FINAL

EWA MARINA COMMUNITY
HONOULIULI, EWA, OAHU, HAWAII
TMK: 9-1-12: PORTION OF 5

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SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

INCREMENT I

EWA MARINA COMMUNITY

HONOULIULI, EWA, OAHU, HAWAII
TMK: 9-1-12: PORTION OF 5

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

INCREMENT I

PURSUANT TO
CHAPTER 343, HAWAII REVISED STATUTES
MARCH, 1984

PREPARED BY

GACI, INC.
926 BETHEL STREET HONOLULU, HAWAII 96813, 533-1725

SECTION 1.0

COVER SHEET

REVISED SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
FOR
INCREMENT I
EWA MARINA COMMUNITY
HONOULIULI, EWA DISTRICT, ISLAND OF OAHU, STATE OF HAWAII
TMK: 9-1-12: Portion of 5

* This Revised Supplemental Environmental Impact Statement (EIS) is prepared pursuant to the requirements of Chapter 343, Hawaii Revised Statutes as a supplement to the generic EIS submitted in February 1981. A copy of the generic EIS is on file at the State of Hawaii Environmental Quality Commission.

* The proposed project referred to as Increment I requires revision of current City and County of Honolulu zoning designations.

Accepting Authority: Department of Land Utilization
City & County of Honolulu

Applicant or Authorized Official:

Walter K. Tagawa
MSM & ASSOCIATES, INC.

Preparation Notice Consultation Period: Nov. 8 - Dec. 8, 1983

Draft Supplemental EIS,
Increment I Review Period: February 8 1984 - March 9, 1984

Applicant Response Period: March 10, 1984 - March 23, 1984

Submittal of Final EIS,
Increment I for Agency
Action: March 30, 1984

Prepared by: GACI, INC.
926 Bethel Street
Honolulu, Hawaii 96813

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EWA MARINA COMMUNITY
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PROJECT DESCRIPTION

(Increment I as related to Overall Project)

Location, Existing Site Conditions. The subject Supplemental Environmental Impact Statement is presented for Increment 1 only.

The total proposed Ewa Marina Community, however, comprises 730.5 acres and is located between Barbers Point Naval Air Station and Ewa Beach Community as shown on Exhibit I, Vicinity Map. Increment I, a portion of the total project as indicated in Exhibit 2 , Aerial View, is situated in the northeast corner and includes approximately 174 acres. (An east-west roadway connection and 2.8 acre proposed park on Campbell Estate property is situated outside of Increment I, but is included as part of Campbell Estate's planning parameters for Ewa properties. This area will be purchased by the development as infrastructural development occurs.)

At roughly the midpoint of the overall project area and southwest of Increment I is Oneula Beach Park (also referred to as Hau Bush Park), a 30 acre public park. To the immediate east and south is the community of Ewa Beach, while Barbers Point Naval Air Station is located to the west. Further east is Iroquois Point, a Naval housing community. To the north is the communty of Ewa Plantation Village (presently a series of villages) which is planned for rehabilitation and new development under the recently amended Ewa Development Plan.

Within the Ewa Plain is also the Campbell Industrial Park and the Barbers Point Deep Draft Harbor currently under construction, both considered major employment generators. Up the coast from the harbor is the proposed West Beach resort and housing community located within the Secondary Urban Center. Further away but still within easy drving distance of this project are the Pearl Harbor Naval Shipyard, Hickam Air Force Base, and the Honolulu International Airport, all considered major destination points as well as employment centers.

The entire project, including Increment I, area is basically flat. However, the overall topography of the Ewa Plain is such that the property rises from sea level to an elevation of 20± feet at the northern boundary of the project area. The geology is basically a coral-shelf with a thin soil cover which creates a substantial base for the type of proposed development. Exhibit 3 illustrates the existing topography.

Increment I is located in an area of light rainfall (20" per year) with temperature ranging from 72 to 80 degrees. The prevailing tradewinds blow across the area 85% of the time averaging 8 to 18 miles per hour. It is noted that the overall project is a part of the southern coast of Oahu which provides the best boating

condition in that it is sheltered and enjoys a very mild climate. Also, the adjacent off-shore areas are considered preferable for fishing, seaweed (limu) picking and surfing.

Presently, much of Increment I is under sugar cane cultivation. While the soils are not the best and the distance to the factory is considerable by comparison, the overall cultivation costs of this area are such that these are among the Oahu Sugar Company's most economical fields to cultivate. These fields have the lowest cost for pumping of irrigation water, the largest single variable in the Company's operations.

According to the Estate of James Campbell, however, the Oahu Sugar Company's original review of its cultivated lands was undertaken to identify which lands should be retained in sugar production, Oahu Sugar Plantation had indicated phasing out of sugar production for the area within Increment I. Subsequently, Oahu Sugar Company decided to continue cultivation in this area until such time as the property was actually needed for development. The lease between Campbell Estate and Oahu Sugar Company provides that Campbell Estate can withdraw up to 4,000 acres classified as cane or contributory from the lease as needed for development projects. The 4,000 acre figure represents Oahu Sugar Company's determination of the total acreage which could be withdrawn from cultivation without affecting the economic viability of its operation.

In accordance with the terms of the lease between Campbell Estate and Oahu Sugar Company, Oahu Sugar Company is kept current as to areas planned for future development which will eventually necessitate withdrawal from the Oahu Sugar lease. Oahu Sugar Company's continued sugar cane cultivation within the project area until such time as the affected properties are actually needed for development should mitigate the short-term loss of income from that property. Therefore, although this land will be eventually withdrawn from the Oahu Sugar Company lease, it will be under cultivation until development occurs.

Oahu Sugar Company has 14,000 acres under lease from Campbell Estate, of which 8,900 are presently under cultivation. Withdrawal from sugar cultivation of the 174.491 acres covered by the subject draft Supplemental EIS should not have any affect on employment by Oahu Sugar Company.

A copy of Campbell Estate's March 12, 1984 letter is attached in response to comments from the Oahu Sugar Company's March 8, 1984 letter in Appendix N.

The remainder of the overall project area is overgrown with strand vegetation and kiawe trees and portions of the area, particularly along Papipi Road and the area around Oneula Beach Park have been used as a dumping ground for abandoned vehicles and

trash. Within the total project area there is a chicken farm and few small residences on a month to month rental agreement, all of which are outside of Increment I.

Overall Project Objectives. The principal objective of the entire Ewa Marina project is to provide a comprehensively planned, integrated, water-oriented residential community to serve the housing needs of a wide variety of income groups. Increment I is the first portion of the total development. Located next to the ocean, the overall project affords a panoramic view of downtown Honolulu as well as Diamond Head. The residential community of Hawaii Kai located next to the ocean with its meandering waterways and marinas would be a comparable development.

Another important objective of the overall project is to provide much needed boating facilities which are currently in limited supply and projected to be in greater demand. The extensive waterways will also provide for a variety of water-oriented recreational activities for those in the nearby community as well as the entire region.

Still another objective is to achieve a development utilizing the cluster/planned development approach to housing for the most part rather than the conventional lot-by-lot approach. This concept,

as proposed for Increment I, would permit mixed housing types surrounded by a continuous greenbelt system, thereby creating a functional and attractive development.

Coordination of this development with other developments in the Ewa Plain is a key element. Provisions for off-site infrastructure to service this and other developments will be done in concort with governmental agencies, developers of the Ewa Plains, the Estate of James Campbell.

Finally, this community will be developed in such a way to reflect and enhance the unique "Hawaiian lifestyle" and to encourage the preservation and enhancement of the distinctive physical characteristics of the site, particularly the ocean.

Overall Project Description. Ewa Marina (Increment I & II) is envisioned as a self-contained community with a total of 4,850 dwelling units with appropriate commercial and public facilities to serve the daily needs of the residents. Regional facilities such as a shopping center are not planned with the exception of the marina and related facilities which are in Increment II.

Although some of the following amenities are outside the scope of Increment 1, project amenities to be provided in the total development includes:

1. Approximately 4.85 miles of frontage along interior waterways.

2. Approximately 98 acres of recreational waters within the development.

3. Park areas to include a 20 acre regional park to be dedicated to the City which are in addition to Oneula Beach Park which is within the project site.

4. Provision of a greenbelt system throughout the entire community for pedestrian and cycling uses, and grade separation.

5. Approximately 1,500 boat slips of which about 1000 will be available to the general public in the vicinity of the marina complex.

The illustrative Master Plan for overall project and Aerial Perspective are shown as Exhibits 4 and 5, respectively. The site plan specifically for Increment I is shown as Exhibit 6.

Community Support for Project. There has been and continues to be strong community support for this project. The Ewa Beach Community Association, Ewa Beach Advisory Committee, Ewa Neighborhood Board No. 23, Pearl City Neighborhood Board No. 21, and Oahu Sugar Company have officially endorsed this project. Many of these organizations have consistently testified in favor of this project before the City Planning Commission and City Council at public hearings relating to the adoption of the Ewa Development Plan in 1981, General Plan revision hearings in 1982, and during the annual review of the Ewa Development Plan in 1983.

A review of public testimonies presented at these hearings have provided the following reasons for support:

1. The project will help upgrade the entire area by providing an attractive community which will provide commercial, recreational, and entertainment facilities.

2. Provide housing opportunities by offering a variety of choice in terms of housing types and price range.

3. Provide employment opportunities.

4. Improve public services such as police, ambulance, infrastructure, etc. resulting from increasede population base of the area. In this regard, there is a general feeling in the Ewa Beach Community that they are being neglected by governmental agencies due to their isolated location and not being in the mainstream of urban growth.

5. Project site having marginal soils for aqricultural pursuits.

6. Compliment the expansion of Campbell Industrial Park and development of the Barber's Point Deep Draft Harbor by providing needed housing nearby thus saving energy and diverting traffic in an opposite direction on Farrington Highway and the H-1 Freeway during peak hours.

Phasing Plan

The Ewa Marina Community overall project, as shown at Exhibit 6, consist of two increments.

Increment I (Subject Area)	174.491 acres
Increment II	556.0 acres

The subject Supplemental Environmental Impact Statemen (EIS) is for Increment I only. A subsequent Supplemental EIS for Increment II will follow. In the context of the overall project, however, the phasing of Increments I and II is presented.

The development of the overall project (both Increment I and II) will follow a critical schedule dictated by the orderly progression of required planning and permit processes. In such a development, many of the required tasks must be accomplished simultaneously to facilitate maximum utilization of time and effort.

The overall project's critical schedule is shown as Schedule 1.

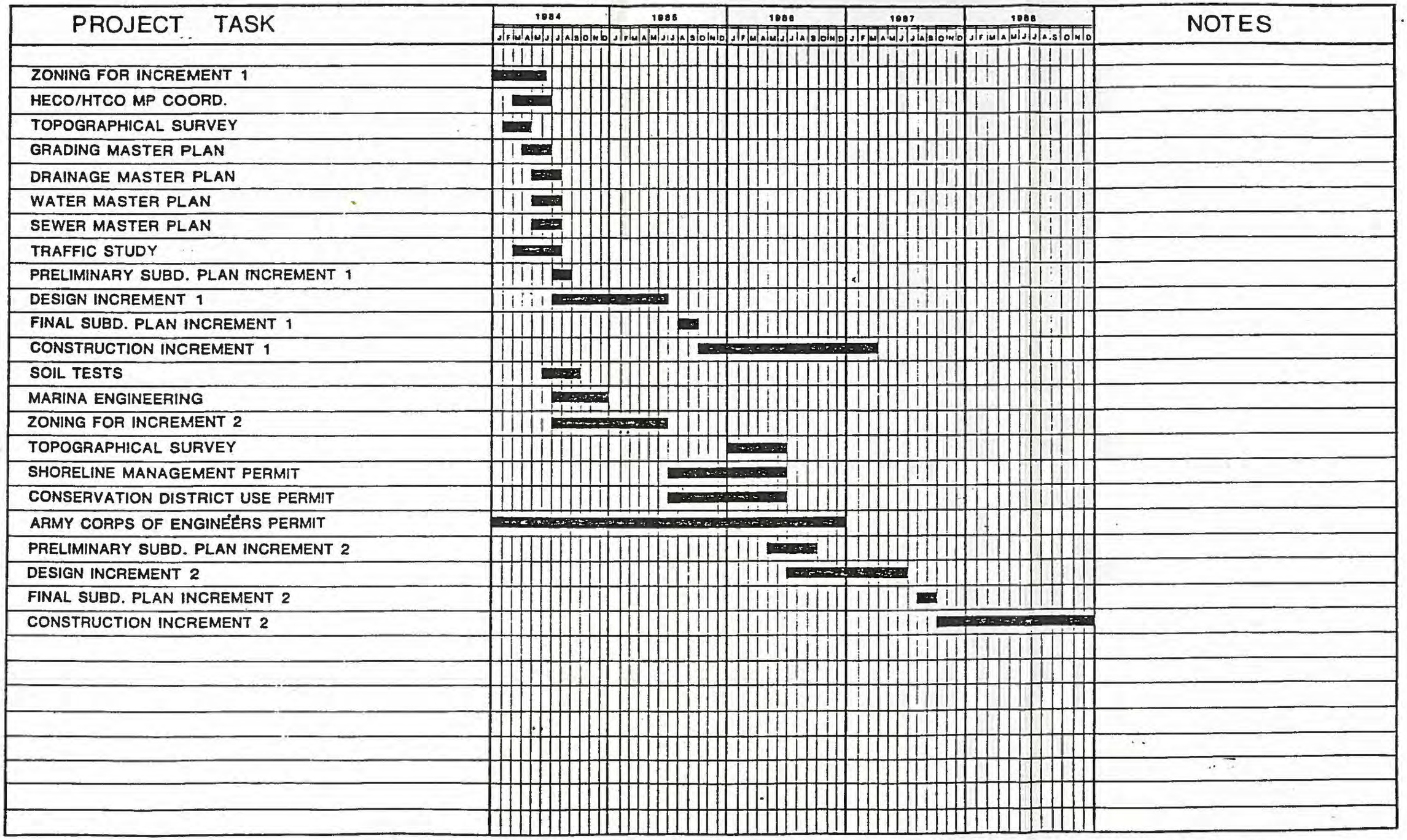
SCHEDULE 1

PROJECT SCHEDULE

INCREMENTS I & II

EWA MARINA 1984 - 1988

Date: 1/15/1984



PROJECT SCHEDULE INCREMENTS I & II

SCHEDULE 1

Permit Schedule. Permits and other requirements for each increment are listed as follows:

PROCESSING REQUIREMENTS (INCREMENTS I & II)

	INCREMENT I (174.491 acres)	INCREMENT II (556.0 acres)
* Land Use	NA-land is designated urban use (State of HI)	Applicable Request for portion of area (181 acres) for boundary adjustment from agr. to urban (pending).
* Rezoning	Applicable-Approval of Sup. EIS, Inc. I required	Applicable-Approval of Sup. EIS, Inc. II required.
* Public Facilities Map Amendment	Applicable	Applicable
* Subdivision Approval	Applicable	Applicable
* Shoreline Management Area Permit	-NA-	Applicable
* Conservation District Use Permit	-NA-	Applicable
* Army Corps of Engineers Permit	-NA-	Applicable
* Infrastructure Permits	Applicable	Applicable
* Building Permits (once all other permits are secured).	Applicable	Applicable

Subdivision and Housing Development Schedule. Pursuant to the approval of the Supplemental EIS and rezoning application, subdivision map(s) for Increment I will be filed to parcelize subject area and provision for infrastructure for servicing subdivided parcels. The subdivision will be as shown at Exhibit 9, Land Use Summary Map comprising 12 parcels, including proposed park site. Subsequently these parcels will be disposed to sub-developers/builders who in turn will subdivide respective parcels for residential and commercial developments.

Parcels will be marketed as subdivision tract map approval(s) are obtained. To a large extent, the timing for construction will be contingent upon prevailing market conditions. However due to their central location and proximity to Fort Weaver Road, parcels A, C, and F, as shown at Exhibit 9, will most likely be the first parcels to be developed.

Schedule 2 represents the projection for absorption of dwelling units to be developed on subject property. It should be noted that commencing with development year 3, there will be some overlap with units to be developed in the subsequent phase of the total project development.

In summary, development phasing for Increment I can be viewed as the first of a four phase program for the total development of the Ewa Marina Community Project. As noted above, the build-out period for Increment I will be about 2 years. As part of the re-zoning application and Supplemental EIS for Increment II on the remaining 556 acres, a more comprehensive phasing plan will be submitted to address such items as the development of the marina.

