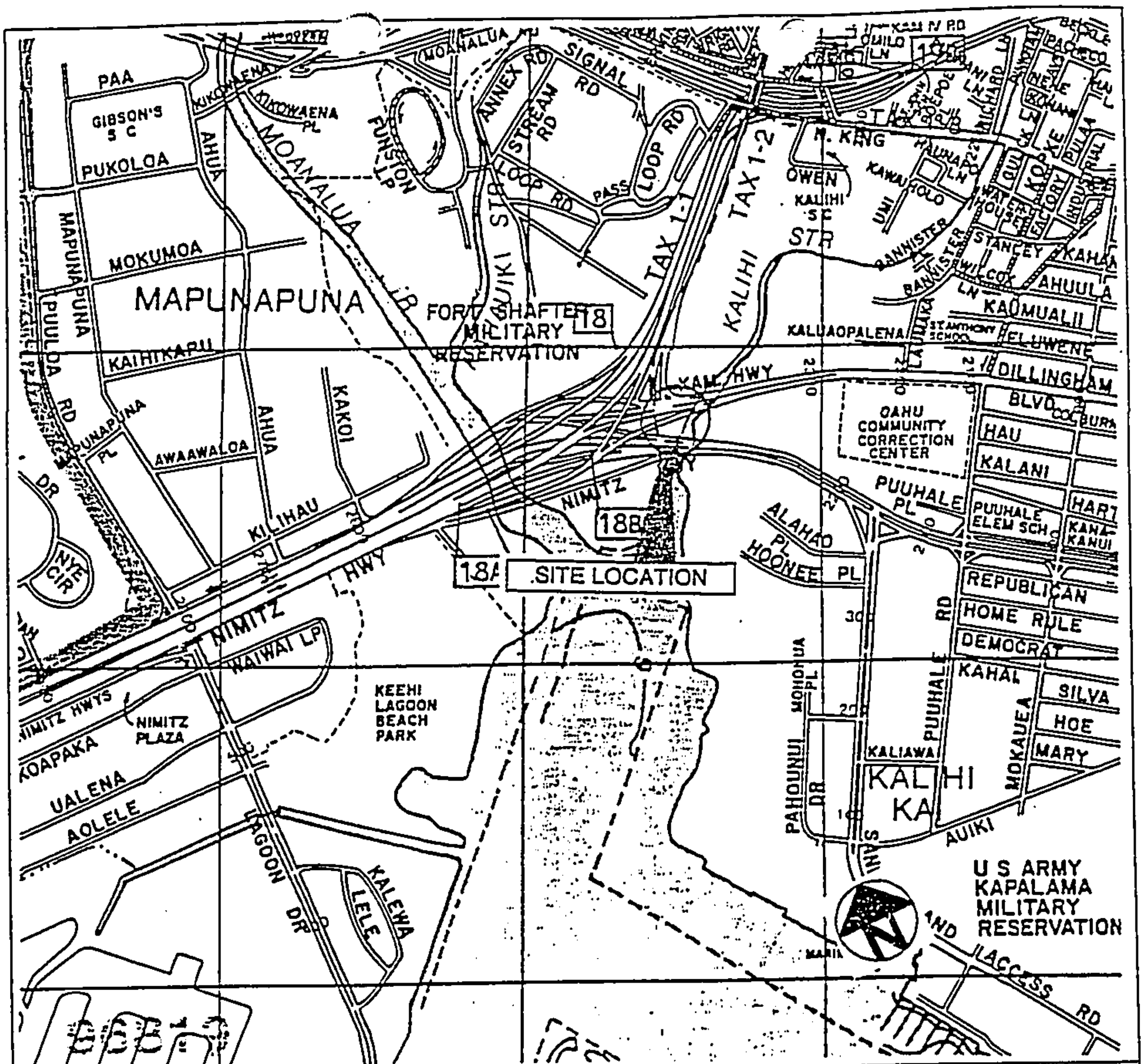
8.0 APPENDICES

APPENDIX I	SITE MAPS
APPENDIX II	SITE PHOTOGRAPHS
APPENDIX III	CORRESPONDENCE

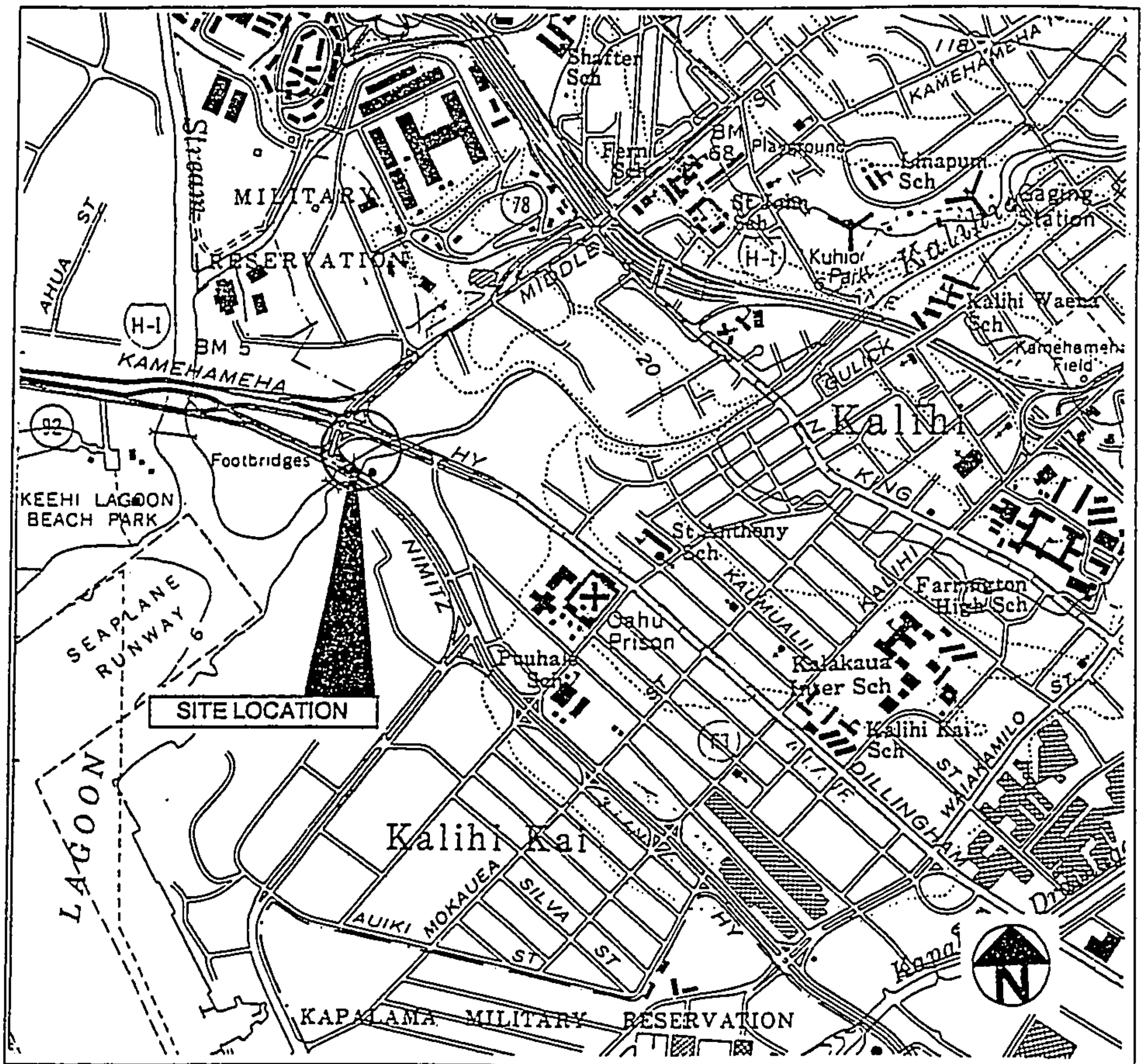
APPENDIX I

SITE MAPS

Muranaka Environmental Consultants, Inc.
1130 N. Nimitz Highway
Honolulu, Hawaii 96817



SITE MAP			
INTERSTATE HIGHWAY FAP # IH1-1 (82)		Date:	1991
Source:	BRYAN'S SEC. MAP	Drawn:	N/A
Scale:	NO SCALE	Project #:	92881
MURANAKA ENVIRONMENTAL CONSULTANTS, INC.			MAP 1



TOPOGRAPHICAL MAP			
INTERSTATE HIGHWAY FAP # IH1-1 (82)		Date:	1983
Source:	USGS	Drawn:	N/A
Scale:	1:24,000	Project #:	92728
MURANAKA ENVIRONMENTAL CONSULTANTS, INC.			MAP 2

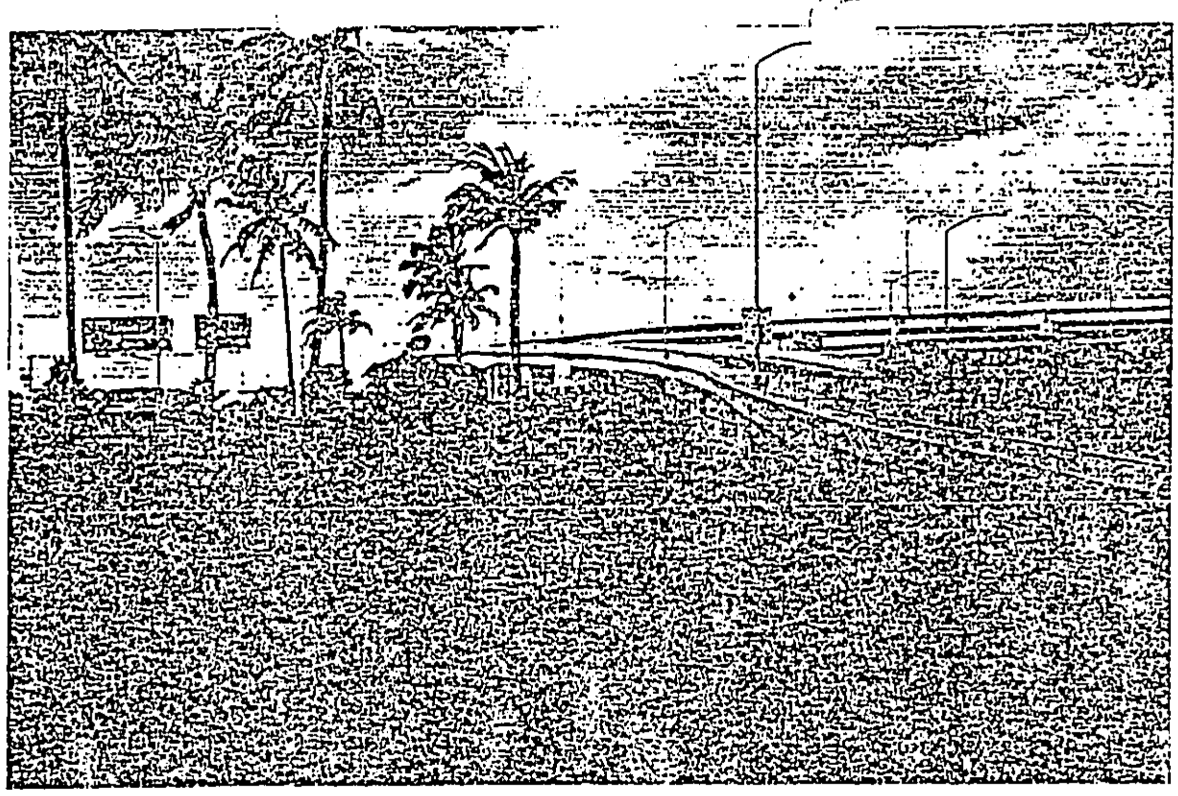


Photo #1 Photo taken next to the Dillingham off ramp, looking west across the property, towards Nimitz Highway.

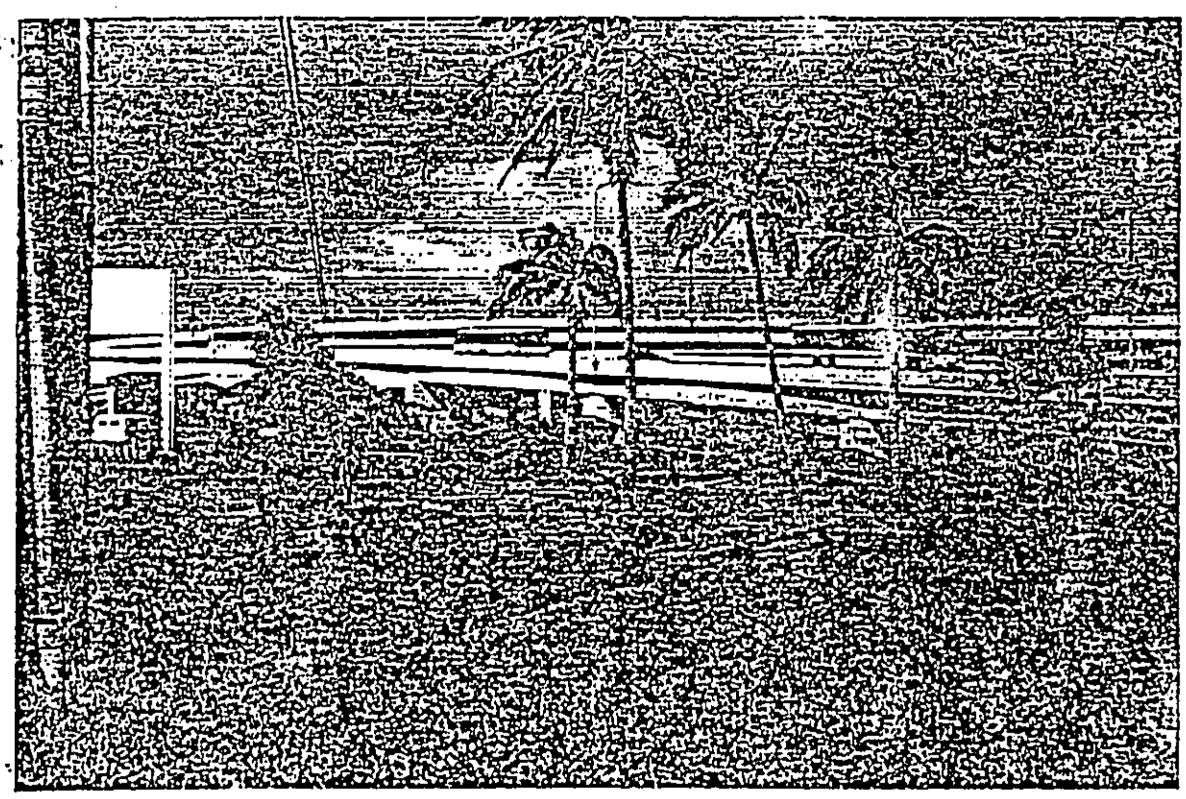


Photo #2 View of the property looking north towards the Keehi interchange.

APPENDIX III

CORRESPONDENCE

Muranaka Environmental Consultants, Inc.
1130 N. Nimitz Highway
Honolulu, Hawaii 96817

MURANAKA
ENVIRONMENTAL CONSULTANTS, INC.
P.O. Box 4341 • Honolulu, Hawaii 96812
(808) 531-8877 • Fax (808) 523-8082

December 15, 1992

City and County of Honolulu
Fire Department
1455 South Beretania Street
Honolulu, Hawaii 96814

Attn: Lionel Camara, Fire Chief

Re: Hazardous Material Spills
MEC Project No. 92981

Dear Mr. Camara:

We are requesting information on any Type 41 spills (spills, leaks without ignition) which may have occurred at or within a one-quarter mile radius of the Keehi interchange between Nimitz highway and Kamehameha Highway at the Dillingham off ramp. Enclosed is a locus map of the site with an approximate one-quarter mile radius encircling it.

Very truly yours,

Rick C. Ravelo
Environmental Specialist

Encl (1)

MURANAKA
ENVIRONMENTAL CONSULTANTS, INC.

P.O. Box 4341 • Honolulu, Hawaii 96812
(808) 531-8877 • Fax (808) 523-8082

December 15, 1992

State of Hawaii
Department of Health: Environmental Management Division
Five Waterfront Plaza, Suite 250
500 Ala Moana Boulevard
Honolulu, Hawaii 96813

Attn: Thomas Arizumi

Re: Request for Public Records
MEC Project No. 92981

Dear Mr. Arizumi:

We are requesting information on any past or pending environmental regulatory actions for the site located at the Keehi interchange between Nimitz Highway and Kamehameha Highway at the Dillingham off ramp in Honolulu, Hawaii. On the eastern portion of the property is a lot, designated as tax map key number 1-2-13:22. The entire subject site has not been assigned a tax map key number. The State of Hawaii is the current owner of the site.

Enclosed is a copy of the tax map sheet showing the subject site. Thank you for your assistance. If you have any questions or comments about our request, please contact me at 531-8877.

Very truly yours,

Rick C. Ravelo
Environmental Specialist

Encl (2)

REQUEST FOR PUBLIC RECORDS
(Use Ink or Typewriter)

To: Director of Health
Department of Health

The following Department of Health records are hereby requested (Identify or describe character of record):

1) Records: We are requesting information on any past or pending environmental regulatory actions for the site located at the Keehi interchange between Nimitz Highway and Kamehameha Highway at the Dillingham off ramp in Honolulu, Hawaii. On the eastern portion of the property is a lot, designated as tax map key number 1-2-13:22. The entire subject site has not been assigned a tax map key number. The State of Hawaii is the current owner of the site.

2) Purpose: An environmental assessment of the property.

3) Anticipated Use: As part of a report generated for our client.

Rick C. Ravelo

Name of Requester or
Duly Authorized Agent

Muranaka Environmental Consultants
P.O. Box 4341
Honolulu, Hawaii 96812
531-8877

Address and Phone Number

Signature Date 12/5/92

(For Department Use Only)

List or Describe records reviewed/copied by above:

Deputy Director for Environmental Health

Date:

DOCUMENT CAPTURED AS RECEIVED

Post-it™ brand fax transmittal memo 7671 | # of pages ▸ 1
To Jeff Coelho | From Ann Shiigi
Co. KUMU Radio | Co. State DOT
Phone # 587-2022
Fax # 538-6425

BENJAMIN J. CAYETANO
[redacted]
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

235 SOUTH KING STREET
FOURTH FLOOR
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-2452

August 1, 1995

TO: Mr. Kats Uyeoka
Department of Transportation

FROM: Leslie Segundo *Leslie Segundo*
Office of Environmental Quality Control

SUBJECT: Draft Environmental Assessment, Interstate Highway, FAP No. I-H1-1(82), Kaahi Interchange, Proposed KUMU Transmission Tower.

Having reviewed the subject document prepared by Mr. Jeff J. Coelho and transmitted by your Director's, July 20, 1995, letter (HWY-RM 3.69861), I have been directed to inform you that the draft environmental assessment does not meet the content requirements for environmental assessments set forth in section 11-200-10, Hawaii Administrative Rules. Because a lack of administratively required information compromises the public review process mandated by section 343-5(c), Hawaii Revised Statutes, we are unable to fulfill our statutory responsibility to process a Chapter 343, HRS document/determination for publication until the following information to complete the environmental assessment is received.

Please revise the draft environmental assessment (DEA) to conform to the environmental assessment content requirements of section 11-200-10, Hawaii Administrative Rules. A copy of the "Guidebook to the Hawaii State Environmental Review Process" is enclosed for your information. Appendix F contains useful information pertaining to environmental assessments. Also, please incorporate the following in the DEA and submit the DEA to our office at your earliest convenience. (Telephone facsimile transmittals are acceptable if followed by a mailed original).

- Description of the affected environment, including a detailed map (preferably the United States Geological Survey topographic map) and related regional map (HAR §11-200-9(b); this is necessary in order for the reader to fully understand the discussion of environmental impact.
- In discussing environmental impacts, it generally is not sufficient to state a conclusion without providing the line of reasoning supporting the conclusion. Each instance where the DEA concludes that there will be "no significant effect" needs to provide a clear and concise pathway of reasoning linking the significance criteria in section 11-200-12(b) of the Hawaii Administrative Rules to the conclusion of "no significant effect."
- To conform to Act 241, SLH 1992, please delete the term "Negative Declaration" on page 1 of the DEA and replace with the term "Draft Environmental Assessment."

If there are any questions, please call me at 586-4185

Enclosure

c: Director, OEQC
Director, DOT

KUMU AM/FM

Hawaii's Place to Relax

FM - 94.7 AM 1500

lonolulu Office:
;41 N. Nimitz Hwy.
lonolulu, 96817

Phone: (808) 531-4511
Fax: (808) 538-6425

eptember 22, 1994

KUMU RADIO TRANSMISSION TOWER

/lr. John T. Harrison
:nvironmental Coordinator
:nvironmental Center, University of Hawaii
:550 Campus Road Crawford Hall 317 Honolulu, Hawaii 96822

)ear Mr. Harrison:

Ve are pleased to respond to your concerns regarding our new transmitter facility. This project ; now into its fifth year, and during this time we have spent a great deal of effort to ensure ıat the operation of this tower will enhance the public interest and in no way present any ıegative impact to the surrounding neighborhood or community at large.

ıddressing your concerns,

:lectromagnetic Radiation

'he tower will be used to transmit the program of KUMU II on AM 1500 KHZ. The nominal power ; 10 KW. The transmission pattern is non-directional. It has been shown that the operation of ıis tower will have a negative impact on the environment. The engineering study proving this was ·erformed by du Treil, Lundin & Rackley, Inc. As verified in the attached document, this tower ; categorically excluded for environmental processing by being totally within the FCC-specified ıuidelines for Human Exposure to Radiofrequency Radiation.

'isual Characteristics

'he only building within viewing range of the tower is to the East, owned by First Hawaiian Bank. 'here are no primary viewing sites from this building facing West. Because the viaduct Kalihi ıterchange is considerably higher and infinitely more massive to the West of the tower, any 'ew from the East to the West will be dominated by the Kalihi viaduct, vertically and horizontally. .ıe open lattice construction of the tower and neutral coloration of its structure will make it irtually invisible to the naked eye, because of the viaduct background.

CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

KUMU AM/FM
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.. John T. Harrison
Environmental Coordinator
-2-

Historical Perspective

KUMU was sharing a tower owned by KAIM in Kaimuki. KAIM decided to re locate their operation to a high power installation on Molokai beamed at Samoa. When they removed Kaimuki, it became necessary for KUMU to re-locate as well.

Conclusions

The EA reviewed by the UH environmental center may not have included the complete disclosure made as part of this proposal to the State of Hawaii and the City and County of Honolulu. In the full proposal, full substantive research concerning health concerns has been addressed by the engineering firm of duTreil, Lundin & Rackley, Inc, with the conclusion that this project is clean and presents a totally negative impact on environmental concerns.

Sincerely,

Jeff Coelho
Executive Vice President
KUMU Radio

cc:
Roger Fujioka
Kazutoshi Najita
Paul Berkowitz

University of Hawai'i at Mānoa

Environmental Center
A Unit of Water Resources Research Center
Crawford 317 • 2550 Campus Road • Honolulu, Hawai'i 96822
Telephone: (808) 956-7361 • Facsimile: (808) 956-3980

September 22, 1995
EA:0129

Mr. Jeff Coelho
Radio KUMU
441 North Nimitz
Honolulu, Hawaii 96819

Dear Mr. Coelho:

Draft Environmental Assessment
KUMU Radio Transmission Tower
Honolulu, Hawaii

Radio KUMU proposes to construct a 150-foot tall radio tower and a single story transmitter facility on a parcel of land located at the Keehi interchange between Nimitz Highway and Kamehameha Highway. The parcel of land currently contains no buildings.

We reviewed this Draft Environmental Assessment (EA) with the assistance of Kazutoshi Najita, Electrical Engineering; and Paul Berkowitz of the Environmental Center.

Electromagnetic Radiation

Given the 150 foot height of the radio tower, there may or may not be environmental impacts from the high powered radio wave propagation. Unfortunately, this Draft Environmental Assessment does not provide any information about the characteristics of the electromagnetic radiation. Therefore, it is impossible to accurately access the impacts of the proposed project. At a minimum, this EA should include information about the transmission frequency, the power level, the transmission pattern, and possible impacts on workers in the surrounding area. Given the significant health effects (such as increased risk of cancer) which can result from exposure to electromagnetic radiation, it is essential for this Draft EA to provide the public with enough information to reasonably assess the project's impacts.

PUB

Visual Characteristics

This EA states that the only visual changes will include a "small triangular based lattice tower (three equal sides of 36 inches)." A 150-foot tall tower seems neither small nor unobtrusive. Will this tower affect the views from nearby buildings?

Historical Perspective

The proposed transmission tower is intended to replace the former KUMU radio tower which was removed from Kaimuki two years ago. What was the reason for removing the tower from Kaimuki?

Conclusions

The purpose of Chapter 343 of the Hawaii Revised Statutes is to ensure that environmental concerns are given adequate attention in the decision making process. A crucial part of this procedure involves determining whether a proposed action will have a significant impact on the environment. Given the potential health effects of electromagnetic radiation, the KUMU radio tower could have a significant environmental effect (as stipulated in Section 11-200-12 of the Hawaii Administrative Rules) since it has the potential to substantially affect public health.

In its present form, the KUMU Draft EA undermines the Chapter 343 requirements since it does not disclose any information regarding the project's potential to affect human health. Have these health concerns been addressed in the planning process? If so, why were they omitted from the EA? Without this information on radio wave propagation, it is virtually impossible for decision makers and the public to adequately evaluate the proposed project. Thus it seems unavoidable that the document should be withdrawn and resubmitted with proper attention given to these health concerns.

Thank you for the opportunity to review this Draft EA.

Sincerely,

John T. Harrison
Environmental Coordinator

cc: OEQC
Department of Transportation
Roger Fujioka
Kazutoshi Najita
Paul Berkowitz

BENJAMIN J. CAYETANO
~~JOHN WAIHEE~~
GOVERNOR

KAZU HAYASHIDA
~~REX D. JOHNSON~~
DIRECTOR

DEPUTY DIRECTORS
KANANI HOLT
GLENN M OKIMOTO
JOYCE T. OMINE

IN REPLY REFER TO.

HWY-RM
3.69243

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
RIGHT-OF-WAY BRANCH
888 MILILANI STREET, SUITE 502
HONOLULU, HAWAII 96813

... 1 1 1995

KUMU AM/FM Radio
441 North Nimitz Highway
Honolulu, Hawaii 96817

Attention Mr. Jeff Coelho

Gentlemen:

Interstate Highway, FAP No. I-H1-1(82)
Keehi Interchange, Portion of Right-of-Way
Between Ramps B and D

Enclosed is your copy of the fully executed Revocable Permit No. HY-94-075, effective January 15, 1995. As a reminder, you are responsible for real property taxes as specified in the terms and conditions of the permit. The Real Property Tax Office receives a copy of this permit and they will bill you accordingly.

Please make your monthly rental payments, made out to the State Department of Transportation to:

State Department of Transportation
Highways Division, <u>FISCAL OFFICE</u>
869 Punchbowl Street
Honolulu, Hawaii 96813

If you have any questions, please call me at 587-2023.

Very truly yours,

Michael K. Amuro

MICHAEL K. AMURO
Head
Property Management Section

Enclosure

[redacted] [redacted]

LEASE

DOT 4-715
(HWY-R 6/91)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

REVOCABLE PERMIT NO. HY-94-075

The STATE OF HAWAII, hereinafter called the "STATE," hereby grants to the "PERMITTEE" permission to enter, use and occupy on a month-to-month basis the premises described in item 2, and outlined in red on Exhibit "A," attached hereto and made a part hereof, for the purpose(s) specified in item 4; and the PERMITTEE agrees to pay the rental specified in item 5 and to perform all other obligations imposed upon it by the Terms and Conditions hereof.

1. PERMITTEE: (NAME AND ADDRESS):	KUMU AM/FM Radio 441 North Nimitz Highway Honolulu, Hawaii 96817
2. PREMISES:	Approximately 3,600 square feet of land more or less between ramps
3. LOCATION:	Interstate Highway, FAP No. I-H1-1(82) Keehi Interchange, Portion of Right-of-Way Between Ramps B and D, Honolulu, Hawaii
4. PURPOSE(S):	Radio Transmission Tower
5. RENTAL:	$375.00 per month
6. SECURITY DEPOSIT:	$750.00
7. EFFECTIVE DATE:	January 15, 1995
8. LIQUIDATED DAMAGES:	$ 75.00 per day
9. SERVICE CHARGE:	None

Dated at Honolulu, Hawaii, December 23, 1994

STATE OF HAWAII

By [signature]
Its Director of Transportation

PERMITTEE

Kumu Am/Fm

By [signature]
Its PRESIDENT

By [signature]
Its Vice President

TERMS AND CONDITIONS

1. TERM. This permit is granted on a month-to-month basis only, for a period not to exceed one year from the effective date hereof. Any renewal of this Permit shall be on a month-to-month basis for a period not to exceed one year. Notice of renewal need not be reduced to writing, it being agreed that such renewal shall be automatic unless a party hereto shall give the other party ten(10) day's notice of its intention not to renew or unless the Board of Land and Natural Resources shall fail to approve the renewal. Further, this Permit will not be renewed or a new Permit granted, should the PERMITTEE not be current in its obligations to the STATE.

2. PERMITTEE's PRIOR INSPECTION. The PERMITTEE warrants that it has inspected the Premises and all improvements thereon, knows the condition thereof and fully assumes all risks incident to the use and enjoyment of the premises.

3. SECURITY DEPOSIT. The PERMITTEE, upon execution of this Permit, shall deposit with the STATE in legal tender or in such other form as may be acceptable to the STATE an amount equal to two months' rental as security for the faithful performance on its part of all the terms and conditions, including the special terms and conditions, if any, specified in paragraph 29 of this Permit. The deposit will be returned, without interest, to the PERMITTEE upon the termination of this Permit only if it has faithfully performed said terms and conditions to the satisfaction of the STATE. In the event the PERMITTEE does not so perform, the STATE may declare the deposit forfeited or apply it as an offset to any amounts owed by the PERMITTEE to the STATE under this Permit or to any damages of loss to the STATE caused by the breach by the PERMITTEE of such terms and conditions. The exercise of this option is without prejudice to the right of the STATE to institute action for debt or damages against the PERMITTEE or take any other or further action against the PERMITTEE provided by law for the enforcement of the rights of the STATE under this Permit.

4. INSURANCE. The PERMITTEE shall, concurrently with the execution of this Permit, deliver to the STATE a Comprehensive General Liability Insurance policy or policies, or a certificate of insurance in lieu thereof, evidencing that such policy has been issued and is in force, with a combined single limit of not less than $500,000 for bodily injury and damage to property per occurrence. The specification of limits contained herein shall not be construed in any way to be a limitation on the liability of the PERMITTEE for any injury or damage or for any rent, service charge or other charges under this Permit.

Such insurance shall (a) be issued by an insurance company or surety company authorized to do business in the State of Hawaii or approved in writing by the Director of Transportation; (b) name the State of Hawaii as an additional insured; (c) provide that the Department of Transportation shall be notified at least thirty (30) days prior to any termination, cancellation or material change in its insurance coverage; (d) cover all injuries, losses or damages arising from, growing out of or caused by any acts or omissions of the PERMITTEE, its officers, agents, employees, invitees or licensees, in connection with the PERMITTEE's use or occupancy of the Premises; and (e) be maintained and kept in effect at the PERMITTEE's own expense throughout the life of this Permit, evidenced by furnishing the STATE without notice of demand a like certificate upon each renewal thereof.

5. FIRE INSURANCE. The PERMITTEE shall procure immediately and keep in force with respect to the Premises a fire insurance policy for real property improvements in the amount determined by the DEPARTMENT whenever it is deemed necessary and specified in the special terms and conditions.

6. INDEMNITY. The PERMITTEE shall at all times with respect to the Premises use due care for public safety and shall defend, hold harmless and indemnify the State, its officers, agents and employees from and against all claims and demands for damages, including claims for property damage, personal injury or death, (a) arising on the Premises, or by reason of any fire of explosion thereon; or (b) arising from, growing out of, or caused by any act or omission on the part of the PERMITTEE, its officers, agents, employees, invitees or licensees, in connection with the PERMITTEE's use or occupancy of the Premises.

7. METHOD OF PAYMENT OF RENTAL AND SERVICE CHARGE ON DELINQUENT PAYMENTS. The monthly rental shall be payable in advance, without notice or demand, at the Highways Division Fiscal Office on Oahu on the first day of each and every month during the life of this Permit. Without prejudice to any other remedy available to the STATE, the PERMITTEE agrees without further notice or demand, as follows: (a) To pay a service charge, currently set at $25.00, of up to $50.00 each month for all delinquent payments in accordance with the Hawaii Administrative Rules; and (b) That the term "delinquent payments" as used herein means any payment of rent, fees, service charges, or other charges payable by the PERMITTEE to the STATE, which are not paid when due.

8. INTEREST. Without prejudice to any other remedy available to the STATE, the PERMITTEE agrees withour further notice or demand, to pay interest at a rate of one per cent (1%) per month, compound interest, shall be assessed against the PERMITTEE for any rentals and other charges not paid when due and such sum shall continue to be assessed against the PERMITTEE until the principal sum and the interest are paid in full.

9. ACCEPTANCE OF RENT NOT A WAIVER. The acceptance of rent by the STATE shall not constitute a waiver of any breach by the PERMITTEE of any of the terms and conditions upon which this Permit is granted and to which the PERMITTEE agrees, or of the STATE's right to terminate or revoke this Permit. Failure by the STATE to insist upon strict performance hereof by the PERMITTEE, or to exercise any option herein reserved, shall not be construed as a waiver or as a relinquishment of any of its rights under this Permit.

10. RESERVATION OF RIGHT TO INCREASE OR DECREASE RENT. The STATE reserves the right to increase or decrease the monthly rental at any time upon thirty (30) days' advance written notice.

11. UTILITIES AND OTHER CHARGES. The PERMITTEE shall be responsible for and pay all charges for water, electricity, telephone and other utilities and all charges for sewer, garbage and trash disposal; where any of such services are provided by the STATE at the request of the PERMITTEE, it shall pay the STATE's charges therefor.

12. WASTE, STRIP AND NUISANCE; MAINTENANCE. The PERMITTEE shall not make, permit or suffer any waste, strip, nuisance or any other unlawful, improper or offensive use of the Premises.

The PERMITTEE shall maintain the premises, improvements thereon, all equipment and other personal property of the PERMITTEE upon the Premises in a strictly clean, neat, safe, orderly and sanitary condition, free of waste, rubbish and debris and shall provide for the safe and sanitary handling and disposal of all trash, garbage and other refuse from the Premises.

13. ENTRY BY STATE. The STATE or its agents and employees may enter the Premises at all reasonable hours to inspect the Premises and determine if the PERMITTEE is complying with the terms and conditions of this permit or for any other proper purpose. The PERMITTEE shall not make any claim for damages or set off of rent, service charge or other charges by reason or on account of such entry.

14. REPAIRS. The PERMITTEE shall, at its own expense, keep and maintain the Premises in a condition similar to that which existed on the effective date of this Permit, ordinary wear and tear and damage by acts of God excepted.

15. STRUCTURAL IMPROVEMENTS, ALTERATIONS OR ADDITIONS. No substantial improvement, alteration or addition of a structural nature shall be made, installed or constructed on, under or within the Premises by the PERMITTEE unless it first submits its plans and specifications therefor to the STATE for its approval and unless said plans and specifications are in fact approved in writing by the STATE. Such plans and specifications shall not be submitted unless they are in full compliance with all applicable statutes and rules and regulations.

Any improvements, alterations or additions shall be accomplished at the sole cost and risk of the PERMITTEE and the STATE shall not be responsible for any damage to destruction of any such improvements, alterations or additions of any personal property on the Premises.

16. REMOVAL OF IMPROVEMENTS OR ADDITIONS. The PERMITTEE may remove, at its own cost and risk, any and all improvements or additions or any portions thereof, constructed or installed by it upon the Premises, at any time during the life of this Permit or within thirty (30) days after the termination or revocation hereof; provided that, the PERMITTEE shall give, prior to said termination or revocation, written notice of its intent to remove the same and that in the event of such removal, the Premises shall be restored by the PERMITTEE to a condition similar to that which existed immediately prior to the construction or installation thereof; ordinary wear and tear excepted and damage by acts of God excepted; provided further that, until such removal and restoration has been completed to the satisfaction of the STATE, the PERMITTEE shall continue to pay the rent set forth in item 4 herein. Failure of the PERMITTEE to give notice of intention to remove prior to termination or revocation shall be deemed to be abandonment of said improvements or additions.

17. OPTION TO REQUIRE REMOVAL OF IMPROVEMENTS OR ADDITIONS. The STATE, with respect to any improvements or additions or any portions thereof constructed or installed by the PERMITTEE on the Premises, reserves the right within twenty (20) days after the date of termination or revocation of this Permit to require the PERMITTEE to remove the same at the PERMITTEE's cost and risk within thirty (30) days after said termination or revocation. Upon failure of the PERMITTEE to effect such removal within the specified time, the STATE may effect such removal and restore the Premises to a condition similar to that which existed immediately prior to the construction of the improvements or additions by its own employees or by an independent contractor and assess the PERMITTEE the total cost thereof.

18. COMPLIANCE WITH LAWS; DISCRIMINATION PROHIBITED. The PERMITTEE shall comply with all laws, ordinances and rules and regulations of all governmental agencies, applicable to the Premises or relating to and affecting any business or other commercial activity conducted on the Premises.

The use and enjoyment of the Premises shall not be in support of any policy which discriminates against anyone based upon race, creed, color, sex or national origin.

19. TRANSFERABILITY. This Permit and the Premises or any part thereof, inclusive of any and all rights or obligations accruing or arising under it, shall not be sold, transferred, assigned, leased, mortgaged, sublet or otherwise alienated or encumbered in any manner whatsoever.

20. PROPERTY TAXES. The PERMITTEE shall pay all real property taxes lawfully assessed against the Premises.

21. TERMINATION AND REVOCATION. This Permit may be terminated by either party without cause upon thirty (30) days' advance written notice; provided that, in the event the PERMITTEE fails to pay any rental, service charge, interest, fees or charges when due or otherwise breaches any of the terms and conditions, the STATE may revoke this Permit upon five (5) calendar days' written notice.

22. RIGHT TO RE-ENTER AND ASSUME POSSESSION. The STATE reserves the right and the PERMITTEE agrees that, upon breach of any one or more of the terms and conditions of this Permit and/or termination thereof under Paragraph 21 herein, the STATE may, without necessity of court action, enter upon and administratively take possession of the Premises from the PERMITTEE.

23. RESTORATION. The PERMITTEE shall, within thirty (30) days of the termination or revocation of this Permit, restore the Premises, at its own cost and risk, to a condition similar to that which existed prior to the effective date of this Permit, reasonable and ordinary wear and tear and damage by acts of God excepted, and peacefully surrender possession thereof to the STATE. In the event the PERMITTEE fails to effect such restoration of the Premises, the STATE may accomplish the same by its own employees or by an independent contractor and assess the PERMITTEE the total cost thereof.

24. LIQUIDATED DAMAGES. If the PERMITTEE does not vacate the Premises upon the revocation of this Permit by the STATE, the PERMITTEE shall pay the STATE liquidated damages in an amount equal to 20% of the current monthly rental for each day or portion thereof the PERMITTEE remains on the Premises over said date of revocation. Such payment is to be in addition to any other rights or remedies the STATE may be entitled to pursue for breach of contract or for illegal occupancy.

25. COURT COSTS AND ATTORNEY'S FEES. The PERMITTEE shall pay any and all court costs and attorney's fees incurred or paid by the STATE in collecting rents, penalties, service charges, fees or other charges due from or payable by the PERMITTEE under this Permit in removing from the Premises the PERMITTEE and any improvements or additions constructed or installed by it thereon, or in recovering any damages or losses caused by the PERMITTEE's breach of any of the terms and conditions of this Permit.

26. INTERPRETATION. The use of any gender shall include all genders, the use of the singular shall include the plural and the use of the plural shall include the singular, as the context may require.

27. CONFLICTING TERMS AND CONDITIONS. When an inconsistency exists between these Terms and Conditions and the Special Terms and Conditions, the Special Terms and Conditions shall govern.

28. DISPUTES AND/OR QUESTIONS. Any and all disputes and/or questions arising under this Permit shall be referred to the Director of Transportation and the Director's determination of such disputes or questions shall be final and binding on the parties.

29. SPECIAL TERMS AND CONDITIONS.

A. Highway and/or roadway columns shall be adequately protected.

B. Storage of flammable materials and/or the construction of any structure shall not be permitted without prior approvals.

C. The STATE will not be responsible for any damages to cars or personal property on the Premises because of water runoff from any State viaduct,water leakage from the extension joints, damage caused by any falling or thrown objects, bird droppings, etc.

D. Should the PERMITTEE do any paving, the PERMITTEE shall, prior to paving, remove the same amount of material from the Premises as it places on the ground.

E. Should the rental called for in item 5 require that a percentage rental be paid, the PERMITTEE shall submit the excess of the percentage rental over the base rental on or before the last day of the month following the month for which the rental is applicable, together with a statement reporting the gross income for the prior month. The term "Gross Income" shall mean all gross revenues and income earned through the operation of the business less the State General Excise Tax.

F. Should the purpose of this Permit as specified in item 4 be for a lunch wagon operation, paragraphs 14, 15, 16, 17 and 23 of these Terms and Conditions shall be inapplicable.

G. If applicable, under 29 E above, the following shall apply: Interest. Without prejudice to any other remedy available to the STATE, interest at the rate of one per cent (1%) per month, compound interest, shall be assessed against the PERMITTEE for any rentals not paid when due and any percentage of gross receipts not paid including those unreported and discovered through audit by the STATE, and such sum shall continue to be assessed against the PERMITTEE until the principal sum and the interest are paid in full.

H. Business Records: The PERMITTEE shall maintain and keep in accordance with accepted accounting practices and on the accrual basis, true and accurate accounts, books, data and records of its operations, which shall, among other things, show all sales made and services performed for cash, credit or otherwise and also, the gross receipts of the concession.

I. The STATE reserves the right and PERMITTEE agrees to the examination and audit of the gross receipts of such records, books of account, cash register tapes, sales slips and the like at any time during the term of the Permit; if such examination or audit reveal discrepancies, the PERMITTEE shall reimburse the STATE for any underpayments made to it as a result of errors in monthly statements. The STATE shall reimburse or credit the PERMITTEE for any overpayments received by it as a result of any such errors.

J. The STATE reserves the right to terminate this Permit in the event the PERMITTEE fails to keep proper business records as specified under Paragraph 29 H and I herein. The STATE may revoke this Permit upon five (5) calendar days' written notice.

K. A person, partnership, or corporation shall not be granted a permit covering public lands if, during the five (5) years preceding the date of the permit, a previous sale, lease, license, permit or easement covering public lands was cancelled for failure to satisfy the terms and conditions thereof.

L. PERMITTEE will allow the STATE (DOT) to utilize the transmission tower for DOT's transmitter to monitor traffic conditions when DOT is ready to operate its transmitter.

Subsurface Investigation Report
Proposed 150 ft. KUMU Radio Tower
Keehi Interchange
Nimitz Highway at Dillingham Boulevard
Kalihi, Honolulu, Hawaii

for

KUMU Radio
441 North Nimitz Highway
Honolulu, Hawaii 96817

by

Stewart Engineering, Inc.
145 Hekili Street Suite 100
Kailua, Oahu, Hawaii

April 7, 1993

SOILS

Table of Contents

Appendix

Subsurface Investigation Report
Proposed 150 ft. KUMU Radio Tower
Keehi Interchange
Nimitz Highway at Dillingham Boulevard
Kalihi, Honolulu, Hawaii

Introduction

Transmitted herein are the results of a subsurface investigation performed at the site of the new KUMU Radio Tower proposed to be constructed within an open area of the Keehi Interchange between Nimitz Highway and Dillingham Boulevard in Honolulu, Hawaii. The purpose of this investigation was to determine the general subsurface conditions existing on the property and to evaluate the suitability of these conditions for support of the planned tower and the small transmitter building to be located near the tower.

This report includes the findings and conclusions of our investigation and presents recommendations for support of the proposed tower and related construction at the new project site. This investigation was performed in accordance with our proposal dated March 5, 1993.

Site Description

The site of the proposed new radio tower is a triangular shaped parcel approximately 20,000 square feet in area located within the southeastern side of the Keehi Interchange for the H-1 Freeway in the Kalihi area of Honolulu, Hawaii. The parcel is owned by the State of Hawaii and is apparently administered by the Department of Transportation, Division of Highways.

The property is bounded by Nimitz Highway to the south and an off-ramp from Keehi Interchange which leads to Dillingham Boulevard on the north side of the parcel. A portion of Kalihi Stream forms the eastern boundary. The general site location can be seen on the Project Location Map, Figure 1 of the Appendix.

BORING LOG LEGEND

MAJOR SOIL TYPES:

Gravel

Sand

Silt

Clay

MAJOR ROCK TYPES:

Basalt

Coral

Tuff

Boulders/
Cobbles

TYPES OF SAMPLES:

Standard Penetration Test
2 Inch O.D. Split Spoon
(SPT)

3 Inch O.D. Split Spoon
with Ring Liners

Thin-Walled Tube Sample

Soil Sample not Retained
in Sampler

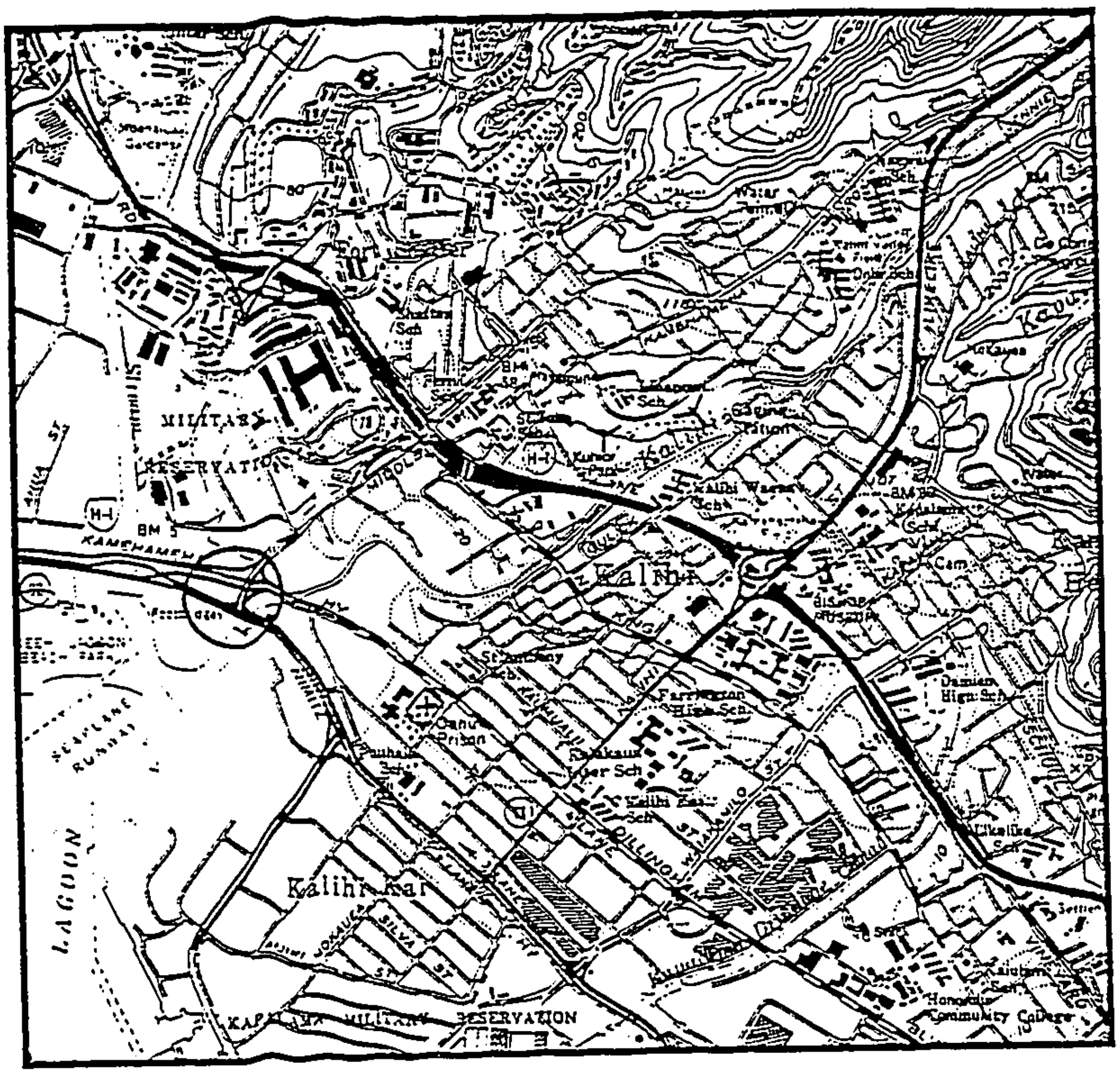
Disturbed Bag Sample

Rock Core Sample

OTHER INFORMATION:

ref.= refusal of sampler
Pen. = Penetrometer Reading
Rec. = Core Recovery
RQD = Rock Quality Designation
P.I. = Plasticity Index
LL = Liquid Limit
phi = Angle of Internal Friction
c = Cohesion
Water Level:

FIGURE 3
BORING LOG LEGEND



(Approx. Scale: 1 inch = 2,000 ft.)

Figure 1
PROJECT LOCATION MAP

Proposed New 150 ft. KUMU Radio Tower
Nimitz Highway at Keehi Interchange
Honolulu, Hawaii

General Area:

Kalihi, Honolulu, Oahu
Hawaii

Reference:

U.S.G.S. Topographic Map
Honolulu Quadrangle

APPENDIX

Stewart Engineering, Inc. should be provided the opportunity for general review of the final design drawings and specifications to verify the recommendations of this report are properly interpreted and implemented. If we are not given the opportunity of making this review, we can assume no responsibility for misinterpretations of the recommendations of this report.

We should also be retained during construction to observe compliance of the design concepts, specifications, and recommendations and to provide design changes in the event the subsurface conditions differ from those anticipated prior to construction.

Should you have any questions regarding this report, or if we can be any assistance to you, please do not hesitate to contact us. We appreciate the opportunity of working with you on this project.

Respectfully submitted,
Stewart Engineering, Inc.

Kenneth F. Stewart, P.E.
President

KENNETH F. STEWART
REGISTERED PROFESSIONAL ENGINEER
No. 3700
HAWAII, U.S.A.

affect settlement on the subject property. The risk of all future ground movements is to be born exclusively by the client.

The recommendations of this report are based in part upon the data obtained from the test borings, and the assumption that the subsurface conditions in both the existing fill and natural ground do not deviate from those observed. If any variations or undesirable conditions are encountered during construction, or if the final construction differs in any way from that planned at the present time, Stewart Engineering, Inc. should be notified so that the conditions or changes can be reviewed, and the conclusions and recommendations of this report modified or verified in writing.

Unanticipated subsurface conditions are commonly encountered, especially in coastal areas around Honolulu, and cannot be fully identified by soil samples, test borings, or test pits. Such unexpected conditions frequently require that additional expenditures be made to attain a properly constructed project. Some contingency funds are recommended to accommodate such potential extra construction costs.

The test boring locations were determined from existing physical features on the site. Elevations were estimated from nearby sea level. No topographic plan or accurate site plan was available at the time of our investigation. The locations and elevations of the test borings should be considered accurate only to the degree implied by the methods used in their determination.

Groundwater was encountered at a depth of approximately 5 feet in the test borings. However, significant fluctuations in the level of the groundwater should be expected at the site due to variations in rainfall, seepage, tides, stream conditions, and other factors not present at the time our observations were made. The design of the project should account for the presence of groundwater and potential flood conditions. Flood studies were not within our scope of work.

Petroleum odor was noticed in subsurface soil samples obtained in most of the test borings between the depths of about 5 feet to 8 feet below existing ground surface. We recommend the client see that the owner of the site has complied with all applicable governmental regulations to identify and/or mitigate whatever contaminants may exist on the site. The identification of hazardous or toxic materials was not a part of the work scope of this investigation.

Recommendations

Site Preparation

1. Prior to the start of construction operations, the tower and support building areas should be cleared of all surface vegetation and other deleterious materials. These items should be removed from the site and disposed of in accordance with applicable county regulations.

2. The use of heavy equipment on the site should be limited so that repetitive activity over the same areas does not occur. Frequent, repetitive travel by heavy equipment over the same area could result in the generation of unstable, pumping conditions in portions of the site.

Grading

3. After clearing and grubbing operations have been accomplished, final grading can commence to attain the finished grades of the project. Site grading should be kept to a minimum because of the presence of soft and loose compressible soils underlying the site. Additional fill should not exceed about 1 foot in thickness. The project geotechnical engineer should be notified if greater fill thicknesses are incorporated into the design for review of the recommendations of this report.

4. On-site excavations should generate primarily coral sand and gravel which can be used as engineered fill if free of deleterious materials and compacted in accordance with the recommendations of this report. Fill material should be placed in relatively uniform lifts not exceeding 6 inches in loose thickness, and should be compacted with relatively light compaction equipment. Deleterious materials should not be used as engineered fill. Sufficient water should be used by the contractor so that no dust is created by the compaction operations, in accordance with grading ordinances of the City and County of Honolulu.

5. It is our understanding that electrical lines are the only underground utilities to be installed for this project. Underground lines should be designed to accommodate long term settlements expected for the site. Any trench excavations extending beneath the existing coral fill will likely encounter ground water at a depth at approximately sea level. This depth can be expected to fluctutate greatly, depending on tides, rainfall, and the level of Kalihi Stream.

Shoring of all excavations should conform to all applicable governmental safety regulations and to prevent the undermining of adjacent structural elements being constructed.

6. Trench backfill above the required bedding should consist of well-graded granular material with no rocks greater than 3 inches in dimension. All trench backfill should be placed in lifts not exceeding 8 inches in loose thickness and compacted to at least 90 percent of ASTM D1557 maximum dry density using hand-operated vibratory or impact equipment. Bedding material should conform to the Standard Specifications for Public Works Construction for the County of Hawaii.

7. No imported fill or backfill should be delivered to the site prior to its approval by the project geotechnical engineer. Any material imported to the site should be a non-expansive granular material free of deleterious substances. It should not have a Plasticity Index(PI) exceeding 10 and should conform to the size restrictions outlined above. A sample of any proposed import should be submitted at least 7 days prior to its intended date of delivery to the site for testing, evaluation, and approval by Stewart Engineering, Inc.

8. All grading operations should be periodically monitored by the project geotechnical engineer to evaluate the degree of compaction being attained and the suitability of the materials used. Coral fills frequently cannot be tested using conventional field density testing methods and must be visually monitored to verify that the grading contractor uses approved materials and effective compaction methods.

Tower Foundation

9. A conventional spread footing can be used for support of the planned metal-frame tower so long as the loads of the tower do not exceed those provided by the tower supplier, outlined above, and the connection between the tower and the foundation is a hinged connection which allows for no transfer of moment forces from the tower to the foundation. The recommendations of this report are not valid if either of these two conditions are not met, including during the construction period, or if the tower and support building are not capable of tolerating large future settlements as described herein. Alternative foundation designs should be used if these criteria are not met.

10. The tower foundation should bear at a depth not less than 1 foot and not deeper 2 feet below the present surface of the coral fill existing at the site. Support of the foundation at a level deeper than recommended could place the foundation bottom too close to the saturated unsuitable materials underlying the coral fill.

11. The top of the foundation concrete should not be higher than the existing ground surface, in order to minimize the net compression load increase to the underlying soils. See Figure-18 of the Appendix. The foundation excavation should be inspected by the project geotechnical engineer to verify that the exposed materials are suitable and that no loose or deleterious materials exist immediately under the foundation.

12. A tower foundation constructed as recommended above should be designed for a maximum allowable bearing capacity not exceeding 200 pounds per square foot(psf) for the maximum short term(dead plus live load) design compression load. Based upon the maximum short-term design compression load of 11.5 kips, it appears a square foundation 9 feet on a side would adequately support the tower with an appropriate safety factor against shear failure. Foundation settlements due to long-term consolidation at the site would still occur, as discussed above.

13. For a foundation of this size, the net maximum compression load, including the weight of the foundation concrete, would be less than 200 pounds per square foot over the area of the foundation so long as the foundation is no thicker than 1 foot and the top of the foundation concrete is no higher than existing grades on the site. Final design of the foundation, including reinforcement, should be as directed by the project structural engineer and reviewed by Stewart Engineering, Inc. Lightweight aggregate is recommended in the concrete to reduce foundation weight.

14. Because of the corrosive conditions apparently at the site, we would recommend the use of Type 5 sulfate resistant cement in foundation concrete, and the maintaining of a greater than normal coverage of concrete over the reinforcing steel in accordance with guidelines of the American Concrete Institute(ACI). Guy wires and anchors should also be protected against corrosion.

Guy Anchors

15. Because of variable soil conditions and potential flood conditions at the site, we believe the vertical resistance to uplift forces in the guy anchors should be provided by the dead weight of the anchor concrete in submerged condition. The maximum design uplift force from temporary wind loads on the guy anchors should be resisted with a factor of safety of at least 2.0.

16. Lateral loads on guy anchors should also be designed to be resisted by the frictional resistance between the foundation concrete and existing sand and gravel fill for a submerged condition with a factor of safety of at least 2.0. A friction factor of 0.60 should be used for determining the lateral resistance, assuming the foundation concrete is poured directly on the existing sand and gravel fill within the upper 3 feet of the existing ground surface. The maximum uplift force should be subtracted from the submerged dead load of the concrete to determine the friction resistance. Passive soil resistance should be disregarded.

17. The bottom of the concrete guy anchors should not be deeper than 3 feet below the adjacent ground surface presently existing at the site. All guy anchor excavations should be observed by the project geotechnical engineer prior to the placement of formwork or concrete in the excavations. Guy anchors placed deeper than 3 feet may encounter wet or loose conditions which may be difficult to remediate.

18. Based on the maximum uplift and lateral design loads provided by the tower supplier, it appears that square ground anchors 9 feet on each side and 3 feet thick would adequately resist both the design lateral and uplift forces anticipated for the anchors. See Figure 19 of the Appendix. Final design of the anchors and guy connections should be as directed by the project structural engineer and reviewed with the project geotechnical engineer.

Transmitter Building

19. It is our understanding the transmitter building is to consist of a relatively light, single story, metal frame structure to house 3 transmitter units. The transmitter units are not sensitive to settlement, but should be located high enough in the building to allow for the appropriate design flood water levels which could occur during the life of the facility. Design

flows and stream levels should be determined by flood study data.

20. The transmitter building can best be supported on a monolithic reinforced concrete slab to reduce differential settlements in the building. Total settlements would not be substantially reduced by use of a structural slab because of the potential for settlement of the entire area encompassing the site which could exceed 1 foot or more.

21. The combination of reinforced slab and a metal-frame structure which is relatively tolerant to sizeable settlement should minimize distress to this building. The use of CMU block or other sensitive materials should be avoided. The slab foundation should be sized to limit the unit load to the ground to no greater than 200 pounds per square foot over the area of the slab. The bottom of the slab should be no deeper than 1.5 feet below the existing grades at the site.

22. Slab reinforcement should be as recommended by the project structural engineer. Slab concrete should be cured for at least 7 days following the pour using moist burlap, plastic sheeting, or other material which ensures the slab remains moist during the curing period. Experience has shown that shrinkage cracks are much more likely to occur if this curing recommendation is not followed. Control joints should be provided in the slabs in accordance with guidelines of the American Concrete Institute(ACI) for slab concrete. Type 5 cement is also recommended for slab concrete, along with extra concrete cover over reinforcing steel.

23. The concrete slabs can be supported by on-site coral fill recompacted as recommended above. To minimize point loading of the slab, a 4-inch thick layer of crushed gravel(3B Fine or equivalent) is recommended beneath the slab to provide a relatively uniform bearing material throughout the slab. An impermeable membrane should be placed between the gravel layer and the slab as a moisture barrier if the interior slab floors are sensitive to moisture or effluoressence. This membrane should not be torn during construction. See Figure 20.

Site Drainage

24. The drainage system for the project should be designed so that surface water is directed away from the transmitter building pad, tower foundation, and the guy anchors to prevent ponding of water around these elements.

Construction Monitoring

25. The recommendations given in this report are contingent upon adequate construction monitoring by Stewart Engineering, Inc. Excavations for foundations and guy anchors should be inspected by Stewart Engineering, Inc. prior to the placement of the formwork, concrete, and steel to verify that the anticipated bearing materials have been encountered.

26. The loads imposed on the tower during construction should not exceed the maximum design loads upon which this investigation was based. These loads are summarized above in the Project Considerations section of this report. The erection contractor should be made aware of this requirement and design the erection methods accordingly.

27. The recommendations herein for the support of the tower are also contingent upon regular, periodic monitoring of the guy system by the appropriate party, preferably the supplier or structural engineer, so that the guys can be adjusted according to whatever settlements have taken place. This monitoring and subsequent guy adjustment requirement should be considered to be necessary indefinitely into the future unless settlements prove to be of minor consequence to the guy system. It is the owner's responsibility to assure that adequate monitoring is accomplished. All monitoring information should be provided to Stewart Engineering, Inc. for review.

Limitations

This report has been prepared in accordance with accepted local engineering practice for the exclusive use of KUMU Radio for the proposed new 150 ft. radio tower planned at the site investigated between Nimitz Highway and Dillingham Boulevard near the Keehi Interchange in Kalihi, Honolulu, Hawaii. No other warranty, expressed or implied, is made. This report should not be used for any other site, or for this site if the design concepts, assumptions, or loads upon which the report was prepared are changed in any way.

The client has been informed that the site is located in an area which has experienced extensive settlement activity over long periods of time and is expected to continue indefinitely in the future. The extent of future settlement is unpredictable because of ground conditions at the site and because man-made or natural activities on other areas surrounding the site could greatly the Keehi Interchange was constructed.

Surcharging of the subject site could eliminate much of the future settlements likely to occur, but this procedure would probably take many years to complete. It is our understanding this time period is not feasible for this project. Surcharging the tower site alone would help reduce total settlements from the new tower loads, and should be considered if a period of at least several months is available to monitor the surcharge settlement.

It should be recognized that additional significant settlements could occur on the project site from future consolidation of the area or from activities on adjacent properties such as additional filling or excavation, or lowering of the local groundwater table. It is not possible to predict these activities or their specific effects on the new tower. It is essential to monitor the tower, guys, and anchors after construction on a regular basis and to adjust the guys appropriately. Failure to adequately monitor the system and adjust the guys could result in excessive loads on the tower foundation for which it is no designed to withstand.

The soils and groundwater at the site are very salty and probably very corrosive to foundation concrete and steel; protection of these elements from both short-term and long-term corrosion should be implemented into the selection of foundation materials. The use of Type 5 sulfate-resistant cement and greater than normal concrete cover over reinforcing steel is encouraged.

Groundwater was encountered in the test borings at a depth of about 5 feet below the existing ground surface. The depth to groundwater should vary significantly with tides and the level of the adjacent Kalihi Stream. The site is in a potential flood zone from both ocean and stream sources. The design of both the tower and the equipment building should consider the flood hazard, which is an especially important consideration for the transmitter equipment.

A pile foundation system for support of the tower has been discussed, but was deemed not economically possible by the owner. Technical problems related to pile or pier foundations would include support of installation equipment, downdrag forces, and differential settlements between the tower and guy anchors. Although Honolulu is not in a high risk seismic zone, the potential of liquefaction should be considered for the tower. The loose, saturated silty materials underlying the upper compacted coral fill should be considered susceptible to liquefaction from seismic activity.

of about 20 feet, and the alluvial soils tended to be more silty and clayey and soft with depth. Pocket penetrometer readings on the saturated, fine-grained samples were consistently less than 0.5 tons per square foot.

The materials underlying the coral fill on the surface of the site are predominantly alluvial materials deposited by Kalihi Stream and lagoon detritus deposited by ocean activity on the tidal flats of nearby Keehi Lagoon. The soft, saturated dark clayey silts and fine sands with coral debris are typically found underlying filled coastal sites from Honolulu to Pearl Harbor.

Natural moisture contents in the deeper clayey silts and fine sands varied from 73 to 85 percent, with dry densities ranging from 49 to 59 pounds per cubic foot. Liquid limits varied from 77 to 101, with plasticity indexes as high as 37. These soils plotted as MH/OH on a standard plasticity chart.

The soft alluvial and lagoon deposits can extend very deep. Piles supporting the Keehi Interchange are reported to have been driven to depths of over 200 feet, while information from borings drilled for nearby buildings across Kalihi Stream from the site indicates the lagoon deposits extend to a depth of over 100 feet.

The U.S.D.A. Soil Conservation Service Soil Survey for the Island of Hawaii classifies the predominant surface materials in the general area of the site as Fill Land(FL), which is described as areas filled with material dredged from the ocean or hauled from nearby areas, garbage, and general material from other sources. The general description given by the U.S.D.A. for the area is consistent with our field observations of the site and the test borings, although the fill observed on the site appear to be primarily dredged coral.

Discussion and Conclusions

The general subsurface conditions at the site for the proposed new radio tower consist of approximately 5 feet to 8 feet of relatively dense coral sand and gravel fill overlying saturated loose silty sands and gravels, and soft silty alluvial deposits which extend to a depth of at least 48 feet and probably to a depth of over 100 feet. While the upper coral fill is a good bearing material, the soft underlying alluvial soils are susceptible to significant long term settlements if subjected to additional loads.

The new tower is a light structure with a total weight of about 4 kips, approximately the weight of an automobile. No moment forces will be transfered to the tower foundation because of the hinged connection which allows free rotation of the tower about its base in all directions. Lateral forces from wind loads on the tower are to be resisted by anchored guys. The recommendations of this report relating to the tower are dependent on this hinge connection and are not valid for any other type of connection.

Under the design loading conditions, it is possible to support the tower on a conventional spread foundation with a low allowable bearing capacity which would transmit very little additional load(less than 100 pounds per square foot) to the compressible layers underlying the compacted upper coral fill. It is essential that the allowable foundation loads recommended in this report are not exceeded during construction of the tower or after the tower is completed.

Uplift forces in the guy anchors should designed to be resisted by the weight of the concrete in the anchors themselves. Lateral loads in the guy anchors would be resisted by frictional forces developed from the weight of the concrete anchors on the coral fill, which was analyzed for saturated conditions. No soil passive resistance should be used in the design to resist lateral forces; the passive resistance actually developed by the anchors would add an additional factor of safety to the resistance of the guy anchors. Both anchors and foundations should be analyzed for flooded conditions.

The tower system should be very tolerant to settlement because of the hinged connection between the tower and foundation, and the use of adjustable guys which can be periodically monitored and adjusted to allow for excess slack or tension which could develop from differential settlement. According to the supplier and owner, the tower could experience settlements of up to 2 feet or more without affecting the structural integrity of the system or the operation of the tower.

Although relatively small settlements on the order of several inches would be expected by the imposition of the light tower foundation loads, larger total settlements in the range of 2 feet or more could occur on the site from the future consolidation of the soft, saturated silty alluvial soils and coral detritus extending to a great depth beneath the site. It is our understanding that portions of Nimitz Highway in the general area of the site have experienced significant settlements over the past years. This settlement has probably been the result of long term consolidation caused by the placement of fill over general area, including the project site, when

Laboratory tests included natural moisture content, in-situ dry density, plastic limits, liquid limits, grain size analysis, penetrometer shear strength, and swell characteristics of a sample the surface soils.

