

1991-07-08-0A FEA

ENVIRONMENTAL ASSESSMENT

* WAIKIKI PROJECT I. (MAUKA TOWER - MAKAI TOWER)*

U.S.A. PENSEE, INC.

APRIL 1991

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ENVIRONMENTAL ASSESSMENT
WAIKIKI PROJECT I. (MAUKA TOWER - MAKAI TOWER)
TAX MAP KEYS: 2-6-24: 65-68 and 80-83
TAX MAP KEYS: 2-6-24: 34-40 and 42-45

1. **Applicant:** U.S.A. Pensee, Inc.
1314 S. King Street, Suite 523
Honolulu, Hawaii 96814

Agent: William C. McCorriston
Attorney at Law
Five Waterfront Plaza
Honolulu, Hawaii 96813
(808) 529-7300
2. **Approving Agency:** Department of Land Utilization
650 S. King Street, 7th Floor
Honolulu, Hawaii 96813
3. **Agencies Consulted:** Department of Land Utilization
Department of Transportation Services
Department of Public Works
Board of Water Supply

4. **Property Profile:**

Tax Map Key:	2-6-24: 65-68 & 80-83	2-6-24: 34-40 & 42-45
Lot Area:	26,227 square feet	49,394 square feet
Flood Zone:	FIRM Zone AE	FIRM Zone AE & X
Zoning:	Apartment Precinct	
Height:	240 feet	
Shoreline Management Area:	No	
Special District:	Waikiki	
State Land Use:	Urban	
Development Plan:	Medium Density Apartment	

5. **Project Description:**

Background

The applicant proposes new construction on two sites in Waikiki; the sites are bordered by Lilioukalani Avenue and Cleghorn Street and are separated by Tusitala Street. Because the project sites are situated in Waikiki, an Environmental Assessment (EA) is required under the provisions of Chapter 343, HRS, Environmental Impact Statements, and a Waikiki Special District Permit, Major, will also be required.

The project proposal was presented to the Waikiki Neighborhood Board No. 9 on April 2, 1991. A copy of the

Board's agenda is included as an Appendix to this Assessment (Appendix A.)

Location

The project sites are located in the Apartment Precinct of the Waikiki District and bounded by Mountain View Drive on the north, Lilioukalani Avenue on the east, Cleghorn Street on the south and Kapili Street on the west. Tusitala Street separates the two project sites. Figure 1. is a Location Map.

Existing Use

Existing uses on the project sites formerly included a mixture of residential and apartment structures. According to City records, the structures, containing approximately 128 units and ranging from one- to four-stories, were constructed as far back as 1923, with the majority built between the 1920's and the 1940's. Demolition has occurred on the site and is continuing in anticipation of the proposed redevelopment.

Surrounding Uses

Uses in the immediate vicinity are a mixture typical to this area of Waikiki and include clusters of small wooden "cottages", one- and two-story dwellings, and mid- and high-rise apartment structures. The latter are the predominate use in the neighborhood, some of which were originally constructed as hotels and later converted to apartment use. The "Pacific Islander Hotel," which abuts a portion of the project site, is a 7-story structure, now containing apartment units, and is typical of the surrounding uses.

Project Proposal

The applicant proposes two apartment structures, the first on a site of approximately 26,227 square feet (the "Mauka Tower") which will contain 46 units with a floor area of approximately 38,525 square feet. The "Makai Tower" will be located on a site of approximately 49,394 square feet, and will contain 101 units with a floor area of approximately 76,328 square feet. The total number of units proposed for the two sites is 147.

Each of the structures would have a maximum height of 240 feet and an attached parking structure, with a recreation deck on top of this structure. The Mauka Tower parking structure will be four levels, starting at grade, while a half-level of basement parking will be provided on the Makai Tower site with four additional levels of parking. Fifty-three

Mauka Tower units will be one-bedroom units of approximately 587 square feet; Makai Tower units will be one-bedroom units of approximately 547 square feet.

Egress/ingress will be from Mountain View Drive and Lilioukalani Avenue for the Mauka Tower, and from Cleghorn Street for the Makai Tower.

Figures 2.A-1.1 through A-3.1 are site drawings showing site and ground floor plans, parking plans, the recreation deck, typical floor plans, and elevations for the Mauka Tower. Figures 3.A-1.1 through A-3.2 are site drawings for the Makai Tower.

In addition to the recreation decks noted above, recreational amenities will include a swimming pool and spa for both structures, and a picnic area and putting green for the Makai Tower site.

An architectural rendering is included as Figure 4. The proposed site plans provide for extensive open space and landscaping. A Landscaping Plan is included as Figure 5., and Figure 6. and Figure 7. show recreational amenities.

Development Schedule/Estimated Costs

A start date of August 1991 is planned, with completion in June 1993. Development costs are estimated at \$23 million.

6. General Description of the Action's Technical, Economic, Social, and Environmental Characteristics

Technical Characteristics

The proposal involves the demolition of the remaining structures on the site and the construction of the Mauka and Makai apartment towers as described above. No major excavation or dewatering activities are proposed.

Economic and Social Characteristics

Economic

For the short-term, an estimated 300 - 400 direct and indirect jobs would result from construction activities on the project sites.

In addition, approximately 4 - 6 long-term positions will be created in management, maintenance and security services for the structures, grounds, recreational amenities and residents of the projects.

It can be anticipated that redevelopment of the project sites will produce some beneficial economic impacts which include new employment opportunities for the short-term and long-term, as well as increased State and County revenues generated from personal income and real property taxes.

Demographics

The projects will result in a relatively insignificant potential increase in residential population in the area. Using an average 1.7 persons per household, approximately 250 residents will occupy the proposed apartment structures. The projects are not expected to result in an increase in the visitor population.

Displacement

As noted above, the sites have for some time contained a mixture of older residential and apartment structures; however, the site is now partially vacant, having been cleared for the proposed projects, and further demolition is underway. The applicant has offered a relocation assistance program to tenants, and there are only seven tenants to be relocated at this time.

C. Environmental Characteristics

Topography/Soils

The site is relatively level and contains no unique topographical features. Preliminary topographic survey data indicate elevations at the Mauka site vary from 4.9 to 5.3 feet. At the Makai site, elevations range from 5.2 feet to 6.3 feet.

Based on available information from nearby projects, a generalized subsurface profile at the project sites will most likely consist of a thin layer of sandy fill about 5 feet thick, a thick layer of very soft silty clay (Lagoonal deposit), a thin coral ledge which may exist at about 30 to 40 feet depth, various layers and zones of coralline sand and gravel, and a lower coral ledge which may exist at about 80 to 110 feet depth. The normal ground water level in Waikiki is generally close to or slightly above the mean sea level and may be assumed to be 4 to 5 feet below the existing ground surface.

A major subterranean stream channel is known to exist near Kaiulani Avenue, which probably will not affect the proposed sites. A subsurface exploratory program is planned at the project site in the future to verify and validate the actual subsurface conditions.

Flood Conditions

The proposed site of the Mauka Tower (TMK 2-6-24: 65-68 and 80-83) is designated on the Flood Insurance Rate Map (FIRM) as FIRM Zone AE, areas of 100-year flooding, where base flood elevations have been determined. The proposed Makai Tower site is within FIRM Zones AE and X, the latter areas determined to be outside the 500-year flood plain. Areas within FIRM Zone AE will be subject to Land Use Ordinance (LUO) Flood Hazard District requirements, and a Flood Elevation Certificate will be submitted for approval. Interpolation of flood contours indicated the minimum floor elevation at the Mauka site is 6.5 feet and 6.25 feet at the Makai site. Refer to Figure 8., which shows FIRM designations and base flood elevations.

Flora and Fauna

Approximately 30 to 40 mature trees and varieties of shrubbery exist on the project sites, typical to this area of Waikiki. Trees include coconut, mango, rubber tree, and plumeria. No trees are listed on the Exceptional Trees Ordinance (Nos. 78-91 and 81-32) and no known unique or endangered species are present.

Since the project sites have been developed with urban uses since the early 1920's, fauna observed on the sites are those common to other urbanized areas, such as rats and mice. Existing vegetation and mature trees provide a habitat for various avifauna, such as sparrow, doves, cardinals and others which are frequently observed in other urbanized areas. There are no known threatened or endangered species of fauna on the site.

Existing trees will be retained or relocated to the extent possible, and any necessary removal will be performed in compliance with existing Waikiki Special District requirements.

Archaeological

An archaeological background study was performed by Cultural Surveys Hawaii Ltd. Findings to date indicate that the project sites were taro lands, later utilized for rice cultivation into the twentieth century when they were drained by the construction of the Ala Wai Canal and probably filled by dredged material from canal construction. (Liliuokalani Avenue was extended to the Ala Wai in 1921.) The southwest corner of the site was a portion of "Ainahau," the estate of Governor Archibald S. Cleghorn and family (possibly huts or other habitation structures), though the main houses were located elsewhere. "Ainahau" was subdivided and sold as individual lots in 1919.

Since there is a possibility that the southwest portion, or the former taro and rice lands, could yield

archaeological findings, further archaeological work will include: (a) subsurface test excavations after the demolition of existing structures; and (b) a specific sampling strategy coordinated with the State Historic Preservation Office.

Air Quality

Since traffic is the major source of long-term pollutants and since project-generated traffic is expected to increase only slightly, long-term adverse impacts, such as major increases in carbon monoxide (CO) emissions are not anticipated. It should also be noted that CO emission rates for automobiles will continue to drop in the future, so that anticipated increases in traffic will not produce higher concentrations at the project sites.

For the short-term, air quality impacts can be expected from construction activity. During site preparation and construction, it is likely that fugitive dust will be generated. It can also be expected that construction vehicle activity will increase automotive pollutant concentrations. This is not a long-term, or permanent impact and appropriate dust control measures, proper vehicle maintenance, as well as other pertinent government standards, will be employed to minimize impacts on air quality during construction activities.

Noise Impacts

An "Environmental Noise Impact Assessment" for the projects was prepared by Darby & Associates and is included in its entirety as Appendix B. A summary of the Assessment is as follows:

The existing acoustical environment at the project site varies widely depending on the location relative to Ala Wai Boulevard. The measured average levels varied from 54 to 63 dBA, and the background levels were in the range of 52 to 57 dBA.

Traffic noise level calculations indicate that the future Average Day-Night Sound Level (Ldn) due to traffic movements on Ala Wai Boulevard will increase by at most 0.5 dB relative to the existing level, regardless of the project development. When comparing the projected future traffic noise levels with and without the project, the increase due to the project is 0.1 dB. This increase in Ldn levels is not considered a significant noise impact.

Relative increases in traffic noise levels from other surrounding streets due to the project development are not expected to cause significant noise impacts at any of

the existing noise sensitive areas located near the project site.

Construction noise could cause some short-term annoyance to occupants of nearby buildings, particularly when pile driving is used. In cases where construction noise is expected to exceed the Department of Health's property line limits, a permit will be obtained which will include restrictions on maximum allowable noise levels as well as permissible operating hours.

All portions of the project site are estimated to be exposed to Ldn's of less than 65 dB. Therefore, the project complies with the U.S. Environmental Protection Agency (EPA) and the Department of Housing and Urban Development (HUD's) Ldn noise standards.

Visual Impacts

There will be a visual change to the site, since the project will be replacing low-rise structures with high-rise structures. However, the height of structures is not incompatible with surrounding structures and the site is both planned and zoned for this use (apartments) and the height proposed.

It should also be noted that current open space and landscaping requirements will be met and that the site will be improved visually by these site planning elements. (Refer to Figures 4. and 5.)

Public Facilities and Services

Transportation/Traffic

A "Traffic Study" for the project sites, prepared by Wilbur Smith Associates, is included as Appendix C.1. The study's Technical Appendix is also included (Appendix C.2.).

The report summarizes the results of a traffic analysis which assessed existing and future traffic conditions, with and without the project, at a number of key intersections. These intersections included two signalized intersections on Liliuokalani Avenue, one at the Ala Wai Boulevard intersection and a second at the Kuhio Avenue Intersection. The analysis also addressed impacts at several unsignalized intersections. These included the intersections of Liliuokalani with three low-volume streets: Mountain View Drive, Tusitala Street, and Cleghorn Street. The unsignalized intersection of Kuhio Avenue and Kupuna Street was also included in the analysis.

The study concluded that the proposed projects would generate an estimated 867 vehicle trips per day.

Project traffic would increase peak hour volumes along Liliuokalani Avenue by about 8 to 14 percent, depending on the peak hour and location. However, the traffic increase would not significantly affect traffic conditions along the street. Intersection levels of service at the signalized intersections would continue to operate at LOS B, with or without the project. The traffic increases also would not affect the level-of-service at the sign-controlled intersections in the area.

The access points to each of the two towers would accommodate the projected traffic demand. No changes to the proposed access scheme were found to be advisable.

Water

There is an existing 6-inch water main in Lilioukalani Avenue and Cleghorn Street and an 8-inch water main in Kapili Street.

Water connection for the Mauka Tower will be from the existing 6-inch water line in Liliuokalani Avenue. Domestic water connection, fire sprinkler connection and irrigation connection will be required.

Water connection for the Makai Tower will be from the existing 6-inch water line in Cleghorn Street. A new domestic water meter will be required for the domestic water connection and a detector check meter will be installed on the fire sprinkler line (line sizes and meter sizes to be determined). A stub out will be provided for irrigation connection, and irrigation will be done during non-peak hours.

Wastewater Disposal

An existing sewer easement with a 6-inch sewer line crosses through the Makai site to Cleghorn Street and will remain in service. There is a 6-inch and 8-inch sewer line in Liliuokalani Avenue which connects to a 30-inch sewer main in Kuhio Avenue. There is a 6-inch sewer line in Cleghorn Street which connects to the 6-inch sewer line in Liliuokalani Avenue. The 6-inch sewer within the Makai site easement connects to a 6-inch sewer line in Kapuni Street, which connects to an existing 30-inch sewer line in Kuhio Avenue.

The Mauka Tower will be connected to the existing 6-inch sewer line in Liliuokalani Avenue. A portion of the 6-inch sewer line within the 5-foot easement through the Makai site will be rerouted through a new sewer easement in favor of the City. The proposed new sewer connection will be to this sewer line within the easement. The applicant has submitted an application for sewer connection with the Department of Public Works.

Grading/Drainage

As noted previously, all flood elevation requirements will be met and, on both sites, the building finish floor elevations will be set above the flood elevation, at a minimum elevation 6.5 feet. Grades will be sloped away from the structures toward the street to provide positive drainage away from the structures.

There are existing drain inlets in the roadway on Mountain View Drive and Tusitala Street. Gutter inlets are located in the gutter between Tusitala Street and Mountain View Drive, connecting to an existing 18-inch drainline daylighting at Ala Wai Canal. With the intensive landscaping proposed, it appears that there will not be a significant increase in stormwater runoff due to the proposed development.

Parks and Schools

Public recreational facilities within reasonable proximity to the project sites include Kapiolani Park and Ala Wai Field Playground. Given the on-site amenities planned for both sites and the relatively small increase in resident population resulting from the proposal, it is unlikely that any major increased demands on existing park facilities will occur.

Schools most likely to be impacted include Ala Wai Elementary, Lunalilo Elementary, Kuhio Elementary, Washington Intermediate and McKinley and Kaimuki Highschools; however, even if past census tract data for the Waikiki area in general is used to project potential impacts on schools (roughly 10 percent of project residents in the school age range), the projects would still result in an increase of only 15 students. It is not anticipated that the projects will affect in a significant or adverse way existing school facilities.

Electricity and Telephone Services

Electrical and telephone services are now available to the project sites and are expected to be adequate in the future. All necessary power requirements will be coordinated with the Hawaiian Electric Co, Inc., as well as construction activities to avoid conflicts with existing facilities and disruption to service in the area. The applicant will also coordinate with Hawaiian Telephone to obtain all necessary approvals for service connection.

Police and Fire Protection

The projects are not expected to have a significant impact on required police services in the area. Internal security measures will be incorporated within project design and coordination with the Honolulu Police Department will be maintained to ensure adequate protection.

No adverse impacts are anticipated on existing fire protection services. All applicable fire safety standards will be met in project design. Proper access to the sites by fire protection vehicles, access roadways, etc., will be developed to comply with Honolulu Fire Department requirements.

7. Summary Description of the Affected Environment

Please refer to Figures 1. through 8. for location, site and other relevant maps, photographs and drawings.

The affected environment is confined to the area immediately surrounding the two project sites, specifically those mid- and high-rise apartment developments in the Lilioukalanai Avenue, Cleghorn Street, Mountain View Drive and Kapili Street area.

Figure 1. shows the location of the project sites in relation to the Waikiki area.

Figures 2. and 3. show site planning and design details for the projects. An architectural rendering and landscaping and amenities are included as Figures 4. through 7., and Figure 8. shows base flood elevations for the project sites.

8. Identification and Summary of Major Impacts and Alternatives Considered, If Any

Probable Impacts

As discussed in Section 6., the projects will have some long-term and short-term impacts. These impacts are not considered significant adverse impacts, and most are short-term, construction-related impacts for which mitigation measures are readily available and will be employed. These are identified and summarized as follows:

1. Economic: The projects will result in increased short-term and long-term employment opportunities and tax revenues for State and City government.

2. Archaeological: There is the possibility that subsurface deposits may exist on portions of the property to be developed. Further study and mitigation measures, in the event that there are findings, will be continued.

3. Air Quality: Long-term impacts will be minimal, since there will be only a slight increase in traffic. Short-term impacts on air quality will be construction-related and temporary.

4. Noise Quality: Noise impacts will be short-term and occur during construction; no long-term effects are anticipated.

5. Visual Impacts: There will be a visual change on the site and in the surrounding area, however, proposed building heights are compatible with surrounding uses and the extensive open space and landscaping proposed will result in positive visual changes.

6. Traffic: There will be a minimal increase in traffic as a result of the proposed redevelopment, however, neither signalized intersections, or sign-controlled intersections, will be adversely affected.

Alternatives Considered

The project sites, as noted previously, are planned and zoned for apartment uses, therefore, no alternative uses were considered, since apartments are clearly the most appropriate use of the sites.

The no action alternative is considered economically unfeasible, since the land would continue in its current underutilized condition, secondary economic benefits to the State and City would not be realized, and opportunities for more attractive site planning and design would be lost.

Various site planning and design alternatives were explored. The plan selected (refer to Figures 2. and 3.) provides an attractive residential environment for future residents, ample recreational amenities, and extensive open space and landscaping.

9. Proposed Mitigation Measures

As noted previously, anticipated impacts are construction-related and mitigation measures are available.

With regard to the possibility of archaeological findings, basic mitigation measures will include subsurface test excavations after demolition of existing structures and a specific sampling strategy to be worked out in coordination with the State Historic Preservation Office.