SCHEDULE 2

HOUSING DEVELOPMENT SCHEDULE

Date 1/15/84

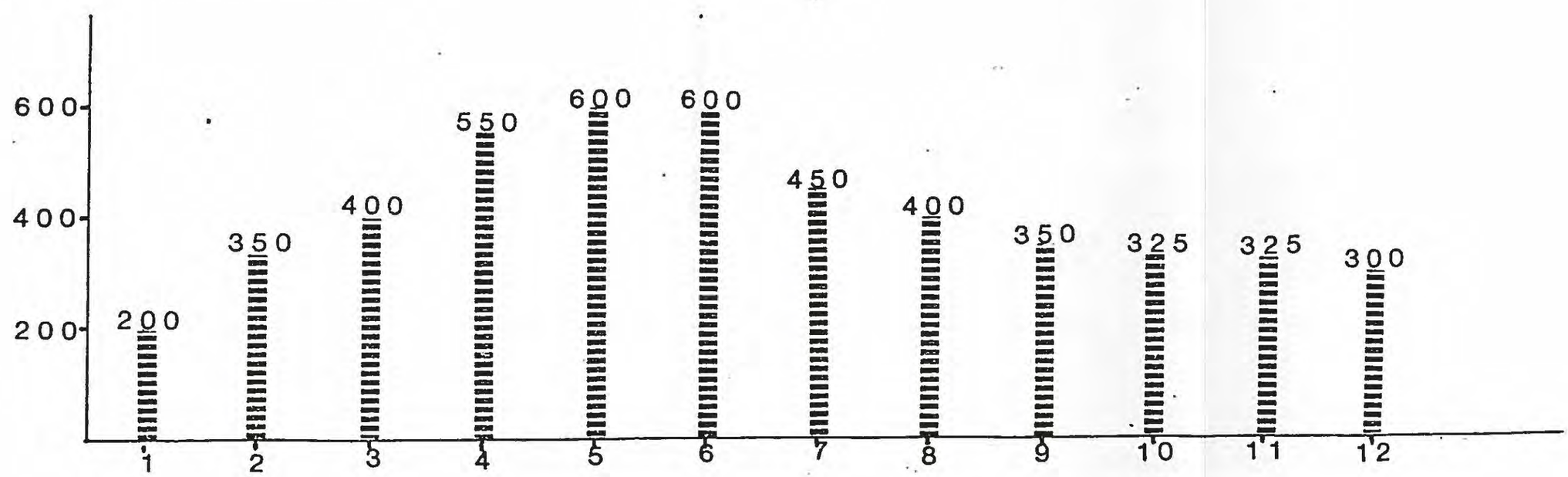
HOUSING DEVELOPMENT SCHEDULE

PROJECTED RESIDENTIAL ABSORPTION BY NUMBER OF UNITS ON INDIVIDUAL PARCELS

Development Year	Units Absorbed	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	200	50		118			32																				
2	350	50				51	90	43	66*	50**																	
3	400		50		129			11	64*	50	36*										60						
4	550		134							16	100*					92	108	100									
5	600										100*		95	75	85		45	100	100								
6	600										100*		90					150	62	23		71	54				50
7	450											25						150		150			70				55
8	400											100						150		59				41			50
9	350											100						40						65		110	35
10	325											100												15	60	150	
11	325											75													100	150	
12	300											40													118	142	
Total	4,850	100	184	118	129	51	122	54	130*	116**	336	440	185	75	85	92	153	690	162	232	60	71	124	121	278	552	190

Denotes affordable units.

Of the total, 19 units are affordable.



projected absorption by number of units by year

SCHEDULE 2

Zoning Plan. Ordinance No. 83-26 approved on June 6, 1983 (Ewa Development Plan Amendments) has designated various urban uses for the entire 730.5 acre project area. Exhibit 7, Development Plan Land Use Map, references these uses. The subject property or Increment I's 174.491 acres constitutes the initial increment with the remaining 556 acres constituting the second increment. Through mutual agreement with City Department of Land Utilization, Increment I is presently under consideration for rezoning contingent on the approval of the supplemental EIS for the subject property.

The 174.491 acres involved in Increment I and referred to as the subject property are designated "Urban" by the State Land Use Commission. At the County level, the subject property with the exception of a five acre parcel zoned R-6, residential, adjoining Fort Weaver Road and next to the neighborhood shopping center is presently zoned Ag-1. Rezoning for the second increment will follow based on the submission of boundary adjustment application with the State Land Use Commission.

The proposed zoning plan for Increment I shown on Exhibit 8, Proposed Zoning Plan, implements the specific land use designations as per the recently amended Ewa Development Plan. The following Table provides the acreages for the various proposed zoning districts:

Acreages By Zoning Districts (Increment I)

Zoning District	Acreages	
R-6, Residential	143.0	acres
A-1, Low Density Apartment . . .	11.2	acres
B-2, Community Business.	5.0	acres
P-1, Preservation District . . .	5.7	acres
Roadways	9.8	acres
TOTAL	174.7	acres*

* The discrepancy of .209 acre between metes and bounds area of 174.491 acres and the 174.7 acres above is due to above calculations being done prior to completion of survey work.

The Table below shows a further breakdown of those areas requested for residential housing development showing the density proposed by parcels. Exhibit 9, Land Use Summary Map, indicates the location of parcels involved.

R-6 Residential District, Density Analysis

Parcel	Acres	# Units	Unit/Acre
A	10.0	100	10
B	18.4	184	10
C	23.6	129	5
D	25.9	129	5
E	10.2	51	5
F	24.5	122	5
G	10.9	54	5
H	11.2	130	8
I	8.3	66	8
TOTAL	143.0	954	6.78

The foregoing table illustrates that the densities proposed for the R-6 residential development of Increment I are well within the limits imposed by the Development Plan. For residential development, the Development Plan permits density to a maximum of 12 units per net acre while the highest density parcels contains 10 units per net acre and the overall average is 6.78 units per net acre. For the low-density apartment area, the proposed plan comtemplates a development to the maximum density permitted by the Development Plan of 30 units per net acre totalling 336 units.

For Increment I, a total of 1,290 dwelling units are planned units will be developed using the cluster concept.

In addition to the R-6 and A-1 zoning categories, a P-1, Preservation District, for the 5.7 acre park site adjoining Fort Weaver Road and a B-2, Community Business District, for the 5 acre parcel along Fort Weaver Road and mauka of the existing Ewa Beach Community shopping complex currently zoned B-2 are proposed.

Alternatives. As pertinent to Increment I, the following items were considered as alternatives during the planning process of the subject project.

* Overall Plan	Originally, the Master Plan considered a "lake" concept to assist in drainage retention. This 6 acre lake was eliminated because of additional costs, maintenance, circulation and flushing problems associated with possible stagnation.
* Drainage	A plan to connect drainage to Fort Weaver and Papipi Roads was omitted after an analysis of the total existing Ewa Beach area. It was determined that the existing area could not handle the storm drainage capacity of the new project. In addition, several plans were eliminated which required either enlarging existing Ewa Beach drains directly into the ocean or creating new drainage channels to flow directly into the ocean. These were eliminated because of additional cost and time needed to provide an additional Environmental Impact Statement and State and Federal permits.

Sewage Disposal	Plan to discharge 100% of the projects sewage into Point A (see Exhibit 16) was eliminated in favor of Point B because of increased cost to use Point A. Alternative to connect subject project sewage directly to the new treatment plant involving "right of ways" and pump stations was also eliminated due to costs.
Water Commitment	The use of non-potable water in the residential, single-family units was eliminated because of State Health Department concerns. The use of all potable water system was also eliminated to conserve potable water.
Recreation	Several park locations were considered under the project, but through negotiations with the Department of Parks and Recreation, the present Northeast location was found to be accessible by the existing community and met regional requirements.
Traffic & Circulation	In consideration of alternatives, the the major parkway was realigned to allow for a logical entry into the project and a centralized location for all uses.
Housing	Included in the housing schemes are low-moderate housing.

Unresolved Issues. Pursuant to Increment I development, the following issues will require resolution:

Water	Efforts are on-going by Campbell Estate to finalize a master plan for a dual water system referenced in Section 5.10. Key issue is timing, as to when water can be delivered and a schedule for locating storage and transmission lines.

Although this Supplemental Environmental Impact Statement is for Increment I only, questions related to Increment II will be addressed in a separate Supplemental EIS which will follow Increment II issues are:

* Archaeology (sites within Increment II)
* Marina development (flushing and dredging)
* Caprock and groundwater
* Shoreline impacts
* Offshore marine impacts
* Tsunami protection
* Wetland area treatment
* Barbers Point AICUZ
* Grading/Drainage and other Increment II infrastructural requirements.

SECTION 5.0

OVERVIEW AND SUPPLEMENTAL EIS STUDIES FOR INCREMENT I

OVERVIEW

The subject Supplemental Environmental Impact Statement (EIS) is for Increment I only. Although information on systems and master plans for the overall project is presented, the intent of the Supplemental EIS, Increment I is to view the subject 174.491 acres as an self standing, functional project. Issues pertinent to Increment II such as the marina and channel will be submitted as a separate document.

On February 20, 1981, the Department of Land Utilization, City and County of Honolulu, approved the Final Environmental Impact Statement for the total Ewa Marina Community Project (79/SMA-139 L.C.) involving 1,100 acres as a programmatic document subject to filing supplemental EIS statements. Pursuant to clarification of the approving agency for the acceptance of the above document, a meeting with the Department of Land Utilization (City & County of Honolulu), Environmental Quality Commission (State of Hawaii) and applicant was held on December 19, 1983. During this meeting the following references from the Environmental Impact Statement Regulations, Environmental Quality Commission, State of Hawaii, effective dated June 2, 1975 were presented to verify the Department of Land Utilization as the approving agency:

Page 6, 1:24 IDENTIFICATION OF APPROVING AGENCY. The authority for requiring Statements and for accepting any required Statements that have been prepared shall rest with the agency initially receiving the request for an approval, after the effective date of these Rules and Regulations. In the event that an applicant simultaneously requests approval from two or more agencies and these agencies are unable to agree as to which agency has the responsibility for complying with Section 4(c) of Chapter 343, Hawaii Revised Statutes, the Environmental Quality Commission after consultation with the agencies involved, shall determine which agency is responsible.

In making such determination, the Commission should take into consideration the following factors among others:

a. the agency with the greatest responsibility for supervising or approving the action as a whole;

b. the agency that can most adequately fulfill the requirements of Chapter 343, Hawaii Revised Statutes and these Regulations;

c. the agency that has special exertise or access to information;

d. the extent of participation of each agency in the action.

Page 24, 2:11 The accepting authority shall be responsible for determining whether a Supplemental Statement is required.

Pursuant to the above, the Department of Land Utilization requested on October 17, 1983 that a supplemental EIS for Increment I be submitted as part of the requirement for rezoning of subject area. Appendix A is a copy of DLU's October 17, 1983 letter. The following draft EIS Supplement Statement for Increment I's 174 acres of the overall project is presented to specifically address these additional issues for development, as identified by DLU on October 17, 1983:

- Drainage/Soils/Grading
- Archaeological/Historical
- Flora/Fauna
- Sewage Disposal/Groundwater Impacts
- Solid Waste Disposal
- Review of Recreational Resources
  a. Impact on Existing Resources
  b. Recreational Facilities to be Created
- Visual
- Traffic/Noise/Air Quality/Circulation
- Housing - Unit Count/Type
- Water Commitment
- Impact to Public Services/Utilities

As part of the supplemental EIS Increment I review process, a copy of the Preparation Notice is exhibited in Appendix B.

SECTION 5.0

SUPPLEMENTAL EIS STUDIES FOR INCREMENT I

5.1 Drainage Soils/Grading

DRAINAGE

Present Conditions

As stated in the generic Environmental Impact Statement for the Ewa Marina Community dated February 1981, the overall project area, including Increment I, is located within the 11.5 square mile water shed of the Kaloi Gulch Flood Plain. Average rainfall in this area is 20 inches, hence the Ewa coastal plain area is quite arid. Accordingly, there is very little evidence of any significant storm water runoff through the project area. Presently, most of the storm water and related sedimentation is absorbed in the agricultural area mauka of the overall project area.

Because of this absorptive capacity of the limestone caprock aquifer, well defined natural surface drainage patterns within the overall project, area are not apparent. The closest natural drainage for the overall project, including Increment I, is the Kaloi Gulch near Honouliuli. Kaloi Gulch, according to the 1972 "Evaluation of Streamflow-Data Program in Hawaii," U.S. Department of Interior, Geological Survey, Water Resources Division has an

estimated mean flow of 0.61 cfs. Flows usually occur after heavy rains during winter storms. At present, most of the runoff from higher elevations do not reach the sea since absorption occurs in the cane fields behind the overall project. Similarly, runoff sediment loads are deposited as the flow percolates into the soils. Annual sediment discharge into the overall project area has not been measured, but it is estimated at approximately 13,000 tons.

Offsite Drainage Improvements and Storm Runoff

According to the Preliminary Hydrologic Report for Kaloi Stream Improvement by William Hee & Associates, Inc., March 1981, a 100-year, six-hour duration storm will ultimately produce overland flow to the Ewa Marina Community Project site of approximately 13,700 cubic feet per second (cfs) at the northern boundaries of the overall project. This report, which has been approved by the Department of Public Works, City and County of Honolulu, establishes the hydrologic criteria and the surface storm runoff quantities to be utilized in the design of major storm drainage facilities, including the Kaloi Stream improvements and drainage facilities within the Ewa Marina project. A copy of this report is included in Appendix C, including the 4/1/81 letter from the Department of Public Works approving the document.

As stated earlier and reported in the Ewa Marina Community Master Plan Report, June 1979, most of the storm water runoff from the Honouliuli Plain is absorbed by the porous substratum. There is very little evidence of storm water runoff of any measurable amount reaching the sea via Kaloi Gulch. However, as development of the area progresses throughout the plain, this phenomena will change where less absorption will occur, and there will be a need to accommodate the expected storm water runoff and to convey it to the sea. City and County standards require consideration of the peak storm (100 year storm) for the design of major storm drainage facilities.

The anticipated peak storm runoff was calculated using both the City and County Drainage Standard Criteria, and the Soils Conservation Services Unit Hydrograph Method. The respective Total Discharge Quantities expected at the northern boundary of the Ewa Marina project are:

1. 13,500 cfs (City & County peak storm) and

2. 13,700 cfs (Soils Conservation Services 100-year storm)

To accommodate the estimated 100-year, six-hour storm, a 10 acre sediment basin will be constructed at the entrance of the Kaloi

Stream improvement, north of the overall project and the Ewa Plantation Development. This basin will accumulate sediment generated by the agricultural field above. In addition, just below the Ewa Plantation Development and north of the Ewa Marina Community Development, a retention/sedimentation basin system will be developed.

The retention basin will have a total size of about 125 acres and is expected to be capable of dampening flood waters without exceeding the recommended maximum allowable water surface elevation of 20 feet (based on mean sea level). With this retention basin, the discharge to the north boundary of the Ewa Marina Community Development may be reduced from 13,700 cfs to about 10,000 cfs. A permanent periodic maintenance program will be established, to be monitored and administered by the developer.

Flow rates and sedimentation would be reduced by the creation of a retention basin system large enough to retain protions of the flow and to also be used as a settling basin to remove sediment before reaching navigable waters. Recreational uses for this area, such as a golf course complex with substantial areas of grass cover, would have desirable infiltration capacity. Grassed recreational fields will be utilized for the temporary detention of the storm water runoff without adversely affecting its primary function.

Such a recreational area would be designed to handle the smaller runoff rate such as a 10-year storm. Should a storm of greater magnitude occur (say the peak storm), the surface area of the drainage travelway through the retention basin would be wide enough to accommodate the added runoff without flooding developed areas. The downstream end of the basin will be equipped with a weir to control the outlet drainage (which could also control the height of the water surface in the retention basin).

Because the tributary area stretches up to the upper ridges of the mountain range several miles from the area of the proposed retention basin, the upper limits of the tributary may experience rain storms while the lower area none. This may result in unexpected "flash" flooding. Since the basin may also be used for recreational purposes, high grounds (safety areas) readily accessible in case of such emergencies would be established. These high ground areas will be built up over the anticipated high water elevation of the drainage way.

Based on the total runoff quantity, the Kaloi Stream improvement will consist of a composite channel section comprising of a concrete channel to accommodate storms up to and including a 25-year storm and with the remaining unlined channel composition able to accommodate a 100-year storm.

Ewa Marina On-Site Drainage System

The Preliminary Hydrologic Report for Kaloi Stream Improvement by William Hee & Associates, March 1981, states that the 100-year storm runoff from the Kaloi Stream water shed could be as much as 13,700 cfs at the mauka boundary of the Ewa Marina Project. The report states further that with a 125-acre retention basin, the discharge into the project site could be reduced to about 10,000 cfs.

To accommodate these large off-site flows, the Ewa Marina project will build a marina to adequately convey the storm runoff to the sea. The marina will be designed to prevent any adverse water level rise in the marina. Preliminary minimum marina widths which have been calculated and included in the approved Preliminary Hydrologic Report for kaloi Stream Improvement are in the order of 300 feet within the marina and 400 feet at its mouth on the sea coast.

Within the project site, a drainage system will be implemented to handle the on-site storm runoff flows. A preliminary Drainage Master Plan is shown on Exhibit 10. As indicated on the master plan, the drainage system will consist of a network of storm culverts and open channels to direct the storm water to the marina

for discharge ultimately into the sea. Greenbelt water ways and landscaped areas will be utilized where possible to absorb flows and reduce sedimentation through percolation.

In selected areas, a typical catch basin, as shown in Exhibits 11 and 12, will be provided. Detailed plans of these basins will be determined at a later time.

The storm drainage system in public roads and easements to be dedicated to the City will be designed in accordance with City and County design standards.

Increment I Drainage System.

The development of Increment I will precede the construction of the marina which will be included in Increment II, and may possibly precede the implementation of the 125-acre retention basin above the Ewa Marina project boundary by others. Consequently, temporary drainage facilities will be constructed to accommodate this interim condition. Exhibit 10A shows the Increment I Drainage Master Plan which consists of permanent drainage facilities within Increment I and temporary diversion channels and sedementation basin to collect and convey storm runoff to the existing Kaloi Gulch Drainage channel.