Because of the presence of gravel-sized broken coral fragments in the zone of influence of the structures, no conventional consolidation or direct shear testing has been performed. Consolidation characteristics of the soils were estimated by empirical methods, using the liquid limit and moisture content data. Subsequent consolidation testing of remolded specimens may be considered to correlate with empirical estimates. Shear strength was estimated by blow count data, pocket penetrometer readings, and grain size analysis information.

Laboratory test results are included on the boring logs where appropriate and are also presented graphically on Figures 8 through 18 of the Appendix.

General Subsurface Conditions

The test boring information indicates the site is underlain by approximately 5 feet to 8 feet of coral sand and gravel fill, which is generally underlain by dark gray loose silty sands and gravels, and soft clayey silts/fine sands containing broken coral fragments.

The near surface fill material was made up primarily of dredged coral sand and gravel, but the upper 6 inches consisted of moderately expansive, brown clayey silt in some areas. Decaying organic materials such as roots, and some debris such as glass and wood were observed in some of the subsurface samples of the fill. Fine organic material was also noticed in the deeper silty soils encountered in Boring 1.

The coral fill was generally in a dense condition but graded to medium dense to loose as the underlying dark, saturated silty deposits were approached near the groundwater surface at a depth of about 5 feet. Generally the silty sands and gravels underlying the coral fill were loose, but some areas of medium dense resistance were recorded. Petroleum odor was noticed at a depth of about 5 feet to 8 feet in most of the test borings, and petroleum product was seen in many of the soil samples evaluated in the laboratory.

The amount of broken coral fragments generally tended to decrease in the soils below the depth structure or a temporary metal container-type unit placed on a concrete slab. Three transmitters are to be housed in the building, each weighing approximately 1.5 kips. The transmitters are not sensitive to settlement.

Minimal grading of the lot is to be accomplished with essentially no changes to the grades presently existing on the lot.

Subsurface Investigation

Four test borings were drilled on March 18 and 19, 1993 at the approximate locations shown on the Site Plan in Figure 2 of the Appendix. A truck-mounted Simco 2400SK-1 drill rig was used to drill the test borings, with 4-inch diameter continuous flight augers and 5-inch diameter steel casing.

Samples of subsurface soils were obtained in a 3.0-inch O.D., 2.375-inch I.D. split-spoon sampler with brass liners. The sampler was driven into the soil by a 140-pound hammer freely falling 30 inches. The number of hammer blows required to advance the sampler 1 foot was recorded and is included on the Boring Logs of this report, Figures 4 through 7 of the Appendix. A Boring Log Legend is provided as Figure 3 to assist in evaluating the logs.

Boring 1 was drilled to a depth of 48 feet below the existing ground surface in the approximate location of the new radio tower, as located by KUMU engineering personnel. The remaining three borings were drilled to a depth of 15 feet at possible guy anchor locations around the tower location.

Boring 2 was relocated about 40 feet north of its original location due to the presence of very hard material at a depth of about 1.5 feet encountered in three separate attempts to advance the boring. It appears the hard material could be old pavement for the original intersection of Nimitz Highway, Dillingham Boulevard, and Middle Street, which may not have been completely removed.

The test borings were drilled under the supervision of a licensed geotechnical engineer, who also obtained the soil samples and maintained logs of the borings. A surface soil sample was also obtained for evaluation of swell potential.

The site has been landscaped with grass and coconut trees, and is nearly level except for an open drainage ditch about 5 feet deep in the western end. Numerous underground irrigation lines with sprinkler fixtures and valve boxes are apparent throughout the site, and a large electric pole with both overhead and underground power lines is located on the parcel near Kalihi Stream. A portion of old asphaltic concrete road parallels the stream.

Although no topographic information or detailed site plan was available at the time of our investigation, the site appeared to be approximately 5 feet above the stream level, which is near sea level. At least part of the area is known to have been filled in for many years; additional fill was placed during the construction of the interchange and surrounding areas in the late 1970's and early 1980's. Most of the fill appears to be coral dredged from other areas.

Project Considerations

A new radio tower 150 feet in height is to be built on the property, with a small single story transmitter building adjacent to the tower. The light steel frame tower is to be approximately 2 feet in diameter and is to be supported by a single spread foundation, with anchored guy wires for lateral support.

A hinged connection with 360 degrees of rotational freedom will mount the tower to the foundation so that no bending moments will be introduced to the foundation by lateral forces acting on the tower. The foundation loads provided by the tower supplier are as follows:

Total Vertical Dead Load(tower plus vertical guy forces) = 4.0 kips
Total Vertical Compression Load(Dead Load plus Wind Loads) = 11.5 kips
Total Lateral Load on tower foundation = 0.2 kip
Total Uplift Load on guy anchors = 4.3 kips
Total Lateral Load on guy anchors = 4.5 kips

According to the tower supplier, the tower system is very tolerant of large settlements because of the hinged connection and the adjustable, anchored guys which can be periodically tightened or loosened to allow for differential ground movements.

A small, single-story transmitter building is to be built adjacent to the tower, with maximum wall foundation loads no greater than 2 kips per linear foot. Although the design of this building is not determined at this time, it is our understanding that it will be a light metal-frame

Structural Calculations
Our Job Number 93-P025

150 FOOT KUMU-AM RADIO TOWER
INTERSTATE HIGHWAY FAP #IH1(82)
KEEHI INTERCHANGE
HONOLULU, HAWAII

for: KUMU Radio
441 N. Nimitz Highway
Honolulu, HI 96817

May 1993

THEODORE J. SUZUKI
REGISTERED PROFESSIONAL ENGINEER
No. 4163-S
HAWAII, U.S.A.

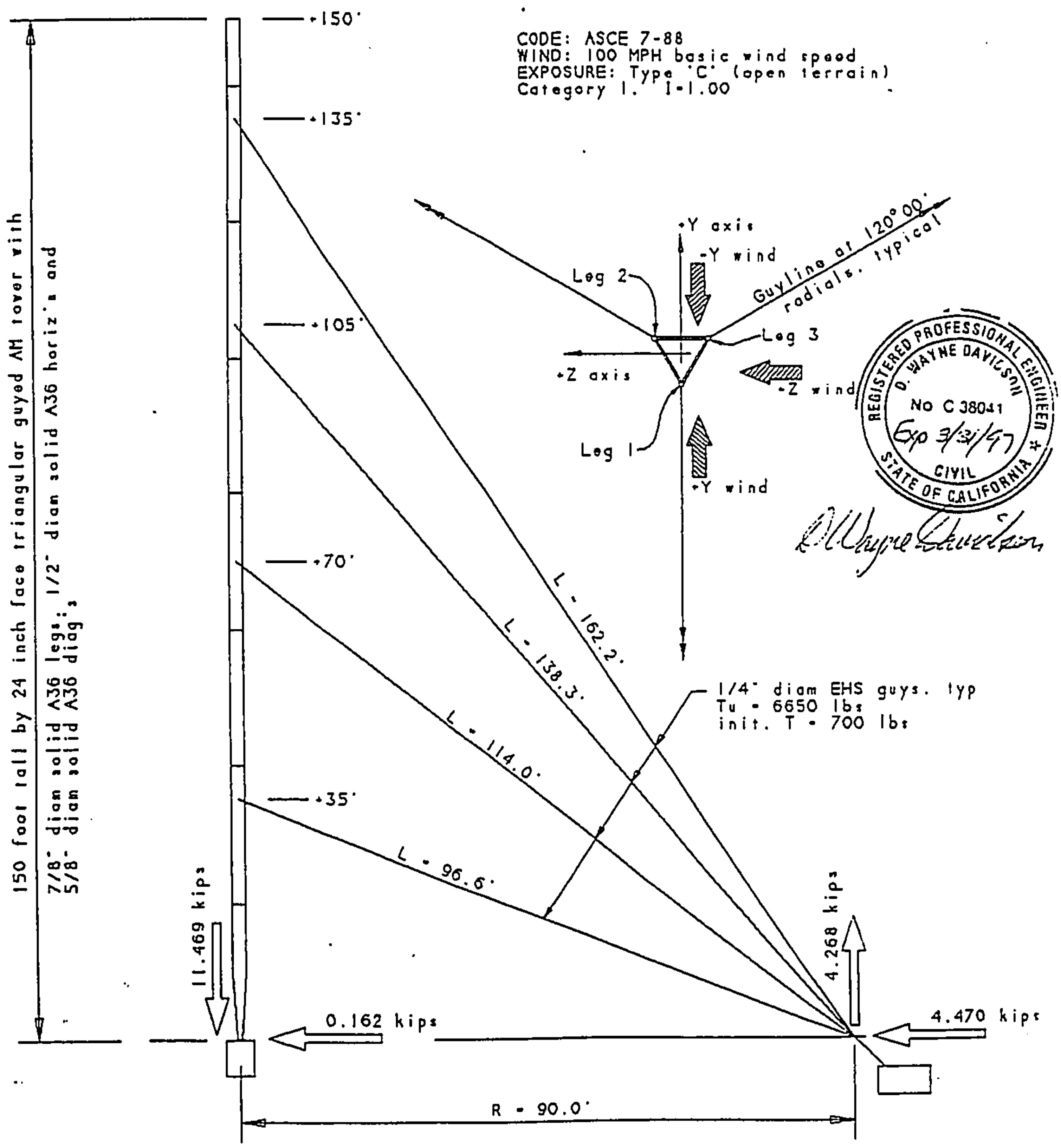
This work was prepared by me or under my supervision

Robert Englekirk Consulting Structural Engineers, Inc.
1130 N. Nimitz Highway, Suite A-215, Honolulu, Hawaii 96817, (808) 521-6958

TOWERS

Job 150'x24"Δ Guyed AM ...	Job No. 1181/93
Client KUMU-AM	
Designed by DWD Date 4/15/93 Page 1 of	

MA JM TOWERS, INC.
9370 Elder Creek Road
Sacramento, CA 95829
916/381-5053



Job 150' x 24" △ Guyed A Tower	Job No. 1181/93
Client KHMU	
Designed by DWD Date 4/15/93 Page 2 of	

MAGNUM TOWERS, INC.
9370 Elder Creek Road
Sacramento, CA 95829
916/381-5053

150 foot tall by 24 inch face triangular guyed tower
Wind and Dead Loads

Code: ASCE 7-88
Wind: 100 MPH basic wind speed
Exposure: Type 'C'
Category 1; I=1.00

Tower Wind and Dead Loads

$A_f = \{ 2'' \times 0.875''\phi + 1.19'' \times 0.500'' + 1.53'' \times 0.625'' \} \times 1/12 = \underline{0.2751\ ft^2/ft}$

$A_g = (24'' + 0.875'') \times 12/144 = \underline{2.0729\ ft^2/ft}$ $\varepsilon = 0.2751 / 2.0729 = .1327$

$G_h = 1.14 \leftarrow$ Table 8, p. 15

$C_f = \{ 3.7 - 4.5 \times (.1327) \} \times 0.67 = \underline{2.0789}$

$w_{twr} = 0.00256 \times K_z \times (1 \times 100)^2 \times 1.14 \times 2.0789 \times .2751 = \underline{16.6905 \times K_z}$

Elevation	avg K_z	w_{twr}
0' - 35'	0.8370	13.97 lbs/ft
35' - 70'	1.1456	19.12 "
70' - 105'	1.3256	22.12 "
105' - 135'	1.4508	24.21 "
135' - 150'	1.5238	25.43 "

tower DL = 26.0 lbs/ft for 7/8" diam solid legs, 1/2" horiz'l webs, 5/8" diag'l webs

Guy Wire Wind and Dead Load

$P_{guy} = .00256 \times K_z \times (1 \times 100)^2 \times 1.14 \times (1.2 + 2 \times 0.3) \times .250''\phi/12 \times L_g$

$= \underline{1.0944 \times K_z \times L_g}$

$P_{35} = 1.0944 \times 0.8370 \times 96.6' = \underline{88\ lbs}$

$P_{70} = 1.0944 \times 1.0203 \times 114.0' = \underline{127\ lbs}$

$P_{105} = 1.0944 \times 1.1456 \times 138.3' = \underline{173\ lbs}$

$P_{135} = 1.0944 \times 1.2309 \times 162.2' = \underline{219\ lbs}$

1/4"ϕ guy DL = 0.0101 lbs/inch

Job 150' x 24" Δ Guyed / Tower	Job No. 1181/93
Client KUMU-AM	
Designed by DWH Date 4/15/93	Page 3 of

M[illegible]NUM TOWERS, INC.
9370 Elder Creek Road
Sacramento, CA 95829
916/381-5053

Tower Design

Leg Design

7/8"ϕ solid rond A36 leg design

max P_{leg} = 6,473 lbs ← p-9

leg $kL/_r$ = 1.0(19.50") x $4/_{0.875"}$ = 89.143 F_a = 14.303 ksi

P_a = 14.303(0.6013)(4/3) = 11.467^k > 6.473^k OK

Use 7/8"ϕ solid round A36 legs @ +0.0' to +150'

Web Design

Horizontal Webs

p.9

max $P_{horiz'l}$ = (436# x 1/2) / .866 = 252 lbs

$kL/_r$ = 1.00(23.125" net) x 4 / 0.500" = 185 F_a = 4.36 ksi

P_a = 4.36(0.1963)(4/3) = 1.141^k > 0.252^k OK

Use 1/2"ϕ solid round A36 horizontal webs thru-out tower

Diagonal Webs

above

max $P_{diag'l}$ = 252 x (30.923"/24") = 325 lbs

$kL/_r$ = 1.00(29.69" net) x 4 / 0.625" = 190 F_a = 4.14 ksi

P_a = 4.14(0.3068)(4/3) = 1.694^k > 0.325^k OK

Use 5/8"ϕ solid round A36 diagonal webs thru-out tower

Guy Wire Design

p-15   p-5

max Tension = 1,890 lbs < 6,650# / 2.0 = 3,325 lbs OK

Use 1/4" diam EHS guys thru-out T_u=6,650 lbs   initial T = 700 lbs

Job 150'x24" △ Guyed A Tower	Job No. 1181/93	MA..IUM TOWERS, INC. 9370 Elder Creek Road Sacramento, CA 95829 916/381-5053
Client KUMU-AM		
Designed by DWD Date 4/15/93	Page 4 of	

Tower Foundation Design

Refer to: *Subsurface Investigation Report - Proposed 150 ft. KUMU Radio Tower Keehi Interchange - Nimitz Highway at Dillingham Boulevard Kalihi, Honolulu, Hawaii*

Prepared by: Stewart Engineering, Inc.
145 Hekili Street Suite 100
~~Honolulu,~~ Hawaii Kailua, Oahu

Dated: April 7, 1993

Tower Base Foundation

max Axial = 11,469 lbs ← P.9

req'd A = $11.469^k / 0.200$ ksf = 57.35 sq ft

width = $(57.35)^{1/2}$ = 7.57 ft square Use 9'0" square

Moment = $.200 \times (4.5)^2 / 2$ = 2.025 kip-ft

$A_s = 2.025^{k'}/(1.44 \times 7.5") = 0.1875"^2/ft$ use #4 at 6" o.c. (A_s=0.4418"^{2}/ft)

Use 9'0" square by 12" thick spread footing based at 12 inches below ground surface with #4 at 6" o.c. each way at bottom

Guy Anchor Design: (R = 90 ft) P.15, typ P.1 P.1

$\Sigma V = 35' \times (1150^{\#}/96.6') + 70' \times (1509^{\#}/114.0') + 105' \times (1781^{\#}/138.3')$
$+ 135' \times (1890^{\#}/162.2') = 417 + 927 + 1352 + 1573 = \underline{4,268 \text{ lbs}}$

$\Sigma H = 90' \times \{ (\text{"}) + (\text{"}) + (\text{"}) + (\text{"}) \} = \underline{4,470 \text{ lbs}}$

$\Sigma T = (\Sigma V^2 + \Sigma H^2)^{1/2} = \underline{6,181 \text{ lbs}}$

req'd rod diameter = $\{ 4/\pi * 6,181^{\#} / (.6 * 36,000 * 4/3) \}^{1/2} = \underline{0.5227"\phi}$

Use buoyant weight of concrete for uplift resistance density=150 - 62 = 88 pcf

Try 9' wide x 9' long x 3' high deadman concrete anchor

Bouyant Concrete Weight = 9' x 9' x 3' x 88 pcf = 21,384 lbs >> 4268 lbs OK

Net concrete weight = 21,384 - 4268 = 17,116 lbs

Required friction factor = 4,470 / 17,116 = 0.2612

F.S. = 0.60/0.2612 = 2.297 > 2.00 OK

Use 9'0" square by 3'0" thick concrete deadman based at 3'0" below ground surface with #4 at 6" o.c. each way each face

JOB 150'x24"Δ Guyed AM Tower JOB NO. 1181-93 PAGE 5

PROPERTIES - STEEL GUY WIRE

EHS = EXTRA HIGH STRENGTH GRADE - E = 14,000 ksi fu = 170 ksi
B.S. = BRIDGE STRAND GRADE (B.S. 19) - E = 19,000 ksi fu = 200 ksi

NOMINAL DIAMETER (inches)	APPROX. AREA (sq. in.)	WEIGHT (lb/in)	ULTIMATE STRENGTH (lbs)	INITIAL TENSION @ 10% Tu	EAI (kips)
3/16" EHS	.0214	.0067	3,990	400	299.6
1/4" EHS	.0356	.0101	6,650	700	498.4
5/16" EHS	.0661	.0188	11,200	1200	925.4
3/8" EHS	.0802	.0228	15,400	1600	1,122.8
7/16" EHS	.1170	.0333	20,800	2100	1,638.0
1/2" EHS	.1520	.0431	26,700	2700	2,128.0
9/16" EHS	.1970	.0559	35,000	3500	2,758.0
5/8" EHS	.2390	.0678	42,400	4300	3,346.0
3/4" EHS	.3390	.0963	58,300	5800	4,746.0
7/8" EHS	.4650	.1318	79,700	8000	6,510.0
1" EHS	.6090	.1728	104,500	10,500	8,526.0
1-1/8" EHS	.7910	.2243	130,800	13,000	11,074.0
1-1/4" EHS	.9810	.2781	162,200	16,000	13,734.0
9/16" B.S.	.1940	.0550	38,000	3800	3,686.0
5/8" B.S.	.2380	.0675	48,000	4800	4,522.0
3/4" B.S.	.3409	.0967	68,000	6800	6,477.1
7/8" B.S.	.4584	.1300	92,000	9200	8,709.6
1" B.S.	.6083	.1725	122,000	12,000	11,557.7
1-1/16" B.S.	.6770	.1975	138,000	14,000	12,863.0
1-1/8" B.S.	.7910	.2243	158,200	16,000	15,029.0
1-1/4" B.S.	.9380	.2733	192,000	19,000	17,822.0
1-3/8" B.S.	1.1300	.3308	232,000	23,000	21,470.0
1-1/2" B.S.	1.3500	.3942	276,000	27,500	25,650.0
1-5/8" B.S.	1.5900	.4625	324,000	32,500	30,210.0
1-3/4" B.S.	1.8400	.5358	376,000	37,500	34,960.0
1-7/8" B.S.	2.1100	.6158	432,000	43,000	40,090.0
2" B.S.	2.4000	.7000	490,000	49,000	45,600.0
2-1/8" B.S.	2.7100	.7908	554,000	55,500	51,490.0
2-1/4" B.S.	3.0400	.8867	620,000	62,000	57,760.0
2-1/2" B.S.	3.7500	1.0942	752,000	75,000	71,250.0

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150 Foot Tall by 24" Face Triangular Guyed Tower - Hawaii - MTI JOB NO. 1181-93
Code: ASCE 7-88, 100 mph basic wind speed, exp. type 'C', category 1; I=1.00, no ice
Client: Putnam Installation Co. - Ross Putnam Date Processed: February 18, 1993
Loading: +Z axis wind load, dead load, and guy wire prestress

GUY WIRE OUTPUT DATA:

GUY NO.	DISPLACEMENT (inches)	CABLE FORCE (lbs)	NEW EA (lbs)
1	.0497	720.	470780.
2	-1.1029	258.	464037.
3	1.0532	1150.	495811.
4	.3286	819.	493681.
5	-2.5569	88.	327321.
6	2.2283	1509.	496845.
7	.7366	919.	492859.
8	-4.3463	61.	243595.
9	3.6097	1781.	498264.
10	1.0420	964.	494012.
11	-5.7036	56.	219539.
12	4.6615	1890.	497688.

BEAM FORCES:

BM NO.	AXIAL (lbs)	SHEAR Y (lbs)	SHEAR Z (lbs)	TORSION (lb-in)	MOMENT Y (lb-in)	MOMENT Z (lb-in)	LEG 1 (lbs)	LEG 2 (lbs)	LEG 3 (lbs)
1	10674.	25.	-104.	0.	0.	0.	3558.	3558.	3558.
1	-10219.	-25.	-140.	0.	3150.	5134.	-3159.	-3398.	-3661.
2	10219.	25.	140.	0.	-3150.	-5134.	3159.	3398.	3661.
2	-9764.	-25.	-385.	0.	-45392.	9830.	-2782.	-5382.	-1600.
3	8992.	10.	-248.	0.	49273.	-9910.	2521.	5289.	1183.
3	-8537.	-10.	-87.	0.	-24217.	10848.	-2324.	-4116.	-2098.
4	8537.	10.	87.	0.	24217.	-10848.	2324.	4116.	2098.
4	-8082.	-10.	-422.	0.	-67869.	11070.	-2161.	-5788.	-132.
5	6598.	-6.	-423.	0.	78340.	-11243.	1658.	5734.	-794.
5	-6143.	6.	36.	0.	-19760.	7929.	-1666.	-3062.	-1415.
6	6143.	-6.	-36.	0.	19760.	-7929.	1666.	3062.	1415.
6	-5688.	6.	-351.	0.	-41992.	4353.	-1687.	-3750.	-251.
7	3591.	-5.	-445.	0.	57664.	-4334.	989.	3704.	-1101.
7	-3201.	5.	82.	0.	-4053.	2207.	-961.	-1289.	-951.
8	3201.	-5.	-82.	0.	4054.	-2207.	961.	1289.	951.
8	-2811.	5.	-281.	0.	-16385.	178.	-929.	-1626.	-259.
9	390.	0.	-381.	0.	34707.	-73.	126.	1578.	-1314.
9	0.	0.	0.	0.	-0.	0.	0.	0.	0.

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150 Foot Tall by 24" Face Triangular Guyed Tower - Hawaii - MTI JOB NO. 1181-93
Code: ASCE 7-88, 100 mph basic wind speed, exp. type 'C', category 1; I=1.00, no ice
Client: Putnam Installation Co. - Ross Putnam Date Processed: February 18, 1993
Loading: +Z axis wind load, dead load, and guy wire prestress

INPUT:(CONT'D)

GUY DATA:

TOTAL NO. OF GUYS = 12 GUYED NODES = 4

NODES		X (ft)	Y (ft)	Z (ft)	Y1 (inches)	Z1 (inches)	EA (lbs)	EAI (lbs)	WEIGHT (lbs/in)	PRESTRESS (lbs)
3	1	35.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
3	1	35.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
3	1	35.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.
5	1	70.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
5	1	70.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
5	1	70.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.
7	1	105.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
7	1	105.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
7	1	105.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.
9	1	135.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
9	1	135.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
9	1	135.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.

OUTPUT:

NODE	DISP X (inches)	DISP Y (inches)	DISP Z (inches)	ROTA X (radians)	ROTA Y (radians)	ROTA Z (radians)
1	.00000	.00000	.00000	.00000	-.00325	-.00001
2	-.00000	.00349	.66003	.00000	-.00301	.00009
3	-.00001	.05111	1.31567	.00000	-.00370	.00040
4	-.00001	.18008	2.25239	.00000	-.00498	.00083
5	-.00001	.40238	3.42840	.00000	-.00664	.00129
6	-.00002	.71730	5.06447	.00000	-.00838	.00168
7	-.00002	1.10056	6.90657	.00000	-.00937	.00193
8	-.00002	1.46083	8.71808	.00000	-.01027	.00205
9	-.00002	1.83513	10.57147	.00000	-.01044	.00209
10	-.00002	2.21165	12.51476	.00000	-.01084	.00209

150 Foot Tall by 24" Face Triangular Guyed Tower - Hawaii - MTI JOB NO. 1181-93
Code: ASCE 7-88, 100 mph basic wind speed, exp. type 'C', category 1; I=1.00, no ice
Client: Putnam Installation Co. - Ross Putnam Date Processed: February 18, 1993
Loading: +Z axis wind load, dead load, and guy wire prestress

INPUT:

NODES = 10 SUPPORT CONDITION = PINNED NODAL LOADS = 4 MODULUS = 29500000.psi

NODAL LOAD INPUT DATA:

NODE NO.	DIRECTION	COORD. NO.	LOADING (lbs)
3	Z	15	88.0
5	Z	27	127.0
7	Z	39	173.0
9	Z	51	219.0

TOWER SECTION PROPERTY INPUT DATA:

NUMBER COMMON = 1	MORE SECTIONS = 1	LENGTH = 210.00 inches		HC = 1		
sq in	sq in	lbs/ft	lbs/ft	lbs/ft	inches	inches
LEG AREA = .6013	DIA AREA = .3068	WOL = 26.00	WLy = .00	WLz = 13.97	DD = 24.00	DL = 19.50
NUMBER COMMON = 1	MORE SECTIONS = 1	LENGTH = 210.00 inches		HC = 0		
NUMBER COMMON = 1	MORE SECTIONS = 1	LENGTH = 210.00 inches		HC = 1		
sq in	sq in	lbs/ft	lbs/ft	lbs/ft	inches	inches
LEG AREA = .6013	DIA AREA = .3068	WOL = 26.00	WLy = .00	WLz = 19.12	DD = 24.00	DL = 19.50
NUMBER COMMON = 1	MORE SECTIONS = 1	LENGTH = 210.00 inches		HC = 0		
NUMBER COMMON = 1	MORE SECTIONS = 1	LENGTH = 210.00 inches		HC = 1		
sq in	sq in	lbs/ft	lbs/ft	lbs/ft	inches	inches
LEG AREA = .6013	DIA AREA = .3068	WOL = 26.00	WLy = .00	WLz = 22.12	DD = 24.00	DL = 19.50
NUMBER COMMON = 1	MORE SECTIONS = 1	LENGTH = 210.00 inches		HC = 0		
NUMBER COMMON = 1	MORE SECTIONS = 1	LENGTH = 180.00 inches		HC = 1		
sq in	sq in	lbs/ft	lbs/ft	lbs/ft	inches	inches
LEG AREA = .6013	DIA AREA = .3068	WOL = 26.00	WLy = .00	WLz = 24.21	DD = 24.00	DL = 19.50
NUMBER COMMON = 1	MORE SECTIONS = 1	LENGTH = 180.00 inches		HC = 0		
NUMBER COMMON = 1	MORE SECTIONS = 0	LENGTH = 180.00 inches		HC = 1		
sq in	sq in	lbs/ft	lbs/ft	lbs/ft	inches	inches
LEG AREA = .6013	DIA AREA = .3068	WOL = 26.00	WLy = .00	WLz = 25.43	DD = 24.00	DL = 19.50

Structural Calculations
Our Job Number 93-P025

150 FOOT KUMU-AM RADIO TOWER
INTERSTATE HIGHWAY FAP #IH1(82)
KEEHI INTERCHANGE
HONOLULU, HAWAII

for: KUMU Radio
441 N. Nimitz Highway
Honolulu, HI 96817

May 1993

THEODORE J. SUZUKI
REGISTERED PROFESSIONAL ENGINEER
No. 4163-S
HAWAII, U.S.A.

This work was prepared by me or under my supervision

Robert Englekirk Consulting Structural Engineers, Inc.
1130 N. Nimitz Highway, Suite A-215, Honolulu, Hawaii 96817, (808) 521-6938

150 Foot Tall by 24" Face Triangular Guyed Tower - Hawaii - MTI JOB NO. 1181-93
Code: ASCE 7-88, 100 mph basic wind speed, exp. type 'C', category 1; I=1.00, no ice
Client: Putnam Installation Co. - Ross Putnam Date Processed: February 18, 1993
Loading: +Y axis wind load, dead load, and guy wire prestress

INPUT:(CONT'D)

GUY DATA:

TOTAL NO. OF GUYS = 12 GUYED NODES = 4

NODES		X (ft)	Y (ft)	Z (ft)	Y1 (inches)	Z1 (inches)	EA (lbs)	EAI (lbs)	WEIGHT (lbs/in)	PRESTRESS (lbs)
3	1	35.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
3	1	35.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
3	1	35.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.
5	1	70.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
5	1	70.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
5	1	70.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.
7	1	105.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
7	1	105.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
7	1	105.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.
9	1	135.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
9	1	135.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
9	1	135.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.

OUTPUT:

NODE	DISP X (inches)	DISP Y (inches)	DISP Z (inches)	ROTA X (radians)	ROTA Y (radians)	ROTA Z (radians)
1	.00000	.00000	.00000	.00000	.00000	.00313
2	-.00000	.63994	.00000	.00000	.00000	.00283
3	-.00001	1.21736	.00000	.00000	.00000	.00303
4	-.00001	1.94173	.00000	.00000	.00000	.00361
5	-.00001	2.75350	.00000	.00000	.00000	.00453
6	-.00002	3.87914	.00000	.00000	.00000	.00569
7	-.00002	5.11923	.00000	.00000	.00000	.00640
8	-.00002	6.38448	.00000	.00000	.00000	.00722
9	-.00002	7.69369	.00000	.00000	.00000	.00748
10	-.00002	9.12342	.00000	.00000	.00000	.00809

150 Foot Tall by 24" Face Triangular Guyed Tower - Hawaii - MTI JOB NO. 1181-93
Code: ASCE 7-88, 100 mph basic wind speed, exp. type 'C', category 1; I=1.00, no ice
Client: Putnam Installation Co. - Ross Putnam   Date Processed: February 18, 1993
Loading: +Y axis wind load, dead load, and guy wire prestress

INPUT:

NODES = 10   SUPPORT CONDITION = PINNED   NODAL LOADS = 4   MODULUS = 29500000.psi

NODAL LOAD INPUT DATA:

NODE NO.	DIRECTION	COORD. NO.	LOADING (lbs)
3	Y	14	88.0
5	Y	26	127.0
7	Y	38	173.0
9	Y	50	219.0

TOWER SECTION PROPERTY INPUT DATA:

NUMBER COMMON = 1   MORE SECTIONS = 1   LENGTH = 210.00 inches   MC = 1

sq in	sq in	lbs/ft	lbs/ft	lbs/ft	inches	inches
LEG AREA = .6013	DIA AREA = .3068	WDL = 26.00	WLy = 13.97	WLz = .00	DD = 24.00	DL = 19.50

NUMBER COMMON = 1   MORE SECTIONS = 1   LENGTH = 210.00 inches   MC = 0

NUMBER COMMON = 1   MORE SECTIONS = 1   LENGTH = 210.00 inches   MC = 1

sq in	sq in	lbs/ft	lbs/ft	lbs/ft	inches	inches
LEG AREA = .6013	DIA AREA = .3068	WDL = 26.00	WLy = 19.12	WLz = .00	DD = 24.00	DL = 19.50

NUMBER COMMON = 1   MORE SECTIONS = 1   LENGTH = 210.00 inches   MC = 0

NUMBER COMMON = 1   MORE SECTIONS = 1   LENGTH = 210.00 inches   MC = 1

sq in	sq in	lbs/ft	lbs/ft	lbs/ft	inches	inches
LEG AREA = .6013	DIA AREA = .3068	WDL = 26.00	WLy = 22.12	WLz = .00	DD = 24.00	DL = 19.50

NUMBER COMMON = 1   MORE SECTIONS = 1   LENGTH = 210.00 inches   MC = 0

NUMBER COMMON = 1   MORE SECTIONS = 1   LENGTH = 180.00 inches   MC = 1

sq in	sq in	lbs/ft	lbs/ft	lbs/ft	inches	inches
LEG AREA = .6013	DIA AREA = .3068	WDL = 26.00	WLy = 24.21	WLz = .00	DD = 24.00	DL = 19.50

NUMBER COMMON = 1   MORE SECTIONS = 1   LENGTH = 180.00 inches   MC = 0

NUMBER COMMON = 1   MORE SECTIONS = 0   LENGTH = 180.00 inches   MC = 1

sq in	sq in	lbs/ft	lbs/ft	lbs/ft	inches	inches
LEG AREA = .6013	DIA AREA = .3068	WDL = 26.00	WLy = 25.43	WLz = .00	DD = 24.00	DL = 19.50

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150 Foot Tall by 24" Face Triangular Guyed Tower - Hawaii - MTI JOB NO. 1181-93
Code: ASCE 7-88, 100 mph basic wind speed, exp. type 'C', category 1; I=1.00, no ice
Client: Putnam Installation Co. - Ross Putnam   Date Processed: February 18, 1993
Loading: +Y axis wind load, dead load, and guy wire prestress

GUY WIRE OUTPUT DATA:

GUY NO.	DISPLACEMENT (inches)	CABLE FORCE (lbs)	NEW EA (lbs)
1	1.1498	1193.	497483.
2	-.5749	459.	485312.
3	-.5749	459.	485312.
4	2.2120	1505.	498272.
5	-1.1060	317.	474577.
6	-1.1060	317.	474577.
7	3.3989	1719.	497604.
8	-1.6995	231.	457396.
9	-1.6995	231.	457396.
10	4.3539	1813.	497500.
11	-2.1770	200.	446833.
12	-2.1770	200.	446833.

BEAM FORCES:

BM NO.	AXIAL (lbs)	SHEAR Y (lbs)	SHEAR Z (lbs)	TORSION (lb-in)	MOMENT Y (lb-in)	MOMENT Z (lb-in)	LEG 1 (lbs)	LEG 2 (lbs)	LEG 3 (lbs)
1	9476.	-162.	0.	0.	0.	0.	3159.	3159.	3159.
1	-9021.	-83.	0.	0.	0.	-14203.	-3690.	-2665.	-2665.
2	9021.	83.	0.	0.	0.	14203.	3690.	2665.	2665.
2	-8566.	-327.	0.	0.	0.	23779.	-1711.	-3427.	-3427.
3	7801.	-269.	0.	0.	0.	-27465.	1279.	3261.	3261.
3	-7346.	-66.	0.	0.	0.	680.	-2416.	-2465.	-2465.
4	7346.	66.	0.	0.	0.	-680.	2416.	2465.	2465.
4	-6891.	-400.	0.	0.	0.	43872.	-186.	-3352.	-3352.
5	5578.	-411.	0.	0.	0.	-53985.	-738.	3158.	3158.
5	-5123.	24.	0.	0.	0.	2329.	-1596.	-1764.	-1764.
6	5123.	-24.	0.	0.	0.	-2329.	1596.	1764.	1764.
6	-4668.	-363.	0.	0.	0.	31912.	-21.	-2324.	-2324.
7	3012.	-432.	0.	0.	0.	-47567.	-1285.	2148.	2148.
7	-2622.	69.	0.	0.	0.	-1087.	-926.	-848.	-848.
8	2622.	-69.	0.	0.	0.	1087.	926.	848.	848.
8	-2232.	-294.	0.	0.	0.	16011.	26.	-1129.	-1129.
9	390.	-381.	0.	0.	0.	-34605.	-1535.	963.	963.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.

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150 Foot Tall by 24" Face Triangular Guyed Tower - Hawaii - MTI JOB NO. 1181-93
Code: ASCE 7-88, 100 mph basic wind speed, exp. type 'C', category 1; I=1.00, no ice
Client: Putnam Installation Co. - Ross Putnam   Date Processed: February 18, 1993
Loading: -Y axis wind load, dead load, and guy wire prestress

GUY WIRE OUTPUT DATA:

GUY NO.	DISPLACEMENT (inches)	CABLE FORCE (lbs)	NEW EA (lbs)
1	-1.3305	191.	443681.
2	.6652	986.	494851.
3	.6652	986.	494851.
4	-3.2583	67.	265336.
5	1.6291	1291.	495835.
6	1.6291	1291.	495835.
7	-5.6232	49.	191553.
8	2.8116	1542.	496669.
9	2.8116	1542.	496669.
10	-7.4418	44.	170907.
11	3.7209	1650.	497118.
12	3.7209	1650.	497118.

BEAM FORCES:

BM NO.	AXIAL (lbs)	SHEAR Y (lbs)	SHEAR Z (lbs)	TORSION (lb-in)	MOMENT Y (lb-in)	MOMENT Z (lb-in)	LEG 1 (lbs)	LEG 2 (lbs)	LEG 3 (lbs)
1	11469.	78.	0.	0.	0.	0.	3823.	3823.	3823.
1	-11014.	166.	0.	0.	0.	-1817.	-3759.	-3628.	-3628.
2	11014.	-166.	0.	0.	0.	1817.	3759.	3628.	3628.
2	-10559.	411.	0.	0.	0.	-54474.	-6141.	-2209.	-2209.
3	9776.	242.	0.	0.	0.	58464.	6072.	1852.	1852.
3	-9321.	93.	0.	0.	0.	-32020.	-4648.	-2337.	-2337.
4	9321.	-93.	0.	0.	0.	32021.	4648.	2337.	2337.
4	-8866.	428.	0.	0.	0.	-73122.	-6473.	-1196.	-1196.
5	7240.	411.	0.	0.	0.	83533.	6432.	404.	404.
5	-6785.	-24.	0.	0.	0.	-23381.	-3387.	-1699.	-1699.
6	6785.	24.	0.	0.	0.	23382.	3387.	1699.	1699.
6	-6330.	363.	0.	0.	0.	-43514.	-4204.	-1063.	-1063.
7	3952.	436.	0.	0.	0.	59224.	4167.	-108.	-108.
7	-3562.	-73.	0.	0.	0.	-4771.	-1417.	-1072.	-1072.
8	3562.	73.	0.	0.	0.	4770.	1417.	1072.	1072.
8	-3172.	290.	0.	0.	0.	-16306.	-1842.	-665.	-665.
9	390.	381.	0.	0.	0.	34816.	1805.	-708.	-708.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.

8

150 Foot Tall by 24" Face Triangular Guyed Tower - Hawaii - MTI JOB NO. 1181-93
Code: ASCE 7-88, 100 mph basic wind speed, exp. type 'C', category 1; I=1.00, no ice
Client: Putnam Installation Co. - Ross Putnam Date Processed: February 18, 1993
Loading: -Y axis wind load, dead load, and guy wire prestress

INPUT:(CONT'D)

GUY DATA:

TOTAL NO. OF GUYS = 12 GUYED NODES = 4

NODES		X (ft)	Y (ft)	Z (ft)	Y1 (inches)	Z1 (inches)	EA (lbs)	EAI (lbs)	WEIGHT (lbs/in)	PRESTRESS (lbs)
3	1	35.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
3	1	35.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
3	1	35.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.
5	1	70.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
5	1	70.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
5	1	70.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.
7	1	105.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
7	1	105.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
7	1	105.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.
9	1	135.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
9	1	135.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
9	1	135.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.

OUTPUT:

NODE	DISP X (inches)	DISP Y (inches)	DISP Z (inches)	ROTA X (radians)	ROTA Y (radians)	ROTA Z (radians)
1	.00000	.00000	.00000	.00000	.00000	-.00315
2	-.00000	-.66443	.00000	.00000	.00000	-.00319
3	-.00001	-1.40409	.00000	.00000	.00000	-.00436
4	-.00001	-2.54220	.00000	.00000	.00000	-.00623
5	-.00002	-4.03727	.00000	.00000	.00000	-.00840
6	-.00002	-6.09405	.00000	.00000	.00000	-.01061
7	-.00002	-8.44668	.00000	.00000	.00000	-.01199
8	-.00002	-10.75049	.00000	.00000	.00000	-.01312
9	-.00002	-13.13548	.00000	.00000	.00000	-.01349
10	-.00002	-15.64654	.00000	.00000	.00000	-.01410

7

150 Foot Tall by 24" Face Triangular Guyed Tower - Hawaii - MTI JOB NO. 1181-93
Code: ASCE 7-88, 100 mph basic wind speed, exp. type 'C', category 1; I=1.00, no ice
Client: Putnam Installation Co. - Ross Putnam   Date Processed: February 18, 1993
Loading: -Y axis wind load, dead load, and guy wire prestress

INPUT:

NODES = 10   SUPPORT CONDITION = PINNED   NODAL LOADS = 4   MODULUS = 29500000.psi

NODAL LOAD INPUT DATA:

NODE NO.	DIRECTION	COORD. NO.	LOADING (lbs)
3	Y	14	-88.0
5	Y	26	-127.0
7	Y	38	-173.0
9	Y	50	-219.0

TOWER SECTION PROPERTY INPUT DATA:

NUMBER COMMON = 1   MORE SECTIONS = 1   LENGTH = 210.00 inches   MC = 1
sq in   sq in   lbs/ft   lbs/ft   lbs/ft   inches   inches
LEG AREA = .6013 DIA AREA = .3068 WDL = 26.00 WLy = -13.97 WLz = .00 DD = 24.00 DL = 19.50

NUMBER COMMON = 1   MORE SECTIONS = 1   LENGTH = 210.00 inches   MC = 0

NUMBER COMMON = 1   MORE SECTIONS = 1   LENGTH = 210.00 inches   MC = 1
sq in   sq in   lbs/ft   lbs/ft   lbs/ft   inches   inches
LEG AREA = .6013 DIA AREA = .3068 WDL = 26.00 WLy = -19.12 WLz = .00 DD = 24.00 DL = 19.50

NUMBER COMMON = 1   MORE SECTIONS = 1   LENGTH = 210.00 inches   MC = 0

NUMBER COMMON = 1   MORE SECTIONS = 1   LENGTH = 210.00 inches   MC = 1
sq in   sq in   lbs/ft   lbs/ft   lbs/ft   inches   inches
LEG AREA = .6013 DIA AREA = .3068 WDL = 26.00 WLy = -22.12 WLz = .00 DD = 24.00 DL = 19.50

NUMBER COMMON = 1   MORE SECTIONS = 1   LENGTH = 210.00 inches   MC = 0

NUMBER COMMON = 1   MORE SECTIONS = 1   LENGTH = 180.00 inches   MC = 1
sq in   sq in   lbs/ft   lbs/ft   lbs/ft   inches   inches
LEG AREA = .6013 DIA AREA = .3068 WDL = 26.00 WLy = -24.21 WLz = .00 DD = 24.00 DL = 19.50

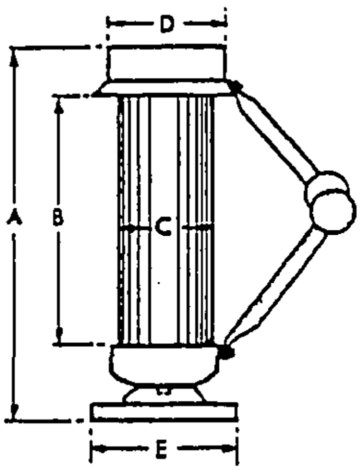
NUMBER COMMON = 1   MORE SECTIONS = 1   LENGTH = 180.00 inches   MC = 0

NUMBER COMMON = 1   MORE SECTIONS = 0   LENGTH = 180.00 inches   MC = 1
sq in   sq in   lbs/ft   lbs/ft   lbs/ft   inches   inches
LEG AREA = .6013 DIA AREA = .3068 WDL = 26.00 WLy = -25.43 WLz = .00 DD = 24.00 DL = 19.50

AUS[illegible]N BASE INSULAT[illegible]RS

6

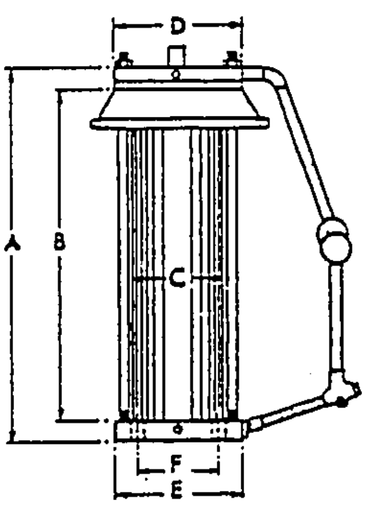
TYPES A–4197–L, A–4722–B



DIMENSIONS

TYPE	A	B	C	D	E	MAST FIXING	INSULATOR MOUNTING	WEIGHT
A–4197–L	13.6" 345mm	7" 178mm	4" 102mm diameter	7.75" 197 mm diameter	7" 178mm diameter	3 holes drilled 5/8" (16mm) on 6.5" (165mm) Bolt Circle Diameter	3 holes drilled 5/8" (16mm) on 5.5" (140mm) Bolt Circle Diameter	45 lb. 20 kg
A–4722–B	26.125" 664mm	17.5" 445mm	6.5" 165mm diameter	7.85" 199mm diameter	10" 254mm diameter	3 holes tapped 5/8" (16mm) 11 TPI on 6.5" (165mm) Bolt Circle Diameter	4 holes drilled 3/4" (19mm) on 8" (203mm) Bolt Circle Diameter	108 lb. 49 kg

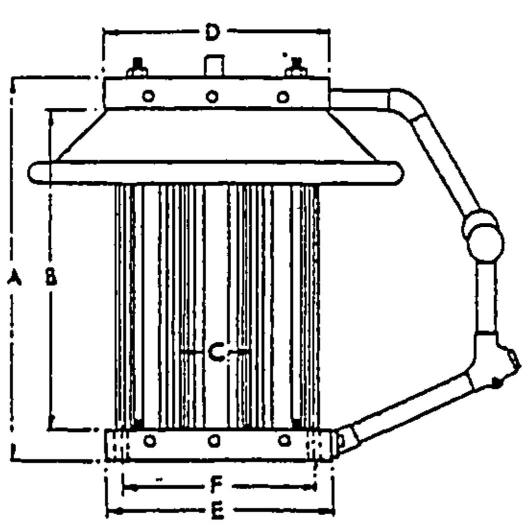
TYPES A–0881, A–0729, A–0167



DIMENSIONS

TYPE	A	B	C	D	E	F	MAST FIXING	INSULATOR MOUNTING	WEIGHT
A–0881	36.5" 927mm	32" 813mm	8.25" 210mm diameter	11" 279mm diameter	11" 279mm square	8.125" 206mm	Centre pin 1½" (38mm) diameter 2" (51mm) long. Keep mast base within clearance diameter of 8" (203mm)	4 holes drilled 1-1/8" (29mm) Square base	140 lb. 64 kg
A–0729	37" 940mm	32" 813mm	9.75" 248mm diameter	12.5" 318mm diameter	12.5" 318mm square	9.0" 229mm	Centre pin 1½" (38mm) diameter 2" (51mm) long. Keep mast base within clearance diameter of 11" (279mm)	4 holes drilled 1¼" (32mm) Square base	265 lb. 120 kg
A–0167	37" 940mm	32" 813mm	11" 279mm diameter	13.75" 349mm diameter	13.75" 349mm square	10.6" 269mm	Centre pin 1½" (38mm) diameter 2" (51mm) long. Keep mast base within clearance diameter of 12" (305mm)	4 holes drilled 1¼" (32mm) Square base	360 lb. 163 kg

TYPES A–3663–B, A–4447–B, A–3820–R



DIMENSIONS

TYPE	A	B	C	D	E	F	MAST FIXING	INSULATOR MOUNTING	WEIGHT
A–3663–B	34" 864mm	30" 762mm	6.5" 165mm diameter	18" 457mm diameter	17" 432mm diameter	Refer to "Insulator Mounting" column	Centre pin 1½" (38mm) diameter 2" (51mm) long. Keep mast base within clearance diameter of 13" (330mm)	3 holes drilled 1-1/8" (29mm) on 15" (381mm) Bolt Circle Diameter Round base	530 lb. 240 kg
A–4447–B	35" 889mm	30" 762mm	6.5" 165mm diameter	21" 533mm diameter	21" 533mm square	18" 457mm	Centre pin 1½" (38mm) diameter 2" (51mm) long. Keep mast base within clearance diameter of 16" (406mm)	4 holes drilled 1-3/8" (35mm) Square base	1005 lb. 456 kg
A–3820–R	37.5" 952mm	30" 762mm	6.5" 165mm diameter	27.5" 699mm diameter	27.5" 699mm diameter	Refer to "Insulator Mounting" column	Centre pin 1½" (38mm) diameter 2" (51mm) long. Keep mast base within clearance diameter of 22" (559mm)	4 holes drilled 1-5/8" (41mm) on 24.5" (622 mm) Bolt Circle Diameter Round base	1895 lb. 860 kg

The site has been landscaped with grass and coconut trees, and is nearly level except for an open drainage ditch about 5 feet deep in the western end. Numerous underground irrigation lines with sprinkler fixtures and valve boxes are apparent throughout the site, and a large electric pole with both overhead and underground power lines is located on the parcel near Kalihi Stream. A portion of old asphaltic concrete road parallels the stream.

Although no topographic information or detailed site plan was available at the time of our investigation, the site appeared to be approximately 5 feet above the stream level, which is near sea level. At least part of the area is known to have been filled in for many years; additional fill was placed during the construction of the interchange and surrounding areas in the late 1970's and early 1980's. Most of the fill appears to be coral dredged from other areas.

Project Considerations

A new radio tower 150 feet in height is to be built on the property, with a small single story transmitter building adjacent to the tower. The light steel frame tower is to be approximately 2 feet in diameter and is to be supported by a single spread foundation, with anchored guy wires for lateral support.

A hinged connection with 360 degrees of rotational freedom will mount the tower to the foundation so that no bending moments will be introduced to the foundation by lateral forces acting on the tower. The foundation loads provided by the tower supplier are as follows:

Total Vertical Dead Load(tower plus vertical guy forces) = 4.0 kips
Total Vertical Compression Load(Dead Load plus Wind Loads) = 11.5 kips
Total Lateral Load on tower foundation = 0.2 kip
Total Uplift Load on guy anchors = 4.3 kips
Total Lateral Load on guy anchors = 4.5 kips

According to the tower supplier, the tower system is very tolerant of large settlements because of the hinged connection and the adjustable, anchored guys which can be periodically tightened or loosened to allow for differential ground movements.

A small, single-story transmitter building is to be built adjacent to the tower, with maximum wall foundation loads no greater than 2 kips per linear foot. Although the design of this building is not determined at this time, it is our understanding that it will be a light metal-frame

Subsurface Investigation Report
Proposed 150 ft. KUMU Radio Tower
Keehi Interchange
Nimitz Highway at Dillingham Boulevard
Kalihi, Honolulu, Hawaii

for

KUMU Radio
441 North Nimitz Highway
Honolulu, Hawaii 96817

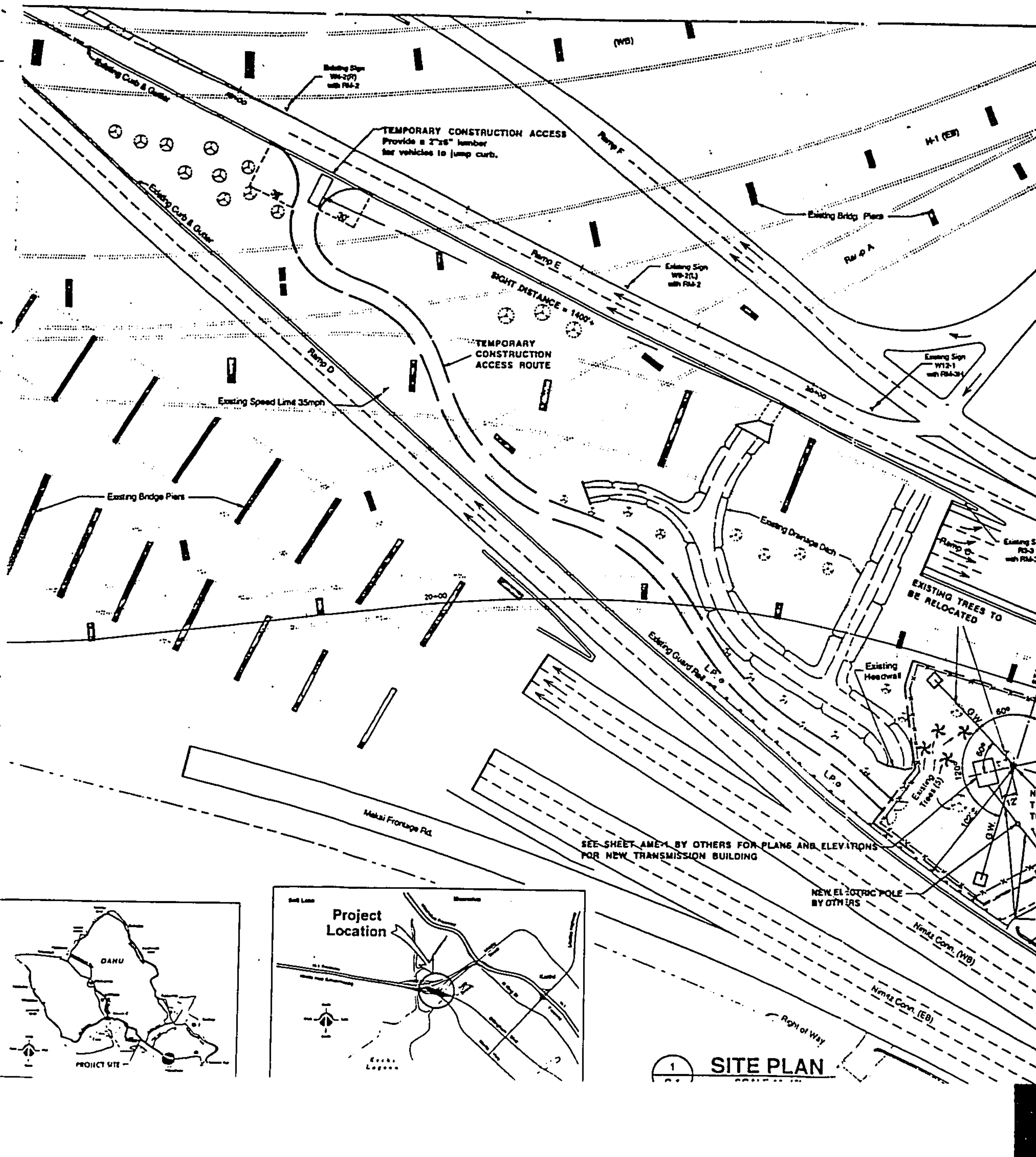
by

Stewart Engineering, Inc.
145 Hekili Street Suite 100
Kailua, Oahu, Hawaii

April 7, 1993

Table of Contents

Appendix


(WB)
H-1 (EB)
Existing Curb & Gutter
TEMPORARY CONSTRUCTION ACCESS
Provide a 2"x6" lumber for vehicles to jump curb.
Ramp F
Ramp E
Ramp A
Ramp D
Existing Bridg. Piers
SIGHT DISTANCE = 1400'±
TEMPORARY CONSTRUCTION ACCESS ROUTE
Existing Speed Limit 35mph
Existing Bridge Piers
Existing Drainage Ditch
EXISTING TREES TO BE RELOCATED
Existing Headwall
Existing Guard Rail
Existing Trees (3)
Makai Frontage Rd.
SEE SHEET AME-1 BY OTHERS FOR PLANS AND ELEVATIONS FOR NEW TRANSMISSION BUILDING
NEW ELECTRIC POLE BY OTHERS
Nimitz Conn. (WB)
Nimitz Conn. (EB)
Right of Way
OAHU
PROJECT SITE
Project Location

SITE PLAN

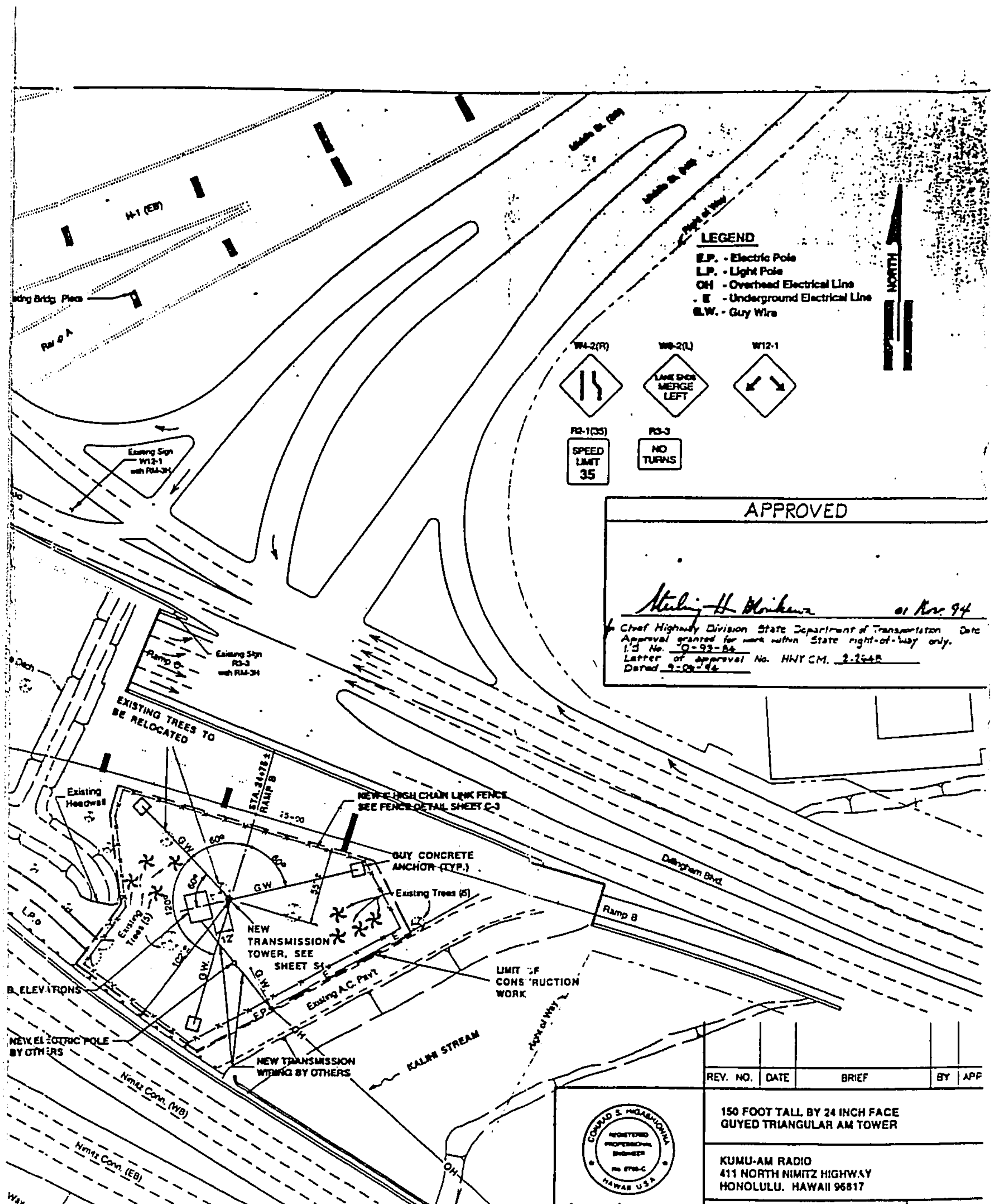
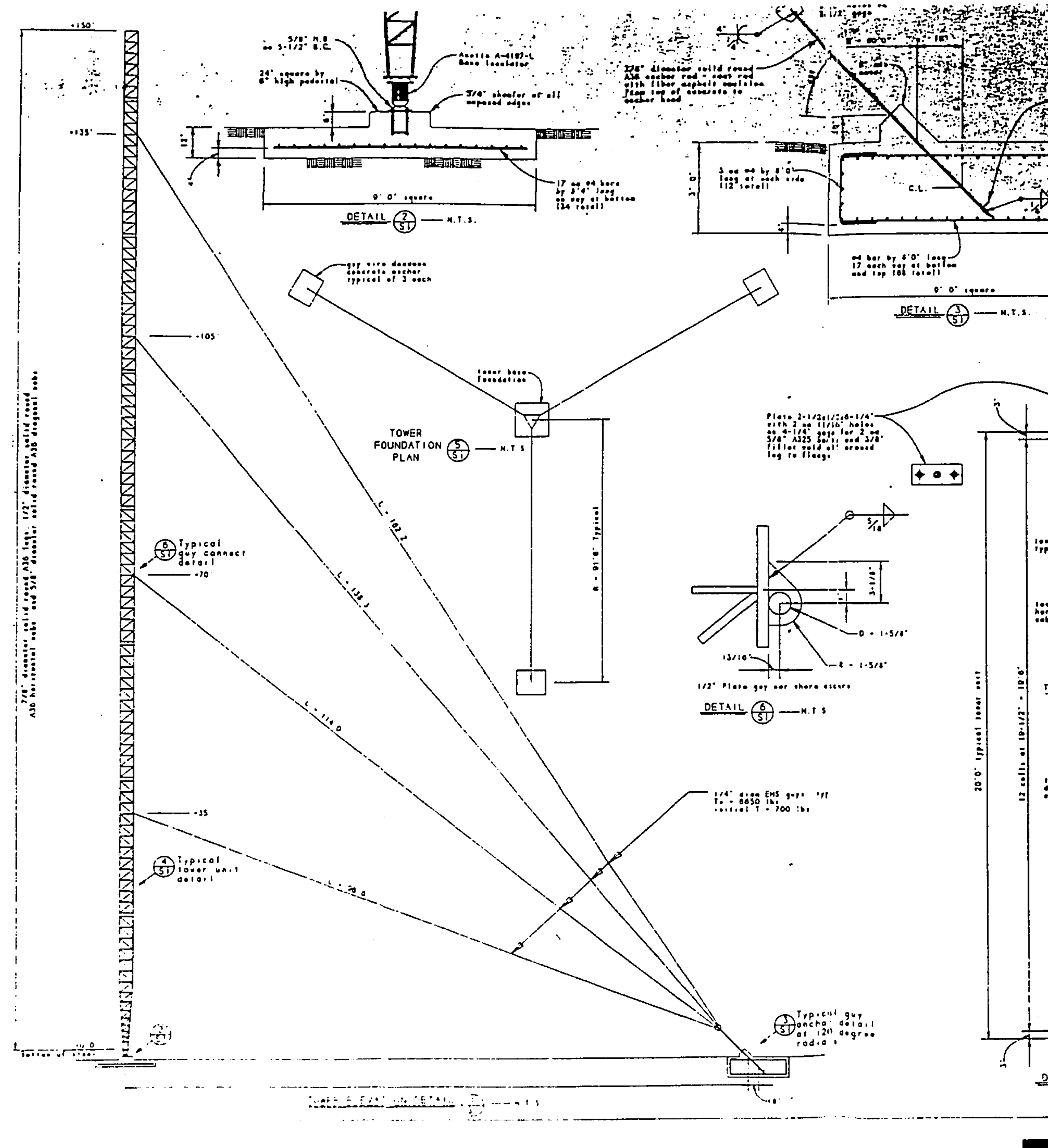


Exhibit C-1
Project Site Plan

DOCUMENT CAPTURED AS RECEIVED



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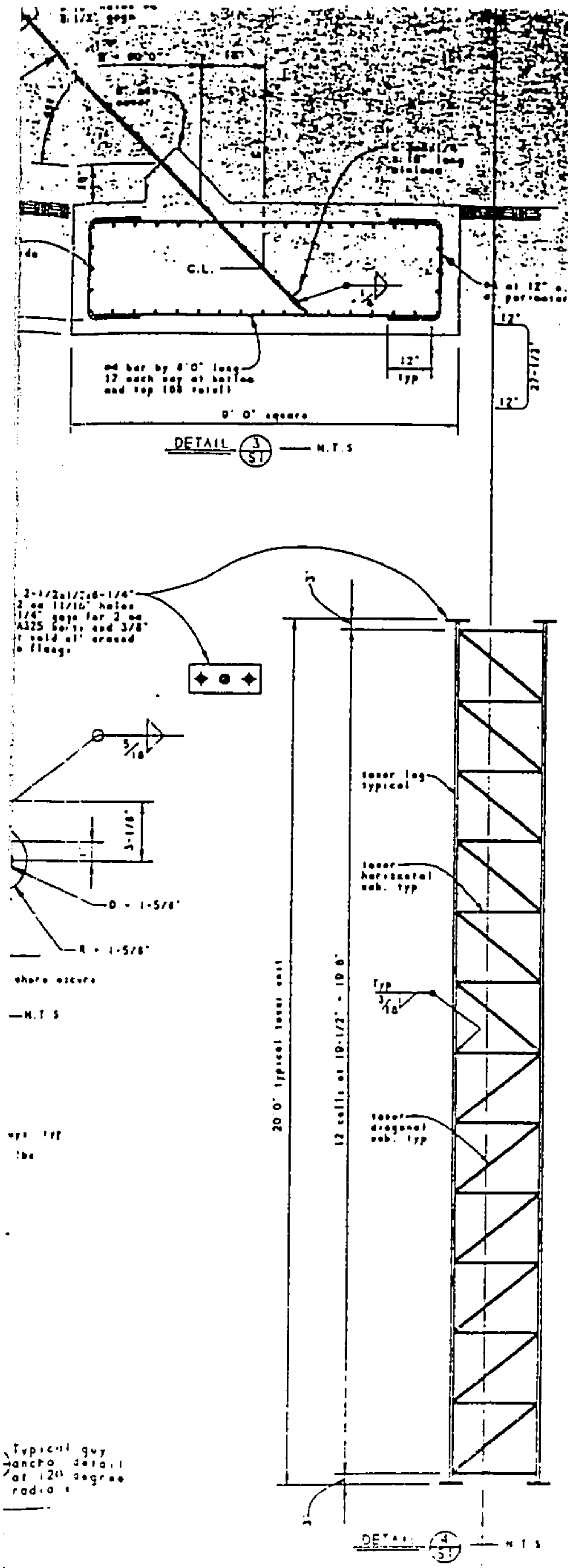


DESIGN CRITERIA

1. Tower load factors are based on the American Society of Civil Engineers standard ASCE 7-88, 100 MPH basic wind speed, with no icing. Allowable stresses for the tower steel strength are based on the American Institute of Steel Construction Specifications, 9th Edition, with a one-third stress increase taken for wind and seismic loads.
2. The tower is designed to support only the equipment and loads shown on structural drawing sheet S1. The addition of equipment which contributes to the dead or wind load on the tower is strictly prohibited without prior written approval for such additions by the Engineer of Record or by a licensed Civil or Structural Engineer.

WELDING REQUIREMENTS

1. Welding shall be done by the electric-arc or electro-flux process in accordance with AWS Standard D1.1 using only certified welders. All butt welds shall have complete penetration unless noted otherwise on plans. All welds shall be cleaned of slag before galvanizing.
2. All welds shall be full penetration butt welds unless noted otherwise on the plans.
3. All splice welds (to increase member length) shall be full penetration butt welds and shall be ground flush at all exposed surfaces. The soundness of all full penetration butt welds (to increase member length) shall be certified by an independent testing laboratory.
4. Where welding of galvanized members and pipe is required, all galvanizing and scale shall be ground 1/2 inch clear of the weld surface.