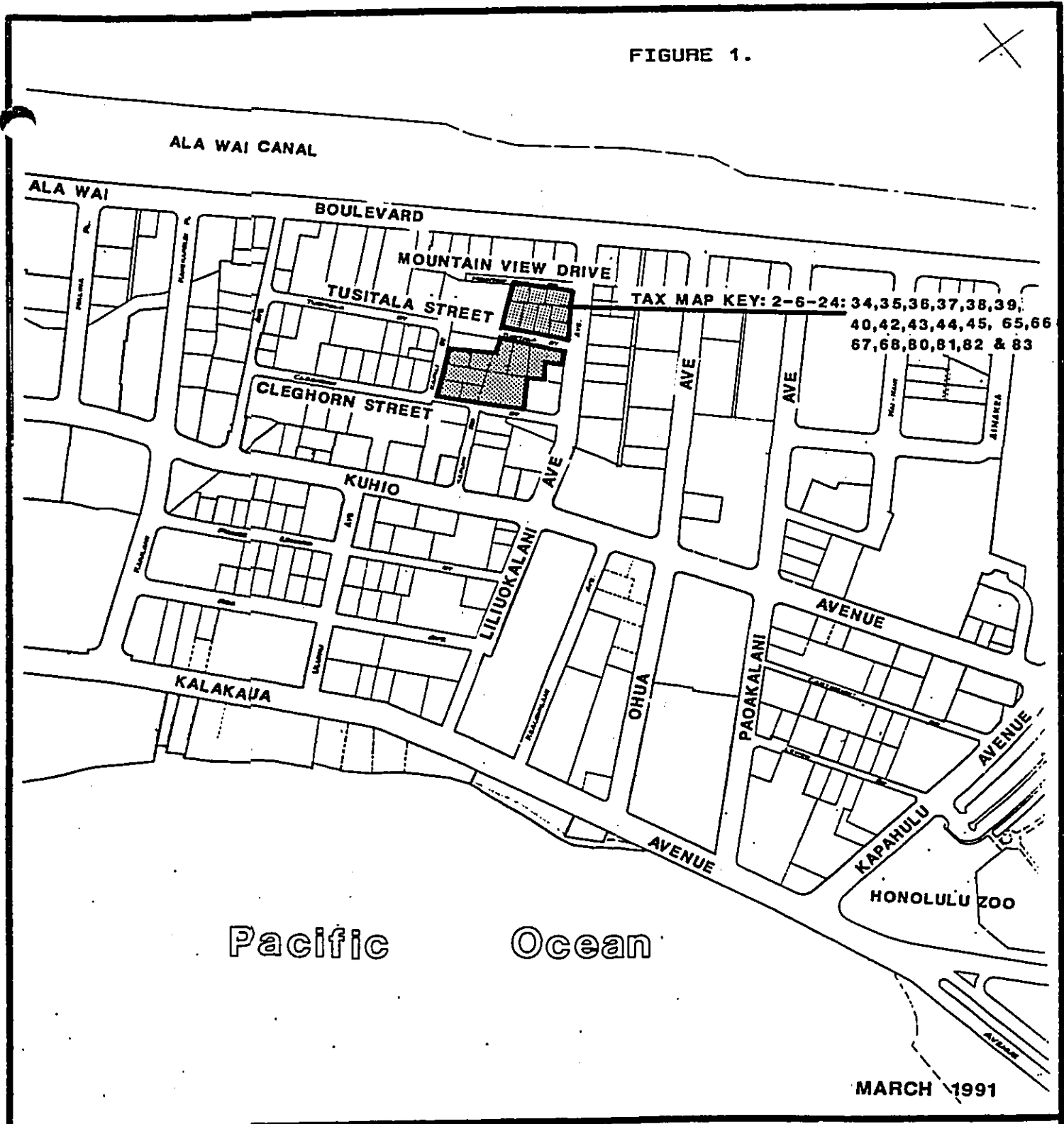
Potential short-term impacts on air quality during construction will be mitigated with fugitive dust control procedures, such as watering and phased landscaping, and proper maintenance of construction vehicles and heavy equipment.

In cases where construction noise is expected to exceed the Department of Health's property line limits, a permit will be obtained and required permit conditions, including restrictions on the maximum allowable noise levels and permissible operating hours, will be met.

10. Determination

An evaluation of the impacts (discussed in previous sections of this Assessment) and a review of various significance criteria contained in Chapter 343, HRS, indicate that an Environmental Impact Statement for the proposal is not warranted and that no significant adverse impacts will result from this action.

FIGURE 1.

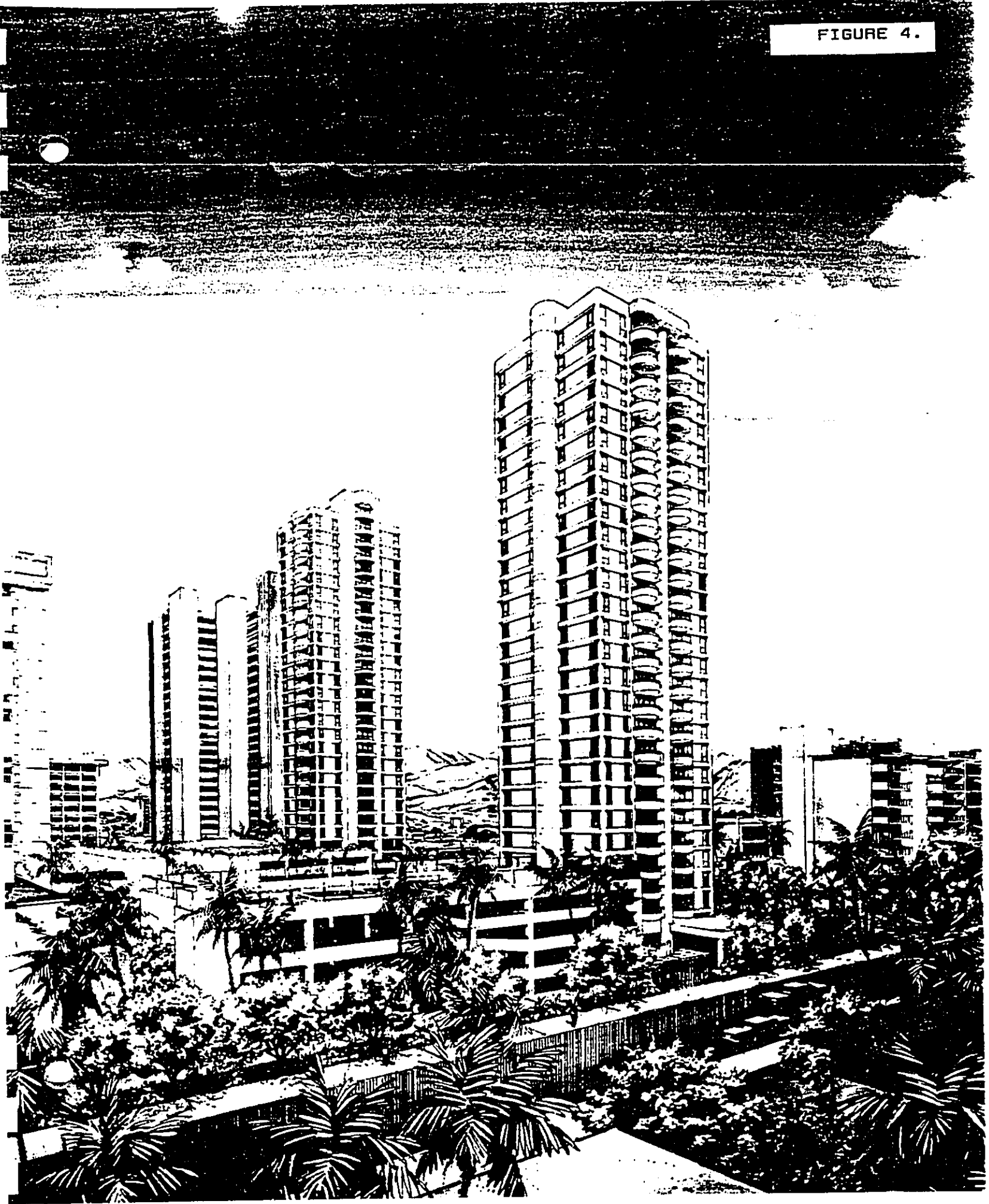


TRUE NORTH

SCALE : 1" = 400'

LOCATION MAP

FIGURE 4.



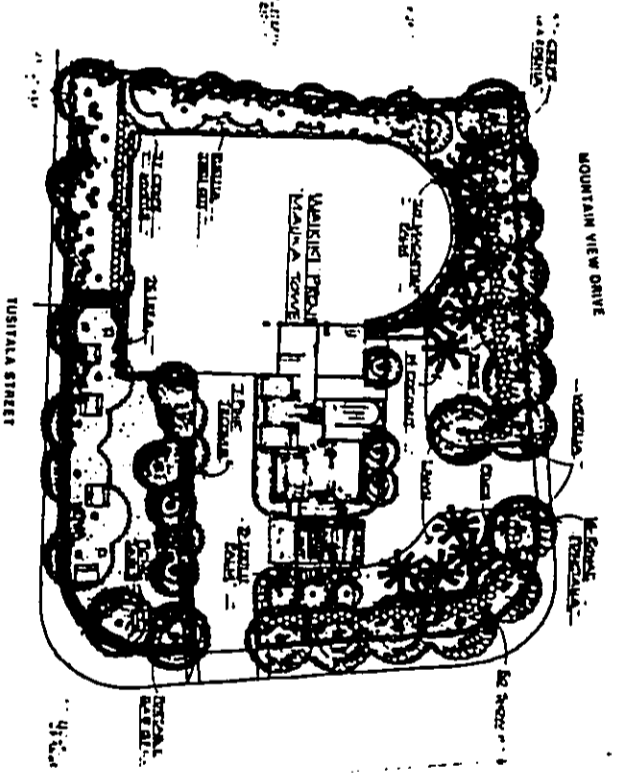
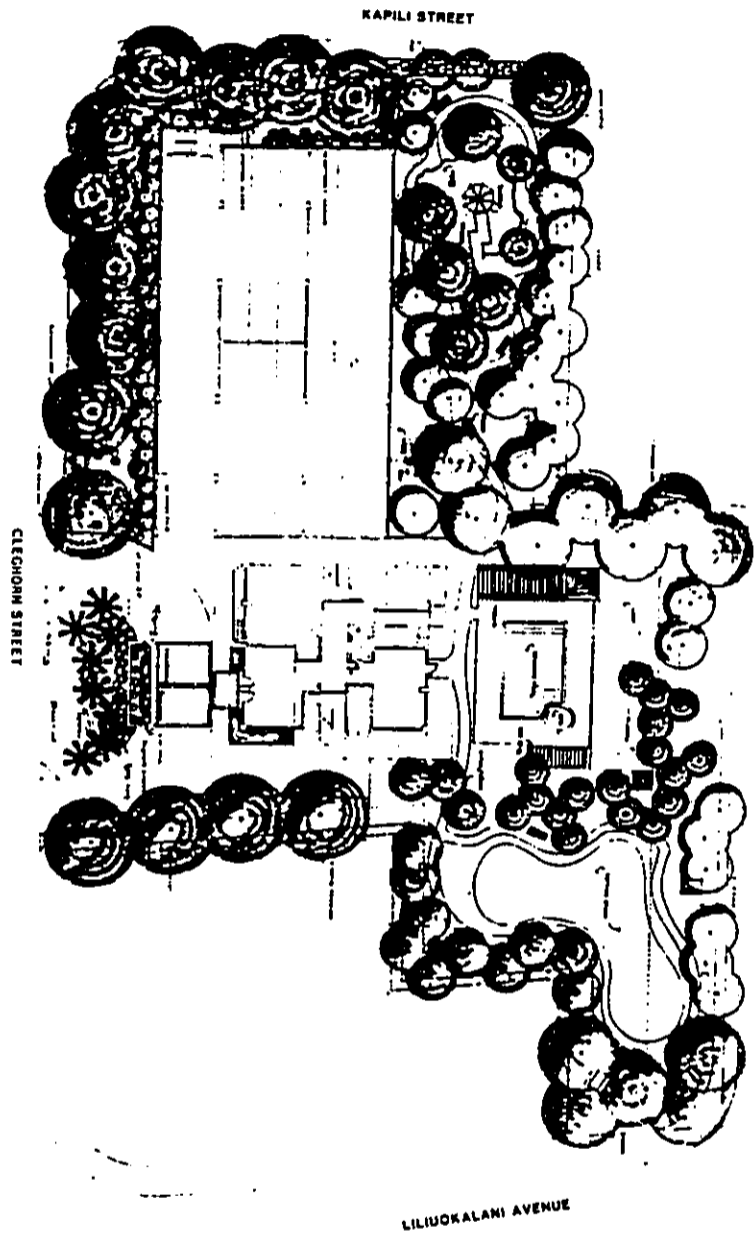


FIGURE 5.

PETER HSI ASSOCIATES, INC.
 610 PUNOH STREET, SUITE 200, HONOLULU, HI 96813

DATE	11/11/88
SCALE	AS SHOWN
DRAWN BY	PHS
CHECKED BY	PHS
APPROVED BY	PHS

SCALE 1" = 10'

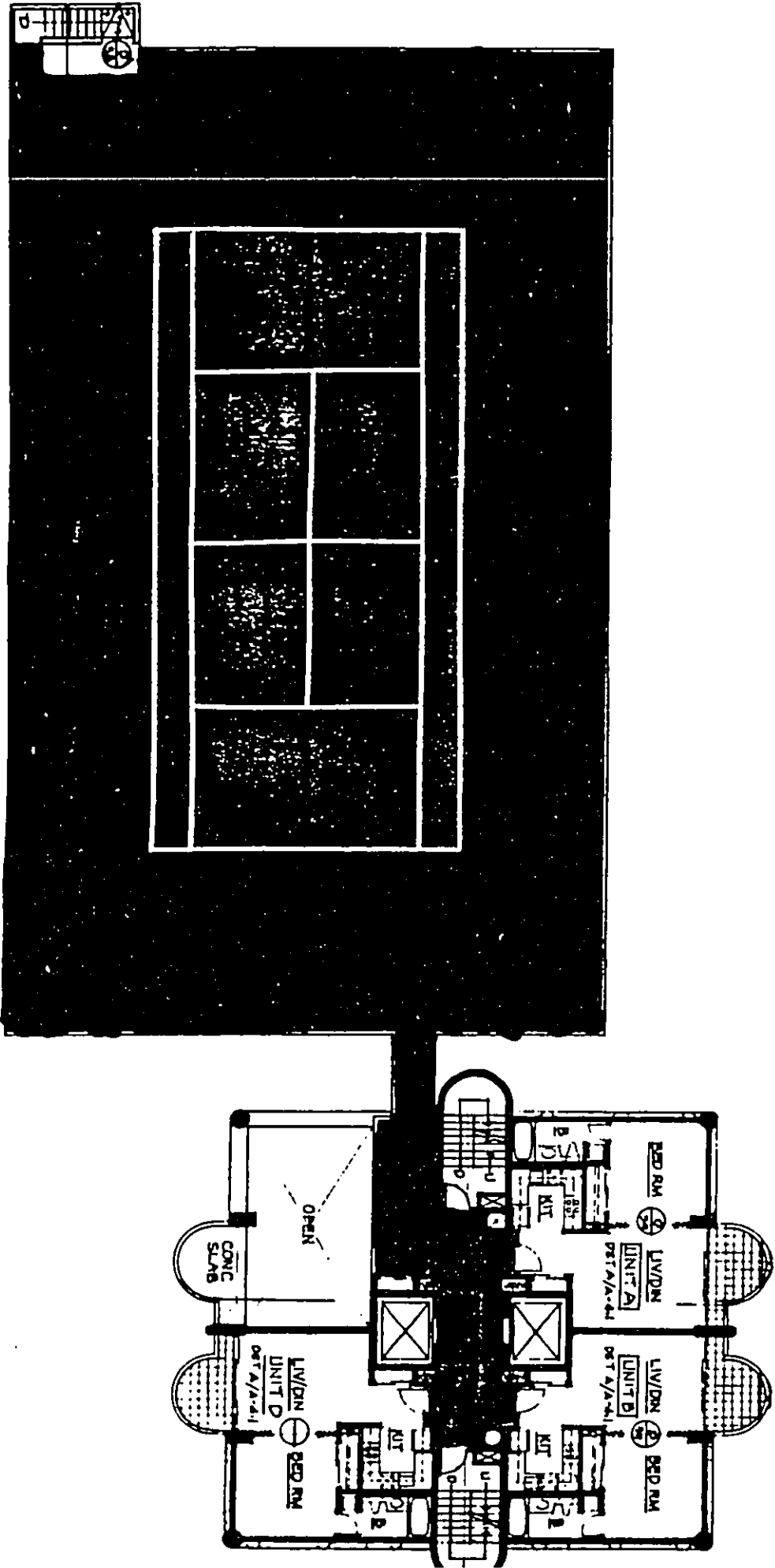


FIGURE 6.

FIGURE 7. 1

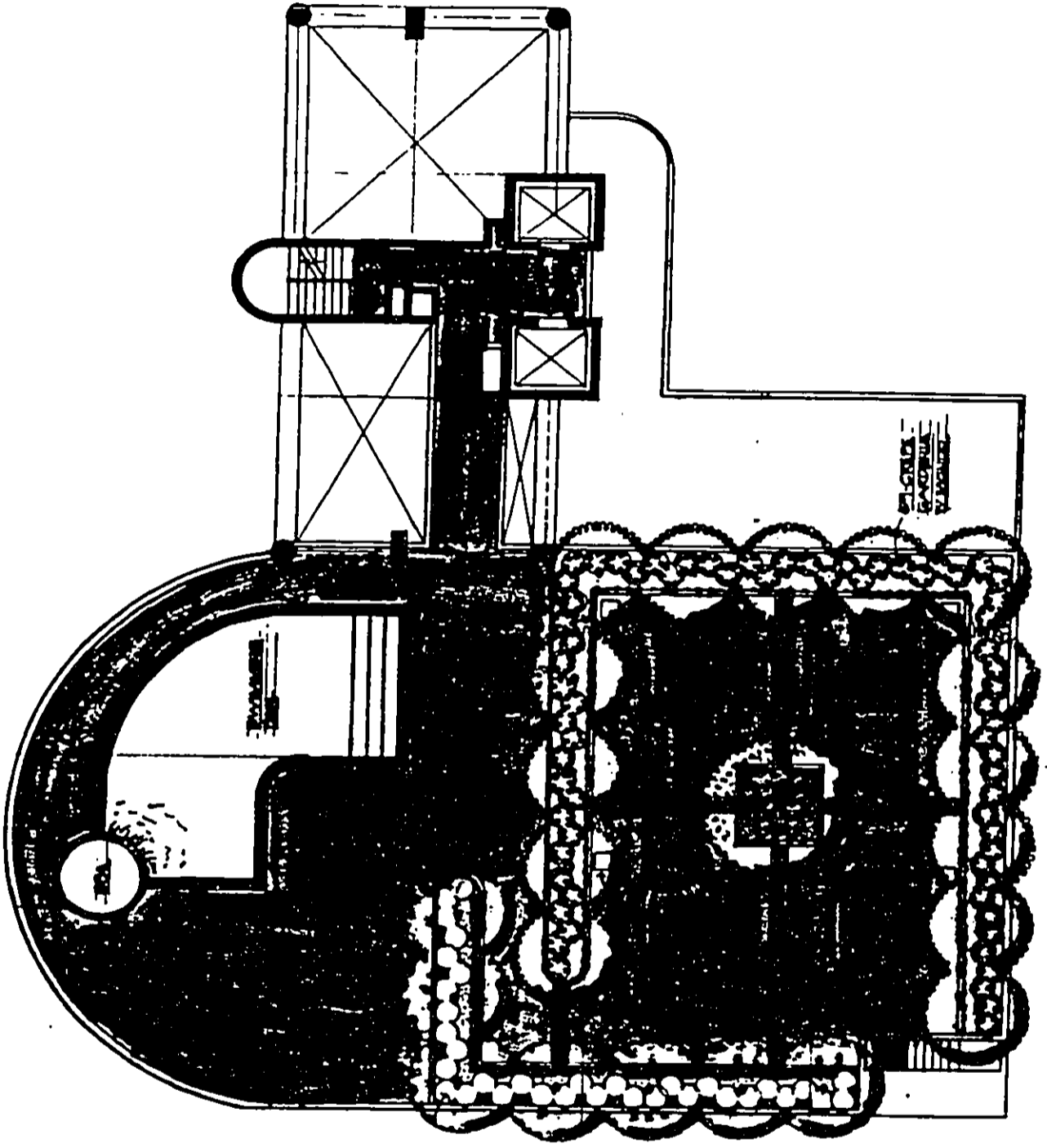
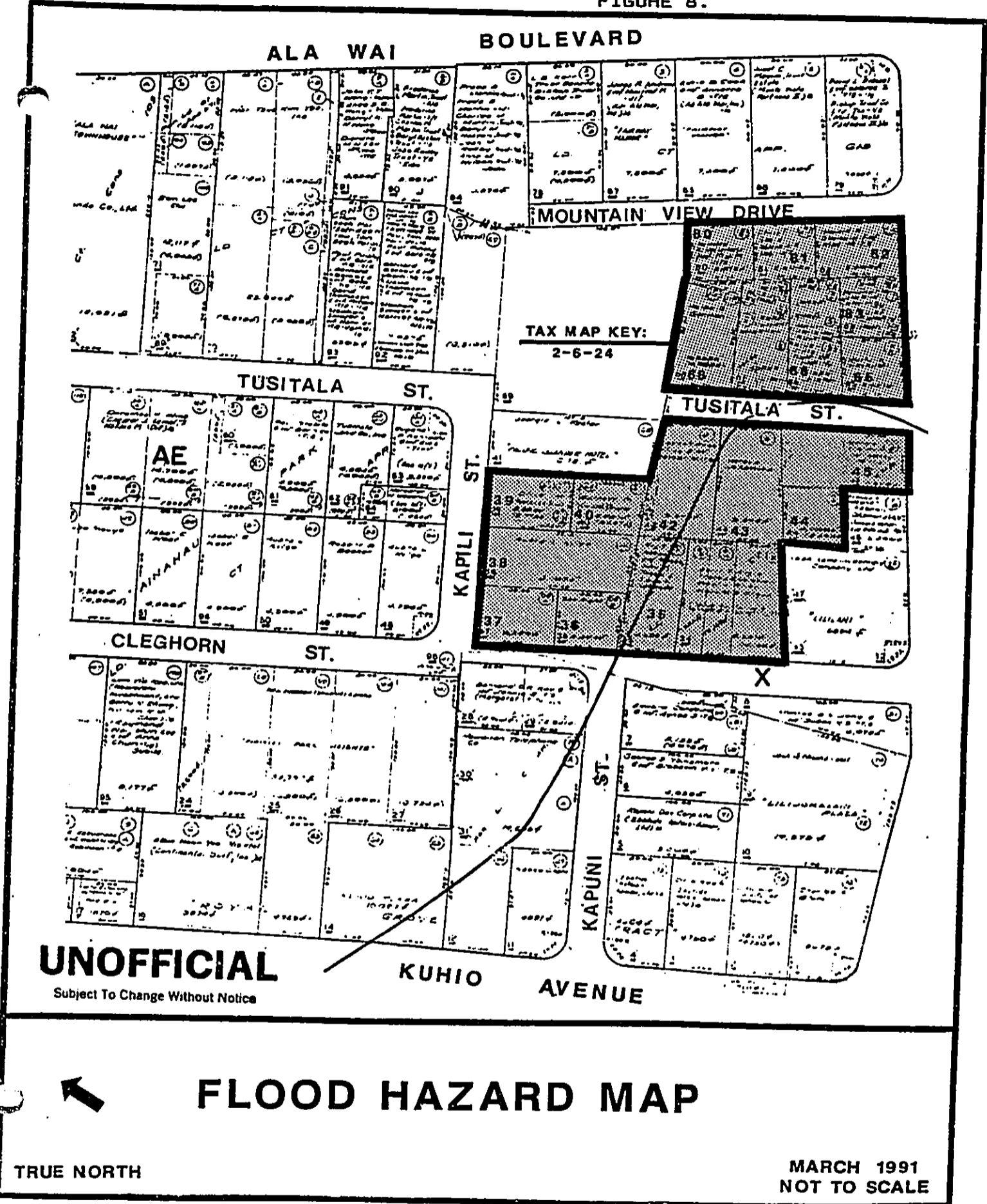


FIGURE 8.