As mentioned previously, there is evidence that a major portion of the storm water is presently absorbed by the permeable soil in the area, due to the extensive agricultural use. The entire tributary above the overall project site (which takes up more than two-thirds of the total tributary area) will remain agricultural and/or conservation for many years before ultimate urbanization of those areas occur. The majority of the storm water will continue to percolate into the substratum due to the nature of the soil and its land use. Therefore, during the development of Increment I prior to the construction of the Marina in Increment II, the same storm conditions that exist today are anticipated mauka of the project site.

Four alternative drainage system discharge/disposal schemes were considered for Increment I.

1. Discharge the storm water into the existing City storm drain system located in Papipi Road. This alternative was not considered viable because the existing drain system cannot accomodate the total storm runoff from Increment I. Expanding the existing system by replacing lines or installing parallel lines would be too costly and disruptive to the existing Ewa Beach community.

2. Discharge the storm water into the sea by constructing a new outlet on the sea coast just west of the existing Ewa Beach community. This alternative was not selected because the new outlet would create a change that could be expected to have an adverse impact on the marine environment near the outlet, and because this scheme would not be consistent with the ultimate drainage system for this project.

3. Discharge the storm water into the adjacent agricultural fields just west of Increment 1. This alternative assumes that the storm runoff would be absorbed by the existing permeable ground. However, while this may be true for most rainfall, it is doubtful that the ground could absorb the runoff from severe storms. Since damages to existing property would result if the storm runoff is not absorbed by the ground, this alternative was not chose.

4. Convey the storm water to the existing Kaloi Gulch drainage channel. This alternative was selected because it posed the lease negative impacts to the matine environment and surrounding community. A sedimentation basin will be provided to minimize sediment discharge into the ocean.

As shown on the Increment 1 Drainage Master Plan (Exhibit 10A), an unlined diversion channel will be constructed along the mauka boundary of the project to intercept and direct storm runoff to the existing Kaloi Gulch drainage channel. This channel will be designed to accommodate the peak storm with low flow velocities and will be maintained with vegetation to minimize erosion.

Within Increment 1, the permanent drainage system will be installed to collect the storm runoff water and discharge it into temporary unlined channels outside Increment 1 leading to a sedimentation basin. Overflow from this basin will then discharge into the existing Kaloi Gulch drainage channel and ultimately out to the sea. The sedimentation basin will be approximately 300 feet wide by 1,500 feet long with a maximum depth of about seven feet. Portions of the drainage channels and the sedimentation basin will be constructed within the limits of the proposed marina to minimize the disruption and impact of future development beyond Increment 1. The drainage channels and sedimentation basin will be maintained by the developer. As required, excess silt will be disposed of within the project, if the material is suitable, or will otherwise be hauled to approved solid waste disposal sites.

As per impacts to surrounding existing urban areas, approximately sixteen(16) acres of Increment I currently drain to the adjacent school site near the proposed development. The actual volume of storm flow is significantly affected by the land slope (.003) and the amount of vegetative cover. With the constuction of Increment I, approximately 50% of the area may be covered by non-pervious improvements, thereby possibly affecting the school site. An intercepting ditch between the school and Increment I's development, however, would deter any off-site storm flows from entering the school grounds as presently occurring. New drainage improvements near Fort Weaver Road flowing to the same intercepting ditch will also reduce storm waters flowing along to Papipi Road and flooding at the school front. Such improvements would eliminate potential flooding at the school.

Soils & Grading

The overall Ewa Marina project is situated on the southern edge of the Ewa Coastal Plain which is composed chiefly of marine sediments deposited on top of the Koolau lavas during the mid-Pleistocene high sea level stands. These sediments are porous reef limestone, bedded calcareous beach rock, lagoonal muds, volcanoclastic sands and silts, chemically leached biocarbonate sedimentary rocks forming breccias and marls, alluvial sediments, peat, silt, dune sands, beach sands and gravels. Basalts of the Koolau and Waianae series under lay these sediments.

Three different sediment types in the overall project area have been identified as part of the Lualualei, fill land, Ewa association by the U. S. Department of Agriculture, Soils Conservation Service, Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii, 1972. These sediment types are fill land, beach sand, and coral outcrop.

Chemical degradation of the coral/algal reef limestones developed a natural clay enriched Mamala soil containing granule to cobble biocarbonates and thick to moderately thick A-horizon organic mats. These soils are sticky and very plastic and yield by tensile fracturing during drying. This soil is normally found

in small voids, sinks and other depressions in the karst limestone topography. The fill land contains mixtures of the coralline/algal carbonates, alluvial debris derived form volcanic rocks and residual clays as well as churned peat deposits. The beach sands consist of dune and beach biocarbonate clastics with minor amounts of volcanoclastic sand-sized fragments.

Portions of the overall project area consists of about 12-inch thick soil above coral/algal limestones with one area containing bog-type peat deposits. The coral/algal limestones vary in porosity, hardness, and degree of chemical degradation.

According to "Geology Groundwater Hydrology and Soils Engineering Feasibility Investigation," Ewa Marina Community Development by Geolabs-Hawaii, February 1979, the biocarbonate sand and gravel, clay granule-cobble mixtures vary density and degree of induration. This material has been reported to vary from medium dense to very hard with occasional soft soils and subsurface voids. Most of the less dense soils and voids were encountered at depths exceeding 20 feet below ground surface, probably due to the solution at that depth of carbonates with redeposition occurring near ground surface.

The overall project area, situated on the southern edge of the Ewa Coastal Plain, has a relatively level through irregular surface sloping gently to the south at about 20 feet per mile. The northern, central, western and northeastern portions of the project area have been modified by leveling and ditching for the cultivation of sugarcane.

Southwest of Increment I within the overall project area, is a coastal portion marked by a 1 to 1.5 meter high wave cut escarpment in the vicinity of Oneula Beach Park which becomes higher as it extends toward the west and Nimitz Beach. The caprock exposed throughout this coastal area is characterized by a coralline marl of variable hardness with the surface will pitted by wave action, rainwater and the gastropod Littorina species. At the western end of the Project Area a coarse sand beach begins and extends through the Nimitz Beach Barber's Point Naval Air Station property.

Increment I however, has been modified by sugar cultivation leveling and ditching. The subject area is predominately of fill land, although a small section along the northern boundary is moderately shallow Ewa Silt Clay loam at 2-6" slope. The fill land, as previously described, contains mixtures of coralline/algae carbonates, alluvial debris derived from volcanic rocks and residual clays as well as churned peat deposits.

An objective for development within Increment I is to attain aproproximately balanced earthwork with excavation and embankment. Although generalized topography is shown on Exhibit 10, a more detailed topographic survey for additional investigation is anticipated shortly.

Major earthwork, extensive fill and recontouring on Increment I property may require up to 18 feet of fill in certain locations. On-site fill of thie magnitude may not be available until Increment II marina excavation commences on a large scale. Marina excavation is currently programmed beginning in the development year three. As such, project phasing and incremental grading within Increment I will be important.

It should also be noted that mass-grading for the overall project will take into account the Tsunami innundation level. A minimum elevation for development in excess of approximately 10 feet above sea level will be maintained.

Subdivision parameters and mass grading earthwork designs for Increment I will be done in coordination with City & County of Honolulu standards, regulations and guidelines.

Exhibit 13 shows soils and geology for subject area.

5.2 ARCHAEOLOGICAL/HISTORICAL

Background. Previous archaeological work in the project area conducted by the Bishop Museum (Jourdane 1979) and Hawaii Marine Research, Inc. (Davis 1979) reported the presence of 107 late prehistoric and early historic features in the forested seaward portion of the area to be developed (Exhibit 14, hatched area). Though the sugar cane lands were at that time part of the area to be developed, they were not surveyed under the assumption that archaeological features previously extant in the area have been eradicated by years of sugar cane cultivation.

In accordance with their permitting authority under Section 404 of the Clean Water Act, and their responsibility under 36 C.F.R. 800, the U.S. Army Corps of Engineers, Honolulu District, reviewed the Environmental Impact Statement prepared for the project and requested a determination of eligibility for the "Oneula Archaeological District" from the Keeper of the National Register of Historic Places. The boundaries of the District corresponded to the boundaries of the overall Marina Development Area. In July of that year, the Keeper of the register responded stating that the documentation provided was insufficient and:

> [i]t is noted in the documentation several times that areas within the cane fields appear to be devoid of cultural resources. Unless subsurface testing has demonstrated the presence of intact deposits or a case is made for plowzone remains retaining important information potential, these areas should be deleted from the district. Please revise district boundaries to conform to the distribution of the resources and justify their placement.
>
> (Keeper of the Register 1981)

It is unclear from the documentation in the State Historic Preservation Officer's files and the files of the Environmental Section, U.S. Army Corps of Engineers, why the boundaries of the district were so inclusively drawn.

The Corps then informed the S.H.P.O. of the determination, and requested additional documentation (representative photographs of the sites described in the determination request). The S.H.P.O. informed the Corps that they concurred with the request for the boundary revision and suggested contacting the original contractor for the photographs. At that time however, the Oneula Archaeological District was mistakenly recorded in the S.H.P.O's files as having been determined eligible for inclusion on the National Register of Historic Places. To date, the Corps has taken no action to revise and resubmit the determination request.

In February of 1982, the developer requested the assistance of the S.H.P.O. in determining what further work was required in the area. Though the S.H.P.O.'s response to that letter was premised on the

incorrect belief that the Oneula Archaeological District had been determined eligible for inclusion on the National Register, it was decided to implement the suggestion for limited archaeological testing in the cane fields. As a result of this, the developer contracted with Science Management, Inc. to conduct the recommended work.

Description of the Project Area. This section discusses certain pertinent facts regarding the current study area that are germane to the discussion that follows. For a more detailed and general overview of the project area, the reader is referred to Davis (1979) in Appendix E and the Environmental Impact Statement, Ewa Marina Community, done by GACI, Inc., 1981.

The project area lies within what is termed the Ewa Plain on an emerged coral reef dating to the late Pleistocene. The undisturbed surface of this landscape is composed of coral-and rubble-strewn, relatively flat, weathered, calcareous material containing little if any soil or sediment. The U.S. Soil Conservation Service (Foote et al. 1972:29) classifies the undisturbed Ewa Plain as coral outcrop (CO) consisting "of coral or cemented calcareous sand." Except for a small portion in the northeastern corner, the currently cultivated portions of the area to be developed that are the subject of the present study are classed as filled land.

During the 1950's and 1960's, bagasse and sediment derived from processing operations of Ewa Sugar Co. (now Oahu Sugar Co.), were deposited in the area. Comparison of current aerial photographs with those included in Foote et al. (1972, photomap 45) clearly show the growth of the cultivated lands. Land to be filled was apparently cleared of vegetation and graded and then the soils and other fill material were brought to the site. This layer of soil on which sugar is now grown is relatively shallow and plowing operations must be modified to avoid intermixing of the corraline substrate with agricultural soils. (Michael Burke, Oahu Sugar Field Engineer, Personal Communication).

Chemical weathering of the emerged reef that forms the Ewa Plain in some areas produced numerous sinkholes in which significant paleontological and archaeological data have been recovered. Studies undertaken in conjunction with construction of the Barbers Point Deep Draft Harbor (Hammatt and Folk 1981; Olsen and James 1981; Kirch and Christensen 1981; Davis and Griffin 1978) about two miles west of the study area, resulted in the recovery of important archaeological material from a sample of the numerous sinkholes in the area. Further east on the plain however, sinkholes appear to become relatively smaller and less numerous. Though the area was completely bulldozed, the site of the Solid Waste Processing and Resource Recovery Facility at Campbell Industrial Park appears to

have fewer and smaller sinkholes than was reported at the site of the new harbor. Davis (1979) reported no sinkholes at all in the survey area immediately seaward of the present study area. In addition, the disturbance resulting from surface preparation, filling, and years of cultivation, have probably eradicated any sinkholes that may have been present in the area of present concern.

Results. Five test excavations were conducted within the study area with the aid of a backhoe equipped with an 18 inch wide bucket. The backhoe and operator was provided by Bateman Construction. The excavations and field inspections of the margins of the cane roads and the extant quarry were conducted on November 11 and 17 by the authors.

Exhibit 14 shows the location of each of the excavation units. They are numbered in the sequence in which they were dug. The first three excavations were placed so as to emphasize the seaward margin of the study area since it was (1) adjacent to the area in which archaeological sites had been previously located; and (2) presumed to have a shallower deposit of soil being on the extremes of the field margins. The fourth and fifth excavation units, somewhat further inland, were placed in field areas where the soil deposit appeared deeper than in other areas tested.

Excavation Unit Descriptions

X-1. This test excavation was placed in an area that is not now in cultivation though it appears that it once was. A recent fire has denuded the sparse vegetation adjacent to the test pit and domestic trash of recent vintage has been dumped nearby. The test hit very solid coral bedrock less than 10 centimeters below the surface of the ground. The bedrock was both smooth and hard enough to deny the teeth of the backhoe bucket any purchase. No cultural material was observed.

X-2. Excavation unit 2 was placed at the margin of a canefield which, though in an uncultivated area has probably been disturbed by agricultural activity and road construction and maintenance. A thin layer of soil (5 to 12 cm. deep) lies atop the coral bedrock. The soil contained both pebbles of coral and fragments of charcoal (the latter probably from sugar cane burning). The soil is a silt loam, non-sticky, non-plastic, containing coarse subangular peds though these may have been redeposited. Color is very pale brown [10 YR 7/3 (Munsell Notation)].

X-3. Excavation unit 3 was placed in the corner of a sugar cane field with young cane. The soil is approximately 25 to 30 centimeters thick, lying on a crumbly coralline bedrock (10 YR 6/3)

The soil is essentially similar to that found in X-2 except for the presence of more gravel of weathered basalt. The proportion of gravel increases with depth. There appear to be pockets of compacted silt loam, compacted sitting on the bedrock (2.5 YR 8/4).

X-4. Excavation unit 4 was placed in the corner of a cleared field that appeared to have been recently harvested.

Layer 1 was a dark reddish brown (5YR 3/2) sticky, plastic clay loam with coarse subangular peds. It was 20 to 25 centimeters deep with a distinct wavy boundary.

Layer 2 was a slightly sticky, slightly plastic, silt loam, yellowish brown (10 YR 5/4) containing weathered basalt gravel.

Layer 3 was a damp, olive yellow, (2.5Y 6/6) structureless, possibly aeolian silt, similar to X-2's layer 2 above.

The material sitting on the bedrock in X-3 and X-4 is virtually the same compacted silt with no stones, sand, or other inclusions. Though it may possibly have been laid down by ponding in a very still environment, aeolian deposition (i.e., loess) seems more likely.

X-5. This excavation unit was situated at the east end of the study area adjacent to residences and Papipi Road.

Layer 1 was a dark reddish brown (5YR 2.5/2), sticky, plastic, clay loam extending down to 20 to 25 centimeters below the surface. Peds were coarse, subangular, and friable.

Layer 2 was a mottled brown to dark reddish brown clay loam with coarse subangular peds and occassional pebbles and cobbles.

Layer 3 consisted of brown (7.5YR 5/4) slightly sticky, slightly plastic silt with coarse, friable, subangular peds. It contains numerous pebbles to large cobbles of weathered basalt.

In addition to the test excavations, an on the ground inspection was conducted of approximately 1.5 miles of cane roads. In addition, the limestone quarry and adjacent dump were surveyed to determine whether any evidence of archaeological material was present. Approximately 6 miles of cane road were also inspected from a slowly moving automobile to see if any undisturbed areas or areas with more substantial soil deposits were present.

No archaeological material, evidence thereof or areas of undisturbed soils were noted.

Conclusion: The archaeological work described above was intended to assess the probability that significant archaeological material still exists within the study area. We were looking for either such material itself (e.g., artifacts or archaeological features) or

other data that might shed light on the past environment of the area (e.g., evidence of modern soil formation and transport, historical or physical data of land disturbance or modification, or other pertinent environmental evidence such as land snails and other faunal remains).

The present study revealed no direct evidence of any archaeological or paleontological material in the study area. All evidence encountered suggests that the study area has been substantially disturbed by sugar cane cultivation during the last 20 years. If archaeological material similar to that reported by Davis (1979) for the area directly seaward were extant here prior to filling and cultivation, they would almost certainly have been eradicated by now.

In sum, there appears to be no basis for the inclusion of the study area in the Oneula Archaeological District, and no necessity for any further archaeological investiqations in the study area;

Exhibit 14 illustrates project area showing excavation unit locations. Appendix D is consultant's response to subsequent archaeological concerns for subject project. Appendix E includes the Davis Archaeological Survey, November, 1979.

REFERENCES

Ahlo, Hamilton M., Jr. and Robert J. Hommon

1983 An Archaeological Reconnaissance Survey of the Site of the the Proposed Solid Waste Processing and Resource Recovery Facility, Honouliuli, Ewa, Oahu.

Davis, Bertell D.

1979 Report on Archaeological Survey of the Proposed Ewa Marina Community Development, Ewa Beach, Oahu, Hawaii Hawaii Marine Research, Inc.

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1973 Interim Report I: Present Environment and Archaeological Survey of the Proposed Deep Draft Harbor Area, Honouliuli, Ewa, Oahu, Hawaii. Archaeological Research Center Hawaii, Inc. ARCH 14-1151. Lawai.

Foote, Donald E., Elmer L. Hill, Sakuichi Nakamura and Floyd Stevens

1973 Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii. Soil Conservation Service, U.S. Department of Agriculture.