INSTALLING GUYS AND PLUMBING TOWER

TOWER GUYS AND RIGGING

FOUNDATION CONCRETE AND DESIGN

150 FOOT TALL BY 24 INCH FACE GUYED TRIANGULAR AM TOWER

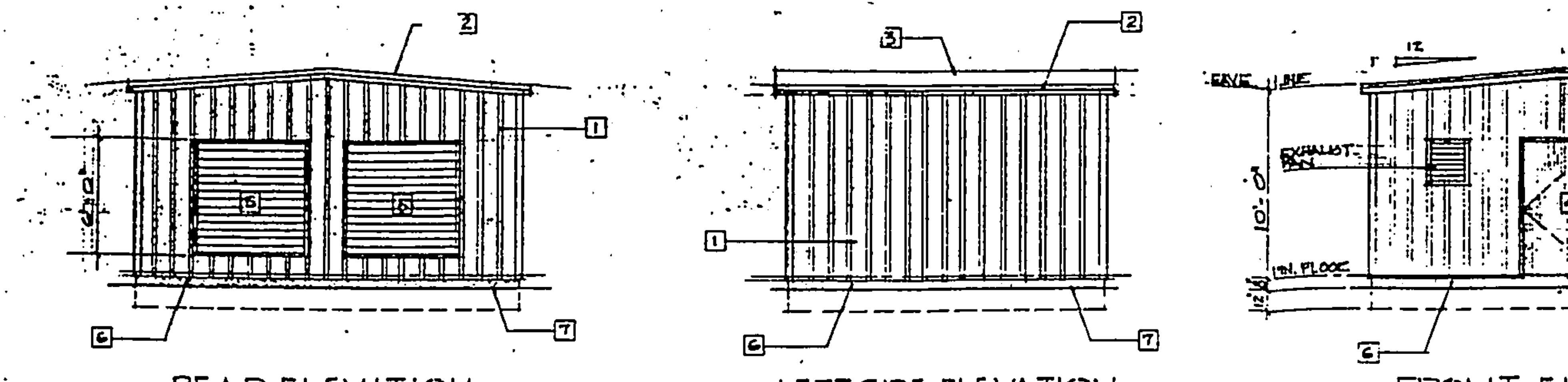
KUMU-AM RADIO
441 NORTH NIMITZ HIGHWAY

MAGNUM TOWERS, INCORPORATED
9370 ELDER CREEK ROAD
SACRAMENTO, CALIFORNIA 95829

DATE	4-15-93
DRAWN BY	DKO
SCALE	N.T.S
JOB NO	1141-93
SHEET	S1

Exhibit C-2
Tower Details, Plan, Elevation, And Specifications

DOCUMENT CAPTURED AS RECEIVED



REAR ELEVATION

LEFT-SIDE ELEVATION

FRONT EL

SCALE : 1/4" = 1'-0"

PANEL SCHEDULE

KUMU TRANSMITTER BLDG.
PANEL: A
LOCATION: —
MOUNTING: SURFACE
FEEDER ENTRY: TOP

VOLTAGE: 120/208 3Ø 4W
MAIN DEVICE: MLO
BUS SIZE: 100 A
SHORT CIRCUIT RATING: 10,000 AIC

DESCRIPTION	WIRE	KVA	BKR. AMP/POLE	CIRCUIT AND PHASE	BKR. AMP/POLE	KVA	WIRE	DESCRIPTION
TRANSMITTER #1	12	1.8	1P15A	1 A 2	1P15A	1.8	12	TRANSMITTER #2
EXHAUST FAN #1	10	2.4	1P20A	3 B 4	1P20A	2.4	10	EXHAUST FAN #2
LIGHTS	12	0.3	1P15A	5 C 6	1P15A	1.1	12	RECEPTACLES
SPARE	—	—	1P15A	7 A 8	1P20A	—	—	SPARE
↓	—	—	↓	9 B 10	↓	—	—	↓
↓	—	—	↓	11 C 12	↓	—	—	↓
				13 A 14				
				15 B 16				
				17 C 18				
				19 A 20				
				21 B 22				
				23 C 24				
				25 A 26				
				27 B 28				
				29 C 30				
				31 A 32				
				33 B 34				
				35 C 36				
				37 A 38				
				39 B 40				
				41 C 42				

CONNECTED LOAD		DEMAND FACTOR	CALCULATED LOAD
... & MISC. CONTINUOUS	KVA	NEC 220-10(b)	8.7 KVA
...TACLES	KVA	NEC 220-13	1.1 KVA
...S	KVA	NEC 220-14	KVA
... CALCULATED LOAD = 9.8	KVA	47.21 AMPERES	

EXHAUST FANS:

SHALL BE CARNES WALL PROPELLER FAN
MODEL # 24 LRDA
5400 CFM @ .250 IN SP.
1/2 HP DIRECT DRIVE 120 VOLT 20 AMP
SUPPLIED WITH GRAVITY BACK DRAFT
DAMPER, WALL MOUNTING COLLAR,
EXTERNAL DAMPER GUARD,
MOTOR SIDE GUARD.

GUY WIRE.
150' HIGH x 24" FACE BROADCAST TOWER.
REINFORCED CONCRETE FOUND...
TOWER MATCHING UNIT...
GUY WIRE.

BY OTHERS

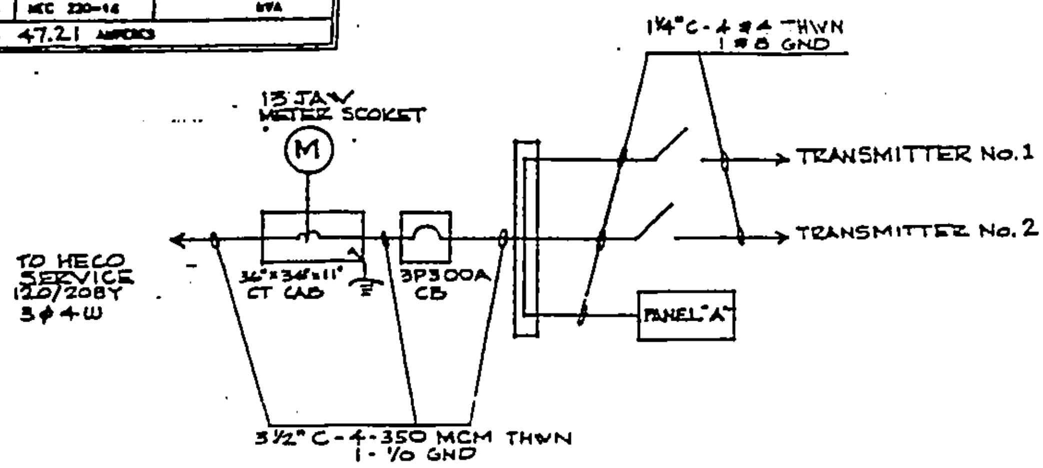
ELECTRICAL LEGEND

120V AC 15A RECEPTACLE

EQUIPMENT CONNECTION

PANEL "A"

NON FUSED DISCONNECT SWI...



ONE LINE DIAGRAM

PLAN / ELEVATION NOTES

1. METAL WALL PANELS, 26 GA. ...
2. FLASHING AND EAVE TRIM.
3. METAL ROOF, 26 GA. ..., SHELL WHITE.
4. STEEL DOOR 4/0 x 7/0 W/FRAME AND MORTISE LO...
5. FIXED-BLADE 4/0 x 4/0 AIR INTAKE WALL LOUVE...
6. CONCRETE FOOTING.
7. FINISHED GRADE.
8. LINER PANEL.
9. R-13 WALL AND ROOF INSULATION.
10. 1 x 4 (2x4 40w) FLUORESCENT LIGHT FIXTURES.
11. TRANSFORMER 17"D x 24"W x 38"H, 600 LBS.
12. POWER SUPPLY 21"D x 40"W x 40"H, 120 LBS.
13. TRANSFORMER 19"D x 23"W x 38"H, 400 LBS.
14. DUMMY LOAD 19" x 23", 100 LBS.
15. SUPPORT EQUIPMENT (TRANSMITTER NO. 1) 75"H
16. TRANSMITTER NO. 1 208 VAC, 3 Ø, 30 KVA, 120 ... 80"H, 2000 LBS. INSTALL ON STEEL PLATE AND ... 2'-0" C.F.F. BY OTHERS.
17. SUPPORT EQUIPMENT (TRANSMITTER NO. 2) 75"H
18. TRANSMITTER NO. 2 208 VAC, 3 Ø, 30 KVA, 120 ... 80"H, 2000 LBS. INSTALL ON STEEL PLATE AND ... 2'-0" C.F.F. BY OTHERS.
19. 100 A 208 V DISCONNECT.
20. 12 SERVICES, 120 V, 15 A, LOAD CENTER. PAAL...
21. 5400 CFM EXHAUST, 120 VAC, 20 A.

DOCUMENT CAPTURED AS RECEIVED

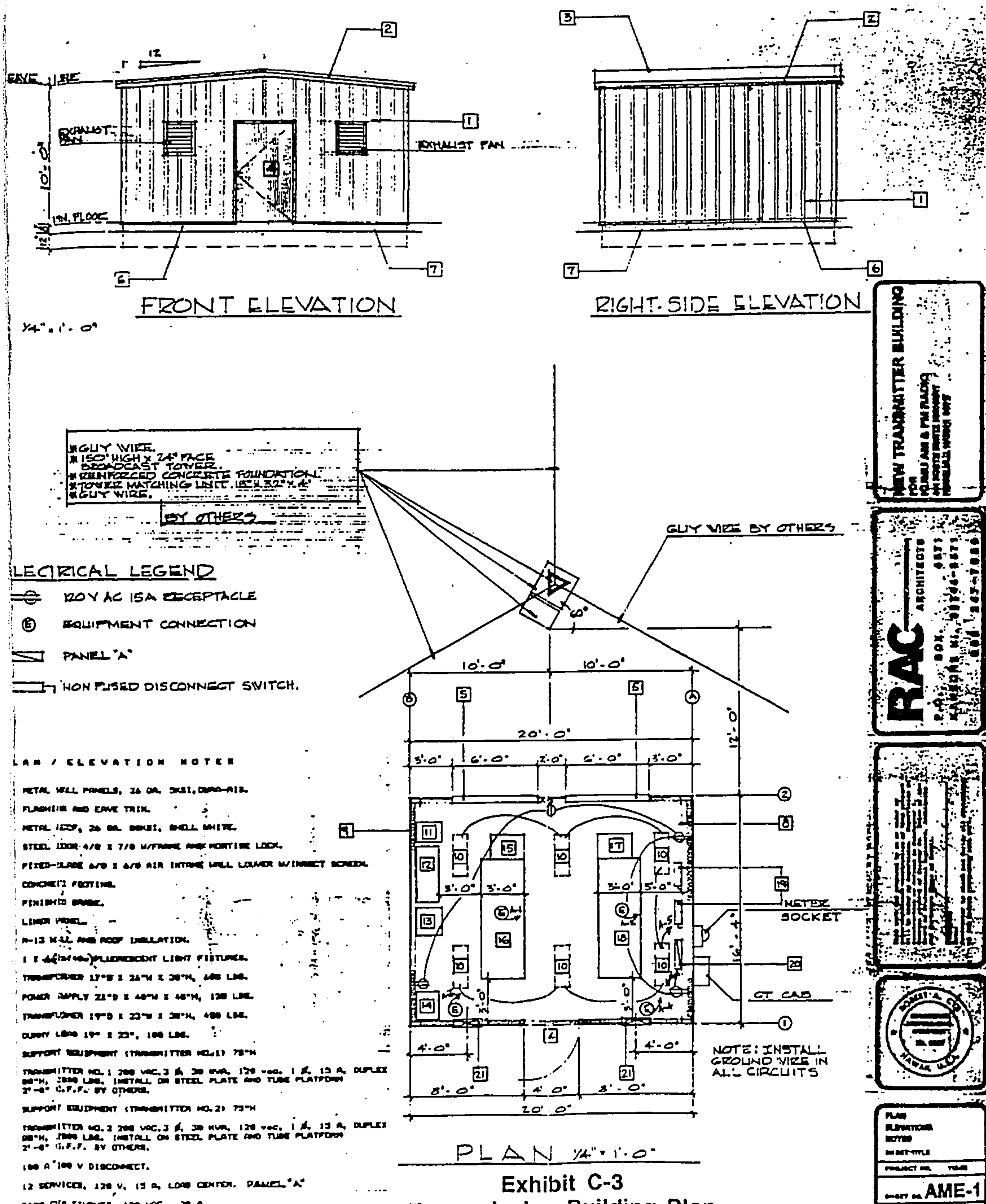


Exhibit C-3
Transmission Building Plan
And Elevation

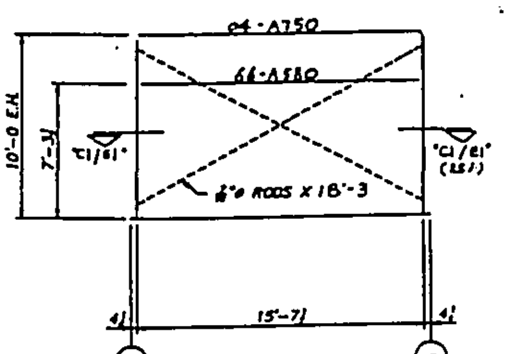
GENERAL NOTES

1) ROOF PANEL 26 GA. DURA-RIB — SHELL WHITE (53)
2) WALL PANEL 26 GA. DURA-RIB — SAND BEIGE (55)
3) LINER PANEL 26 GA. DURA-RIB — SHELL WHITE (53)
4) CORNER FLASH 26 GA. — SAND BEIGE (55)
5) BASE FLASH 26 GA. — SAND BEIGE (55)
6) ALL OTHER FLASH 26 GA. — SHELL WHITE (53)

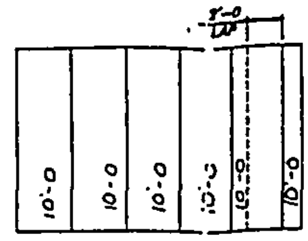
ACCESSORIES

(A) ONE - 4070 EMBOSSED BLANK SWING DOOR W/MORTISE LOCK W/INSULATION TRIM W/WEATHERSTRIP
(B) 2 - ENDWALLS INSULATION TRIM ANGLE
(C) 16 - LINEAL FEET OF 7'-3 LINER

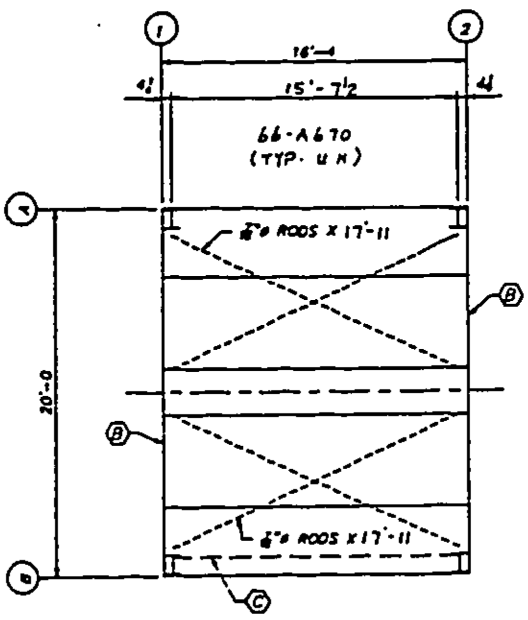
NOTE ANTI-ROLL CLIP 05-096 REQUIRED AT PEAK PURLIN AT EVERY COLUMN LINE.
RE: STANDARD DRAWING 17 11.00 DETAIL "B"



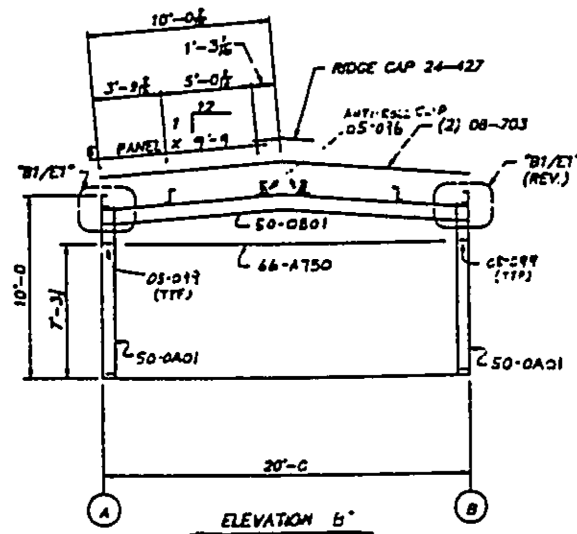
ELEVATION "A"



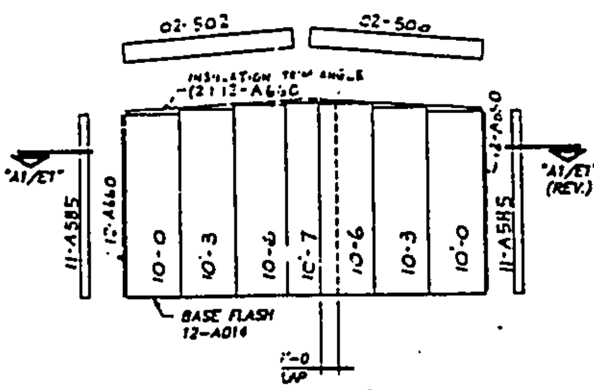
ELEVATION "A"



ROOF FRAMING PLAN



ELEVATION "B"



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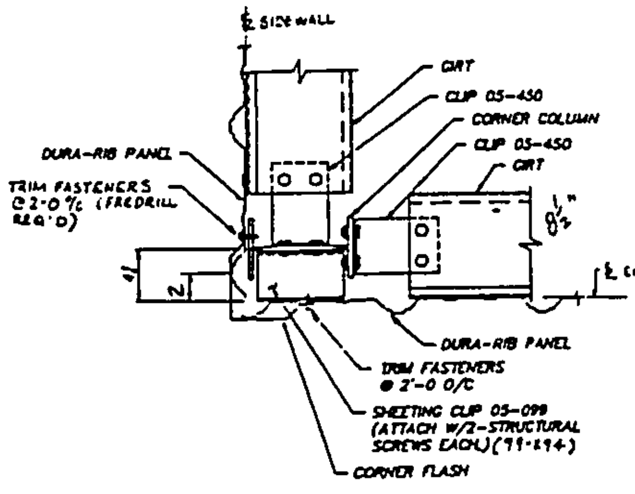
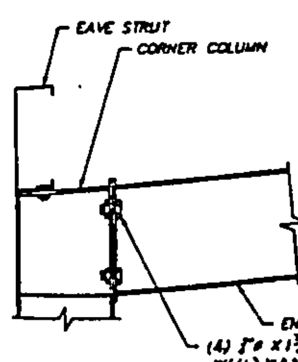


SECTION "A1/E1"



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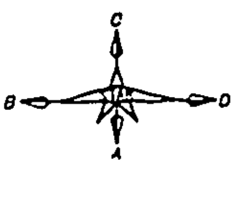

REVISIONS	BY	DATE	NOTES		DRN BY 6/4/93	DATE	ST
					CHK BY	DATE	

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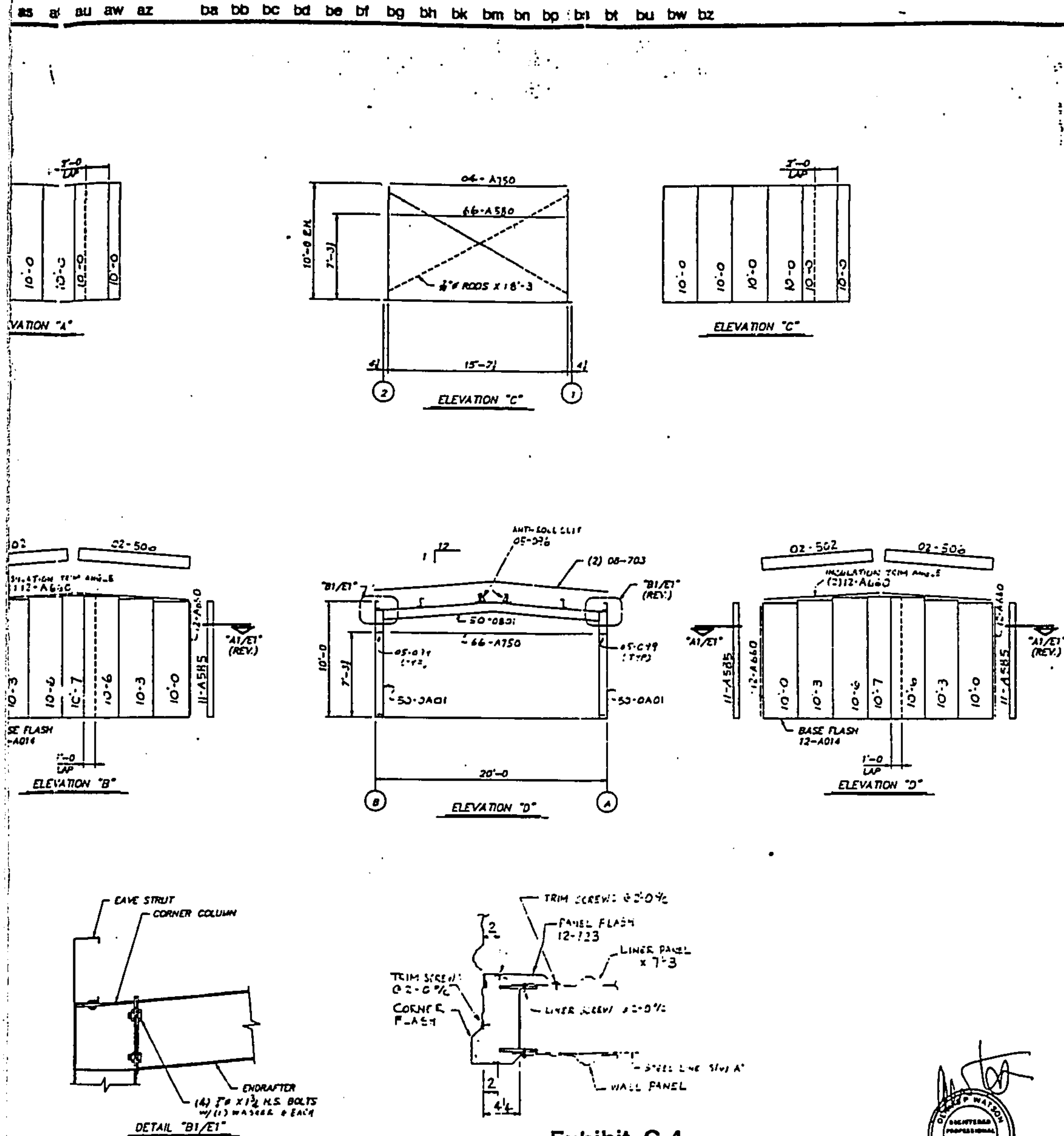

Exhibit C-4
Transmission Building Roof Framing Plan

DRN BY JB/LT 6/4/93	STAR BUILDING SYSTEMS a Robertson Ceco company	CAL PACIFIC STRUCTURES/HAWAII KUMU RADIO HONOLULU, HAWAII	93-0931
CHK BY			E1/L

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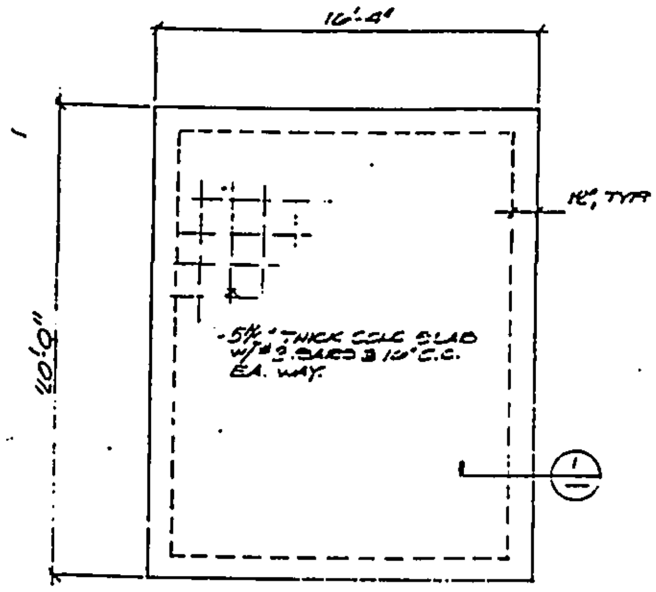
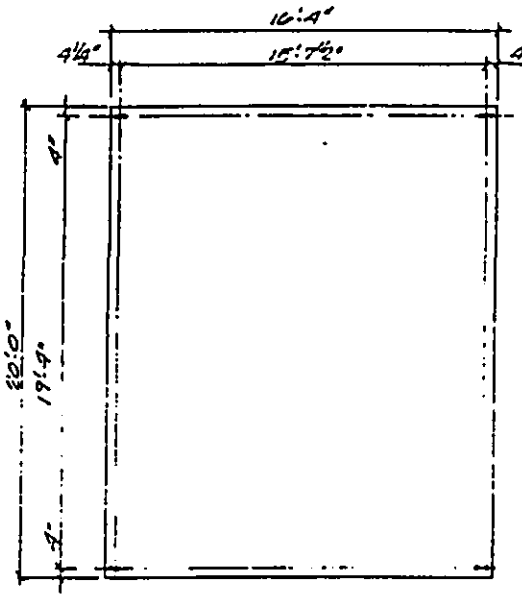
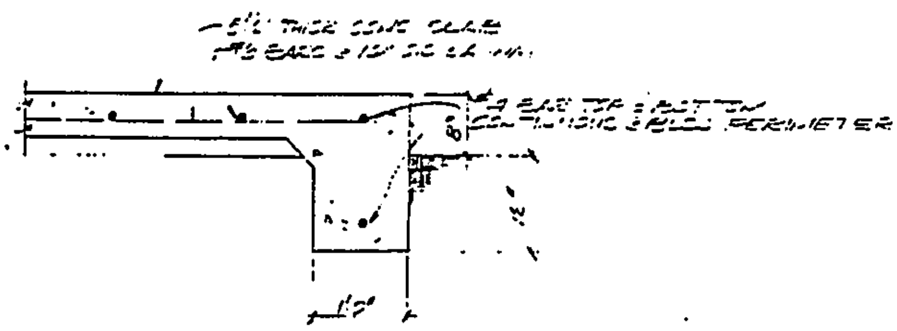


FOUNDATION PLAN 1/8"=1'-0"



ANCHOR BOLT SETTING PLAN 1/8"=1'-0"



PERIMETER FOOTING

DOCUMENT CAPTURED AS RECEIVED

1/4"

STRUCTURAL NOTES

GENERAL

1. All construction shall conform to the requirements of the Uniform Building Code 1985 Edition, and all other applicable codes and ordinances as adopted by the local authority, unless otherwise noted herein.
2. Dimensions shall not be scaled from drawings, written dimensions shall govern. Where written dimensions conflict with field conditions, or one another, such conflict shall be brought to the attention of the Engineer for clarification. Dimensions related to field conditions shall be verified in the field prior to commencement of construction.
3. The Engineer is not responsible for field conditions, location of property lines and/or easements, soil conditions, mechanical and/or electrical work, or the present or location of utilities not reported to him in writing by the owner.
4. Details of construction not shown or noted shall be considered of the same character as for similar conditions shown.

SOILS

1. Allowable soil bearing pressure is 100 psf at new foundations. All soils work shall be in conformance with the requirements of Chapter 29 of the UBC.
2. All footing excavations shall be dug as neat and as close to the footing dimensions as practicable. Over excavations in depth shall be filled with concrete. in width may be filled with concrete or backfill.
3. All foundations shall bear on firm undisturbed native soils or engineered fills at or exceeding the depths shown on the drawings.
4. Where backfill is placed against wall, the wall shall be adequately shored with the construction which braces the wall has been erected and has attained a design strength.

CONCRETE

1. All concrete work shall conform to the requirements of ACI 318-83, "Specifications for the Structural Concrete for Buildings."
2. Concrete for footings and slabs shall reach minimum 3,000 psi strength at 28 days using maximum 1 1/2" aggregate, minimum 5 1/2 sacks of cements, maximum 4" slump. NOTE: CONCRETE DESIGN BASED ON f'c =2,000 PSI (NO SPECIAL INSPECTION REQUIRED)
3. Lap reinforcing at splices minimum 40 bar dia. U.N.O. on plans.
4. Horizontal construction joints shall be cleaned and roughened by having the casting surface removed to expose aggregate solidly embedded.
5. All anchor bolts, inserts, or other hardware to be set in concrete shall be firmly set in place before placing concrete.
6. All reinforcing steel shall be clean and free of rust, and shall conform to ASTM A615 grade 40 for #5 bars and smaller, grade 60 for #6 bars and larger.

1/8" = 1'-0"

Current Design Date

Revisions

△
△
△
△
△

MORTON / PHILLIPS INC
Professional Engineers & Building
Code Consultants
Donald T. Morton SE1211
800 B Street
Santa Rosa, California
95401-5102
Telephone (707) 527-8500
Facsimile (707) 527-0338

Project

Title

SHEET DATA
Project
Date
Drawn
Engineer
Check

Exhibit C-5
Transmission Building
Foundation Plan

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[GE]NERAL NOTES

[1.] Verify and check all dimensions and details on the construction drawings for any discrepancy. Any discrepancy shall be brought to the attention of the engineer.

[2.] Work incidental to the contract and necessary to complete the project although not specifically referred to on the contract documents, shall be furnished and performed by the contractor.

[3.] In performing all work, the contractor shall exercise due care and caution necessary to avoid any damage to or an impairment in the use of any existing utility line. Any damage inflicted on existing utility lines resulting from the contractor's operations shall be immediately repaired or restored as directed by the engineer at the contractor's expense.

[4.] The contractor agrees that he shall assume sole and complete responsibility for the job site conditions during the course of construction of this project, including the safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the contractor shall defend, indemnify and hold the owner and engineer harmless from any and all liability, real or alleged, in connection with the performance or work on this project, excepting for liability arising from the sole negligence of the owner or the engineer.

[5.] Location of existing utility lines shown on plan and profile are approximate. Therefore, no assurance can be provided that the actual locations will be precisely as shown on the contract drawings. The contractor shall verify the location and depth of the facilities and exercise proper care in excavating in the area. Wherever connections of new utilities to existing utilities are shown on the plans, the contractor shall expose the existing lines at the proposed connections to verify their locations and depths prior to excavation of new lines.

[6.] Adequate provisions for traffic control shall be provided in accordance with "Rules and Regulations Governing the Traffic Control Devices at Work Sites on or Adjacent to Public Streets and Highways of the State of Hawaii" and with Federal Highway Administration "Manual on Uniform Traffic Control Devices for Streets and Highways" (1988).

[7.] Contractor shall make arrangements for utilities such as electricity, water, etc., required for his operations and all cost shall be borne by the contractor.

[8.] Written dimensions take precedence over scaled dimensions.

[9.] Permits shall be obtained by the contractor.

[10.] The contractor shall coordinate the storage of his material with the engineer.

[11.] The contractor shall observe and comply with all Federal, State, and local laws required for the protection of public health, safety, and environmental quality.

12. No construction equipment shall be parked within the road right-of-way in such a manner that the equipment will obstruct the normal movement and sight distance of the driving motorist, except during actual working hours.

[13.] Except during actual work hours, all signs which do not pertain to the construction activity, such as "Men Working" and "Flagman Ahead" shall be covered or laid down. However, all signs necessary for the safety of the public shall be maintained.

[14.] Any pavement markings, structures, and appurtenances damaged by the utilities line installation shall be repainted or reconstruction satisfactory to the Engineer.

15. The topographic features shown on this plan are based on information from State Department of Transportation (DOT) Right-of-Way maps and construction plans and are to be field verified.

[16.] The location of transmission tower and transmission building is approximate. The contractor will adjust location of tower and building during construction to fit field conditons.

17. Contractor shall repair landscaping damaged during construction. Existing trees shall be relocated by a landscaper to a location as directed by the engineer.

NOTES FOR CONSTRUCTION WITHIN STATE RIGHT-OF-WAY

1. The Contractor shall obtain a construction permit from the State's Highway District Engine[er] 727 Kakoi Street, Honolulu, Hawaii prior to commencement of work within State Highway r[ight-of-way]

2. Construction and restoration of all existing highway facilities within State right-of-way sha[ll be] done in accordance with all applicable sections of the current Standard Specifications for [Road and] Bridge Construction, and the Specification for Installation of Miscellaneous Improvements within State Highways, of the State Highways Division.

3. All lanes shall be opened to traffic during the morning peak hours from 6 a.m. to 8:30 [a.m. and] during the afternoon peak hours from 3:30 pm to 5:30 pm. and during off-work hours. [One lane] of traffic in each direction shall be maintained open at all times.

4. The contractor shall provide, install, and maintain all necessary signs, lights, flares, barric[ades,] markers, cones, and other protective facilities and shall take all necessary precautions for protection and for the convenience and safety of public traffic. All such protective facili[ties and] precautions to be taken shall conform with the "Administrative Rules of Hawaii Governing t[he Use of] Traffic Control Devices at Work Sites On or Adjacent to Public Streets and Highways" adop[ted by the] Director of Transportation, and the current U.S. Federal Highway Administration "Manual on [Uniform] Traffic Control Devices for Street and Highways, Part VI—Traffic Control for Highway Constru[ction] and Maintenance Operations". If lanes closures are required during construction, a traffic [control] plan shall be incorporated into the construction plans and must be approved by the Division [prior to] the issuance of the permit.

5. No material and/or equipment shall be stockpiled or otherwise stored within highway right-[of-way] except at locations designated in writing and approved by the District Engineer.

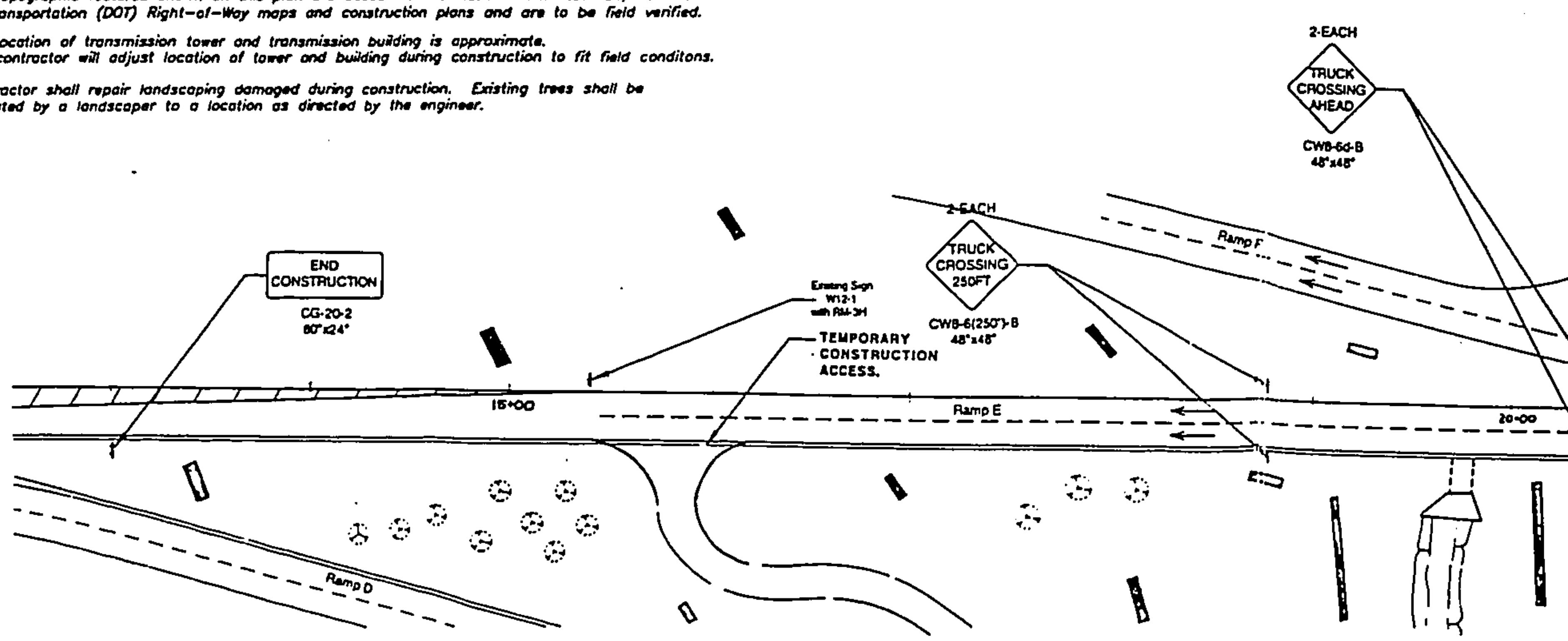
6. Longitudinal drainage along the highway shall be maintained.

7. Approval of permit construction plans shall be valid for a period of one year thereof from [the date] of notification of approval to the applicant. In the event construction does not commence [within the] one-year period, the applicant will be required to resubmit his construction plans for the [Division's] review and approval.

8. All regulatory, guide and construction signs and barricades shall be of high intensity reflect[ive] sheeting.

SOLID WASTE NOTES

1. If a County landfill is used, the contractor shall be responsible to provide all necessary lab[or,] equipment, materials and supplies to properly landfill his waste.



1 C-2 TRAFFIC CONTROL PLAN
SCALE 1"=40'

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GHT-OF-WAY

from the State's Highway District Engineer at
encement of work within State Highway right-of-way.

y facilities within State right-of-way shall be
the current Standard Specifications for Road and
allation of Miscellaneous Improvements
ion.

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3:30 pm. and during off-work hours. One lane
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shall take all necessary precautions for the
public traffic. All such protective facilities and
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ent to Public Streets and Highways" adopted by the
Federal Highway Administration "Manual on Uniform
Part VI-Traffic Control for Highway Construction
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alid for a period of one year thereof from the date
the event construction does not commence within this
o resubmit his construction plans for the Division's

barricades shall be of high intensity reflective

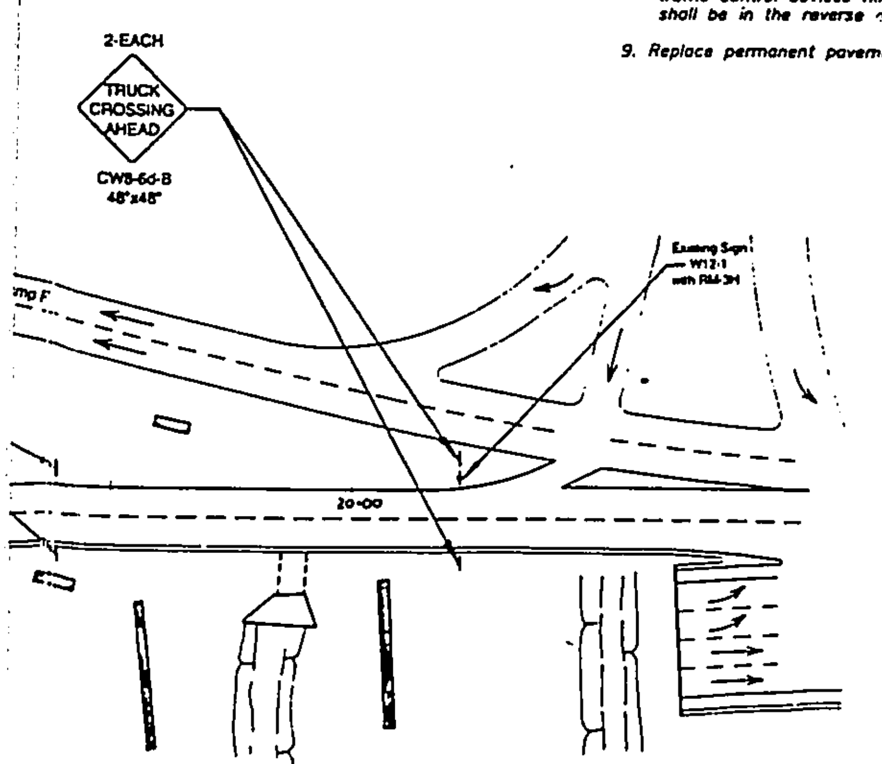
be responsible to provide all necessary labor,
ndfill his waste.

HECO AND HTCO NOTES

1. The Contractor shall exercise caution when excavation and construction crosses or is in close proximity of underground telephone and signal cable facilities and maintain adequate clearance for his equipment while working close to and/or under the overhead facilities. Any damage to the existing underground and overhead utilities shall be repaired and paid for by the Contractor.
2. Should it become necessary, any work required to relocate HECO facilities shall be done by HECO and paid for by the Contractor. The Contractor shall be responsible for all coordination.
3. The Contractor is to exercise extreme caution when the excavation and construction crosses or is in close proximity of HECO underground electrical facilities and maintain adequate clearance for his equipment while working close to and/or under HECO's overhead facilities.
4. Should field conditions and/or construction procedure require that poles be braced to facilitate construction, the contractor is to contact HECO district construction superintendent a minimum of 72 hours in advance for bracing instruction.
5. The existence and location of HECO overhead and underground facilities as shown on the plans are from existing records of varying degrees of accuracy and are not guaranteed as shown. Should relocation of HECO facilities be required, HECO is to be contacted four (4) weeks in advance. Any work required to relocate HECO facilities shall be done by HECO and paid for by the contractor. The contractor shall be responsible for all coordination.
6. The contractor is to comply with the directions of the State of Hawaii Occupational Safety and Health Law (DOSH).
7. The contractor shall report any damages to HECO's facilities to the HECO trouble dispatcher.

GENERAL NOTES FOR TRAFFIC CONTROL PLAN

1. The permittee shall make minor adjustments at intersections, driveways, bridges, structures, etc., to fit field conditions.
2. Traffic control devices shall be installed such that the sign or device farthest from the work area shall be placed first. The others shall then be placed progressively toward the work area.
3. Regulatory and warning signs within the construction zone that are in conflict with the Traffic Control Plans shall be removed or covered. All signs shall be restored upon completion of the work.
4. Flaggers and/or police officers shall be in sight of each other or in direct communication at all times.
5. All traffic lanes shall be a minimum of 10 feet wide.
6. All construction warning signs shall be promptly removed or covered whenever the message is not applicable or not in use.
7. The backs of all signs used for traffic control shall be appropriately covered to preclude the display of inapplicable sign messages (i.e., when signs have messages on both faces).
8. At the end of each work day or as soon as the work is completed, the permittee shall remove all traffic control devices no longer needed to permit free and safe passage of public traffic. Removal shall be in the reverse order of installation.
9. Replace permanent pavement markings and traffic signs upon completion of each phase of work.



ROL PLAN

Exhibit C-6
Traffic Control Plan

REV	NO.	DATE	BRIEF	BY	APP

150 FOOT TALL BY 24 INCH FACE
GUYED TRIANGULAR AM TOWER

KUMU-AM RADIO
411 NORTH NIMITZ HIGHWAY
HONOLULU, HAWAII 96817

PACIFIC PLANNING & ENGINEERING, INC.

CONRAD S. HIGASHIONNA
REGISTERED PROFESSIONAL ENGINEER
HAWAII U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

DSGN	DRWN	CHDK	APPD

C-2

NEW KUMU RADIO AM TOWER

du Treil, Lundin & Rackley, Inc.
A Subsidiary of A. D. Ring, P. C.

TECHNICAL EXHIBIT
MODIFICATION OF APPLICATION
FOR CONSTRUCTION PERMIT
JOHN HUTTON CORPORATION
RADIO STATION KUMU
HONOLULU, HAWAII.

October 20, 1992

1500 KHZ 10 KW U

TECHNICAL EXHIBIT
MODIFICATION OF APPLICATION
FOR CONSTRUCTION PERMIT
JOHN HUTTON CORPORATION
RADIO STATION KUMU
HONOLULU, HAWAII
1500 KHZ 10 KW U

Table of Contents

TECHNICAL EXHIBIT
MODIFICATION OF APPLICATION
FOR CONSTRUCTION PERMIT
JOHN HUTTON CORPORATION
HONOLULU, HAWAII
1500 KHZ 10 KW U

Technical Narrative

The technical exhibit of which this narrative is part was prepared on behalf of the John Hutton Corporation, licensee of AM broadcast station KUMU Honolulu, Hawaii. Station KUMU is licensed for operation on 1500 kHz with power of 10 kilowatts, unlimited time. The station was asked to vacate its transmitter site and due to the unavailability of other potential transmitter sites in or near Honolulu, proposed operation on the nearby island of Molokai. At that proposed location, operation would continue on 1500 kHz, but power would be increased to 50 KW, and a two element directional antenna installed in order to enhance the proposed coverage of Honolulu. Even with the higher power and directional antenna, a request for waiver of principal community coverage, 47CFR73.24(i), was needed. The pending application was assigned File No. BP-920605AF.

It was recently learned by the John Hutton Corporation that the City of Honolulu would make available a parcel of land near a traffic interchange. The site was studied for suitability and it was determined that operation from this site with power of 10 KW would provide better service to Honolulu and vicinity, than would the proposed higher power directional operation on Molokai. Due to the location of the site and the size of Honolulu, a waiver of the principal community coverage requirement is still required. In addition, the proposed signal level in excess of 10 mV/m at the FCC Waipahu monitoring station must be addressed. Communication with the Field Operations Bureau of the FCC will commence with filing of the application.

With the exceptions listed in the preceding paragraph, the application complies with the rules and regulations of the Federal Communications Commission.

Proposed Transmitter Location

The proposed transmitter site is located at the Keehi Interchange near the Kamehameha Highway and Kalihi Stream, in Honolulu County, Hawaii. The geographic coordinates for the site were scaled from a U.S.G.S. topographic quadrangle map entitled "HONOLULU, HAWAII". They are:

21° 20' 10" North Latitude

157° 53' 33" West Longitude.

A map showing the transmitter location is included herein as Figure 1. Photographs of the transmitter location are included as Figure 4.

There are five AM stations licensed to Honolulu located within 3 kilometers of the proposed site. Three of the stations, KNDI (1270 kHz), KCCN (1420 kHz) and KISA (1540 kHz) operate from the same tower located 1.9

kilometers on a bearing of 135.8 degrees true from proposed KUMU. The other two stations, KSSK (590 kHz) and KIKI (830 kHz) operate from a tower 2.2 kilometers on a bearing of 127.8 degrees true from proposed KUMU. Due to the difference in frequency and the physical separation, no interaction or pattern distortion problems are anticipated.

There is one FM broadcast stations located within 3 kilometers of proposed KUMU. Station KIKI-FM operates at a site 2.2 kilometers from KUMU collocated with KIKI (AM).

There are no TV stations within three miles of the proposed KUMU site.

No adverse reaction with any of these relatively close stations is anticipated.

Proposed Antenna System

The antenna system to be employed by KUMU will consist of a series fed vertical tower 46 meters in height. The overall height of the tower above ground will be 47 meters. Aeronautical lighting is not proposed. A sketch of the tower is shown on Figure 3.

The ground system will consist of 120 copper wire radials each 60.1 meters in length, except where terminated at property boundaries as indicated on Figure 2, a plat of the transmitter site. The antenna system is expected to produce 933 mV/m at one kilometer from the antenna with input power of 10 KW. This radiation value includes minor losses expected due to the restricted ground system.

Allocation Studies

As there are no AM stations on frequencies from 1470 kHz to 1530 kHz in Hawaii except for KUMU, there is no possibility of a daytime allocation problem.

A tabulation showing the permissible radiation during nighttime hours is shown in Figure 7. The actual radiation proposed by KUMU is substantially less than that permitted.

The nighttime interference free contour for KUMU is calculated to be 2.1 mV/m as shown on Sheet 3 of Figure 7.

The proposed KUMU operation will produce an estimated field strength of 18.2 mV/m at the FCC Monitoring Station at Waipahu. As this value exceeds the threshold value of 10 mV/m by a relatively small amount, the matter will be brought to the attention of the Field Operations Bureau of the FCC. It is possible that this increase in field strength as compared with the existing KUMU operations will not present a problem for the monitoring station.

Coverage Contours

Coverage contours are shown on Figure 5. The proposed 5 mV/m contour provides coverage to 77 percent of the city of Honolulu, only 3 percent below the acceptable value of 80 percent. As the availability of alternative transmitter sites is virtually non existent, waiver of this minor infraction is requested. Information employed in determining the location of contours is shown on Figure 6.

Environmental Considerations

The proposed KUMU operation was evaluated for potential exposure of the general public and workers to electromagnetic radiation in accordance with OST Bulletin No. 65, "Evaluating Compliance With FCC-Specified Guidelines for Human Exposure to Radiofrequency Radiation." Based on Table 1 of Appendix D, for a 10 KW operation, the minimum "worst-case" distance at which the electric and magnetic fields are predicted to fall below the ANSI standards is 7 meters. Consequently, the applicant proposed to install a fence at least 7 meters around the tower and to post appropriate warning signs. Should it be necessary for workers or other authorized personnel to enter the restricted area or climb the tower, the applicant verifies that the power will be reduced or the station taken off the air to insure no exposure to radiofrequency radiation in excess of the guidelines.

The proposal appears to be categorically excluded from environmental processing, as it meets all of the criteria for such an exclusion in 47CFR1.1306. The proposal does not involve construction at a site location specified under 47CFR1.1307(a)(1)-(7), is not expected to require tower lighting and the potential for human

RADIATION

exposure to radiofrequency radiation is predicted to be within the standards specified in 47CFR1.1307(b)

Louis R. du Treil

Louis R. du Treil

October 20, 1992

Office of Engineering and Technology

Spectrum Engineering Division

Federal Communications Commission

QUESTIONS AND ANSWERS ABOUT BIOLOGICAL EFFECTS AND POTENTIAL HAZARDS OF RADIOFREQUENCY RADIATION

OET BULLETIN NO. 56

Third Edition
January 1989

Federal Communications Commission
Office of Engineering & Technology
Washington, D.C. 20554

INTRODUCTION

The Federal Communications Commission (FCC) is responsible for licensing or authorizing many of the transmitting devices in the United States that use radiofrequency (RF) radiation to provide a variety of important telecommunications services. Because of its responsibilities in this regard the FCC often receives inquiries concerning potential health risks from exposure to the RF radiation emitted by these transmitters.

Recent years have witnessed increasing interest and concern on the part of the public with respect to this issue. The expanding use of RF technology has resulted in speculation concerning the alleged "electromagnetic pollution" of the environment and the potential dangers of exposure to non-ionizing radiation. This publication is designed to provide factual information to the public by answering some of the most commonly asked questions about this complex and often misunderstood topic.

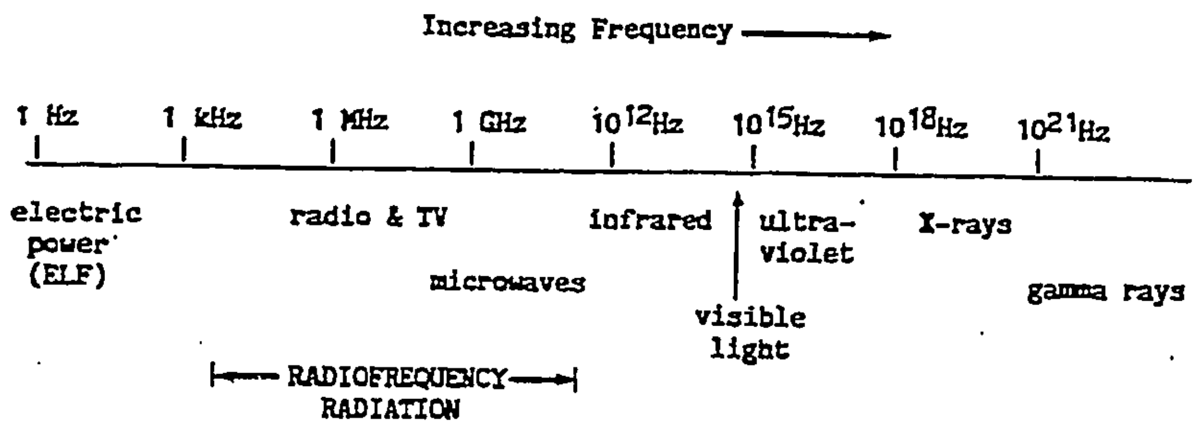
WHAT IS RADIOFREQUENCY RADIATION?

Radiofrequency (RF) radiation is one of several types of electromagnetic radiation. Electromagnetic radiation consists of waves of electric and magnetic energy moving together through space. These waves are generated by the movement of electrical charges. For example, the movement of charge in a transmitting radio antenna, i.e., the alternating current, creates electromagnetic waves that radiate away from the antenna and can be picked up by a receiving antenna.

Electromagnetic waves travel through space at the speed of light. Each electromagnetic wave has associated with it a wavelength and frequency which are inversely related by a simple mathematical formula: (frequency) times (wavelength) = the speed of light. Since the speed of light is a fixed number, electromagnetic waves with high frequencies have short wavelengths and waves with low frequencies have long wavelengths.

The electromagnetic "spectrum" includes all of the various forms of electromagnetic radiation ranging from extremely low frequency (ELF) radiation (with very long wavelengths) to X-rays and gamma rays which have very high frequencies and correspondingly short wavelengths. In between these extremes lie radio waves, microwaves, infrared radiation, visible light, and ultraviolet radiation. The RF part of the electromagnetic spectrum is generally defined as electromagnetic radiation with frequencies in the range from about 3 kilohertz to 300 gigahertz. One "hertz" equals one cycle per

second. A kilohertz (kHz) is one thousand hertz, a megahertz (MHz) is one million hertz, and a gigahertz is one billion hertz. The diagram below illustrates the electromagnetic spectrum and the approximate relationship between the various forms of electromagnetic radiation.



WHAT IS MICROWAVE RADIATION?

Microwave radiation is a high-frequency form of RF radiation. Microwave frequencies occupy the upper part of the RF electromagnetic spectrum, usually defined as the frequency range from about 300 MHz to 300 GHz. The most familiar use of microwave radiation is in household microwave ovens which rely on the principle that microwaves generate heat throughout an object rather than just at the surface. Therefore, microwave ovens can cook food more rapidly than conventional ovens. Other uses of microwaves are: the transmission of telephone and telegraph messages through low-power microwave relay antennas, military and civilian radar systems, the transmission of signals between ground stations and satellites, and the transmission of signals in certain broadcasting operations. Certain medical devices use microwave frequencies in therapeutic applications of RF radiation.

WHAT ARE TYPICAL USES OF RADIOFREQUENCY RADIATION?

Many uses have been developed for RF energy. Familiar applications involving telecommunications include AM and FM radio, television, citizens band (CB) radio, hand-held walkie-talkies, amateur radio, short-wave radio, cordless telephones, and microwave point-to-point and ground-to-satellite telecommunications links. Non-telecommunications applications include microwave ovens and radar, as mentioned above. Also important are devices that use RF energy in industrial heating and sealing operations. The latter devices generate RF radiation that rapidly heats the material being processed in the same way that a microwave oven cooks food. These RF heaters and sealers have many uses in industry, including molding plastic materials, gluing wood products, sealing items, such as shoes and pocketbooks, and processing food products. Medical applications of RF radiation include a technique called diathermy that takes advantage of RF energy's ability to heat tissue below the body's surface rapidly. The term "hyperthermia" is used in reference to therapeutic RF heating of cancerous tumors. RF energy is also used in the stimulation of bone healing.

WHAT IS NON-IONIZING RADIATION, AND HOW DOES IT DIFFER FROM IONIZING RADIATION?

The energy associated with electromagnetic radiation depends on its frequency (or wavelength); the greater the frequency (and shorter the wavelength), the higher the energy. Therefore, x-radiation and gamma radiation, which have extremely high frequencies, have relatively large amounts of energy; while, at the other end of the electromagnetic spectrum, ELF radiation is less energetic by many orders of magnitude. In between these extremes lie ultraviolet radiation, visible light, infrared radiation, and RF radiation (including microwaves), all differing in energy content.

Of the various forms of electromagnetic radiation, x-radiation and gamma radiation represent the greatest relative hazard because of their greater energy content and correspondingly greater potential for damage. In fact, X-rays and gamma rays are so energetic that they can cause ionization of atoms and molecules and thus are classified as "ionizing" radiation. Ionization is a process by which electrons are stripped from atoms and molecules, producing molecular changes that can lead to significant genetic damage in biological tissue. Less energetic forms of electromagnetic radiation, such as RF and microwave radiation, lack the ability to ionize atoms and molecules and are classified as "non-ionizing" radiation. It is important that the terms, "ionizing" and "non-ionizing," not be confused when referring to electromagnetic radiation, since their mechanisms of interaction with the human body are quite different. Biological effects of (non-ionizing) RF radiation are discussed in a later section.

HOW IS RADIOFREQUENCY RADIATION MEASURED?

Since radiofrequency radiation has both an electric and a magnetic component, it is often convenient to express intensity of a radiation field in terms of units specific to each component. The unit "volts per meter" (V/m) is used for the electric component, and the unit "amperes per meter" (A/m) is used for the magnetic component. We often speak of an electromagnetic "field," and these units are used to provide information about the levels of electric and magnetic "field strength" at a measurement location.

Another commonly used unit for characterizing an RF electromagnetic field is "power density." Power density is most accurately used when the point of measurement is far enough away from the RF emitter to be located in what is referred to as the "far field" zone of the radiation pattern. In closer proximity to the transmitter, i.e., in the "near field" zone, the physical relationships between the electric and magnetic components of the field can be complex, and it is best to use the field strength units discussed above. Power density is measured in terms of power per unit area, for example, milliwatts per square centimeter (mW/cm^2). When speaking of frequencies in the microwave range and higher, power density is usually used to express intensity since exposures that might occur would likely be in the far field zone. A detailed discussion of the physics of RF fields and their measurement can be found in Reference 1.

WHAT BIOLOGICAL EFFECTS CAN BE CAUSED BY RF RADIATION?

There is a relatively extensive body of published literature concerning the biological effects of RF radiation. The following discussion only provides highlights of current knowledge in this area. Detailed information on this topic can be found in References 2-14.

It has been known for some time that high intensities of RF radiation can be harmful due to the ability of RF energy to heat biological tissue rapidly. This is the principle by which microwave ovens cook food, and exposure to high RF power densities, i.e., on the order of 100 mW/cm^2 or more, can result in heating of the human body and an increase in body temperature. Tissue damage can result primarily because of the body's inability to cope with or dissipate the excessive heat. Under certain conditions, exposure to RF power densities of about 10 mW/cm^2 or more could result in measurable heating of biological tissue. The extent of heating would depend on several factors including frequency of the radiation; size, shape, and orientation of the exposed object; duration of exposure; environmental conditions; and efficiency of heat dissipation. Biological effects that result from heating of tissue by RF energy are often referred to as "thermal" effects.

Two areas of the body, the eyes and the testes, can be particularly susceptible to heating by RF energy because of the relative lack of available blood flow to dissipate the excessive heat load. Laboratory experiments have shown that short-term exposure to high levels of RF radiation (100-200 mW/cm^2) can cause cataracts in rabbits. Temporary sterility, caused by such effects as changes in sperm count and in sperm motility, is possible after exposure of the testes to high-level RF radiation.

It should be emphasized that environmental levels of RF radiation routinely encountered by the public are far below the levels necessary to produce significant heating and increased body temperature. In fact, the U.S. Environmental Protection Agency has estimated that 98-99% of the population in seven U.S. urban areas studied is exposed to less than 0.001 mW/cm^2 (Reference 15). However, there may be situations, particularly workplace environments, where RF safety standards are exceeded and people could be exposed to potentially harmful levels of RF radiation.

In addition to intensity, the electromagnetic frequency of RF radiation is important in determining the relative hazard. At a distance of several wavelengths from a source of RF radiation, whole-body absorption of RF energy by humans will occur at a maximum rate when the frequency of the radiation is between about 30 and 300 MHz. Because of this "resonance" phenomenon, RF safety standards take this frequency dependence into account. Therefore, as discussed in a later section, the most stringent standards are in this frequency range of maximum absorption.

At relatively low levels of exposure to RF radiation, i.e., field intensities lower than those that would produce significant and measurable heating, the evidence for production of harmful biological effects is less clear. A number of reports have appeared in the Russian and East European literature claiming a wide range of low-level biological effects. The low-level effects on animals and humans reported in the Soviet and East European literature have included behavioral modifications, effects on the blood-forming and immunological system, reproductive effects, changes in hormone levels, headaches, irritability, fatigue, and cardiovascular effects. However, further research is needed to confirm the existence of these effects and to determine whether they might constitute a health hazard, particularly with regard to long-term exposure.

In recent years some Western scientists have also reported biological effects after exposure of animals and animal tissue to relatively low levels of RF radiation. These effects, often referred to as "non-thermal" effects, have included changes in the immune system, neurological effects, behavioral effects, evidence for a link between microwave exposure and the action of certain drugs and compounds, and a "calcium efflux" effect in brain tissue (discussed below). Experimental results have also suggested that microwaves might be involved in cancer "promotion" under certain conditions. However, contradictory experimental results have also been reported in many of these cases, and further experiments are needed to determine the generality of these effects and whether they constitute a threat to human health. It is possible that "non-thermal" mechanisms exist that could cause harmful biological effects in animals and humans exposed to RF radiation. However, whether this is the case remains to be proven.

One of the "non-thermal" biological effects that appears to be reproducible is the "calcium efflux" effect. This effect can be described as the observation that the release of calcium ions from animal brain tissue is enhanced after exposure to certain low intensities of RF radiation under discrete conditions of frequency and signal modulation. This effect has been observed at RF levels well below those necessary to produce heating of tissue. The extent to which this effect might indicate a hazard is not presently known, and further research is needed to determine the relevance, if any, of this phenomenon to human health.

Another RF biological effect that has received attention is the so-called microwave "hearing" effect. Under certain specific conditions of frequency, signal modulation, and intensity, it has been shown that animals and humans can perceive an RF signal as a buzzing or clicking sound. Although a number of theories have been advanced to explain this effect, the most widely-accepted hypothesis is that the microwave signal produces thermoelastic pressure within the head that is perceived as sound by the auditory apparatus within the ear. It is important to emphasize that the conditions under which this effect occurs would not normally be encountered by members of the general public.

WHAT ARE SAFE LEVELS FOR EXPOSURE TO RADIOFREQUENCY/MICROWAVE RADIATION?

There is disagreement over exactly what levels of RF radiation are "safe," particularly with regard to low levels of exposure. In the Soviet Union and several Eastern European countries occupational and population exposure standards are generally more restrictive than existing or proposed standards in most Western countries. This discrepancy may be due, at least in part, to the likelihood that Russian and East European standards are based on levels where it is believed no biological effects of any sort would occur, rather than where recognized hazards exist. Western standards generally are based on levels where hazards are known to exist, and a safety factor is then incorporated to provide sufficient protection.

In the United States there is currently (early 1989) no official, mandatory federal standard for protection of the public or workers from potentially hazardous exposure to RF radiation. There is a performance standard established by the U.S. Food and Drug Administration for microwave ovens, but that standard is an emission standard (as opposed to an exposure standard) that only defines acceptable levels of RF energy that can be radiated from microwave ovens. Until recently the U.S. Environmental Protection Agency (EPA) was developing federal guidelines ("Federal Guidance") for exposure of the public to RF radiation. However, the EPA recently stated its intention to defer that activity indefinitely.

A federal RF radiation protection guide for workers was issued by the Occupational Safety and Health Administration (OSHA) in 1971 but it was later ruled to be advisory only. This protection guide was based on an earlier RF exposure standard recommended by the American National Standards Institute (ANSI), a non-government organization that develops recommended standards for a variety of applications. To date, OSHA has not updated its 1971 guideline, although its sister agency, the National Institute for Occupational Safety and Health (NIOSH), has been working on a recommended worker standard for RF exposure for several years. There is currently no indication that NIOSH will issue a recommendation in the near future.

In 1982, ANSI issued revised RF protection guidelines based on more recent data on the interaction of RF radiation with the human body. The ANSI protection guide is probably the most widely used and technically supportable exposure standard available today. As discussed in a later section of this bulletin. the FCC now uses the ANSI protection guides for purposes of evaluating environmental impact from the RF transmitters it regulates.

The 1982 ANSI guidelines recommend frequency-dependent exposure limits covering RF frequencies from 300 kHz to 100 GHz (Reference 16). The guidelines incorporate data showing that the human body absorbs RF energy at some frequencies more efficiently than at others. The most restrictive limits are in the frequency range of 30-300 MHz where maximum levels of 1 mW/cm^2, as averaged over any six minute period of exposure, are recommended.

The ANSI standard was developed over a period of several years by scientists and engineers with considerable experience and knowledge in the area of RF biological effects and related issues. The recommendations were based on a determination that the threshold for hazardous biological effects was approximately 4 watts per kilogram (4 W/kg) ["W/kg" is an expression for the rate of energy absorption in the body given in terms of the "specific absorption rate" or "SAR"]. A safety factor of ten was then incorporated to arrive at the final recommended protection guidelines. In other words, the protection guides can be correlated with an SAR threshold of about 0.4 W/kg.

The guidelines are intended to apply to non-occupational as well as to occupational exposures. However, ANSI states that because of "limitations in the biological effects data base" the guide indicates upper limits of safe exposure, particularly for the general public. It should be noted that ANSI is currently (early 1989) in the process of revising its 1982 standard in light of more recent data on biological effects. Therefore, a new ANSI recommendation may be forthcoming in the next one or two years that could be more restrictive with respect to some exposure situations. In particular, the new guidelines could differentiate between exposure of workers and exposure of the general public using an approach similar to that followed by other standard-setting organizations (see later discussion).

The 1982 ANSI guidelines are summarized in the following table. Note that recommended exposure levels are given in terms of the squares of the electric and magnetic field strengths as well as in terms of power density. For the lower frequencies listed, intensities are best expressed in terms of field strength values, and the indicated power density is essentially a "far field equivalent" power density. At higher frequencies, and when one is in the "far field" of a radiation source at any frequency, the actual power density is an appropriate unit to use. It is important to remember that the ANSI standard is a "time-averaged" standard, i.e., it is permissible to exceed the recommended limits for short periods of time as long as the average exposure (over 6 minutes) does not exceed the limits.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
1982 RADIOFREQUENCY PROTECTION GUIDE

Frequency Range (MHz)	Electric Field Strength E^2 (V^2/m^2)	Magnetic Field Strength H^2 (A^2/m^2)	Power Density (mW/cm^2)
0.3-3	400,000	2.5	100
3-30	4,000 ($900/f^2$)	0.025 ($900/f^2$)	$900/f^2$
30-300	4,000	0.025	1.0
300-1500	4,000 (f/300)	0.025 (f/300)	f/300
1500-100,000	20,000	0.125	5.0

NOTE: f = frequency in megahertz (MHz)
E^2 = electric field strength squared
H^2 = magnetic field strength squared
V^2/m^2 = volts squared per meter squared
A^2/m^2 = amperes squared per meter squared
mW/cm^2 = milliwatts per centimeter squared

The 1982 ANSI RF protection guide excludes radiating devices with input powers of seven watts or less that operate at frequencies between 300 kHz and 1000 MHz (1 GHz). The guidelines also state that the exposure limits may be exceeded if exposure conditions can be shown to produce specific absorption rates below 0.4 W/kg, as averaged over the whole body, or below 8 W/kg, as averaged over any one gram of tissue.