APPENDIX A.

WAIKIKI NEIGHBORHOOD BOARD NO. 9

c/o NEIGHBORHOOD COMMISSION • CITY HALL, ROOM 400 • HONOLULU, HAWAII 96813

REGULAR MEETING MINUTES
TUESDAY, APRIL 2, 1991
** FORT DeRUSSY**
ROOMS 17 and 18
(PLEASE NOTE NEW LOCATION)
7:00 TO 10:00 P.M.

RECEIVED
CITY CLERK
O&C OF HONOLULU
MAR 25 12 57 PM '91

- I. CALL TO ORDER/ROLL CALL
- II. APPROVAL OF THE MARCH 5, 1991 REGULAR MEETING MINUTES
- III. TREASURER'S REPORT
- IV. PUBLIC SAFETY
 - A. Honolulu Police Department
 - Anti-prostitution H.B. Bill 1304
 - B. Honolulu Fire Department
- V. COMMITTEE REPORTS
 - A. Housing
 1. Update on leasehold reform legislation
 2. Property Tax assessments, bills in City Council
 3. Update on transient vacation rentals
 - B. Chair's Report
 1. Mayor Frank F. Fasi's Advisory Committee on Waikiki Master Plan
 2. Vision for Waikiki 2020 Master Planning Committee, City Council Chair Arnold Morgado
 3. Bill 13, FDI - A bill for an Ordinance Regulating for an Interim Period Development within the Waikiki Area
 - Zoning Committee, April 2nd
 - City Council, April 10th
 4. Projects that involve Waikiki Special District or SMA Permits
 - a. U.S.A. Pensee (Tusitala area)
 - b. Waikikian Hotel (Tahitian Lanai)
 - c. Waikiki Bazaar (Lewers/Kalakaua area)
 - d. Board recommendations on applications
 5. Rail Transit (5 minute update by Rail Transit Team)
 6. Conference of Oahu Neighborhood Boards - Limited County Home Rule
 7. Correspondence
 8. Conflict of Interest - Revised Neighborhood Plan 1986
 9. Newsletter/Survey
 10. Neighborhood Board Election
 - C. Business and Tourism
 - Update on Queen Emma Foundation Master Plan - Lowrise Community and Convention Center Alternative to the massive convention center at the International Market Place
 - D. Transportation
 - Report on Planning Commission and OMPO meetings



Oahu's Neighborhood Board System - Established 1973

D.L. ADAMS ASSOCIATES, LTD.



#91-09
March 22, 1991

Ms. Barbara A. Moon
Land Use Consultant
Kawaiahao Plaza, Suite 178
567 S. King St.
Honolulu, HI 96813

RE: ENVIRONMENTAL NOISE IMPACT ASSESSMENT, WAIKIKI PROJECT I,
MAUKA/MAKAI TOWER, WAIKIKI, HONOLULU, HAWAII

Dear Ms. Moon:

This presents our findings on the environmental noise aspects of the subject project.

1. SUMMARY OF FINDINGS

- 1.1 The project site is located within an existing residential area of Waikiki. The existing noise sensitive areas in the immediate vicinity of the project site are naturally ventilated residential buildings (both low and high-rise). There are also a few air-conditioned high-rise buildings in the vicinity, but these are considered less noise-sensitive than the naturally ventilated buildings.
- 1.2 The existing acoustical environment at the project site varies widely depending on the location relative to Ala Wai Boulevard. The measured average levels varied from 54 to 63 dBA, and the background levels were in the range of 52 to 57 dBA.
- 1.3 Traffic noise level calculations indicate that the future Average Day-Night Sound Level (Ldn) due to traffic movements on Ala Wai Boulevard will increase by at most 0.5 dB relative to the existing level, regardless of the project development. When comparing the projected future traffic noise levels with and without the project, the increase due to the project is 0.1 dB. This increase in Ldn levels is not considered a significant noise impact.

PALI PALMS PLAZA • 970 NO. KALAHEO AVENUE • SUITE A-311
KAILUA, HAWAII 96734 • (808) 254-3318 • FAX (808) 254-5295

APPENDIX B.

Relative increases in traffic noise levels from other surrounding streets due to the project development are not expected to cause significant noise impacts at any of the existing noise sensitive areas located near the project site.

- 1.4 Potential noise sources located within the project site are: mechanical and electrical equipment, parking lot, tennis court and other recreational activities. Such noise sources will be reduced to acceptable levels at the property lines (i.e., in compliance with the appropriate State Department of Health [DOH] and City and County of Honolulu Land Use Ordinance [LUO] limits), provided the appropriate noise control measures are incorporated in the design.
- 1.5 Construction noise could cause some short-term annoyance to occupants of nearby buildings, particularly when pile driving is used. In cases where construction noise is expected to exceed the DOH's property line limits, a permit must be obtained from the DOH. Required permit conditions include restrictions on the maximum allowable noise levels as well as permissible operating hours. When pile driving is used, vibration monitoring is recommended to ensure that ground-borne vibration transmitted into adjacent buildings is well below the limits at which structural damage can occur.
- 1.6 All portions of the project site are estimated to be exposed to Ldn's of less than 65 dB. Therefore, the project complies with the U.S. Environmental Protection Agency (EPA) and the Department of Housing and Urban Development (HUD)'s Ldn noise standards.

2. PROJECT DESCRIPTION

The project site is located within the residential area of Waikiki in the vicinity of the intersection of Ala Wai Boulevard and Liliuokalani Avenue. The project consists of two twenty-eight story towers (Mauka and Makai Towers) separated by Tusitala Street, with a total of 147 residential units. The project will also include a four to five level parking garage (with the highest elevation at a four-story level above the existing ground), a recreation deck with a tennis court, pool and a spa (Figure 1).

3. NOISE STANDARDS AND GUIDELINES

- 3.1 Average Day-Night Sound Level (Ldn) Standards, EPA and HUD -- Land use compatibility guidelines are commonly presented in terms of the Average Day-Night Sound Level (Ldn), a measure of noise exposure over a typical 24-hour period. Ldn is essentially the Equivalent Continuous Noise Level (Leq), or an average noise level, measured over a 24-hour period

with a 10 dBA addition to the noise levels recorded between 10 pm and 7 am, to account for people's higher sensitivity to noise during the nighttime hours.

The U.S. Environmental Protection Agency (EPA) and Department of Housing and Urban Development (HUD) specify that residential and other noise sensitive developments can normally be constructed in areas subjected to noise exposure levels of up to 65 dB Ldn, with no special noise control measures required in buildings of conventional construction (References 1 and 2). Sites exposed to Ldn's in the range of 65 to 75 dB are considered normally unacceptable for residential development, with building approval subject to additional noise control measures.

Note that for residential developments located within an Ldn 65 to 70 dB zone, HUD's site acceptability standards require the construction to provide a minimum of 5 dB attenuation in addition to "attenuation provided by buildings as commonly constructed in the area, and requiring open windows for ventilation." A minimum of 10 dB additional attenuation is required for residential projects exposed to an Ldn of 70 to 75 dB. HUD also has a design goal of Ldn 45 dB or less for the interior spaces of dwelling units.

- 3.2 State and County Noise Regulations, DOH and LUO -- On Oahu, State and County noise regulations may be enforced whenever noise emissions exceed specified levels and cause complaints from occupants of nearby properties. The State Department of Health (DOH) and City and County of Honolulu Land Use Ordinance (LUO) noise regulations are expressed in terms of maximum allowable noise levels rather than a 24-hour noise exposure level, such as Ldn (see Figures 2 and 3).

The DOH regulations use A-weighted sound levels and state that the allowable noise levels shall not be exceeded for more than 10% of the time during any 20-minute period (Reference 3). The LUO regulations differ from those of the DOH in that they use octave band sound pressure levels instead of A-weighted sound levels and no temporal factor is involved (Reference 4). In addition, the DOH also specifies maximum allowable noise levels for vehicles, including trucks (Reference 5).

4. EXISTING CONDITIONS

- 4.1 Description of the Existing Noise Sensitive Areas -- The existing noise sensitive areas in the immediate vicinity of the project site are:

- o Naturally ventilated low-rise (1 to 4 story apartment buildings or a single-family homes)

- o Naturally ventilated high-rise buildings (8 stories or higher)
- o Air-conditioned high-rise residential buildings

These are shown in Figure 4.

4.2 Existing Acoustical Environment -- Ambient noise measurements were made at and near the project site during the morning hours of March 11, 1991, to assess the existing conditions. Noise levels were recorded over 10-minute sampling periods at Locations 1, 2, 3, 4, and 5, shown in Figure 5, using a Larson-Davis Laboratories, Model 700, Sound Level Meter. The measurement locations are described below:

Location 1 -- On the mauka-side sidewalk of Ala Wai Boulevard.

2 -- On the makai corner of Liliuokalani Avenue and Mountain View Drive.

3 -- On Tunitala Street, 115 feet from Liliuokalani Avenue.

4 -- On the project-side of Cleghorn Street, at the Diamond Head-side project property line.

5 -- On the project-side of Kapili Street, mauka-side project property line.

Weather conditions during the measurements were partly cloudy, with occasional showers. The temperature was around 75 to 80 degrees with gusty tradewinds of about 15 to 25 mph.

The noise measurement results, in terms of the equivalent sound level (Leq), and the levels exceeded 90%, 50%, 10% and 1% of the time (L90, L50, L10 and L1, respectively), are summarized in Table 1 (page 10). These statistical levels are commonly used as descriptors of environmental noise; for example, the L1 level describes the near-maximum noise, while L90 is a good measure of the ambient noise level.

As can be seen in Table 1, the equivalent sound levels ranged from 54 to 63 dBA depending on the locations. Note that the Location 1 is not within the project site. It is anticipated that noise levels at the higher elevations of the future Mauka Tower facing Ala Wai Boulevard will be significantly greater than those measured at ground level at Location 2, since some of the noise shielding provided by the intervening buildings will be removed at those elevations. At the ground level of other locations away from Ala Wai Boulevard, the

existing acoustical environment is typical of relatively quiet residential areas within urban surroundings.

5. ASSESSMENT OF POTENTIAL IMPACT ON THE EXISTING NOISE SENSITIVE AREAS DUE TO PROJECT DEVELOPMENT AND DESCRIPTION OF RECOMMENDED CONTROLS

- 5.1 Traffic Noise -- A traffic count was performed during the noise measurement at Location 1 to permit calibration of the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (Reference 6). This calibrated model was then used, in conjunction with traffic volume data for existing, future with and future without the project (References 7 and 8) to estimate the change in noise levels. The results of the traffic noise calculations for Ala Wai Boulevard are summarized in Table 2 (page 11).

The results presented in Table 2 show that the future traffic noise levels will increase by less than 0.5 dB regardless of the project development. Furthermore, the project generated traffic will cause noise level increases of 0.1 dB. This is considered an insignificant increase in noise level.

Traffic parameters such as flow condition and vehicle speed for Liliuokalani Avenue and Cleghorn Street do not allow the FHWA prediction model to be used for these streets. However, it is possible to predict the relative changes in morning and afternoon peak hour noise levels due to the increase in traffic volume. The results are presented in Table 3 (page 12). Note that the analysis assumes all traffic parameters, except for the traffic volume, to remain constant throughout all conditions.

As can be seen in Table 3, the increase in noise levels solely due to the project development is at most 0.5 dB for all reaches of Liliuokalani Avenue. This is not considered a significant noise impact. At Cleghorn Street, the increase is about 1.5 dB. This is less than the minimum increase of 3 dB considered to be the threshold of perceived change by a person with a normal hearing. In addition, the overall Ldn levels generated by traffic on these streets are not expected to exceed 65 dB at the project site. No significant noise impact is expected at the existing noise sensitive locations near the project site due to project generated traffic movements on Liliuokalani Avenue and Cleghorn Street.

- 5.2 Project Operational Noise -- Noise sources generated within the project site which could cause annoyance to the nearby residences and could violate the state and county noise regulations are:

- o Mechanical and electrical equipment (air-conditioning, exhaust fans, transformers, etc.)
- o Parking lot activities (tire squeal, vehicle engine, car door slamming, car stereo, etc.)
- o Tennis court and other recreational activities (racquet-to-ball impact, shoe screech, people yelling, etc.)

Noise from these sources can be reduced to acceptable levels at the property lines (i.e., in compliance with the appropriate DOH and LUO limits) and within the development itself, provided appropriate noise control measures are incorporated in the design. The required noise control measures may include the following:

- o Sound attenuators on building exhaust fans.
- o Inlet and discharge silencers on cooling towers.
- o Acoustical louvers or silencers at mechanical and electrical equipment room air intake and discharge openings.
- o Installation of vibration isolation mounts on mechanical equipment and acoustical treatment of mechanical and electrical equipment room walls and floor/ceiling assemblies.
- o Rough-textured surfaces in the garage to reduce tire squeals.
- o Noise barriers at the garage areas.
- o Administrative controls (i.e., house rules) to reduce boisterous activities at the tennis court and other recreational areas.

Noise from service areas, such as loading docks and trash pickup points, can also be reduced to acceptable levels at the closest noise sensitive areas by suitably locating these areas, use of acoustical treatments, etc.

- 5.3 Construction Noise -- Development of the project site will involve excavation and construction activities. The various construction phases of the development project may generate significant amounts of noise; the actual amounts are dependent upon the methods employed during each stage of the construction process. Typical construction equipment noise ranges in dBA are shown in Figure 6.

In cases where construction noise is expected to exceed, the DOH's "allowable" property line limits, a permit must be obtained from DOH to allow the operation of vehicles, construction equipment, power tools, etc., which emit noise levels in excess of the "allowable" limits. Required permit conditions for construction activities are:

"No permit shall allow construction activities creating excessive noise...before 7:00 am and after 6:00 pm of the same day."

"No permit shall allow construction activities which emit noise in excess of ninety-five dB(A)...except between 9:00 am and 5:30 pm of the same day."

"No permit shall allow construction activities which exceed the allowable noise levels on Sundays and on...[certain] holidays. Activities exceeding ninety-five dB(A) shall [also] be prohibited on Saturdays."

Pile drivers will be the loudest equipment used during construction and will probably cause some short-term annoyance to occupants of the neighboring commercial buildings. It would be advisable to monitor ground vibration caused by any pile driving activities to ensure that the vibration transmitted into neighboring buildings is well below the levels at which structural damage can occur.

Construction equipment and on-site vehicles or devices requiring an exhaust of gas or air must be equipped with mufflers. Also, construction vehicles using local roadways will satisfy the noise level requirements defined in Reference 5.

6. ASSESSMENT OF POTENTIAL IMPACT ON THE PROJECT AND DESCRIPTION OF RECOMMENDED CONTROLS

- 6.1 Traffic Noise -- The noisiest portion of the project site is expected to be the Mauka Tower building facade facing Ala Wai Boulevard, located at a distance of about 150 feet from Ala Wai Boulevard. At a such distance, along with the noise barrier effect of the intervening buildings, the Ldn level (future with the project) at the facade is estimated to be at most 65 dB. The rest of the project site area is estimated to be exposed to lower Ldn levels. Therefore, the project buildings comply with the EPA and HUD's 65 dB Ldn noise standards.

Traffic on other surrounding streets such as Liliuokalani Avenue, Cleghorn Street, Tusitala Street and Mountain View Drive, are not

Barbara Moon
March 22, 1991

#91-09
Page 8

expected to generate noise levels exceeding 65 dB Ldn, and therefore, is not a significant noise source.

Although not required, implementing the following measures will reduce the possibility of future residents of the project experiencing annoyance due to traffic and other noise sources. These measures would also ensure compliance with the HUD's 45 dB Ldn interior noise level guideline.

- o Avoid jalousie windows, or restrict their use to the less noise-sensitive areas (bathrooms, laundries, etc.). Where possible, use sliding windows with double strength glass, and frames that seal well in the closed position.
- o Air-condition or mechanically ventilate noise-sensitive areas to allow windows to be kept closed for noise reduction purposes.

6.2 Other Noise Sources -- Currently, there are several high-rise buildings with parking facilities, located adjacent to the project site. Although not measured, noise generated by activities within these parking facilities may be a source of annoyance to the future residents of the project units. The parking lot noise, however, is not expected to increase the overall Ldn level at the project site. The measures described in the previous paragraph will reduce the intrusion of this noise into the project residential units.

* * *

This concludes our noise study for the project. Please let us know if there are any changes to the project plan which could affect our findings. We will revise our report accordingly.

Sincerely,



Mike S. Lee

MSL/msl

REFERENCES:

1. *HUD Environmental Criteria and Standards*, 24 CFR Part 51, Federal Register, Volume 44, No. 135, July 12, 1979; amended 49 FR 880, January 6, 1984.
2. *Toward a National Strategy for Noise Control*, U.S. Environmental Protection Agency, April 1977.
3. *Chapter 43 - Community Noise Control for Oahu*, Department of Health, State of Hawaii, Administrative Rules, Title 11, 1981.
4. *Section 3.11, Noise Regulations*, Land Use Ordinance, City and County of Honolulu, October 22, 1986.
5. *Chapter 42 - Vehicular Noise Control for Oahu*, Department of Health, State of Hawaii, Administrative Rules, Title 11, November 6, 1981.
6. *Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model*, FHWA-RD-77-108; U.S. Department of Transportation, December 1978.
7. Traffic volume data provided by Wilbur Smith Associates, received on March 18, 1991.
8. Traffic Volume Count on Ala Wai Boulevard Southeast of Liliuokalani Avenue, January 10-11, 1991, Department of Transportation Services, City and County of Honolulu.