Kirch, Patrick V. and Carl C. Christensen

1981 Nonmarine Molluscs and Paleoecology at Barbers Point Oahu. IN Hallett H. Hammatt and William Folk, 1982

Olsen, Storrs L. and Helen F. James

1981 Paleontological Salvage at Barbers Point, Oahu. IN Hallett H. Hammatt and William Folk, 1981.

5.3 FLORA/FAUNA

Increment I is presently under sugar cane cultivation and thereby does not consist of vegetation types found along the southern, coastal areas of the overall project. A such, none of the plant species listed in the Federal Register of the propsed threatened and endangered list are known to exist within Increment.[1] Koahaole, swollen fingergrasss (chloris inflata), castor (Ricinus communis), however, are common plants found along the edges of the peripheral roads along Increment I.

Characteristic animals include the barred dove (the most abundant bird), house sparrow, munias, plover, house mice, two species of rat, and the metallic skink. As evident throughout the area, all mammals recorded or probably present are common, introduced, and frequently pestiferous animals; none of them are rare or unusual. Mos abundant is probably house mice due to their small size, reproductive capacity, and adapatability to a variety of habitats. Cats were common on cane roads and the predacious mongoose was observed within the cane areas.

Exhibit 15 illustrates vegetation types for Increment I.

[1] U.S. Department of Interior, Fish and Wildlife Service, 1976, Endangered and Threatened Species, Plants, Federal Register 41 (117 24524-24572)

5.4 SEWAGE DISPOSAL/GROUNDWATER IMPACTS

Sewage Disposal. As previously stated in the generic Environmental Impact Statement, Ewa Marina Community, February 1981, the City's partially completed Honouliuli Wastewater Treatment Plant will have an ultimate capacity of 51 million gallons per day (mgd). Of this flow capacity, 11 mgd have been projected to accommodate future development between Makakilo and Halawa.

The City has recently completed the Ewa Beach Sewer System which connects to Honouliuli WWTP. This system was sized to accommodate an area of approximately 180 acres of R-6 zoning properties within the Ewa Marina Community. The present City & County of Honolulu Sewer Master Plan also designates a portion of the Ewa Marina Development to discharge 2.4 mgd into the existing 24" Ewa Interceptor Sewer at Papipi Road.

Appendix F, documents the May 26, 1983, the Department of Public Works concurrence that the existing system will be able to handle approximately 180 acres of anticipated flows southwest of Increment I. In addition, the Department of Public Works' document indicates that later increments of the development may be serviced by constructing a sewer line directly to the Honouliuli

Wastewater Treatment Plant located north of the site. Subsequently on December 6, 1983, the Wastewater Management Division, Department of Public Works, determined that wastewater disposal specifically for Increment I, was possible if the sewage was discharged into a 24 inch existing interceptor along Pohakupuna Road providing discharge does not exceed .49 mgd.

As shown on Exhibit 16, a Sewer Master Plan for the overall project and Increment I has been developed which identifies anticipated quantities per area. Increment I, as defined as Phase I on the Sewer Master Plan, woiuld generate the following quantities:

Increment I Area	Quantity (mgd)
A	.213
B	.393
C	.265
D	.292
E	.113
F	.276
G	.124
H	.274
I	.270
	1.675 mgd

Although the City & County of Honolulu Sewer Master Plan designated discharge of 2.4 mgd into the existing 24" Ewa Interceptor Sewer at Papipi Road (Point A), implementation of Increment I's sewer system as the first priority area (Areas A - I) requires discharge of approximately 2.2 mgd into the existinq 24 inch interceptor along Pohakupuna Road at Point B.

The balance of 0.2 mgd from a portion of Increment II's Area T (shown as Phase II on the Sewer Master Plan) would be discharged into the existing interceptor at Point A on Papipi Road.

Because these connection points to the Ewa Interceptor Sewer would supersede previous Department of Public Works locations, approval was requested on January 19, 1984 to discharge approximately 2.2 mgd of wastewater at Pohakupuna Road and 0.2 mgd at Papipi Road. The total discharge into the Ewa Interceptor Sewer, however, would remain at 2.4 mgd.

All subdivision sewers will be designed in accordance with City and County standards.

Verification that these wage flows from Increment I can be discharged into the Existing Interceptor Sewer, West Portion, as shown in Exhibit 16, is referenced to the Department of Public Work's February 29, 1984 letter included in Appendix N.

Groundwater Impacts. There are three aquifers within the Ewa Coastal Plain: The Basal Aquifer within the Waianae Volcanic Series and the calcareous and non-calcareous limestone Caprock Aquifer. The calcareous and non-calcareous aquifers are interbedded and crop out along the mauka side of the Ewa Coastal Plain and, as such, is treated as single Caprock Aquifer.

The Basal and Caprock Aquifers are separated by an aquaclude consisting of low permeability alluvial and marine sediments. In much of the Ewa Coastal Plain, groundwater in the Caprock Aquifer occurs under unconfined conditions and is responsive to direct infiltration from rainfall, stream runoff, irrigation water and tidal fluctuations. Caprock groundwater grades vertically and laterally to the Pacific Ocean as confirmed by chemical analyses of wells of widely ranging depths. The upper 300-500 feet of the Caprock Aquifer is primarily coralline limestone and calcareous sediments derived from the breakup and disintegration of older reefs and coral heads. The tidal effects were noted to a distance of approximately 2,800 feet north of the shoreline by a Geolabs-Hawaii study in February 1979, entitled "Geology Groundwater Hydrology and Soils Engineering Feasibility Investigation, Ewa Marina Community Development" for Campbell Estates Properties, Oahu, Hawaii, but not at any greater distances from the ocean.

The average groundwater level in the Ewa Coastal Plain is about two feet above Mean Sea Level (MSL) as indicated from test borings made in the overall project area by the 1979 Geolabs Study. The Cox and Lao report, "Development of Deep Monitoring Stations for Pearl Harbor Groundwater of Oahu," Technical Report No. 4, WRRC, University of Hawaii 1967, indicated that a groundwater level of 2.5 feet above MSL in 1966 for a deep well (Ewa-1) located approximately 2.4 miles east of the overall project area, while the Stearns and Vaksvik study in 1935 reported that groundwater levels in four wells (previously owned by the Ewa Plantation; now the Oahu Sugar Company, Ltd.) located in an area approximately 2.5 miles northeast of the Project Area, were at 2 feet as far back as 1930. The groundwater levels in the Ewa Plain section of the Caprock Aquifier have been at or slightly above sea level for many years. There has been no significant changes in groundwater use or in the overall volume of water availability for use in the Ewa Plain during that timeframe.

The current groundwater level in the overall project area is slightly above MSL and therefore has a tendency to move toward the ocean. Unless the groundwater levels are lowered significantly within and mauka of the overall project area, it is not anticipated that any significant salt water intrusion from the ocean will occur.

No major dredging is planned within the Increment I project boundaries. Furthermore, since caprock in the area extends to a depth of over 1,000 feet, penetration of construction activities into the fresh water aquifer is precluded. Thus, no negative impact on groundwater is anticipated as a result of project construction. (See Section 5.10 of this report for a discussion of water commitment and demand resulting from land uses in Increment I).

5.5 SOLID WASTE DISPOSAL

Refuse collection and disposal for Increment I, is to be provided by the Department of Public Works, City and County of Honolulu, contingent on obtaining approval for increased personnel and trucks. Appendix G, dated May 9, 1983, documents the Department's response. Relatedly, the City and County is conducting a study of several sites for a new sanitary landfill to serve Leeward Oahu. A solid waste energy resources recovery project may also be implemented in the near future which would lessen the need for a new sanitary landfill.

5.6 RECREATIONAL RESOURCES

Pursuant to requirements set forth by the Department of Parks & Recreation, City & County of Honolulu, the overall project will include approximately 8.5 acres of park lands dedicated to comply with the City's Park Dedication Ordinance No. 4621.

A park site of approximately 5.7 acres as shown on Exhibit 8 as P-2, will be situated adjacent to Fort Weaver Road in the northerly corner of Increment I. An additional 2.8 acre park shown as P-3 outside of Increment I will be dedicated. As part of the Park Dedication process, the site will be dedicated, graded, grassed, and provided with all off-site improvements, including the installation of some type of irrigation system at no cost to the City. In the design, the site will also be developed in close coordination with the Department of Parks and Recreation to finalize the location, size, actual configuration, and public access as required by the City.

Because the total area of the P-2 and P-3 park sites exceeds the 8.5 acres required for dedication, any remaining area will be utilized as credit for residentail developments in Increment II, as clarified by the Department of Parks & Recreation on December 15, 1983. A unilateral agreement will be executed as part of the

re-zoning application assuring the City that the project in its entirety will fully comply with the Park Dedication ordinance requirements.

Increment I's park will have a favorable impact on the surrounding neighborhoods by providing additional recreational resources for activities such as picnicking, sports, and other recreational facilities. Located adjacent to Fort Weaver Road on the northeast corner of the project, the park will be highly accessible to both the existing residents of Ewa Beach as well as to new residents.

5.7 VISUAL

The predominantly single-family residences and low-density apartment area along the northerly boundary will be compatible with the existing residences and limited commercial developments and public facilities adjacent to Increment I. This low-rise development consisting of a residential scale and quality harmonious with adjacent areas, should become an impetus for increased revitalization and maintenance of the Ewa Beach area. In addition, the inclusion of landscape elements within Increment I and along Fort Weaver Road will soften the impact of the new built environment and strengthen the natural, scenic elements of the area.

5.8 TRAFFIC/NOISE/AIR QUALITY/CIRCULATION

Traffic: INTRODUCTION & EXISTING CONDITIONS

The following traffic study is presented as a supplement to a report previously prepared in October 1980 by PRC Voorhees (see Appendix H) which evaluated the traffic impact of the entire project on the local street and highway system. For analysis, the overall project includes the development of 7200 dwelling units and 150,000 square feet of retail space on a 1000-acre parcel of land in the Ewa District of Oahu. This traffic analysis is limited to the assessment of impacts generated by Increment I, consisting of approximately 1290 dwelling units on 160 acres of land.

The scope of this current work differed in two major aspects from the original analysis. First, the original study assumed that the improvements to Fort Weaver Road would be complete from Farrington Highway to Papipi Road in Ewa Beach. At the time of this study, the Fort Weaver Road improvements had proceeded only to Renton Road. The portions from Renton to Papipi were not completed and the planned completion date is uncertain. Secondly, the original study included the impact of traffic generated by a variety of other new developments in the area.

The status and the impact of many of these projects is uncertain at this time.

The scope of work was, therefore, limited to the following general areas of analysis:

* Evaluation of the potential impact of the 1290 dwelling units in Increment I on the existing roadway system.
* Identification of the measures which may be needed if the Fort Weaver Road improvement project is not completed by the completion of the first increment.
* Assessment of the impact of Increment I if the Fort Weaver Road projects are completed.

Existing Conditions. The project site is isolated from major urban communities and is currently situated on agricultural (sugar cane) land. The Barbers Point Naval Air Station abuts the western boundary of the site, while the Ewa Beach community and the Pearl Harbor Naval Reservation at Iroquois Point surround the site on the east. Forming the southeast boundary of the site is a small housing community. Areas north of the project site are agricultural land except for the small community of Ewa New Town.

Highway Facilities. The key highway facility which serves the site is Fort Weaver Road, a state highway which provides direct access to Interstate H-1 and Farrington Highway, two highways of regional significance. Fort Weaver Road has a full interchange with H-1 and a newly constructed interchange with Farrington Highway. It has also been recently widened and realigned from Farrington Highway to Renton Road, north of the site. It is a major two-lane undivided rural arterial from Renton Road to Papipi Road, south of the site. It is the only facility providing access

from Ewa Beach, Iroquois Point, and the project site to Waipahu, Central Honolulu, Leeward Oahu, and Central Oahu. Access to Fort Weaver Road from the sugar cane fields and residential communities is currently provided by numerous plantation and minor county collector roadways. Traffic signals along Fort Weaver Road are provided at intersections with Papipi, Iroquois and Renton Roads.

The H-1 freeway is a major facility with three lanes in each direction at the vicinity of the Kunia interchange. The major roadways providing access are also shown in Exhibit 1.

Transit Service. Current transit service to Ewa Beach and Iroquois Point is being provided by the City and County of Honolulu by Route 50. This route has three sublines which serve Iroquois Point, Ewa Beach, Ewa Mill and Makakilo. Additional service is also provided to Waipahu. The route provides service from these areas via routes along Fort Weaver Road, Farrington Highway, Kamehameha Highway and Dillingham Boulevard to major employment and shopping areas in Honolulu. Currently, three buses per hour are provided during the morning and evening peak hours to and from Honolulu.

Traffic Volumes. Existing traffic counts taken along various intersections during July and August of 1979 along Fort Weaver Road were obtained from the State Department of Transportation. The results of these counts taken for the morning and evening peak

hours and for 24 hours of the day, adjusted to reflect school season volumes along Fort Weaver Road, are illustrated in Exhibits 17 and 18.

TRAFFIC: Impact Analysis.

The analysis of the potential impact of the overall project and Increment I on the local street and highway system was conducted by employing a multi-step process which includes the estimation of project-generated traffic, forecast of total future traffic without the project, total future traffic with the project, and an assessment of the traffic impact related to the project as opposed to impacts generated by other projects.

Proposed Development. The Ewa Marina Community is a marina subdivision development on approximately 1000 acres of land and planned for completion in two phases. The overall project is estimated to include the following:

* 4850 multi-family dwelling units
* 35.0 acres of land for commercial use
* 9.8 acres for a school

Increment I, is planned for completion over a five-year period with a proposed housing absorption schedule as follows:

Development Year	Units Absorbed	Population @ 3/D.U.
1	200 D.U.	600
2	300	900
3	350	1,050
4	300	900
5	140	570
Total	1,290 D.U.	3,870

Before a traffic impact analysis could be conducted, it was necessary to determine the characteristics of the traffic which the project would be expected to generate. These characteristics include the total magnitude of the generated traffic, the hourly distribution of this traffic during the course of the day, the geographical distribution of the trips and the potential diversion to bus transit of these trips.

A careful analysis of the project and of traffic conditions which currently exist indicate that the most critical time periods relative to traffic impact would be the morning and evening peak periods on the adjacent streets and highways. The remainder of this section concentrates on these two time periods.

Traffic Generation. Traffic studies conducted in Honolulu and many mainland cities indicate that each specific land use has associated with it its own identifiable traffic-generating characteristics. These relate to the magnitude of the daily traffic, the peak periods of traffic generation, and the geographic distribution of attractions and productions. For a project such as the Ewa Marina Community, the following traffic generation rates can be applied.

* Daily	-	6.1 trips/D.U.
* AM Peak	- In -	0.1 trips/D.U.
	Out -	0.4 trips/D.U.
* PM Peak	- In -	0.4 trips/D.U.
	Out -	0.2 trips/D.U.

Using these rates, it is projected that the proposed project would exhibit the following traffic generation characteristics:

* Daily	-		7870 trips/day
* AM Peak	- In	-	130 trips/hour
	- Out	-	515 trips/hour
* PM Peak	- In	-	515 trips/hour
	Out	-	260/trips/hour

Trip Distribution. The geographic distribution of the traffic which would be attracted or produced by the development is dependent upon various factors. These would include factors such as places of employment, school locations, shopping and commercial areas, dwelling units, and relative distances to these land uses. Based on the results of unpublished, person trip tables[1] which include the impact of the newly adopted Oahu General Plan, estimates were made of the distribution of residential peak hour trips generated by the proposed development.

The resulting trip distribution patterns are summarized as percentages:

[1]Unpublished person trip tables developed for "Interstate Route H-3 Alternatives Study, Travel Demand Analysis." September 1977, Alan M. Voorhees and Associates/Parsons, Brinckerfoff-Quade and Douglas.

TRIP DISTRIBUTION PERCENTAGES
FOR EWA MARINA

Major Area	Percentage
Honolulu	53%
Pearl City	5
Wahiawa/Mililani	8
Waipahu	10
Makakilo	7
Waianae Coast	2
Ewa Beach	15
TOTAL	100%

These percentages represent trips to and from each area indicated. In addition, the above table indicates that 85 percent of trips would have destinations north of the site, while 15 percent would remain within Ewa Beach.

Traffic Assignments. The assignment of the generated traffic to the transportation facilities was relatively straightforward since the realigned and improved Fort Weaver Road would be the only major facility which traffic would need to utilize to gain access to the project from various areas north of the site. Access to areas internal to the site would be via two proposed roadways. All northern traffic to and from the site would utilize Fort Weaver Road and would disperse to areas north, east or west of

the project via the various ramps at the present Kunia Interchange with H-1, Renton Road, Farrington Highway, and Kunia Road. The distribution of generated peak hour traffic as shown in Exhibit 19 was used in the analysis of potential impacts.

Future Traffic.

The future traffic projected to use the local street and highway system will be composed of three elements:

* The base existing traffic and whatever growth that may occur as a result of regional growth and other minor development in the area.
* Traffic generated by other major projects in the area.
* Traffic generated by the Ewa Marina Community.

The previous section described and quantified the traffic from the Ewa Marina. Traffic from the other two sources is discussed below.

Base Traffic. Traffic on Fort Weaver Road in the vicinity of the project has changed very little over the past six or seven years. The data in Exhibit 17 and 18 were collected in 1977. Data collected in 1981 were approximately equal to these counts. Data collected in 1983 were slightly lower. For the purposes of this project, a very conservative approach was taken. It was assumed that the base traffic would increase by 10 percent as a result of regional growth and development, and potential new changes within the Ewa Beach area.