Other organizations besides ANSI have issued health and safety standards for RF radiation. The National Council on Radiation Protection and Measurements (NCRP) is a nonprofit corporation chartered by the U.S. Congress to develop information and recommendations concerning radiation protection, radiation measurements, and related issues. In 1986, the NCRP issued a report (Reference 11) that contained a review of the literature on biological effects of radiofrequency radiation as well as specific recommendations for exposure of workers and the general public.

The NCRP exposure guidelines differ from the 1982 ANSI protection guide in that separate exposure levels are recommended for workers and for the general public. The NCRP recommendations for worker exposure are essentially the same as the ANSI recommendations. However, NCRP recommended that the average exposure limits for the public be generally one-fifth that of the limits recommended for workers, although the averaging time specified for public exposure was 30 minutes rather than the 6-minute period for worker exposure. The NCRP noted that its two-tiered recommendation was more traditional and consistent with past NCRP practice in differentiating between occupational and public exposure by providing for a greater margin of safety for the general public.

Exposure guidelines have also been issued by the International Radiation Protection Association (IRPA) and by the American Council of Governmental Industrial Hygienists (ACGIH). The IRPA guidelines (Reference 17) are similar to the NCRP recommendations in that a greater degree of protection is recommended for the general public than for workers. The ACGIH guidelines (Reference 18) are basically a modified version of the 1982 ANSI guidelines and only apply to workers.

Largely because of the lack of guidelines from the Federal Government, some local and state jurisdictions have adopted, or have considered adopting, population and/or occupational standards for RF radiation. Local or state RF standards have been established or proposed in Oregon, Washington, Massachusetts, New York and New Jersey. Many of these standards are more restrictive than the 1982 ANSI standard for exposure of the general public.

HOW SAFE ARE MICROWAVE OVENS?

The Center for Devices and Radiological Health (CDRH), a part of the U.S. Food and Drug Administration, has regulated radiation from microwave ovens since 1971. CDRH has established a radiation performance standard for microwave ovens that allows leakage (measured at five centimeters from the oven surface) of 1 mW/cm^2 at the time of manufacture and a maximum level of 5 mW/cm^2 during the lifetime of the oven. The standard also requires ovens to have two independent interlock systems that prevent the oven from generating microwaves the moment that the latch is released or the door of the oven is opened. On the basis of current knowledge about microwave radiation, CDRH believes that ovens that meet its standards and are used according to the manufacturer's recommendations are safe for use.

IS IT SAFE TO USE AN ELECTRONIC CARDIAC PACEMAKER NEAR A RADIOFREQUENCY DEVICE SUCH AS A MICROWAVE OVEN?

In the past there may have been occasional problems due to signals from RF devices interfering with the proper operation of certain implanted electronic pacemakers. Because pacemakers are electronic devices, they can be susceptible to electromagnetic signals that could cause them to malfunction and thereby incorrectly regulate a user's heartbeat. However, it is doubtful that signals from a microwave oven would be strong enough to cause such interference.

This situation has now been largely remedied by the incorporation of electromagnetic shielding into the design of modern pacemakers. This shielding prevents undesirable RF signals from being picked up by the electronic circuitry in the pacemaker. The potential for the "leads" of pacemakers to pick up RF radiation has also been of some concern, but this does not appear to be a serious problem. Patients with pacemakers should consult their physician if they believe that they may have a problem related to RF interference. However, there should be no problem of electromagnetic interference from a properly maintained and operated microwave oven.

HOW SAFE IS THE RADIOFREQUENCY RADIATION EMITTED BY RADIO AND TELEVISION BROADCASTING ANTENNAS?

Radio and television broadcast stations transmit their signals via RF electromagnetic waves. These signals can be a significant source of RF energy in the environment since there are currently over 11,000 radio and TV stations on the air in the United States. Broadcast stations transmit at various RF frequencies, depending on the channel, ranging from about 550 kHz for AM radio up to about 800 MHz for some UHF television stations. Frequencies for FM radio and VHF television lie in between these two extremes.

Ground-level intensities of the RF electromagnetic fields resulting from broadcast transmissions depend on several factors, including the type of station, design characteristics of the antenna being used, power transmitted to the antenna, height of the antenna, and distance from the antenna. Calculations can be performed to predict what field intensity levels would exist at various distances from an antenna. Since energy at some frequencies is absorbed by the human body more readily than energy at other frequencies, the existence of a possible hazard would depend on the frequency of the transmitted signal as well as the intensity.

Public access to broadcasting antennas is normally restricted so that individuals cannot be exposed to high-level fields that might exist near an antenna. Measurements made by EPA and others (References 15 and 19) have shown that RF radiation levels in inhabited areas near broadcasting facilities are generally well below levels believed to be hazardous. There have been a few situations around the country where exposure levels have been found to be higher than those recommended by applicable safety standards (e.g., Reference 20). But such cases are relatively rare, and few members of the general public are likely to be routinely exposed to excessive levels of RF radiation from broadcast towers.

In unusual cases where exposure levels pose a problem, there are various steps a broadcast station can take to ensure compliance with safety standards. For example, high-intensity areas could be posted and access to them could be restricted by fencing or other appropriate means. In some cases more drastic measures might have to be considered, such as redesigning an antenna, reducing power, or station relocation.

Maintenance workers are occasionally required to climb antenna structures for such purposes as painting, repairs, or beacon replacement. Both the EPA and OSHA have reported that in these cases it is possible for a worker to be exposed to hazardous levels of RF radiation if work is performed on an active tower or in areas immediately surrounding a radiating antenna (References 21 and 22). Therefore, precautions should be taken to ensure that maintenance personnel are not exposed to hazardous field intensities. Such precautions could include temporarily lowering power levels while work is being performed, having work performed only when the station is not broadcasting, using auxiliary antennas while work is performed on the main antenna, and establishing work procedures that would specify the minimum distance that a worker should maintain from an energized antenna.

IS THERE ANY DANGER FROM POINT-TO-POINT MICROWAVE RELAY ANTENNAS? WHAT ABOUT DISH ANTENNAS USED FOR SATELLITE-EARTH COMMUNICATION?

Point-to-point microwave relay antennas transmit and receive microwave signals across relatively short distances. These antennas are usually rectangular or circular in shape and are normally found mounted at the top or midway up a supporting tower. These antennas have a variety of uses such as transmitting telephone and telegraph messages and serving as links between broadcast or cable-TV studios and their broadcast antennas.

The microwave signals from these antennas travel in a directed beam from a transmitting antenna to a receiving antenna, and dispersion of microwave energy outside of the relatively narrow beam is minimal or insignificant. In addition, these antennas transmit using very low power levels, usually on the order of a few watts or less. Such levels are much lower than power levels used, for example, by broadcast stations. Measurements have shown that ground-level power densities due to microwave directional antennas are normally a thousand times or more below recommended safety limits. In fact, an individual would likely have to stand directly in front of such an antenna for a significant period of time in order to be exposed to microwave levels that might be considered harmful. In addition, as an added margin of safety, microwave tower sites are normally made inaccessible to the general public.

Satellite-earth stations consist of parabolic "dish" antennas, some as large as 10 to 30 meters in diameter, that are used to transmit or receive microwave signals via satellites in orbit around the earth. The satellites receive the signals beamed up to them and, in turn, retransmit the signals back down to an earthbound receiving station. These signals allow a variety of communications services to be performed, including long distance telephone service.

Since earth-station antennas are directed toward satellites above the earth, the transmitted beams point skyward at various angles of inclination, depending on the particular satellite being used. Because of the longer distances involved, power levels used to transmit these signals are relatively great when compared to those used for the microwave point-to-point relay links discussed above. However, as with the microwave relay links, the beams used for transmitting earth-to-satellite signals are relatively narrow and highly directional. In addition, public access to a station site would normally be restricted. For these reasons it would be unlikely that a transmitting earth-station antenna could expose members of the public to hazardous levels of microwaves. Some earth station antennas are used only to receive RF signals. Since these antennas do not transmit any signals, there would, of course, be no danger of exposure from them.

WHAT ABOUT PORTABLE RADIO TRANSMITTERS? IS THERE ANY RISK FROM EXPOSURE TO RF RADIATION FROM HAND-HELD WALKIE-TALKIES, CELLULAR TELEPHONES, VEHICLE-MOUNTED ANTENNAS, OR CORDLESS TELEPHONES?

"Land-mobile" communication refers to a variety of communications systems which involve the use of portable RF transmitters. Police radio, business radio, and cellular radio are a few examples of these communications systems. They have the advantage of providing communications links between various fixed and mobile locations. Cordless telephones are consumer products that also make mobility possible in communication, although over shorter distances.

There are basically three types of RF transmitters associated with land-mobile systems: base-station transmitters, vehicle-mounted transmitters, and hand-held transmitters. The antennas used for these various transmitters are adapted for their specific purpose. For example, a base-station transmitter must transmit to a relatively large area, and, therefore, its antenna would generally be more powerful than a vehicle-mounted or hand-held radio transmitter.

Although base-station antennas usually operate with higher power levels than the other types of land-mobile antennas, their powers are still quite a bit lower than high-powered transmitters such as most radio and television broadcast stations. Land-mobile base-station antennas are normally inaccessible to the public since they must be mounted at significant heights above ground to provide for adequate signal coverage. Also, many of these antennas transmit only intermittently. For these reasons, base-station antennas have generally not been of concern with regard to possible hazardous exposure to RF radiation.

Transmitting power levels for vehicle-mounted antennas are generally less than those used by base-station antennas but higher than those used for hand-held units. At least one manufacturer recommends that users and other nearby individuals maintain a distance of a few feet from a vehicle-mounted antenna during transmission. However, studies have shown that this is probably a conservative precaution, particularly when the "duty factor" (percentage of time the antenna is actually transmitting) is taken into account since safety standards are "time-averaged." The extent of any possible exposure would also depend on the actual power level and frequency used by the vehicle-mounted antenna. In general, there is no evidence that there is any safety hazard associated with RF exposure from vehicle-mounted antennas.

Hand-held portable radios such as walkie-talkies and cellular radios are generally low-powered devices used to transmit and receive messages over relatively short distances. Because of the low power levels used (usually only a few watts or less) these radios would normally not be considered as possible sources of hazardous exposure to RF fields. However, questions relating to the safety of these devices have arisen because the RF signal is emitted in the immediate vicinity of the user's head and some of these radios use microwave frequencies.

At least one manufacturer has conducted extensive tests of hand-held radios operating at various frequencies in order to determine the amount of RF energy that might be absorbed in the head of an individual using one of these devices. The only potential hazard found could occur in the unlikely event that the antenna tip was placed directly at the surface of the eye. Other studies (e.g., Reference 23) have concluded that during routine use of hand-held radios exposures would normally be in compliance with accepted safety guidelines. Significant absorption might occur if the transmitting antenna of the radio were placed within a distance of about 1-2 centimeters (less than an inch) from the head or eye. However, this would be a very unlikely user position, and even if it occurred the overall time-averaged exposure would probably be acceptable. Therefore, if hand-held radios are used properly there is no evidence that they could cause hazardous absorption of RF energy.

Cordless telephones are consumer products that use RF energy to communicate with a telephone "base" unit. These devices operate at very low power levels, and there is no evidence that users experience any significant RF exposure.

WHICH FEDERAL AGENCIES HAVE RESPONSIBILITIES RELATED TO HEALTH EFFECTS OF RADIOFREQUENCY RADIATION?

Several agencies in the Federal Government have been involved to various degrees in investigating or controlling human exposure to RF radiation. By authority of the Radiation Control for Health and Safety Act of 1968, the Center for Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration (FDA) develops performance standards for the emission of radiation from electronic products including X-ray equipment and other medical devices, television sets, microwave ovens, and sunlamps. As discussed previously, CDRH has established a radiation safety standard for microwave ovens that limits the amount of radiation that an oven can leak throughout its lifetime. However, leakage standards have not been issued for other RF-emitting devices.

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor is responsible for protecting workers from exposure to hazardous chemical and physical agents. In 1971, OSHA issued a protection guide for exposure of workers to RF radiation [29 CFR 1910.97]. The guide, covering the frequency range between 10 MHz and 100 GHz, stated that exposure of workers should not exceed a power density of ten milliwatts per square centimeter (10 mW/cm^2) as averaged over any 6-minute period of the workday. However, this guide was later ruled to be only advisory and not mandatory. Moreover, it was based on an earlier (1966) American National Standards Institute (ANSI) RF protection guide that has been superseded by revised versions in 1974 and 1982 (see previous discussion of standards).

The National Institute for Occupational Safety and Health (NIOSH) of the U.S. Department of Health and Human Services has for some years been considering issuing a recommendation for occupational exposure to RF radiation that would be transmitted to OSHA for consideration in establishing an exposure standard for workers. However, at the present time (early 1989) there is no indication from NIOSH as to when such an official recommendation might be forthcoming.

There is currently no official federal standard for exposure of the general public to RF radiation. It is generally agreed that federal responsibility for developing national guidelines for public exposure to non-ionizing radiation rests with the U.S Environmental Protection Agency (EPA). Until recently, EPA was developing "Federal Guidance" for RF radiation that would have recommended safe levels of exposure for the public. If approved, such a recommendation would have been transmitted to other federal agencies for implementation. However, as noted previously, EPA has apparently decided to abandon that effort and to "defer" indefinitely its program dealing with non-ionizing electromagnetic radiation due to budgetary constraints and a lack of resources. At press time it was unclear whether that decision might be reversed.

WHAT IS THE ROLE OF THE FCC IN EVALUATING POTENTIAL RADIOFREQUENCY HAZARDS?

The FCC licenses and approves equipment and facilities that generate RF and microwave radiation. Although the FCC would not knowingly authorize a facility or device that resulted in a health hazard, the FCC's primary jurisdiction does not lie in the health and safety area. Therefore, the FCC must rely on other agencies and organizations for guidance in these matters.

The issue of potential hazards due to RF radiation emitted by FCC-regulated facilities was first addressed by the Commission in a 1979 Notice of Inquiry. Subsequently, several other items related to RF radiation hazards have been approved by the Commission. The FCC's basic policy was outlined in a 1985 Report and Order [50 Fed. Register 11151, 1985].

As an agency of the Federal Government, the FCC has certain responsibilities under the National Environmental Policy Act of 1969 (NEPA) to consider whether its actions will "significantly affect the quality of the human environment." Therefore, FCC approval and licensing of facilities and operations must be evaluated for significant impact on the environment. The 1985 FCC Order made clear that human exposure to RF radiation emitted by FCC-regulated entities is one of several factors that must be considered in such environmental evaluations.

In making the determination that environmental RF radiation would be evaluated, the Commission decided to specify the 1982 ANSI RF radiation protection guides (see earlier discussion of standards) for use in determining safe levels of exposure for the public and for workers. It was decided that, in view of the lack of an official standard issued by a federal agency such as EPA, the FCC must use what it considered to be the best available standard at the time. The 1982 (non-government) ANSI standard was chosen because it was considered to be widely accepted and technically supportable.

Because of the 1985 FCC Order and subsequent adopted items, major RF transmitting facilities under the jurisdiction of the FCC, such as radio and television broadcast stations, satellite-earth stations, and experimental radio stations, are subject to environmental evaluation for compliance with the identified RF health and safety guidelines. Failure to comply with these guidelines could lead to preparation of a formal Environmental Impact Statement and possible rejection of an application for a transmitting facility. Facilities and operations that operate with lower power levels or are judged to offer insignificant environmental risk from RF radiation have been categorically exempted from these requirements.

The FCC's rules on evaluation of environmental RF radiation are found in Section 1.1307(b) of the FCC's Rules and Regulations [47 CFR 1.1307(b)]. Guidelines for compliance with the FCC's rules can be found in an FCC technical bulletin (OST Bulletin No. 65, Reference 24). Subsequent FCC items adopted since the first Order have dealt primarily with which RF sources are subject to the RF environmental rule and which are excluded [52 Federal Register 13240, 1987; 52 Federal Register 49032, 1987; 53 Federal Register 28223, 1988; 53 Federal Register 40918, 1988].

WHERE CAN FURTHER INFORMATION BE OBTAINED REGARDING RADIOFREQUENCY RADIATION AND RELATED MATTERS?

Within the Federal Government the number of individuals assigned to this area is relatively small, and some agencies are reducing or eliminating personnel in this field. Nevertheless, it is usually possible to obtain at least some basic information concerning RF transmitters or problems. The following federal agencies should be able to provide some information and assistance in this area.

FDA: Questions about radiation from microwave ovens and other consumer and industrial products can be directed to: Center for Devices and Radiological Health (CDRH), Food and Drug Administration, Rockville, MD 20857.

EPA: The Environmental Protection Agency's Office of Radiation Programs (401 M. St., S.W., Washington, D.C. 20460 or P.O. Box 98517, Las Vegas, Nevada 89193-8517) studies exposure of the public to RF radiation. However, at the present time (early 1989) EPA has apparently decided to phase out the Washington office that deals with RF exposure and to limit future EPA activities in this area to its Las Vegas office.

OSHA/NIOSH: The Occupational Safety and Health Administration's (OSHA) Health Response Team (390 Wakara Way, P.O. Box 8137, Salt Lake City, Utah 84108) has been involved in studies related to occupational exposure to RF radiation in the past. However, OSHA has limited involvement in this area at the present time. The National Institute for Occupational Safety and Health (NIOSH) maintains a limited program for studying exposure of workers to non-ionizing radiation. The address is: NIOSH, Physical Agents Branch, 4676 Columbia Parkway, Cincinnati, Ohio 45226.

FCC: The FCC maintains a limited program in this area. Questions regarding potential RF hazards from FCC-regulated transmitters can be directed to the Spectrum Engineering Division, Office of Engineering and Technology, FCC, Washington, D.C. 20554.

In addition to federal agencies, there are other sources of information and possible assistance regarding environmental RF energy. A few states maintain non-ionizing radiation programs or, at least, some expertise in this field. These state activities are usually part of a department of public health or environmental control. Also, the list of references at the end of this bulletin should be consulted for detailed information on specific topics related to RF exposure.

A non-government source of information on RF energy is the Electromagnetic Energy Policy Alliance (EEPA), an organization that provides educational and other services in this field. EEPA is an association of manufacturers and users of electronic and electrical systems. The group's self-described purpose is "to work for a responsible and rational public policy regarding electromagnetic energy." EEPA's address is: 1255 23rd St., N.W., Washington, D.C. 20037.

REFERENCES

[Reports with NTIS Order Numbers are U.S. Government publications and can be ordered for a fee from the National Technical Information Service, U.S. Department of Commerce, (800) 336-4700]

(1) "Radiofrequency Electromagnetic Fields; Properties, Quantities and Units, Biophysical Interaction, and Measurements," NCRP Report No. 67, 1981. National Council on Radiation Protection and Measurements. Purchasing information: NCRP Publications, 7910 Woodmont Ave., Suite 1016, Bethesda, MD 20814; (301) 657-2652.


Site Coordintes:
21° 20' 10" N
157° 53' 33" W
1000 mV/m
157° 54' 00"
157° 51' 30"
21° 20' 00"
2363000m N
20'
PEARL CITY 5.8 MI.
AIEA 3 MI.
WAHIAWA 16 MI.
PEARL HARBOR 3.2 MI.
Kalihi Kai
Kamehameha Heights
KAPALAMA MILITARY RESERVATION
LAGOON
Moanalua Gardens
Kalihi
OCTOBER

HONOLULU, HAWAII
N2115—W15746.5/7.5

1983

SCALE 1:24000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

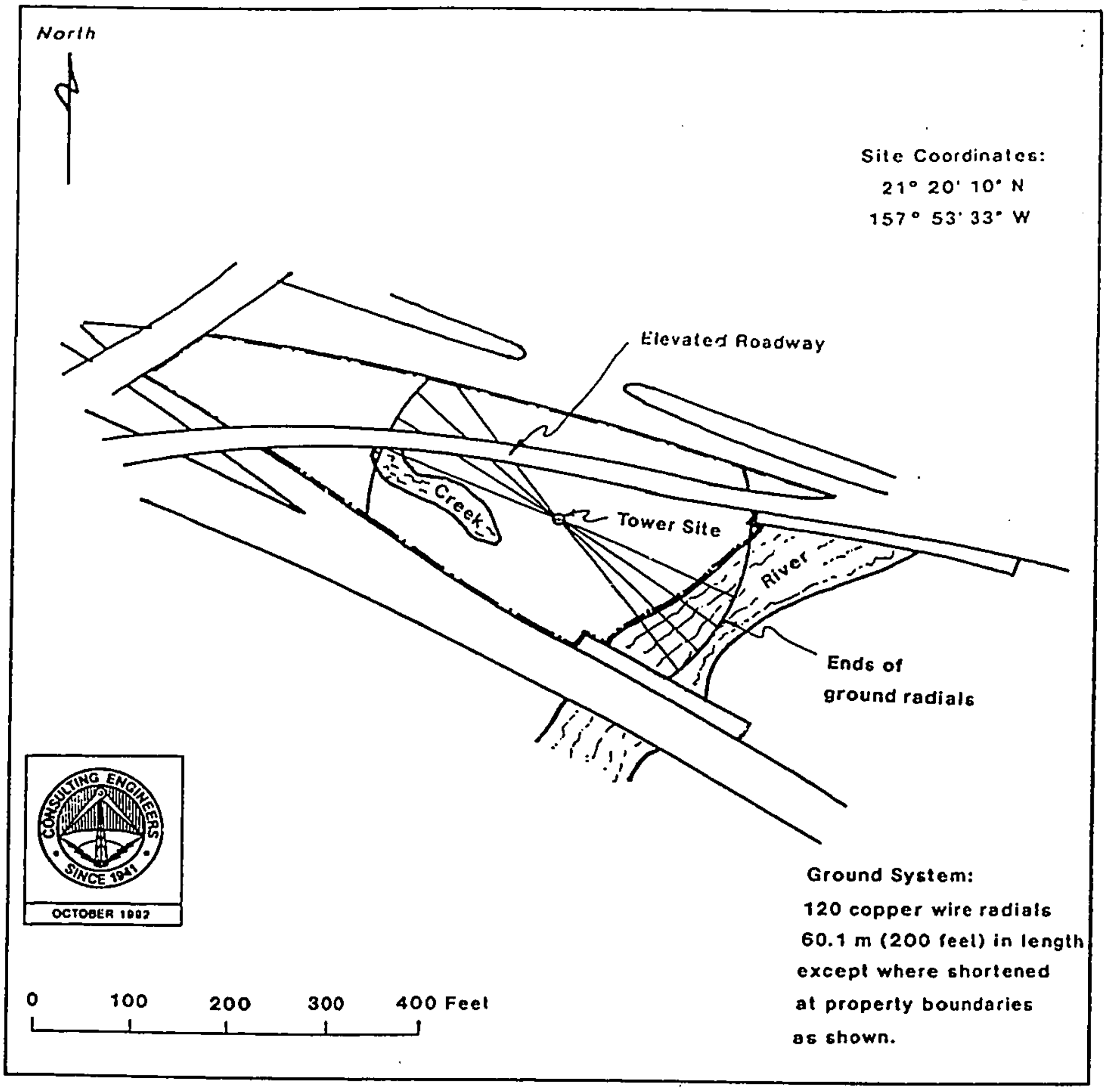
CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

PROPOSED TRANSMITTER LOCATION AND 1000 MV/M CONTOUR

JOHN HUTTON CORPORATION
RADIO STATION KUMU
HONOLULU, HAWAII
1500 KHZ 10 KW U

duTreil, Lundin & Rackley, Inc. Washington, D.C.

Figure 2

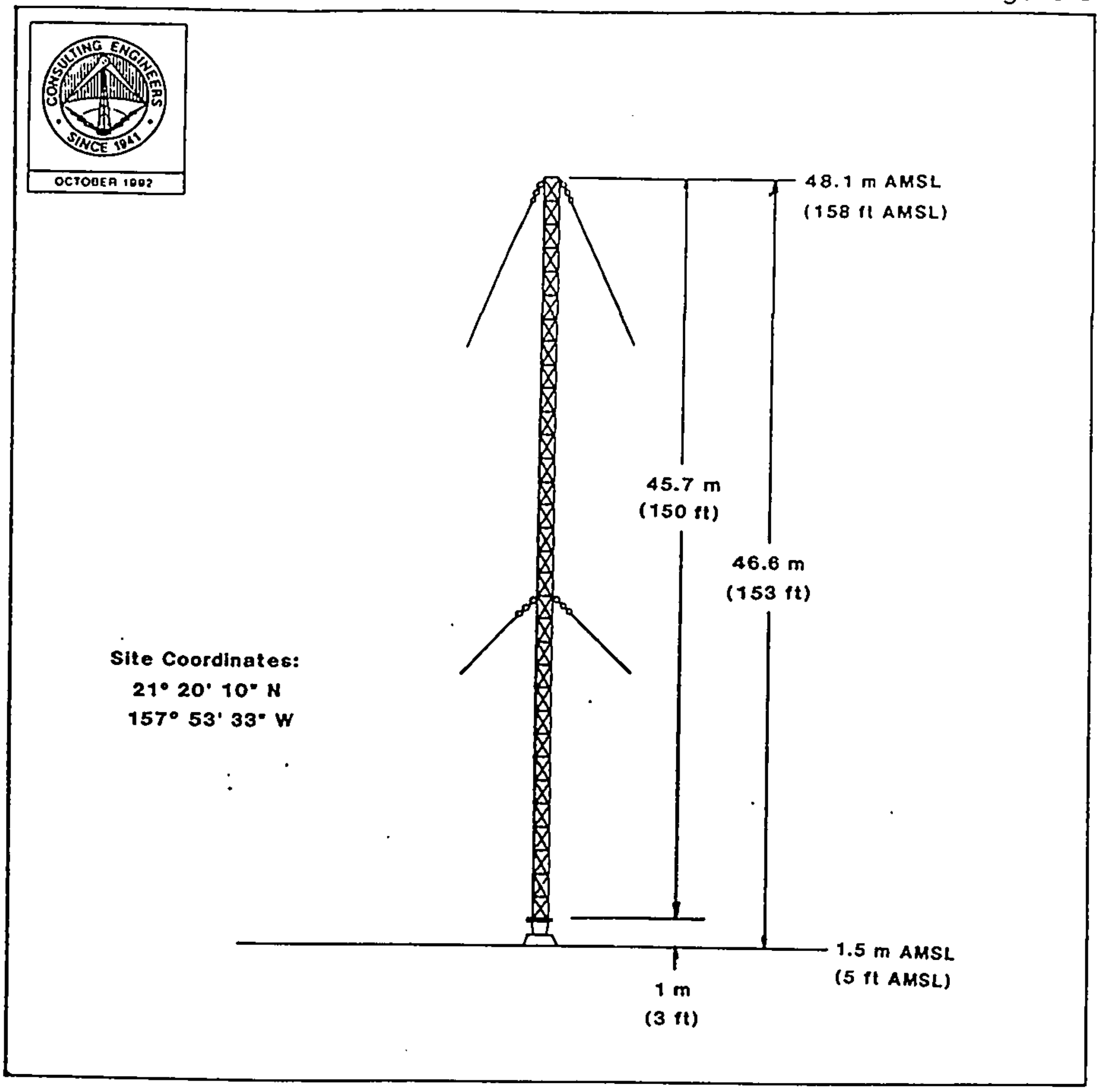


PLAT OF TRANSMITTER SITE

JOHN HUTTON CORPORATION
RADIO STATION KUMU
HONOLULU, HAWAII
1500 KHZ 10 KW U

duTreil, Lundin & Rackley, Inc. Washington, D.C.

Figure 3



PROPOSED ANTENNA AND SUPPORTING STRUCTURE

JOHN HUTTON CORPORATION

RADIO STATION KUMU

HONOLULU, HAWAII

1500 KHZ 10 KW U

duTreil, Lundin & Rackley, Inc. Washington, D.C.

Figure 4

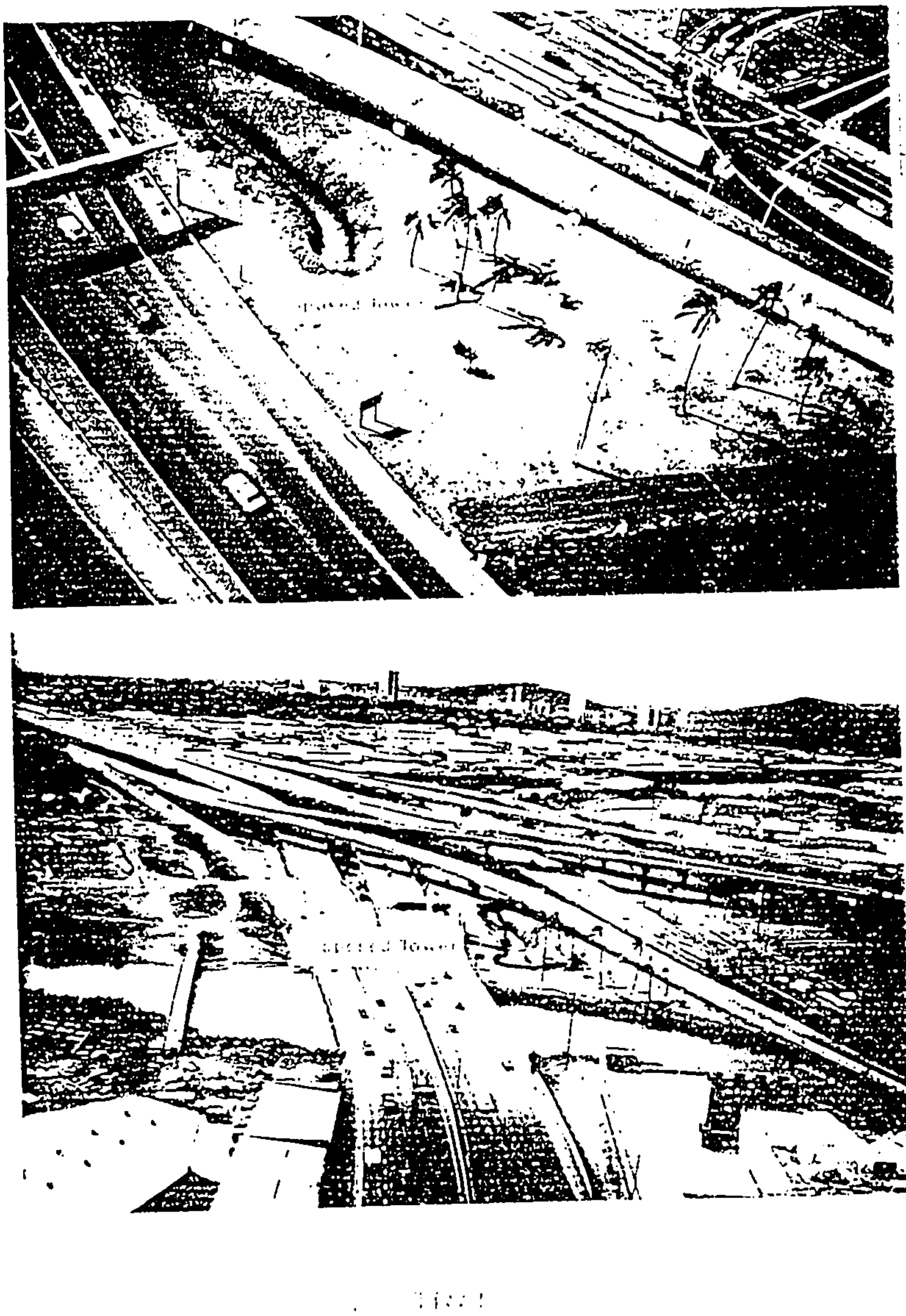
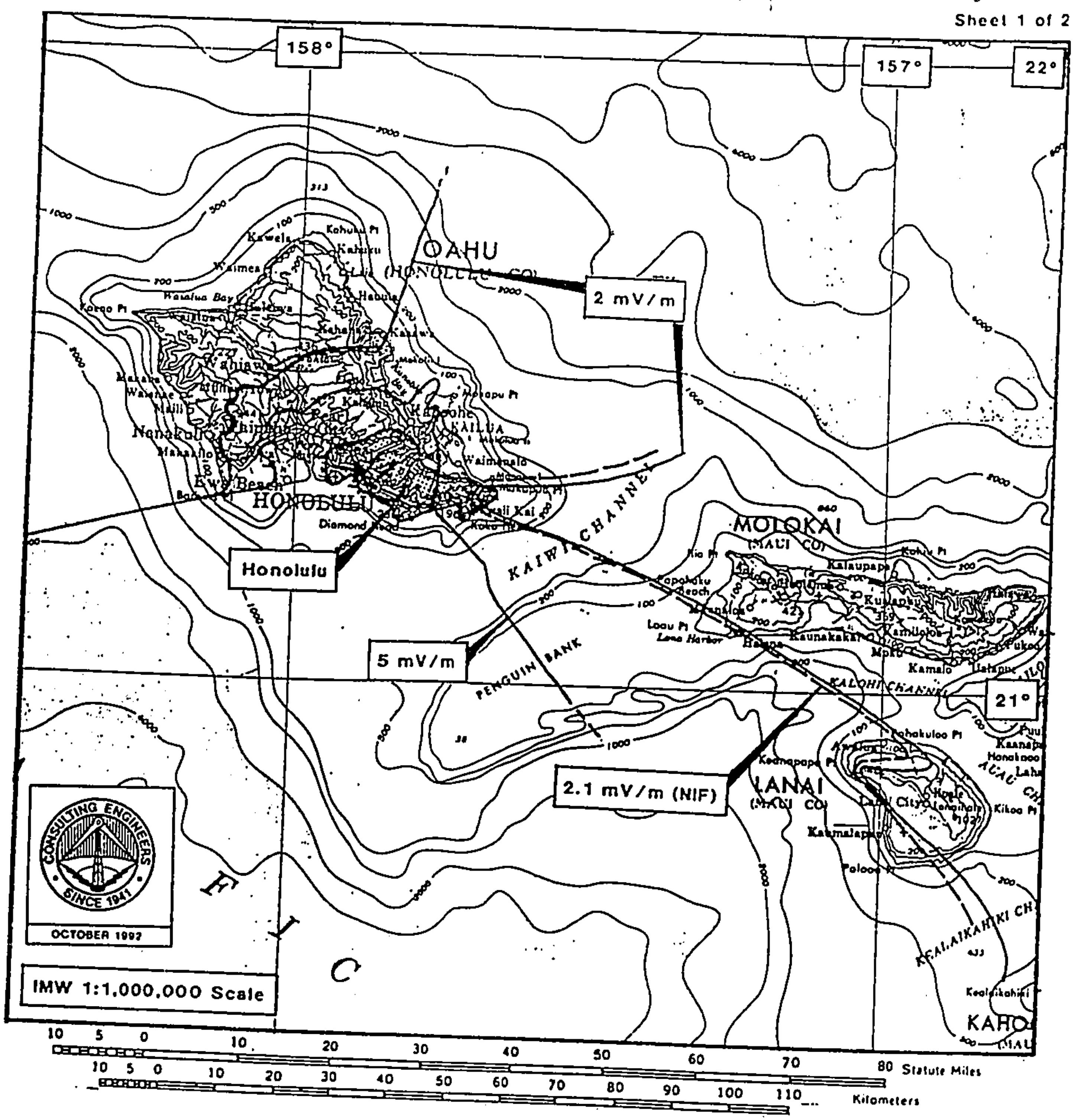


Figure 5
Sheet 1 of 2



PROPOSED FIELD STRENGTH CONTOURS

JOHN HUTTON CORPORATION
RADIO STATION KUMU
HONOLULU, HAWAII
1500 KHZ 10 KW U

duTreil, Lundin & Rackley, Inc. Washington, D.C.

Figure 5
Sheet 2 of 2

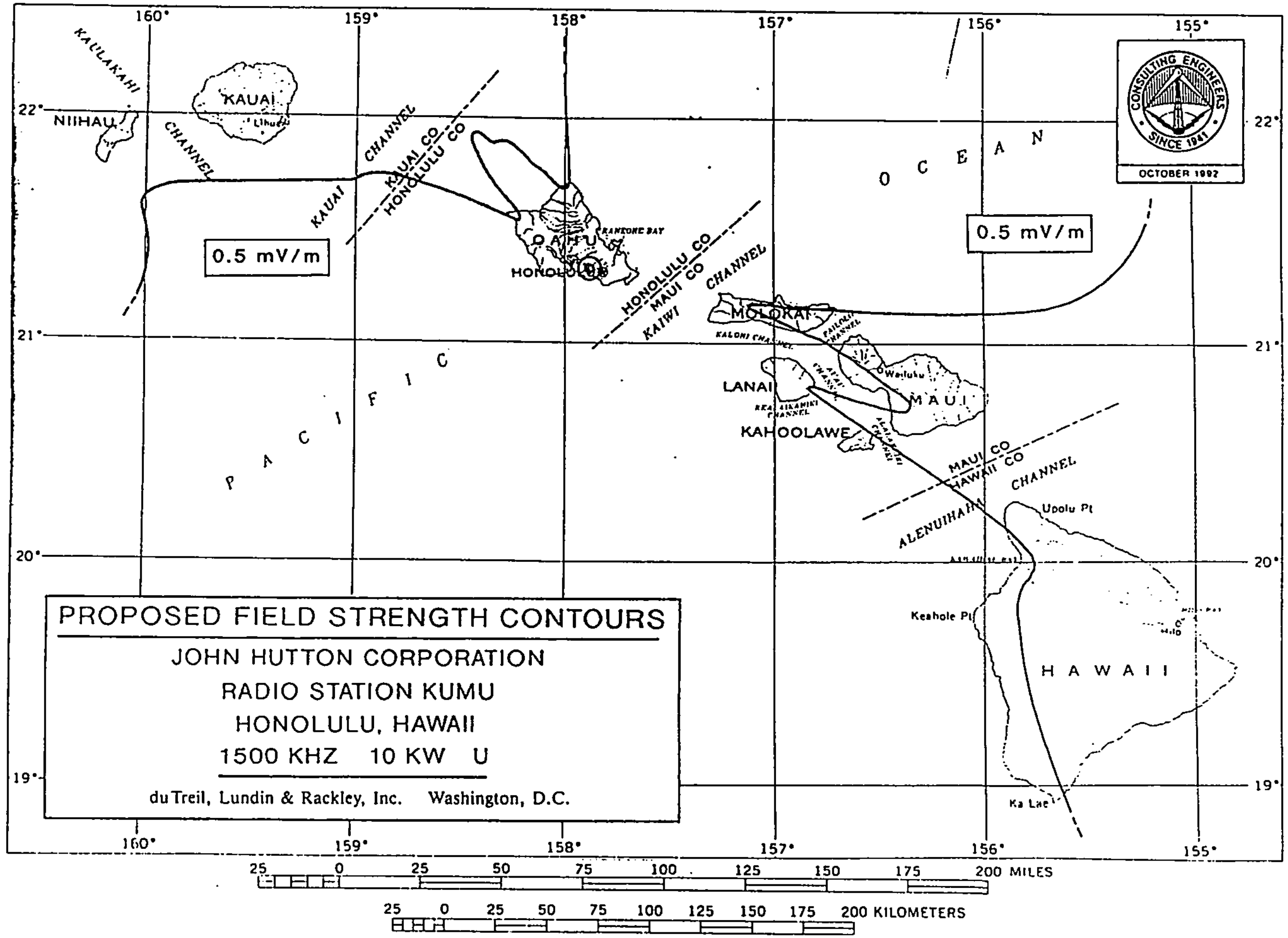


Figure 6
Sheet 1 of 2

TECHNICAL EXHIBIT
APPLICATION FOR CONSTRUCTION PERMIT
JOHN HUTTON CORPORATION
RADIO STATION KUMU
HONOLULU, HAWAII
1500 KHZ 10 KW U

Tabulation of Data Employed
in Calculation of Groundwave Contours

Azimuth (deg)	1 km Field (mV/m)	Segment Conductivity-Distance (mS/m)-(km)
0.0	933.	2-28.2,5000-remainder (R)
5.0	933.	2-24.8,5000-R
10.0	933.	2-24,5000-R
15.0	933.	2-17.8,5000-2.3,2-1.1,5000-R
20.0	933.	2-15.2,5000-R
25.0	933.	2-14.9,5000-R
30.0	933.	2-14.9,5000-R
35.0	933.	2-14.3,5000-R
40.0	933.	2-13.9,5000-R
45.0	933.	2-14.3,5000-2.8,2-2.7,5000-R
50.0	933.	2-13.9,5000-3.8,2-3.3,5000-R
55.0	933.	2-18.6,5000-0.2,2-0.4,5000-R
60.0	933.	2-17.5,5000-R
65.0	933.	2-17.5,5000-R
70.0	933.	2-18.9,5000-R
75.0	933.	2-19.4,5000-R
80.0	933.	2-18.8,5000-R
85.0	933.	2-19.2,5000-R
90.0	933.	2-20.2,5000-R
95.0	933.	2-22.8,5000-R
100.0	933.	2-24.3,5000-71,2-4.1,5000-9.6,2-R
105.0	933.	2-22.6,5000-45.6,2-R
110.0	933.	2-17.4,5000-2.5,2-1.3,5000-44.5,2-13.1,5000-53.3,2-R
115.0	933.	2-15.5,5000-93.1,2-8.8,5000-48.1,2-R
120.0	933.	2-14.1,5000-86,2-R
125.0	933.	2-13.5,5000-139,2-6.7,5000-1,2-R
130.0	933.	2-13.2,5000-246,2-R
135.0	933.	2-3.3,5000-0.2,2-8.6,5000-276,2-1.6,5000-1.9,2-R
140.0	933.	2-3.2,5000-0.6,2-2.7,5000-317,2-10.6,5000-R
145.0	933.	2-2.2,5000-0.4,2-0.6,5000-1.2,2-1.5,5000-R
150.0	933.	2-2.1,5000-3.2,2-0.2,5000-R
155.0	933.	2-2,5000-R

Tabulation of Data Employed
in Calculation of Groundwave Contours
Honolulu, Hawaii

Azimuth (deg)	1 km Field (mV/m)	Segment Conductivity-Distance (mS/m)-(km)
160.0	933.	2-2,5000-R
165.0	933.	2-2,5000-R
170.0	933.	2-2,5000-R
175.0	933.	2-2,5000-R
180.0	933.	2-2,5000-R
185.0	933.	2-1.6,5000-R
190.0	933.	2-1.2,5000-R
195.0	933.	2-1,5000-R
200.0	933.	2-0.9,5000-R
205.0	933.	2-0.8,5000-R
210.0	933.	2-0.7,5000-R
215.0	933.	2-0.6,5000-R
220.0	933.	2-0.6,5000-R
225.0	933.	2-0.6,5000-R
230.0	933.	2-0.5,5000-R
235.0	933.	2-0.5,5000-R
240.0	933.	2-0.5,5000-1.8,2-2.7,5000-R
245.0	933.	2-0.5,5000-0.9,2-4.2,5000-R
250.0	933.	2-0.5,5000-0.5,2-5.3,5000-R
255.0	933.	2-0.5,5000-0.3,2-6.5,5000-R
260.0	933.	2-0.5,5000-0.3,2-6.9,5000-1.4,2-14,5000-R
265.0	933.	2-0.5,5000-0.2,2-7.3,5000-0.4,2-15.3,5000-R
270.0	933.	2-8.2,5000-0.7,2-15.5,5000-R
275.0	933.	2-8.3,5000-1.3,2-15.4,5000-R
280.0	933.	2-8.4,5000-0.4,2-0.5,5000-2.7,2-14.6,5000-R
285.0	933.	2-7.8,5000-1,2-3.2,5000-2,2-16.8,5000-R
290.0	933.	2-5.8,2-4.8,2-2.7,5000-0.8,2-18.6,5000-R
295.0	933.	2-6.7,5000-2.8,2-0.2,5000-1.6,2-26.6,5000-R
300.0	933.	2-6.6,5000-3.2,2-1.2,5000-0.3,2-29.1,5000-R
305.0	933.	2-6.6,5000-3.5,2-R
310.0	933.	2-6.6,5000-1.2,2-34.8,5000-R
315.0	933.	2-38.7,5000-R
320.0	933.	2-36.4,5000-R
325.0	933.	2-37.4,5000-R
330.0	933.	2-38.1,5000-R
335.0	933.	2-40.2,5000-R
340.0	933.	2-41.7,5000-R
345.0	933.	2-R
350.0	933.	2-41.3,5000-R
355.0	933.	2-32.4,5000-1.8,2-0.4,5000-R

Figure 7
Sheet 1 of 3

TECHNICAL EXHIBIT
APPLICATION FOR CONSTRUCTION PERMIT
JOHN HUTTON CORPORATION
RADIO STATION KUMU
HONOLULU, HAWAII
1500 KHZ 10 KW U

Nighttime Allocation Study

Proposed KUMU, Honolulu, HI
1500 kHz, 10 kW, U
G=82.4°, E=933 mV/m/km
21°20'10"N/157°53'33"W

Toward Station	Freq. (kHz)	GC Dist. (km)	Bear. (degT)	Angles Min (deg)	Angles Max (deg)	Skywav Mult. (uV/m)	50 % Ex-RSS (mV/m)	25 % Ex-RSS (mV/m)	Reqd. Prot. (mV/m)	Permisbl Vert-Rad mV/m@1km
KRCK	1500	4116.1	60.9	.0	.0	5.14	9.31	10.39	2.60	2528.3
KSJX	1500	3886.4	54.7	.0	.0	5.54	5.49	6.45	1.60	1447.5
WTOP1B	1500	7767.4	54.8	.0	.0	.58	2.64	4.00	.50	4278.3
WKIZ	1500	7700.2	70.8	.0	.0	1.19	11.89	11.89	2.97	12516.9
KUHU	1500	10.9	121.0	.0	.0	.00	2.15	2.40	.00	.0
WLQV	1500	7198.6	52.2	.0	.0	.71	3.72	4.23	1.06	7404.9
KSTP1B	1500	6393.0	49.3	.0	.0	1.06	2.40	3.14	.50	2359.3
KANI	1500	6208.1	68.3	.0	.0	2.01	8.16	9.69	2.41	5978.4
WMNT	1500	9409.4	72.3	.0	.0	.72	18.03	22.05	5.51	38448.0
CKAY	1500	4290.6	36.5	.0	.0	1.62	5.98	6.45	2.99	9237.6
XEEBC	1500	4237.4	65.2	.0	.0	1.65	42.57	42.57	21.29	64310.7
XERH	1500	6095.7	80.8	.0	.0	.78	15.39	16.35	7.41	47189.2
XEFL	1500	5837.3	79.3	.0	.0	.85	18.99	23.25	9.49	55515.0
XENP	1500	5697.5	80.5	.0	.0	.90	25.65	28.37	12.83	71470.7
MELCHO	1500	5819.8	83.3	.0	.0	.86	43.36	43.36	21.68	>100000
XEUV	1500	6765.2	80.7	.0	.0	.64	23.15	24.32	11.57	90099.6
XEGN	1500	6411.4	80.7	.0	.0	.71	31.62	31.62	15.81	>100000
HIPA	1500	9185.4	72.9	.0	.0	.15	4.68	5.56	2.20	73949.2
HISD	1500	8945.0	72.4	.0	.0	.16	4.83	5.67	2.37	76266.7
HIDE	1500	9154.6	72.5	.0	.0	.15	4.64	5.59	2.26	75511.9
4VBD	1500	8796.3	72.9	.0	.0	.16	4.04	4.82	1.93	60468.7
ANGUIL	1500	9757.7	71.3	.0	.0	.14	2.79	3.17	1.27	47110.7
HJLJ	1500	8975.3	89.8	.0	.0	.15	4.76	5.22	2.38	76988.1
HJTW	1500	9164.3	88.3	.0	.0	.15	4.75	5.07	2.37	79423.4
HJZH	1500	8954.2	86.8	.0	.0	.16	4.75	5.19	2.37	76429.6
TILQA	1500	7890.5	86.1	.0	.0	.19	2.41	2.85	1.20	31191.6
HCRO1	1500	8922.0	93.6	.0	.0	.16	4.46	4.46	2.20	70500.1
WTOP-P	1500	7767.4	54.8	.0	.0	.58	2.64	4.00	.50	4278.3
WLQV-P	1500	7198.6	52.2	.0	.0	.71	3.72	4.23	1.06	7404.9
KSTP-P	1500	6393.0	49.3	.0	.0	1.06	2.40	3.14	.50	2359.3

Nighttime Allocation Study
Honolulu, Hawaii

Figure 7
Sheet 2 of 3

Toward Station	Freq. (kHz)	GC Dist. (km)	Bear. (degT)	Angles Min (deg)	Angles Max (deg)	Skywav Mult. (uV/m)	50 % Ex-RSS (mV/m)	25 % Ex-RSS (mV/m)	Reqd. Prot. (mV/m)	Permisbl Vert-Rad mV/m@1km
XEJQ-O	1500	5666.1	73.9	.0	.0	.91	10.36	13.44	4.80	26422.8
XEYQ-O	1500	5635.9	77.0	.0	.0	.92	15.54	17.27	7.77	42370.0
CMKR-B	1500	8354.7	73.0	.0	.0	.17	3.64	4.24	1.82	52043.7
CMEM-B	1500	7941.1	72.5	.0	.0	.19	3.44	3.89	1.72	45091.4
4VMD-P	1500	8758.2	73.3	.0	.0	.16	3.88	4.98	1.94	60214.9
HJMP-B	1500	9082.8	84.3	.0	.0	.15	5.06	5.06	2.53	83304.8
YSDA-B	1500	7290.8	84.3	.0	.0	.22	5.61	6.25	2.52	56693.2
PJC9-B	1500	9406.4	79.0	.0	.0	.14	3.20	4.23	1.60	55862.5
KNSE	1510	4179.0	61.4	.0	.0	4.98	8.25	8.54	2.13	21448.1
KDKO	1510	5369.3	55.4	.0	.0	2.27	5.47	5.97	1.49	32858.3
WNLC	1510	8114.6	51.5	.0	.0	.39	10.92	11.26	2.74	>100000
WSSH	1510	8165.4	50.3	.0	.0	.34	7.46	7.46	1.87	>100000
WLAC1B	1510	6975.2	59.1	.0	.0	1.05	1.46	2.11	.50	23775.3
KGA-1B	1510	4640.9	41.2	.0	.0	2.83	1.10	1.30	.50	8828.7
WAVB	1510	9367.3	72.9	.0	.0	.75	9.05	9.78	2.44	>100000

Proposed KUMU Nighttime Limitation

From Station (Call)	KRCK	KSJX	KSTP1B	KSTP-P	XERH	YNPT-B
Frequency (kHz)	1500	1500	1500	1500	1500	1500
G. C. Distance (km)	4116.096	3886.364	6393.042	6393.042	6095.720	7635.563
Slant Distance (km)	4120.952	3891.507	6396.169	6396.169	6099.000	7638.182
Bearing,degrees True	260.079	252.956	268.439	268.439	282.942	288.390
Mid-Pt Latitude(deg)	29.258	30.584	37.658	37.658	23.068	20.351
Geomag. MP Lat.(deg)	32.509	33.409	42.386	42.386	28.530	27.107
Min-Angle (degrees)	.000	.000	.000	.000	.000	.000
Max-Angle (degrees)	.000	.000	.000	.000	.000	.000
Horizontal-Rad(mV/m)	1538.477	1248.606	4449.352	4449.352	1080.562	879.870
Max-Vert-Rad. (mV/m)	1538.477	1248.606	4449.352	4449.352	1080.562	879.870
Skywave Mult. (uV/m)	5.226	5.659	1.194	1.194	2.712	1.756
Night Limit (mV/m)	1.608	1.413	1.063	1.063	.586	.309

From Station (Call)	CKAY	KGA-1B	XENP	PJC9-B	MELCHO	XEFL
Frequency (kHz)	1500	1510	1500	1500	1500	1500
G. C. Distance (km)	4290.631	4640.910	5697.503	9406.421	5819.764	5837.281
Slant Distance (km)	4295.290	4645.217	5701.012	9408.547	5823.200	5840.707
Bearing,degrees True	237.056	245.369	281.524	290.701	283.473	281.338
Mid-Pt Latitude(deg)	36.226	36.144	23.246	22.858	21.993	23.748
Geomag. MP Lat.(deg)	38.408	38.880	28.353	30.986	27.222	28.971
Min-Angle (degrees)	.000	.000	.000	.000	.000	.000
Max-Angle (degrees)	.000	.000	.000	.000	.000	.000
Horizontal-Rad(mV/m)	404.538	3650.710	305.780	978.600	281.640	278.420
Max-Vert-Rad. (mV/m)	404.538	3650.710	305.780	978.600	281.640	278.420
Skywave Mult. (uV/m)	3.702	3.048	3.139	.921	3.117	2.924
Night Limit (mV/m)	.300	.223	.192	.180	.176	.163

From Station (Call)	KANI	XEEBC	XEGN	XEUV	YSDA-B	TILQA
Frequency (kHz)	1500	1500	1500	1500	1500	1500
G. C. Distance (km)	6208.110	4237.360	6411.438	6765.227	7290.848	7890.480
Slant Distance (km)	6211.331	4242.077	6414.557	6768.183	7293.591	7893.014
Bearing,degrees True	277.074	264.375	283.867	284.888	287.540	289.172
Mid-Pt Latitude(deg)	28.882	28.140	23.037	22.957	20.860	19.474
Geomag. MP Lat.(deg)	34.259	31.630	28.775	28.999	27.341	26.423
Min-Angle (degrees)	.000	.000	.000	.000	.000	.000
Max-Angle (degrees)	.000	.000	.000	.000	.000	.000
Horizontal-Rad(mV/m)	361.848	140.820	281.640	281.640	309.500	309.500
Max-Vert-Rad. (mV/m)	361.848	140.820	281.640	281.640	309.500	309.500
Skywave Mult. (uV/m)	2.055	5.093	2.416	2.135	1.927	1.673
Night Limit (mV/m)	.149	.143	.136	.120	.119	.104

RSS Night Limit to Station KUMU
50 % Exclusion = 2.141 mV/m from : KRCK KSJX
25 % Exclusion = 2.390 mV/m from : KRCK KSJX KSTP1B
0 % Exclusion = 2.785 mV/m from All Stations

Section V-A - AM BROADCAST ENGINEERING DATA	FOR COMMISSION USE ONLY File No. ________ ASB Referral Date ________ Referred by ________

Name of Applicant JOHN HUTTON CORPORATION

Purpose of Application: *(check all appropriate boxes)*

[ ] Construct new station

[X] Make changes in authorized/existing station — Call Sign KIIMU

- [ ] Principal authorized/licensed community
- [ ] Hours of operation
- [ ] Frequency
- [X] Transmitter location
- [ ] Power
- [ ] Filed in compliance with an Allotment Plan to migrate to the expanded band
- [ ] Main studio location
- Allotment Number ________
- [X] Antenna system *(including increase in height by addition of FM or TV antenna)*
  - [X] New antenna construction
  - [ ] Alteration of existing structure
    - [ ] Increase height
    - [X] Decrease height
    - [ ] Non-DA to DA
    - [ ] DA to Non-DA

[X] Other *(Summarize briefly the nature of the changes proposed)*
Modification of pending application BP - 920605AF

2. Principal community to be served:

State	County	City or Town
HI	HONOLULU	HONOLULU

3. Facilities requested:

Frequency: 1500 kHz — Hours of Operations:

Power: Night: 10 kW — Day: 10 kW — Critical hours: N/A kW

Class of Station (A,B,C or D) B — [ ] Stereo — [X] Monaural

4. Transmitter location:

State	County	City or Town
HI	HONOLULU	HONOLULU

Exact antenna location *(street address)*. If outside city limits, give name of nearest town and distance *(in kilometers)*, and direction of antenna from town. Kamehameha Hwy at Kalihi Stream.

Geographical coordinates *(to nearest second)*. For directional antenna give coordinates of center of array. For single vertical radiator give tower location. Specify South Latitude or East Longitude where applicable; otherwise, North Latitude or West Longitude will be presumed.

	°	'	"		°	'	"
Latitude	21	20	10	Longitude	157	53	33

CTION V-A – AM BROADCAST ENGINEERING DATA (Page 2)

:s the proposed site the same transmitter-antenna site of other stations authorized by the Commis- sion or specified in another application pending before the Commission? [ ] Yes [X] No

If Yes, indicate call sign or application file number: NA

Antenna system *(including ground or counterpoise system)*

Non-Directional [X] Day [X] Night [ ] Critical Hours

Estimated efficiency 295 mV/m per kW at one kilometer

If antenna is either top loaded or sectionalized, describe fully in an Exhibit. *(Include apparent electrical height.)* Exhibit No. N/A

Directional [ ] Day only (DA-D) [ ] Night only (DA-N)

[ ] Same constants and power day and night (DA-1)

[ ] Different constants and/or power day and night (DA-2)

[ ] Different constants and/or power day, critical hours and night (DA-3)

Submit complete engineering data in accordance with 47 C.F.R. Section 73.150 for each Directional antenna pattern proposed.

Non-directional/Directional

If antenna(s) is/are either top loaded or sectionalized, describe fully in an Exhibit. *(Include apparent electrical height.)* Exhibit No. N/A

Type of feed circuits (excitation) [X] Series Feed [ ] Shunt Feed

[ ] Folded Unipole [ ] Other (explain)

TOWERS *(meters, rounded to nearest meter)*	1	2	3	4	5	6
Overall height of radiator above base insulator, or above base, if grounded	46					
Overall height above ground *(without obstruction lighting)*	47					
Overall height above ground *(include obstruction lighting)*	47					
Overall height above mean sea level *(include obstruction lighting)*	48					

additional towers, attach information exactly as it appears above.

Has the FAA been notified of the proposed construction? [X] Yes [ ] No

If Yes, give date and office where notice was filed and attach as an Exhibit a copy of FAA determination, if available. Exhibit No. N/A

Date Oct. 20, 1992 Office where filed Western-Pacific Region

ECTION V-A – AM BROADCAST ENGINE..NG DATA (Page 3)

List all landing areas within 8 kilometers of antenna site. Give distances and direction to the nearest boundary of each landing area from the antenna site.

	Landing Area	Distance (km)	Direction
	(a) MOANALUA MED. CTR.	3.6	344.2
(a)	(b) HONOLULU INTL	3.7	245.1
	(c) THE QUEEN'S MED. CTR.	4.6	125.0
(b)	(d) HON. MUNICIPAL BLDG.	4.7	132.2
	(e) KUAKINI MED. CTR.	4.9	116.2
(c)			

Attach as an Exhibit a description and vertical plan sketch *(including supporting buildings, if any)* of the proposed structure, giving heights above ground, in meters, for all significant features. Clearly indicate existing portions, noting lighting, and distinguishing between the skeletal or other main supporting structure and the antenna elements. If a directional antenna, give spacing and orientation of towers. — Exhibit No. Tech.

If not fully described above, attach as an Exhibit further details and dimensions, including any other antennas mounted on tower and associated isolation circuits. — Exhibit No. N/A

Attach as an Exhibit, a plat of the transmitter site clearly showing boundary lines, roads, railroads, other obstructions, and the ground system or counterpoise. Show number and dimensions of ground radials or, if a counterpoise is used, show heights and dimensions. — Exhibit No. Tech.

). Will the main studio be located within the station's principal community contour as defined by 47 C.F.R. Section 73.24(i)? — [X] Yes [ ] No

If No, attach as an Exhibit a justification pursuant to 47 C.F.R. Section 73.1125. — Exhibit No. N/A

. Is there a remote control location or is one to be established in accordance with 47 C.F.R. Section 73.1400? — [X] Yes [ ] No

If yes, submit the following:

State	County	City or Town
HI	HONOLULU	HONOLULU
Street address *(or other identification)* 441 North Nimitz Hwy		

: Attach as an Exhibit a sufficient number of aerial photographs taken in clear weather at appropriate altitudes and angles to permit identification of all structures in the vicinity. The photographs must be marked so as to show compass directions, exact boundary lines of the proposed site, and locations of the proposed 1000 mV/m contour for both day and night operation. Photographs taken in eight different directions from an elevated position on the ground will be acceptable in lieu of the aerial photographs if the data referred to can be clearly shown. — Exhibit No. Tech.

. Is the population within the 1 V/m (1000 mV/m) contour less than 300 persons or less than 1.0 percent of the population within the 25 mV/m contour? — [x] Yes [ ] No

If No, attach as an Exhibit a justification pursuant to 47 C.F.R. Section 73.24(g). — Exhibit No. N/A

. Environmental Statement. *(See 47 C.F.R. Section 1.1301 et seq.)*

(a) Would a Commission grant of this application come within 47 C.F.R. Section 1.1307, such that it may have a significant environmental impact? — [ ] Yes [x] No

If you answer Yes, submit as an Exhibit an Environmental Assessment required by 47 C.F.R. Section 1.1311. — Exhibit No. N/A

If No, explain briefly why not. See Technical Narrative

(b) Distance from tower(s) to the nearest point of the fence enclosing the tower(s) in meters. 7 Meters

ECTION V-A – AM BROADCAST ENGINEERING DATA (Page 4)

. Allocation Studies

A. Daytime (For assistance, see 47 C.F.R. Section 73.37)

(1) For daytime operation, attach as an exhibit map(s) having appropriate scales, showing the 1000, 5, 2 and 0.5 (0.1, if Class A station) daytime contours in mV/m for both existing and proposed operations. On the map(s) showing the 5 mV/m contours CLEARLY INDICATE THE LEGAL BOUNDARIES OF THE PRINCIPAL COMMUNITY TO BE SERVED. — Exhibit No. Tech.

(2) Does the daytime 5 mv/m contour encompass the legal boundaries of the principal community to be served? — [ ] Yes [X] No

If No, attach as an Exhibit a justification for waiver of 47 C.F.R. Section 73.24(i). — Exhibit No. Tech.

(3) For daytime operation, for stations on a frequency between 535 kHz and 1605 kHz, attach as an Exhibit an allocation study utilizing Figure M-3 (Figure R-3 47 C.F.R. Section 73.190) or an accurate full scale reproduction thereof and using pertinent field strength measurement data where available, a full scale exhibit of the entire pertinent area to show the following: — Exhibit No. Tech.

(a) Normally protected and the interfering contours for the proposed operation along all azimuths.

(b) Normally protected and interfering contours of existing stations and other proposed stations in pertinent areas with which prohibited overlap would result as well as those existing stations and other proposals which require study to clearly show absence of prohibited overlap. If prohibited overlap were to occur as a result of the proposal, appropriate justification for waiver of 47 C.F.R. Section 73.37 is to be included.

(c) Plot of the transmitter location of each station or proposal requiring investigation, with identifying call letters, file numbers, and operating or proposed facilities.

(d) Properly labeled longitude and latitude degree lines, shown across entire Exhibit.

(4) For daytime operation, attach as an Exhibit a tabulation of the following: — Exhibit No. Tech.

(a) Azimuths along which the groundwave contours were calculated for all stations or proposals shown on allocation study exhibits required by (3)(a).

(b) Inverse distance field strength used along each azimuth.

(c) Basis for ground conductivity utilized along each azimuth specified in (4)(a). If field strength measurements are used, submit copies of the analyzed measurements. If measurement data are taken from Commission records identify the source of the measurements in the Commission's files.

(d) Calculated distances.

B. Critical Hours (If applicable, see 47 C.F.R. Section 73.187)

(1) For critical hour operation, attach as an Exhibit map(s) having appropriate scales, showing the 1000, 5 and 0.5 critical hours contours in mV/m for both existing and proposed operations. On the map(s) showing the 5 mV/m contours CLEARLY INDICATE THE LEGAL BOUNDARIES OF THE PRINCIPAL COMMUNITY TO BE SERVED. — Exhibit No. N/A

(2) Does the critical hours 5 mV/m contour encompass the legal boundaries of the principal community be served? — [ ] Yes [ ] No

If No, attach as an Exhibit justification for waiver of 47 C.F.R. Section 73.24(i). — Exhibit No.

(3) For critical hours operation, attach as an Exhibit an allocation study utilizing Figure M-3 (Figure R-3 47 C.F.R. Section 73.190) or an accurate full scale reproduction thereof and using pertinent field strength measurement data where available, a full scale exhibit of the entire pertinent area to show the following: The 0.1 mV/m groundwave contour pertinent arcs of Class A stations and appropriate studies to establish compliance with 47 C.F.R. Section 73.187 when operation is proposed on a U.S. Class A channel. — Exhibit No. N/A

C. Nighttime. *(For assistance, see 47 C.F.R. Section 73.182)*

(1) For nighttime operation, attach as an Exhibit map(s) having appropriate scales showing the 1000 mV/m and coverage contours (appropriate minimum protected value for proposed class of station, or RSS nighttime interference-free contour; whichever is the greater value) for both existing and proposed operations. On the map(s) showing the interference-free contours. CLEARLY INDICATE THE LEGAL BOUNDARIES OF THE PRINCIPAL COMMUNITY TO BE SERVED.

Exhibit No. Tech.

(2) Does the nighttime 5 mV/m or nighttime interference free contour (which ever is higher) encompass 80% of the principal community to be served (50% for expanded band 1605-1705 kHz stations?

☐ Yes ☒ No

If No, attach as an Exhibit justification for waiver of, or exemption pursuant to 47 C.F.R. Section 73.24(i).

Exhibit No. Tech.

(3) For nighttime operation, for stations on a frequency between 535 kHz and 1605 kHz. attach as an Exhibit allocation data including the following:

Exhibit No. Tech.

(a) Proposed nighttime limitation to other existing or proposed stations with which objectionable interference could result, as well as those other proposals and existing stations which require study to show clearly absence of objectionable interference.

(b) All existing or proposed nighttime limitations which enter into the nighttime RSS limitation of each of the existing or proposed facilities investigated under (3)(a) above.

(c) All existing and proposed limitations which contribute to the RSS nighttime limitation of the proposed operation, together with those limitations which must be studied before being excluded.

(d) A detailed interference study plotted upon an appropriate scale map if a question exists with respect to nighttime interference to other existing or proposed facilities along bearing other than on a direct line toward the facility considered. (Clipping study)

(e) The detailed basis for each nighttime limitation calculated under (3)(a), (b), (c) and (d) above.

6. Attach as an Exhibit a map *(7.5 minute U.S. Geological Survey topographic quadrangles, if available)* of the proposed antenna location showing the following information:

Exhibit No. Tech.

A. Proposed transmitter location accurately plotted with the latitude and longitude lines clearly marked and showing a scale in kilometers.

B. Heights of buildings or other structures and terrain elevations in the vicinity of the antenna, indicating the location thereof.

C. Transmitter location and call signs of non-broadcast radio stations *(except amateur and citizens band)*, established commercial and government receiving stations in the general vicinity which may be adversely affected by the proposed operation.

D. Transmitter location and call letters of all AM, FM and TV broadcast stations within three (3) kilometers of the proposed antenna location.

CERTFICATION

ertify that I have prepared this Section of this application on behalf of the applicant, and that after such preparation, have examined and found it to be accurate and true to the best of my knowledge and belief.