Table 1. Summary of the Noise Measurement Results of March 11, 1991

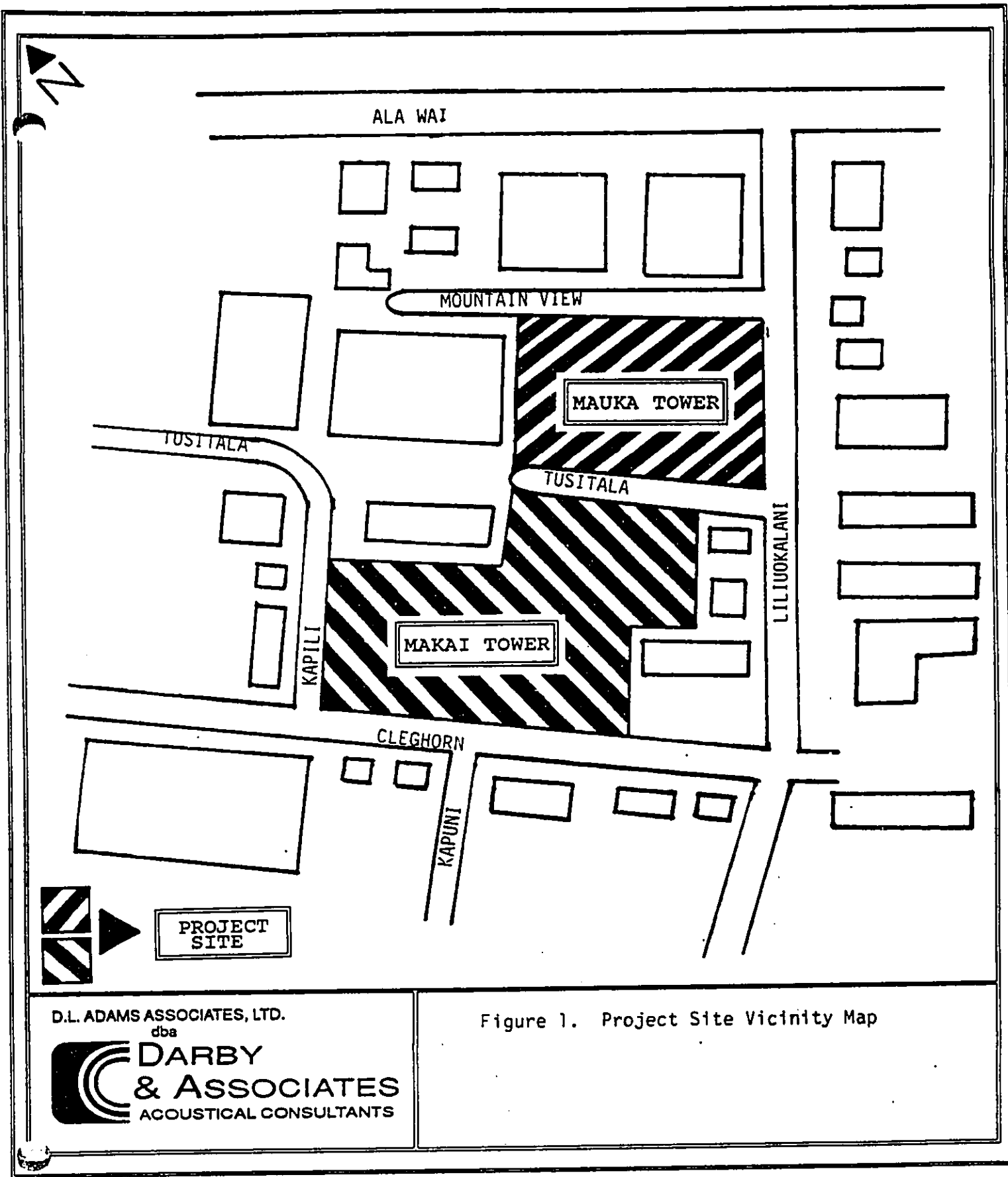
Location	Measured Noise Levels - dBA					Dominant Noise Sources
	Leq	L90	L50	L10	L1	
1	66	56	63	70	74	wind, traffic
2	63	57	60	66	71	wind, traffic,
3	58	55	56	61	69	wind, traffic, construction
4	57	55	57	59	61	wind, traffic
5	54	52	54	55	56	wind

Table 2. Summary of the Results of Traffic Noise Calculations
at 50 feet from the centerline of Ala Wai Boulevard

Case	Average Day-Night Sound Level, Ldn	Change in Ldn relative to the existing level	Change in Ldn relative to the future-without- the-project level
Existing	72.9 dB	--	--
Future without the project	73.2	+0.3 dB	--
Future with the project	73.3	+0.4	+0.1 dB

Table 3. Summary of the Results of the Traffic Noise Increase Calculations -- Liliuokalani Avenue and Cleghorn Street

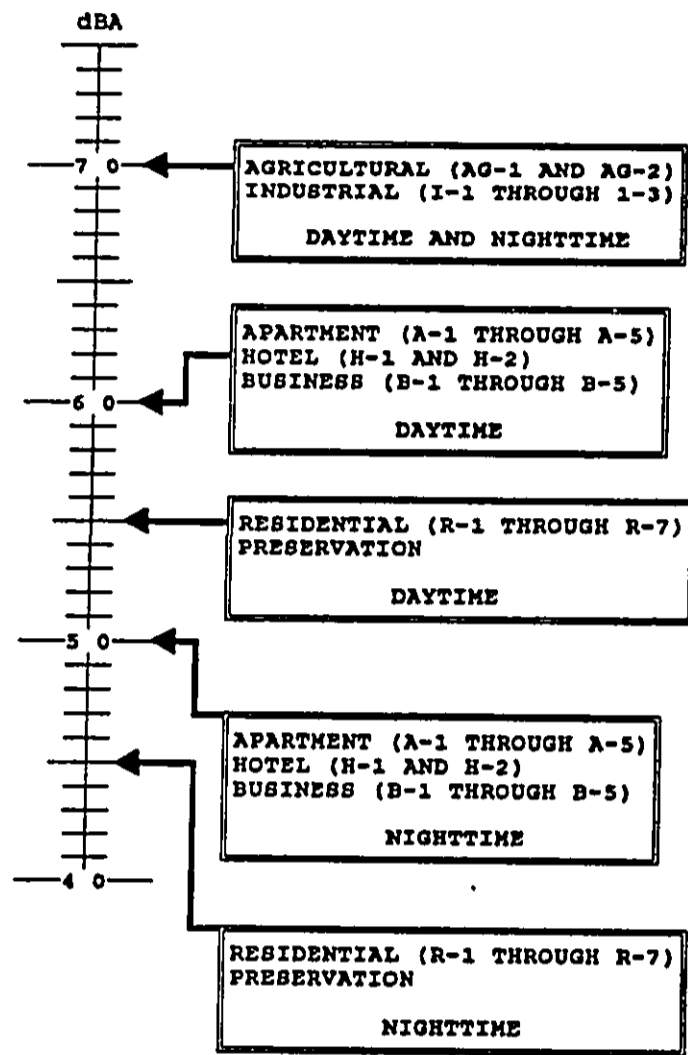
	Existing to future- without- project (in dB)		Existing to future- with project (in dB)		Future without to future with project (in dB)	
	am	pm	am	pm	am	pm
Liliuokalani Avenue						
Between Kuhio and Cleghorn	+0.4	+0.9	+0.5	+1.5	+0.1	+0.6
Between Cleghorn and Mountain View	+0.6	+0.6	+0.9	+1.0	+0.3	+0.4
Between Mountain View and Ala Wai	+0.8	+0.5	+1.3	+0.8	+0.5	+0.3
Cleghorn Street						
Between Liliuokalani and Kapuni	+2.3	+2.6	+3.7	+4.1	+1.4	+1.5



 PROJECT SITE

D.L. ADAMS ASSOCIATES, LTD.
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Figure 1. Project Site Vicinity Map



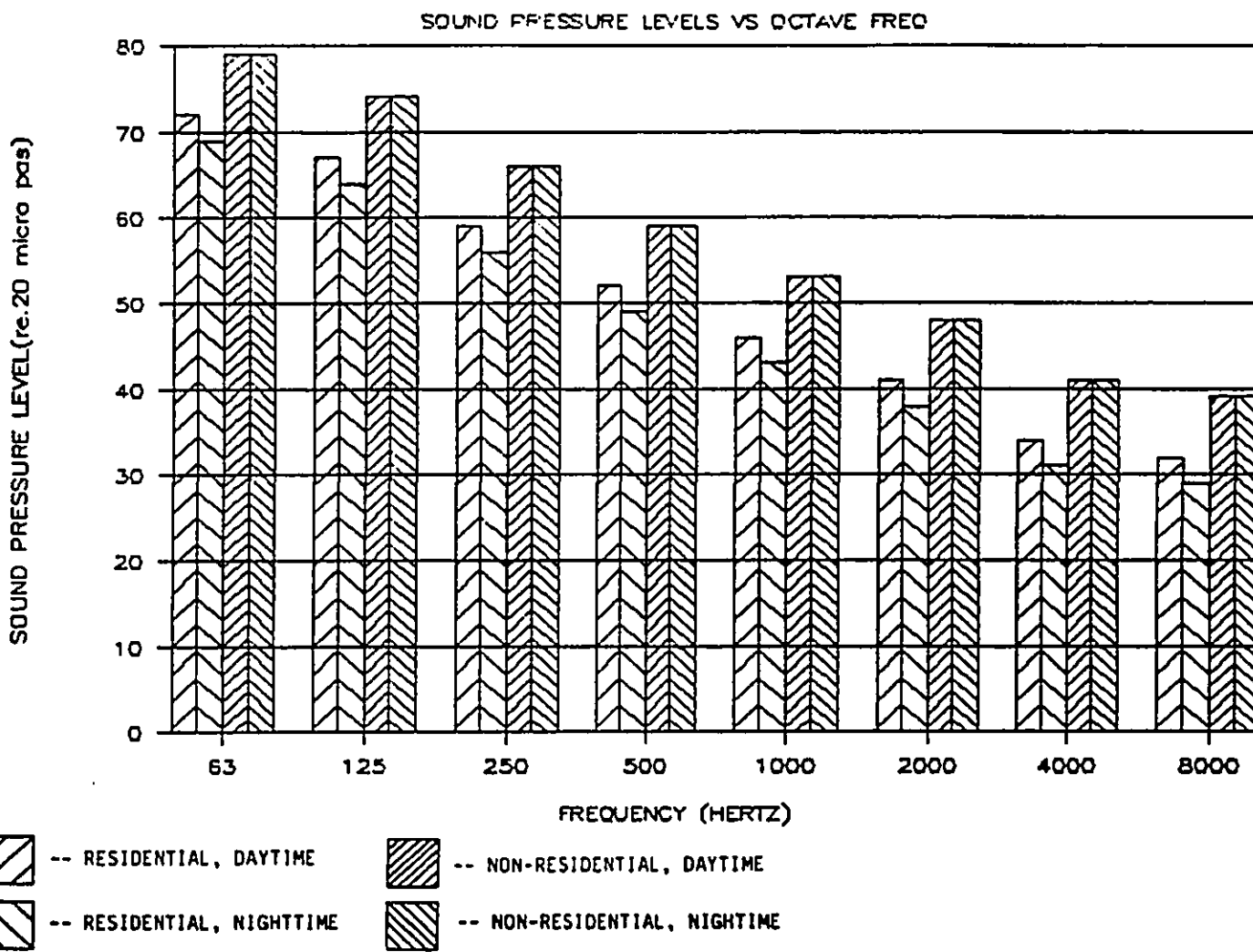
NOTE:

THE REGULATION STATES THAT THE ALLOWABLE LEVELS SHALL NOT BE EXCEEDED FOR TEN PERCENT OF THE TIME WITHIN ANY TWENTY MINUTE PERIOD

D.L. ADAMS ASSOCIATES, LTD.
dba



Figure 2. State Department of Health's Allowable Noise Levels

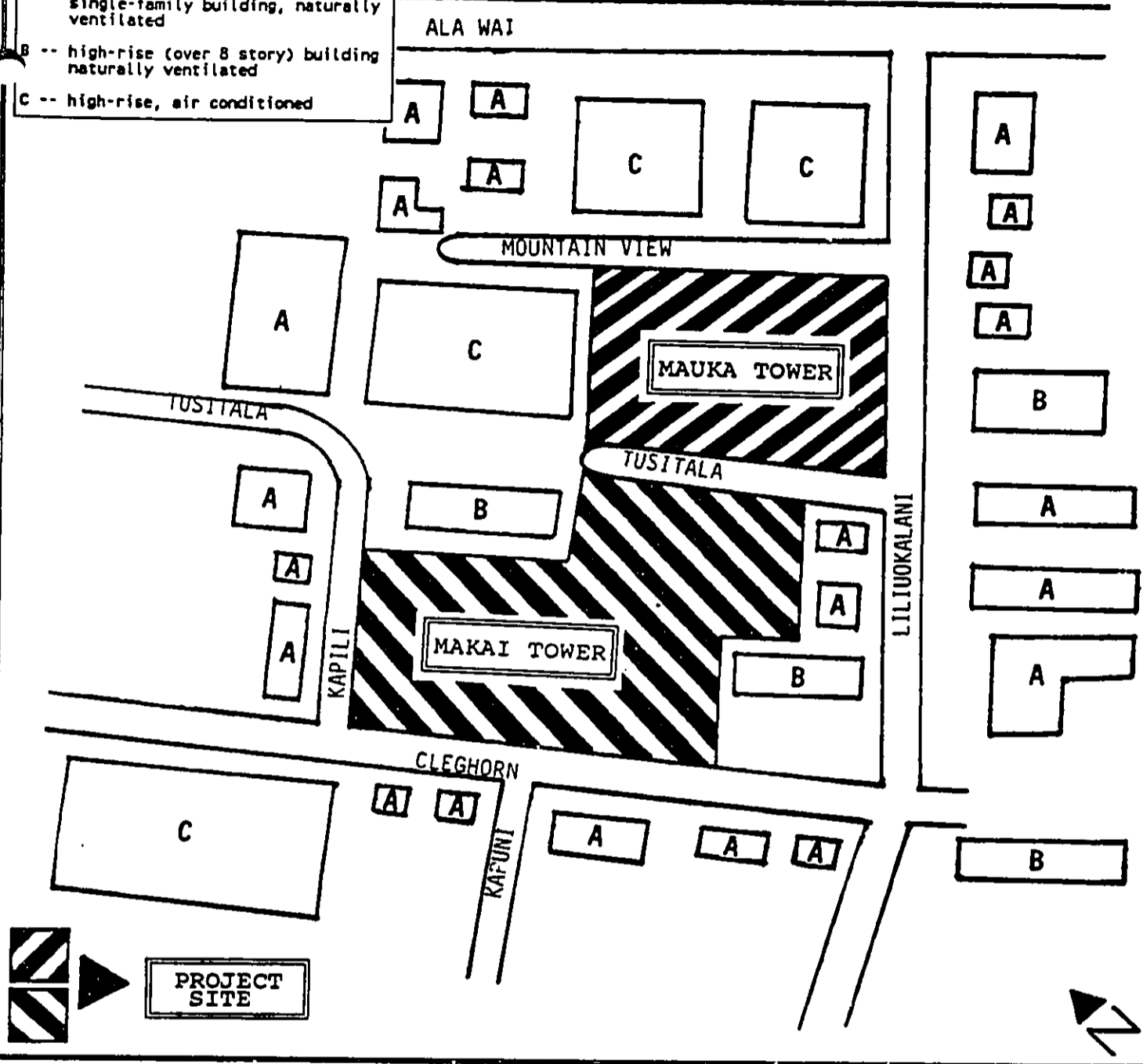


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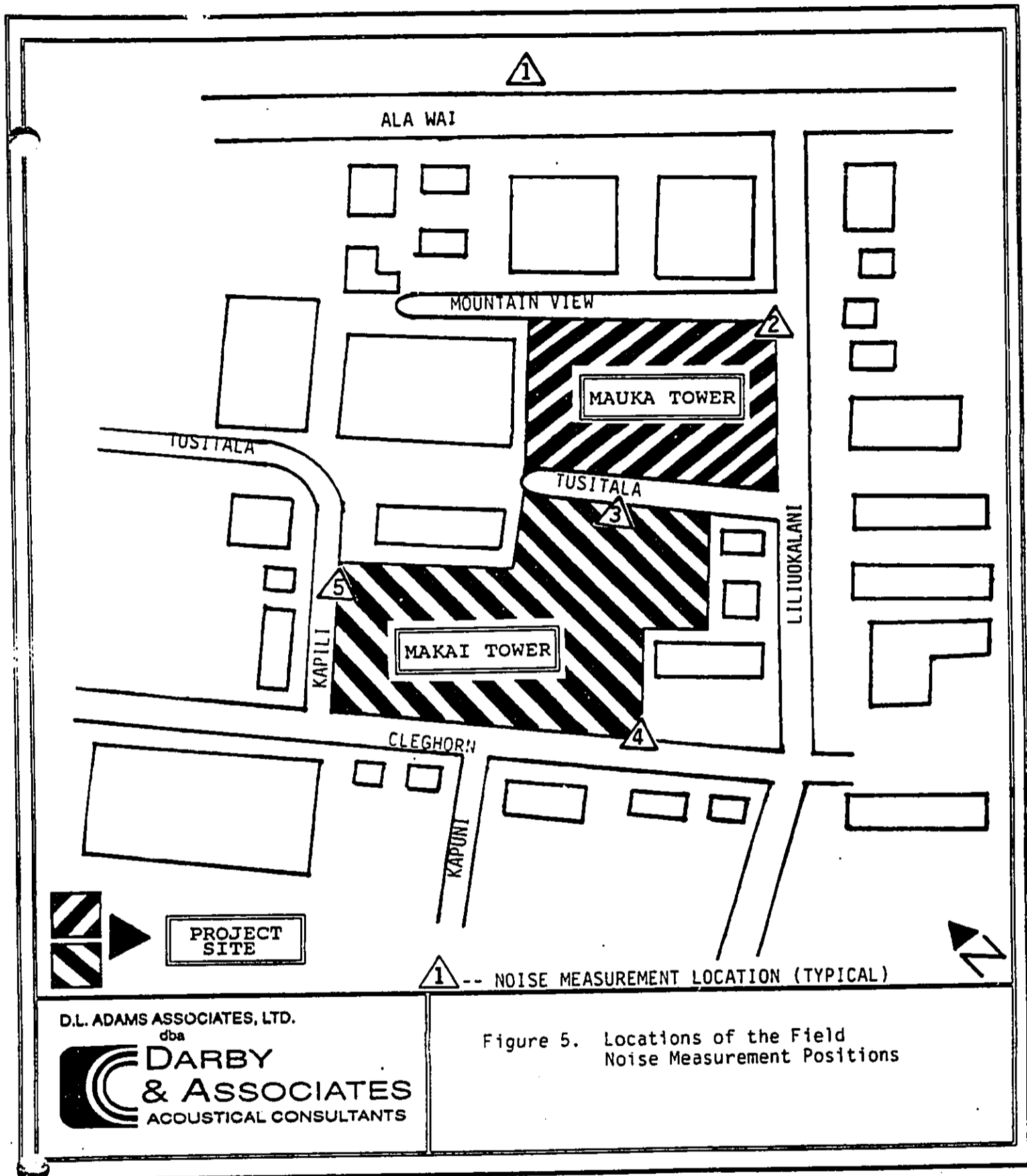
Figure 3. City and County of Honolulu
 Land Use Ordinance
 Noise Limits

LEGENDS
 A -- low-rise (1 to 4 story) apartment/
 single-family building, naturally
 ventilated
 B -- high-rise (over 8 story) building
 naturally ventilated
 C -- high-rise, air conditioned