Other Projects. Although a variety of proposed developments are planned for the Central and West Oahu areas during the next several years, very little information is available which can be reliably used in this study. The original traffic analysis for Ewa Marina discussed the potential for additional residential development in nine specific areas.

A summarization of this discussion is as follows:

FORECAST OF MAJOR LAND USE CHANGES IN
CENTRAL AND LEEWARD OAHU
1978-1990

Region	Additional Households
North Shore	1045
Wahiawa	0
Mililani	5000
Waianae Coast	1600
Makakilo	4000
Village Park	1750
Ewa Beach	350
Waipio-Gentry	1000
Ewa Village	7000
West Beach	3000

Note: This is a reproduction of Table 1 from the original study.

Currently available information indicates that the most appropriate approach to take regarding other developments and their impact on this study was to assume that the Ewa Plantation project, located north of Ewa Marina, would be the only project to consider. The others listed above are too uncertain and/or too long range to include in this analysis; or the traffic expected to be generated by them would not impact Fort Weaver Road, the primary focus for this study. It was conservatively assumed that the Ewa Plantation would have developed 1750 dwelling units after Year 5 of Increment I for the Ewa Marina Community.

Exhibit 20 illustrates the projected future traffic without the Ewa Marina-generated traffic. The volumes illustrated in this figure include a 10 percent growth in existing traffic and the traffic expected to be generated by the Ewa Plantation.

Traffic Impact

The three elements of traffic projected for the area were assigned to the street network to assess the potential impact of the Ewa Marina Community. Exhibit 21 illustrates the total projected future traffic which includes Ewa Marina, the other development projects in the area, and the growth in the background traffic. The analysis considered the impact of future traffic at several key locations. These are:

* Papipi Road and Fort Weaver Road
* Ewa Marina Access 3 and Fort Weaver Road

* Ewa Marina Access 4 and Fort Weaver Road
* Hanakahi Road and Fort Weaver Road
* Geiger Road and Fort Weaver Road
* H-1 Interstate and Fort Weaver Road
* Farrington Highway and Fort Weaver Road

A summary of the volume/capacity (V/C) analysis conducted at these locations for traffic projected during the morning and evening peak hours is included below which illustrates the V/C ratio for three conditions: existing conditions, future (1990) without Ewa Marina, and future (1990) with Ewa Marina. The results of the analysis indicate that all but the intersection of Hanakahi Road and Fort Weaver Road would have a V/C ratio of less than 0.90, or would operate at Level of Service[1] or better. At Hanakahi/Fort Weaver, the V/C is expected to be 1.05 (L.O.S. F) during the AM peak hour and 0.93 (L.O.S. E) during the PM peak hour. These results are based on the assumption that no further improvements would be made to Fort Weaver Road even with the implementation of Increment I of Ewa Marina and 1750 D.U.'s of Ewa Plantation.

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[1]Level of service is a qualitative measure of the effect of a number of factors, which include speed and travel time, traffic interruptions, freedom to maneuver, safety, driving comfort, and convenience. They are represented by a standard which goes from A (best) to F (worst).

SUMMARY OF VOLUME/CAPACITY ANALYSIS

	Volume/Capacity Ratio					
	Morning Peak			Evening Peak		
		Future (1990)			Future (1990)	
		Without	With		Without	With
	Existing	E.M.	E.M.	Existing	E.M.	E.M.
Papipi/Fort Weaver	0.45	0.49	0.54	0.59	0.65	0.68
Access 3/Fort Weaver	--	--	0.22	--	--	0.13
Access 4/Fort Weaver	--	--	0.31	--	--	0.26
Hanakahi/Fort Weaver	0.72	0.79	1.08	0.61	0.67	0.93
Geiger/Fort Weaver	0.55	0.78	0.96	0.52	0.57	0.75
H-1/Fort Weaver						
On-Ramp to H-1 East	0.42	0.53	0.78*	0.30	0.38	0.39
On-Ramp to H-1 West	0.16	0.18	0.19	0.23	0.29	0.30
Off-Ramp from H-1 East	0.17	0.40	0.42	0.40	0.48	0.80*
Off-Ramp from H-1 West	0.35	0.38	0.40	0.21	0.24	0.26
Farrington/Fort Weaver						
NB to EB	--	0.89	0.78*	--	0.69	0.82
WB to NB	--	0.38	0.42	--	0.65	0.67
WB to SB	--	0.56	0.74	--	0.70	0.80*

*Adjustments in assignment made to balance movement.

Also, the analysis assumes that during the morning peak hour, traffic making the movement from northbound on Fort Weaver Road to eastbound on H-1 and Farrington Highway would "balance" itself. That is, a volume proportional to the respective capacities would use H-1 and Farrington Highway so both would have similar V/C ratios and levels of service. The same would occur driving the evening peak hour for the opposite movement, i.e., westbound to southbound.

Traffic: MITIGATION MEASURES AND OTHER ISSUES

The key intersections along Fort Weaver Road were further analyzed to determine whether any short-term mitigation measures could be implemented which would alleviate some of the problems which have been identified. Also, the impact of the implementation of the previously discussed improvements to Fort Weaver Road was analyzed. Finally, an assessment was made to determine the relative magnitude of traffic contributed by the Ewa Marina as compared to other projects using Fort Weaver Road.

Short-term Mitigation Measures. The impact of left-turn and right-turn storage lanes was evaluated at the intertsections of Geiger at Fort Weaver and Hanakahi at Fort Weaver. These improvements would increase the capacity of the intersection sufficiently to improve the V/C ratio so that it would be less than 1.0 during the morning peak hour and 0.90 during the evening peak hour. Consideration was also given to widening these approaches, to accommodate two through north-south lanes. While these improvements would improve the operating conditions at the intersection, it would merely relocate the congestion to a point farther upstream unless the widening is extended the entire length of the highway.

Proposed Highway Improvement Program. If the proposed widening and realignment of Fort Weaver Road were implemented, the impact would be much more significant. The V/C ratios at the various intersections would be as follows:

Intersection	V/C Ratio with Both Projects AM Peak	PM Peak
Papipi/Fort Weaver	0.22	0.23
Access 3/Fort Weaver	0.10	0.07
Access 4/Fort Weaver	0.16	0.14
Hanakahi/Fort Weaver	0.77	0.75
Geiger/Fort Weaver	0.63	0.68

It can be seen that each of the intersections would operate at a very acceptable level of service with these improvements. The ramps onto and off of H-1 and Farrington Highway would not be affected by this improvement.

Projected Traffic Levels. An analysis was made to determine the relative levels of traffic which can be attributed to various sources at key locations along Fort Weaver Road. The analysis concentrated on the section of roadway on Fort Weaver Road south of Farrington Highway and at the intersection of Fort Weaver and Farrington. The information below illustrates the percentage contribution of traffic from three sources at the intersection during the morning and evening peaks, and the section of road south of the intersection of a daily basis.

	AM Peak	PM Peak	ADT
Ewa Marina	13%	12%	15%
Ewa Plantation	22%	21%	20%
Background Traffic	65%	67%	58%

It can be seen that the majority of the traffic is the "background traffic," the existing traffic and the growth that occurred to it as a result of regional development. In each case, the Ewa Marina contributed 15% or less of the traffic.

Traffic: SUMMARY AND CONCLUSION

The results of a traffic analysis conducted for the Ewa Marina Community are summarized as follows:

* Increment 1, Phase I of the project is expected to generate 7,870 daily vehicle trips into and out of the site. Of these, 665 vehicles/hour are expected to occur during the morning peak hour and 875 vehicles/hour during the evening peak hour.

* Of the trips generated by the project, 85 percent are expected to travel to and from destinations north of the site and 15 percent south of the site toward Ewa Beach.

* During the morning peak hour, it is projected that 435 vehicles/hour would travel northbound on Fort Weaver Road from the site and 110 vehicles/hour southbound into the site.

* During the evening peak hour, it is projected that 220 vehicles/hour would travel northbound out of the site on Fort Weaver Road and 435 vehicles/hour southbound into the site.

* By 1990, the projected completion date for Increment 1, the traffic on Fort Weaver Road is expected to increase by about 20 percent without the addition of Ewa Marina traffic, as a result of the other developments in the area. With the addition of Ewa Marina, the traffic would increase an additional 15 percent.

* If no additional improvements are made to Fort Weaver Road over those which currently exist, the additional traffic generated by Ewa Marina and the other development projects in the area would cause the intersection of Fort Weaver Road and Hanakahi Road to operate at Level of Service F[1] (V/C = 1.08) during the morning peak hour.

* If minor improvements were made to the intersection of Fort Weaver and Hanakahi (widening of approaches on Fort Weaver Road), it would have a volume/capacity ratio of less then 1.0 and operate at L.O.S. E.

* If the planned improvements to Fort Weaver Road are completed (widen to/from lanes from Renton Road to Papipi Road), the entire section of roadway would have V/C ratio of 0.78 or better and operate at L.O.S. C or better during both peak periods.

* The access roads into and out of Ewa Marina are planned to include two lanes in each direction at Fort Weaver Road. These are more than adequate to accommodate the projected traffic through the first increment of construction.

This issue of funding Fort Weaver Road widening is presently unresolved. To mitigate any impacts in lieu of this situation the developer will be coordinating efforts with the Department of Transportation and other appropriate agencies access requirements to ensure safe and efficient movement of traffic at the intersection of the access road prior to highway widening.

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[1]Level of service is a qualitative measure of the effect of a number of factors, which include speed and travel time, traffic interruptions, freedom to maneuver, safety, driving comfort, and convenience. They are represented by a standard which goes from A (best) to F (worst).

Noise

There are three sources of noise which are potentially sensitive relative to the project:

Construction. An intial short-term period of significant noise generation will occur during the construction period resulting primarily from the use of vehicles and equipment. However, this impact will be mitigated by conforming construction activities to the requirements of Title 11, Administrative Rules, developed by the State Department of Health.

Automobiles. The development of Increment I is expected to create an insignificant increase in automobile noise. The internal system of roadways is designed to draw traffic through the development via two access roads, one intersecting Fort Weaver Road near the uppermost boundary of the existing residential community, and the other intersecting Fort Weaver Road near the middle of the existing residential area to the east. However, Fort Weaver Road is already quite active and currently generates a significant noise impact on the existing community. Following improvements to this road, the contribution of Increment I to this source of noise should be minimal and without any significant intensification of noise pollution.

If deemed appropriate, reductions in traffic noise could be achieved by the use of strict controls of vehicular speeds, structures, and the application of green belts, grade separations, berms, and landscaping.

Aircraft. Flight patterns to Honolulu International Airport will impact the subject property. However, Increment I is not subjected to noise from the Naval Air Station at Barbers Point. Approximately 5.5 acres in the northeast corner of Increment I are impacted by noise generated by HIA approach activity to Runway 8 left. This 5.5 acre area is exposed to noise from Ldn 62.5 to Ldn 64 as shown on the State D.O.T. Honolulu International Airport Environs Master Plan and Study, dated June 1981.

As shown in Exhibit 6, the upper limit of the 62.5 Ldn contour line crosses the subject project at its extreme northeast corner. This corner, including an additional margin below the contour line, is designated for park use, thus ensuring that all residential areas below are located well within the 62.5 Ldn zone.

Subsequently on December 8, 1983, the Department of the Navy, Naval Air Station at Barbers Point, Hawaii issued the following statement in reference to Increment I:

"The proposed development as stated in the preparation notice is compatible with air operations at Naval Air Station Barbers Point as indicated by our noise Study of July 1982 and by the AICUZ study draft of October, 1983."

Both the Navy and the Department of Transportation-Airports Division recommended consideration such as a truth-in-sales ordinance for any noise sensitive areas, as recommended in the Honolulu International Airport and Environs Master Plan Study, June 1981. As such, future homeowners and residents will be provided with a convenant incorporated for properties within areas of aircraft noise exposures of 60 Ldn and above. A sample of the declaration of convenant is included in Appendix I.

Air Quality

Previous air quality studies for the total Ewa Marina project area (Root, 1979 and Morrow, 1979) have identified five categories of potential air pollution sources associated with the Ewa Marina Commmunity: (1) short term fugitive dust emissions from construction activities, (2) electric power generation, (3) solid waste incineration, (4) power boats, and (5) motor vehicles. Both studies have shown that sources 1 through 4 are either of negligible impact or can be mitigated by typical control techniques. Motor vehicle emissions, however, were identified as the principal potential source of air pollutants. The pollutants include: Carbon Monoxide (CO), Nitrogen Oxides (NOx), Hydrocarbons (HC), Sulfur Oxides (SOx), Lead (Pb), and Particulate Matter (PM). CO is a relatively inert combustion product and

the largest fraction of motor vehicle emissions; therefore, it is generally selected as the input parameter of choice in atmospheric pollutant dispersion model studies.

To identify the projected air quality impact for Increment I development, a correction factor was used to modify the pollutant emissions projected in 1992, in order to estimate the pollutant emissions associated with Increment I in 1991. The correction factor is based on the same assumption used in the traffic volume reduction described previously, namely a linear decrease in relation to the number of residential units in Increment I. Revised CO emissions at two potentially "critical" sites (noted in traffic analysis are shown in Table 2, Appendix J. The values are developed by multiplying the incremental changes in CO emissions at specific sites by the correction factor and adding this amount to anticipated background emissions without the development.

Vehicle capacity ratios associated with Increment I suggest no queing although CO emissions during the "worst case" meteorological conditions from Phase I (as defined in Appendix J or 700 acres of 5300 units) ambient air quality standards (Chapter 59 of Title 11, Administrative Rules) may occasionally be exceeded, emission standards are not expected to be exceeded as a

result of Increment I development. Air Quality monitoring during the following Increment I construction may be initiated to verify these projects.

The linear reduction approximations applied here are considered conservative for they do not reflect increased use of mass transportation services and development of the Barbers Point Deep Draft Harbor with a resulting decrease in eastbound traffic. Additionally, "worst case" meteorological conditions are expected to occur less than 10% of the time and will coincide with peak traffic (when maximum emissions are generated) only a small fraction of this percentage.

Although any degree of development and population would inevitably result in some abridgement of air quality, impacts from the construction and occupancy of Increment I of the Ewa Marina Community should be relatively minor. Short term impacts are primarily limited to fugitive dust emissions (as discussed in the previously cited reports). These impacts are expected to be mitigated by site specific control measures.

A copy of the Air Quality Analysis by M & E Pacific, Inc. dated December 1983 is provided in Appendix J.

Internal Circulation

Increment I will be served by two 60' wide major east-west access roads connecting to Fort Weaver Road, one crossing the north-northwest corner and the other crossing the lower middle portion of the project. A discussion of the north-south access road is included in Appendix H, PRC Voorhees analysis done in October 1980. Such an access would be elaborated in the environmental impact study for Increment II. It is noted, however, that the addition of a north-south access road would lessen the traffic impact of the overall project by diverting a significant amount of traffic from Fort Weaver Road and ensure that no additional improvements are necessary.

Internal residential areas for Increment I are served through small feeder roads which terminate in cul-de-sacs. All proposed on-site roadways and their connections to existing streets are sized to handle the projected loads and will be constructed according to applicable City and County, State, and Federal Standards.

5.9 HOUSING - UNIT/TYPE

Increment I will include a total of 1290 residential units, including 474 single family homes and 816 cluster units. The proposed housing absorption schedule is as follows:

Development Year	Units Absorbed	Cluster Housing	Single Family
		(8-30 units/acre)	(5 units/acre)
1	200 units	100 units	100 units
2	300 units	200 units	100 units
3	350 units	250 units	100 units
4	300 units	200 units	100 units
5	140 units	66 units	74 units
Total	1290 units	816 units	474 units

With an overall density of 8.37 units per residential acres, Increment I would have a 5 units per acre density of single family and 13.8 units per acre density of cluster units. Ten percent (10%) of the total proposed housing units will be priced at a level which is affordable to those in the low/moderate income category, as applicable to all zone changes, cluster and planned development housing applications.

As shown in the above schedule, the development of Increment I will have a positive effect on the quality of housing availability, with an average of 258 new units added to the housing market each year through a 5-year period. It is also anticipated that the increse in housing stock will have a minimal effect on land and housing speculation. Development within Increment I may appreciate values of existing homes in the area.

This impact, however, is difficult to assess. Property values have been experiencing a slight increase in this area without and independent of the implementation of Increment I, resulting in an increase of local property taxes overtime.

5.10 WATER COMMITMENT

On March 6, 1984, the Board of Water Supply, City and County of Honolulu, verified that the present policy of the City and County as expressed through the General Plan and Ewa Development Plan is to develop a secondary urban center in the West Beach-Makakilo-Ewa Area. Because of this policy, the Board of Water Supply is responsible to support this effort by ensuring that the necessary water facilities to support this secondary urban center are provided. (See Appendix L)

Dual Water System.

Projected potable water requirements for the total proposed development in the Ewa area (including other projects such as West Beach) approximates 20 million gallons per day (mgd). However, the Board of Water Supply proposes to reduce this amount substantially through use of a dual water system. In contrast to single systems that provide only potable water, dual systems for Ewa involves the distribution of two grades of water, potable and

non-potable. The non-potable water will have higher salinity and total dissolved solids but will not otherwise have adverse health effects. The potable water is provided for drinking, cooking, and cleaning. The non-potable water is provided for irrigation and other non-potable uses. Depending on the degrees of implementation, such a plan can reduce the potable water requirement by half. Use of dual systems will give better assurance that the water needs will be met for the total development. Ewa is in an agricultural area with supplies of brackish groundwater that is currently being used for cane irrigation. As the agricultural land is converted to urban use, these brackish water supplies should become available for use in a dual water system.