Name (Typed or Printed)	Relationship to Applicant (e.g., Consulting Engineer)
LOUIS R. du TREIL	Technical Consultant
Signature Louis R. du Treil	Address (Include ZIP Code) du Treil, Lundin & Rackley, Inc. 1019 19th Street, N.W., Third Floor Washington, D.C. 20036
Date October 20, 1992	Telephone No. (Include Area Code) (202) 223-6700

S

DO NOT REMOVE CARBONS

U.S. Department of Transportation Federal Aviation Administration

NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION

Aeronautical Study Number: 92-AWP-1158-OE

1. Nature of Proposal

A. Type: ☒ New Construction ☐ Alteration

B. Class: ☒ Permanent ☐ Temporary (Duration ___ months)

C. Work Schedule Dates: Beginning Subject to / End FCC Approval

3A. Name and address of individual, company, corporation, etc. proposing the construction or alteration. (Number, Street, City, State and Zip Code)

(808) 531-4511
area code Telephone Number

John Hutton Corporation DLR:0311
c/o Mr. John Weiser, Jr.
441 N. Nimitz Hwy.
Honolulu, HI 96817

B. Name, address and telephone number of proponent's representative if different than 3 above.

Louis R. du Treil
du Treil, Lundin & Rackley, Inc.
240 NORTH WASHINGTON BLVD. STE 700
SARASOTA, FLA. 34236

2. Complete Description of Structure

A. Include effective radiated power and assigned frequency of all existing, proposed or modified AM, FM, or TV broadcast stations utilizing this structure.

B. Include size and configuration of power transmission lines and their supporting towers in the vicinity of FAA facilities and public airports.

C. Include information showing site orientation, dimensions, and construction materials of the proposed structure.

Change of transmitter site for KUMU, operation to continue on 1500 kHz with power of 10 kW.

(If more space is required, continue on a separate sheet.)

4. Location of Structure

A. Coordinates (To nearest second)	B. Nearest City or Town and State	C. Name of nearest airport, heliport, flightpark or seaplane base
	Honolulu, HI	Moanalua Med. Ctr.
Latitude 21 20 10	(1) Distance to 4B: Within City	(1) Distance from structure to nearest point of nearest runway: 3.6 km
Longitude 157 53 33	(2) Direction to 4B: Limits	(2) Direction from structure to airport: 245.1° T

5. Height and Elevation (Complete to the nearest foot)

A. Elevation of site above mean sea level	5 (1.5 m)
B. Height of structure including appurtenances and lighting (if any) above ground, or water if so situated	153 (46.6 m)
C. Overall height above mean sea level (A + B)	158 (48.1 m)

D. Description of location of site with respect to highways, streets, airports, prominent terrain features, existing structures, etc.

Kamehameha Highway at Kalihi Stream.

I HEREBY CERTIFY that all of the above statements made by me are true, complete, and correct to the best of my knowledge. In addition, I agree to obstruction mark and/or light the structure in accordance with established marking & lighting standards if necessary.

Date	Typed Name/Title of Person Filing Notice	Signature
Oct. 20, 1992	Louis R. du Treil/Consultant Technical	

FOR FAA USE ONLY NAD83 21-20-56.6C 157-53-35.12 ... FAA will either return this form or issue a separate acknowledgement.

The Proposal:

☐ Does not require a notice to FAA.

☒ Is not identified as an obstruction under any standard of FAR, ... and would not be a hazard to air navigation.

☐ Is identified as an obstruction under the standards of FAR, Part 77, Subpart C, but would not be a hazard to air navigation.

☐ Should be obstruction ☐ marked, ☐ lighted per FAA Advisory Circular 70/7460-1, Chapter(s)

☒ Obstruction marking and lighting are not necessary.

Supplemental Notice of Construction FAA Form 7460-2 is required any time the project is abandoned, or

☐ At least 48 hours before the start of construction.

☐ Within five days after the construction reaches its greatest height.

This determination expires on July 22, 1993 unless:

(a) extended, revised or terminated by the issuing office.

(b) the construction is subject to the licensing authority of the Federal Communications Commission and an application for a construction permit is made to the FCC on or before the above expiration date. In such case the determination expires on the date prescribed by the FCC for completion of construction, or on the date the FCC denies the application.

NOTE: Request for extension of the effective period of this determination must be postmarked or delivered to the issuing office at least 15 days prior to the expiration date.

If the structure is subject to the licensing authority of the FCC, a copy of this determination will be sent to that Agency.

ANY FUTURE CHANGE IN FREQUENCY, RADIATED POWER OR ANTENNA CHARACTERISTICS SHALL BE FILED AS NOTICE TO THE FAA ON FORM 7460-1.

Remarks: Based on sponsors assurance that radiated power will be maintained below allowable level

Issued in	Signature	Date
Hawthorne Ca		Jan 22 1993

FAA Form 7460-1

DO N[redacted]

FAA

du Treil, Lundin & Rackley, Inc.
A Subsidiary of A. D. Ring, P.C.

January 25, 1993

Secretary, Federal Communications Commission
Washington, D. C. 20554

Re: John Hutton Corporation
Honolulu, Hawaii
File No. BP-920605AF

Gentlemen:

In reference to the above pending application, I am enclosing a copy of the FAA determination of No Hazard regarding the proposed tower to be erected in Honolulu.

Kindly contact the undersigned if there is any question regarding this matter.

Best Wishes

Very truly yours,

Louis R. du Treil

Louis R. du Treil

cc: Mr. John Weiser, Jr.
Leonard Joyce, Esq.

DUT\ew

240 N. Washington Blvd.
Suite 700
Sarasota • Florida 34236
(813) 366-2611
(813) 366-5533 FAX

UNITED STATES OF AMERICA
FEDERAL COMMUNICATIONS COMMISSION

File No. BMP-950510DA

Call Sign KUMU (AM)

Modification No.

MODIFICATION OF CONSTRUCTION PERMIT

AM
(Class of station)

John Hutton Corporation
441 North Nimitz Highway
Honolulu, Hawaii 96817

Permittee: John Hutton Corporation

Station location: Honolulu, Hawaii

Associated Broadcast station:

The Authority Contained in Authorization File No. BP-941018DB as modified dated November 15, 1994 granted to the Permittee listed above is hereby modified in part as follows:

DATE OF REQUIRED COMPLETION OF CONSTRUCTION: DEC 2 1995

This modification of construction permit shall be attached to and be made a part of the construction permit of this station.

Except as herein expressly modified, the above-mentioned construction permit, subject to all modifications heretofore granted by the Commission, is to continue in full force and effect in accordance with the terms and conditions thereof and for the period therein specified.

Dated: [illegible] 2 1995
MDH:rao

FEDERAL
COMMUNICATIONS
COMMISSION

FCC Form 351
October 1978

F. C. C. - WASHINGTON, D. C.

Call Sign - KUMU File No. - BP-920605AF

THE AUTHORITY GRANTED IS SUBJECT TO THE FOLLOWING CONDITIONS:

Operation by remote control authorized.

Antenna obstruction markings not required.

Permittee shall install a type accepted transmitter, or submit application (FCC Form 301) along with data prescribed in Section 73.1660(b) should non-type accepted transmitter be proposed.

The fundamental field strength produced by KUMU's operation as determined by measurements at a point 22 feet east and 105 feet south of the southeast corner of the main building at the Commission's Honolulu Office, shall not exceed 25 mV/m (88.0 dBu) at any time.

In the event of interference to the monitoring station's operations, which is in any way related to this station's facilities or transmissions, the licensee shall take such corrective action as is necessary to eliminate the interference. Corrective action shall include the provision, installation, and adjustments of suitable transmitter filter circuits, shielding, or other appropriate devices at this and other stations which may be required to eliminate the interference. If these or other measures do not eliminate the interference, the licensee shall reduce power to comply or cease transmissions.

Any all spurious emissions, other than on frequencies contained within the AM Broadcast band, that are in any way related to this stations's facilities or transmission, as detected by the monitoring equipment at the Commission's Honolulu Office, shall be no greater than 0.71 uV/m (-3 dBu).

United States of America
FEDERAL COMMUNICATIONS COMMISSION

FCC 351
December 1985

File No.: BP-920605AF
Call Sign: KUMU

AM BROADCAST STATION CONSTRUCTION PERMIT

1. Permittee:

JOHN HUTTON CORPORATION

2. Station location: Honolulu, Hawaii
3. Transmitter location: Kamehameha Hwy at Kalihi Stream, Honolulu, HI

North Latitude: 21° 20' 10"
West Longitude: 157° 53' 33"

4. Main studio location: 441 North Nimitz Hwy Honolulu, Hi
(Listed only if not at transmitter site or not within boundaries of principal community.)
5. Remote control location:
6. Transmitter: Type accepted
(See Section 73.1660, 73.1665 and 73.1670 of the Commission's Rules.)

Average hours of sunrise and sunset:
Standard Time (Non-Advanced)

PROVIDED WITH PREVIOUS AUTHORIZATION

7. Antenna and ground system: Vertical, guyed, series-excited, steel radiator of uniform cross section 45.7 meters (82.3°) in height (46.6 m overall). Theoretical efficiency: 295 mV/m/kW at 1km. Ground system consists of 120 equally spaced, buried copper radials 60.1 meters in length except where shortened at property boundaries.

8. Obstruction marking and lighting specifications: FCC Form 715, paragraphs: None required.

9. Operating Assignment

Frequency: 1500 kHz
Power—Night: 10 kW (Nondirectional)
Day: 10 kW (Nondirectional)
Hours of Operation: Unlimited
10. Conditions: Attached

11. Deadline for completion of construction and filing FCC Form 302: 18 months from date of grant (shown below)

Subject to the provisions of the Communications Act of 1934, as amended, treaties, and Commission Rules, and further subject to conditions set forth in this permit,[1] authority is hereby granted to construct an AM broadcast station located and described as above.

Equipment and program tests shall be conducted only pursuant to Sections 73.1610 and 73.1620 of the Commission Rules.

This permit shall be forfeited if the station is not ready for operation within the time specified or within such further time as the Commission may allow unless completion of the station is prevented by causes not under the control of the permittee. See Section 73.3598 of the Commission's Rules.

[1] This construction permit consists of this page and page(s) 2

Dated: MAR 11 1993

EAL

FEDERAL COMMUNICATIONS COMMISSION

FCC 351
December 1985

United States of America
FEDERAL COMMUNICATIONS COMMISSION

File No.: BP-920605AF
Call Sign: KUMU

AM BROADCAST STATION CONSTRUCTION PERMIT

1. Permittee:

JOHN HUTTON CORPORATION

2. Station location .... :	Honolulu, Hawaii
3. Transmitter location .... :	Kamehameha Hwy at Kalihi Stream, Honolulu, HI
North Latitude .... :	21° 20' 10"
West Longitude .... :	157° 53' 33"
4. Main studio location .... : (Listed only if not at transmitter site or not within boundaries of principal community.)	441 North Nimitz Hwy Honolulu, Hi
5. Remote control location .... :	
6. Transmitter .... : (See Section 73.1660, 73.1665 and 73.1670 of the Commission's Rules.)	Type accepted

Average hours of sunrise and sunset: Standard Time (Non-Advanced)

PROVIDED WITH PREVIOUS AUTHORIZATION

7. Antenna and ground system: Vertical, guyed, series-excited, steel radiator of uniform cross section 45.7 meters (82.3°) in height (46.6 m overall). Theoretical efficiency: 295 mV/m/kW at 1km. Ground system consists of 120 equally spaced, buried copper radials 60.1 meters in length except where shortened at property boundaries.

8. Obstruction marking and lighting specifications: FCC Form 715, paragraphs: None required.

9. Operating Assignment

Frequency .... :	1500 kHz
Power–Night .... :	10 kW (Nondirectional)
Day .... :	10 kW (Nondirectional)
Hours of Operation .... :	Unlimited
10. Conditions .... :	Attached

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[1] This construction permit consists of this page and page(s) 2

Dated: MAR 11 1993

EAL

FEDERAL COMMUNICATIONS COMMISSION

ENVIRONMENTAL CONCERNS

This section addresses the applicable environmental requirements, infrastructure requirements, impacts on public services, and social concerns associated with the project.

4.1 Applicable Environmental Requirements

Historic/Archaeological Sites

There are no historic or archaeological sites presently known to be situated on the project site. Furthermore, no archaeological sites are expected given that the project site was identified as Fill Land (FL) by the U.S. Soil Conservation Service's Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii (1972), and substantiated by subsurface investigation study results.

4.2 Infrastructure Requirements

Water Supply

The project would not create any additional demand on the current potable water supply nor require improvements to existing water facilities since the site would essentially be uninhabited except for the periodic maintenance of its facilities.

Wastewater Disposal

The project would not create any additional demand on the existing wastewater system serving the area because there would be no potable water demand created or restroom facilities provided on the site. As a result, no improvements to existing wastewater facilities are necessary.

Drainage Facilities

The project site is located in a Flood Fringe area which is designated as Zone AE under the Flood Insurance Rate Map, Community Panel Number 150001 0112 C. Since minimal grading activities are required for this site, there should be no major change or impact to the existing drainage conditions. Subsequently, pertinent engineering studies are being conducted to ensure suitable development of facilities on this site. Compliance with all regulatory requirements for this project site will be performed, and necessary permits and approvals will be obtained before construction activities commence.

Transportation Facilities

The project would not create additional traffic on the surrounding roadways since it would essentially be uninhabited except for the periodic maintenance of the transmitter facility. As previously discussed under Section 2.1, access to the site for periodic maintenance would be conducted by walking onto the site. Therefore, no improvements to transportation facilities in the immediate area are necessary.

4.3 Public Services

Refuse Collection

The operations associated with the broadcasting tower and transmitter facility would not generate any solid wastes requiring either private or City collection services because the site would be uninhabited.

Solid wastes generated during construction activities are expected to be insignificant since minimal grading activities are expected due to the nature of the project. Disposal of these wastes would be carried out using normal construction practices in accordance with City regulations.

Fire Protection

The project is not expected to create additional demands on the City's fire department since only a broadcasting tower and transmitter facility would be located on the site.

Police Protection

The project site would be uninhabited and surrounded with a chain-link fence to keep out trespassers. As a result, no additional demands on the City's police department are expected.

Educational Facilities

The project would not increase the residential population in the surrounding area since no residential units are planned. Therefore, there would be no impact or additional demands placed on educational facilities or personnel serving the area.

4.4 Housing And Population

The project would not create additional housing demands nor increase the resident population in the area since only a broadcasting tower and transmitter facility would be constructed.

4.5 Employment

There would be no increase in permanent jobs created by the project because the transmitter facility would be used for current operations replacing the temporary wire antenna facility. However, there would be a few short-term jobs created for construction of the facilities which may last about three weeks.

4.6 Parks And Recreation

The project site is presently not used for any recreational activity, therefore, the construction of the broadcasting tower and transmitter facility would not impact recreational activities. Furthermore, there would be no additional demands for park facilities created by the project.

4.7 Day Care Facilities

The project would not increase the residential population in the surrounding area and therefore have no impact or demands created for day care facilities.

4.3 Community Concerns

There are no community concerns presently known associated with the proposed project.

PHASE I REPORT
PROPERTY ENVIRONMENTAL ASSESSMENT
INSTERSTATE HIGHWAY FAP #IH1-1 (82)
KEEHI INTERSTATE
HONOLULU, HAWAII 96816

Prepared for:

KUMU RADIO
c/o JEFF COELHO
441 NORTH NIMITZ HIGHWAY
HONOLULU, HAWAII 96817

Prepared by:

MURANAKA ENVIRONMENTAL CONSULTANTS, INC.
1130 NORTH NIMITZ HIGHWAY, SUITE A-221
HONOLULU, HAWAII 96817

ENVIRO 2

PHASE I REPORT
PROPERTY ENVIRONMENTAL ASSESSMENT

INTERSTATE HIGHWAY FAP # IH1-1 (82)
KEEHI INTERCHANGE
HONOLULU, HAWAII 96819

Prepared for:

KUMU RADIO
441 NORTH NIMITZ HIGHWAY
HONOLULU, HAWAII 96817

Prepared by:

MURANAKA ENVIRONMENTAL CONSULTANTS, INC.
1130 NORTH NIMITZ HIGHWAY, SUITE A-221
HONOLULU, HAWAII 96817
(808) 531-8877

Project No. 92981

December 18, 1992

REQUEST FOR PUBLIC RECORDS
(Use Ink or Typewriter)

To: Director of Health
Department of Health

The following Department of Health records are hereby requested
(Identify or describe character of record):

1) Records: We are requesting information on any past or pending environmental regulatory actions for the site located at the Keehi interchange between Nimitz Highway and Kamehameha Highway at the Dillingham off ramp in Honolulu, Hawaii. On the eastern portion of the property is a lot, designated as tax map key number 1-2-13:22. The entire subject site has not been assigned a tax map key number. The State of Hawaii is the current owner of the site.

2) Purpose: An environmental assessment of the property.

3) Anticipated Use: As part of a report generated for our client.

Rick C. Ravelo

Name of Requester or
Duly Authorized Agent

Muranaka Environmental Consultants
P.O. Box 4341
Honolulu, Hawaii 96812
531-8877

Address and Phone Number

Signature Date 12/5/92

(For Department Use Only)

List or Describe records reviewed/copied by above:

Deputy Director for Environmental Health

Date:

MURANAKA
ENVIRONMENTAL CONSULTANTS, INC.
P.O. Box 4341 • Honolulu, Hawaii 96812
(808) 531-8877 • Fax (808) 523-8082

December 15, 1992

State of Hawaii
Department of Health: Environmental Management Division
Five Waterfront Plaza, Suite 250
500 Ala Moana Boulevard
Honolulu, Hawaii 96813

Attn: Thomas Arizumi

Re: Request for Public Records
MEC Project No. 92981

Dear Mr. Arizumi:

We are requesting information on any past or pending environmental regulatory actions for the site located at the Keehi interchange between Nimitz Highway and Kamehameha Highway at the Dillingham off ramp in Honolulu, Hawaii. On the eastern portion of the property is a lot, designated as tax map key number 1-2-13:22. The entire subject site has not been assigned a tax map key number. The State of Hawaii is the current owner of the site.

Enclosed is a copy of the tax map sheet showing the subject site. Thank you for your assistance. If you have any questions or comments about our request, please contact me at 531-8877.

Very truly yours,

Rick C. Ravelo
Environmental Specialist

Encl (2)

MURANAKA
ENVIRONMENTAL CONSULTANTS, INC.
P.O. Box 4341 • Honolulu, Hawaii 96812
(808) 531-8877 • Fax (808) 523-8082

December 15, 1992

City and County of Honolulu
Fire Department
1455 South Beretania Street
Honolulu, Hawaii 96814

Attn: Lionel Camara, Fire Chief

Re: Hazardous Material Spills
MEC Project No. 92981

Dear Mr. Camara:

We are requesting information on any Type 41 spills (spills, leaks without ignition) which may have occurred at or within a one-quarter mile radius of the Keehi interchange between Nimitz highway and Kamehameha Highway at the Dillingham off ramp. Enclosed is a locus map of the site with an approximate one-quarter mile radius encircling it.

Very truly yours,

Rick C. Ravelo
Environmental Specialist

Encl (1)

APPENDIX III

CORRESPONDENCE

Muranaka Environmental Consultants, Inc.
1130 N. Nimitz Highway
Honolulu, Hawaii 96817

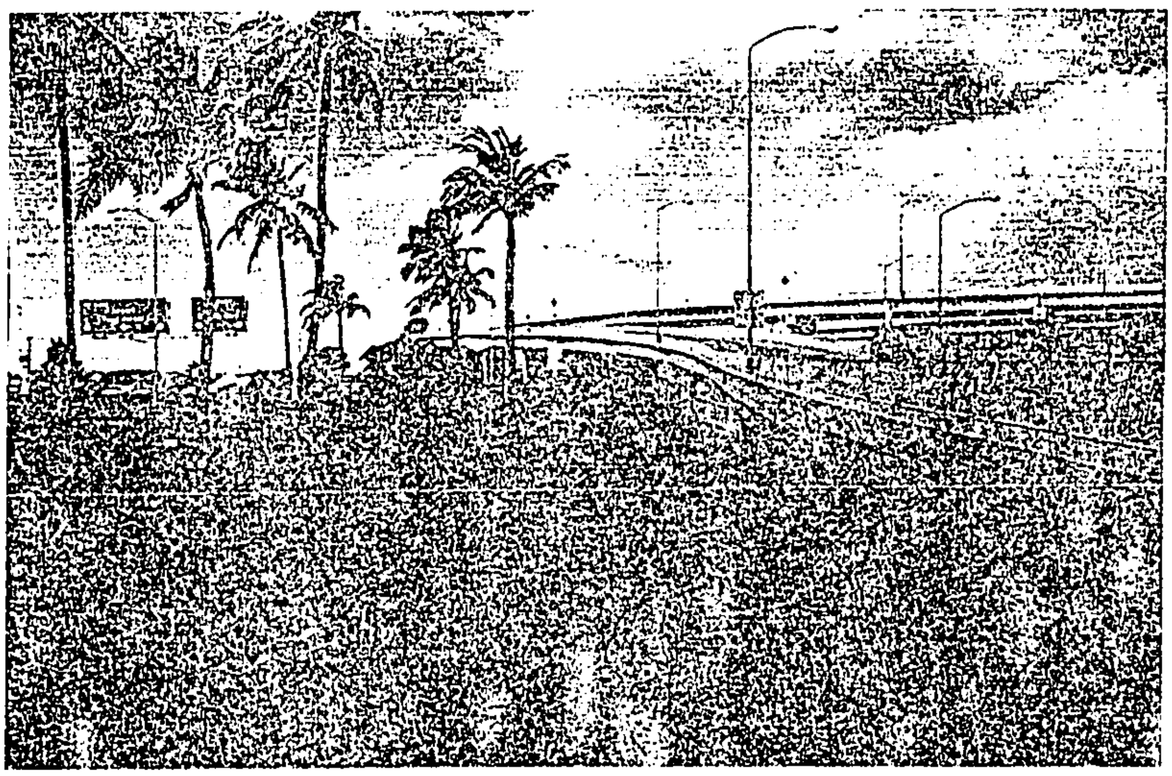


Photo #1 Photo taken next to the Dillingham off ramp, looking west across the property, towards Nimitz Highway.

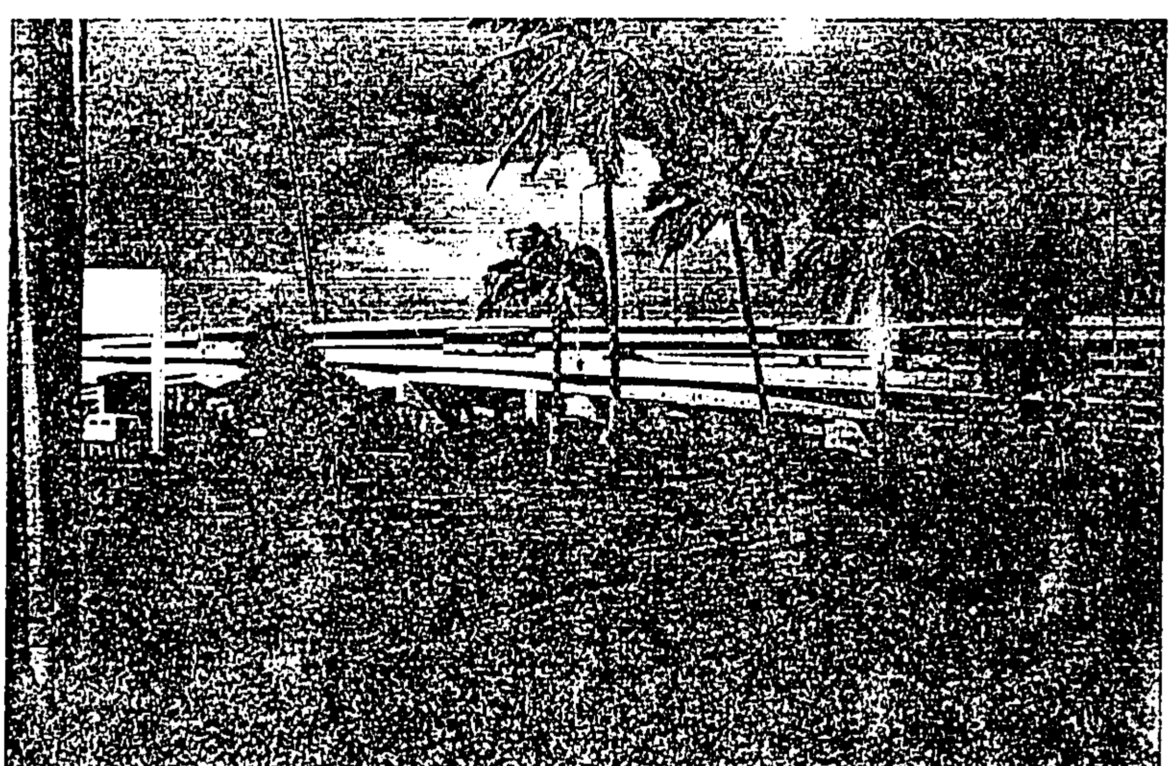
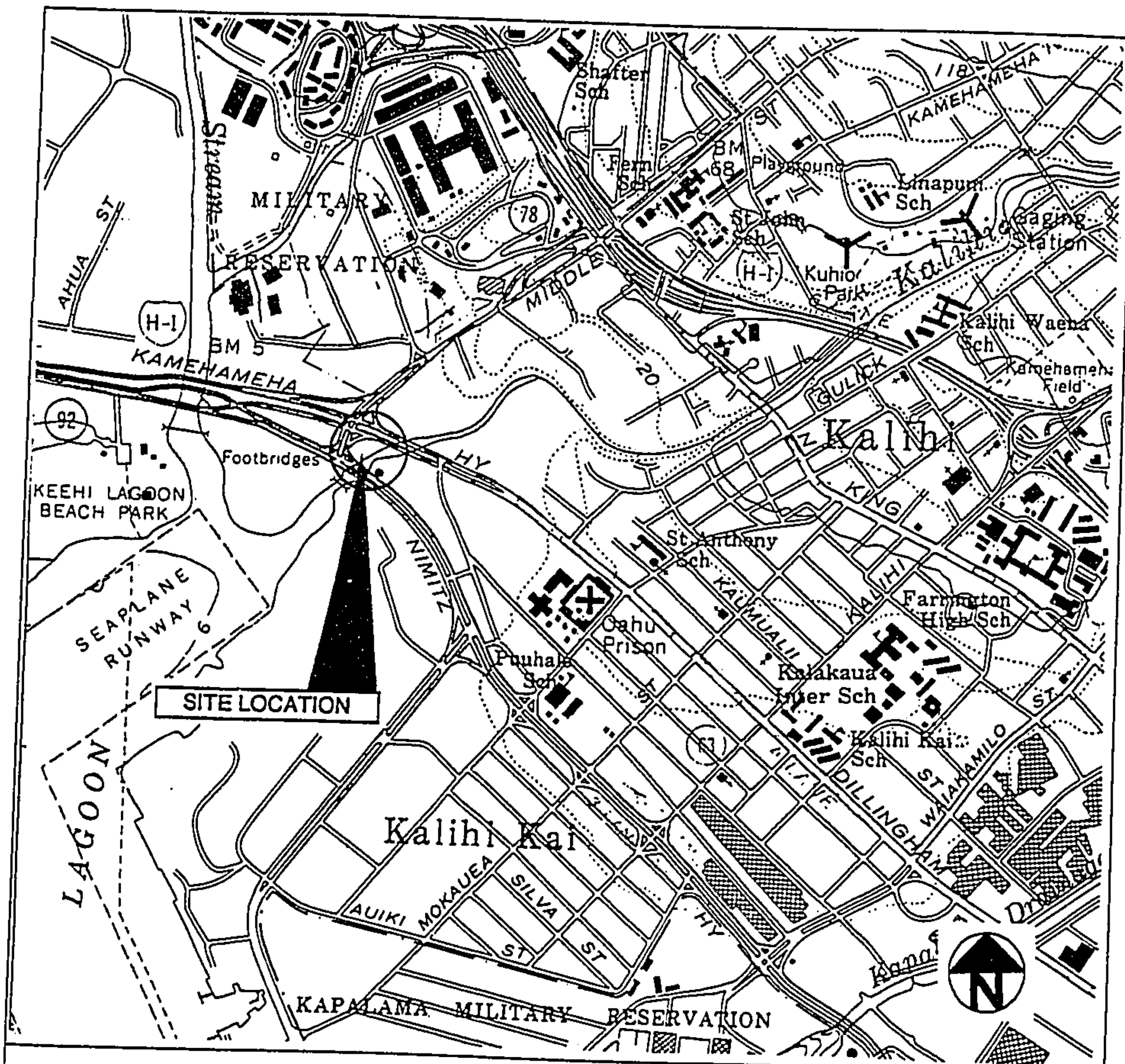
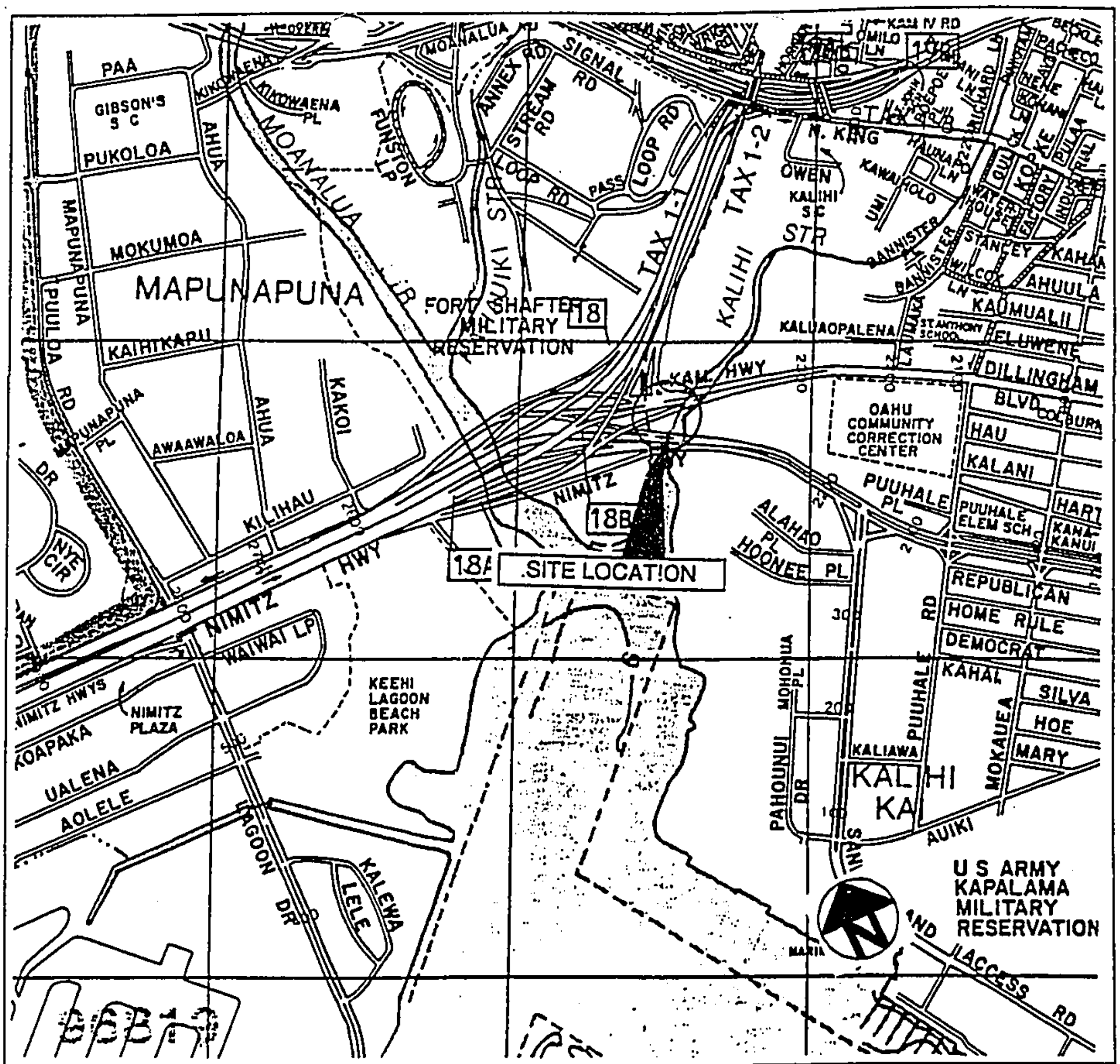


Photo #2 View of the property looking north towards the Keehi interchange.



TOPOGRAPHICAL MAP	
INTERSTATE HIGHWAY FAP # IH1-1 (82)	Date: 1983
Source: USGS	Drawn: N/A
Scale: 1:24,000	Project #: 92728
MURANAKA ENVIRONMENTAL CONSULTANTS, INC.	MAP 2



SITE MAP	
INTERSTATE HIGHWAY FAP # IH1-1 (82)	Date: 1991
Source: BRYAN'S SEC. MAP	Drawn: N/A
Scale: NO SCALE	Project #: 92881
MURANAKA ENVIRONMENTAL CONSULTANTS, INC.	MAP 1

APPENDIX I

SITE MAPS

Muranaka Environmental Consultants, Inc.
1130 N. Nimitz Highway
Honolulu, Hawaii 96817

8.0 APPENDICES

APPENDIX I	*SITE MAPS*
APPENDIX II	SITE PHOTOGRAPHS
APPENDIX III	CORRESPONDENCE

7.0 SIGNATURES

This document was prepared by me and by personnel under my supervision during the period November 30, 1992 to December 18, 1992.

Darrell R. Robertson
Project Manager/Geologist

Rick C. Ravelo, B.S.
Environmental Specialist

John C. Marshall
Environmental Engineer

6.0 REFERENCES

The following documents were examined during the course of this assessment. Copies were not retained nor included herein:

City and County of Honolulu, Real Property Assessment Division. Field Book, Real Property Ownership Records Tax Map (1) 1-2-13:22, First Tax Division, City and County of Honolulu. 1992.

Foote, Donald E., et al. 1972. Soil Survey of Island of Hawaii, State of Hawaii. United States Department of Agriculture, Soil Conservation Service, in cooperation with the University of Hawaii.

State of Hawaii Department of Health, Leaking Underground Storage Tank Section. State of Hawaii. UST Leak Log. January 21, 1992.

State of Hawaii Department of Health, Underground Storage Tank Program. State of Hawaii. Underground Storage Tank Registration List. March 11, 1990.

U.S. Department of Interior Geological Survey. State of Hawaii Department of Health Underground Injection Control Program. 1981. Honolulu Quadrangle. 7.5 Minute Series (Topographic Map).

State of Hawaii Department of Health, HEER Data Base List. December 3, 1991.

U.S. Environmental Protection Agency. August 17, 1992. EPA National Priority List. Title 40 CFR Part 00, Appendix B. Washington, D.C.

U.S. Environmental Protection Agency. August 17, 1992. EPA Superfund/CERCLA List. Title 40 CFR Part 00, Appendix B. Washington, D.C.

U.S. Environmental Protection Agency. May 1, 1992. EPA Region IX RCRA Database.

U.S. Environmental Protection Agency. September 2, 1992. Superfund Program CERCLIS Site/Event listing.

5.0 FINDINGS AND RECOMMENDATIONS

A number of published subsurface contamination areas have been identified within one-quarter mile of the site. MEC has identified four leaking underground storage tanks and one CERCLIS site within approximately one-quarter mile of the site. Therefore, if there are plans to develop the site which include excavation, trenching, or dewatering, MEC recommends that a soil and ground water study be performed. The study would address the presence and extent of soil or ground water contamination, and the effects that any contamination would have on the proposed construction design and methods.

In conclusion, at this time, MEC does not recommend any additional investigation of the site.

Asbestos-Containing Building Materials

In the past, asbestos mineral fibers were commonly incorporated into building materials, such as *insulation*, fire proofing, floor tile, and roofing materials. During the inspection, MEC searched for debris, that may have been left on-site which may have contained asbestos mineral fibers. The property did not contain any extensive amounts of debris, only a few pies of rubbish. There were no visible signs of any ACBMs on-site.

TABLE 4.3

Hazardous Waste Generators Located within One-quarter Mile of the Site

Facility ID #	Facility Name\Address	Generator Type
HID981656945	Consumer Tire Warehouse 733 Middle Street	SQG
HID981613144	Hawaiian Marines Sales and Service 223 Hoonee Place	SQG
HID980893119	IMPS, Inc. 2298 Alahao Place	-N-
HID981440241	Keehi Transfer Station 606 Middle Street	SQG
HID981629314	Keico Pacific Inc. Fort Shafter Building No. 1528	SQG
HID982487209	M.T.L., Inc. 811 Middle Street	LQG
HID982459950	Trane Pacific Service 2298 D Alahao Place	SEQ

LQG = Large quantity generator (more than 1000 kg per month)
SQG = Small quantity generator (100-1000 kg per month)
-N- = Facility notified for that activity but is not now engaged in that activity.
note = Exact location of Fort Shafter Buildings may be further than one-quarter mile.

TABLE 4.2 Continued

USTs Located within One-quarter Mile of the Site

Owner\Location	Number	Volume (gal)	Age (yrs)	Contents
*U.S. Army Support Command Fort Shafter Building Number 1527	1 2	10,000 10,000	unk unk	diesel kerosene
U.S. Army Support Command Fort Shafter Building Number 1605A	2 1	1,000 1,000	45 6	diesel diesel

unk = unknown
* = LUST
note = Exact location of Fort Shafter Buildings may be further than one-quarter mile.

Hazardous Materials and Hazardous Wastes

During the inspection, MEC personnel did not observe USEPA regulated Resource Conservation and Recovery Act (RCRA) hazardous waste generated, treated, disposed, or stored on-site. Hazardous waste is strictly regulated by the USEPA under the RCRA. Hazardous waste generators are responsible for determining whether their waste is hazardous waste. Firms that improperly manage hazardous waste may be subject to large fines. Table 4.3 lists the seven hazardous waste generators, registered with the USEPA, located within approximately a one-quarter mile radius of the subject site.

TABLE 4.2 Continued

USTs Located within One-quarter Mile of the Site

Owner\Location	Number	Volume (gal)	Age (yrs)	Contents
Island Wide Towing 611 Middle Street	1 1	6,000 4,000	18 18	diesel gasoline
Kems, Inc. 2234 Hoonee Place	1	1,000	12	gasoline
Oahu Bindery, Inc. 2278 Hoonee Place	1	500	25	gasoline
U.S. Army Support Command Fort Shafter Building Number 420	1	unk	unk	used oil
U.S Army Support Command Fort Shafter Building Number 1535	1	280	6	used oil
U.S. Army Support Command Fort Shafter Building Number 1528	1	1,000	unk	used oil
U.S. Army Support Command Fort Shafter Building Number 535	5 1	10,000 500	unk unk	gasoline used oil
*U.S. Army Support Command Fort Shafter Building Number 422	1 1	2,000 2,000	12 12	diesel kerosene

TABLE 4.2

USTs Located within One-quarter Mile of the Site

Owner\Location	Number	Volume (gal)	Age (yrs)	Contents
*Ameron H. C. & D. Ltd.	1	6,100	25	gasoline
811 Middle Street	1	6,100	25	diesel
	1	10,000	25	diesel
Div. Automotive Equip. Serv.	1	5,000	14	diesel
Keehi Transfer Station				
606 Middle Street				
F.T. Opperman & Company	2	970	32	gasoline
2340-B Kamehameha Hwy				
*Foremost Dairies-Hawaii	1	10,000	35	#5 fuel oil
2277 Kamehameha Hwy	1	4,000	3	gasoline
	1	8,000	3	diesel
	1	3,000	35	gasoline
	1	4,000	35	gasoline
	1	4,000	35	#5 fuel oil
Gaspro	1	6,000	10	diesel
2305 Kamehmeha Hwy	1	7,000	24	gasoline
Granger Pacific, Inc.	1	1,000	25	gasoline
611 Middle Street				
Harders Company	1	1,000	17	gasoline
2312 Kam Hwy Building H-2				
Hawaii Meat Company, Ltd	1	500	40	water
711 Middle Street	1	1,000	40	gasoline
	1	1,000	45	#5 bunker

PCB Items

At the time of the investigation, MEC personnel did not observe any evidence of PCB containing items on the property.

Underground Storage Tanks

During the site reconnaissance visit, MEC personnel did not observe UST indicators, such as: concrete caps, fill pipes, vent pipes, and dispenser pumps. The DOH has no record of registered underground storage tanks on the site. However, the DOH has records of eighteen USTs, four of which have been recorded as LUSTs, within one-quarter mile of the investigated site. The exact location of five UST and two LUST sites, located at Fort Shafter, are not readily available to MEC and may be greater than one-quarter mile from the investigated site.

Table 4.2 summarizes the information available on these tanks. Entries with an asterisk indicate locations with leaking tanks. A map with UST and LUST locations which are located within one-quarter mile of the site are presented in Appendix I.

property located at 2305 Kamehameha Highway, where a Gaspro does business. This site was discovered on January 1, 1980, by the Environmental Protection Agency (EPA); a preliminary assessment was done by the State of Hawaii on May 1, 1985; and a site inspection on June 1, 1988 was performed by the EPA.

In addition, the DOH HEER list has documented four hazardous material release within one-quarter mile of the site. Table 4.1 below lists the dates, locations and the type of spills that occurred.

TABLE 4.1

Hazardous Material Spills within One-quarter Mile of the Site

Date	Location	Description
01/14/88	Nimitz Highway*	A broken pipeline released 1,200 gallons of oil, diesel on the ground.
03/09/91	Kalihi Stream behind Gaspro	Potential oil release from Gaspro oil sump drain pipe.
06/10/91	2305 Kamehameha Hwy	Two gas cylinders were found in a stream. The cylinders were empty.
06/19/91	Dillingham and Nimitz Hwy, behind Gaspro	Workers received chemical burns at construction site. The alkaline level in the water was high. There were no indication of any actions taken.

* = Exact address not reported. Spill may have occurred further than one-quarter mile from the site.

1961, the State of Hawaii became the owner of the 18,077 ft^2 parcel. The status of the parcel remains the same to date.

Obvious Surface and Published Subsurface Contamination

At the time of the inspection, MEC personnel did not observe any indications of obvious surface contamination, such as stained soil, stressed vegetation, or unusual odors on the property.

On December 15, 1992, MEC made a request to the DOH for any public records pertaining to past or pending environmental regulatory actions within the project boundaries and to the Honolulu Fire Department (HFD) for a listing of any hazardous material spills which have occurred within approximately one-quarter mile of the site. The DOH and the HFD generally responds within forty-five days; MEC will forward a copy of their responses as soon as they are available.

To investigate the possibility of subsurface contamination of soil and ground water of the site and the area, MEC reviewed the following Federal and State data bases: Comprehensive Environmental Response Compensation and Liability Act (CERCLA or Superfund) list, National Priority List (NPL), Comprehensive Environmental Response Compensation Liability Information System (CERCLIS) list, and the Hazard Evaluation and Emergency Response (HEER) list. Presently, there are no CERCLA or Superfund sites on the island of Oahu. However, there is one CERCLIS sites within a one-quarter mile of the

This type of land is mostly near Pearl Harbor and in Honolulu, adjacent to the Ocean. It consists of areas filled with material dredged from the ocean or hauled from nearby areas, garbage, and general material from other sources. This land type is used for urban development including airports, housing areas, and industrial facilities, nut is not a capability classification.

Property History

Historical maps of the site, historic tax records, and interviews with people knowledgeable with the site, were used to compile a brief history of past operations of the project site and the surrounding area.

MEC was unable to provide a specific description of the historical uses of the property since Sanborn Fire Insurance Maps, providing historic cartography of the site, were nonexistent. However, MEC personnel, Rick Ravelo, talked with Mike Amuro at the Department of Transportation and confirmed that the land has not been utilized for any other purpose other than a highway parcel.

Tax records available from the City and County of Honolulu tax map office indicate that the investigated site has not been issued a tax map key number. However, a 18,077 ft^2 parcel with tax map key number (1) 1-2-13:22, overlies the designated site on the eastern side. In 1952, this parcel was considered the territory of Hawaii and was 10,890 ft^2. Then, in the same year, the parcel was extended to 79,052 ft^2 and later reduced to 18,077 ft^2. In

4.0 SITE SPECIFIC OBSERVATIONS AND RESULTS

Property Description

The project area is approximately a 38,000 ft^2 parcel of land located at the Keehi Interchange, Interstate FAP # IH1-1 (82), between Nimitz Highway and Kamehameha Highway at the Dillingham off ramp in Honolulu, Hawaii. The investigated area had no address or tax map key number. However, the eastern section of the site is designated as tax map key number (1) 1-2-13:22. No structural buildings were located on-site at the time of inspection. Observable items on the property consisted of several palm trees, an asphalt road, a drainage canal, a sprinkler system and a telephone pole.

The parcel is located in the Kalihi-Kai neighborhood of Oahu, and the land surrounding the site is utilized for commercial and industrial purposes. The site borders Kalihi Stream to the southeast, Nimitz Highway to the southwest side and the Dillingham off ramp of Kamehameha Highway to the North. Other surroundings businesses included Schuman's Used Cars to the North, Canon to the northwest, a vehicle storage lot to the southwest and an Industrial warehouses to the southeast.

The soil at the subject site is classified by the United States Department of Agriculture (USDA) as "Fill Land, mixed". This land type consists of areas filled with material from dredging, excavation from adjacent uplands, garbage, and bagasse slurry from the sugar mills.

Disclaimer

Conclusions reached, and observations and recommendations made in this report are based upon the conditions of the property at the time of the inspection. MEC disclaims any and all liability for any representation, whether expressed or implied, or for omissions or inaccuracies in any part of this report which may be attributable to inaccessible, not readily accessible, or obscured areas, or from incomplete or inaccurate information provided by personnel and/or owners of the site, or from missing or unobtainable information beyond our control. Please note that any negative findings developed during this survey cannot absolutely confirm the absence of environmental contamination.

Asbestos-Containing Building Materials

Asbestos-containing building materials (ACBMs) were commonly incorporated into structures built prior to 1982. The presence of ACBMs does not necessarily imply that building occupants will experience any health hazard. Most misconceptions about ACBMs and the potential for increased health risk are a result of poorly presented information and the general public's anxiety arising from a misunderstanding of such information. In addition, no regulations exist which require ACBM removal from buildings in use. Federal regulations require that for buildings to be demolished, or in areas of a building that will be demolished through renovation, amounts of friable material greater than 160 ft^2 of surfacing or 260 lineal feet of pipe covering must be removed prior to demolition. The State of Hawaii Division of Occupational Safety and Health (DOSH) requires personal air monitoring whenever asbestos-containing material is disturbed.

Measuring fibers in air to quantify exposure to asbestos is the only objective method. This approach as been criticized for measuring only current conditions and gives no information about fiber release potential and future air levels. However, when combined with an assessment of conditions, it provides a technically sound determination of ambient air levels and therefore potential risk.

materials provide information about the material pertaining to its chemical composition, storage recommendations, and first aid for human exposure. MSDSs are required to prepare a Hazard Communication Program for all people working with or around hazardous materials. As part of an assessment, inventories of all hazardous materials are compiled and methods of uses and storage are also noted.

Hazardous Wastes

Hazardous waste is strictly regulated by the EPA under the Resource Conservation and Recovery Act (RCRA). Waste generators are responsible for determining whether their waste is a hazardous waste as defined by 40 CFR Part 261, and the degree to which a generator is regulated is dependent upon the type and amount of waste generated. Firms that improperly generate, treat, store, dispose, or transport hazardous waste may be subject to large fines imposed by the State of Hawaii and the EPA. In addition, poor management of hazardous waste can also contribute to contamination of the air, soil, surface water, and groundwater of the generator's site and surrounding sites. Clean-up of uncontrolled hazardous waste sites can be a costly and lengthy process.

In the course of a site reconnaissance, waste management practices are inspected. In addition, available records from the EPA pertaining to permitted hazardous waste generators within the project area and in the surrounding area were reviewed.

PCB Items

Polychlorinated biphenyls (PCBs) are synthetic chemicals which were frequently used in the past as an additive to insulating and heat transfer fluids in electric equipment, particularly liquid-cooled electrical transformers. In 1979, the EPA banned the commerce of PCBs and passed the Toxic Substance Control Act (TSCA) to regulate the use and disposal of PCB items. As part of the assessment, an inventory of all electrical transformers, switches, and capacitors on the subject site was made.

Underground Storage Tank Systems

Underground storage tank system management is strictly regulated by the U.S. EPA under 40 CFR Part 280, and by the State of Hawaii under Section 42-62 of the Hawaii Revised Statutes. Regulations include registering all underground storage tank systems with the DOH and the City and County Fire Department. Underground storage tanks currently in use must meet rigorous leak detection, corrosion protection, and spill and overfill prevention performance standards. In addition, tank systems which are abandoned or no longer to be used in their present capacity must undergo a proper closure; upon closure, an assessment of soil or ground water contamination must be performed.

Hazardous Materials

Proper use and storage of hazardous materials is necessary to ensure a safe work place and to prevent possible environmental damage due to spills or leaks of hazardous materials to the environment. Material Safety Data Sheets (MSDSs) for all hazardous

Areas of Investigation

Obvious Surface Contamination

Obvious surface contamination is often an indication of an ongoing or past release of oil or hazardous materials and may only indicate a small fraction of surface or subsurface soil and/or water contamination. Obvious surface contamination is usually observed in the field as stained or discolored soils, stressed vegetation, or unusual odors.

Published Subsurface Contamination

To further investigate possible contamination of soil and ground water on the site and within one-quarter mile of the area, MEC reviewed the following Federal and State databases:

i) USEPA Comprehensive Environmental Response Compensation Liability Act (CERCLA or Superfund) list of uncontrolled hazardous waste sites to be remediated with federal funds

ii) USEPA National Priorities List (NPL) of hazardous waste sites to be considered for remediation with federal funds

iii) USEPA Comprehensive Environmental Response Compensation Liability Information System (CERCLIS) list of Superfund activities

iv) Hawaii Department of Health (DOH), Hazard Evaluation and Emergency Response (HEER) list of hazardous material releases.

Review of Historical Data

The historical records review focused on identifying previous landowners and their land uses. This information is usually acquired through a search of historic tax records, DOH records, historic cartography, and interviews. Specific areas of interest included: past and present on-site manufacturing and operating practices, facility development plans, and adjacent land uses from the initial utilization of the site to the present day.

Historic tax records indicate past owners and lessors of the site. Information (if available) provided by the DOH, Division of Environmental Management, consists of known environmental incidents (solid and hazardous waste, waste water discharges, chemical spills, citations or inspections by the regulatory authorities), and current operating permits. Historic cartography (if available) presents graphic illustrations of past site uses. Finally, other resources such as past environmental audits, maintenance records for existing underground storage tanks, and any other documents which could give a more detailed picture of current and potential liabilities for the client were reviewed.

Interviews

Oral interviews with people knowledgeable of the site are valuable sources of past and present site uses; some of which may not be contained in municipal records.

3.0 MATERIALS AND METHODS

Introduction

MEC personnel performed the Phase I Environmental Assessment to investigate potential environmental liabilities associated with the property. Methods used to perform the assessment were: a site reconnaissance visit, a review of historical data, interviews with people knowledgeable with the site, and preparation of a written report. Particular areas investigated included past historical uses, PCB containing items, USTs, hazardous materials and wastes, obvious surface and published subsurface contamination, and suspect ACBMs. A discussion of each method used, and each area investigated follows.

Site Reconnaissance

MEC personnel visually inspected all grounds and tenant spaces of the project area for evidence of: past releases of oil or hazardous material or any other condition that may constitute a threat of release of oil or hazardous material, items which were suspected to contain PCBs, suspect ACBMs, surface evidence of USTs, on-site hazardous material use and storage practices, and hazardous waste handling and disposal practices. Any observable evidence of soil or water contamination, PCB items, USTs, hazardous materials and wastes, or suspect ACBMs were documented through written notes as well as photographs.

2.0 INTRODUCTION

Muranaka Environmental Consultants, Inc. (MEC), has completed a Phase I Environmental Assessment of a parcel located at the Keehi Interchange, Interstate Highway FAP # IH1-1, between Nimitz Highway and Kamehameha Highway at the Dillingham off ramp in Honolulu, Hawaii. The area investigated is approximately 38,000 square feet (ft^2). The site had no address or tax map key number. However, the eastern portion is part of a lot designated as tax map key number (1) 1-2-13:22, which is owned by the State of Hawaii. There were no structural buildings located on-site.

This assessment was performed to determine the presence and the extent of potential conditions or situations at the site which may result in present real, or potential hazards, or environmental liabilities as dictated by federal, state, and local statutes or regulations. Specific areas investigated include: historical uses, obvious surface and published subsurface contamination, polychlorinated biphenyl (PCB) items, underground storage tanks (USTs), hazardous materials and wastes, and suspect asbestos-containing building materials (ACBMs).

The Phase I assessment consisted of a visual inspection of present surface conditions, a review of plans and maps of the site, a review of pertinent historical records kept by private sources as well as the Department of Health (DOH) and the United States Environmental Protection Agency (USEPA), and interviews with people knowledgeable of the site.

MEC personnel did not discover any evidence of PCB or asbestos mineral fiber materials on the property.

In conclusion, at this time, MEC does not recommend any additional investigation of the site.

Response Compensation and Liability Act (CERCLA or Superfund) sites or National Priority List (NPL) sites, within one-quarter mile of investigated site. However, there is one Comprehensive Environmental Response Compensation Liability Information System (CERCLIS) site within one-quarter mile of the site at Gaspro, 2305 Kamehameha Highway.

On December 15, 1992, MEC requested records of any past or pending environmental regulatory actions at the subject site from the DOH Department of Environmental Management. In addition, on December 15, 1992, MEC requested a listing of any hazardous material spills which have occurred within approximately one-quarter mile of the site from the Honolulu Fire Department (HFD). The DOH and the HFD generally respond within forty-five days. MEC will forward a copy of their responses as soon as they are available.

During the inspection, MEC personnel did not observe UST indicators, such as: fill pipes, dispenser pumps, vent pipes, and concrete caps. The DOH has records of eighteen USTs within approximately one-quarter mile of the site, four of which have been recorded as leaking USTs (LUSTs). Information on the exact location of five UST and two LUST sites, located at Fort Shafter, is not readily available to MEC and they may be located greater than one-quarter mile from the investigated site.

While inspecting the site, MEC personnel did not observe any United States Environmental Protection Agency (USEPA) regulated Resource Conservation and Recovery Act (RCRA) hazardous waste generated, treated, stored or disposed on-site. In addition,

1.0 EXECUTIVE SUMMARY

Muranaka Environmental Consultants, Inc. (MEC), has completed the site inspection and research for a Phase I Environmental Assessment of a parcel located at the Keehi interchange, Interstate FAP # IH1-1 (82), between Nimitz Highway and Kamehameha Highway at the Dillingham off ramp in Honolulu, Hawaii. The area investigated is approximately 38,000 square feet (ft^2). The site had no address or tax map key number. However, the eastern portion is designated as tax map key number (1) 1-2-13:22, which is owned by the State of Hawaii. There were no structural buildings located on-site.

MEC performed the assessment to determine the presence and the extent of potential conditions or situations at the site which may result in present real, or potential hazards, or environmental liabilities as dictated by federal, state, and local statutes or regulations. Specific areas investigated include: historical uses, obvious surface and published subsurface contamination, polychlorinated biphenyl-containing switches, transformers, and capacitors (PCBs), underground storage tanks (USTs), hazardous materials and hazardous wastes, and suspect asbestos-containing building materials (ACBMs).

At the time of the inspection, MEC personnel did not observe any visible evidence of obvious surface contamination at the site, and did not find any direct evidence of published subsurface contamination. The State of Hawaii Department of Health (DOH) Hazard Evaluation Emergency Response (HEER) has no records of past releases of hazardous materials on the site. Presently, there are no Comprehensive Environmental

TABLE OF CONTENTS

DOCUMENT CAPTURED AS RECEIVED

BENJAMIN J. CAYETANO
[redacted]
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

220 SOUTH KING STREET
FOURTH FLOOR
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE [illegible]

brand fax transmittal memo 7671	# of pages ▸ 1
To Jeff Coelho	From Ann Shiigi
Co. KUMU Radio	Co. State DOT
Dept.	Phone # 587-2022
Fax # 538-6425	Fax #

August 1, 1995

TO: Mr. Kats Uyeoka
Department of Transportation

FROM: Leslie Segundo *Leslie Segundo*
Office of Environmental Quality Control

SUBJECT: Draft Environmental Assessment, Interstate Highway, FAP No. I-H1-1(82), Keehi Interchange, Proposed KUMU Transmission Tower.

Having reviewed the subject document prepared by Mr. Jeff J. Coelho and transmitted by your Director's, July 20, 1995, letter (HWY-RM 3.69861), I have been directed to inform you that the draft environmental assessment does not meet the content requirements for environmental assessments set forth in section 11-200-10, Hawaii Administrative Rules. Because a lack of administratively required information compromises the public review process mandated by section 343-5(c), Hawaii Revised Statutes, we are unable to fulfill our statutory responsibility to process a Chapter 343, HRS document/determination for publication until the following information to complete the environmental assessment is received.

Please revise the draft environmental assessment (DEA) to conform to the environmental assessment content requirements of section 11-200-10, Hawaii Administrative Rules. A copy of the "Guidebook to the Hawaii State Environmental Review Process" is enclosed for your information. Appendix F contains useful information pertaining to environmental assessments. Also, please incorporate the following in the DEA and submit the DEA to our office at your earliest convenience. (Telephone facsimile transmittals are acceptable if followed by a mailed original).

- Description of the affected environment, including a detailed map (preferably the United States Geological Survey topographic map) and related regional map (HAR §11-200-9(b); this is necessary in order for the reader to fully understand the discussion of environmental impact.
- In discussing environmental impacts, it generally is not sufficient to state a conclusion without providing the line of reasoning supporting the conclusion. Each instance where the DEA concludes that there will be "no significant effect" needs to provide a clear and concise pathway of reasoning linking the significance criteria in section 11-200-12(b) of the Hawaii Administrative Rules to the conclusion of "no significant effect."
- To conform to Act 241, SLH 1992, please delete the term "Negative Declaration" on page 1 of the DEA and replace with the term "Draft Environmental Assessment."

If there are any questions, please call me at 586-4185

Enclosure

c: Director, OEQC
Director, DOT

PUB

KUMU AM/FM

Hawaii's Place to Relax

FM - 94.7 AM 1500

ɪnolulu Office:
1 N. Nimitz Hwy.
ɪnolulu, 96817

Phone: (808) 531-4511
Fax: (808) 538-6425

:ptember 22, 1994

KUMU RADIO TRANSMISSION TOWER

r. John T. Harrison
ɿvironmental Coordinator
ɿvironmental Center, University of Hawaii
350 Campus Road Crawford Hall 317 Honolulu, Hawaii 96822

ear Mr. Harrison:

'e are pleased to respond to your concerns regarding our new transmitter facility. This project now into its fifth year, and during this time we have spent a great deal of effort to ensure .at the operation of this tower will enhance the public interest and in no way present any ɜgative impact to the surrounding neighborhood or community at large.

ddressing your concerns,

lectromagnetic Radiation

he tower will be used to transmit the program of KUMU II on AM 1500 KHZ. The nominal power 10 KW. The transmission pattern is non-directional. It has been shown that the operation of ıis tower will have a negative impact on the environment. The engineering study proving this was ɜrformed by du Treil, Lundin & Rackley, Inc. As verified in the attached document, this tower categorically excluded for environmental processing by being totally within the FCC-specified uidelines for Human Exposure to Radiofrequency Radiation.

isual Characteristics

he only building within viewing range of the tower is to the East, owned by First Hawaiian Bank. here are no primary viewing sites from this building facing West. Because the viaduct Kalihi ıterchange is considerably higher and infinitely more massive to the West of the tower, any ·ew from the East to the West will be dominated by the Kalihi viaduct, vertically and horizontally. .ıe open lattice construction of the tower and neutral coloration of its structure will make it ırtually invisible to the naked eye, because of the viaduct background.

CORRECTION

THE PRECEDING DOCUMENT(S) HAS BEEN-REPHOTOGRAPHED TO ASSURE LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

DOCUMENT CAPTURED AS RECEIVED

KUMU AM/FM

Hawaii's Place to Relax

FM - 94.7   AM 1500

ınolulu Office:
1 N. Nimitz Hwy.
ınolulu, 96817

Phone: (808) 531-4511
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:ptember 22, 1994

KUMU RADIO TRANSMISSION TOWER

r. John T. Harrison
ıvironmental Coordinator
ıvironmental Center, University of Hawaii
550 Campus Road Crawford Hall 317 Honolulu, Hawaii 96822

ear Mr. Harrison:

/e are pleased to respond to your concerns regarding our new transmitter facility. This project now into its fifth year, and during this time we have spent a great deal of effort to ensure at the operation of this tower will enhance the public interest and in no way present any egative impact to the surrounding neighborhood or community at large.

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.. John T. Harrison
ıvironmental Coordinator
2-

storical Perspective

JMU was sharing a tower owned by KAIM in Kaimuki. KAIM decided to re locate their operation a high power installation on Molokai beamed at Samoa. When they removed Kaimuki, it became ecessary for KUMU to re-locate as well.

onclusions

ıe EA reviewed by the UH environmental center may not have included the complete disclosure ade as part of this proposal to the State of Hawaii and the City and County of Honolulu. In the ll proposal, full substantive research concerning health concerns has been addressed by the ıgineering firm of duTreil, Lundin & Rackley, Inc, with the conclusion that this project is clean and esents a totally negative impact on environmental concerns.

ncerely,

ff Coelho
ecutive Vice President
JMU Radio

:
oger Fujioka
ızutoshi Najita
ıul Berkowitz

University of Hawai'i at Mānoa

Environmental Center
A Unit of Water Resources Research Center
Crawford 317 • 2550 Campus Road • Honolulu, Hawai'i 96822
Telephone: (808) 956-7361 • Facsimile: (808) 956-3980

September 22, 1995
EA:0129

Mr. Jeff Coelho
Radio KUMU
441 North Nimitz
Honolulu, Hawaii 96819

Dear Mr. Coelho:

Draft Environmental Assessment
KUMU Radio Transmission Tower
Honolulu, Hawaii

Radio KUMU proposes to construct a 150-foot tall radio tower and a single story transmitter facility on a parcel of land located at the Keehi interchange between Nimitz Highway and Kamehameha Highway. The parcel of land currently contains no buildings.

We reviewed this Draft Environmental Assessment (EA) with the assistance of Kazutoshi Najita, Electrical Engineering; and Paul Berkowitz of the Environmental Center.

Electromagnetic Radiation

Given the 150 foot height of the radio tower, there may or may not be environmental impacts from the high powered radio wave propagation. Unfortunately, this Draft Environmental Assessment does not provide any information about the characteristics of the electromagnetic radiation. Therefore, it is impossible to accurately access the impacts of the proposed project. At a minimum, this EA should include information about the transmission frequency, the power level, the transmission pattern, and possible impacts on workers in the surrounding area. Given the significant health effects (such as increased risk of cancer) which can result from exposure to electromagnetic radiation, it is essential for this Draft EA to provide the public with enough information to reasonably assess the project's impacts.

Visual Characteristics

This EA states that the only visual changes will include a "small triangular based lattice tower (three equal sides of 36 inches)." A 150-foot tall tower seems neither small nor unobtrusive. Will this tower affect the views from nearby buildings?

Historical Perspective

The proposed transmission tower is intended to replace the former KUMU radio tower which was removed from Kaimuki two years ago. What was the reason for removing the tower from Kaimuki?

Conclusions

The purpose of Chapter 343 of the Hawaii Revised Statutes is to ensure that environmental concerns are given adequate attention in the decision making process. A crucial part of this procedure involves determining whether a proposed action will have a significant impact on the environment. Given the potential health effects of electromagnetic radiation, the KUMU radio tower could have a significant environmental effect (as stipulated in Section 11-200-12 of the Hawaii Administrative Rules) since it has the potential to substantially affect public health.

In its present form, the KUMU Draft EA undermines the Chapter 343 requirements since it does not disclose any information regarding the project's potential to affect human health. Have these health concerns been addressed in the planning process? If so, why were they omitted from the EA? Without this information on radio wave propagation, it is virtually impossible for decision makers and the public to adequately evaluate the proposed project. Thus it seems unavoidable that the document should be withdrawn and resubmitted with proper attention given to these health concerns.

Thank you for the opportunity to review this Draft EA.

Sincerely,

John T. Harrison
Environmental Coordinator

cc: OEQC
Department of Transportation
Roger Fujioka
Kazutoshi Najita
Paul Berkowitz

BENJAMIN J. CAYETANO
~~JOHN WAIHEE~~
GOVERNOR

KAZU HAYASHIDA
~~REX D. JOHNSON~~
DIRECTOR

DEPUTY DIRECTORS
KANANI HOLT
GLENN M. OKIMOTO
JOYCE T. OMINE
~~[illegible]~~

IN REPLY REFER TO.

HWY-RM
3.69243

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
RIGHT-OF-WAY BRANCH
888 MILILANI STREET, SUITE 502
HONOLULU, HAWAII 96813

JAN 11 1995

KUMU AM/FM Radio
441 North Nimitz Highway
Honolulu, Hawaii 96817

Attention Mr. Jeff Coelho

Gentlemen:

Interstate Highway, FAP No. I-H1-1(82)
Keehi Interchange, Portion of Right-of-Way
Between Ramps B and D

Enclosed is your copy of the fully executed Revocable Permit No. HY-94-075, effective January 15, 1995. As a reminder, you are responsible for real property taxes as specified in the terms and conditions of the permit. The Real Property Tax Office receives a copy of this permit and they will bill you accordingly.

Please make your monthly rental payments, made out to the State Department of Transportation to:

State Department of Transportation
Highways Division, FISCAL OFFICE
869 Punchbowl Street
Honolulu, Hawaii 96813

If you have any questions, please call me at 587-2023.

Very truly yours,

Michael K. Amuro

MICHAEL K. AMURO
Head
Property Management Section

Enclosure

LEASE

DOT 4-715
(HWY-R 6/91)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

REVOCABLE PERMIT NO. HY-94-075

The STATE OF HAWAII, hereinafter called the "STATE," hereby grants to the "PERMITTEE" permission to enter, use and occupy on a month-to-month basis the premises described in item 2, and outlined in red on Exhibit "A," attached hereto and made a part hereof, for the purpose(s) specified in item 4; and the PERMITTEE agrees to pay the rental specified in item 5 and to perform all other obligations imposed upon it by the Terms and Conditions hereof.

1. PERMITTEE: (NAME AND ADDRESS):	KUMU AM/FM Radio 441 North Nimitz Highway Honolulu, Hawaii 96817
2. PREMISES:	Approximately 3,600 square feet of land more or less between ramps
3. LOCATION:	Interstate Highway, FAP No. I-H1-1(82) Keehi Interchange, Portion of Right-of-Way Between Ramps B and D, Honolulu, Hawaii
4. PURPOSE(S):	Radio Transmission Tower
5. RENTAL:	$375.00 per month
6. SECURITY DEPOSIT:	$750.00
7. EFFECTIVE DATE:	January 15, 1995
8. LIQUIDATED DAMAGES:	$ 75.00 per day
9. SERVICE CHARGE:	None

Dated at Honolulu, Hawaii, December 23, 1994

STATE OF HAWAII

By [signature]
Its Director of Transportation

PERMITTEE

Kumu Am/Fm

By [signature]
Its PRESIDENT

By [signature]
Its Vice President

TERMS AND CONDITIONS

1. TERM. This permit is granted on a month-to-month basis only, for a period not to exceed one year from the effective date hereof. Any renewal of this Permit shall be on a month-to-month basis for a period not to exceed one year. Notice of renewal need not be reduced to writing, it being agreed that such renewal shall be automatic unless a party hereto shall give the other party ten(10) day's notice of its intention not to renew or unless the Board of Land and Natural Resources shall fail to approve the renewal. Further, this Permit will not be renewed or a new Permit granted, should the PERMITTEE not be current in its obligations to the STATE.