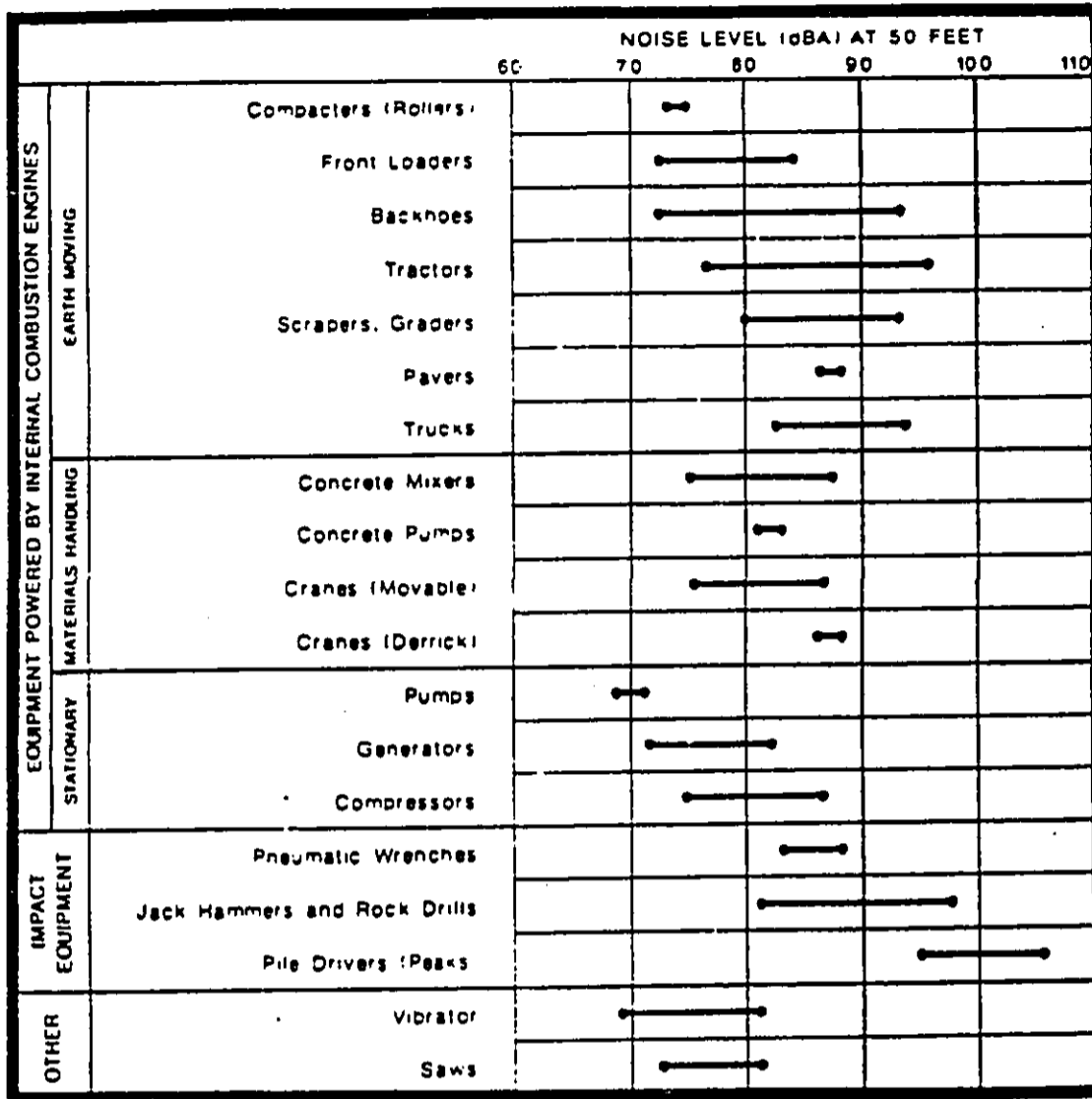
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Figure 4. Locations and Descriptions of the Existing Noise Sensitive Areas in the Immediate Vicinity of the Project Site



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Figure 5. Locations of the Field Noise Measurement Positions



Note: Based on Limited Available Data Samples

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Figure 6. Construction Noise Levels

SOURCE: U.S. ENVIRONMENTAL PROTECTION AGENCY
1972

WAIKIKI PROJECT 1 TRAFFIC STUDY

Prepared for
USA PENSEE, INC



WILBUR SMITH ASSOCIATES

March 22, 1991

WAIKIKI PROJECT 1

TRAFFIC STUDY

Prepared for
USA PENSEE, INC



March 22, 1991

APPENDIX C. 1.

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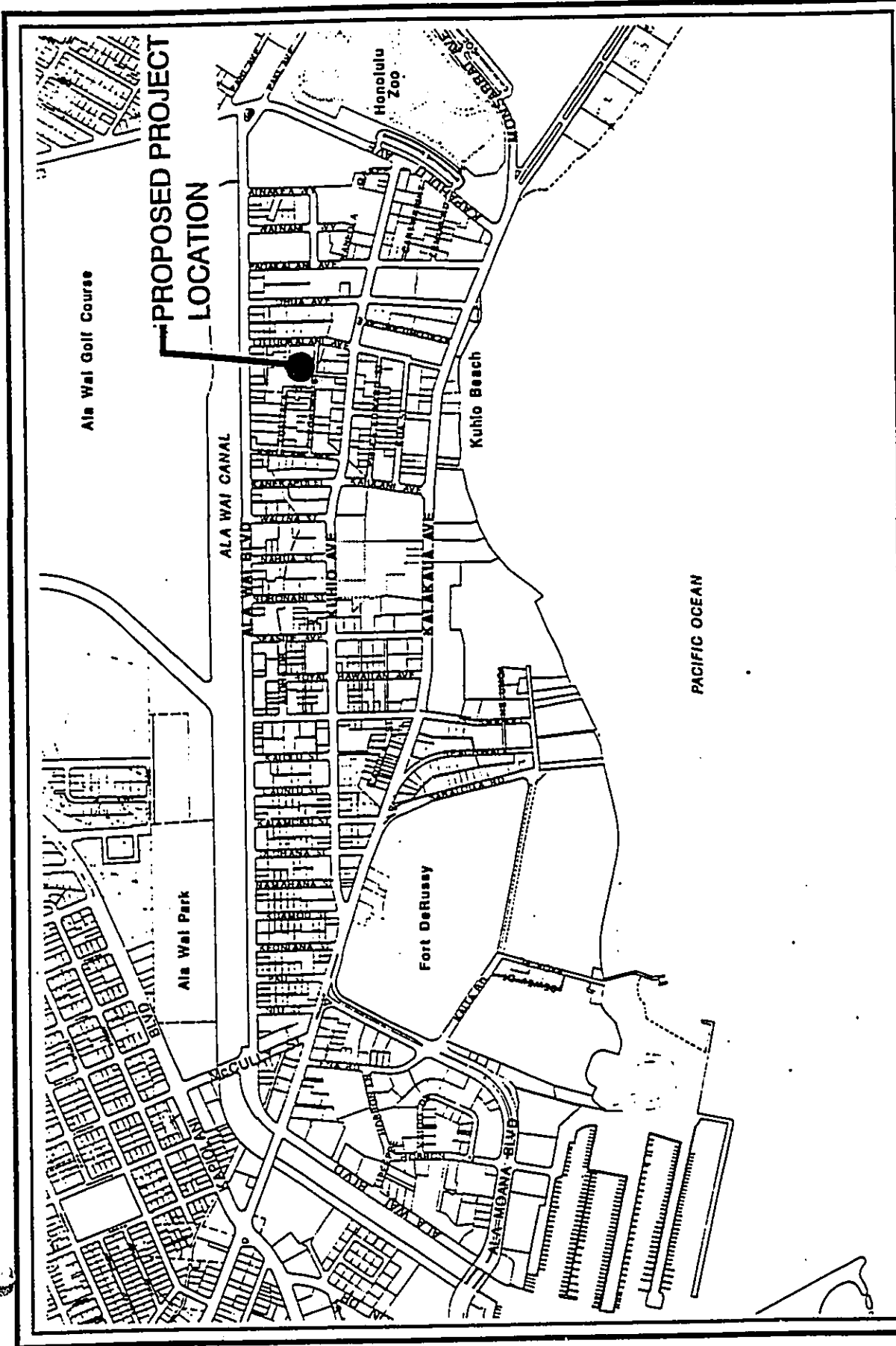
INTRODUCTION

The following report summarizes the results of a traffic analysis conducted for a planned residential development in Honolulu, Hawaii. As shown in Figure 1, the site of the proposed project would be located toward the Diamondhead end of Waikiki. The project would consist of two residential towers, totaling 147 dwelling units. The Mauka Tower would contain 46 units. Automobile access to this tower would be on Mountainview Drive. The Makai Tower would contain 101 units. Automobile access to this tower would be on Cleghorn Street. It was estimated that the project would be built and fully occupied within 2.5 years, or by 1993.

This report assesses existing and future traffic conditions with and without the project at a number of key intersections. These key intersections include two signalized intersections on Liliuokalani Avenue, one at the Ala Wai Boulevard intersection and a second at the Kuhio Avenue intersection. The analysis also addresses impacts at several unsignalized intersections. These include the intersections of Liliuokalani with three low volume streets:

- Mountainview Drive;
- Tusitala Street; and
- Cleghorn Street.

The unsignalized intersection of Kuhio Avenue and Kupuna Street is also addressed in this report.



PROJECT LOCATION
 Walkiki Project I Traffic Study



EXISTING CONDITIONS

This section presents the analysis of existing traffic conditions in the study area, including existing intersection levels of service, existing traffic flows, and a discussion of existing traffic problems.

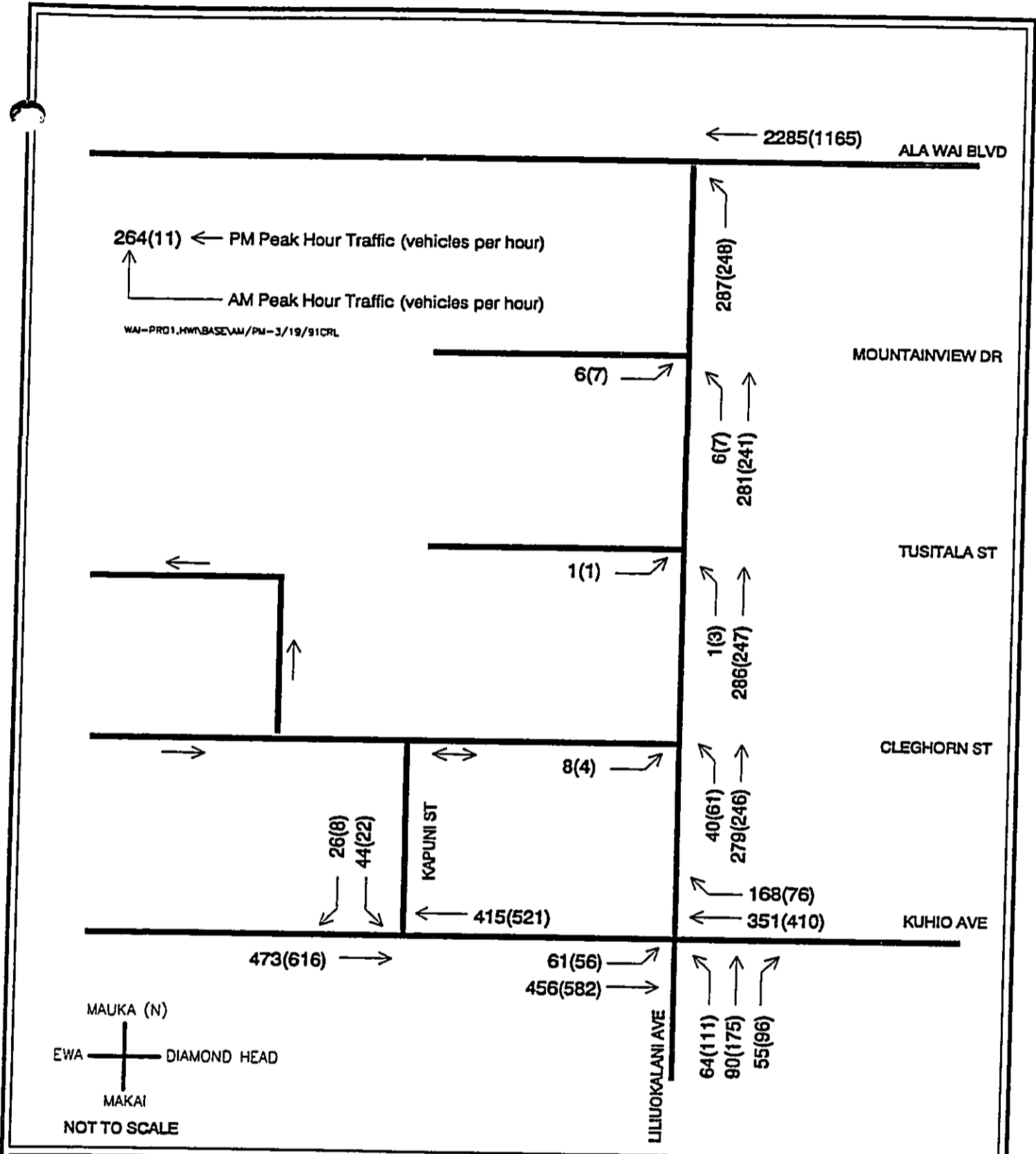
Existing Traffic Flows

Updated traffic counts were conducted during the AM and PM peak periods at the key study area intersections. The resulting peak hour turning movement flows are illustrated in Figure 2.

The Level-of-Service Concept

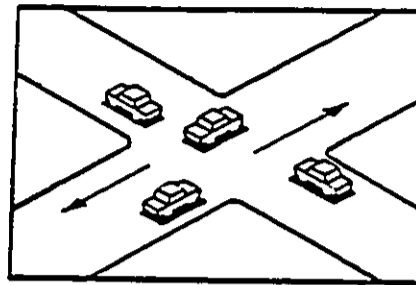
The Transportation Research Board (TRB), a division of the National Science Foundation, has developed the standardized methods used in traffic impact analyses to evaluate the effectiveness and quality of transportation facilities. Facilities include intersections, roadways, freeways, transit services, and pedestrian areas. While specific calculations for each type of facility differ, many of the TRB evaluation methods involve a concept known as level-of-service (LOS) which describes facility operations on a letter basis from A to F, signifying excellent to unacceptable traffic conditions.

Most of the evaluation methods compare facility demand to the facility's theoretical capacity to estimate level of service. Demand is estimated using actual or projected traffic counts for a given time period. Capacity is estimated based on the facility's physical characteristics, (e.g. size, the number of lanes, etc.), traffic conditions (e.g. types of vehicles, directional distribution, etc.) and control conditions (e.g. signalized, un-signalized, etc.). The comparison is frequently referred to as the volume-to-capacity (V/C) ratio. The V/C ratio is used to determine the level of service of the facility. Figure 3 illustrates the six level of service categories, A to F.



LEVEL OF SERVICE "A" - $V/C = 0$ TO 0.60

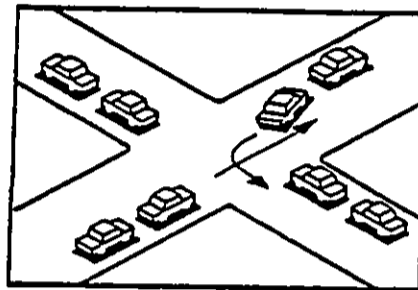
Describes operations with very low delay, i.e., less than 5 seconds per vehicle. This occurs when signal progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all.



LOS 'A'

LEVEL OF SERVICE "B" - $V/C = 0.61$ TO 0.70

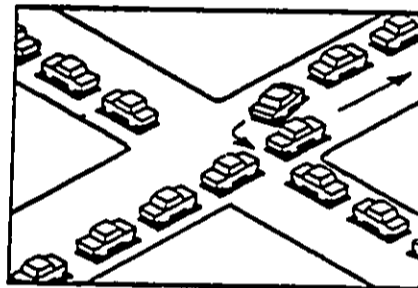
Describes operations with delays in the range of 5 to 15 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS "A", causing higher levels of average delay.



LOS 'C'

LEVEL OF SERVICE "C" - $V/C = 0.71$ TO 0.80

Describes operation with delay in the range of 15 to 25 seconds per vehicle. Occasionally vehicles may wait more than one red signal phase. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.



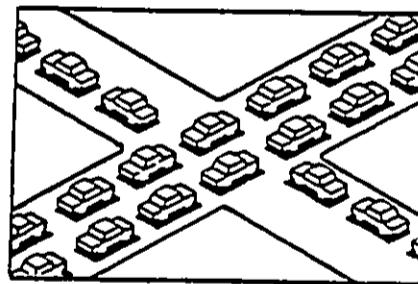
LOS 'D'

LEVEL OF SERVICE "D" - $V/C = 0.81$ TO 0.90

Describes operations with delay in the range of 25 to 40 seconds per vehicle. At LOS "D", the influence of congestion becomes more noticeable. Many vehicles stop, and the proportion of vehicles not stopping declines. Noticeable numbers of vehicles fail to clear signal during the first green phase.

LEVEL OF SERVICE "E" - $V/C = 0.91$ TO 1.00

Describes operations with delay in the range of 40 to 60 seconds per vehicle. These high delay values generally indicate poor progression, long cycle lengths, and high V/C ratios. Vehicles frequently fail to clear the signal during the first green phase.



LOS 'F'

LEVEL OF SERVICE "F" - V/C GREATER THAN 1.00

Describes operations with delay in excess of 60 seconds per vehicle. This condition often occurs with oversaturation, i.e., when arrival flow rates exceed the capacity of the intersection.

SOURCE: Highway Capacity Manual, 1985.



Signalized Intersections - Signalized intersections are one of the most complex locations in the traffic system. Consequently, the TRB has developed several methods for evaluating the level of service at signalized intersections. In most of the methods, level-of-service is estimated based on the volume-to-capacity ratio for critical conflicting movements. Conflicting movements are defined as those which interfere with each other. For example, left-turns must wait for breaks in opposing through traffic before turning left. In this case, left-turning vehicles would be said to conflict with through vehicles.

Unsignalized Intersections - The techniques described in the TRB's *1985 Highway Capacity Manual* (1985 HCM) were used in this study to evaluate unsignalized intersections. In this analysis method, level of service is based on the reserve capacity for a particular turning movement. The reserve capacity is an estimate of the total number of vehicles which can make the critical movement.

For example, in order to cross an intersection, a vehicle must wait until there is a break in opposing traffic from both the left and right directions. The number of breaks in opposing traffic is related to the total volume of traffic coming from the left and right. Reserve capacity simply estimates the number of vehicles which can cross through an intersection with a given level of opposing traffic.

At un-signalized intersections, vehicles making each movement will experience a different level-of-service depending on the type of control and the volume of opposing traffic. For this reason, levels-of-service and traffic volumes are often presented for each movement separately at un-signalized intersections to provide a more complete understanding of intersection operations. For example, one movement may operate at a low level-of-service, but there may be a very small number of vehicles making that movement.

Existing Levels-of-Service

Levels-of-service were calculated at the key intersections using the methodology presented in the 1985 HCM. The resulting levels of service from these calculations are summarized in Table 1.

Table 1 INTERSECTION LEVELS OF SERVICE SUMMARY EXISTING CONDITIONS Waikiki Project I Traffic Study					
Signalized Intersections		AM Peak Hour		PM Peak Hour	
		LOS	V/C	LOS	V/C
Liliuokalani Ave./Kuhio Ave.		B	0.46	B	0.65
Liliuokalani Ave./Ala Wai Blvd.		B	0.63	B	0.36
Unsignalized Intersections	Movement	AM Peak Hour		PM Peak Hour	
		LOS	RC	LOS	RC
Liliuokalani Ave./ Mountainview Drive	NB-Left	A	993	A	992
	EB-Left	A	636	A	668
Liliuokalani Ave./ Cleghorn Street	NB-Left	A	956	A	933
	EB-Left	A	596	A	600
Kuhio Ave./ Kapuna Street	SB-Left/Right	C	242	D	166

LOS = Level-of-Service; V/C = Volume-to-Capacity; RC = Reserve Capacity.
Wilbur Smith Associates; March 15, 1991.

According to this analysis, it would appear that all key study area intersections with traffic signals operate at LOS B, with volume-to-capacity ratios ranging from V/C 0.36 to V/C 0.65. This is representative of relatively uncongested conditions.

It is important to note, however, that during the morning peak period a large number of vehicles (about 56 per hour) were observed entering the Prince Kuhio Hotel on Kuhio Avenue in the Diamondhead bound direction. Because of the close proximity of the hotel's driveway to the intersection of Kuhio Avenue and Liliuokalani Avenue, the left-turn storage capacity in the two-way left-turn lane is limited to one or two vehicles. On occasion, it was observed that traffic waiting to enter the driveway would back-up into the adjacent intersection. Aside from this occurrence, no other significant traffic problems were observed.