According to the Board of Water Supply, the required potable water can be made available through one or both of the following means:

1. Capture of Waiau spring water.

   The HECO Waiau spring presently leaks approximately 5-8 mgd of potable water into Pearl Harbor. The Board of Water Supply is providing for means to capture this water and make it available to help meet Ewa's future potable demand.

2. Reduction in export from the basin by imports to Honolulu from Windward sources.

Presently, approximately 40.0 mgd are exported from the Pearl Harbor Basin to Honolulu. The reductions in export from the Pearl Harbor Basin to Honolulu from Windward sources are contingent on the results from our exploratory well development program. Source potential exists although individual developments tend to be small. Collectively, if the planned sources were to be developed and estimated yields prove correct, excess water estimated at 10.0 mgd, could be diverted to Honolulu by 1990, which in turn, would allow the Board of Water Supply to reduce export from the Pearl Harbor basin and to use the water for proposed developments in the basin, including the Ewa, Makakilo, Campbell Industrial areas.

3. Reduction in pumpage to the Waianae-Makaha area with development of wells at Makaha and Waianae.

The Board plans to develop wells both at Makaha and Waianae with a total potential yield of 6.0 mgd. If successful, the development of the wells would allow the Board to reduce export to these areas and make the water available to the Ewa plain area.

Since the project area lies withing the Pearl Harbor Groundwater Control area, certain restrictions apply to Increment I with respect to sources of water. In any event, the amount of water withdrawn will not exceed the limit. Control will be under the Board of Water Supply. Because new expansion in water is not possible without major improvements, the Department of Land and Natural Resources, State of Hawaii, will not allow new sources development without a corresponding reduction in certified pumpage by another user of the resource.

Subdivision plans for the development of the dual water system will be established in accordance with existing (and yet to be determined) regulations, statutes, procedures, and policies established by the Department of Public Works, City & County of Honolulu. These plans must be approved by the regulatory agencies who are empowered to grant such installations. Since the system will be dedicated to the City, installation procedures and subsequent maintenance will be done by the Department of Public Works.

Alternative Schemes.

In coordination with the Board of Water Supply for the overall project area, several schemes to project water demand have been assessed. Two schemes were considered. In scheme A, the

non-potable system would only supply irrigation requirements, while in Scheme B the system would also supply toilets inside houses.

Subsequent to cost evaluations, marketing implications and resource availability, an "A-Modified" scheme for the dual system was adopted. Variations from the BWS scheme are:

* Makakilo expansion will be supplied by an all potable system; all needed offsite improvements have already been installed. (Any new sources in a designated ground water control area for the expansion of Makakilo will require the approval of the State Department of Land and Natural Resources and the concurrence of the Board of Water Supply).

* Single family residential development will be supplied by an all potable system.

* Fire protection would be provided through the potable system.

* Where groundwater resources permit and economics are warranted, private irrigation systems would be developed. The golf courses for West Beach and Ewa Plantation outside of the Ewa Marina Community are most notable examples of this.

On April 1, 1983, a joint committee including Campbell Estate, consultants, the Board of Water Supply (BWS) and the Board of Health was established by BWS to evaluate the proper application of the dual water system. This committee determined that the Ewa Marina Community was unique in that at the present time it was the only development which contains detached single family housing. Although only a portion of the community contains these detached single family houses, it was determined and agreed by the Board of Water Supply that non-potable water should not be used in an "uncontrolled" environment such as the single family houses. Therefore, an allowance was made to provide water used in these detached single family housing units as potable. This condition received approval also from the Department of Health and accounts for .39 mgd. (non-potable water will be contained for parkway, greenbelt and common areas).

New Supply Wells. Projected water demand and development of new supply wells through the year 2000 for year-by-year potable and non-potable water requirements will be presented in two categories: 1) East Ewa comprised of the Plantation, Village and Ewa Marina projects and 2) West Ewa comprised of West Beach and expansions of JCIP and Makakilo. These categories will be divided as required by project, but not necessarily by type of land use.

The schedule for installation of new supply wells would be presented in five catagories:

1. New potable wells above H-1 Freeway to supply East and West Ewa.

2. Campbell Estates Makakilo wells.

3. New potable wells in upper Makakilo to supply expansion for that area.

4. Non-potable well field to supply East Ewa.

Transfer of certified pumpage will be phased from OSCO to Campbell Estate to BWS and the possible supply by BWS projects at Waiau and Makaha wells will be reviewed to reduce the number of wells in the area above H-1 Freeway. New sources would only be relied upon to fulfill development by BWS for inclusion in the Master Water Plan for Ewa Plain. Mitigation measures would require developers to provide adequate sources approved by BWS.

With respect to the proposed "A-Modified" scheme for the dual water system, Campbell Estate is seeking approval to be co-holder with Oahu Sugar Company, sharing in the use of certain wells. As Oahu Sugar Company's requirement for water is reduced with

correspondingly reduced pumpage from those wells, Campbell Estate will use the allocation released and develop new wells to service the proposed development. There should, therefore, be no impact upon the irrigation water needs of Oahu Sugar Company because the re-allocation to the dual water system will occur as Oahu Sugar Company's requirement for water is reduced.

Pipelines and Storage Tanks.

Proposed pipelines and storage tanks through year 2000 include:

* Potable and non-potable pipelines to East Ewa based on 228-foot spillway elevations for both systems.

* Pipeline(s) from potable tanks above H-1 Freeway delivering East Ewa's peak flow to Farrington Highway and West Ewa's maximum day flow to the Honouliuli boosters.

* Analysis of the adequacy of the existing 30-inch Farrington Highway main from the Honouliuli boosters to the Barbers Point tanks.

* Onsite potable and non-potable pipelines from Barbers Point tanks to West Beach and JCIP expansion.

* Onsite pipeline of other projects.

* Storage Tanks

  - Potable tanks above H-1 Freeway for East Ewa supply and booster pumping to West Ewa.

  - Non-potable tanks above H-1 Freeway for service to East only.

  - Barbers Point potable tanks for service to West Ewa and booster pumping to Nanakuli.

  - Non-potable Barbers Point tanks for service to West End only.

Increment I and Overall Project Requirements. Of the additional 20 million gallons per day (mgd) required to service all the developments planned for Ewa over the next 20 years (Year 2000), the subject property (Increment I) requires approximately 700,000 gallons per day. This is based on the Board of Water Supply's standard of 500 gallons per dwelling unit per day plus an allowance for commercial use. A preliminary summary of water resources (potable and non-potable) projected for the overall project including Increment I is as follows:

EWA MARINA COMMUNITY
WATER MASTER PLAN
PROJECTED POTABLE WATER DEMAND
February 1984

Parcel	Type	No. of Units	Flow/Unit (GPD)	Ave. Flow (MGD)	Max. Flow (MGD)	Peak Flow (MGD)	Point of Draft
A	SF	100	500	0.05	0.08	0.16	23
B	SF	184	500	0.09	0.14	0.28	3
C	SF	118	500	0.06	0.09	0.18	24
D	SF	129	500	0.06	0.10	0.20	35
E	SF	51	500	0.03	0.04	0.08	26
F	SF	122	500	0.06	0.09	0.18	24
G	SF	54	500	0.03	0.04	0.08	26
H	SF	130	500	0.06	0.09	0.18	25
I	SF	116	500	0.06	0.09	0.18	29
J	LD	336	331	0.11	0.17	0.34	4
K	LD	440	331	0.15	0.22	0.44	5
L	SF	185	500	0.09	0.14	0.28	36
M	SF	75	500	0.04	0.06	0.12	37
N	SF	85	500	0.04	0.06	0.12	28
O	SF	92	500	0.05	0.07	0.14	30
P	SF	153	500	0.08	0.12	0.24	31
Q	MD	690	331	0.23	0.34	0.68	32
R	SF	162	500	0.08	0.12	0.24	32
S	SF	232	500	0.12	0.17	0.34	31
T	SF	60	500	0.03	0.04	0.08	30
U	SF	71	500	0.04	0.05	0.10	7
V	SF	124	500	0.06	0.09	0.18	38
W	LD	121	331	0.04	0.06	0.12	9
X	LD	278	331	0.09	0.14	0.28	11
Y	MD	552	331	0.18	0.27	0.54	12
Z	SF	190	500	0.10	0.14	0.28	39
1	COMM	2 AC	3000/AC	0.006	0.01	0.02	22
2	COMM	13 AC	2160/AC	0.03	0.04	0.08	14
3	COMM	8 AC	2160/AC	0.02	0.03	0.06	16

EWA MARINA COMMUNITY
WATER MASTER PLAN
PROJECTED POTABLE WATER DEMAND (Cont)

Parcel	Type	No. of Units	Flow/Unit (GPD)	Ave. Flow (MGD)	Max. Flow (MGD)	Peak Flow (MGD)	Point of Draft
4	COMM	17 AC	2160/AC	0.04	0.06	0.12	18
5	COMM	15 AC	2160/AC	0.03	0.05	0.10	20
6	PRESERV.	27.5 AC	720/AC	0.02	0.03	0.06	19
P-1	PARK	30 AC	720/AC	0.02	0.03	0.06	34
P-2	PARK	5.7 AC	720/AC	0.004	0.006	0.01	2
P-3	PARK	14.5 AC	720/AC	0.01	0.02	0.04	2
P-4	PARK	4.3 AC	720/AC	0.003	0.005	0.01	10
	BOATS	1600	50/BOAT	0.08	0.12	0.24	20
			SUBTOTAL	2.27	3.42	6.84	
FUTURE DEVELOP	SF	2244	500	1.12	1.68	3.36	6,15
			SUBTOTAL	3.39	5.10	10.20	
FUTURE GOLF COURSE	PARK	180 AC	720/AC	0.13	0.19	0.38	17
			TOTAL	3.52	5.29	10.58	

Note:

C Values for pipes: 8", 12" - C = 110
16", 20" - C = 120

EWA MARINA COMMUNITY
WATER MASTER PLAN
PROJECTED NON-POTABLE WATER DEMAND
February 1984

Parcel	Type	No. of Units	Flow/Unit (GPD)	Ave. Daily Demand (MGD)	Peak Flow (MGD)	Point of Draft
J	LD	336	149	0.05	0.10	3
K	LD	440	149	0.07	0.14	4
Q	MD	690	149	0.10	0.20	15
W	LD	121	149	0.02	0.04	5
X	LD	278	149	0.04	0.08	7
Y	MD	552	149	0.08	0.16	8
2	COMM	13 AC	1440/AC	0.02	0.04	10
3	COMM	8 AC	1440/AC	0.01	0.02	11
4	COMM	17 AC	1440/AC	0.02	0.04	12
5	COMM	15 AC	1440/AC	0.02	0.04	14
6	PRESERV.	27.5 AC	4080/AC	0.11	0.22	13
P-1	PARK	30 AC	4080/AC	0.12	0.24	16
P-2	PARK	5.7 AC	4080/AC	0.02	0.04	2
P-3	PARK	14.5 AC	4080/AC	0.06	0.12	2
P-4	PARK	4.3 AC	4080/AC	0.02	0.04	6
		TOTAL		0.76	1.52	

Note:

C Values for pipes: 8", 12" - C = 110
16", 20" - C = 120

A copy of the draft Ewa Water Plan 1985-2000, Campbell Estate, March 1984 and respective water demand requirements by land use for Campbell Estate developments and residual pressure computations for peak hours and fire flow rates are shown in Appendix K. Exhibits 22 and 23 illustrate potable and non-potable water master plans for the Ewa Marina Community.

As indicated previously, the task of providing water is a joint undertaking involving the Estate and all affected developers working with public agencies and other organizations. Negotiations are presently underway with governmental agencies and other entities.

5.11 IMPACT ON PUBLIC SERVICE/UTILITIES

Electricity

Electrical power for Increment I will be provided by the Hawaiian Electric Company (HECO) and connected to the Ewa Beach Substation. Accordingly, future development in the Honouliuli region such as Increment I will be handled by the Company on an ad hoc basis provided sufficient advance warning is given to the Company to allow the programmed expansion of facilities as required. Street lighting, telephone, and electrical systems will be underground in accordance with applicable City Ordinances. Based on HECO's load data, it is estimated that Increment I and subsequent projects including residential, commercial, light industrial, parks, and schools, will consume electrical energy annually as follows:

Residential	120,960,000 KWH
Commercial	17,337,000 KWH
Schools/Parks	1,425,000 KWH

Presently, HECO has the capability of servicing the estimated 1290 units of Increment I. Development of more units outside of Increment I, however, may require a 46 KV substation and two additional 46 KV lines thereto. Should this be necessary, the

site for the substation will be leveled and cleared, with road access provided by the developer. The 46 KV lines to the substation can be strung overhead and the primary 1 distribution system installed underground as required by the City and County of Honolulu Ordinance 2875.

Exhibit 24 shows HECO's existing utilities.

Gas

Gas service required for Increment I will be provided by GASCO, Inc. of Pacific Resources, Inc., which currently provides gas service to the Ewa Beach area. The existing main source of supply is from two 2,000 gallon lpg tanks in a holder station located just east of the elementary school north of Papipi Road in Ewa Beach. The gas is propane with a heating value of 2.520 BPTU per cubic foot per hour and specific gravity of 1.5; applicable operating pressure is 11" water column (91,300 BTU/gallon).

Gas mains two inches in diameter run from the gas holding station down Papipi and Fort Weaver Roads. Connections to this system will occur where these roads abut Increment I. These gas mains will be required to serve Increment I and will be placed with the other utilities within the major and secondary road systems

throughout the project area. Storage facilities will be generated by GASCO, Inc., as required.

Communications

Telephone service for Increment I as required will be provided by the Hawaiian Telephone Company, a subsidiary of General Telephone and Electronics Corporation. Inter-island and mainland calls are handled by a direct dialing system. Extension of telephone facilities to cater to new community development is provided by the Company as required, provided that sufficient advance planning time is allowed.

Although the cost of the telephone manholes and duct system is to be borne by the developer, they will be installed at no cost to the developer. In addition, the Hawaiian Telephone Company will purchase a minimum of 10,000 square feet of land within the development for its switching station, which location will be determined at a later date. Since the site is located in a region where television reception is particularly good, cable transmission may not be required. Television cable system for the Ewa area, however, is available through Cable Vision, Inc.

Fire Protection

Fire protection services are provided by the City and County of Honolulu Fire Department for all non-military areas on the Island of Oahu. Increment I will be served by the existing Ewa Beach Fire Station No. 24 located in Ewa Beach at the intersection of Pohakupuna and Fort Weaver Roads. The entire area of Increment I lies within a hypothetical two-mile service radius of the station, which satisfies the service location standards desirable for highly urbanized areas.

Due to the rapid growth of the Ewa Community, a new fire facility in the Campbell Industrial Park and Ewa Tenney Village area and the relocation of the existing Ewa Beach Fire Station is under consideration. These projects were originally deferred beyond fiscal year 1986, but are now reconsidered as higher priorities.

The present Ewa Beach facility consists of a 1,250 pumper truck with a five-man crew on a continuous 24-hour basis. In case of major conflagrations in the local area, backup service would be provided by the Waipahu fire station which has a pumper as well as a ladder truck. Also available under a mutual assistance pact is a fire protection company operated by the United States Navy at Barbers Point Naval Air Station.

Police Protection

Similar to fire protection services, police protection is provided by the City and County of Honolulu Police Department. The Ewa Beach Community is currently served by the Pearl City Precinct, which operates two 24-hours patrols, Beats 326 and 327, in the area. These two patrol areas effectively divide the Ewa community at Fort Weaver Road. Beat 326 covers Ewa Township and all lands westerly of Fort Weaver Road and Barbers Point Naval Air Station, including Increment I and the beachfront, while Beat 327 oversees the Ewa community mauka of the beachfront and easterly of Fort Weaver Road.

The Pearl City Precinct covers an extensive geographic service area, ranging from Red Hill to Kaena Point. This area is undergoing rapid development, with the consequence that the currently expanding and planned new communities may not be serviced by existing manpower levels.

A new "beat" may be necessary to serve Increment I and other new developments in Ewa Beach. According to the Honolulu Police Department, new developments are often a redistribution of present population and can be serviced through reallocation of available police resources. As development progresses, the Honolulu Police

Department will provide the resources to adequately service the growing population. As needed, additional beats will be considered.

Emergency Medical

Emergency medical services are provided by the City and County of Honolulu's Department of Health. A total of 12 ambulance units are stationed at strategic points throughout Oahu; the ambulance responding to Ewa Beach is located at the fire station in Waipahu. Discussions with the Health Department officials indicate that Increment I can be adequately served under the existing system of ambulance deployment without placing undue stress on the overall level of service. The Waipahu ambulance, for example, responds currently to demand for service at the rate of 2,500 to 3,000 calls per year. In contrast, the Waikiki-based ambulance manages over 7,000 calls on an annual basis.

School Facilities

When Increment I and subsequent projects for Ewa Marina are developed, the anticipated enrollment by school category is as follows: Elementary, 1,050 students; Intermediate, 280 students; and High School, 500 students. This relatively small increase in school age population is due to the anticipated nature of the Ewa

Marina Community. The housing density and market range of the project suggests a high percentage of small family units of mature families where children are over high school age. The Ewa Beach Community is presently served by a complex of schools located south of Increment I at the intersection of Fort Weaver Road and Papipi Roads. Existing facilities include the following: Ewa Beach Elementary School; Kaimiloa Elementary School; Pohakea Elementary School; Ilima Intermediate Schoo; and Campbell High School. Enrollment at the these school has generally been declining in recent years, particularly in the upper grade levels. As a consequence, it is very likely that Increment I generated intermediate and high shcool students can be adequately served by the existing facilities.