2. PERMITTEE's PRIOR INSPECTION. The PERMITTEE warrants that it has inspected the Premises and all improvements thereon, knows the condition thereof and fully assumes all risks incident to the use and enjoyment of the premises.

3. SECURITY DEPOSIT. The PERMITTEE, upon execution of this Permit, shall deposit with the STATE in legal tender or in such other form as may be acceptable to the STATE an amount equal to two months' rental as security for the faithful performance on its part of all the terms and conditions, including the special terms and conditions, if any, specified in paragraph 29 of this Permit. The deposit will be returned, without interest, to the PERMITTEE upon the termination of this Permit only if it has faithfully performed said terms and conditions to the satisfaction of the STATE. In the event the PERMITTEE does not so perform, the STATE may declare the deposit forfeited or apply it as an offset to any amounts owed by the PERMITTEE to the STATE under this Permit or to any damages of loss to the STATE caused by the breach by the PERMITTEE of such terms and conditions. The exercise of this option is without prejudice to the right of the STATE to institute action for debt or damages against the PERMITTEE or take any other or further action against the PERMITTEE provided by law for the enforcement of the rights of the STATE under this Permit.

4. INSURANCE. The PERMITTEE shall, concurrently with the execution of this Permit, deliver to the STATE a Comprehensive General Liability Insurance policy or policies, or a certificate of insurance in lieu thereof, evidencing that such policy has been issued and is in force, with a combined single limit of not less than $500,000 for bodily injury and damage to property per occurrence. The specification of limits contained herein shall not be construed in any way to be a limitation on the liability of the PERMITTEE for any injury or damage or for any rent, service charge or other charges under this Permit.

Such insurance shall (a) be issued by an insurance company or surety company authorized to do business in the State of Hawaii or approved in writing by the Director of Transportation; (b) name the State of Hawaii as an additional insured; (c) provide that the Department of Transportation shall be notified at least thirty (30) days prior to any termination, cancellation or material change in its insurance coverage; (d) cover all injuries, losses or damages arising from, growing out of or caused by any acts or omissions of the PERMITTEE, its officers, agents, employees, invitees or licensees, in connection with the PERMITTEE's use or occupancy of the Premises; and (e) be maintained and kept in effect at the PERMITTEE's own expense throughout the life of this Permit, evidenced by furnishing the STATE without notice of demand a like certificate upon each renewal thereof.

5. FIRE INSURANCE. The PERMITTEE shall procure immediately and keep in force with respect to the Premises a fire insurance policy for real property improvements in the amount determined by the DEPARTMENT whenever it is deemed necessary and specified in the special terms and conditions.

6. INDEMNITY. The PERMITTEE shall at all times with respect to the Premises use due care for public safety and shall defend, hold harmless and indemnify the State, its officers, agents and employees from and against all claims and demands for damages, including claims for property damage, personal injury or death, (a) arising on the Premises, or by reason of any fire of explosion thereon; or (b) arising from, growing out of, or caused by any act or omission on the part of the PERMITTEE, its officers, agents, employees, invitees or licensees, in connection with the PERMITTEE's use or occupancy of the Premises.

7. METHOD OF PAYMENT OF RENTAL AND SERVICE CHARGE ON DELINQUENT PAYMENTS. The monthly rental shall be payable in advance, without notice or demand, at the Highways Division Fiscal Office on Oahu on the first day of each and every month during the life of this Permit. Without prejudice to any other remedy available to the STATE, the PERMITTEE agrees without further notice or demand, as follows: (a) To pay a service charge, currently set at $25.00, of up to $50.00 each month for all delinquent payments in accordance with the Hawaii Administrative Rules; and (b) That the term "delinquent payments" as used herein means any payment of rent, fees, service charges, or other charges payable by the PERMITTEE to the STATE, which are not paid when due.

8. INTEREST. Without prejudice to any other remedy available to the STATE, the PERMITTEE agrees withour further notice or demand, to pay interest at a rate of one per cent (1%) per month, compound interest, shall be assessed against the PERMITTEE for any rentals and other charges not paid when due and such sum shall continue to be assessed against the PERMITTEE until the principal sum and the interest are paid in full.

9. ACCEPTANCE OF RENT NOT A WAIVER. The acceptance of rent by the STATE shall not constitute a waiver of any breach by the PERMITTEE of any of the terms and conditions upon which this Permit is granted and to which the PERMITTEE agrees, or of the STATE's right to terminate or revoke this Permit. Failure by the STATE to insist upon strict performance hereof by the PERMITTEE, or to exercise any option herein reserved, shall not be construed as a waiver or as a relinquishment of any of its rights under this Permit.

10. RESERVATION OF RIGHT TO INCREASE OR DECREASE RENT. The STATE reserves the right to increase or decrease the monthly rental at any time upon thirty (30) days' advance written notice.

11. UTILITIES AND OTHER CHARGES. The PERMITTEE shall be responsible for and pay all charges for water, electricity, telephone and other utilities and all charges for sewer, garbage and trash disposal; where any of such services are provided by the STATE at the request of the PERMITTEE, it shall pay the STATE's charges therefor.

12. WASTE, STRIP AND NUISANCE; MAINTENANCE. The PERMITTEE shall not make, permit or suffer any waste, strip, nuisance or any other unlawful, improper or offensive use of the Premises.

The PERMITTEE shall maintain the premises, improvements thereon, all equipment and other personal property of the PERMITTEE upon the Premises in a strictly clean, neat, safe, orderly and sanitary condition, free of waste, rubbish and debris and shall provide for the safe and sanitary handling and disposal of all trash, garbage and other refuse from the Premises.

13. **ENTRY BY STATE.** The STATE or its agents and employees may enter the Premises at all reasonable hours to inspect the Premises and determine if the PERMITTEE is complying with the terms and conditions of this permit or for any other proper purpose. The PERMITTEE shall not make any claim for damages or set off of rent, service charge or other charges by reason or on account of such entry.

14. **REPAIRS.** The PERMITTEE shall, at its own expense, keep and maintain the Premises in a condition similar to that which existed on the effective date of this Permit, ordinary wear and tear and damage by acts of God excepted.

15. **STRUCTURAL IMPROVEMENTS, ALTERATIONS OR ADDITIONS.** No substantial improvement, alteration or addition of a structural nature shall be made, installed or constructed on, under or within the Premises by the PERMITTEE unless it first submits its plans and specifications therefor to the STATE for its approval and unless said plans and specifications are in fact approved in writing by the STATE. Such plans and specifications shall not be submitted unless they are in full compliance with all applicable statutes and rules and regulations.

Any improvements, alterations or additions shall be accomplished at the sole cost and risk of the PERMITTEE and the STATE shall not be responsible for any damage to destruction of any such improvements, alterations or additions of any personal property on the Premises.

16. **REMOVAL OF IMPROVEMENTS OR ADDITIONS.** The PERMITTEE may remove, at its own cost and risk, any and all improvements or additions or any portions thereof, constructed or installed by it upon the Premises, at any time during the life of this Permit or within thirty (30) days after the termination or revocation hereof; provided that, the PERMITTEE shall give, prior to said termination or revocation, written notice of its intent to remove the same and that in the event of such removal, the Premises shall be restored by the PERMITTEE *to a condition similar to that which existed immediately* prior to the construction or installation thereof; ordinary wear and tear excepted and damage by acts of God excepted; provided further that, until such removal and restoration has been completed to the satisfaction of the STATE, the PERMITTEE shall continue to pay the rent set forth in item 4 herein. Failure of the PERMITTEE to give notice of intention to remove prior to termination or revocation shall be deemed to be abandonment of said improvements or additions.

17. **OPTION TO REQUIRE REMOVAL OF IMPROVEMENTS OR ADDITIONS.** The STATE, with respect to any improvements or additions or any portions thereof constructed or installed by the PERMITTEE on the Premises, reserves the right within twenty (20) days after the date of termination or revocation of this Permit to require the PERMITTEE to remove the same at the PERMITTEE's cost and risk within thirty (30) days after said termination or revocation. Upon failure of the PERMITTEE to effect such removal within the specified time, the STATE may effect such removal and restore the Premises to a condition similar to that which existed immediately prior to the construction of the improvements or additions by its own employees or by an independent contractor and assess the PERMITTEE the total cost thereof.

18. **COMPLIANCE WITH LAWS; DISCRIMINATION PROHIBITED.** The PERMITTEE shall comply with all laws, ordinances and rules and regulations of all governmental agencies, applicable to the Premises or relating to and affecting any business or other commercial activity conducted on the Premises.

The use and enjoyment of the Premises shall not be in support of any policy which discriminates against anyone based upon race, creed, color, sex or national origin.

19. **TRANSFERABILITY.** This Permit and the Premises or any part thereof, inclusive of any and all rights or obligations accruing or arising under it, shall not be sold, transferred, assigned, leased, mortgaged, sublet or otherwise alienated or encumbered in any manner whatsoever.

20. **PROPERTY TAXES.** The PERMITTEE shall pay all real property taxes lawfully assessed against the Premises.

21. **TERMINATION AND REVOCATION.** This Permit may be terminated by either party without cause upon thirty (30) days' advance written notice; provided that, in the event the PERMITTEE fails to pay any rental, service charge, interest, fees or charges when due or otherwise breaches any of the terms and conditions, the STATE may revoke this Permit upon five (5) calendar days' written notice.

22. **RIGHT TO RE-ENTER AND ASSUME POSSESSION.** The STATE reserves the right and the PERMITTEE agrees that, upon breach of any one or more of the terms and conditions of this Permit and/or termination thereof under Paragraph 21 herein, the STATE may, without necessity of court action, enter upon and administratively take possession of the Premises from the PERMITTEE.

23. **RESTORATION.** The PERMITTEE shall, within thirty (30) days of the termination or revocation of this Permit, restore the Premises, at its own cost and risk, to a condition similar to that which existed prior to the effective date of this Permit, reasonable and ordinary wear and tear and damage by acts of God excepted, and peacefully surrender possession thereof to the STATE. In the event the PERMITTEE fails to effect such restoration of the Premises, the STATE may accomplish the same by its own employees or by an independent contractor and assess the PERMITTEE the total cost thereof.

24. **LIQUIDATED DAMAGES.** If the PERMITTEE does not vacate the Premises upon the revocation of this Permit by the STATE, the PERMITTEE shall pay the STATE liquidated damages in an amount equal to 20% of the current monthly rental for each day or portion thereof the PERMITTEE remains on the Premises over said date of revocation. Such payment is to be in addition to any other rights or remedies the STATE may be entitled to pursue for breach of contract or for illegal occupancy.

25. **COURT COSTS AND ATTORNEY'S FEES.** The PERMITTEE shall pay any and all court costs and attorney's fees incurred or paid by the STATE in collecting rents, penalties, service charges, fees or other charges due from or payable by the PERMITTEE under this Permit in removing from the Premises the PERMITTEE and any improvements or additions constructed or installed by it thereon, or in recovering any damages or losses caused by the PERMITTEE's breach of any of the terms and conditions of this Permit.

26. **INTERPRETATION.** The use of any gender shall include all genders, the use of the singular shall include the plural and the use of the plural shall include the singular, as the context may require.

27. **CONFLICTING TERMS AND CONDITIONS.** When an inconsistency exists between these Terms and Conditions and the Special Terms and Conditions, the Special Terms and Conditions shall govern.

28. DISPUTES AND/OR QUESTIONS. Any and all disputes and/or questions arising under this Permit shall be referred to the Director of Transportation and the Director's determination of such disputes or questions shall be final and binding on the parties.

29. SPECIAL TERMS AND CONDITIONS.

A. Highway and/or roadway columns shall be adequately protected.

B. Storage of flammable materials and/or the construction of any structure shall not be permitted without prior approvals.

C. The STATE will not be responsible for any damages to cars or personal property on the Premises because of water runoff from any State viaduct,water leakage from the extension joints, damage caused by any falling or thrown objects, bird droppings, etc.

D. Should the PERMITTEE do any paving, the PERMITTEE shall, prior to paving, remove the same amount of material from the Premises as it places on the ground.

E. Should the rental called for in item 5 require that a percentage rental be paid, the PERMITTEE shall submit the excess of the percentage rental over the base rental on or before the last day of the month following the month for which the rental is applicable, together with a statement reporting the gross income for the prior month. The term "Gross Income" shall mean all gross revenues and income earned through the operation of the business less the State General Excise Tax.

F. Should the purpose of this Permit as specified in item 4 be for a lunch wagon operation, paragraphs 14, 15, 16, 17 and 23 of these Terms and Conditions shall be inapplicable.

G. If applicable, under 29 E above, the following shall apply: Interest. Without prejudice to any other remedy available to the STATE, interest at the rate of one per cent (1%) per month, compound interest, shall be assessed against the PERMITTEE for any rentals not paid when due and any percentage of gross receipts not paid including those unreported and discovered through audit by the STATE, and such sum shall continue to be assessed against the PERMITTEE until the principal sum and the interest are paid in full.

H. Business Records: The PERMITTEE shall maintain and keep in accordance with accepted accounting practices and on the accrual basis, true and accurate accounts, books, data and records of its operations, which shall, among other things, show all sales made and services performed for cash, credit or otherwise and also, the gross receipts of the concession.

I. The STATE reserves the right and PERMITTEE agrees to the examination and audit of the gross receipts of such records, books of account, cash register tapes, sales slips and the like at any time during the term of the Permit; if such examination or audit reveal discrepancies, the PERMITTEE shall reimburse the STATE for any underpayments made to it as a result of errors in monthly statements. The STATE shall reimburse or credit the PERMITTEE for any overpayments received by it as a result of any such errors.

J. The STATE reserves the right to terminate this Permit in the event the PERMITTEE fails to keep proper business records as specified under Paragraph 29 H and I herein. The STATE may revoke this Permit upon five (5) calendar days' written notice.

K. A person, partnership, or corporation shall not be granted a permit covering public lands if, during the five (5) years preceding the date of the permit, a previous sale, lease, license, permit or easement covering public lands was cancelled for failure to satisfy the terms and conditions thereof.

L. PERMITTEE will allow the STATE (DOT) to utilize the transmission tower for DOT's transmitter to monitor traffic conditions when DOT is ready to operate its transmitter.

Subsurface Investigation Report
Proposed 150 ft. KUMU Radio Tower
Keehi Interchange
Nimitz Highway at Dillingham Boulevard
Kalihi, Honolulu, Hawaii

for

KUMU Radio
441 North Nimitz Highway
Honolulu, Hawaii 96817

by

Stewart Engineering, Inc.
145 Hekili Street Suite 100
Kailua, Oahu, Hawaii

April 7, 1993

CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

Subsurface Investigation Report
Proposed 150 ft. KUMU Radio Tower
Keehi Interchange
Nimitz Highway at Dillingham Boulevard
Kalihi, Honolulu, Hawaii

for

KUMU Radio
441 North Nimitz Highway
Honolulu, Hawaii 96817

by

Stewart Engineering, Inc.
145 Hekili Street Suite 100
Kailua, Oahu, Hawaii

April 7, 1993

SOILS

Subsurface Investigation Report
Proposed 150 ft. KUMU Radio Tower
Keehi Interchange
Nimitz Highway at Dillingham Boulevard
Kalihi, Honolulu, Hawaii

Introduction

Transmitted herein are the results of a subsurface investigation performed at the site of the new KUMU Radio Tower proposed to be constructed within an open area of the Keehi Interchange between Nimitz Highway and Dillingham Boulevard in Honolulu, Hawaii. The purpose of this investigation was to determine the general subsurface conditions existing on the property and to evaluate the suitability of these conditions for support of the planned tower and the small transmitter building to be located near the tower.

This report includes the findings and conclusions of our investigation and presents recommendations for support of the proposed tower and related construction at the new project site. This investigation was performed in accordance with our proposal dated March 5, 1993.

Site Description

The site of the proposed new radio tower is a triangular shaped parcel approximately 20,000 square feet in area located within the southeastern side of the Keehi Interchange for the H-1 Freeway in the Kalihi area of Honolulu, Hawaii. The parcel is owned by the State of Hawaii and is apparently administered by the Department of Transportation, Division of Highways.

The property is bounded by Nimitz Highway to the south and an off-ramp from Keehi Interchange which leads to Dillingham Boulevard on the north side of the parcel. A portion of Kalihi Stream forms the eastern boundary. The general site location can be seen on the Project Location Map, Figure 1 of the Appendix.

Subsurface Investigation Report
Proposed 150 ft. KUMU Radio Tower
Keehi Interchange
Nimitz Highway at Dillingham Boulevard
Kalihi, Honolulu, Hawaii

for

KUMU Radio
441 North Nimitz Highway
Honolulu, Hawaii 96817

by

Stewart Engineering, Inc.
145 Hekili Street Suite 100
Kailua, Oahu, Hawaii

April 7, 1993

Project: New KUMU Radio Tower, Honolulu
Project No.: 070
Date: March 19, 1993

Boring No.: 2
Surface Elevation: 5 ft.(approx.)
Depth to Groundwater: 5 ft. ±

Laboratory Test Data	% Moist.	Dry Dens. (pcf)	Blows per foot	Sample	Depth (ft)	Description
					1	Tan silty coral Sand and Gravel, dense, slightly moist
					2	grades to moist, very dense
	13	96	81	1		
					3	
					4	grades to very moist, dense
27% passing No.200 sieve	34	87	37	2	5	
					6	Dark gray/black clayey Silt and Sand with many broken coral fragments in gravel sizes, wet, soft to medium stiff
					7	
	33	85	7	3	8	(petroleum odor)
					9	
					10	(soft drilling to 13 ft.)
(lost sample)	-	-	5	4	11	
					12	
					13	
(lost sample)	-	-	5	5	14	
					15	Boring terminated at a depth of 15 ft. Groundwater encountered at approximately 5 ft. Petroleum odor noticed at a depth of 7 ft.
					16	
					17	
					18	
					19	
					20	

Figure 5

Project: New KUMU Radio Tower, Honolulu
Project No.: 070
Date: March 19, 1993

Boring No.: 3
Surface Elevation: 5 ft.(approx.)
Depth to Groundwater: 5 ft. ±

Laboratory Test Data	% Moist.	Dry Dens. (pcf)	Blows per foot	Sample	Depth (ft)	Description
					1	Tan clayey Silt and Sand with coral gravel, dense, dry to slightly moist
	36	80	43	1	2	grades to tan silty coral Sand and Gravel, moist, dense
					3	
					4	
40% passing No.200 sieve	32	96	12	2	5	grades to very moist, medium dense to loose
					6	Dark gray/black silty coral Sand and Gravel(broken coral fragments), wet, soft to medium stiff; with some broken glass pieces; petroleum odor
					7	
	99	45	4	3	8	grades to gray/brown clayey Silt and fine Sand, soft, wet; with rounded basalt gravel up to 3/4-inch in size, coral fragments, and organics; isolated hard pockets
					9	
					10	
	59	67	5	4	11	
					12	
					13	grades with rounded basalt gravel up to 2 inches in size
(lost sample)	-	-	6	5	14	
					15	
					16	Boring terminated at a depth of 15 ft. Groundwater encountered at approximately 5 ft. Petroleum odor noticed at a depth of 7 ft.
					17	
					18	
					19	
					20	

Figure 6

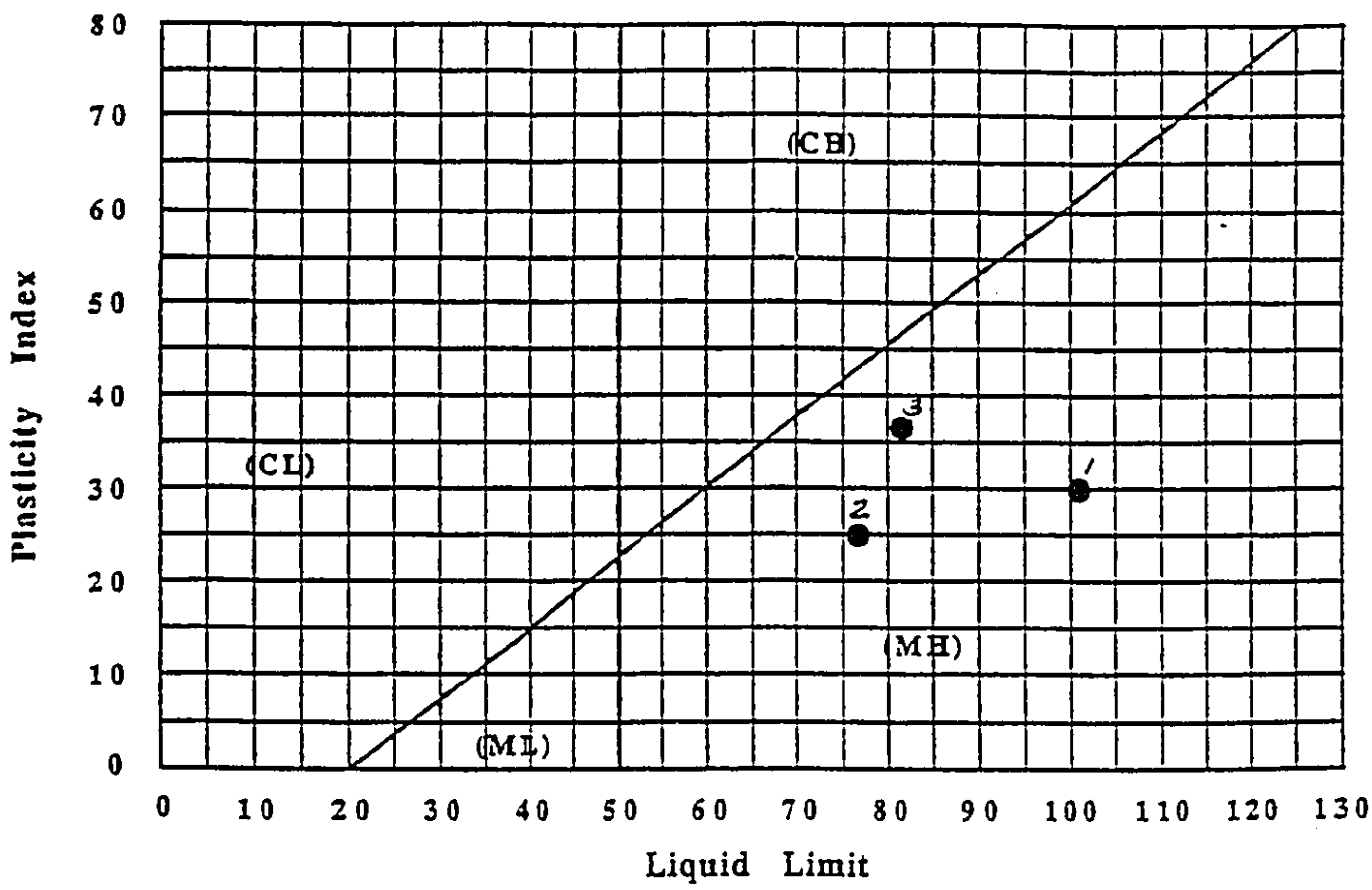
Project: New KUMU Radio Tower, Honolulu
Project No.: 070
Date: March 19, 1993

Boring No.: 4
Surface Elevation: 5 ft.(approx.)
Depth to Groundwater: 5 ft.±

Laboratory Test Data	% Moist.	Dry Dens. (pcf)	Blows per foot	Sample	Depth (ft)	Description
					1	Tan silty coral Sand and Gravel, dense, dry to slightly moist
	7	69	27	1	2	grades less silty, medium dense
					3	
					4	grades to wet, medium dense to loose, more silty; petroleum odor
30%passing No.200 sieve	48	73	7	2	5	
					6	
					7	grades with fewer fines, some organic material, wet, medium dense
	34	80	11	3	8	
					9	
					10	Dark gray silty coral and basalt Sand and Gravel, wet, loose/soft; with some shells and wood
	36	92	3	4	11	
					12	
					13	grades more sandy, with more broken coral fragments, very soft, wet
	52	75	2	5	14	
					15	
					16	Boring terminated at a depth of 15 ft. Groundwater encountered at approximately 5 ft.
					17	
					18	
					19	
					20	

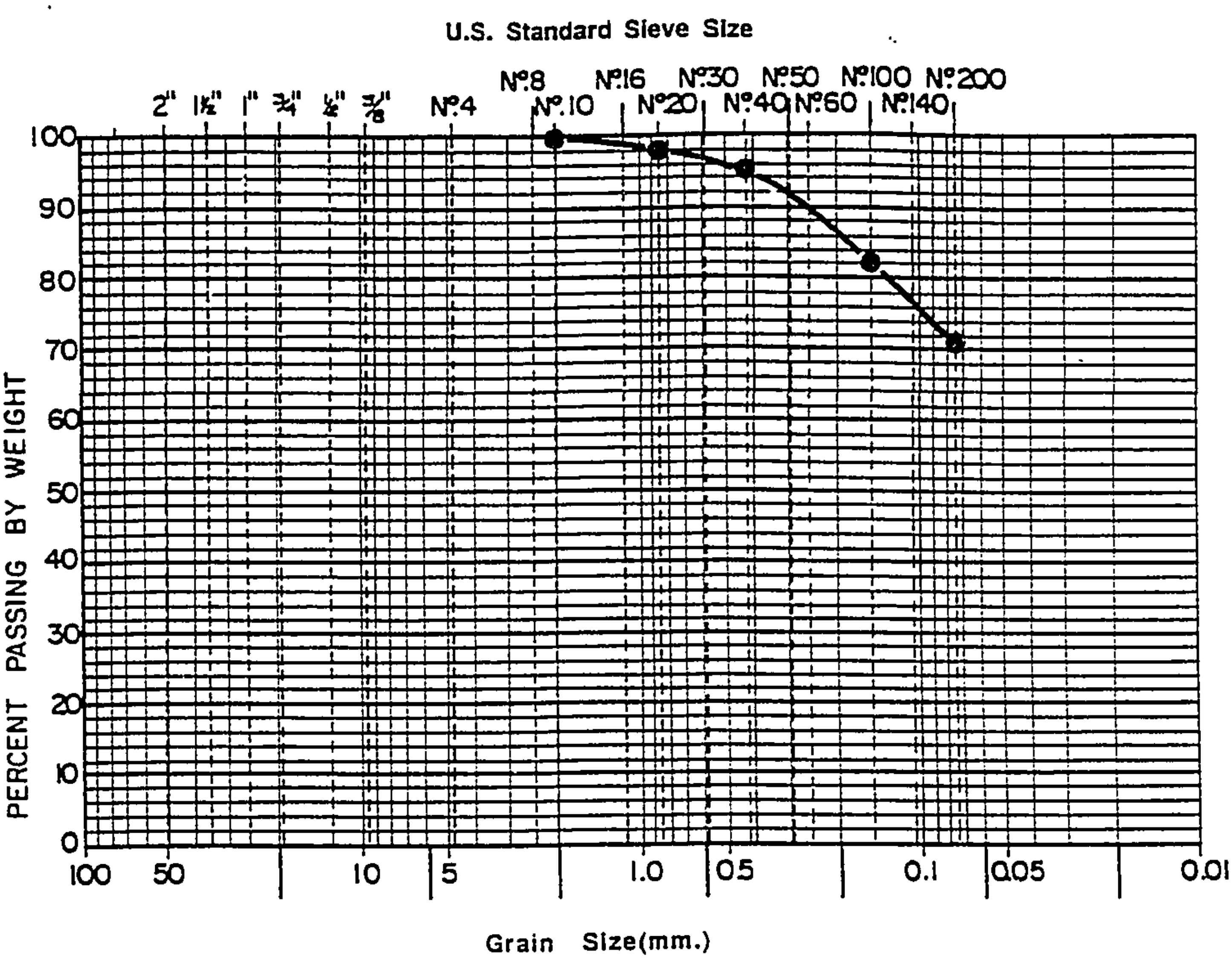
Figure 7

PLASTICITY CHART



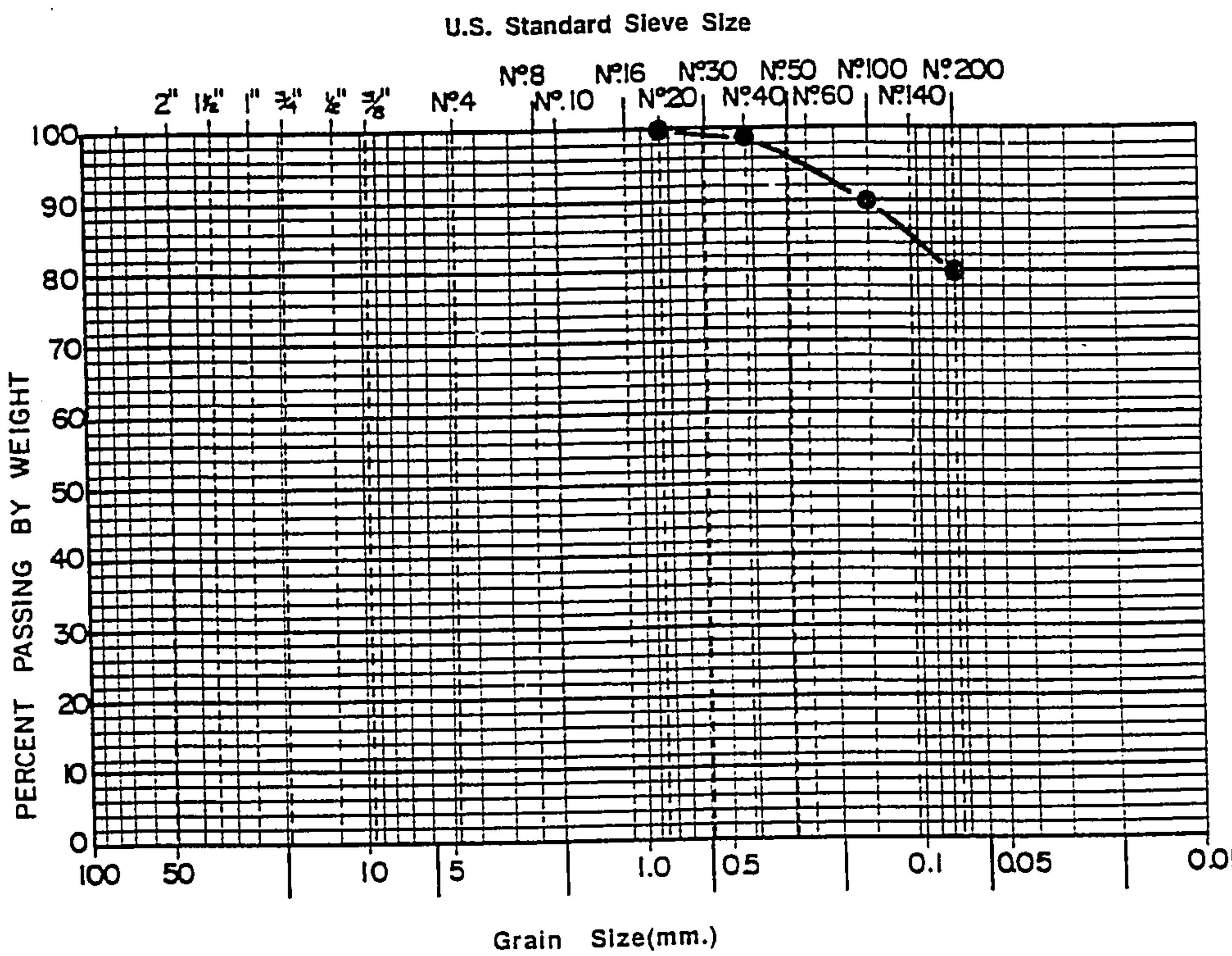
Sample No.	Sample Location	Depth (ft.)	Liquid Limit, %	Plastic Limit, %	Plasticity Index(PI)	USC Symbol
1	B-1	30.5	101	71	30	MH/OH
2	B-1	36	77	52	25	MH/OH
3	B-1	40	82	45	37	MH/OH

Figure 8: Plasticity Data



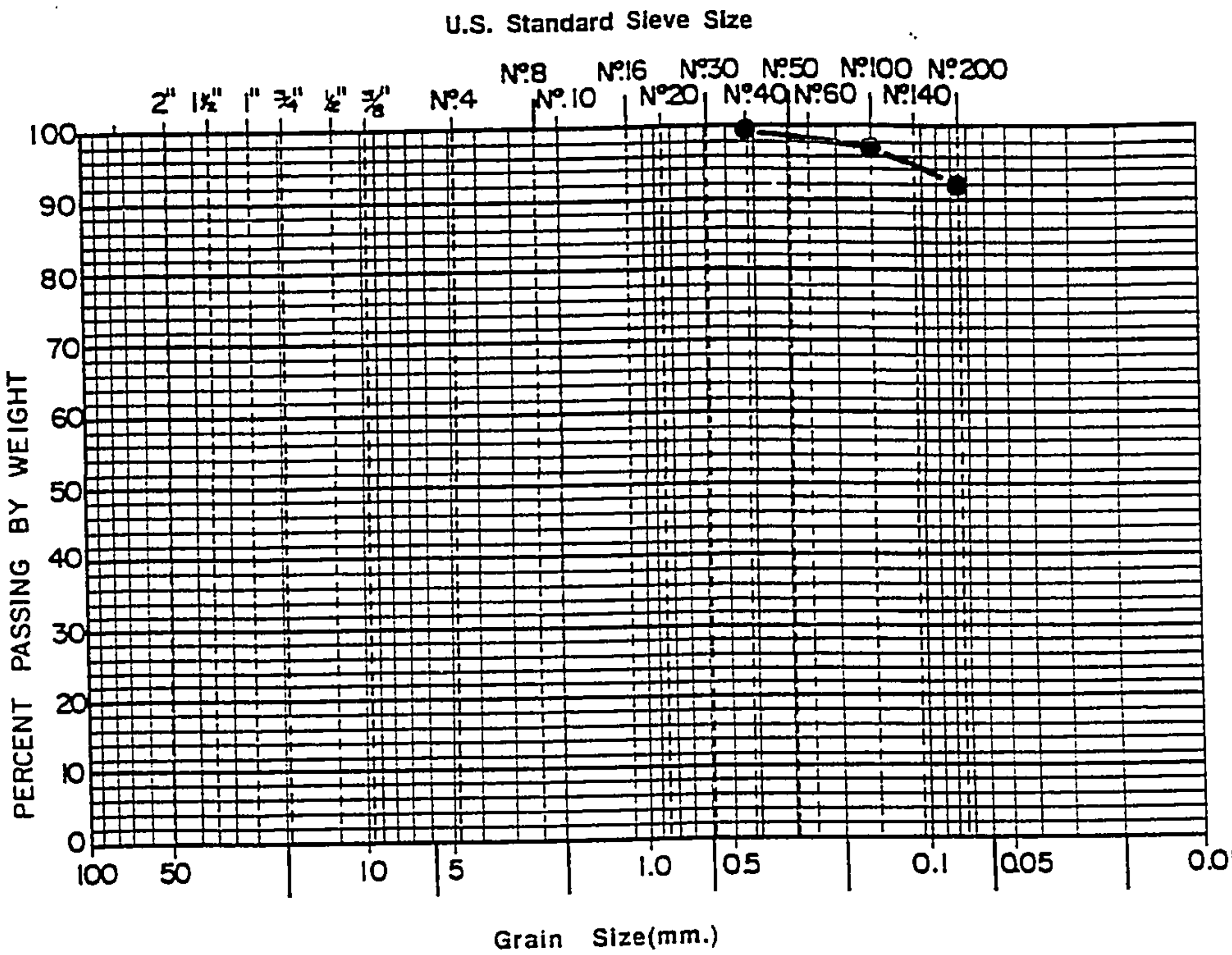
Boring No.	Depth (ft.)	Description
B-1	35.5' to 36'	Black clayey Silt with fine sand and organics(MH/OH)

FIGURE 9: Grain Size Analysis



Boring No.	Depth (ft.)	Description
B-1	40.5' to 41'	Black clayey Silt with fine sand(MH)

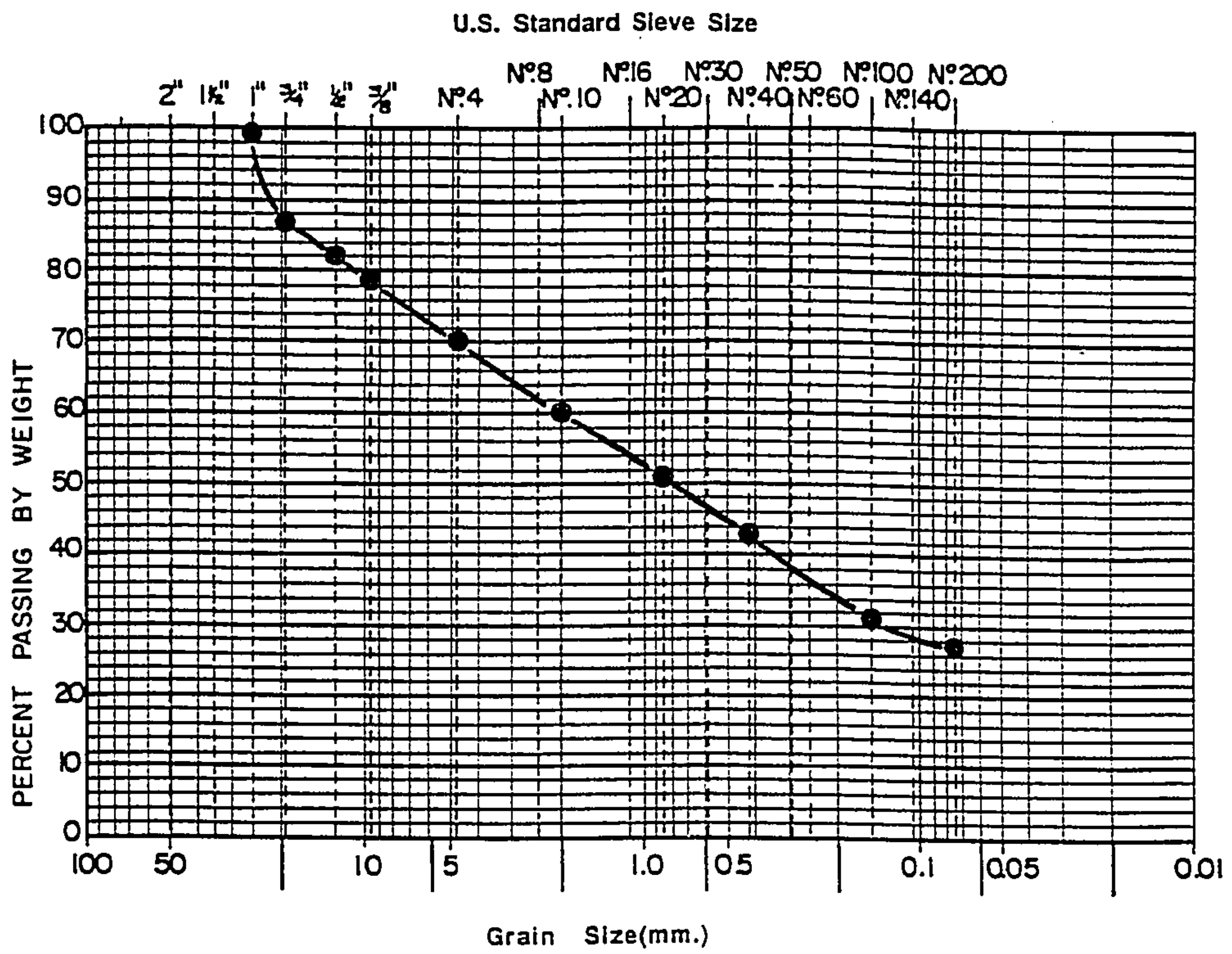
FIGURE 10: Grain Size Analysis



Boring No.	Depth (ft.)	Description
B-1	45.5' to 46'	Black/dark gray clayey Silt with fine sand and organics(MH/OH)

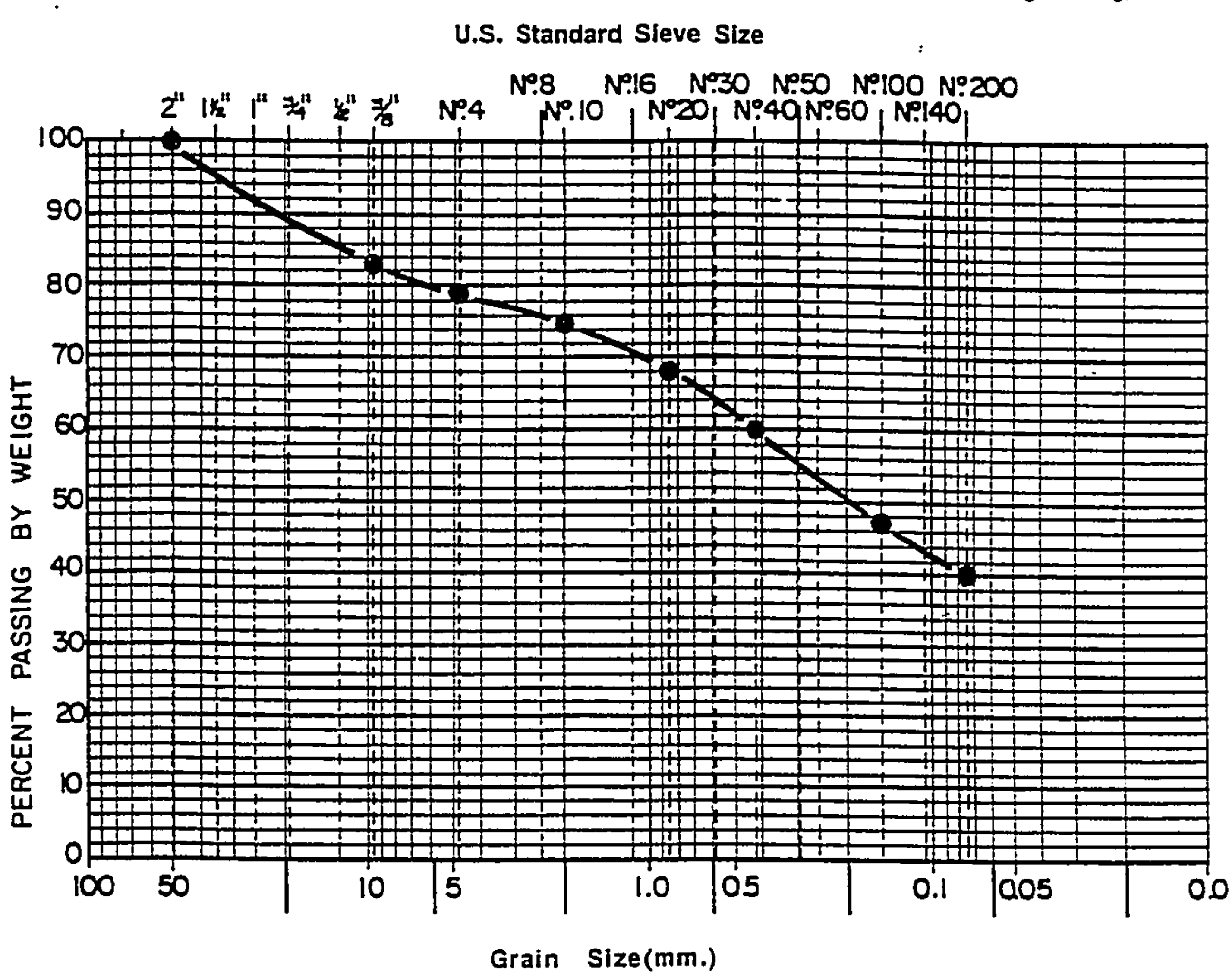
FIGURE 11: Grain Size Analysis

Stewart Engineering, Inc.



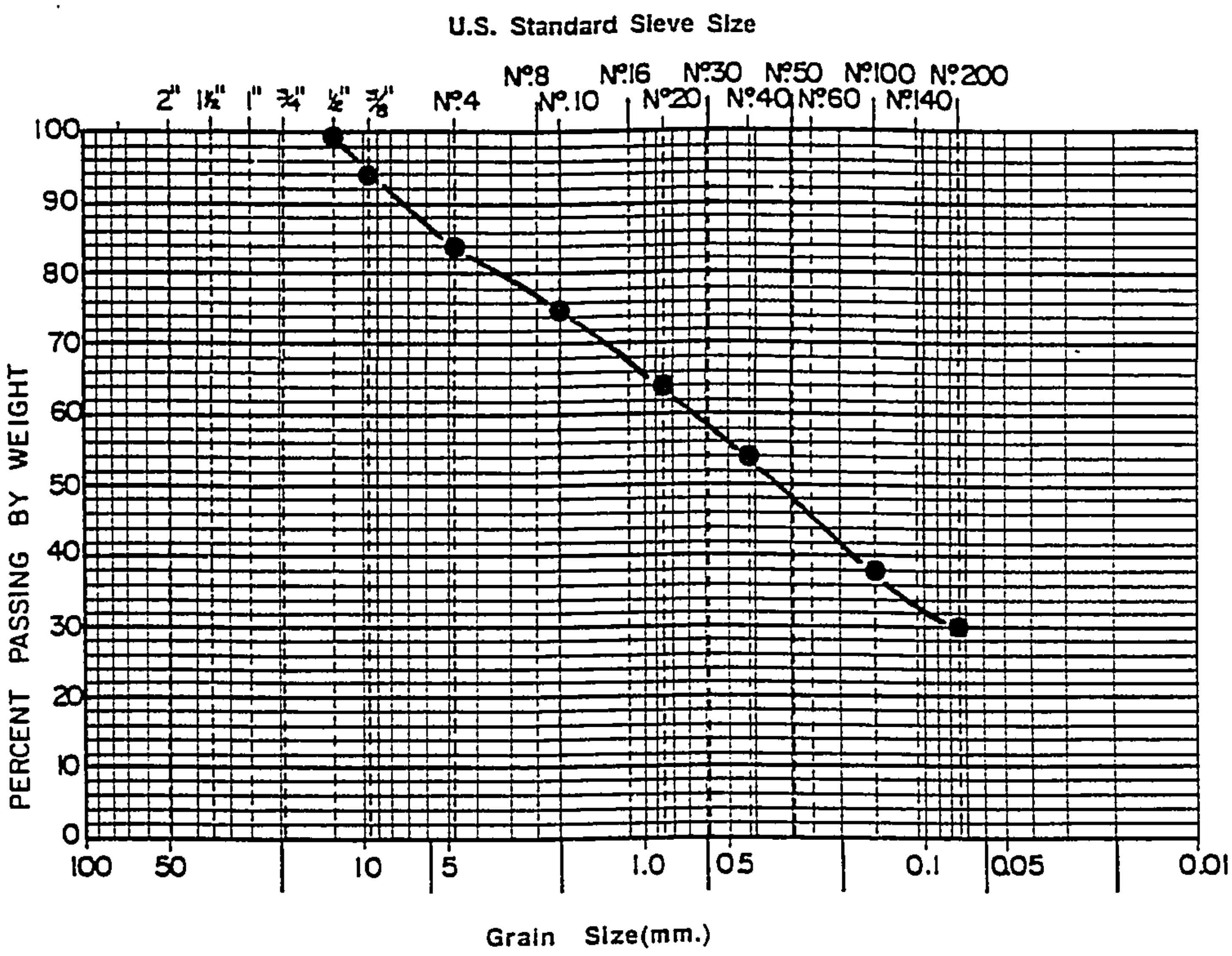
Boring No.	Depth (ft.)	Description
B-2	4.5' to 5'	Tan silty coral Sand and Gravel(Fill)

FIGURE 12: Grain Size Analysis



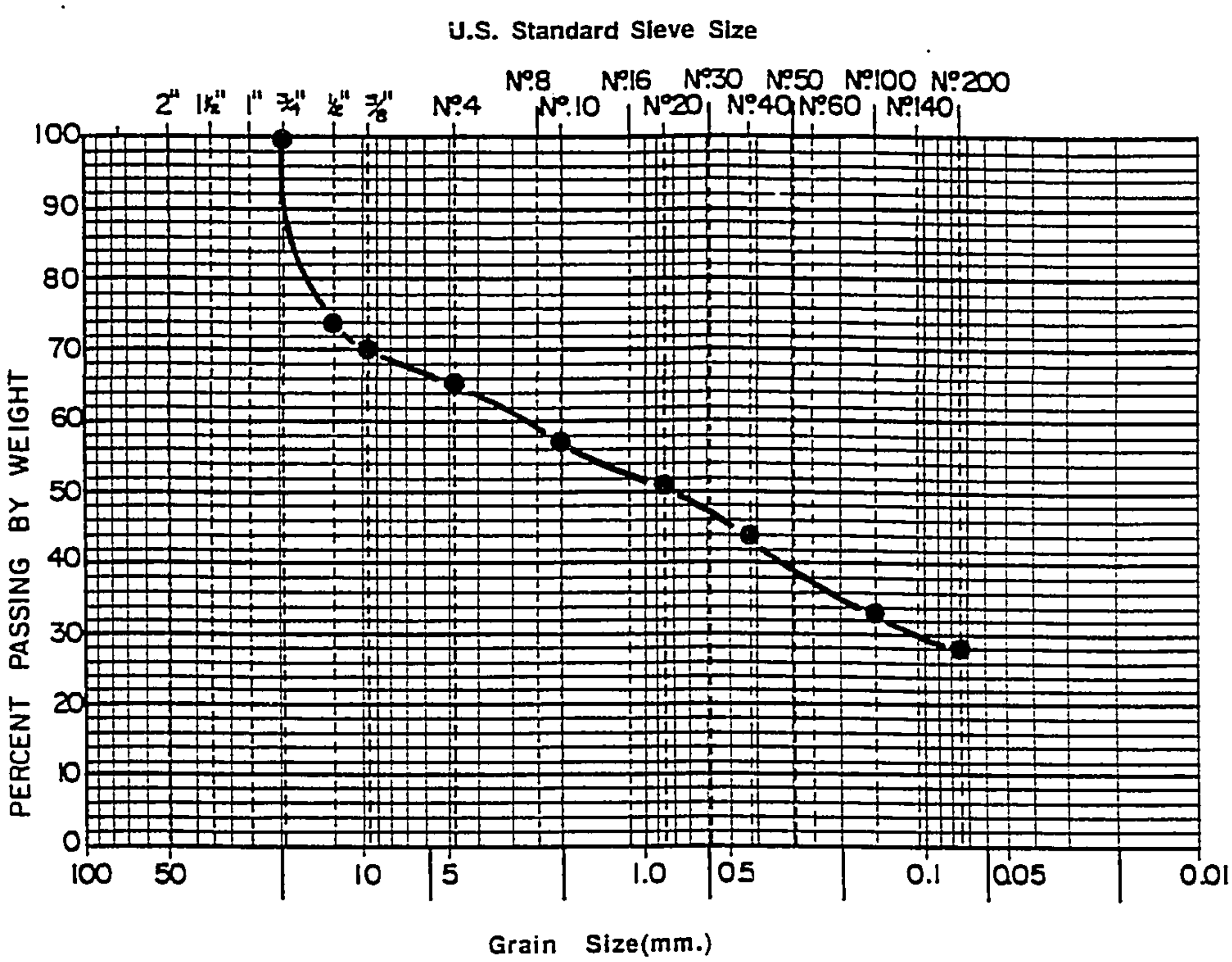
Boring No.	Depth (ft.)	Description
B-3	5' to 5.5'	Dark gray/black very silty coral Sand and Gravel, slightly clayey (Fill)

FIGURE 13: Grain Size Analysis



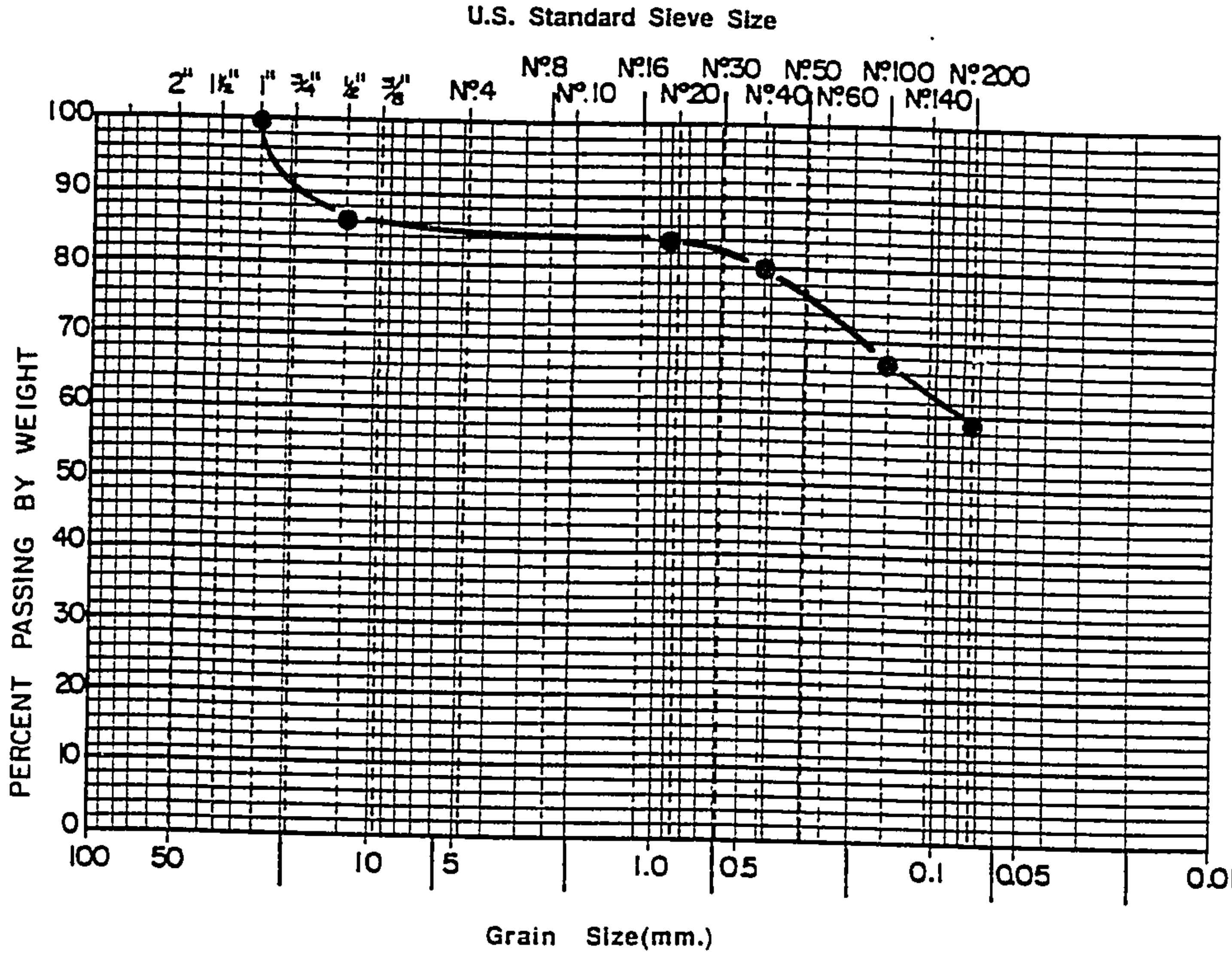
Boring No.	Depth (ft.)	Description
B-4	5' to 5.5'	Tan silty coral Sand and Gravel, slightly clayey (Fill)

FIGURE 14: Grain Size Analysis



Boring No.	Depth (ft.)	Description
B-1	8' to 9.5'	Dark gray silty coral Sand and Gravel, slightly clayey(FILL)

FIGURE 15: Grain Size Analysis



Boring No.	Depth (ft.)	Description
B-1	30' to 30.5'	Black clayey Silt and fine Sand with coral gravel and organics(MH/OH)

FIGURE 16: Grain Size Analysis

Figure 17

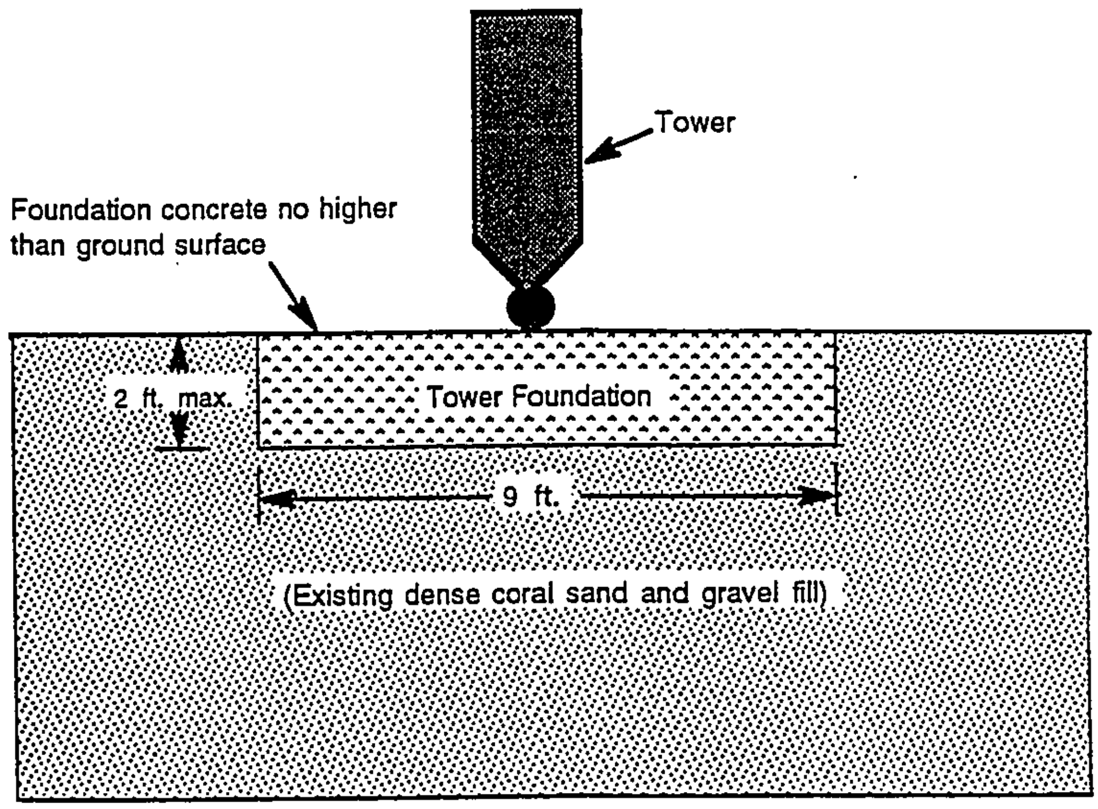
Summary of Swell Test Data

Sample Location	Depth (ft.)	U.S.C. Soil Type	Initial Test Dry Dens. (pcf)	Initial Test Moisture %	Test Surcharge (psf)	Max. Swell Pressure (psf)	Maximum Percent Swell
Remolded:							
B-1	0 to 1.0	MH	89.7	21.9	144	-	4.6

Note: Remolded sample prepared in brass ring, 2.375 inches in diameter, 1.00 inch in height.

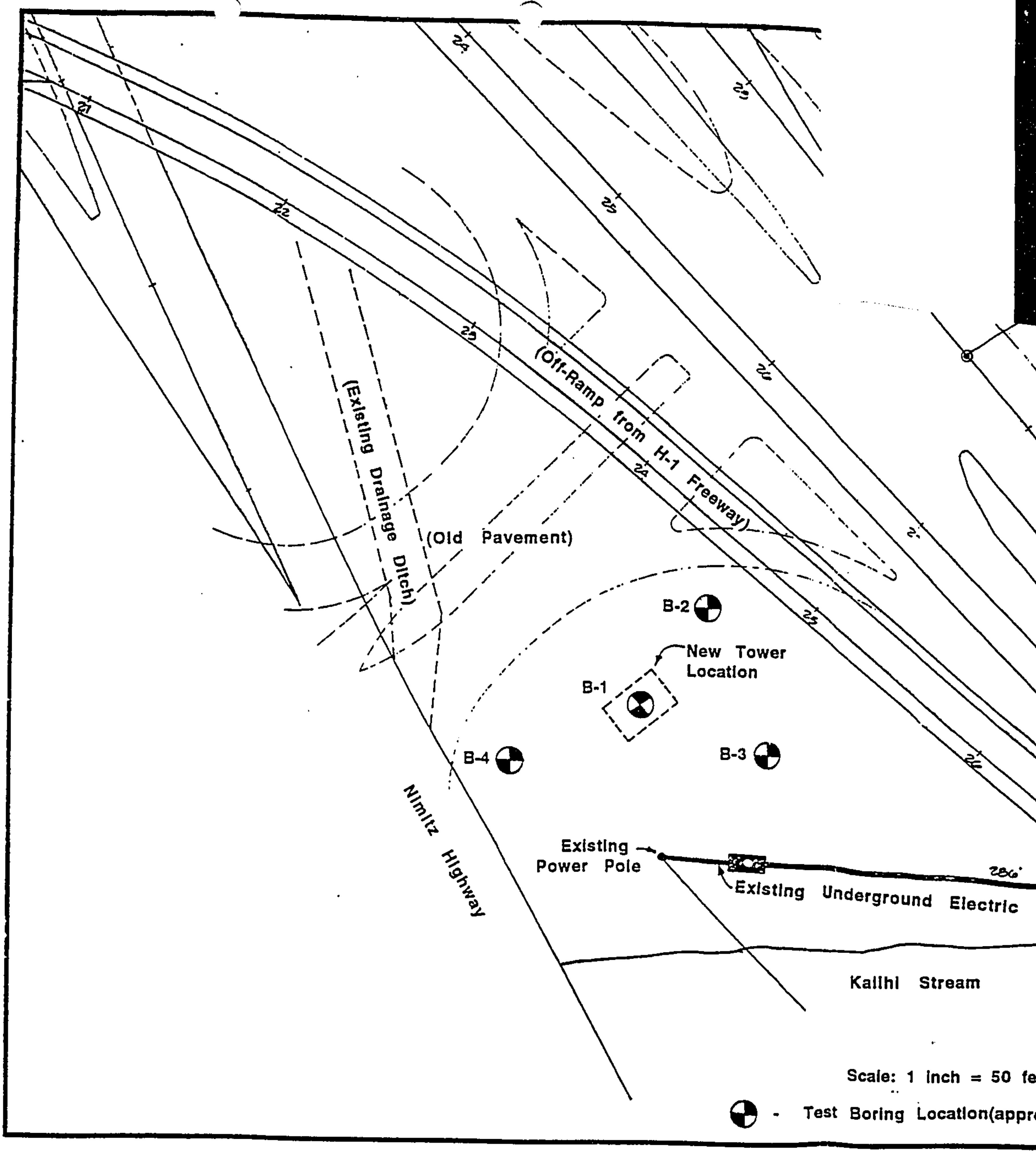
FIGURE 18

Tower Foundation
(not to scale)



Note:
1. Final design of foundation by project structural engineer.
2. Foundation excavation to be observed by project geotechnical engineer.
3. See Recommendations for additional details.