With the exception of the Kapuna Street/Kuhio Avenue intersection, all movements at the unsignalized intersections in the study area operate at LOS A during both the morning and evening peak periods. At the Kapuna Street/Kuhio Avenue intersection, the Kupuna Street approach operates at LOS C during the morning peak hour and at LOS D during the PM peak hour.

FUTURE CONDITIONS WITH THE PROJECT

The following section presents an assessment of the project's trip generation characteristics as well as the impacts of both project and cumulative traffic on the local street system.

Trip Generation

The number of peak hour and daily trips generated by the project was estimated according to standard ITE trip generation rates for residential condominiums. Applying these rates, which are summarized in Table 2, resulted in an estimated 867 daily trips, 68 AM peak hour trips, and 83 PM peak hour trips. The resulting in/out splits are also summarized in Table 2.

For the purposes of this analysis, a conservative approach was taken: no reductions in trip generation were made to account for the traffic generated by the existing residential units that were standing when the background traffic counts were conducted. Likewise, no reductions in the trip generation rates were applied to reflect the possible occurrence of part-year occupancy by some of the units.

Cumulative traffic growth was assumed to grow at a constant rate of two percent per year; thus, during the 2.5 year construction and leasing process, background traffic would be expected to increase by about five percent. There are currently no known significant development projects in the study area other than the proposed residential project.

Trip Distribution and Assignment

The traffic assignment for the project is summarized in Figure 4 for the AM peak hour and in Figure 5 for the PM peak hour. The traffic flows in these figures include the sum of existing traffic, project traffic, and other cumulative growth. Project traffic is summarized in parenthesis.

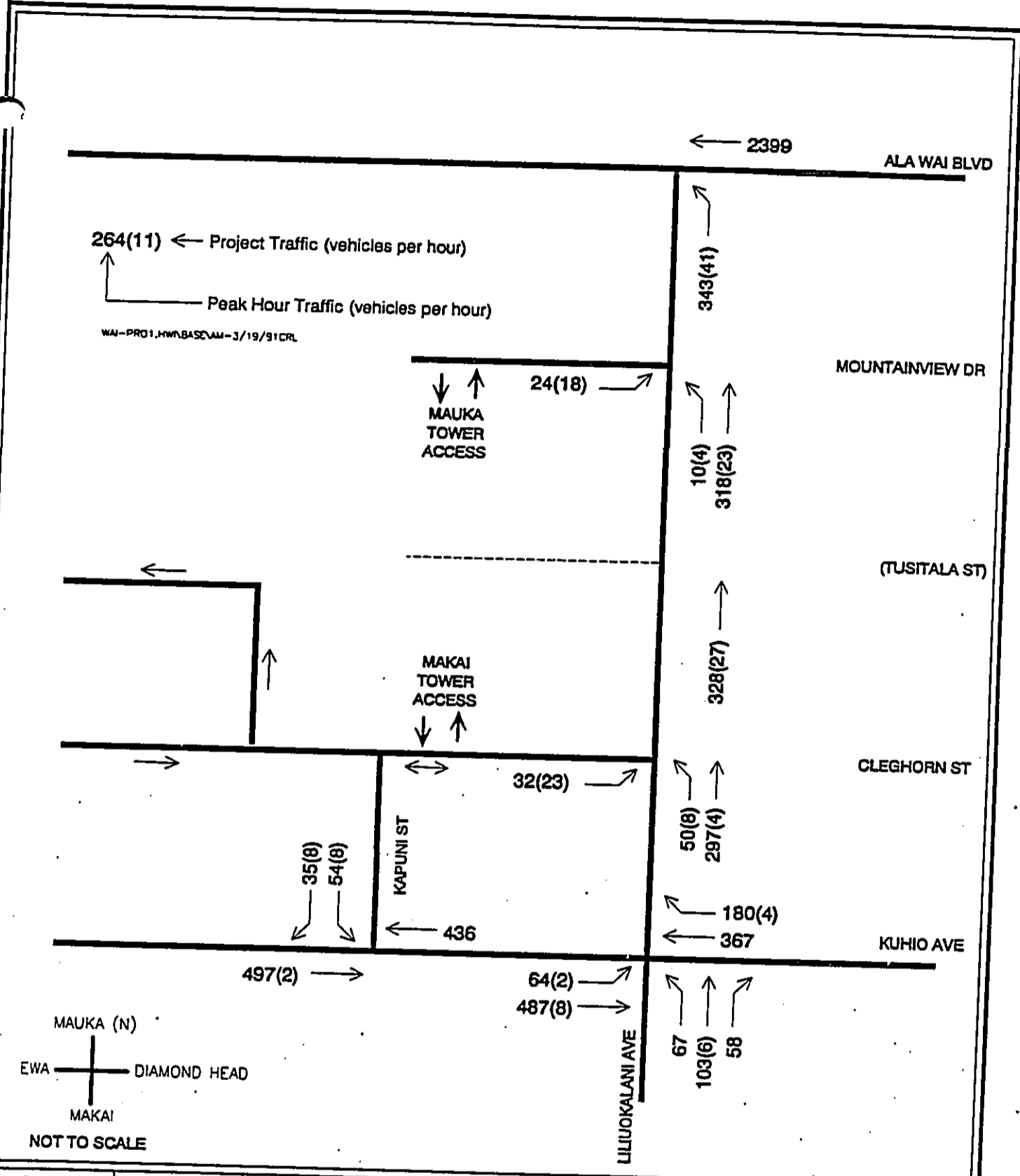
Table 2

TRIP GENERATION
Walkikt Project I Traffic Study

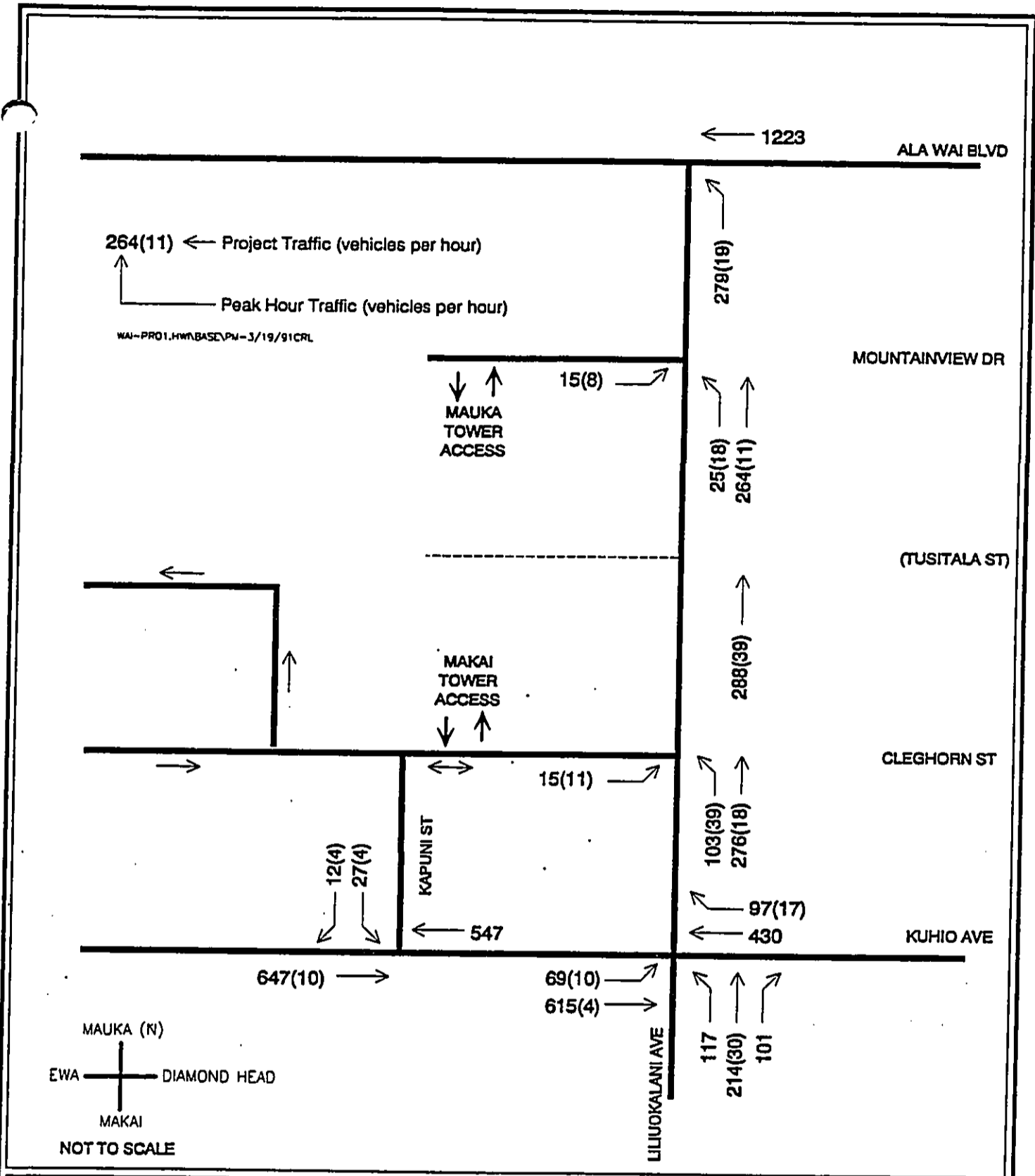
Residential Building	Trip Generation								Daily Total (vpd)
	AM Peak Hour				PM Peak Hour				
	Inbound (vph)	Outbound (vph)	Total (vph)	Total (vph)	Inbound (vph)	Outbound (vph)	Total (vph)	Total (vph)	
Mauka Tower (46 Units)	4	18	22	22	18	8	26	26	271
Makai Tower (101 Units)	8	39	47	47	39	18	57	57	596
Total	12	57	69	69	57	26	83	83	867
Trip Rates ⁽¹⁾ (Trips per Unit)	0.08	0.34	0.47	0.47	0.38	0.18	0.56	0.56	5.9

vph = vehicles per hour; vpd = vehicles per day.
 (1) ITE Trip Generation; Land Use 230, residential condominiums.

Wilbur Smith Associates; March 14, 1991.



AM PEAK HOUR TRAFFIC FLOWS
 WITH THE PROJECT AND CUMULATIVE GROWTH
 Waikiki Project I Traffic Study



PM PEAK HOUR TRAFFIC FLOWS
 WITH THE PROJECT AND CUMULATIVE GROWTH
 Waikiki Project I Traffic Study

Site Access

Access points to the site were reviewed to assure that they conform with standard access requirements. Access to the Mauka Tower would be provided on Mountainview Drive. It would be located about 50 feet in the ewa direction from Liliuokalani Avenue. This driveway location would be sufficient to accommodate the projected 26 vehicle trips per hour that would be generated during the PM peak hour. Access to the Makai Tower would be provided on Cleghorn Street. This loop driveway would be located well over 50 feet in the ewa direction from Liliuokalani Avenue. This driveway would also be sufficient to accommodate the projected 57 vehicle trips per hour that would be generated during the PM peak hour.

Future Intersection Levels-of-Service

Future intersection levels-of-service was calculated for conditions with the project and without the project. These are summarized in Table 3 for conditions with the project and in Table 4 for conditions without the project.

Future Levels-of-Service with the Project - It was forecast that under conditions with the project and cumulative traffic growth, the level-of-service categories at all intersections would not change compared to existing conditions. This holds for both the signalized and the unsignalized intersections. It is important to note, however, that the addition of project and cumulative traffic would increase volume-to-capacity ratios and would lower the reserve capacity at unsignalized intersections. The degree of this change would not be large enough to alter the level-of-service category describing traffic conditions at each intersection.

Traffic increases on Mountainview Drive and on Cleghorn Street would represent a large percentage increase because existing traffic flows on these two streets are relatively low. The traffic flows on these two streets would remain well within the level of traffic flows that are typical of residential streets, where flows reach up to 2,500 vehicles per day. Also, this increase would not have significant adverse impacts on the quality of traffic flow at the key intersections.

Table 3 INTERSECTION LEVELS OF SERVICE SUMMARY CUMULATIVE CONDITIONS WITH THE PROJECT Waikiki Project I Traffic Study					
Signalized Intersections		AM Peak Hour		PM Peak Hour	
		LOS	V/C	LOS	V/C
Liliuokalani Ave./Kuhio Ave.		B	0.49	B	0.71
Liliuokalani Ave./Ala Wai Blvd.		B	0.68	B	0.39
Unsignalized Intersections	Movement	AM Peak Hour		PM Peak Hour	
		LOS	RC	LOS	RC
Liliuokalani Ave./ Mountainview Drive	NB-Left	A	989	A	973
	EB-Left	A	584	A	617
Liliuokalani Ave./ Cleghorn Street	NB-Left	A	945	A	887
	EB-Left	A	545	A	523
Kuhio Ave./ Kapuna Street	SB-Left/Right	C	208	D	147

LOS = Level-of-Service; V/C= Volume-to-Capacity; RC= Reserve Capacity.
Wilbur Smith Associates; March 15, 1991.

Future Levels-of-Service without the Project - A nominal change in volume-to-capacity ratios at the signalized intersections would occur as a result of cumulative growth. The difference in volume-to-capacity ratios for future conditions with the project compared to future conditions without the project, however, are lower than could be measured in the field with statistical confidence. Comparing future conditions with and without the project, no significant difference in levels of service at the unsignalized intersections was forecast. Traffic flows on Mountainview Drive would be close to existing conditions.

**Table 4
 INTERSECTION LEVELS OF SERVICE SUMMARY
 CUMULATIVE CONDITIONS WITHOUT THE PROJECT
 Waikiki Project I Traffic Study**

Signalized Intersections		AM Peak Hour		PM Peak Hour	
		LOS	V/C	LOS	V/C
Liliuokalani Ave./Kuhio Ave.		B	0.48	B	0.68
Liliuokalani Ave./Ala Wai Blvd.		B	0.66	B	0.38
Unsignalized Intersections	Movement	AM Peak Hour		PM Peak Hour	
		LOS	RC	LOS	RC
Liliuokalani Ave./ Mountainview Drive	NB-Left	A	993	A	992
	EB-Left	A	625	A	658
Liliuokalani Ave./ Cleghorn Street	NB-Left	A	954	A	930
	EB-Left	A	583	A	588
Kuhio Ave./ Kapuna Street	SB-Left/Right	C	218	D	146

LOS = Level-of-Service; V/C = Volume-to-Capacity; RC = Reserve Capacity.
 Wilbur Smith Associates; March 15, 1991.

SUMMARY AND CONCLUSION

The proposed project, located on Liliuokalani Avenue between Mountainview Drive and Cleghorn Street, would consist of two residential towers totaling 147 units. The access points to each of the two towers would accommodate the projected traffic demand. No changes to the proposed access scheme were found to be advisable.

The proposed project would generate an estimated 867 vehicle trips per day. Project traffic would increase peak hour volumes along Liliuokalani Avenue by about 8% to 14%, depending on the peak hour and location. However, the traffic increases would not significantly affect traffic conditions along the street. Intersection levels of service at the signalized intersections would continue to operate at LOS B, with or without the project. The traffic increases also would not affect the level-of-service at the STOP sign-controlled intersections in the area.

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CITY OF HONOLULU

**AN ARCHAEOLOGICAL ASSESSMENT OF TWO PARCELS
(TMK 2-6-24:65-68 & 80-83 and TMK 2-6-24:34-40 & 42-45)
IN WAIKIKI AHUPUA'A, O'AHU, HAWAII**

by

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prepared for

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CULTURAL SURVEYS HAWAII

JULY 1991

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INTRODUCTION

Cultural Surveys Hawaii has conducted, at the request of Barbara Moon, Land Use Consultant, a preliminary archaeological assessment of two parcels - comprising TMK 2-6-24:65-68 & 80-83, and TMK 2-6-24:34-40 & 42-45 - located in the ahupua'a of Waikiki in the Kona district on the island of Oahu. The parcels are adjacent - separated only by Tusitala Street - and are bounded by Mountain View Drive, Lili'uokalani Avenue, Cleghorn Street, and Kapili Street where they border two existing condominium buildings: the Waikiki Lanais and the Pacific Islander Hotel (TMK 2-6-24:69 and 41). Two buildings at the corner of Cleghorn Street and Lili'uokalani Avenue - a four-story building and the Hawaiian Crown apartment building (TMK 2-6-24:46 and 47) - border the parcels to the south. At the time of this report's preparation (July 1991) the parcels have been cleared of the low-rise structures that had previously occupied most of the property. Only a two-story wooden building at the makai corner of Tusitala Street and Lili'uokalani Avenue (TMK 2-6-24:45) remains standing on the parcels.

Research conducted by Cultural Surveys Hawaii focussed on the following concerns:

- 1) A summary of traditional Hawaiian and historic land use patterns in the specific environs of the two parcels. This summary would be based upon a review of early accounts by European visitors and native Hawaiian historians, historic maps, Land Commission Award records, photographs and other pertinent documents.
- 2) An attempt to accurately locate the parcels on maps predating the extensive twentieth century modifications of the lands of Waikiki. This was deemed especially critical since the parcels appeared to be situated on or near the historically significant "Ainahau"--the residence and estate of Governor Archibald S. Cleghorn, his wife Miriam Likelike, and their daughter Princess Kaiulani.
- 3) A review of previous archaeological research conducted in the ahupua'a of Waikiki.
- 4) An assessment of possible archaeologically significant sub-surface deposits which this preliminary research suggests may be present in two parcels and which may be impacted by future construction.
- 5) Recommendations for mitigation of potential impact from future construction.

Research procedures undertaken included studies of documents at the Hawaii State Archives, the Hawaii Public Library, and the Bishop Museum Library; study of maps at the Survey Office of the Department of Land and Natural Resources; study of photographs at the Visual Collections of the Bishop Museum; and on-site inspections of the parcels by the staff of Cultural Surveys Hawaii. The results of this research are the subject of this report.

CULTURAL HISTORY

Waikiki, by the time of the arrival of Europeans in the Hawaiian Islands during the late eighteenth century, had long been a center of population and political power on Oahu. According to Martha Beckwith (1940), by the end of the fourteenth century Waikiki had become "the ruling seat of the chiefs of Oahu." The pre-eminence of Waikiki continued into the eighteenth century and is attested to by the fact that Kamehameha I chose to reside there after wresting control of Oahu by defeating the island's chief, Kalanikupule. The nineteenth century Hawaiian historian John Papa I'i (1959), himself a member of the ali'i, described the king's Waikiki residence:

Kamehameha's houses were at Puaalilii, makai of the old road, and extended as far as the west side of the sands of Apuakehau. Within it was Helumoa where Kaahumanu *ma* went to while away the time. The king built a stone house there, enclosed by a fence.

I'i further noted that the "place had long been a residence of chiefs. It is said that it had been Kekuapoi's home, through her husband Kahahana, since the time of Kahekili."

Chiefly residences, however, were only one element of a complex of features - sustaining a large population - that characterized Waikiki up to pre-contact times. Beginning in the fifteenth century, a vast system of irrigated taro fields was constructed, extending across the littoral plain from Waikiki to lower Manoa and Palolo valleys. This field system - an impressive feat of engineering the design of which is traditionally attributed to the chief Kalamakua - took advantage of streams descending from Makiki, Manoa and Palolo valleys which also provided ample fresh water for the

Hawaiians living in the ahupua'a. Water was also available from springs in nearby Mo'ili'ili and Punahou. Closer to the Waikiki shoreline, coconut groves and fishponds dotted the landscape. A sizeable population developed amidst this Hawaiian-engineered abundance. Captain George Vancouver, arriving at "Whyteete" in 1792, captured something of this profusion in his journals:

On shores, the villages appeared numerous, large, and in good repair, and the surrounding country pleasingly interspersed with deep, though not extensive valleys; which, with the plains near the sea-side, presented a high degree of cultivation and fertility.

[Our] guides led us to the northward through the village, to an exceedingly well-made causeway, about twelve feet broad, with a ditch on each side.