On December 28, 1983, the Department of Education (DOE) indicated that at present student enrollment specifically for Increment I would be as follows:

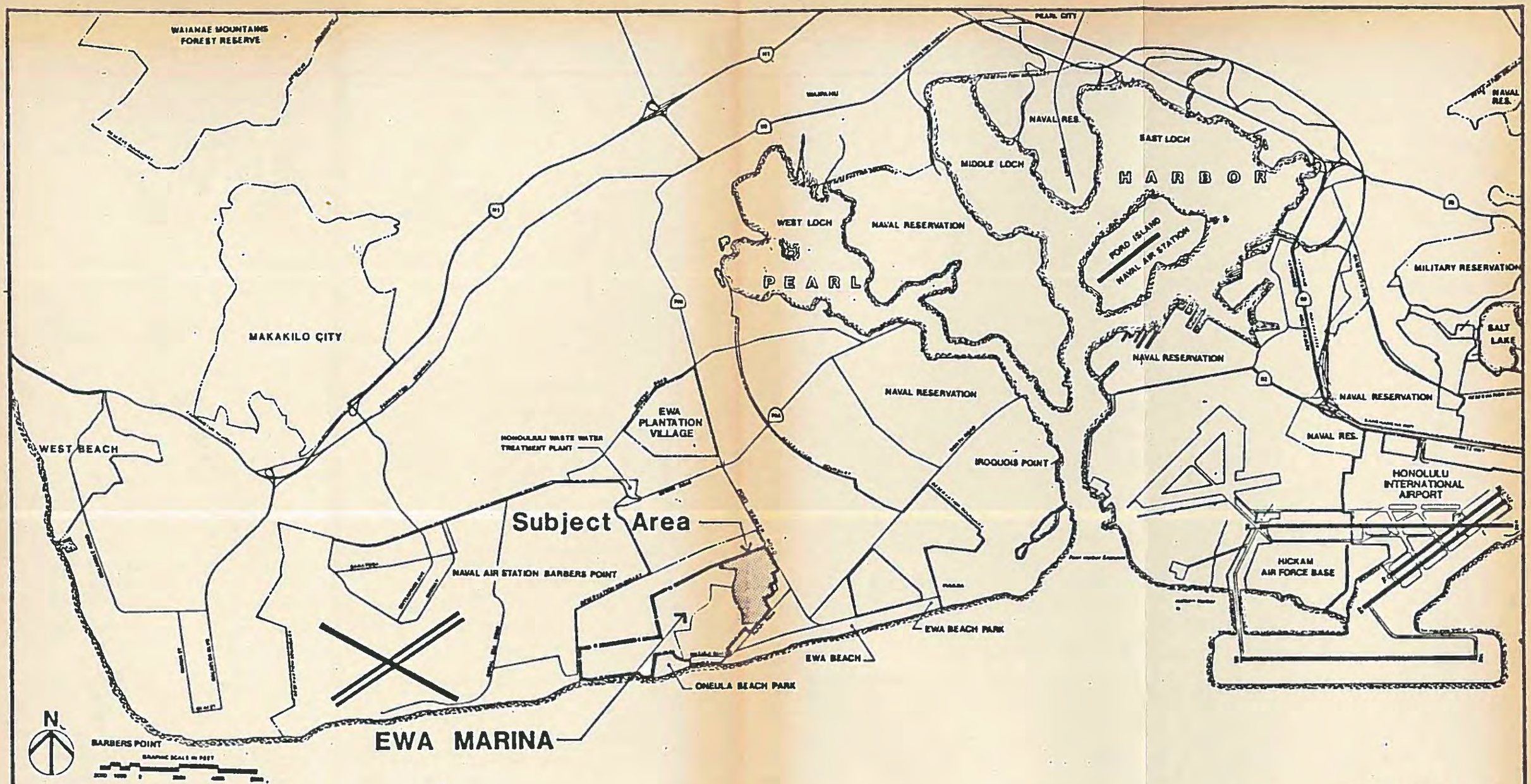
School	Grade	Approximate Enrollment
* Ewa Beach Elementary	K - 6	40 - 170
* Ilima Intermediate	7 - 8	25 - 40
* Campbell High School	9 - 12	40 - 80

The DOE confirmed that the above listed schools could accommodate the enrollment increase with existing and planned school facilities. Previously, DOE reported to the Department of General Planning that adequate facilities were available for student enrollment generated by the total overall Ewa Marina project,

including Increment I. This was in connection with the recent amendments to the Ewa Development Plan during the F.Y. 82-83 annual review. Consequently, school facilities for Increment I appear adequate.

EXHIBIT 1

VICINITY MAP



VICINITY MAP

EXHIBIT 1

EWA MARINA COMMUNITY
OAHU HAWAII

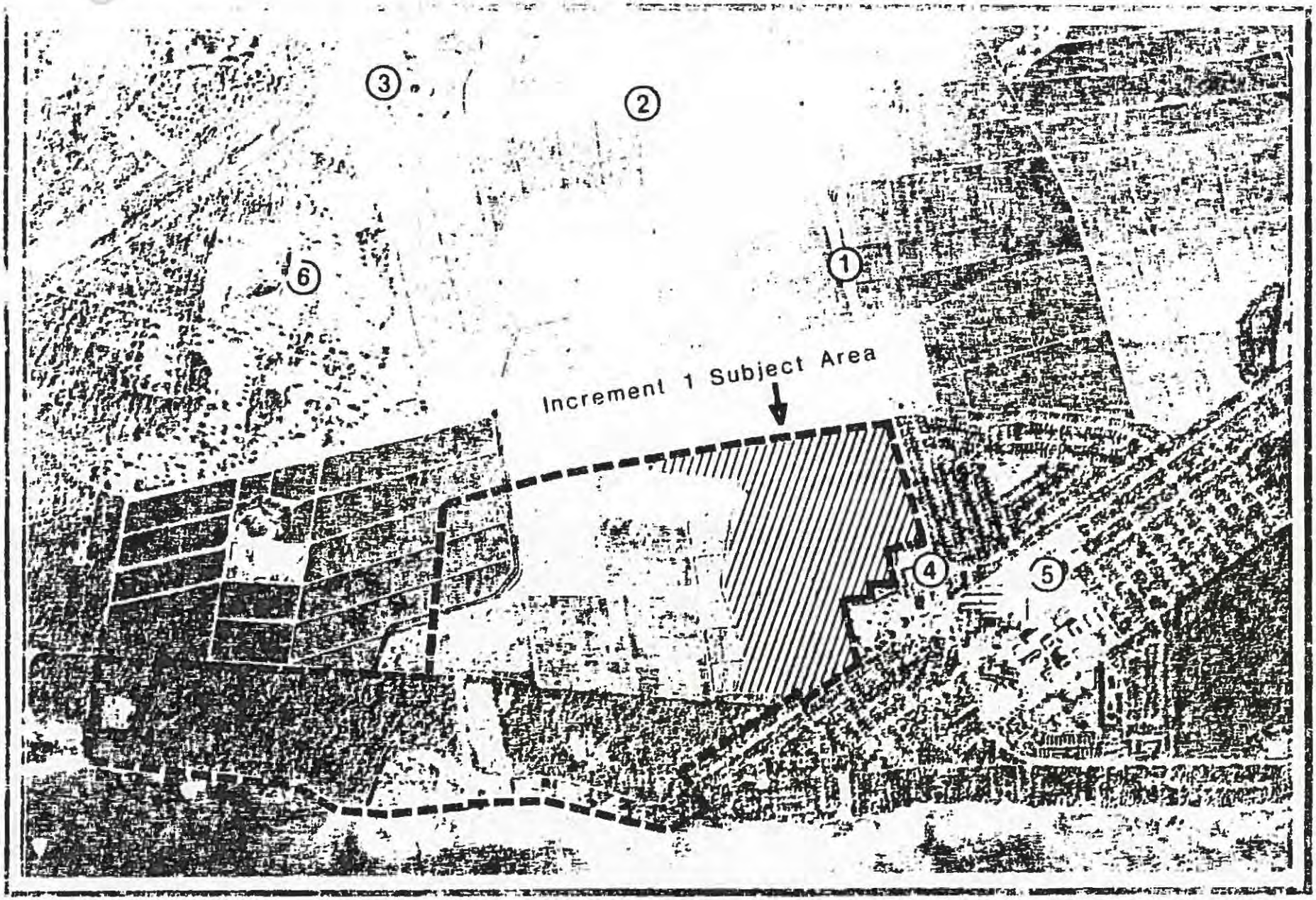
MSM & ASSOCIATES INC
MASTER DEVELOPERS

PEARSON & WUESTHOFF AIA AICP
ARCHITECTS PLANNERS

DATE 8/83
PLATE NUMBER
VM

EXHIBIT 2

AERIAL VIEW



AERIAL VIEW

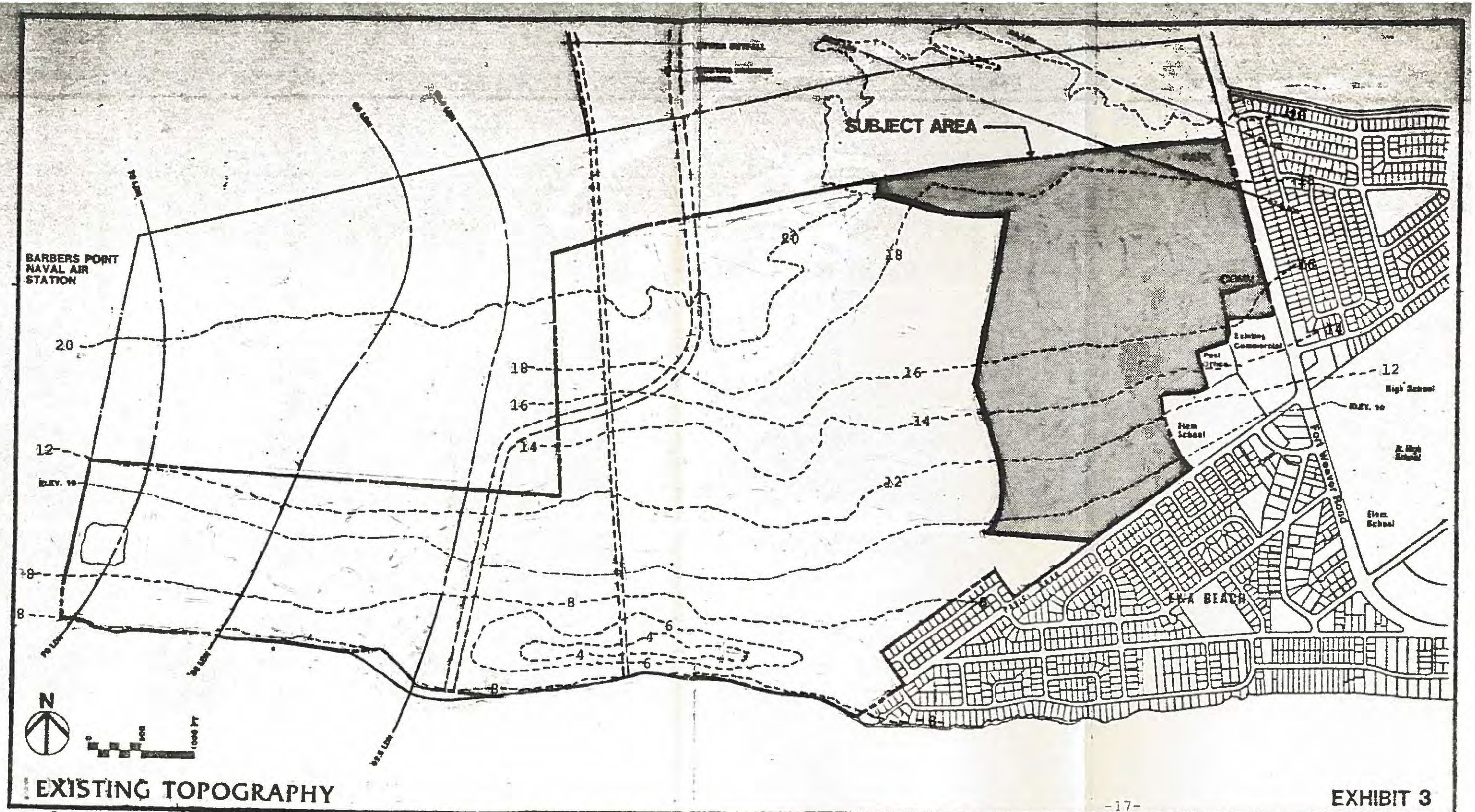
EXHIBIT 2

Subject Property

1. Fort Weaver Road
2. Geiger Road
3. Honouliuli Sewer Treatment Plant
4. Ewa Beach Shopping Center
5. Campbell High & Ilima Intermediate School
6. Barbers Point Golf Course