DOCUMENT CAPTURED AS RECEIVED



Boring Bulletin

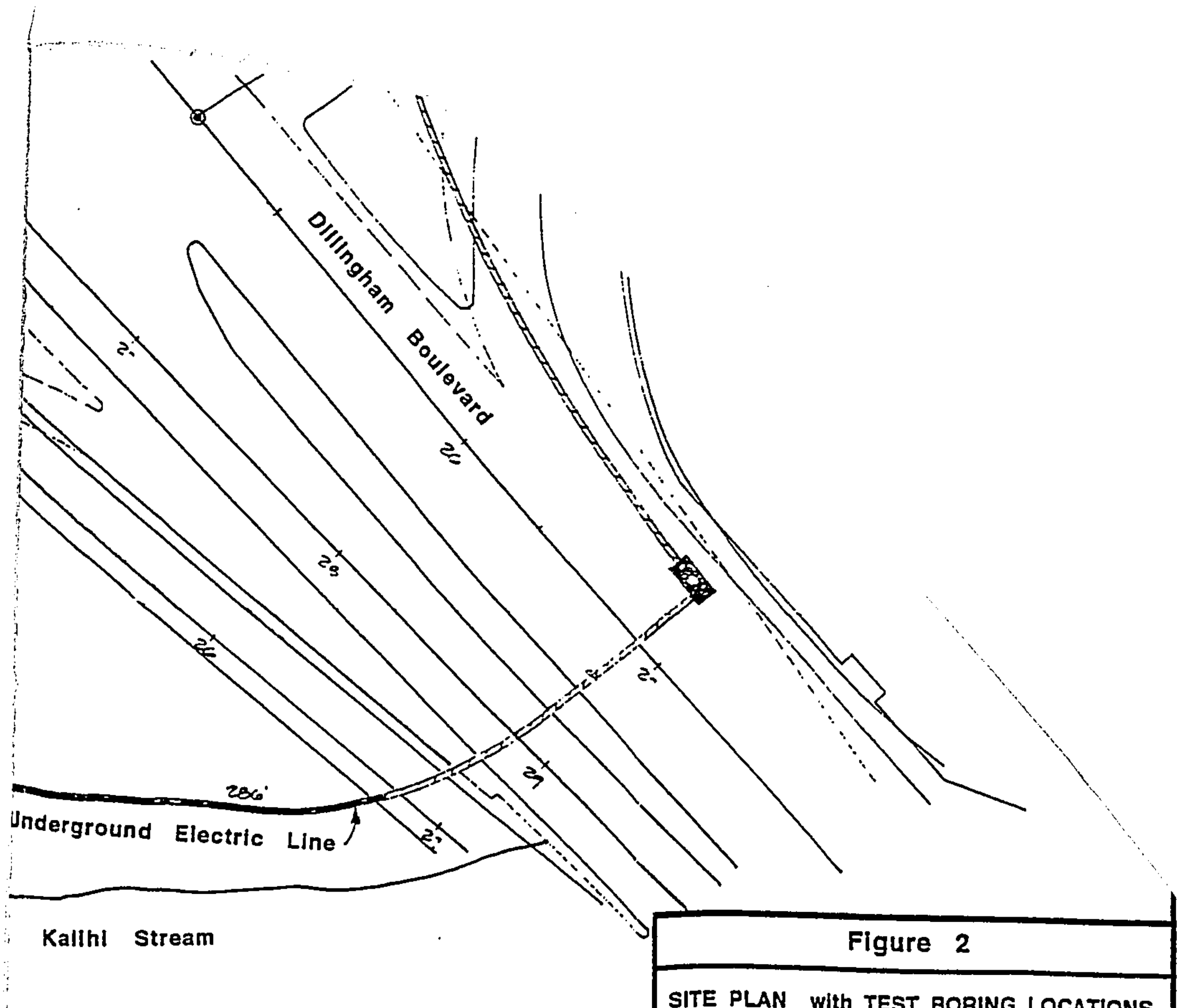


Figure 2

SITE PLAN with TEST BORING LOCATIONS

Proposed New 150 ft. KUMU Radio Tower
Nimitz Highway at Keehi Interchange
Honolulu, Oahu, Hawaii

Project: New KUMU Radio Tower, Honolulu
Project No.: 070
Date: March 18, 1993

Boring No.: 1
Surface Elevation: 5 ft.(approx.)
Depth to Groundwater: 5 ft. ±

Laboratory Test Data	% Moist.	Dry Dens. (pcf)	Blows per foot	Sample	Depth (ft)	Description
					1	Light brown clayey Silt with tan coral sand and gravel, loose to firm, dry
	29	87	71	1	2	Tan silty coral Sand and Gravel, slightly clayey, dense, moist
					3	
					4	
					5	grades to very moist, medium dense, with some wood fragments; petroleum odor
	34	87	18	2	6	
					7	
					8	Dark gray/black very silty Sand with broken coral fragments in gravel sizes, very loose/soft, wet
28% passing No.200 sieve	48	74	3	3	9	
					10	(soft drilling)
					11	grades to medium stiff to soft
					12	
	58	68	9	4	13	
					14	
					15	grades with more coral fragments and some basalt gravel
					16	
	12	-	8	5	17	very gravelly, few fines
					18	
					19	grades to dark gray silty coral fragments in gravel sizes, slightly clayey, wet, loose to medium dense
					20	

Figure 4

Project: New KUMU Radio Tower
Project No.: 070
Date: March 18, 1993

Boring No.: 1, continued
Surface Elevation: 5 ft.(approx.)
Depth to Groundwater: 5 ft.±

Laboratory Test Data	% Moist.	Dry Dens. (pcf)	Blows per foot	Sample	Depth (ft)	Description
80% passing No.200 sieve L.L. = 82 P.I. = 37 *pen.< 0.5 tsf*	73	58	3	10	41	Dark gray/black clayey Silt and fine Sand with few coral fragments, very soft to soft, wet
					42	
					43	(soft drilling to 46 ft.)
					44	
					45	
					46	
92% passing No.200 sieve pen.< 0.5 tsf	74	59	5	11	47	
					48	
					49	Boring terminated at a depth of 48 ft. Groundwater encountered at approximately 5 ft.
					50	
					51	
					52	
					53	
					54	
					55	
					56	
					57	
					58	
					59	
					60	

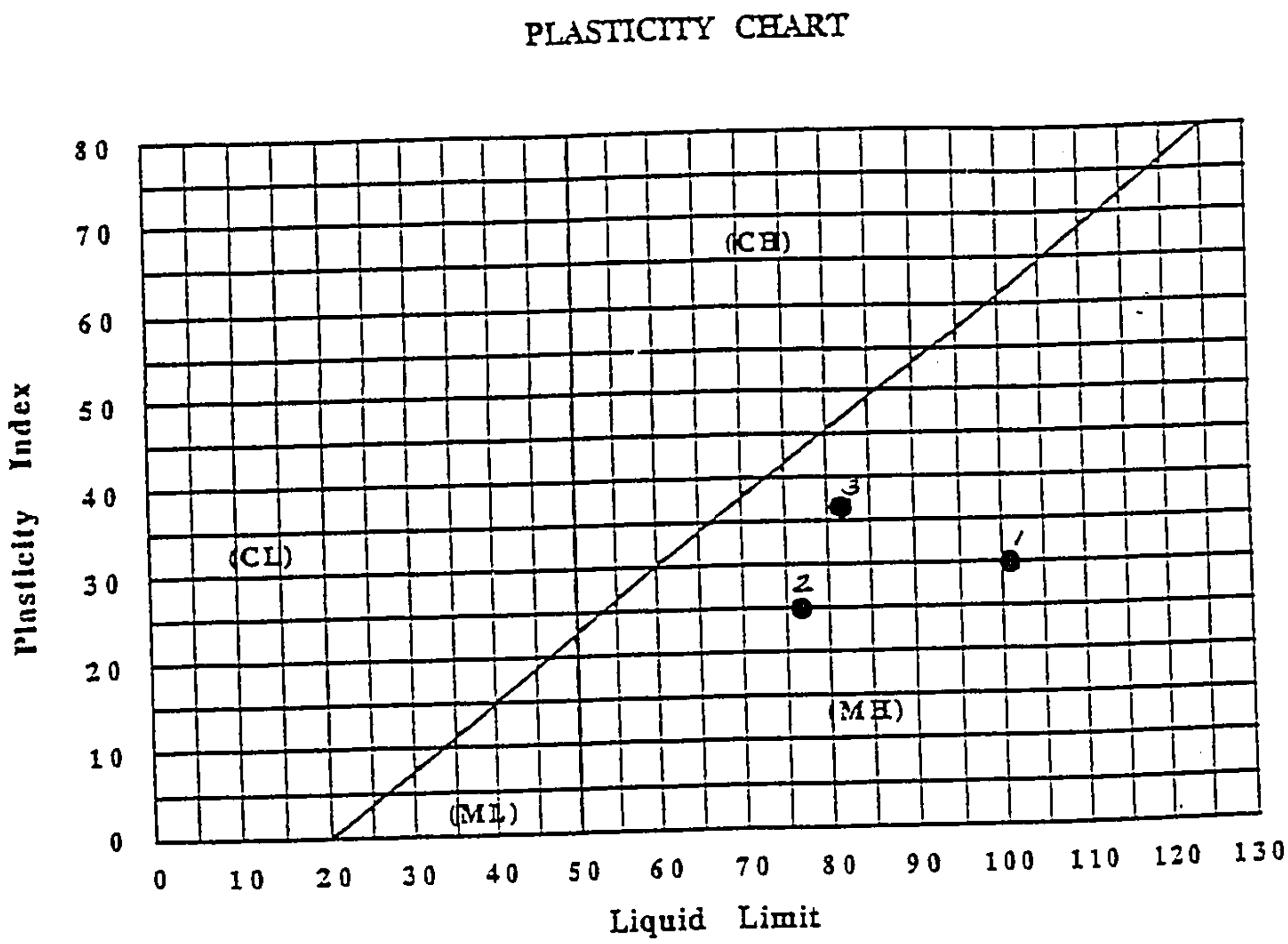
Figure 4, continued

Project: New KUMU Radio Tower, Honolulu
Project No.: 070
Date: March 18, 1993

Boring No.: 1, continued
Surface Elevation: 5 ft.(approx.)
Depth to Groundwater: 5 ft.±

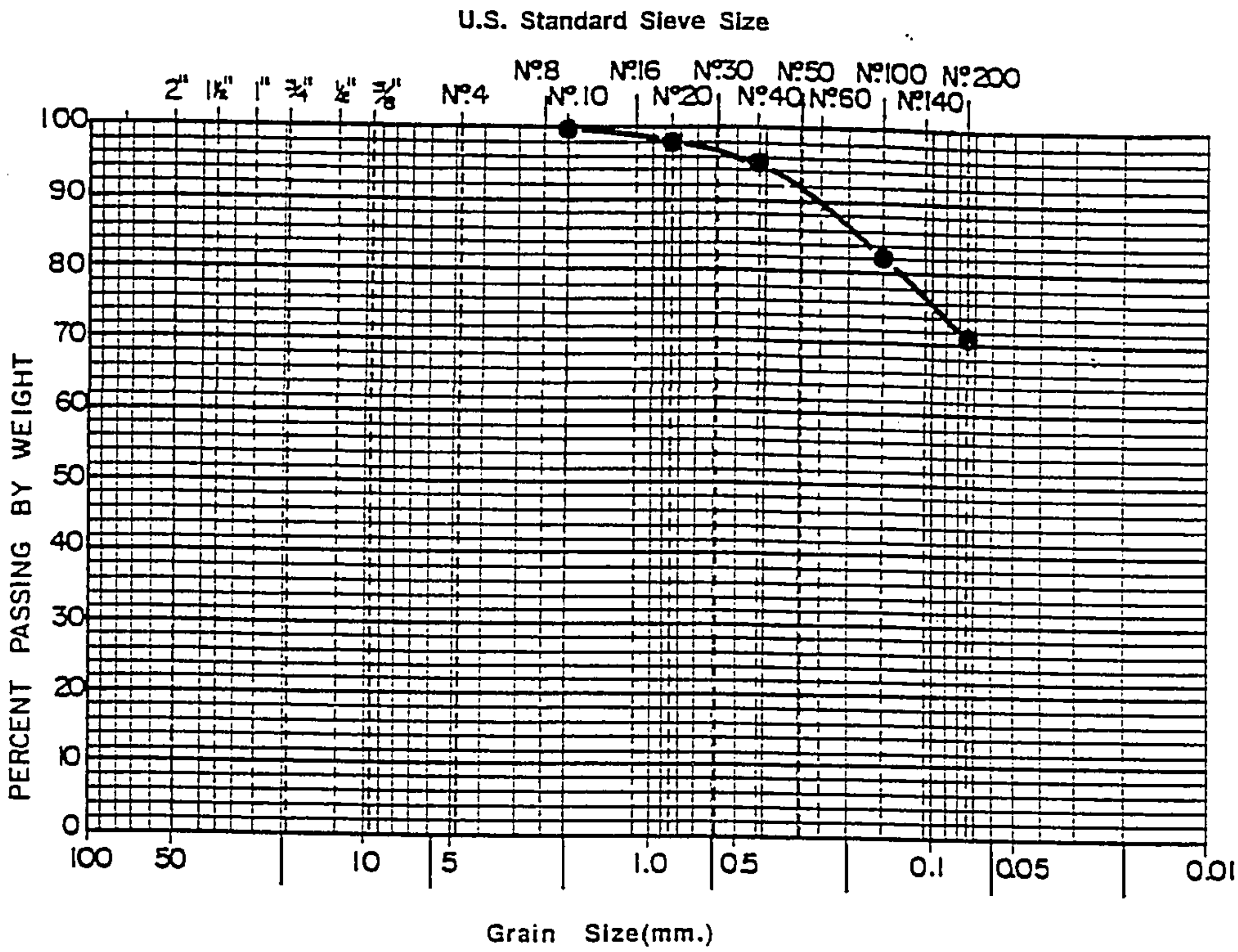
Laboratory Test Data	% Moist.	Dry Dens. (pcf)	Blows per foot	Sample	Depth (ft)	Description
	22	-	10	6	21	Dark gray silty broken coral fragments in gravel sizes, sandy, loose to medium dense, wet
					22	
					23	
					24	(soft drilling)
					25	
(lost sample)	-	-	8	7	26	
					27	
					28	Dark gray/black clayey Silt and fine Sand with few coral fragments and small shells, wet, soft to medium stiff
					29	
					30	
59% passing No.200 sieve L.L. = 101 P.I. = 30 pen.< 0.5 tsf	85	49	6	8	31	
					32	
					33	(grades softer)
					34	
					35	Dark gray/black clayey Silt and Fine Sand with few coral fragments up to 1.5-inches in size; few small white shells, soft, wet
71% passing No.200 sieve L.L. = 77 P.I. = 25 pen.< 0.5 tsf	83	55	4	9	36	
					37	
					38	
					39	grades with fewer coral fragments and shells
					40	

Figure 4, continued



Sample No.	Sample Location	Depth (ft.)	Liquid Limit. %	Plastic Limit. %	Plasticity Index(PI)	USC Symbol
1	B-1	30.5	101	71	30	MH/OH
2	B-1	36	77	52	25	MH/OH
3	B-1	40	82	45	37	MH/OH

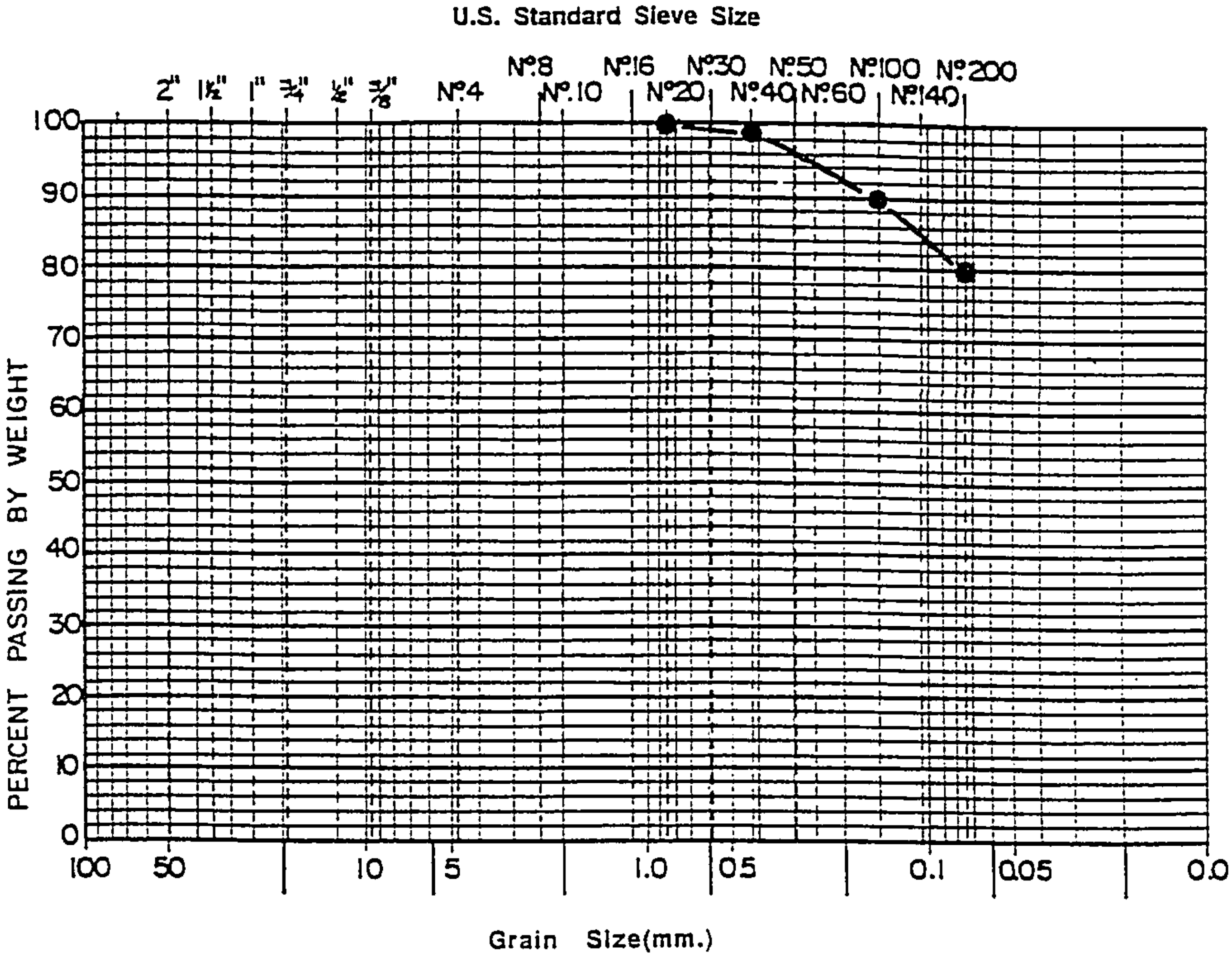
Figure 8: Plasticity Data



Boring No.	Depth (ft.)	Description
B-1	35.5' to 36'	Black clayey Silt with fine sand and organics(MH/OH)

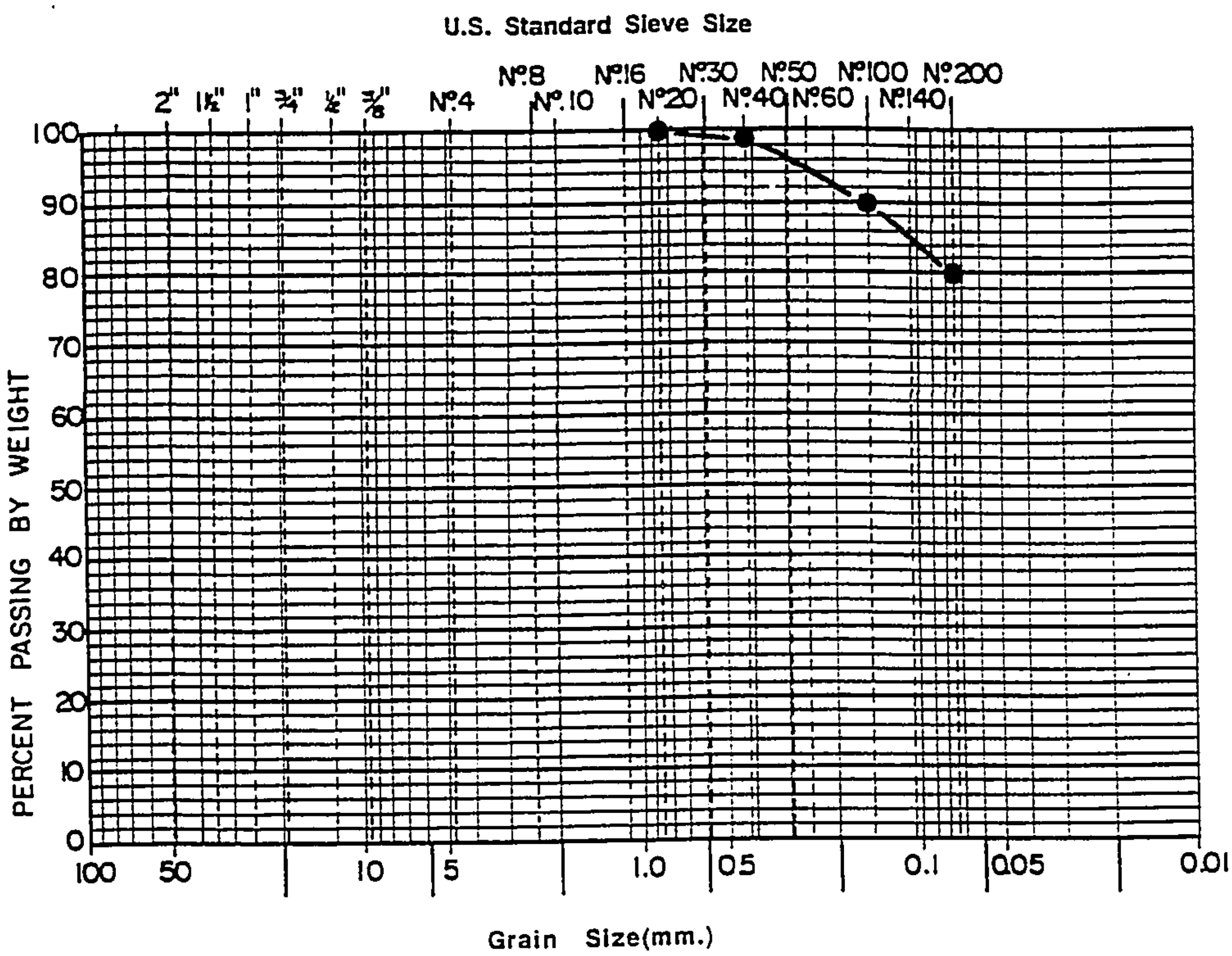
FIGURE 9: Grain Size Analysis

Stewart Engineering, Inc.



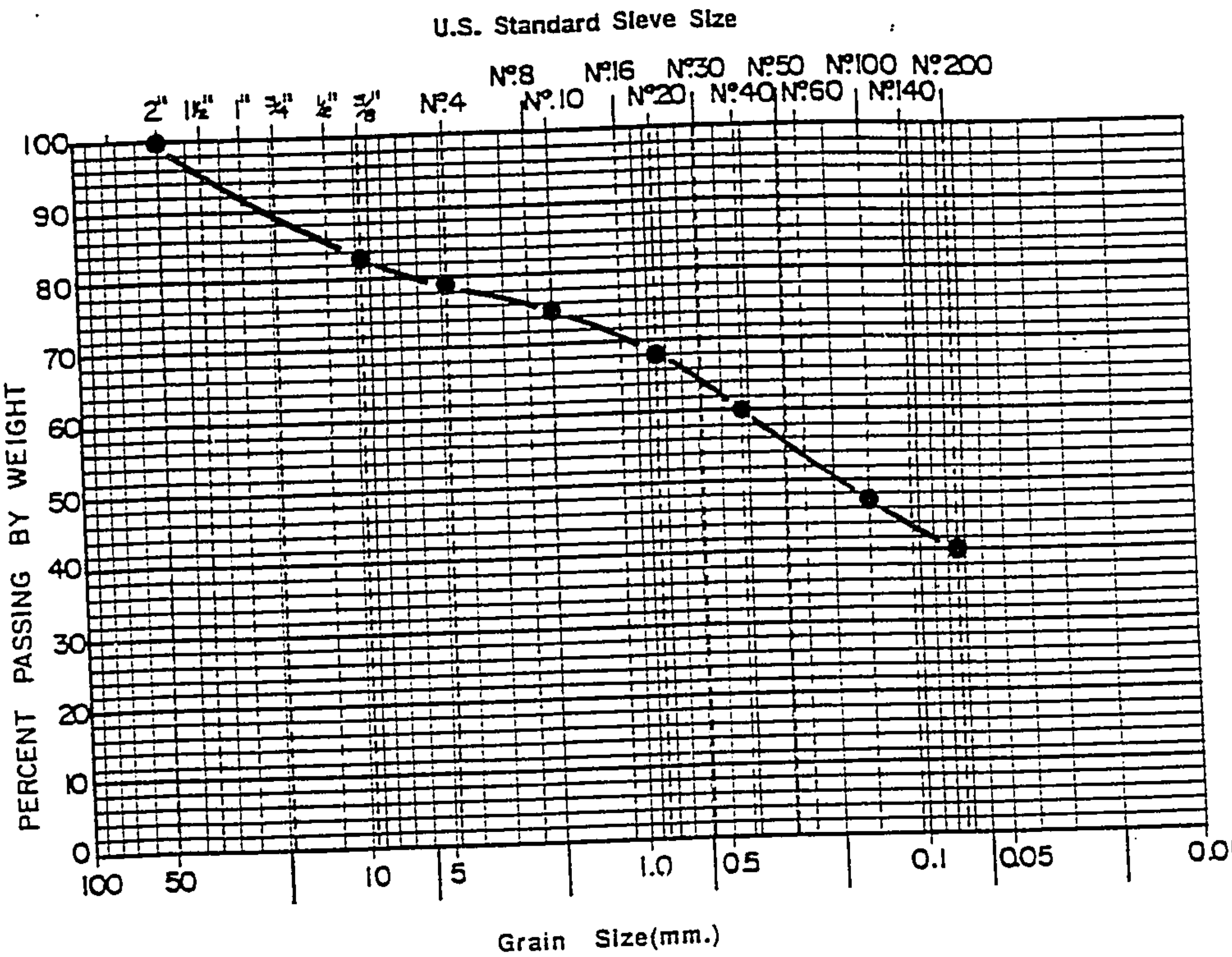
Boring No.	Depth (ft.)	Description
B-1	40.5' to 41'	Black clayey Silt with fine sand(MH)

FIGURE 10: Grain Size Analysis



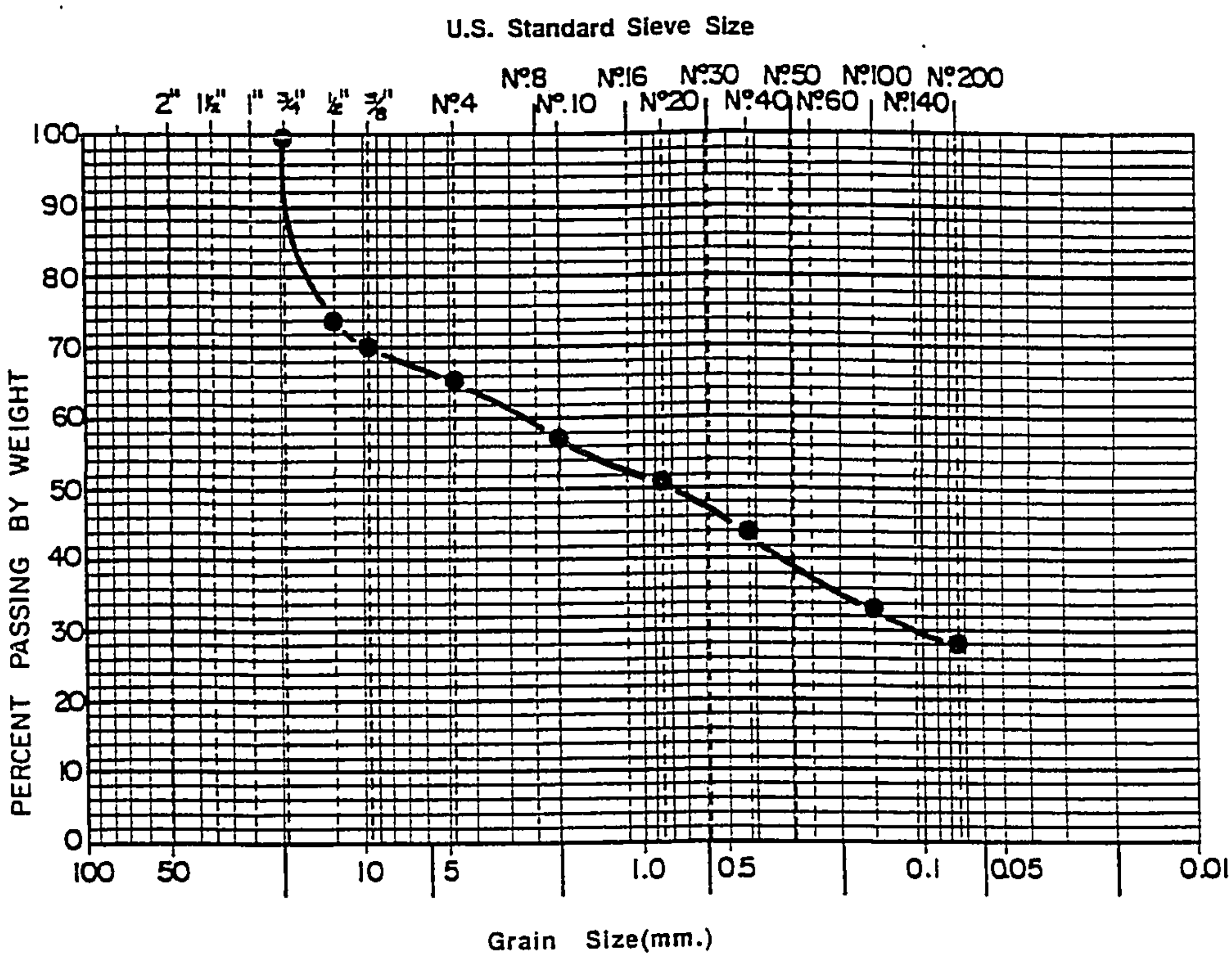
Boring No.	Depth (ft.)	Description
B-1	40.5' to 41'	Black clayey Silt with fine sand(MH)

FIGURE 10: Grain Size Analysis



Boring No.	Depth (ft.)	Description
B-3	5' to 5.5'	Dark gray/black very silty coral Sand and Gravel, slightly clayey (Fill)

FIGURE 13: Grain Size Analysis



Boring No.	Depth (ft.)	Description
B-1	8' to 9.5'	Dark gray silty coral Sand and Gravel, slightly clayey(FILL)

FIGURE 15: Grain Size Analysis

Structural Calculations
Our Job Number 93-P025

150 FOOT KUMU-AM RADIO TOWER
INTERSTATE HIGHWAY FAP #IH1(82)
KEEHI INTERCHANGE
HONOLULU, HAWAII

for: KUMU Radio
441 N. Nimitz Highway
Honolulu, HI 96817

May 1993

THEODORE J. SUZUKI
REGISTERED PROFESSIONAL ENGINEER
No. 4163-S
HAWAII, U.S.A.

This work was prepared by me or under my supervision

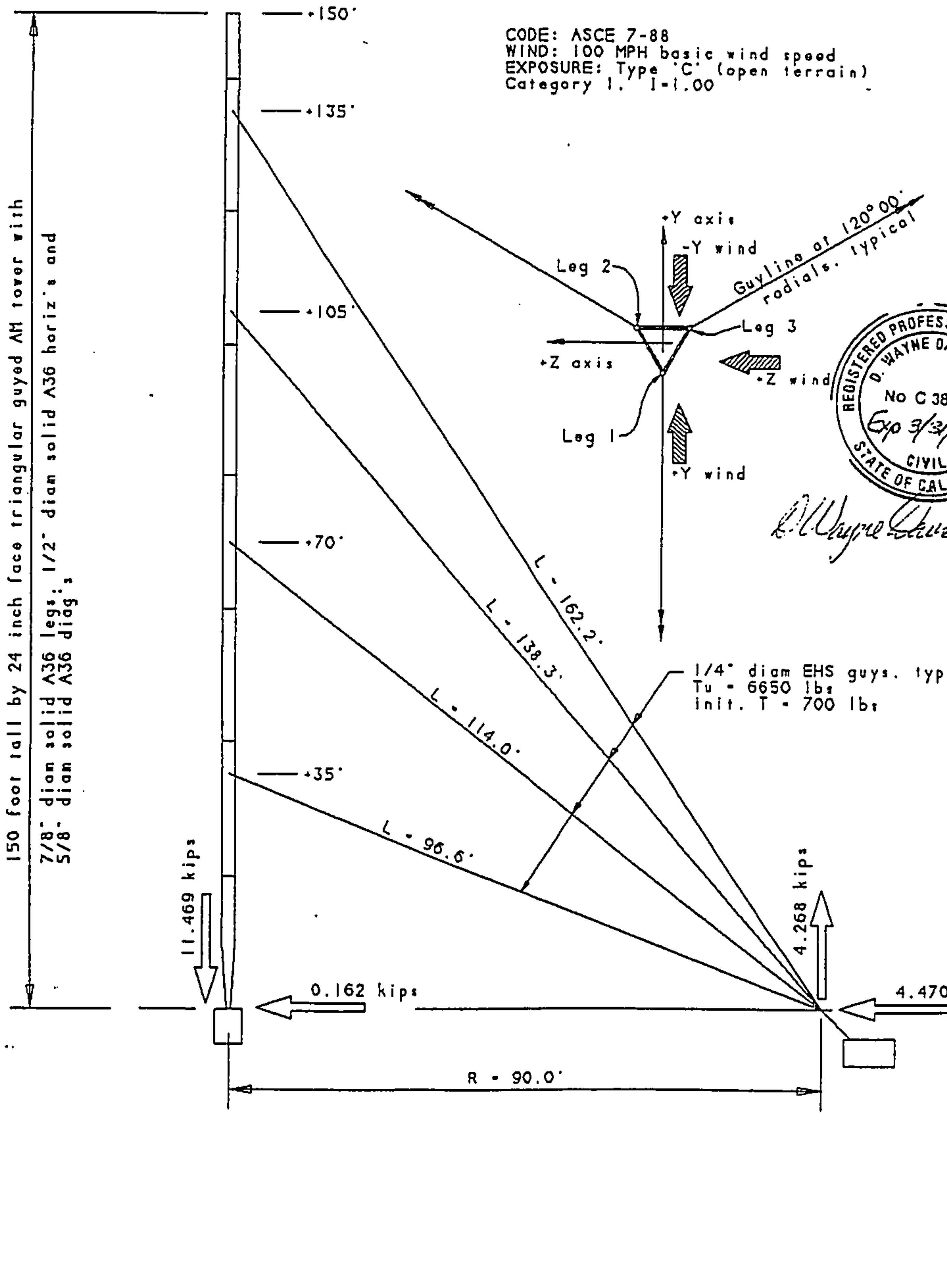
Robert Englekirk Consulting Structural Engineers, Inc.
1130 N. Nimitz Highway, Suite A-215, Honolulu, Hawaii 96817, (808) 521-6958

TOWER

Job 150'x24"Δ Guyed AM Tower	Job No. 1181/93
Client KUMU-AM	
Designed by DWD Date 4/15/93 Page 1 of	

MAGNUM TOWERS, INC.
9370 Elder Creek Road
Sacramento, CA 95829
916/381-5053

CODE: ASCE 7-88
WIND: 100 MPH basic wind speed
EXPOSURE: Type 'C' (open terrain)
Category 1. I=1.00



REGISTERED PROFESSIONAL ENGINEER
D. WAYNE DAVIDSON
No C 38041
Exp 3/31/97
CIVIL
STATE OF CALIFORNIA

D. Wayne Davidson

Job 150' x 24" △ Guyed A[illegible] Tower	Job No. 1181/93
Client KIIMU	
Designed by DWD Date 4/15/93 Page 2 of	

MAGNUM TOWERS, INC.
9370 Elder Creek Road
Sacramento, CA 95829
916/381-5053

150 foot tall by 24 inch face triangular guyed tower
Wind and Dead Loads

Code: ASCE 7-88
Wind: 100 MPH basic wind speed
Exposure: Type 'C'
Category 1; I=1.00

Tower Wind and Dead Loads

$A_f = \{ 2^{'/'} \times 0.875"\phi + 1.19^{'/'} \times 0.500" + 1.53^{'/'} \times 0.625" \} \times 1/_{12} = \underline{0.2751\ ft^2/ft}$

$A_g = (24"+0.875") \times {}^{12}/_{144} = \underline{2.0729\ ft^2/ft}$ $\quad \varepsilon = 0.2751\ /\ 2.0729 = .1327$

$G_h = 1.14 \leftarrow$ Table 8, p. 15

$C_f = \{ 3.7 - 4.5 \times (.1327) \} \times 0.67 = \underline{2.0789}$

$w_{twr} = 0.00256 \times K_z \times (1 \times 100)^2 \times 1.14 \times 2.0789 \times .2751 = \underline{16.6905 \times K_z}$

Elevation	avg K_z	w_{twr}
0' - 35'	0.8370	13.97 lbs/ft
35' - 70'	1.1456	19.12 "
70' - 105'	1.3256	22.12 "
105' - 135'	1.4508	24.21 "
135' - 150'	1.5238	25.43 "

tower DL = 26.0 lbs/ft for 7/8" diam solid legs, 1/2" horiz'l webs, 5/8" diag'l webs

Guy Wire Wind and Dead Load

$P_{guy} = .00256 \times K_z \times (1 \times 100)^2 \times 1.14 \times (1.2 + 2 \times 0.3) \times {}^{.250"\phi}/_{12} \times L_g$

$= \underline{1.0944 \times K_z \times L_g}$

$P_{35} = 1.0944 \times 0.8370 \times 96.6' = \underline{88\ lbs}$ $\quad$ 1/4"ϕ guy DL = 0.0101 lbs/inch

$P_{70} = 1.0944 \times 1.0203 \times 114.0' = \underline{127\ lbs}$

$P_{105} = 1.0944 \times 1.1456 \times 138.3' = \underline{173\ lbs}$

$P_{135} = 1.0944 \times 1.2309 \times 162.2' = \underline{219\ lbs}$

Job 150' x 24" Δ Guyed Tower	Job No. 1181/93		M. GNUM TOWERS, INC. 9370 Elder Creek Road Sacramento, CA 95829 916/381-5053
Client KUMU-AM			
Designed by DWH	Date 4/15/93	Page 3 of	

Tower Design

Leg Design

7/8"φ solid rond A36 leg design

max P_{leg} = 6,473 lbs ← p-9

leg $kL/_r$ = 1.0(19.50") x $4/_{0.875"}$ = 89.143 F_a = 14.303 ksi

P_a = 14.303(0.6013)($^4/_3$) = 11.467^k > 6.473^k OK

Use 7/8"φ solid round A36 legs @ +0.0' to +150'

Web Design

Horizontal Webs

p.9

max $P_{horiz'l}$ = (436# x 1/2) / .866 = 252 lbs

$kL/_r$ = 1.00(23.125" net) x 4 / 0.500" = 185 F_a = 4.36 ksi

P_a = 4.36(0.1963)($^4/_3$) = 1.141^k > 0.252^k OK

Use 1/2"φ solid round A36 horizontal webs thru-out tower

Diagonal Webs

above

max $P_{diag'l}$ = 252 x (30.923"/24") = 325 lbs

$kL/_r$ = 1.00(29.69" net) x 4 / 0.625" = 190 F_a = 4.14 ksi

P_a = 4.14(0.3068)($^4/_3$) = 1.694^k > 0.325^k OK

Use 5/8"φ solid round A36 diagonal webs thru-out tower

Guy Wire Design

p.15 p.5

max Tension = 1,890 lbs < 6,650# / 2.0 = 3,325 lbs OK

Use 1/4" diam EHS guys thru-out T_u=6,650 lbs initial T = 700 lbs

Job 150'x24"△ Guyed AM Tower	Job No. 1181/93
Client KUMU-AM	
Designed by DWD Date 4/15/93 Page 4 of	

MAGNUM TOWERS, INC.
9370 Elder Creek Road
Sacramento, CA 95829
916/381-5053

Tower Foundation Design

Refer to: *Subsurface Investigation Report - Proposed 150 ft. KUMU Radio Tower*
Keehi Interchange - Nimitz Highway at Dillingham Boulevard
Kalihi, Honolulu, Hawaii

Prepared by: Stewart Engineering, Inc.
145 Hekili Street Suite 100
~~Honolulu,~~ Hawaii Kailua, Oahu

Dated: April 7, 1993

Tower Base Foundation

max Axial = 11,469 lbs ← p.9

req'd A = $11.469^k / 0.200$ ksf = 57.35 sq ft

width = $(57.35)^{1/2}$ = 7.57 ft square Use 9'0" square

Moment = $.200 \times (4.5)^2 / 2 = 2.025$ kip-ft

$A_s = 2.025^{k'} / (1.44 \times 7.5") = 0.1875"^2/ft$ use #4 at 6" o.c. ($A_s = 0.4418"^2/ft$)

Use 9'0" square by 12" thick spread footing based at 12 inches below ground surface with #4 at 6" o.c. each way at bottom

Guy Anchor Design: (R = 90 ft)

p.15, typ p.1 p.1

$\Sigma V = 35' \times (1150^\# / 96.6') + 70' \times (1509^\# / 114.0') + 105' \times (1781^\# / 138.3')$
$+ 135' \times (1890^\# / 162.2') = 417 + 927 + 1352 + 1573 = \underline{4,268 \text{ lbs}}$

$\Sigma H = 90' \times \{ (") + (") + (") + (") \} = \underline{4,470 \text{ lbs}}$

$\Sigma T = (\Sigma V^2 + \Sigma H^2)^{1/2} = \underline{6,181 \text{ lbs}}$

req'd rod diameter = $\{ 4/\pi * 6,181^\# / (.6 * 36,000 * 4/3) \}^{1/2} = \underline{0.5227"\phi}$

Use buoyant weight of concrete for uplift resistance density=150 - 62 = 88 pcf

Try 9' wide x 9' long x 3' high deadman concrete anchor

Bouyant Concrete Weight = 9' x 9' x 3' x 88 pcf = 21,384 lbs >> 4268 lbs OK

Net concrete weight = 21,384 - 4268 = 17,116 lbs

Required friction factor = 4,470 / 17,116 = 0.2612

F.S. = 0.60/0.2612 = 2.297 > 2.00 OK

Use 9'0" square by 3'0" thick concrete deadman based at 3'0" below ground surface with #4 at 6" o.c. each way each face

JOB 150' x 24" Δ Guyed AM Tower JOB NO. 1181-93 PAGE 5

PROPERTIES - STEEL GUY WIRE

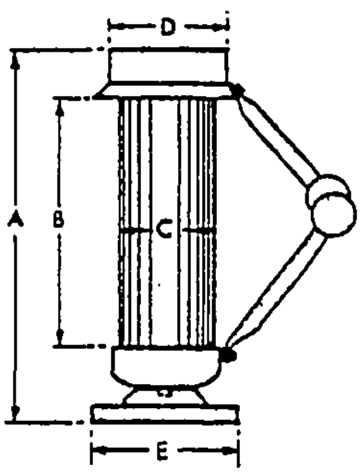
EHS = EXTRA HIGH STRENGTH GRADE - E = 14.000 ksi fu = 170 ksi
B.S. = BRIDGE STRAND GRADE (B.S. 19) - E = 19.000 ksi fu = 200 ksi

NOMINAL DIAMETER (inches)	APPROX. AREA (sq. in.)	WEIGHT (lb/in)	ULTIMATE STRENGTH (lbs)	INITIAL TENSION @ 10% Tu	EAI (kips)
3/16" EHS	.0214	.0067	3,990	400	299.6
1/4" EHS	.0356	.0101	6,650	700	498.4
5/16" EHS	.0661	.0188	11,200	1200	925.4
3/8" EHS	.0802	.0228	15,400	1600	1,122.8
7/16" EHS	.1170	.0333	20,800	2100	1,638.0
1/2" EHS	.1520	.0431	26,700	2700	2,128.0
9/16" EHS	.1970	.0559	35,000	3500	2,758.0
5/8" EHS	.2390	.0678	42,400	4300	3,346.0
3/4" EHS	.3390	.0963	58,300	5800	4,746.0
7/8" EHS	.4650	.1318	79,700	8000	6,510.0
1" EHS	.6090	.1728	104,500	10,500	8,526.0
1-1/8" EHS	.7910	.2243	130,800	13,000	11,074.0
1-1/4" EHS	.9810	.2781	162,200	16,000	13,734.0
9/16" B.S.	.1940	.0550	38,000	3800	3,686.0
5/8" B.S.	.2380	.0675	48,000	4800	4,522.0
3/4" B.S.	.3409	.0967	68,000	6800	6,477.1
7/8" B.S.	.4584	.1300	92,000	9200	8,709.6
1" B.S.	.6083	.1725	122,000	12,000	11,557.7
1-1/16" B.S.	.6770	.1975	138,000	14,000	12,863.0
1-1/8" B.S.	.7910	.2243	158,200	16,000	15,029.0
1-1/4" B.S.	.9380	.2733	192,000	19,000	17,822.0
1-3/8" B.S.	1.1300	.3308	232,000	23,000	21,470.0
1-1/2" B.S.	1.3500	.3942	276,000	27,500	25,650.0
1-5/8" B.S.	1.5900	.4625	324,000	32,500	30,210.0
1-3/4" B.S.	1.8400	.5358	376,000	37,500	34,960.0
1-7/8" B.S.	2.1100	.6158	432,000	43,000	40,090.0
2" B.S.	2.4000	.7000	490,000	49,000	45,600.0
2-1/8" B.S.	2.7100	.7908	554,000	55,500	51,490.0
2-1/4" B.S.	3.0400	.8867	620,000	62,000	57,760.0
2-1/2" B.S.	3.7500	1.0942	752,000	75,000	71,250.0

AUSTIN BASE INSULATORS

6

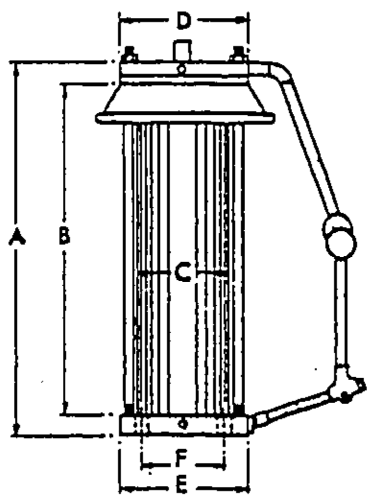
TYPES A–4197–L, A–4722–B



DIMENSIONS

TYPE	A	B	C	D	E	MAST FIXING	INSULATOR MOUNTING	WEIGHT
A-4197-L	13.6" 345mm	7" 178mm	4" 107mm diameter	7.75" 197 mm diameter	7" 178mm diameter	3 holes drilled 5/8" (16mm) on 6.5" (165mm) Bolt Circle Diameter	3 holes drilled 5/8" (16mm) on 5.5" (140mm) Bolt Circle Diameter	45 lb. 20 kg
A-4722-B	26.125" 664mm	17.5" 445mm	6.5" 165mm diameter	7.85" 199mm diameter	10" 254mm diameter	3 holes tapped 5/8" (16mm) 11 TPI on 6.5" (165mm) Bolt Circle Diameter	4 holes drilled 3/4" (19mm) on 8" (203mm) Bolt Circle Diameter	108 lb. 49 kg

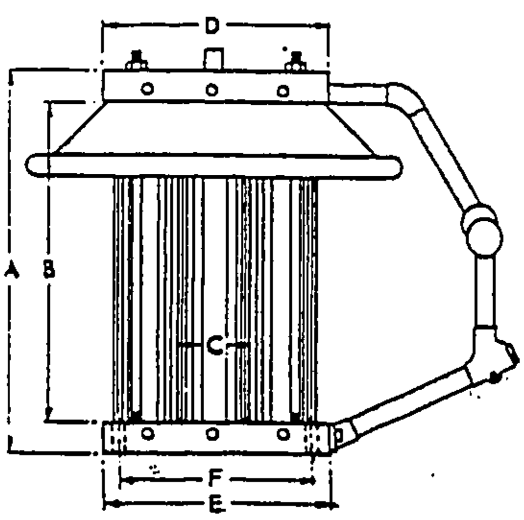
TYPES A–0881, A–0729, A–0167



DIMENSIONS

TYPE	A	B	C	D	E	F	MAST FIXING	INSULATOR MOUNTING	WEIGHT
A-0881	36.5" 927mm	32" 813mm	8.25" 210mm diameter	11" 279mm diameter	11" 279mm square	8.125" 206mm	Centre pin 1½" (38mm) diameter 2" (51mm) long Keep mast base within clearance diameter of 8" (203mm)	4 holes drilled 1-1/8" (29mm) Square base	140 lb. 64 kg
A-0729	37" 940mm	32" 813mm	9.75" 248mm diameter	12.5" 318mm diameter	12.5" 318mm square	9.0" 229mm	Centre pin 1½" (38mm) diameter 2" (51mm) long Keep mast base within clearance diameter of 11" (279mm)	4 holes drilled 1¼" (32mm) Square base	265 lb. 120 kg
A-0167	37" 940mm	32" 813mm	11" 279mm diameter	13.75" 349mm diameter	13.75" 349mm square	10.6" 269mm	Centre pin 1½" (38mm) diameter 2" (51mm) long Keep mast base within clearance diameter of 12" (305mm)	4 holes drilled 1¼" (32mm) Square base	360 lb. 163 kg

TYPES A–3663–B, A–4447–B, A–3820–R



DIMENSIONS

TYPE	A	B	C	D	E	F	MAST FIXING	INSULATOR MOUNTING	WEIGHT
A-3663-B	34" 864mm	30" 762mm	6.5" 165mm diameter	18" 457mm diameter	17" 432mm diameter	Refer to "Insulator Mounting" column	Centre pin 1½" (38mm) diameter 2" (51mm) long Keep mast base within clearance diameter of 13" (330mm)	3 holes drilled 1-1/8" (29mm) on 15" (381mm) Bolt Circle Diameter Round base	530 lb. 240 kg
A-4447-B	35" 889mm	30" 762mm	6.5" 165mm diameter	21" 533mm diameter	21" 533mm square	18" 457mm	Centre pin 1½" (38mm) diameter 2" (51mm) long Keep mast base within clearance diameter of 16" (406mm)	4 holes drilled 1-3/8" (35mm) Square base	1005 lb. 456 kg
A-3820-R	37.5" 953mm	30" 762mm	6.5" 165mm diameter	27.5" 699mm diameter	27.5" 699mm diameter	Refer to "Insulator Mounting" column	Centre pin 1½" (38mm) diameter 2" (51mm) long Keep mast base within clearance diameter of 22" (559mm)	4 holes drilled 1-5/8" (41mm) on 24.5" (622mm) Bolt Circle Diameter Round base	1895 lb. 860 kg

150 Foot Tall by 24" Face Triangular Guyed Tower - Hawaii - MTI JOB NO. 1181-93
Code: ASCE 7-88, 100 mph basic wind speed, exp. type 'C', category 1; I=1.00, no ice
Client: Putnam Installation Co. - Ross Putnam Date Processed: February 18, 1993
Loading: -Y axis wind load, dead load, and guy wire prestress

INPUT:

NODES = 10 SUPPORT CONDITION = PINNED NODAL LOADS = 4 MODULUS = 29500000.psi

NODAL LOAD INPUT DATA:

NODE NO.	DIRECTION	COORD. NO.	LOADING (lbs)
3	Y	14	-88.0
5	Y	26	-127.0
7	Y	38	-173.0
9	Y	50	-219.0

TOWER SECTION PROPERTY INPUT DATA:

```
NUMBER COMMON =  1     MORE SECTIONS =  1     LENGTH =  210.00 inches     MC =  1
            sq in                sq in        lbs/ft          lbs/ft          lbs/ft      inches        inches
LEG AREA =  .6013   DIA AREA =  .3068   WOL =   26.00   WLy =  -13.97   WLz =     .00   DD = 24.00   DL = 19.50

NUMBER COMMON =  1     MORE SECTIONS =  1     LENGTH =  210.00 inches     MC =  0

NUMBER COMMON =  1     MORE SECTIONS =  1     LENGTH =  210.00 inches     MC =  1
            sq in                sq in        lbs/ft          lbs/ft          lbs/ft      inches        inches
LEG AREA =  .6013   DIA AREA =  .3068   WOL =   26.00   WLy =  -19.12   WLz =     .00   DD = 24.00   DL = 19.50

NUMBER COMMON =  1     MORE SECTIONS =  1     LENGTH =  210.00 inches     MC =  0

NUMBER COMMON =  1     MORE SECTIONS =  1     LENGTH =  210.00 inches     MC =  1
            sq in                sq in        lbs/ft          lbs/ft          lbs/ft      inches        inches
LEG AREA =  .6013   DIA AREA =  .3068   WOL =   26.00   WLy =  -22.12   WLz =     .00   DD = 24.00   DL = 19.50

NUMBER COMMON =  1     MORE SECTIONS =  1     LENGTH =  210.00 inches     MC =  0

NUMBER COMMON =  1     MORE SECTIONS =  1     LENGTH =  180.00 inches     MC =  1
            sq in                sq in        lbs/ft          lbs/ft          lbs/ft      inches        inches
LEG AREA =  .6013   DIA AREA =  .3068   WOL =   26.00   WLy =  -24.21   WLz =     .00   DD = 24.00   DL = 19.50

NUMBER COMMON =  1     MORE SECTIONS =  1     LENGTH =  180.00 inches     MC =  0

NUMBER COMMON =  1     MORE SECTIONS =  0     LENGTH =  180.00 inches     MC =  1
            sq in                sq in        lbs/ft          lbs/ft          lbs/ft      inches        inches
LEG AREA =  .6013   DIA AREA =  .3068   WOL =   26.00   WLy =  -25.43   WLz =     .00   DD = 24.00   DL = 19.50
```

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150 Foot Tall by 24" Face Triangular Guyed Tower - Hawaii - MTI JOB NO. 1181-93
Code: ASCE 7-88, 100 mph basic wind speed, exp. type 'C', category 1; I=1.00, no ice
Client: Putnam Installation Co. - Ross Putnam   Date Processed: February 18, 1993
Loading: -Y axis wind load, dead load, and guy wire prestress

INPUT:(CONT'D)

GUY DATA:

TOTAL NO. OF GUYS = 12   GUYED NODES = 4

NODES		X (ft)	Y (ft)	Z (ft)	Y1 (inches)	Z1 (inches)	EA (lbs)	EAI (lbs)	WEIGHT (lbs/in)	PRESTRESS (lbs)
3	1	35.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
3	1	35.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
3	1	35.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.
5	1	70.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
5	1	70.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
5	1	70.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.
7	1	105.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
7	1	105.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
7	1	105.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.
9	1	135.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
9	1	135.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
9	1	135.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.

OUTPUT:

NODE	DISP X (inches)	DISP Y (inches)	DISP Z (inches)	ROTA X (radians)	ROTA Y (radians)	ROTA Z (radians)
1	.00000	.00000	.00000	.00000	.00000	-.00315
2	-.00000	-.66443	.00000	.00000	.00000	-.00319
3	-.00001	-1.40409	.00000	.00000	.00000	-.00436
4	-.00001	-2.54220	.00000	.00000	.00000	-.00623
5	-.00002	-4.03727	.00000	.00000	.00000	-.00840
6	-.00002	-6.09405	.00000	.00000	.00000	-.01061
7	-.00002	-8.44668	.00000	.00000	.00000	-.01199
8	-.00002	-10.75049	.00000	.00000	.00000	-.01312
9	-.00002	-13.13548	.00000	.00000	.00000	-.01349
10	-.00002	-15.64654	.00000	.00000	.00000	-.01410

150 Foot Tall by 24" Face Triangular Guyed Tower - Hawaii - MTI JOB NO. 1181-93
Code: ASCE 7-88, 100 mph basic wind speed, exp. type 'C', category 1; I=1.00, no ice
Client: Putnam Installation Co. - Ross Putnam Date Processed: February 18, 1993
Loading: -Y axis wind load, dead load, and guy wire prestress

GUY WIRE OUTPUT DATA:

GUY NO.	DISPLACEMENT (inches)	CABLE FORCE (lbs)	NEW EA (lbs)
1	-1.3305	191.	443681.
2	.6652	986.	494851.
3	.6652	986.	494851.
4	-3.2583	67.	265336.
5	1.6291	1291.	495835.
6	1.6291	1291.	495835.
7	-5.6232	49.	191553.
8	2.8116	1542.	496669.
9	2.8116	1542.	496669.
10	-7.4418	44.	170907.
11	3.7209	1650.	497118.
12	3.7209	1650.	497118.

BEAM FORCES:

BM NO.	AXIAL (lbs)	SHEAR Y (lbs)	SHEAR Z (lbs)	TORSION (lb-in)	MOMENT Y (lb-in)	MOMENT Z (lb-in)	LEG 1 (lbs)	LEG 2 (lbs)	LEG 3 (lbs)
1	11469.	78.	0.	0.	0.	0.	3823.	3823.	3823.
1	-11014.	166.	0.	0.	0.	-1817.	-3759.	-3628.	-3628.
2	11014.	-166.	0.	0.	0.	1817.	3759.	3628.	3628.
2	-10559.	411.	0.	0.	0.	-54474.	-6141.	-2209.	-2209.
3	9776.	242.	0.	0.	0.	58464.	6072.	1852.	1852.
3	-9321.	93.	0.	0.	0.	-32020.	-4648.	-2337.	-2337.
4	9321.	-93.	0.	0.	0.	32021.	4648.	2337.	2337.
4	-8866.	428.	0.	0.	0.	-73122.	-6473.	-1196.	-1196.
5	7240.	411.	0.	0.	0.	83533.	6432.	404.	404.
5	-6785.	-24.	0.	0.	0.	-23381.	-3387.	-1699.	-1699.
6	6785.	24.	0.	0.	0.	23382.	3387.	1699.	1699.
6	-6330.	363.	0.	0.	0.	-43514.	-4204.	-1063.	-1063.
7	3952.	436.	0.	0.	0.	59224.	4167.	-108.	-108.
7	-3562.	-73.	0.	0.	0.	-4771.	-1417.	-1072.	-1072.
8	3562.	73.	0.	0.	0.	4770.	1417.	1072.	1072.
8	-3172.	290.	0.	0.	0.	-16306.	-1842.	-665.	-665.
9	390.	381.	0.	0.	0.	34816.	1805.	-708.	-708.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.

150 Foot Tall by 24" Face Triangular Guyed Tower - Hawaii - MTI JOB NO. 1181-93
Code: ASCE 7-88, 100 mph basic wind speed, exp. type 'C', category 1; I=1.00, no ice
Client: Putnam Installation Co. - Ross Putnam   Date Processed: February 18, 1993
Loading: +Y axis wind load, dead load, and guy wire prestress

INPUT:

NODES = 10   SUPPORT CONDITION = PINNED   NODAL LOADS = 4   MODULUS = 29500000.psi

NODAL LOAD INPUT DATA:

NODE NO.	DIRECTION	COORD. NO.	LOADING (lbs)
3	Y	14	88.0
5	Y	26	127.0
7	Y	38	173.0
9	Y	50	219.0

TOWER SECTION PROPERTY INPUT DATA:

```
NUMBER COMMON = 1    MORE SECTIONS =  1    LENGTH = 210.00 inches    MC = 1
               sq in            sq in          lbs/ft         lbs/ft        lbs/ft     inches       inches
LEG AREA = .6013  DIA AREA = .3068  WOL =  26.00  WLy =  13.97  WLz =   .00  DD = 24.00  DL = 19.50

NUMBER COMMON = 1    MORE SECTIONS =  1    LENGTH = 210.00 inches    MC = 0

NUMBER COMMON = 1    MORE SECTIONS =  1    LENGTH = 210.00 inches    MC = 1
               sq in            sq in          lbs/ft         lbs/ft        lbs/ft     inches       inches
LEG AREA = .6013  DIA AREA = .3068  WOL =  26.00  WLy =  19.12  WLz =   .00  DD = 24.00  DL = 19.50

NUMBER COMMON = 1    MORE SECTIONS =  1    LENGTH = 210.00 inches    MC = 0

NUMBER COMMON = 1    MORE SECTIONS =  1    LENGTH = 210.00 inches    MC = 1
               sq in            sq in          lbs/ft         lbs/ft        lbs/ft     inches       inches
LEG AREA = .6013  DIA AREA = .3068  WOL =  26.00  WLy =  22.12  WLz =   .00  DD = 24.00  DL = 19.50

NUMBER COMMON = 1    MORE SECTIONS =  1    LENGTH = 210.00 inches    MC = 0

NUMBER COMMON = 1    MORE SECTIONS =  1    LENGTH = 180.00 inches    MC = 1
               sq in            sq in          lbs/ft         lbs/ft        lbs/ft     inches       inches
LEG AREA = .6013  DIA AREA = .3068  WOL =  26.00  WLy =  24.21  WLz =   .00  DD = 24.00  DL = 19.50

NUMBER COMMON = 1    MORE SECTIONS =  1    LENGTH = 180.00 inches    MC = 0

NUMBER COMMON = 1    MORE SECTIONS =  0    LENGTH = 180.00 inches    MC = 1
               sq in            sq in          lbs/ft         lbs/ft        lbs/ft     inches       inches
LEG AREA = .6013  DIA AREA = .3068  WOL =  26.00  WLy =  25.43  WLz =   .00  DD = 24.00  DL = 19.50
```

150 Foot Tall by 24" Face Triangular Guyed Tower - Hawaii - MTI JOB NO. 1181-93
Code: ASCE 7-88, 100 mph basic wind speed, exp. type 'C', category 1; I=1.00, no ice
Client: Putnam Installation Co. - Ross Putnam Date Processed: February 18, 1993
Loading: +Y axis wind load, dead load, and guy wire prestress

INPUT:(CONT'D)

GUY DATA:

TOTAL NO. OF GUYS = 12 GUYED NODES = 4

NODES		X (ft)	Y (ft)	Z (ft)	Y1 (inches)	Z1 (inches)	EA (lbs)	EAI (lbs)	WEIGHT (lbs/in)	PRESTRESS (lbs)
3	1	35.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
3	1	35.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
3	1	35.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.
5	1	70.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
5	1	70.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
5	1	70.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.
7	1	105.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
7	1	105.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
7	1	105.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.
9	1	135.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
9	1	135.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
9	1	135.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.

OUTPUT:

NODE	DISP X (inches)	DISP Y (inches)	DISP Z (inches)	ROTA X (radians)	ROTA Y (radians)	ROTA Z (radians)
1	.00000	.00000	.00000	.00000	.00000	.00313
2	-.00000	.63994	.00000	.00000	.00000	.00283
3	-.00001	1.21736	.00000	.00000	.00000	.00303
4	-.00001	1.94173	.00000	.00000	.00000	.00361
5	-.00001	2.75350	.00000	.00000	.00000	.00453
6	-.00002	3.87914	.00000	.00000	.00000	.00569
7	-.00002	5.11923	.00000	.00000	.00000	.00640
8	-.00002	6.38448	.00000	.00000	.00000	.00722
9	-.00002	7.69369	.00000	.00000	.00000	.00748
10	-.00002	9.12342	.00000	.00000	.00000	.00809

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150 Foot Tall by 24" Face Triangular Guyed Tower - Hawaii - MTI JOB NO. 1181-93
Code: ASCE 7-88, 100 mph basic wind speed, exp. type 'C', category 1; I=1.00, no ice
Client: Putnam Installation Co. - Ross Putnam   Date Processed: February 18, 1993
Loading: +Y axis wind load, dead load, and guy wire prestress

GUY WIRE OUTPUT DATA:

GUY NO.	DISPLACEMENT (inches)	CABLE FORCE (lbs)	NEW EA (lbs)
1	1.1498	1193.	497483.
2	-.5749	459.	485312.
3	-.5749	459.	485312.
4	2.2120	1505.	498272.
5	-1.1060	317.	474577.
6	-1.1060	317.	474577.
7	3.3989	1719.	497604.
8	-1.6995	231.	457396.
9	-1.6995	231.	457396.
10	4.3539	1813.	497500.
11	-2.1770	200.	446833.
12	-2.1770	200.	446833.

BEAM FORCES:

BM NO.	AXIAL (lbs)	SHEAR Y (lbs)	SHEAR Z (lbs)	TORSION (lb-in)	MOMENT Y (lb-in)	MOMENT Z (lb-in)	LEG 1 (lbs)	LEG 2 (lbs)	LEG 3 (lbs)
1	9476.	-162.	0.	0.	0.	0.	3159.	3159.	3159.
1	-9021.	-83.	0.	0.	0.	-14203.	-3690.	-2665.	-2665.
2	9021.	83.	0.	0.	0.	14203.	3690.	2665.	2665.
2	-8566.	-327.	0.	0.	0.	23779.	-1711.	-3427.	-3427.
3	7801.	-269.	0.	0.	0.	-27465.	1279.	3261.	3261.
3	-7346.	-66.	0.	0.	0.	680.	-2416.	-2465.	-2465.
4	7346.	66.	0.	0.	0.	-680.	2416.	2465.	2465.
4	-6891.	-400.	0.	0.	0.	43872.	-186.	-3352.	-3352.
5	5578.	-411.	0.	0.	0.	-53985.	-738.	3158.	3158.
5	-5123.	24.	0.	0.	0.	2329.	-1596.	-1764.	-1764.
6	5123.	-24.	0.	0.	0.	-2329.	1596.	1764.	1764.
6	-4668.	-363.	0.	0.	0.	31912.	-21.	-2324.	-2324.
7	3012.	-432.	0.	0.	0.	-47567.	-1285.	2148.	2148.
7	-2622.	69.	0.	0.	0.	-1087.	-926.	-848.	-848.
8	2622.	-69.	0.	0.	0.	1087.	926.	848.	848.
8	-2232.	-294.	0.	0.	0.	16011.	26.	-1129.	-1129.
9	390.	-381.	0.	0.	0.	-34605.	-1535.	965.	963.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.

150 Foot Tall by 24" Face Triangular Guyed Tower - Hawaii - MTI JOB NO. 1181-93 13
Code: ASCE 7-88, 100 mph basic wind speed, exp. type 'C', category 1; I=1.00, no ice
Client: Putnam Installation Co. - Ross Putnam Date Processed: February 18, 1993
Loading: +Z axis wind load, dead load, and guy wire prestress

INPUT:

NODES = 10 SUPPORT CONDITION = PINNED NODAL LOADS = 4 MODULUS = 29500000.psi

NODAL LOAD INPUT DATA:

NODE NO.	DIRECTION	COORD. NO.	LOADING (lbs)
3	Z	15	88.0
5	Z	27	127.0
7	Z	39	173.0
9	Z	51	219.0

TOWER SECTION PROPERTY INPUT DATA:

NUMBER COMMON = 1 MORE SECTIONS = 1 LENGTH = 210.00 inches MC = 1
LEG AREA = .6013 sq in DIA AREA = .3068 sq in WOL = 26.00 lbs/ft WLy = .00 lbs/ft WLz = 13.97 lbs/ft DD = 24.00 inches DL = 19.50 inches

NUMBER COMMON = 1 MORE SECTIONS = 1 LENGTH = 210.00 inches MC = 0

NUMBER COMMON = 1 MORE SECTIONS = 1 LENGTH = 210.00 inches MC = 1
LEG AREA = .6013 sq in DIA AREA = .3068 sq in WOL = 26.00 lbs/ft WLy = .00 lbs/ft WLz = 19.12 lbs/ft DD = 24.00 inches DL = 19.50 inches

NUMBER COMMON = 1 MORE SECTIONS = 1 LENGTH = 210.00 inches MC = 0

NUMBER COMMON = 1 MORE SECTIONS = 1 LENGTH = 210.00 inches MC = 1
LEG AREA = .6013 sq in DIA AREA = .3068 sq in WOL = 26.00 lbs/ft WLy = .00 lbs/ft WLz = 22.12 lbs/ft DD = 24.00 inches DL = 19.50 inches

NUMBER COMMON = 1 MORE SECTIONS = 1 LENGTH = 210.00 inches MC = 0

NUMBER COMMON = 1 MORE SECTIONS = 1 LENGTH = 180.00 inches MC = 1
LEG AREA = .6013 sq in DIA AREA = .3068 sq in WOL = 26.00 lbs/ft WLy = .00 lbs/ft WLz = 24.21 lbs/ft DD = 24.00 inches DL = 19.50 inches

NUMBER COMMON = 1 MORE SECTIONS = 1 LENGTH = 180.00 inches MC = 0

NUMBER COMMON = 1 MORE SECTIONS = 0 LENGTH = 180.00 inches MC = 1
LEG AREA = .6013 sq in DIA AREA = .3068 sq in WOL = 26.00 lbs/ft WLy = .00 lbs/ft WLz = 25.43 lbs/ft DD = 24.00 inches DL = 19.50 inches

150 Foot Tall by 24" Face Triangular Guyed Tower - Hawaii - MTI JOB NO. 1181-93
Code: ASCE 7-88, 100 mph basic wind speed, exp. type 'C', category 1; I=1.00, no ice
Client: Putnam Installation Co. - Ross Putnam Date Processed: February 18, 1993
Loading: +Z axis wind load, dead load, and guy wire prestress

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INPUT:(CONT'D)

GUY DATA:

TOTAL NO. OF GUYS = 12 GUYED NODES = 4

NODES		X (ft)	Y (ft)	Z (ft)	Y1 (inches)	Z1 (inches)	EA (lbs)	EAI (lbs)	WEIGHT (lbs/in)	PRESTRESS (lbs)
3	1	35.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
3	1	35.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
3	1	35.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.
5	1	70.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
5	1	70.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
5	1	70.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.
7	1	105.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
7	1	105.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
7	1	105.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.
9	1	135.000	-90.000	.000	-13.856	.000	498400.	498400.	.0101	700.
9	1	135.000	45.000	77.942	6.928	12.000	498400.	498400.	.0101	700.
9	1	135.000	45.000	-77.942	6.928	-12.000	498400.	498400.	.0101	700.