This opened our view to a spacious plain, which, in the immediate vicinity of the village, had the appearance of the open common fields in England; but, on advancing, the major part appeared to be divided into fields of irregular shape and figure, which were separated from each other by low stone walls, and were in a very high state of cultivation. These several portions of land were planted with the eddo or *taro* root, in different stages of inundation; none being perfectly dry, and some from three to six or seven inches under water. The causeway led us near a mile from the beach, at the end of which was the water we were in quest of. It was a rivulet five or six feet wide, and about two or three feet deep, well banked up, and nearly motionless; some small rills only, finding a passage through the dams that checked the sluggish stream, by which a constant supply was afforded to the *taro* plantations.

[We] found the plant in a high state of cultivation, mostly under immediate crops of *taro*; and abounding with a variety of wild fowl, chiefly of the duck kind...The sides of the hills, which were at some distance, seemed rocky and barren; the intermediate vallies, which were all inhabited, produced some large trees, and made a pleasing appearance. The plain, however, if we may judge from the labour bestowed on their cultivation, seemed to afford the principal proportion of the different vegetable productions on which the inhabitants depend for their subsistence. (Vancouver, 1798: I, 161-164)

Further details of the exuberant life that must have characterized the Hawaiians use of the lands that included the ahupua'a of Waikiki are given by Archibald Menzies, a naturalist accompanying Vancouver's expedition:

The verge of the shore was planted with a large grove of cocoanut palms, affording a delightful shade to the scattered habitations of the natives. Some of those near the beach were raised a few feet from the ground upon a kind of stage, so as to admit the surf to wash underneath them. We pursued a pleasing path back to the plantation, which was nearly level and very extensive, and laid out with great neatness into little fields planted with taro, yams, sweet potatoes and the cloth plant. These, in many cases, were divided by little banks on which grew the sugar cane and a species of *Dracaena* without the aid much cultivation, and the whole was watered in a most ingenious manner by dividing the general stream into little

aqueducts leading in various directions so as to be able to supply the most distant fields at pleasure, and the soil seemed to repay the labour and industry of these people by the luxuriancy of its productions. Here and there we met with ponds of considerable size, and besides being well stocked with fish, they swarmed with water fowl of various kinds such as ducks, coots, water hens, bitterns, plovers and curlews. (Menzies, 1920:23-24)

However, the traditional Hawaiian focus on Waikiki as a center of chiefly and agricultural activities on southeastern Oahu was soon to change--disrupted by the same European contact which produced the first documentation (including the records cited above) of that traditional life. The ahupua'a of Honolulu - with the only sheltered harbor on Oahu - became the center for trade with visiting foreign vessels, drawing increasing numbers of Hawaiians away from their traditional environments. The shift in pre-eminence is illustrated by the fact that Kamehameha moved his residence from Waikiki to Honolulu. Indeed, by 1828, Levi Chamberlain describing a journey into Waikiki would note:

Our path led us along the borders of extensive plats of marshy ground, having raised banks on one or more sides, and which were once filled with water, and replenished abundantly with esculent fish; but now overgrown with tall rushes waving in the wind. The land all around for several miles has the appearance of having once been under cultivation. I entered into conversation with the natives respecting this present neglected state. They ascribed it to the decrease of population. (Chamberlain, 1957:26)

Tragically, the de-population of Waikiki was not merely a result of the attractions of Honolulu (where, by the 1820s, the population was estimated at 6,000 to 7,000) but also of the European diseases that had devastating effects upon the Hawaiians.

The de-population, however, was not complete and Waikiki continued to sustain Hawaiians living traditionally into the nineteenth century. Land Commission Award records from the time of the Great Mahele during the 1850s document awardees continuing to maintain irrigated and dry-land agricultural plots though on a greatly reduced scale than had been possible previously with adequate manpower. At the same time, Waikiki was becoming a popular site among foreigners - mostly American - who had settled on Oahu; an 1865 article in the Pacific Commercial Advertiser mentioned a small community that had developed along the beach. The area continued to be popular with the

ali'i - the Hawaiian royalty - and several notables had residences there. Other developments during the second half of the nineteenth century - prefiguring the changes that would alter the landscape of Waikiki during this century - include the improvement of the road connecting Waikiki to Honolulu, the building of a tram line between the two areas, and the construction of Kapiolani Park.

Traditional land-uses were abandoned or modified. By the end of the nineteenth century most of the fish ponds that had previously proliferated had been neglected and allowed to deteriorate. The remaining former taro were planted in rice to supply the growing numbers of immigrant laborers imported from China and Japan, and for shipment to the west coast of the United States.

The history of Waikiki in the twentieth century is primarily a record of the development of the center of Hawaii's tourism-based economy. Perhaps the most telling event - geographically, archaeologically and socially - in that record was the construction of the Ala Wai Drainage Canal which began in 1921 and was finally completed eight years later. With the construction of the canal, the ponds and irrigated fields of Waikiki were drained and filled, and most of Waikiki itself was physically separated from its neighboring lands creating the enisled tourist haven existing today.

In summary, the ahupua'a of Waikiki in the centuries before the arrival of Europeans was a well-used locale with abundant natural and cultivated resources - including an expansive system of irrigated taro fields - supporting a large population that included the highest-ranking ali'i. In the nineteenth century, after a period of de-population and desuetude, Waikiki was re-animated by the Hawaiian ali'i and the foreigners residing there and by the farmers continuing to work the irrigated field system which was converted from taro to rice. This farming continued up to the first decades of this century until the Ala Wai Canal drained the remaining ponds and irrigated fields.

All of the above-recounted elements of the history of Waikiki are directly relevant to the two parcels under study and will be discussed in more detail in the "Ainahau and Taro: A Document Search section of this report.

PREVIOUS ARCHAEOLOGY

Prior to the 1980s the majority of information from previous archaeological sources concerned human burials inadvertently excavated during construction activities. In 1901, while digging a sewer line at the James B. Castle property near Diamond Head (in the environs of the present Elks Club), the remains of at least four adult Hawaiians were unearthed along with "a number of conical teeth of whale teeth, a number of round glass beads of large size, and a small sized niho-palaoa, such as was generally appropriated to the use of the chiefs" (Emerson, 1902:19).

In the 1920s and 30s the first systematic archaeological survey of Oahu was conducted by J.C. McAllister (1930). He recorded four heiau, three of which were located at the mauka reaches of Waikiki ahupua'a in lower Manoa Valley. The fourth heiau - Papaenaena - was located at the foot of Diamond Head crater in the environs of the present Hawaii School for Girls. Papaenaena heiau is traditionally associated with Kamehameha I who was said to have visited the heiau before setting off to battle for Niihau and Kauai in 1804. Five years later, according to John Papa I'i, Kamehameha placed at Papaenaena the remains of an adulterer - "all prepared in the customary manner of that time" (I'i, 1959:50-51).

During the 1960s through the 1970s inadvertent burial finds were reported at construction sites stretching from the Fort DeRussy area to the foot of Diamond Head crater. In 1961 a human burial and a nineteenth century trash pit were unearthed during construction on Saratoga Road adjacent to Fort DeRussy. In 1963 human burials were discovered during construction activities at 2431 Prince Edward Street and at the site of the present Outrigger Canoe Club across from Kapiolani Park.

Among the twenty-five burials - excavated by the Bishop Museum - were several discovered in flexed (with knees drawn up to the chin) or semi-flexed positions, traditional Hawaiian burial postures.

Sand dune burials - another traditional Hawaiian mortuary practice - were revealed in 1964 as beach sand fronting the Surfrider Hotel shifted and eroded.

The remains of six burials - five of apparent prehistoric or early historic age and one of more recent date - were unearthed in 1976 during construction of the Hale Koa Hotel adjacent to the Hilton Hawaiian Village Hotel.

Four years later, three burials were encountered at the Hilton Hawaiian Village itself during construction of the hotel's Tapa Tower. Earl Neller of the (then named) State Historic Preservation Program was called in upon discovery of the burials and conducted fieldwork limited to three brief inspections of the project area. Controlled excavations were not possible. Neller's (1980) report, termed by him "an emergency field investigation to recover human remains", noted:

The bones from three Hawaiian burials were partially recovered; one belonged to a young adult male, one a young adult female, and one was represented by a single bone. An old map showed that rapid shoreline accretion had occurred in the area during the 1800s, and that the beach in the construction was not very old. It is possible the burials date back to the smallpox epidemic of 1853. It is likely that burials will continue to be found in the area. It is also possible that early Hawaiian sites exist farther inland, beneath Moiliili, adjacent to where the shoreline would have been 1000 years ago. (Neller, 1980:5)

Neller also documented the presence of trash pits, including one from the 1890s which contained "a large percentage of luxury items, including porcelain tablewares imported from China, Japan, the United States, and Europe" (*ibid*:5). He further notes:

It is suspected that other important historic archaeological sites exist in the highly developed concrete jungle of Waikiki, with discrete, dateable trash deposits related to the different ethnic and social groups that occupied Waikiki over the last 200 years. (*ibid*:5)

Between December 1981 and February 1982, archaeologists from the Bishop Museum led by Bertell Davis conducted a program of excavations and monitoring during construction of the new Halekulani Hotel (Davis 1984). Six human burials were recovered along with "animal burials [and]

cultural refuse from prehistoric Hawaiian firepits, and a large collection of bottles, ceramics, and other materials from trash pits and privies dating to the late 19th century" (*ibid.:i*). Age analysis of volcanic glass recovered from the site led Davis to conclude: "For the first time we can now empirically date...settlement in Waikiki to no later than the mid-1600s" (*ibid.:i*). Just as significant to Davis was the collection of historic era material at the Halekulani site; he states:

[The] Halekulani excavations clearly demonstrate...that there is a definite need to consider historic-period archaeology as a legitimate avenue of inquiry in Hawaiian research. Furthermore, archaeology in the urban context can yield results every bit as significant as in less developed areas. Development in the 19th and early 20th centuries clearly has not destroyed all archaeological resources in Waikiki, Honolulu, or in any of the other urbanized areas of Hawai'i. (*ibid.:i*)

From January through December of 1983, Earl Neller of the State Historic Preservation Office conducted archaeological fieldwork during construction of the Lili'uokalani Gardens condominium on Paoakalani Street. The bones of seven individuals -all from prehistoric Hawaiian graves - were recovered at the site. Neller's report noted:

Queen Lili'uokalani had a bungalow at the project site, and broken glass and ceramic were collected that once was used by the Queen and her guests. There is a deeply buried cultural layer at the site that is older than the graves. (Neller, 1984:i)

Neller recommended further work to develop a full-scale study of the material collected at the site; unfortunately, no such study was ever produced.

In 1987 State Historic Preservation Office archaeologists recovered a human burial at Kalakaua Avenue during renovation work on the Moana Hotel.

This Previous Archaeology survey has been limited to findings and studies accomplished within that makai portion of the ahupua'a of Waikiki bounded by the Pacific Ocean, the Ala Wai Canal and the foot of Diamond Head crater. This limit was imposed to focus on those findings that may prove helpful in assessing the archaeological potential of the present study parcels which are located at the nexus of the delimited area.

Archaeological reports have documented human burials - both pre-contact Hawaiian and historic - throughout the breadth of this makai portion of Waikiki and as far mauka as the modern block bounded by Wai Nani Way, Pualani Way, Paoakalani Avenue and Ala Wai Blvd (Neller 1984). The burials located at this last named area are especially relevant to the present study parcels which are situated at approximately the same distance inland and within 300 yards ewa (northwest) of the burials site. Also relevant are the burials recovered on Prince Edward Street located within 200 yards makai (southwest) of the present study parcels.

Several studies have recorded the presence within Waikiki of sub-surface cultural deposits of both pre-contact Hawaiian and historic provenance. These deposits had remained intact despite the years of construction activity that have altered the surface of the entire area. The authors of the studies emphasize that the potential for discovering similar intact deposits elsewhere in Waikiki cannot be discounted.

"AINAHAU" AND TARO: A DOCUMENT SEARCH

The Cultural History and Previous Archaeology sections of this report have presented an overall view of Waikiki through time and the archaeologically significant remains that have documented Waikiki's past. This section will use that overview as a basis for a more detailed investigation of the present study parcels. This closer inquiry was especially concerned with the parcels apparent proximity to Ainahau, the home and estate of Governor Archibald S. Cleghorn (1835-1910), his wife Princess Miriam Likelike (1851-1887), and their daughter Princess Ka'iulani (1875-1899) - all significant personages in the history of Hawaii. Cultural Surveys Hawaii was able to determine with some accuracy the location of the former estate - which does indeed occupy a portion of the present study parcels - and to determine the traditional Hawaiian and early modern use of the

remaining portion of the parcels. This section recounts how those determinations were made as it details the history of the study parcels.

The current tax map (TMK 2-6-24) (see Fig.1) shows the two study parcels in their relationship to the present urban Waikiki landscape.

A 1927 Sanborn Fire Insurance Map (Fig. 2) shows the parcels and the area as it existed during the final stages of the construction of the Ala Wai Canal. The parcels are readily discernible on the fire map since streets and lots are similarly configured to those on the current tax map. Only three street names are different: the current Mountain View Drive, Cleghorn Street, and Kapili Street were then named Cleghorn Drive No.1, Cleghorn Drive No.2, and Cleghorn Drive No.3, respectively. The individual lots comprising the parcels appear to have contained the typically clustered cottages and bungalows proliferating in Waikiki during the first decades of the twentieth century.

The precise location of the Ainahau estate and a clue to the topography of the locale prior to the construction of the Ala Wai Canal are found in an advertisement (Fig. 3) appearing in the Pacific Commercial Advertiser on May 5, 1919. In 1917 the realtor Percy M. Pond had purchased the former Ainahau estate. The land was subdivided into residential lots which were being sold in 1919. The map displayed in the advertisement announcing the sale reveals the full configuration of the former Ainahau estate. The outlines of the new sub-division's lots and streets are easily coordinated with the features already discerned on the current tax map and the 1927 fire insurance map just discussed. The five contiguous lots (numbered 24, 68, 67, 66, and 65) on the right side of the map clearly correspond to the five fronting Cleghorn Drive No. 3 on the fire insurance map and to the seven fronting Kapili Street on the current tax map. Thus, within the present study parcels, five lots - TMK 2-6-24: 36, 37, 38, 39 and 40 - comprise land that was formerly the southern corner of the Ainahau estate. The remainder of the study parcels comprise lands immediately outside the southeastern boundary of Ainahau.

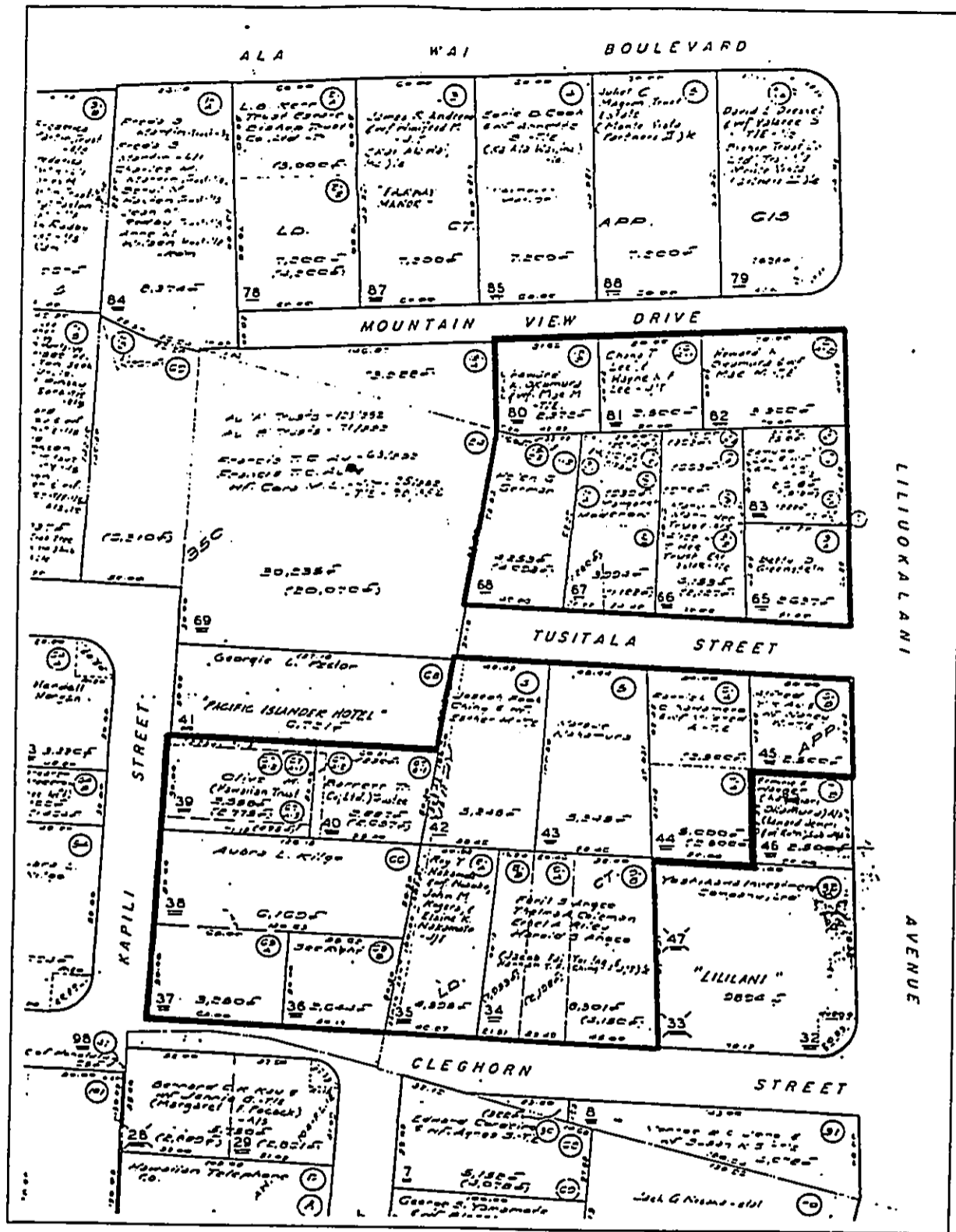


Figure 1 Current Tax Map (TMK 2-6-24) Showing Study Parcels (Outlined)

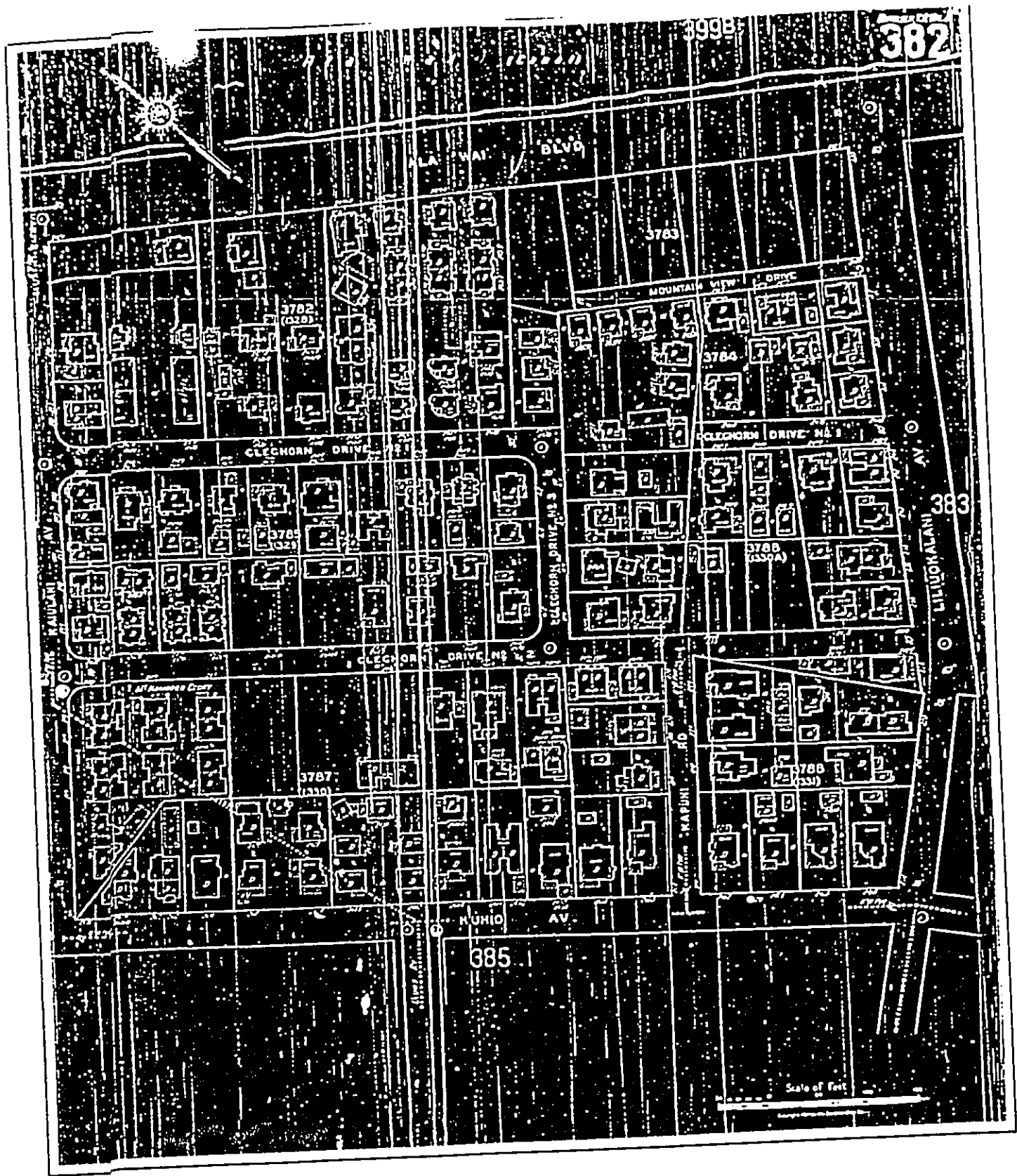


Figure 2 1927 Sanborn Fire Insurance Map

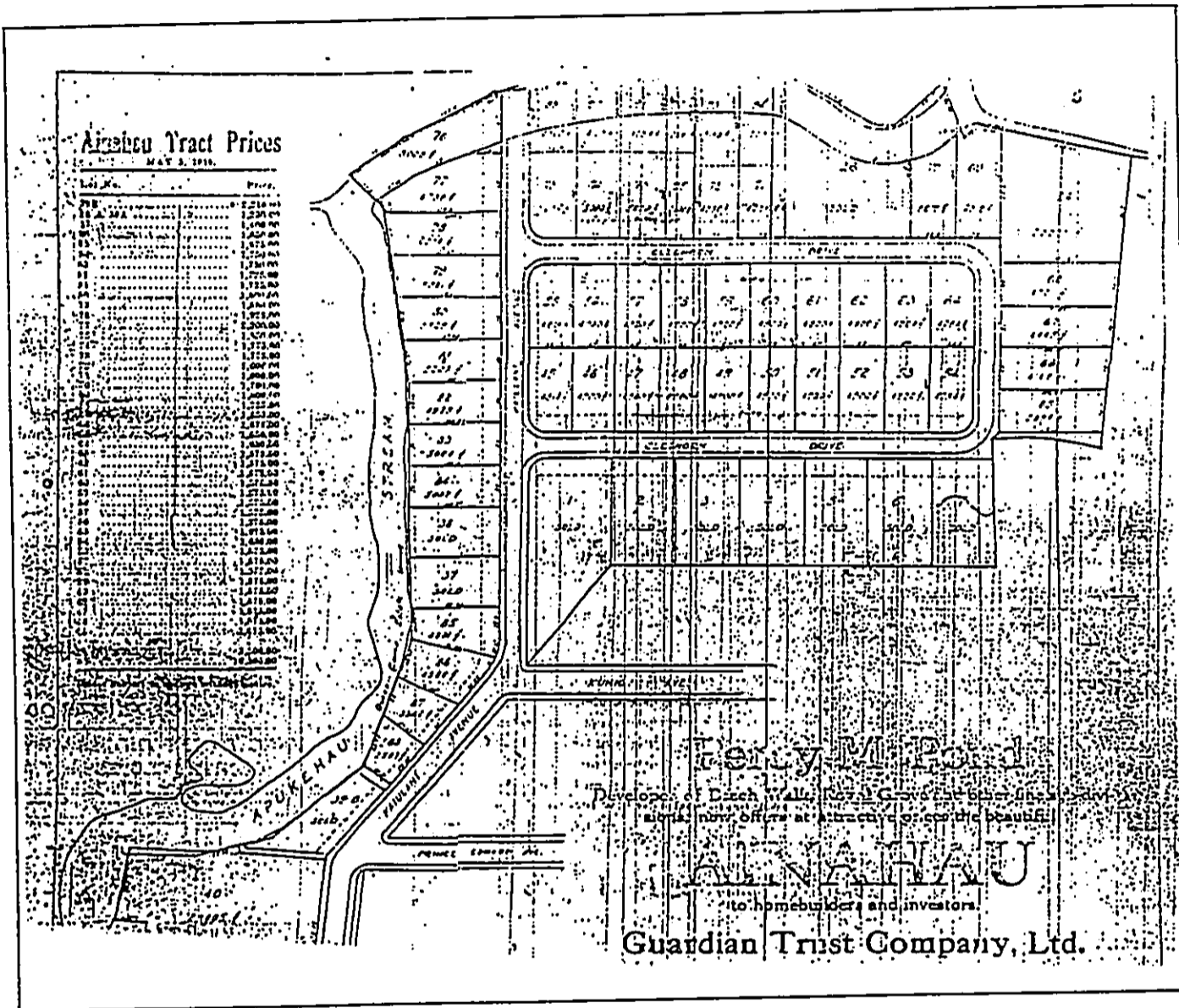


Figure 3 Ainalahu Sub-division Advertisement (May 5, 1919)

The advertisement map also shows the stream - labelled "Apukehau" but more accurately named "Apuakehau" - which defined the northeastern and northwestern borders of Ainahau. Within a decade - with the construction of the Ala Wai Canal - that stream would no longer exist.

After the deaths of his wife and daughter, Archibald Cleghorn had continued to live at the estate until his own death in 1910. An article in the Hawaiian Almanac and Annual for 1914 described Ainahau's fate in the following years before Percy Pond bought it; in his will, Cleghorn had left Ainahau

as a conditional gift for governmental care to public use under certain restrictions as a memorial to his daughter, Princess Kaiulani...Legislative action declining the gift, the property has been assigned to a more commercial public use and is added to the attractive hostelryes of the city. (Thrum, ed. 1913:54)

A U.S. Army Engineers map (Fig. 4) from 1910 establishes Ainahau and the present study parcels in the context of the surrounding terrain as it existed prior to the Ala Wai Canal's construction. The map renders the extensive system of fishponds and wetland fields - described in the Cultural History section of this report - that had been created by the Hawaiians over the centuries in the ahupua'a of Waikiki.

The course of Apuakehau Stream - shown on the 1919 advertisement map as the northeastern and northwestern boundaries of Ainahau - enables placement of the estate on this 1910 map. The large structure at the center is the main residence and the dotted lines leading to it delineate the former driveway (the present Kaiulani Avenue) into the estate from the main Waikiki road (the present Kalakaua Avenue). The map also shows structures in or near the southern corner of the Ainahau estate that corresponds with the five lots (TMK 2-6-24:36-40) of the present study parcels.

The map further establishes that immediately adjacent to the southeastern boundary of Ainahau was an expanse of embanked irrigated fields fed and delineated by a channel branching off Apuakehau Stream. Thus the remaining portions of the present study parcels - which have been shown to lie immediately outside the southeastern boundary of Ainahau - appear, on the evidence of this map, to

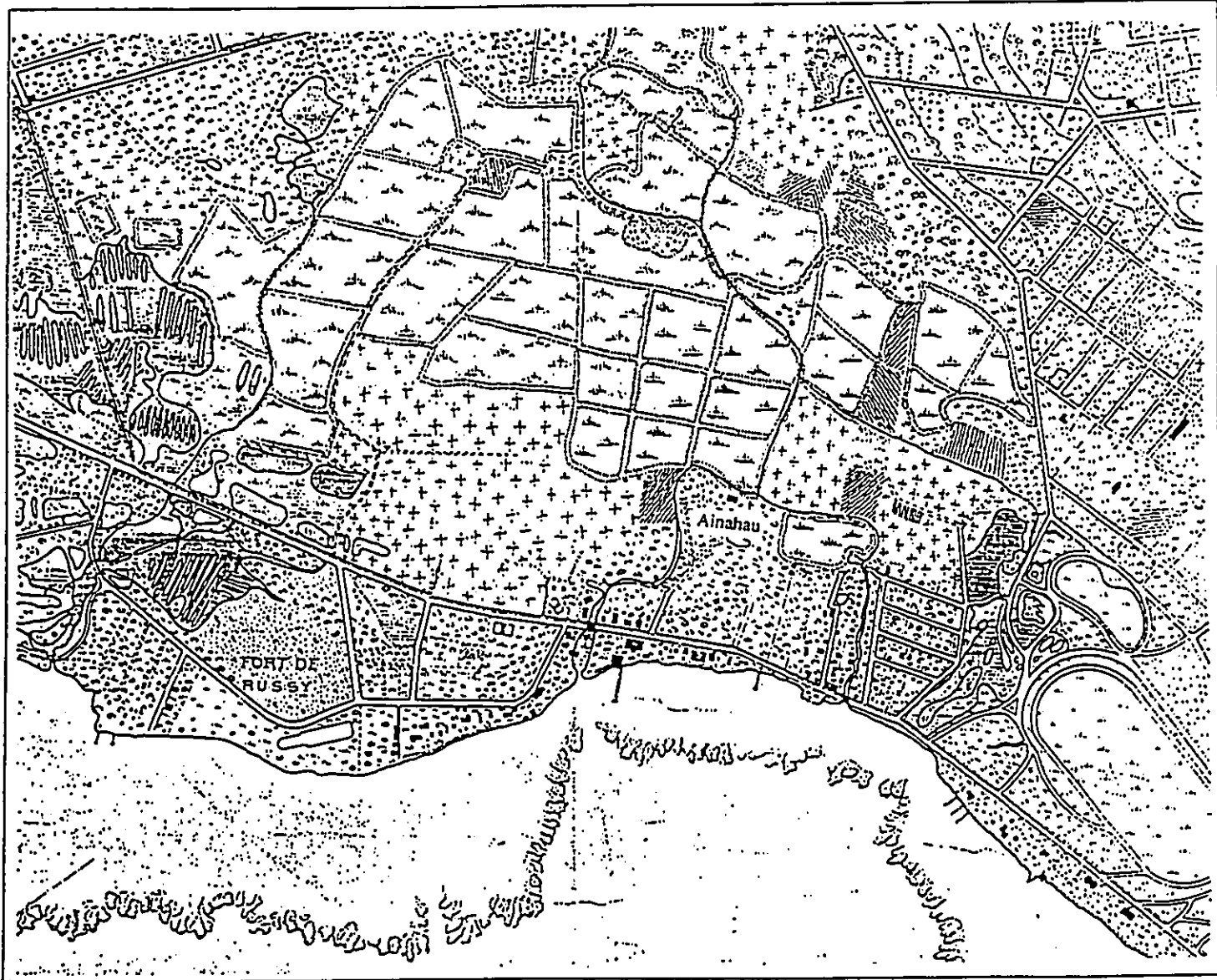


Figure 4 (Portion) U.S. Army Engineers Map of Waikiki (1910)

have once been irrigated fields. A late nineteenth or early twentieth century photograph (Fig. 5) taken from Ainahau shows the full extent of these fields and reveals that they were then planted in rice. Discernible in the photograph is an embankment defining the far border of the fields; conceivably, the border between Ainahau itself and the fields was similarly embanked.

Nineteenth century maps and documents - when correlated with the twentieth century material discussed above - present an even more precise picture of former land-use within the present study parcels.

An 1881 map (Fig. 6) - based on a survey by S.E. Bishop - shows the traditional 'ili (land divisions) of Waikiki, plots the locations of structures then extant, and indicates the individual land awards given at the time of the Great Mahele in the 1850s. The borders of the Ainahau estate - upon which several buildings are indicated (including one on or near the segment comprising a portion of the present study parcels) - and of the irrigated fields adjacent to it are readily described. The map discloses that the mauka half of the Ainahau lands (again including the segment comprising a portion of the present study parcels) - which Archibald Cleghorn purchased for three hundred dollars in 1872 - were in the 'ili of Auaukai and were originally awarded to Kamaukoli in LCA (Land Commission Award) 7597:2. In the Native Register (vol.5, pg.413) records, Anederea Kamaukoli states:

To the Land Commissioners, Greetings to you all: I, the one whose name is below, hereby state my claim for land. Auaukai, an 'ili, was given to me by Kaahumanu I in the year in which Poki sailed to Nanapua and disappeared. That was when I acquired this 'ili and from that time I have occupied this land as konohiki. The tenants are living under me, and going to my work days and are ruled by the laws of this time. My own lo'i in Auaukai, an 'ili in the ahupua'a of Waikiki, are three taro lo'i, one weed grown kula for planting sweet potatoes and gourd.

Kamaukoli discloses his role as konohiki (or overseer) of the 'ili, revealing himself to be a member of the lesser ali'i. The "one weed grown kula" - or dryland agricultural field - Kamaukoli refers to is evidently the land Cleghorn bought in 1872 and transformed into Ainahau.

Below. Diamond Head with the rice fields in foreground. View taken from Aina'hau



Figure 5 Photograph and Caption from Waldron (1967)

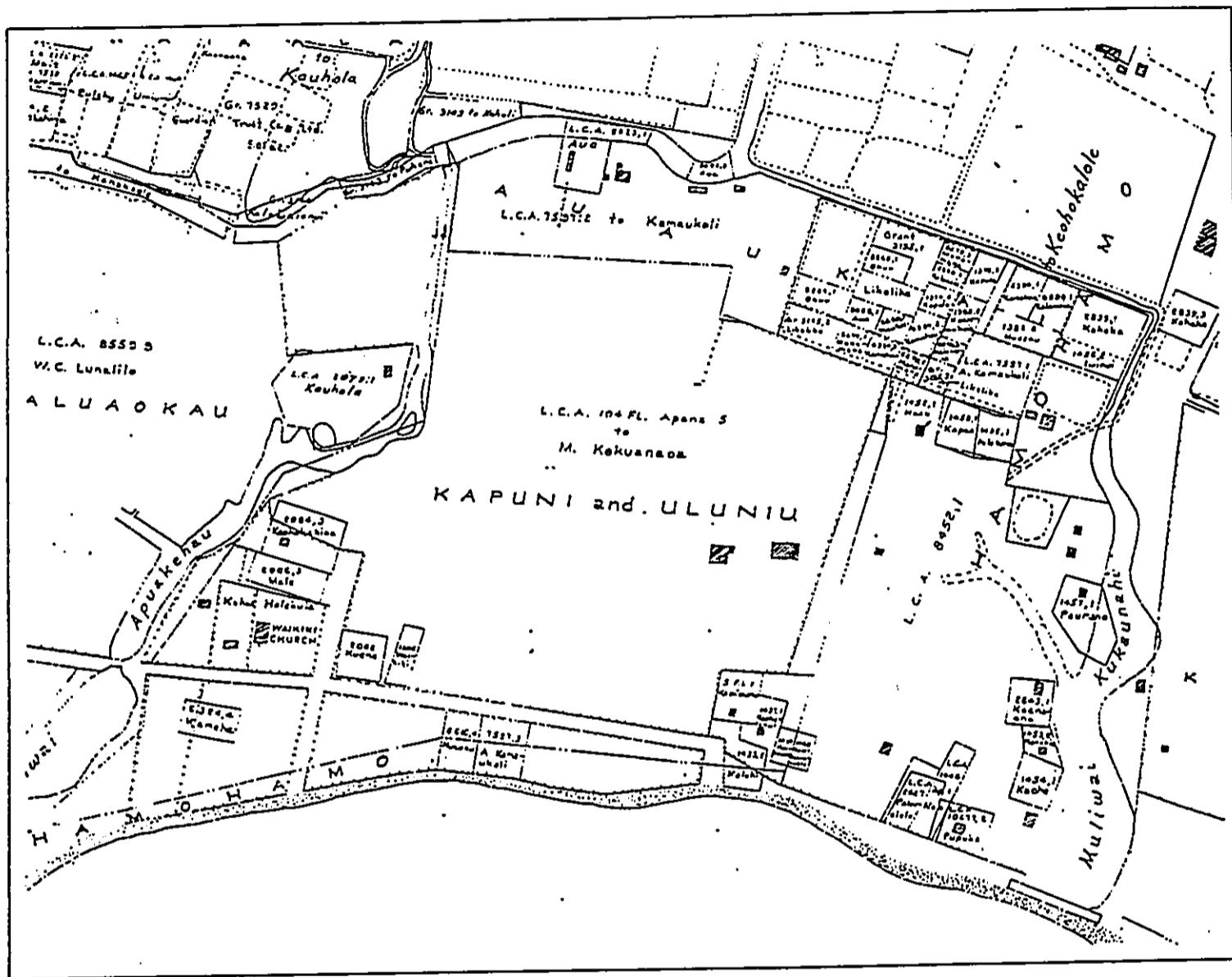



Figure 6 (Portion) 1881 S.E. Bishop Map of Waikiki (re-drawn 1922 & 1985)

Other documentary evidence shows that Kamaukoli's allusion to the "tenants...living under me" refers to those individuals farming and - at the time of the Mahele - claiming the patchwork of irrigated fields immediately outside the southeastern border of the future Ainahau. Foreign Testimony records show the fields to have been taro lo'i and the claimants all testify to having received their lands from Kamaukoli.

The features shown on the 1881 map - once more coordinated with those on maps studied previously - suggest that the portion of the present study parcels that does not include Ainahau was formerly taro lo'i and had been utilized as such for a considerable period. More precisely, the area encompassing LCA 8269,1 to Okuu; LCA 8023,1 to Aua (identified in documents as Kamaukoli's son-in-law); and Grant 3195,1&2 to Likelike correspond to TMK 2-6-24:34,35,42-45,&65-68 on the current tax map. The watercourse just mauka of the taro lo'i - identified in the Mahele documents as the "auwai of Hamohamo" - would thus have run through what are now TMK 2-6-24: 80-83 on the current tax map.

Further confirmation of the land-use patterns detailed thus far is given on a map (RM# 213, Survey Division, [DLNR]) drawn by J.S. Emerson and dated Nov. 6,1877. The map is labelled "Plan of Govt. Kalo Patches situated in Auaukai, Waikiki, Oahu, applied for by Hon. A.S. Cleghom." The map delineates the same taro patches shown in the 1881 map just discussed. The government patches Cleghom was applying for are those identified as Grant 3195 on the 1881 map. Emerson's map records that these patches were then (1877) "Full of Kalo." Emerson also identifies the  symbol on the 1881 as indicating a "rail fence" which bordered the taro patches.

Archibald Cleghom's Ainahau estate and the taro patches adjoining it - portions of both of which comprise the present study parcels - are paradigms of the history of the ahupua'a of Waikiki before the distortions of the twentieth century. Ainahau seems a last effort to re-create the paradisa

environment that once had been simply everyday life to the Hawaiians of Waikiki. The taro patches immediately adjacent represent the engineering and agricultural skills that transformed the ahupua'a of Waikiki, enabling it to sustain a prospering population.

SUMMARY AND RECOMMENDATIONS

Previous archaeological research within the ahupua'a of Waikiki, along with Waikiki's pre-contact history as a densely populated well-utilized environment, suggest that within the present study parcels there is the possibility of the presence of human burials and the possibility or probability of intact prehistoric and early historic occupation layers. Sub-surface testing could yield indications of significant cultural material if modern residential development has not destroyed these earlier cultural deposits.

Cultural Surveys Hawaii's research suggests that a portion of the present study parcels - specifically TMK 2-6-24:36-40 - was formerly a corner of the Ainahau estate, associated with important personages in Hawaiian history. Early maps indicate that there were habitation structures in or near this corner of the estate (though the main houses were located elsewhere). Archaeological testing in this area could uncover significant trash and refuse pits.

Cultural Surveys Hawaii's research further suggests that the remainder of the present study parcels comprise a former 'auwai and taro and rice fields. This portion of the study parcels could yield datable material associated with the development of irrigated agriculture in the ahupua'a of Waikiki.

Basic recommendations for further archaeological testing include: a) subsurface test excavations; and b) a specific sampling strategy to be worked out in coordination with the State Historic Preservation Office of the Department of Land and Natural Resources.

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