OUTPUT:

NODE	DISP X (inches)	DISP Y (inches)	DISP Z (inches)	ROTA X (radians)	ROTA Y (radians)	ROTA Z (radians)
1	.00000	.00000	.00000	.00000	-.00325	-.00001
2	-.00000	.00349	.66003	.00000	-.00301	.00009
3	-.00001	.05111	1.31567	.00000	-.00370	.00040
4	-.00001	.18008	2.25239	.00000	-.00498	.00083
5	-.00001	.40238	3.42840	.00000	-.00664	.00129
6	-.00002	.71730	5.06447	.00000	-.00838	.00168
7	-.00002	1.10056	6.90657	.00000	-.00937	.00193
8	-.00002	1.46083	8.71808	.00000	-.01027	.00205
9	-.00002	1.83513	10.57147	.00000	-.01044	.00209
10	-.00002	2.21165	12.51476	.00000	-.01084	.00209

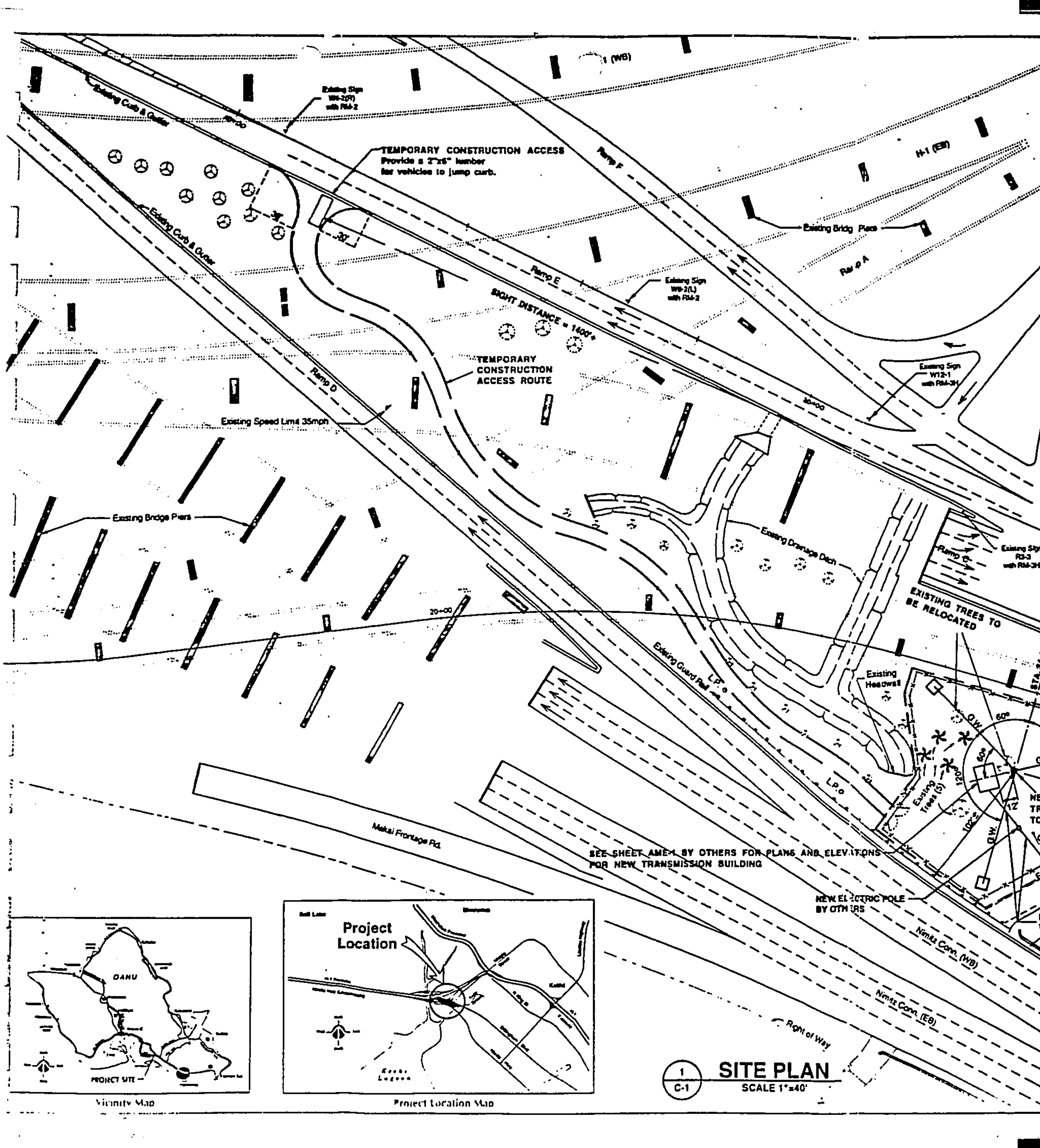
150 Foot Tall by 24" Face Triangular Guyed Tower - Hawaii - MTI JOB NO. 1181-93
Code: ASCE 7-88, 100 mph basic wind speed, exp. type 'C', category 1; I=1.00, no ice
Client: Putnam Installation Co. - Ross Putnam Date Processed: February 18, 1993
Loading: +Z axis wind load, dead load, and guy wire prestress

GUY WIRE OUTPUT DATA:

GUY NO.	DISPLACEMENT (inches)	CABLE FORCE (lbs)	NEW EA (lbs)
1	.0497	720.	470780.
2	-1.1029	258.	464037.
3	1.0532	1150.	495811.
4	.3286	819.	493681.
5	-2.5569	88.	327321.
6	2.2283	1509.	496845.
7	.7366	919.	492859.
8	-4.3463	61.	243595.
9	3.6097	1781.	498264.
10	1.0420	964.	494012.
11	-5.7036	56.	219539.
12	4.6615	1890.	497688.

BEAM FORCES:

BM NO.	AXIAL (lbs)	SHEAR Y (lbs)	SHEAR Z (lbs)	TORSION (lb-in)	MOMENT Y (lb-in)	MOMENT Z (lb-in)	LEG 1 (lbs)	LEG 2 (lbs)	LEG 3 (lbs)
1	10674.	25.	-104.	0.	0.	0.	3558.	3558.	3558.
1	-10219.	-25.	-140.	0.	3150.	5134.	-3159.	-3398.	-3661.
2	10219.	25.	140.	0.	-3150.	-5134.	3159.	3398.	3661.
2	-9764.	-25.	-385.	0.	-45392.	9830.	-2782.	-5382.	-1600.
3	8992.	10.	-248.	0.	49273.	-9910.	2521.	5289.	1183.
3	-8537.	-10.	-87.	0.	-24217.	10848.	-2324.	-4116.	-2098.
4	8537.	10.	87.	0.	24217.	-10848.	2324.	4116.	2098.
4	-8082.	-10.	-422.	0.	-67869.	11070.	-2161.	-5788.	-132.
5	6598.	-6.	-423.	0.	78340.	-11243.	1658.	5734.	-794.
5	-6143.	6.	36.	0.	-19760.	7929.	-1666.	-3062.	-1415.
6	6143.	-6.	-36.	0.	19760.	-7929.	1666.	3062.	1415.
6	-5688.	6.	-351.	0.	-41992.	4353.	-1687.	-3750.	-251.
7	3591.	-5.	-445.	0.	57664.	-4334.	989.	3704.	-1101.
7	-3201.	5.	82.	0.	-4053.	2207.	-961.	-1289.	-951.
8	3201.	-5.	-82.	0.	4054.	-2207.	961.	1289.	951.
8	-2811.	5.	-281.	0.	-16385.	178.	-929.	-1624.	-259.
9	390.	0.	-381.	0.	34707.	-73.	126.	1578.	-1314.
9	0.	0.	0.	0.	-0.	0.	0.	0.	0.



Existing Curb & Gutter
Existing Sign W4-2(R) with R4-2
TEMPORARY CONSTRUCTION ACCESS
Provide a 2"x6" lumber for vehicles to jump curb.
Ramp F
H-1 (EB)
Existing Bridg Piers
Existing Curb & Gutter
Ramp E
SIGHT DISTANCE = 1400'±
Existing Sign W9-2(L) with R4-2
Existing Sign W12-1 with R4-3H
TEMPORARY CONSTRUCTION ACCESS ROUTE
Ramp D
Existing Speed Limit 35mph
Existing Bridge Piers
Existing Drainage Ditch
Ramp C
Existing Sign R3-3
EXISTING TREES TO BE RELOCATED
Existing Guard Rail
L.P.
Existing Headwall
Existing Trees (5)
Makai Frontage Rd.
SEE SHEET AME-1 BY OTHERS FOR PLANS AND ELEVATIONS FOR NEW TRANSMISSION BUILDING
NEW ELECTRIC POLE BY OTHERS
Nimitz Conn. (WB)
Nimitz Conn. (EB)
Right of Way
OAHU
PROJECT SITE
Vicinity Map
Project Location
Project Location Map
1
C-1
SITE PLAN
SCALE 1"=40'

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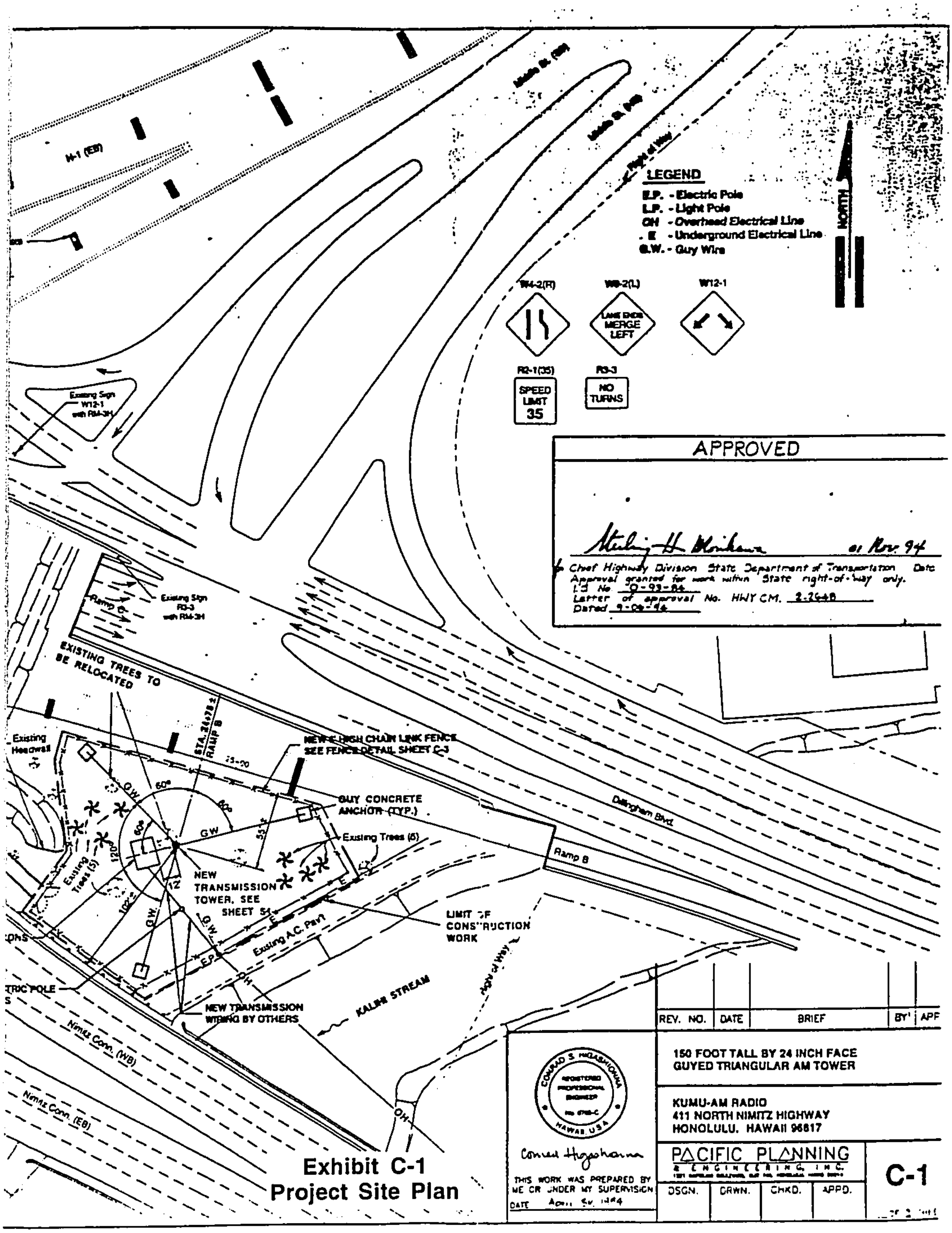

Exhibit C-1
Project Site Plan

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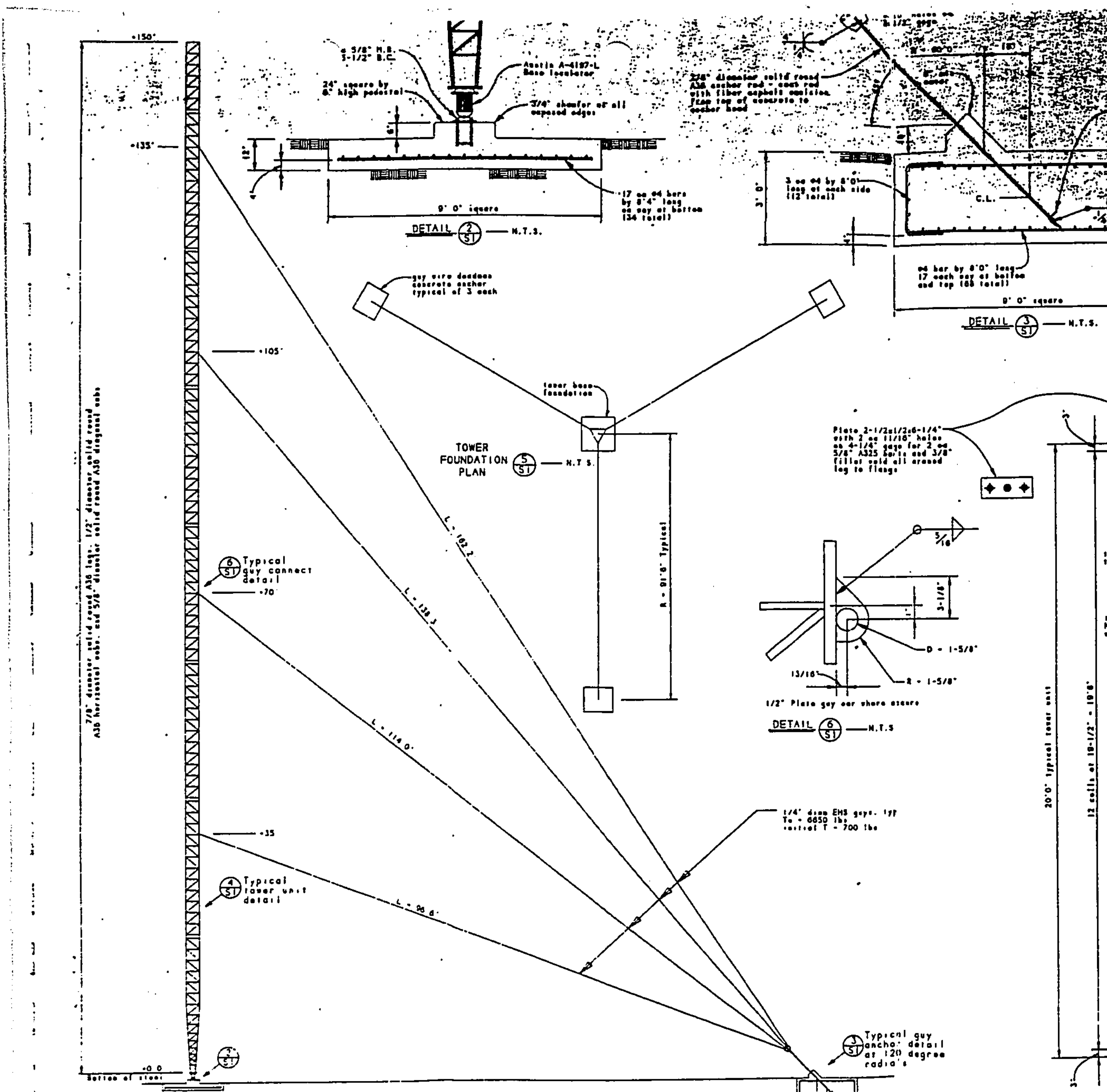

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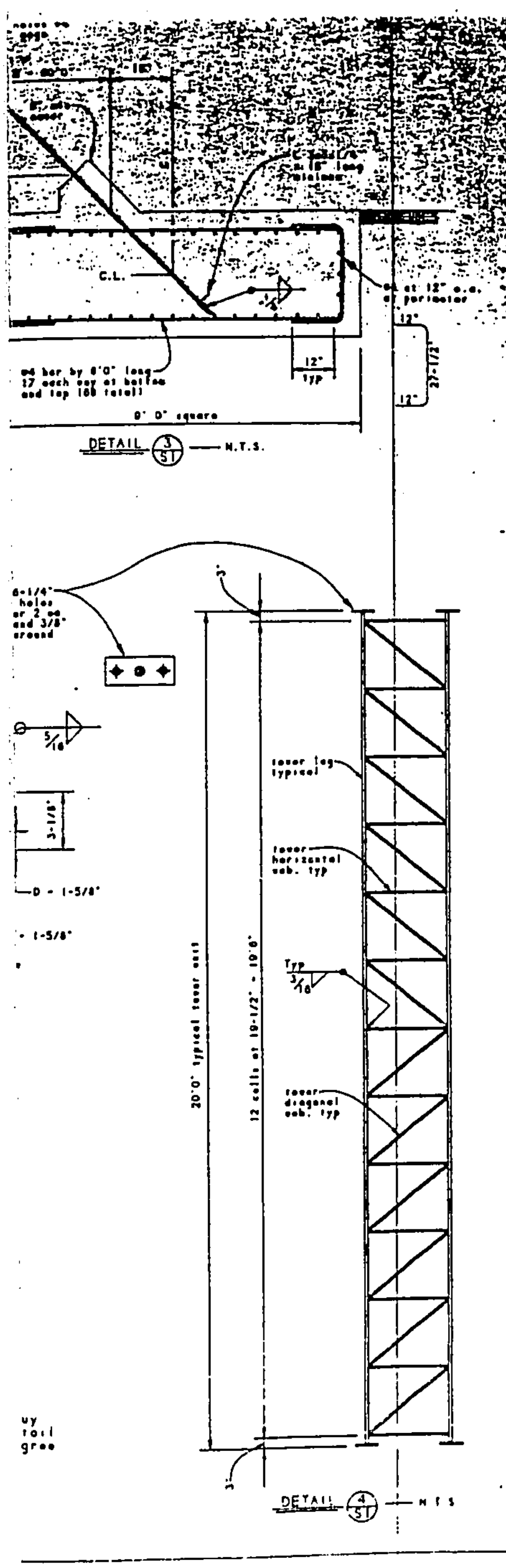


[illegible]

10. It shall be the [illegible] responsibility of the contractor and the Owner to [illegible] by this construction.

11. Contractors shall verify all dimensions and conditions before proceeding with the work.

12. The Contractor shall notify the Fabricator and the Engineer of Record where a conflict occurs on any of the contract drawings or documents. The Contractor shall not take delivery of, or erect any portion of, the structure that is in conflict until such conflict is resolved with the affected parties.

DESIGN CRITERIA

1. Tower load factors are based on the American Society of Civil Engineers standard ASCE 7-88, 100 MPH basic wind speed, with no icing. Allowable stresses for the tower mast strength are based on the American Institute of Steel Construction Specifications, 9th Edition, with a one-third stress increase taken for wind and seismic loads.
2. The tower is designed to support only the equipment and loads shown on structural drawing sheet S1. The addition of equipment which contributes to the dead or wind load on the tower is strictly prohibited without prior written approval for such additions by the Engineer of Record or by a licensed Civil or Structural Engineer.

WELDING REQUIREMENTS

1. Welding shall be done by the electric-arc or electro-flux process in accordance with AWS Standard D1.1 using only certified welders. All butt welds shall have complete penetration unless noted otherwise on plans. All welds shall be cleaned of slag before galvanizing.
2. All welds shall be full penetration butt welds unless noted otherwise on the plans.
3. All splice welds (to increase member length) shall be full penetration butt welds and shall be ground flush at all exposed surfaces. The soundness of all full penetration butt welds (to increase member length) shall be certified by an independent testing laboratory.
4. Where welding of galvanized members and pipe is required, all galvanizing and scale shall be ground 1/2 inch clear of the weld interface.

INSTALLING GUYS AND PLUMBING TOWER

1. Tower guys shall be tensioned accurately to ensure the adequate performance of the tower.
2. Plumb the tower in calm weather only (15 MPH winds maximum). Wind loads on the tower and guy wires changes the tension in all guys.
3. The three permanent guys at the lowest guy attachment level should be fastened to the tower first. THEN ALL GUYS AT THIS LEVEL SHALL BE PULLED TO THE ANCHORS SIMULTANEOUSLY. Use proper tensioning equipment. Tension guy wires to the specified [illegible], plus or minus 5 percent.
4. All permanent guys shall be installed progressively up the tower at similar [illegible]. ALL guys at a level shall ALWAYS be pulled to the anchors simultaneously to avoid damaging the tower.
5. Plumb of the tower, winds, uneven terrain and temperature are factors which affect guy tensions. If the tower site is level, the weather is calm, and anchor distances and elevations are equal, the tensions in all three guys at a guy level will be equal when the tower is plumb.
6. Plumb of the tower shall ALWAYS be checked simultaneously with at least two transits. One transit shall be set up sighting in the direction parallel to one guy and the second transit shall be set up at right perpendicular to this direction and along a face of the tower.

TOWER GUYS AND RIGGING

1. Guy wires shall be Phillystran HPTG non-metallic rope or Extra High Strength (EHS) grade galvanized steel strand manufactured in accordance with ASTM specification A122. Galvanized coatings shall be manufactured in accordance with ASTM designation A475.
2. Minimum ultimate (breaking) strengths shall be as follows:

   [illegible] Extra High Strength steel strand – 6,650 lbs.

3. All guy connections and tightening devices shall be galvanized or non-metallic and shall have ultimate strengths nominally equivalent to that of the guy wires, unless otherwise shown on the plans.
4. Guys shall be insulated with [illegible] as shown on structural drawing sheet S1.
5. Insofar as large foundation settlements are expected, guy tensions shall be checked at least twice annually.

FOUNDATION CONCRETE AND DESIGN

1. Foundation design is based on the report: "*Subsurface Investigation Report - Proposed 150 ft. KUMU Radio Tower [illegible] - Nimitz Highway at Dillingham Boulevard, Kalihi, Honolulu, Hawaii*" prepared by [illegible] Engineering, Inc., 145 [illegible] Street Suite 108, Kailua, Oahu, Hawaii, dated April 7, 1993. The recommendations contained within the report by [illegible] Engineering are incorporated as a part of these specifications by reference.
2. Concrete shall have an ultimate compressive strength of at least 2000 psi at 28 days and shall contain 5.5 sacks of cement per cubic yard, minimum.
3. Reinforcing bars shall conform to ASTM A615 - Grade 40, minimum. Provide 3" minimum clearance at all sides except as noted otherwise on plans.
4. Structural footing excavations shall be cleaned of all loose material prior to placing concrete. A representative of [illegible] Engineering, Inc. shall observe and approve all foundation excavations before concrete placement. Foundations shall bear against existing fill material overlying the natural alluvial soils.
5. Cement shall conform to ASTM C-150, Type I, [illegible]. Structural lightweight concrete shall be used for construction of the tower base and guy anchor foundations. Lightweight aggregate shall conform to ASTM C330.
6. Welding of reinforcing steel shall conform to AWS D12.1 using proper low hydrogen electrodes. Tack welding of re-bar is strictly prohibited.
7. Reinforcing steel shall be fabricated according to the "Manual of Standard Practice for Reinforced Concrete Construction" of the Concrete Reinforcing Steel Institute, latest edition.
8. Foundations are designed to bear on a maximum allowable bearing value of 200 pounds per square foot, neglecting the weight of soil replaced by concrete.
9. Lateral forces on the guy anchors are resisted by the net buoyant friction of the concrete deadman guy anchors. Buoyant concrete is considered to weigh 88 pounds per cubic foot for design purposes. Uplift forces are resisted by the buoyant weight of the deadman concrete anchors. An allowable friction factor of 0.40 is used for determining lateral load resistance of the deadman anchors. Passive pressures are neglected for determining guy anchor lateral capacity.

Exhibit C-2
Tower Details, Plan, Elevation, And Specifications

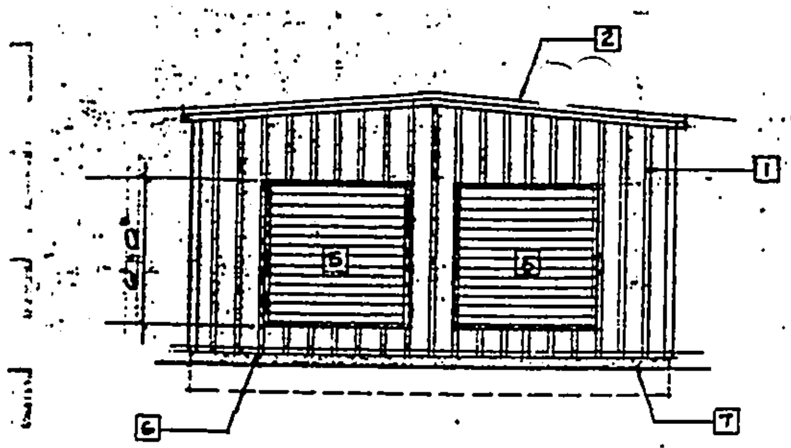
150 FOOT TALL BY 24 INCH FACE GUYED TRIANGULAR AM TOWER

KUMU-AM RADIO
441 NORTH NIMITZ HIGHWAY

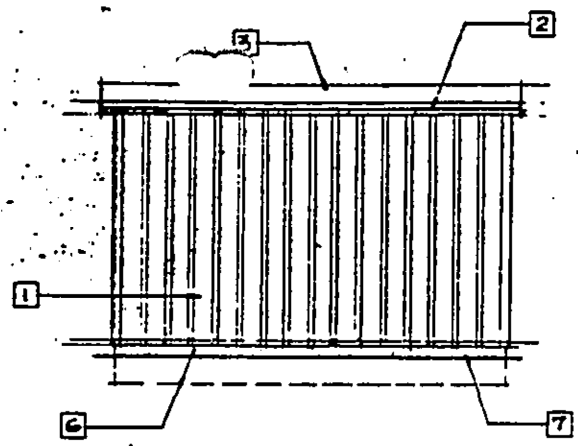
MAGNUM TOWERS, INCORPORATED
9370 ELDER CREEK ROAD
SACRAMENTO, CALIFORNIA 95829

DATE	4-15-93
DRAWN BY	DMD
SCALE	N.T.S.
JOB NO.	1181-93
SHEET	S1

DOCUMENT CAPTURED AS RECEIVED

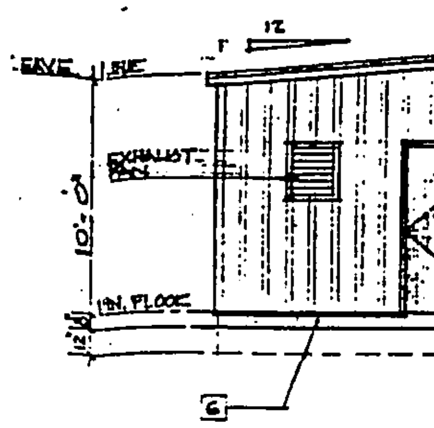


REAR ELEVATION



LEFT-SIDE ELEVATION

SCALE : 1/4" = 1'-0"



FRONT E

KUMU TRANSMITTER BLDG. PANEL SCHEDULE								
NAMEPLATE: A				VOLTAGE: 120/208 3φ 4W				
LOCATION: —				MAIN DEVICE: MLO				
MOUNTING: SURFACE				BUS SIZE: 100 A				
FEEDER ENTRY: TOP				SHORT CIRCUIT RATING: 10,000 AIC				
DESCRIPTION	WIRE	KVA	BKR. AMP/POLE	CIRCUIT AND PHASE	BKR. AMP/POLE	KVA	WIRE	DESCRIPTION
TRANSMITTER #1	12	1.8	1P15A	1 A 2	1P15A	1.8	12	TRANSMITTER #2
EXHAUST FAN #1	10	2.4	1P20A	3 B 4	1P20A	2.4	10	EXHAUST FAN #2
LIGHTS	12	0.3	1P15A	5 C 6	1P15A	1.1	12	RECEPTACLES
SPARE	—	—	1P15A	7 A 8	1P20A	—	—	SPARE
↓	—	—	↓	9 B 10	↓	—	—	↓
↓	—	—	↓	11 C 12	↓	—	—	↓
				13 A 14				
				15 B 16				
				17 C 18				
				19 A 20				
				21 B 22				
				23 C 24				
				25 A 26				
				27 B 28				
				29 C 30				
				31 A 32				
				33 B 34				
				35 C 36				
				37 A 38				
				39 B 40				
				41 C 42				

CONNECTED LOAD		DEMAND FACTOR	CALCULATED LOAD
LTG & MISC. CONTINUOUS	KVA	NEC 220-10(B)	8.7 KVA
RECEPTACLES	KVA	NEC 220-13	1.1 KVA
MOTORS	KVA	NEC 220-14	KVA
TOTAL CALCULATED LOAD = 9.8 KVA 47.21 AMPERES			

EXHAUST FANS:

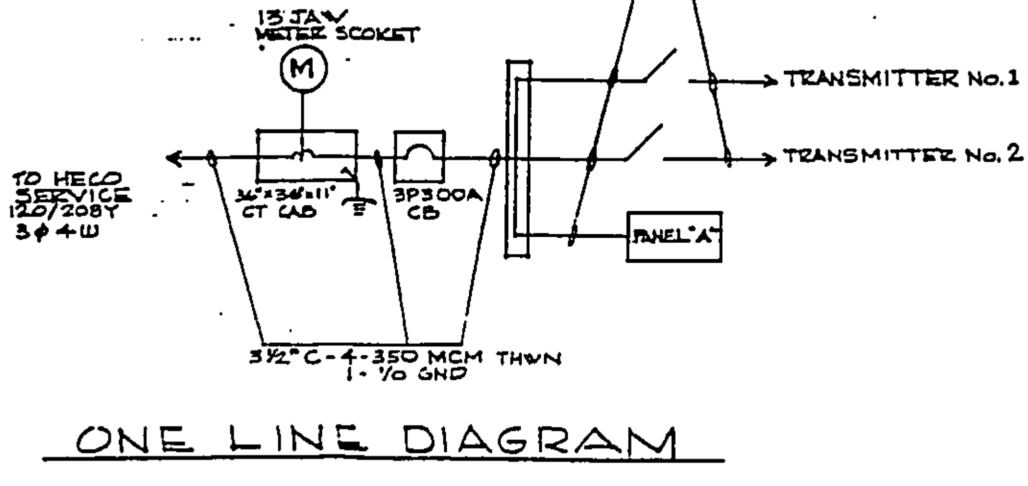
SHALL BE CARNES WALL PROPELLER FAN MODEL # 24LRDA
5400 CFM @ .250 in SP.
1/2 HP DIRECT DRIVE 120VOLT 20AMP
SUPPLIED WITH GRAVITY BACK DRAFT DAMPER, WALL MOUNTING COLLAR, EXTERNAL DAMPER GUARD, MOTOR SIDE GUARD.

- GUY WIRE.
- 150' HIGH x 24" FACE BROADCAST TOWER.
- REINFORCED CONCRETE FO
- TOWER MATCHING UNIT. (BC
- GUY WIRE.

BY OTHERS

ELECTRICAL LEGEND

- 120V AC 15A RECEPTACLE
- Ⓔ EQUIPMENT CONNECTION
- PANEL "A"
- NON FUSED DISCONNECT SW



ONE LINE DIAGRAM

PLAN / ELEVATION NOTES

1. METAL WALL PANELS, 26 GA. SKSI, DURA-RIB.
2. FLASHING AND EAVE TRIM.
3. METAL ROOF, 26 GA. SKSI, SHELL WHITE.
4. STEEL DOOR 4/0 X 7/0 W/FRAME AND MORTISE
5. FIXED-BLADE 6/0 X 6/0 AIR INTAKE WALL LOU
6. CONCRETE FOOTING.
7. FINISHED GRADE.
8. LINER PANEL.
9. R-13 WALL AND ROOF INSULATION.
10. 1 X 4(2-F40s) FLUORESCENT LIGHT FIXTURES.
11. TRANSFORMER 17"D X 26"W X 30"H, 600 LBS.
12. POWER SUPPLY 21"D X 48"W X 48"H, 120 LBS.
13. TRANSFORMER 19"D X 23"W X 30"H, 400 LBS.
14. DUMMY LOAD 19" X 23", 100 LBS.
15. SUPPORT EQUIPMENT (TRANSMITTER NO. 1) 73"H
16. TRANSMITTER NO. 1 208 VAC, 3 Ø, 30 KVA, 120 80"H, 2000 LBS. INSTALL ON STEEL PLATE AND 2'-0" O.F.F. BY OTHERS.
17. SUPPORT EQUIPMENT (TRANSMITTER NO. 2) 73"H
18. TRANSMITTER NO. 2 208 VAC, 3 Ø, 30 KVA, 120 80"H, 2000 LBS. INSTALL ON STEEL PLATE AND 2'-0" O.F.F. BY OTHERS.
19. 100 A 250 V DISCONNECT.
20. 12 SERVICES, 120 V, 15 A, LOAD CENTER. PA
21. 5400 CFM EXHAUST, 120 VAC, 20 A.

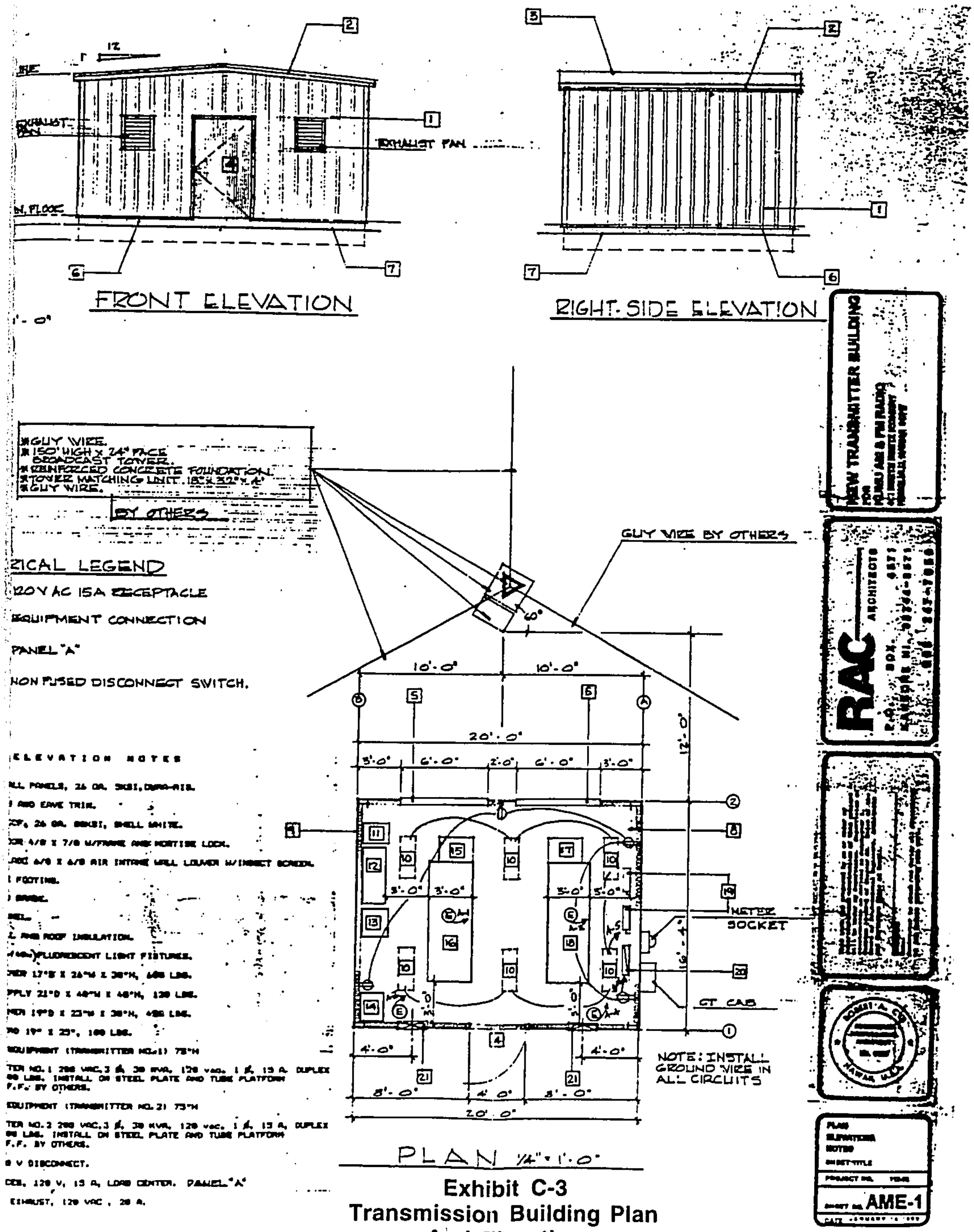


Exhibit C-3
Transmission Building Plan
And Elevation

b c d e f g h k m n p s t u w z aa ab ac ad ae af ag ah ak am an ap as at au aw az ba bb bc

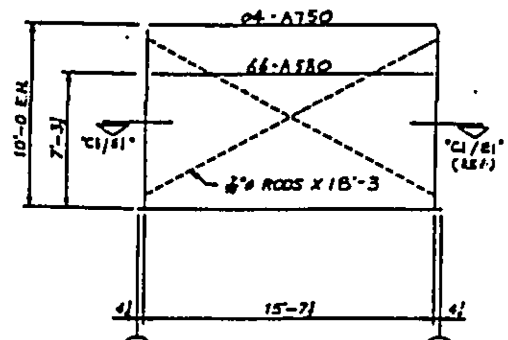
GENERAL NOTES

1) ROOF PANEL 26 GA. DURA-RIB — SHELL WHITE (53)
2) WALL PANEL 26 GA. DURA-RIB — SAND BEIGE (55)
3) LINER PANEL 26 GA. DURA-RIB — SHELL WHITE (53)
4) CORNER FLASH 26 GA. — SAND BEIGE (55)
5) BASE FLASH 26 GA. — SAND BEIGE (55)
6) ALL OTHER FLASH 26 GA. — SHELL WHITE (53)

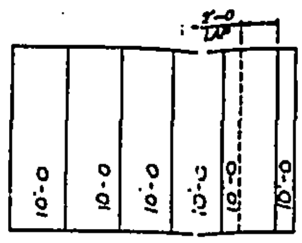
ACCESSORIES

(A) ONE – 4070 EMBOSSED BLANK SWING DOOR W/MORTISE LOCK W/INSULATION TRIM W/WEATHERSTRIP
(B) 2 – ENDWALLS INSULATION TRIM ANGLE
(C) 16 – LINEAL FEET OF 7-3 LINER

NOTE ANTI-ROLL CLIP 05-096 REQUIRED AT PEAK PURLIN AT EVERY COLUMN LINE.
RE: STANDARD DRAWING 17 11.00 DETAIL "B"



ELEVATION "A"



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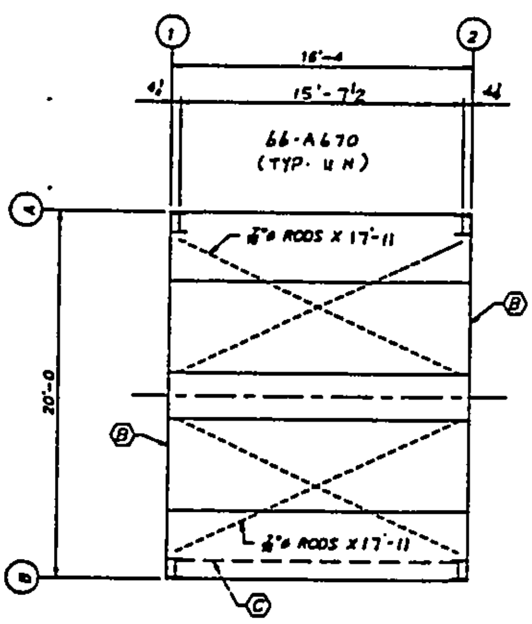
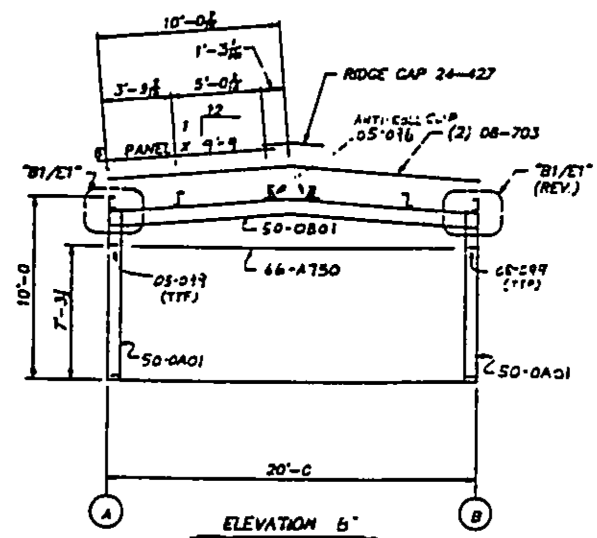
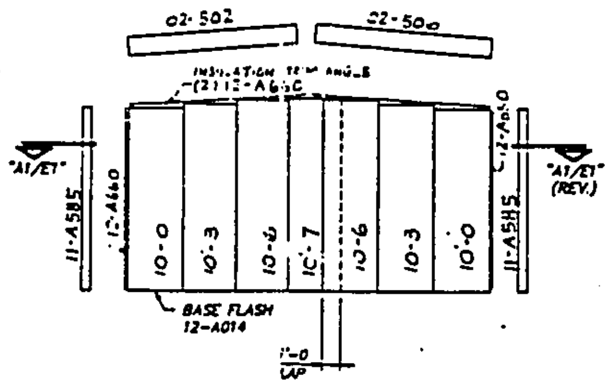


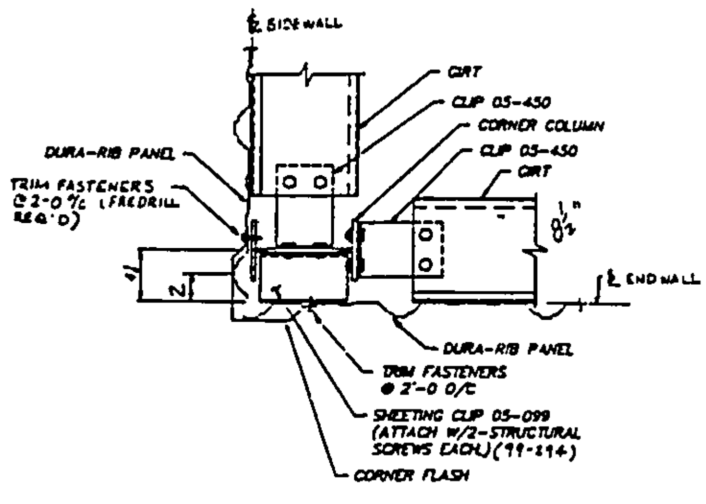
ROOF FRAMING PLAN



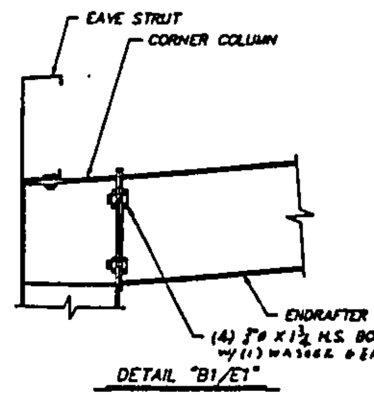
ELEVATION "B"



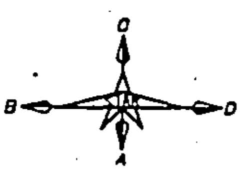
ELEVATION "B"



SECTION "A1/E1"



DETAIL "B1/E1"



REVISIONS	BY	DATE	NOTES		DRN BY JBL-T 6/4/93	DATE	STAR
					CHK BY	DATE	

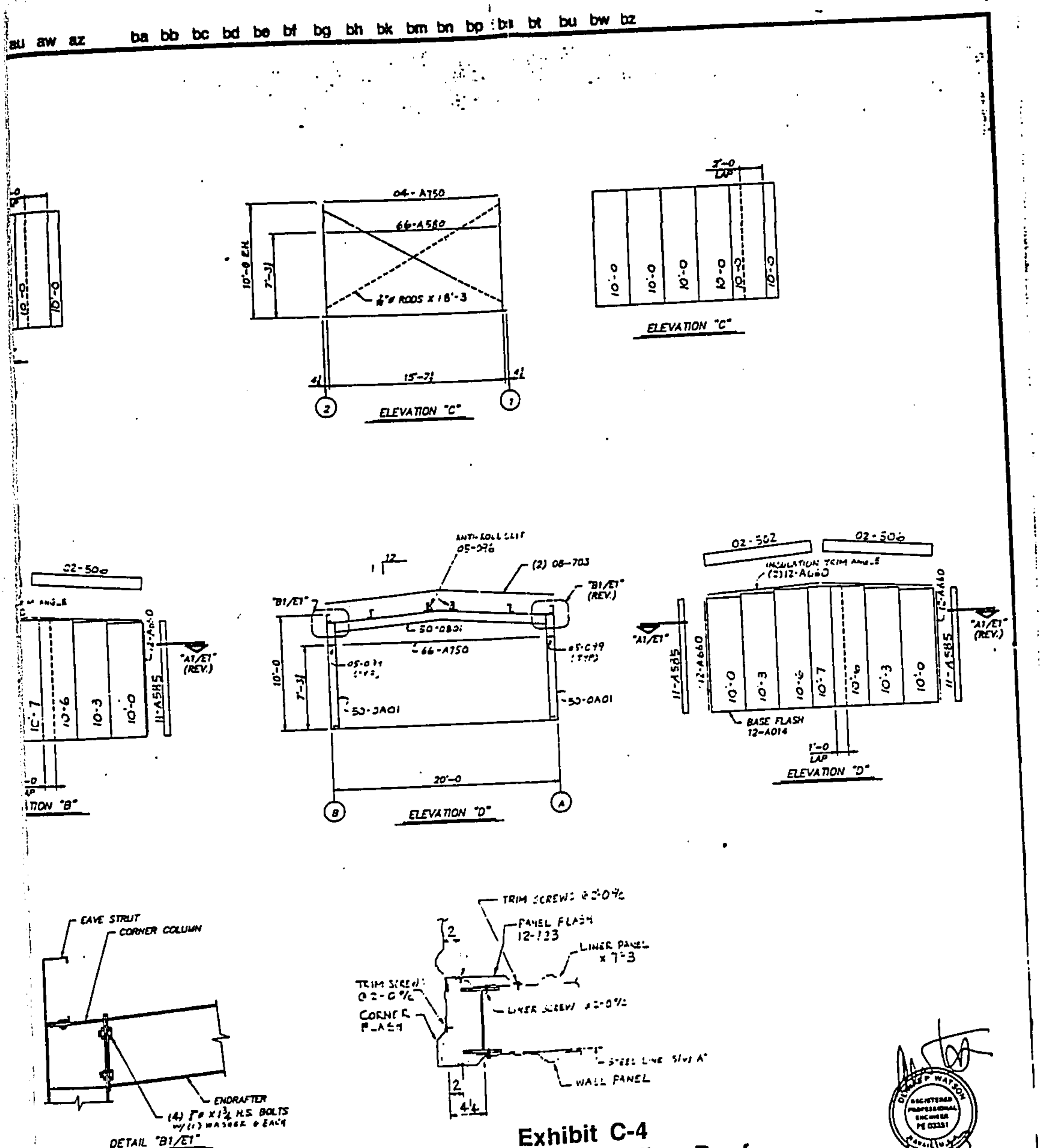


Exhibit C-4
Transmission Building Roof Framing Plan

DRN BY JB/LT 6/4/93 DATE	STAR BUILDING SYSTEMS	CAL PACIFIC STRUCTURES/HAWAII	93-0931
CHK BY DATE	a Robertson Ceco company	KUMU RADIO	
		HONOLULU, HAWAII	E1/1

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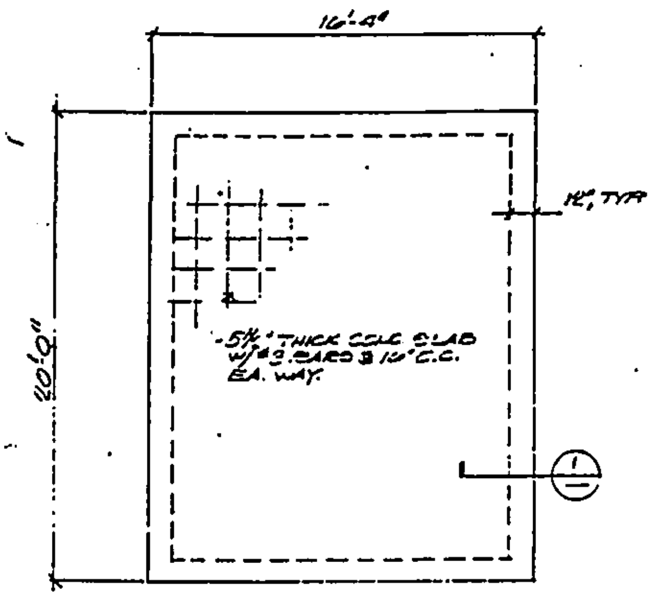
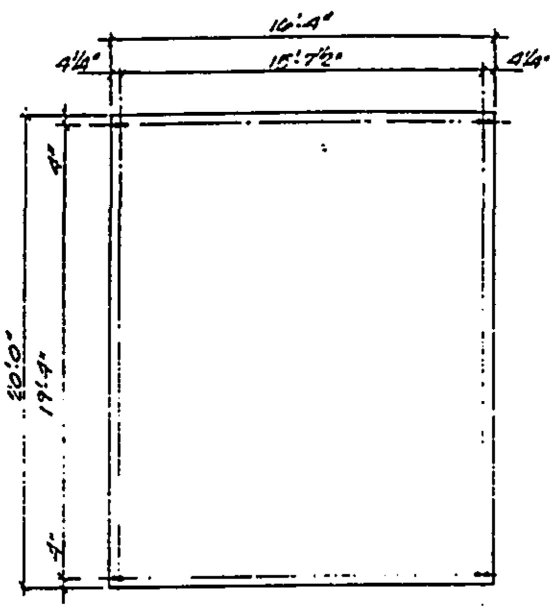
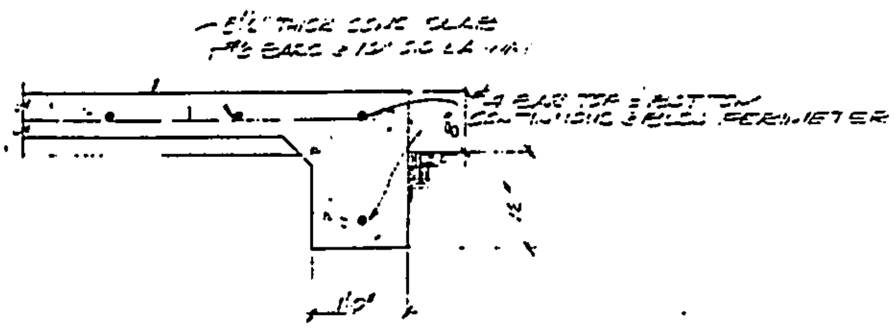


FOUNDATION PLAN 1/4"=1'0"



ANCHOR BOLT SETTING PLAN 1/4"=1'0"



1 PERIMETER FOOTING

Current Design Date:

Revisions

STRUCTURAL NOTES

GENERAL

1. All construction shall conform to the requirements of the Uniform Building Code 1985 Edition, and all other applicable codes and ordinances as adopted by the local authority, unless otherwise noted herein.
2. Dimensions shall not be scaled from drawings, written dimensions shall govern. Where written dimensions conflict with field conditions, or one another, such conflict shall be brought to the attention of the Engineer for clarification. Dimensions related to field conditions shall be verified in the field prior to commencement of construction.
3. The Engineer is not responsible for field conditions, location of property lines and/or easements, soil conditions, mechanical and/or electrical work, or the present or location of utilities not reported to him in writing by the owner.
4. Details of construction not shown or noted shall be considered of the same character as for similar conditions shown.

SOILS

1. Allowable soil bearing pressure is 200 psf at new foundations. All soils work shall be in conformance with the requirements of Chapter 29 of the UBC.
2. All footing excavations shall be dug as neat and as close to the footing dimensions as practicable. Over excavations in depth shall be filled with concrete, in width may be filled with concrete or backfill.
3. All foundations shall bear on firm undisturbed native soils or engineered fills at or exceeding the depths shown on the drawings.
4. Where backfill is placed against wall, the wall shall be adequately shored with the construction which braces the wall has been erected and has attained a design strength.

CONCRETE

1. All concrete work shall conform to the requirements of ACI 318-83, "Specifications for the Structural Concrete for Buildings."
2. Concrete for footings and slabs shall reach minimum 3,000 psi strength at 28 days using maximum 1 1/2" aggregate, minimum 5 1/2 sacks of cements, maximum 4" slump. NOTE: CONCRETE DESIGN BASED ON f'c =2,000 PSI (NO SPECIAL INSPECTION REQUIRED)
3. Lap reinforcing at splices minimum 40 bar dia. U.N.O. on plans.
4. Horizontal construction joints shall be cleaned and roughened by having the casting surface removed to expose aggregate solidly embedded.
5. All anchor bolts, inserts, or other hardware to be set in concrete shall be firmly set in place before placing concrete.
6. All reinforcing steel shall be clean and free of rust, and shall conform to ASTM A615 grade 40 for #5 bars and smaller, grade 60 for #6 bars and larger.

MORTON / PHILLIPS INC
Professional Engineers & Building Code Consultants
Donald T. Morton SE1211
600 B Street
Santa Rosa, California
95401-5102
Telephone (707) 527-8500
Facsimile (707) 527-0338

Project
Title

SHEET DATA
Project
Date
Drawn
Engineer
Check

Exhibit C-5
Transmission Building
Foundation Plan

DOCUMENT CAPTURED AS RECEIVED

NERAL NOTES

Verify and check all dimensions and details on the construction drawings for any discrepancy. Any discrepancy shall be brought to the attention of the engineer.

Work incidental to the contract and necessary to complete the project although not specifically referred to on the contract documents, shall be furnished and performed by the contractor.

In performing all work, the contractor shall exercise due care and caution necessary to avoid any damage to or an impairment in the use of any existing utility line. Any damage inflicted on existing utility lines resulting from the contractor's operations shall be immediately repaired or restored as directed by the engineer at the contractor's expense.

The contractor agrees that he shall assume sole and complete responsibility for the job site conditions during the course of construction of this project, including the safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the contractor shall defend, indemnify and hold the owner and engineer harmless from any and all liability, real or alleged, in connection with the performance or work on this project, excepting for liability arising from the sole negligence of the owner or the engineer.

5. Location of existing utility lines shown on plan and profile are approximate. Therefore, no assurance can be provided that the actual locations will be precisely as shown on the contract drawings. The contractor shall verify the location and depth of the facilities and exercise proper care in excavating in the area. Wherever connections of new utilities to existing utilities are shown on the plans, the contractor shall expose the existing lines at the proposed connections to verify their locations and depths prior to excavation of new lines.

Adequate provisions for traffic control shall be provided in accordance with "Rules and Regulations Governing the Traffic Control Devices at Work Sites on or Adjacent to Public Streets and Highways of the State of Hawaii" and with Federal Highway Administration "Manual on Uniform Traffic Control Devices for Streets and Highways" (1988).

7. Contractor shall make arrangements for utilities such as electricity, water, etc., required for his operations and all cost shall be borne by the contractor.

Written dimensions take precedence over scaled dimensions.

9. Permits shall be obtained by the contractor.

The contractor shall coordinate the storage of his material with the engineer.

The contractor shall observe and comply with all Federal, State, and local laws required for the protection of public health, safety, and environmental quality.

12. No construction equipment shall be parked within the road right-of-way in such a manner that the equipment will obstruct the normal movement and sight distance of the driving motorist, except during actual working hours.

Except during actual work hours, all signs which do not pertain to the construction activity, such as "Men Working " and "Flagman Ahead" shall be covered or laid down. However, all signs necessary for the safety of the public shall be maintained.

Any pavement markings, structures, and appurtenances damaged by the utilities line installation shall be repainted or reconstruction satisfactory to the Engineer.

15. The topographic features shown on this plan are based on information from State Department of Transportation (DOT) Right-of-Way maps and construction plans and are to be field verified.

The location of transmission tower and transmission building is approximate. The contractor will adjust location of tower and building during construction to fit field conditons.

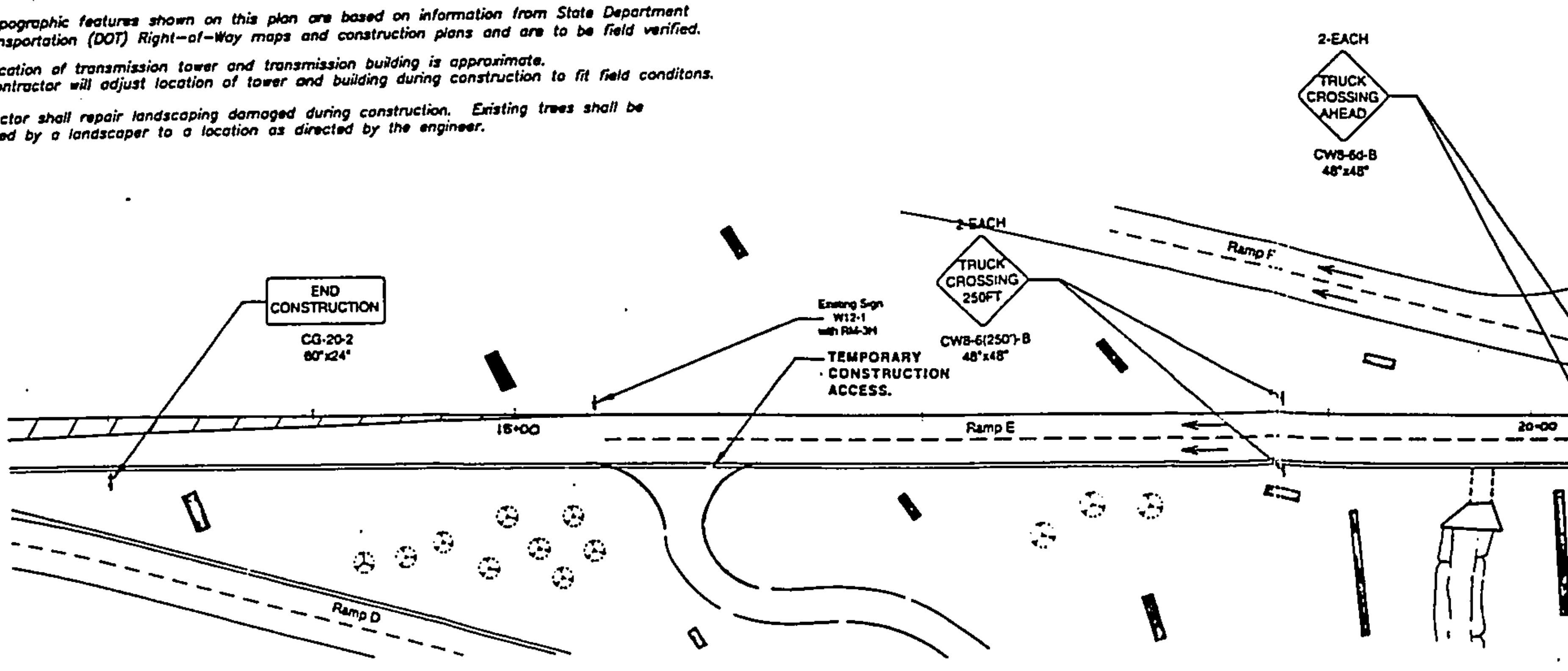
17. Contractor shall repair landscaping damaged during construction. Existing trees shall be relocated by a landscaper to a location as directed by the engineer.

NOTES FOR CONSTRUCTION WITHIN STATE RIGHT-OF-WAY

1. The Contractor shall obtain a construction permit from the State's Highway District Enginee 727 Kakoi Street, Honolulu, Hawaii prior to commencement of work within State Highway r
2. Construction and restoration of all existing highway facilities within State right-of-way sho done in accordance with all applicable sections of the current Standard Specifications for Bridge Construction, and the Specification for Installation of Miscellaneous Improvements within State Highways, of the State Highways Division.
3. All lanes shall be opened to traffic during the morning peak hours from 6 a.m. to 8:30 during the afternoon peak hours from 3:30 pm to :1:30 pm. and during off-work hours. of traffic in each direction shall be maintained open at all times.
4. The contractor shall provide, install, and maintain al necessary signs, lights, flares, barric markers, cones, and other protective facilities and shall take all necessary precautions for protection and for the convenience and safety of public traffic. All such protective facil precautions to be taken shall conform with the "Administrative Rules of Hawaii Governing Traffic Control Devices at Work Sites On or Adjacent to Public Streets and Highways" adop Director of Transportation, and the current U.S. Federal Highway Administration "Manual on Traffic Control Devices for Street and Highways, Part VI-Traffic Control for Highway Constr and Maintenance Operations". If lanes closures are required during construction, a traffic plan shall be incorporated into the construction plans and must be approved by the Divisio the issuance of the permit.
5. No material and/or equipment shall be stockpiled or otherwise stored within highway right except at locations designated in writing and approved by the District Engineer.
6. Longitudinal drainage along the highway shall be maintained.
7. Approval of permit construction plans shall be valid for a period of one year thereof fron of notification of approval to the applicant. In the event construction does not commenc one-year period, the applicant will be required to resubmit his construction plans for the review and approval.
8. All regulatory, guide and construction signs and barricades shall be of high intensity refle sheeting.

SOLID WASTE NOTES

1. If a County landfill is used, the contractor shall be responsible to provide all necessary l equipment, materials and supplies to properly landfill his waste.



1 C-2 TRAFFIC CONTROL PLAN
SCALE 1"=40'

DOCUMENT CAPTURED AS RECEIVED

OF-WAY

the State's Highway District Engineer at
ent of work within State Highway right-of-way.

ities within State right-of-way shall be
current Standard Specifications for Road and
of Miscellaneous Improvements

peak hours from 6 a.m. to 8:30 a.m. and
pm. and during off-work hours. One lane
all times.

cessary signs, lights, flares, barricades,
take all necessary precautions for the
c traffic. All such protective facilities and
trative Rules of Hawaii Governing the Use of
Public Streets and Highways" adopted by the
Highway Administration "Manual on Uniform
-Traffic Control for Highway Construction
uired during construction, a traffic control
nd must be approved by the Division prior to

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by the District Engineer.

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a period of one year thereof from the date
ent construction does not commence within this
bmit his construction plans for the Division's

ides shall be of high intensity reflective

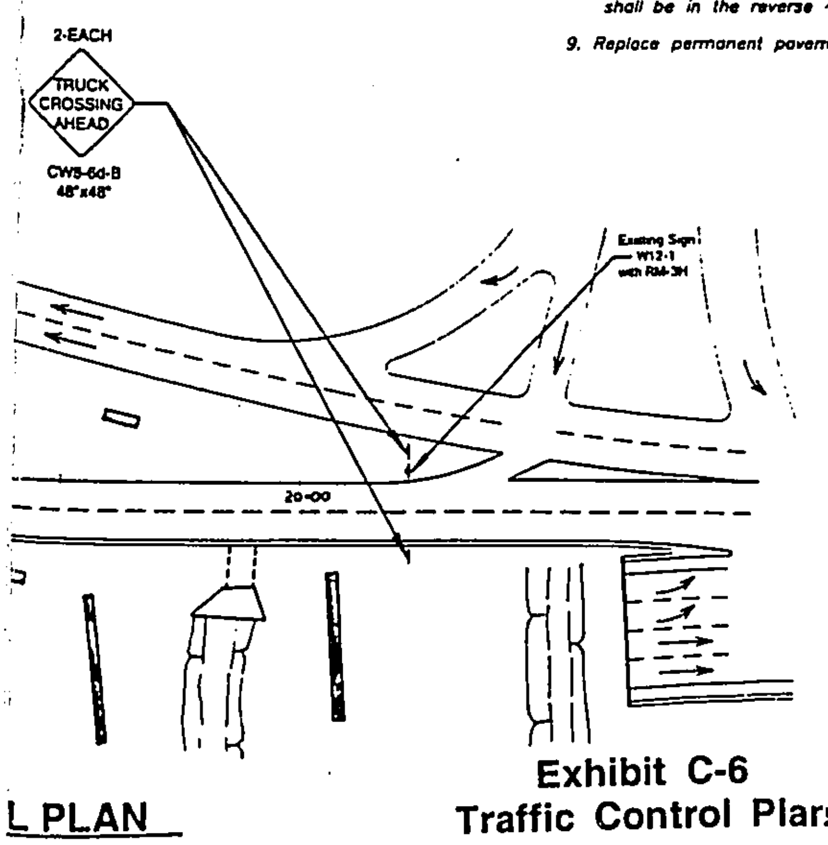
sponsible to provide all necessary labor,
is waste.

HECO AND HTCO NOTES

1. The Contractor shall exercise caution when excavation and construction crosses or is in close proximity of underground telephone and signal cable facilities and maintain adequate clearance for his equipment while working close to and/or under the overhead facilities. Any damage to the existing underground and overhead utilities shall be repaired and paid for by the Contractor.
2. Should it become necessary, any work required to relocate HECO facilities shall be done by HECO and paid for by the Contractor. The Contractor shall be responsible for all coordination.
3. The Contractor is to exercise extreme caution when the excavation and construction crosses or is in close proximity of HECO underground electrical facilities and maintain adequate clearance for his equipment while working close to and/or under HECO's overhead facilities.
4. Should field conditions and/or construction procedure require that poles be braced to facilitate construction, the contractor is to contact HECO district construction superintendent a minimum of 72 hours in advance for bracing instruction.
5. The existence and location of HECO overhead and underground facilities as shown on the plans are from existing records of varying degrees of accuracy and are not guaranteed as shown. Should relocation of HECO facilities be required, HECO is to be contacted four (4) weeks in advance. Any work required to relocate HECO facilities shall be done by HECO and paid for by the contractor. The contractor shall be responsible for all coordination.
6. The contractor is to comply with the directions of the State of Hawaii Occupational Safety and Health Law (DOSH).
7. The contractor shall report any damages to HECO's facilities to the HECO trouble dispatcher.

GENERAL NOTES FOR TRAFFIC CONTROL PLAN

1. The permittee shall make minor adjustments at intersections, driveways, bridges, structures, etc., to fit field conditions.
2. Traffic control devices shall be installed such that the sign or device farthest from the work area shall be placed first. The others shall then be placed progressively toward the work area.
3. Regulatory and warning signs within the construction zone that are in conflict with the Traffic Control Plans shall be removed or covered. All signs shall be restored upon completion of the work.
4. Flaggers and/or police officers shall be in sight of each other or in direct communication at all times.
5. All traffic lanes shall be a minimum of 10 feet wide.
6. All construction warning signs shall be promptly removed or covered whenever the message is not applicable or not in use.
7. The backs of all signs used for traffic control shall be appropriately covered to preclude the display of inapplicable sign messages (i.e., when signs have messages on both faces).
8. At the end of each work day or as soon as the work is completed, the permittee shall remove all traffic control devices no longer needed to permit free and safe passage of public traffic. Removal shall be in the reverse order of installation.
9. Replace permanent pavement markings and traffic signs upon completion of each phase of work.



L PLAN

Exhibit C-6
Traffic Control Plan

REV. NO.	DATE	BRIEF	BY	APP.

150 FOOT TALL BY 24 INCH FACE
GUYED TRIANGULAR AM TOWER

KUMU-AM RADIO
411 NORTH NIMITZ HIGHWAY
HONOLULU, HAWAII 96817

CONRAD S. HIGASHIONNA
REGISTERED PROFESSIONAL ENGINEER
HAWAII USA

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
DATE April 1998

PACIFIC PLANNING & ENGINEERING, INC.

DSGN.	DRWN	CHDK.	APPD

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