EXHIBIT 3

EXISITING TOPOGRAPHY



EXISTING TOPOGRAPHY

EXHIBIT 3

EWA MARINA COMMUNITY
OAHU HAWAII

MSM & ASSOCIATES INC
MASTER DEVELOPERS

PEARSON & WUESTHOFF AIA AICP
ARCHITECTS PLANNERS

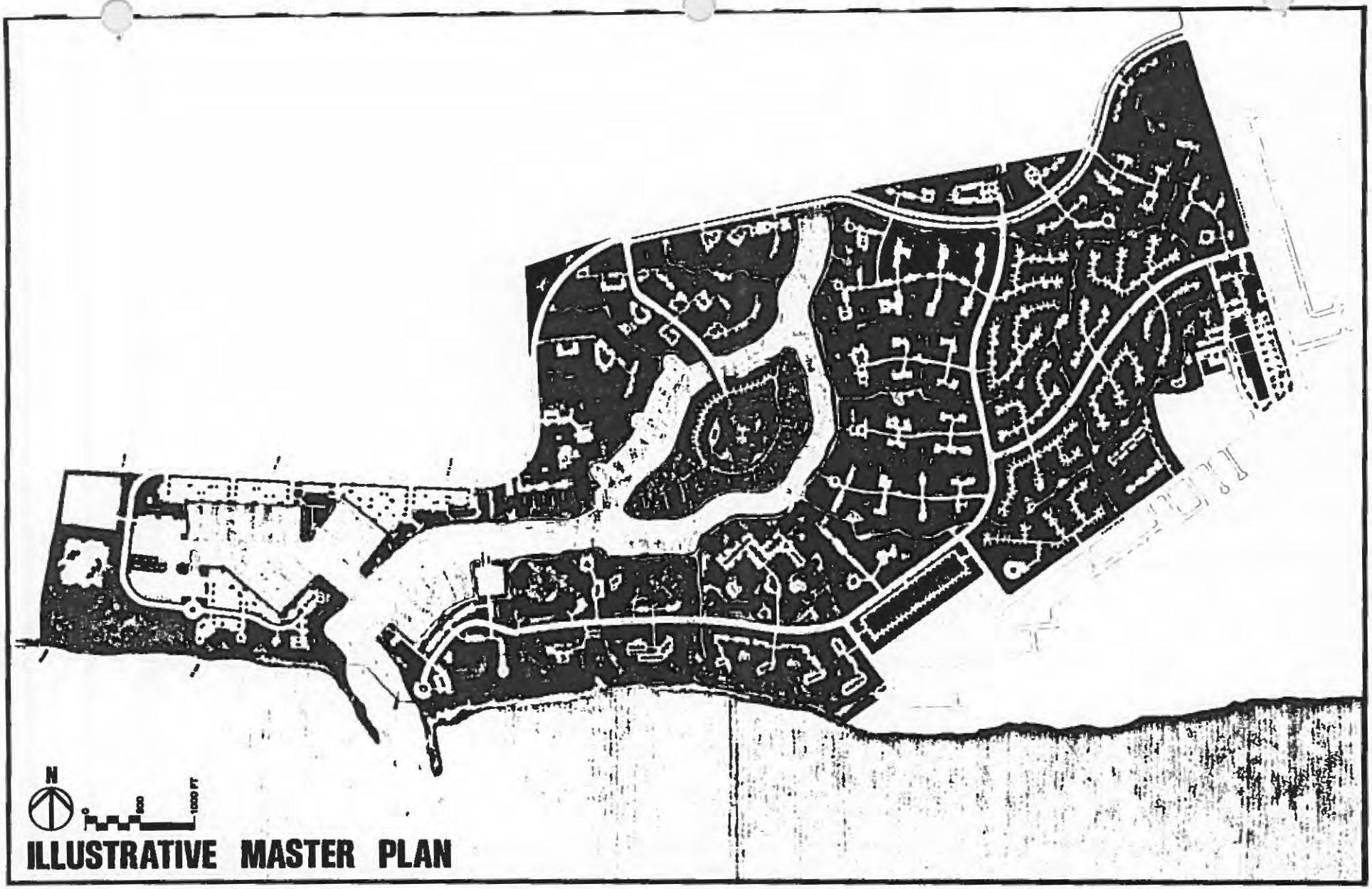
DATE

PLATE NUMBER

LU-1

EXHIBIT 4

OVERALL PROJECT CONCEPT



EWA MARINA COMMUNITY
OAHU HAWAII

MSM & ASSOCIATES INC
MASTER DEVELOPERS

PEARSON & WUESTHOFF AIA AICP
ARCHITECTS PLANNERS

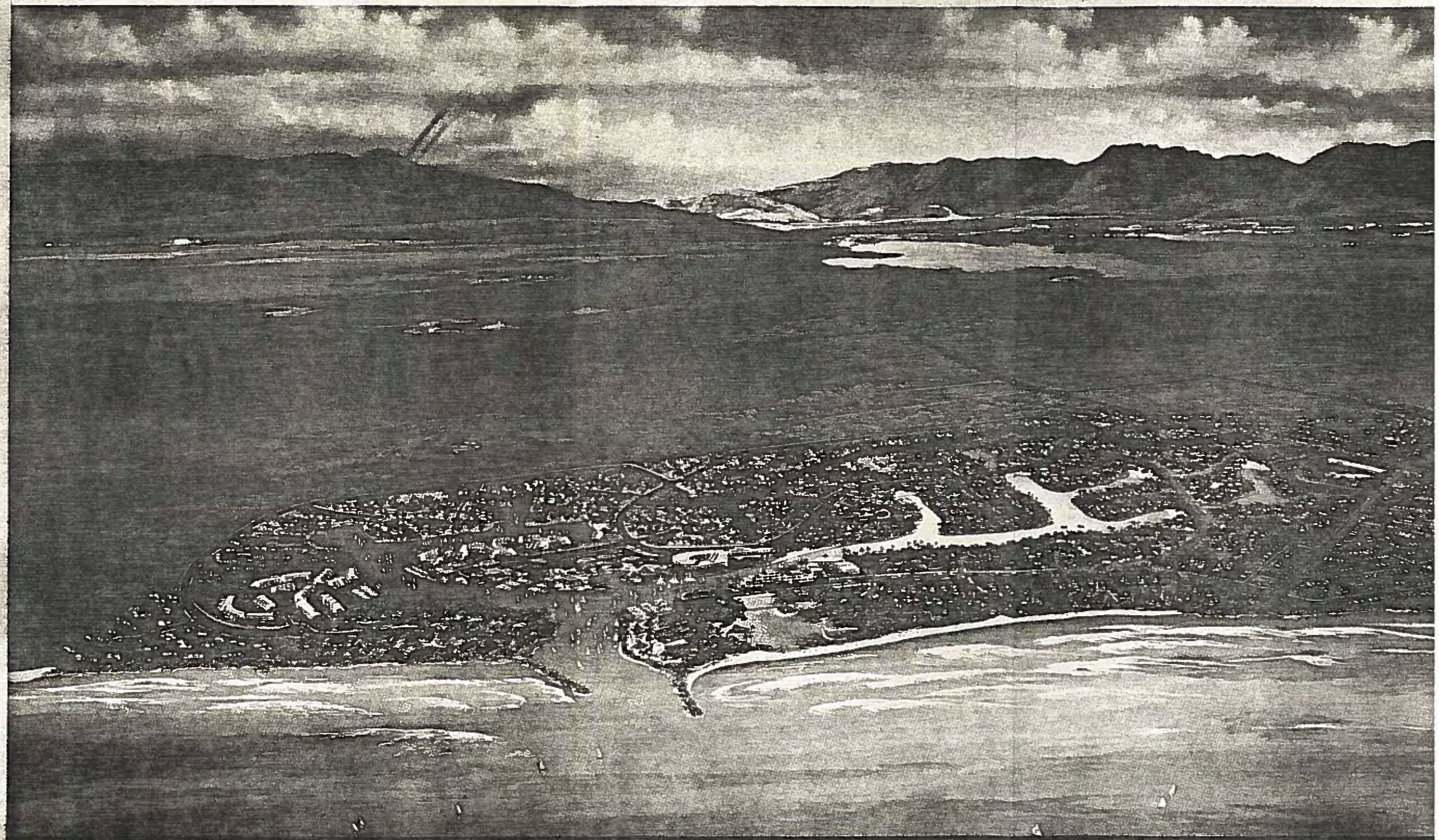
DATE AUG 83
PLATE NUMBER

EXHIBIT 4

EXHIBIT 5

AERIAL PERSPECTIVE

(Marina configuration has been revised)



MSM & ASSOCIATES INC
MASTER DEVELOPERS

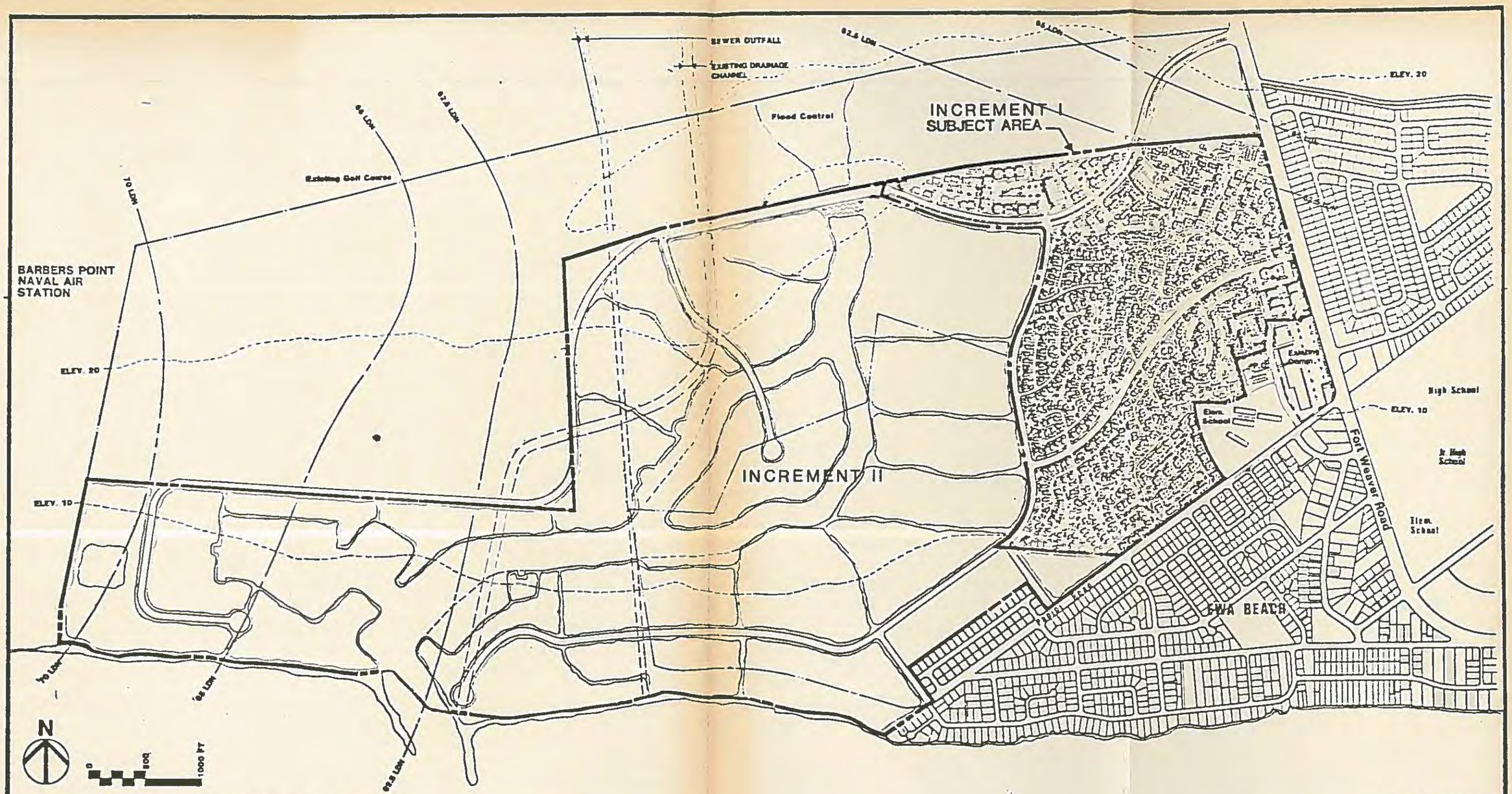
PEARSON & WUESTHOFF
AIA ARCHITECTS PLANNERS AIP

EWA MARINA COMMUNITY
OAHU HAWAII

AERIAL PERSPECTIVE

EXHIBIT 6

SITE PLAN - INCREMENT I



SITE PLAN - SUBJECT AREA INCREMENT I

EXHIBIT 6

EWA MARINA COMMUNITY
OAHU HAWAII

MSM & ASSOCIATES INC
MASTER DEVELOPERS

PEARSON & WUESTHOFF AIA AICP
ARCHITECTS PLANNERS

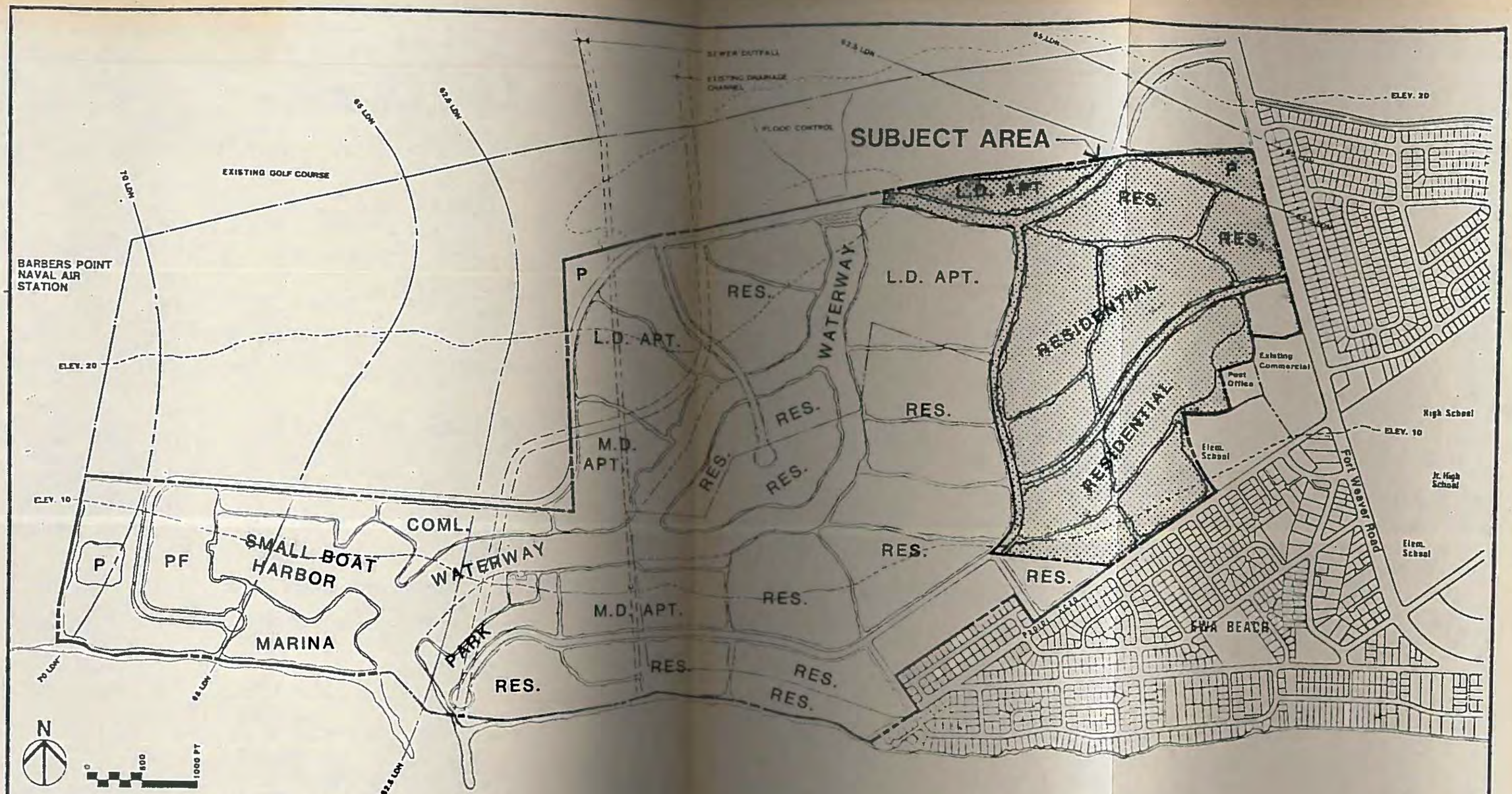
DATE August 85
PLATE NUMBER
SP-1

EXHIBIT 7

DEVELOPMENT PLAN;

LAND USE MAP

(CITY AND COUNTY OF HONOLULU)



LAND USE MAP (GENERALIZED)

EXHIBIT 7

LEGEND

RES	RESIDENTIAL
LDA	LOW DENSITY APARTMENT
MDA	MEDIUM DENSITY APARTMENT
COML	COMMERCIAL
PF	PUBLIC FACILITY
P	PARK / RECREATION

EWA MARINA COMMUNITY
OAHU HAWAII

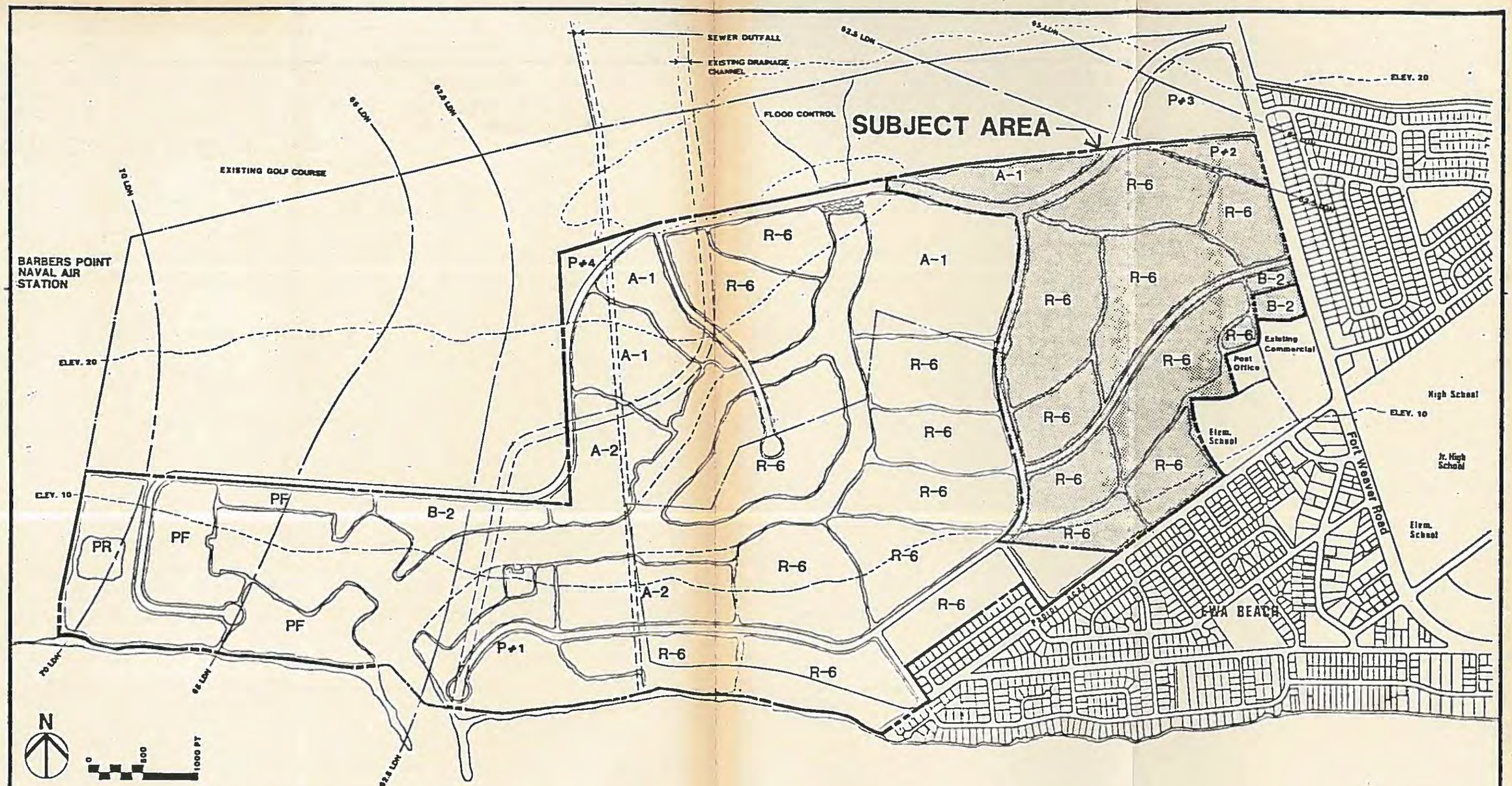
MSM & ASSOCIATES INC
MASTER DEVELOPERS

PEARSON & WUESTHOFF AIA AICP
ARCHITECTS PLANNERS

DATE August 83
PLATE NUMBER
PZ-1

EXHIBIT 8

PROPOSED ZONING



PROPOSED ZONING PLAN

EXHIBIT 8

LEGEND

R-6	RESIDENTIAL
A-1	LOW DENSITY APARTMENT
A-2	MEDIUM DENSITY APARTMENT
B-2	COMMERCIAL
PF	PUBLIC FACILITY
P	PARK / RECREATION
PR	PRESERVATION

EWA MARINA COMMUNITY
OAHU HAWAII

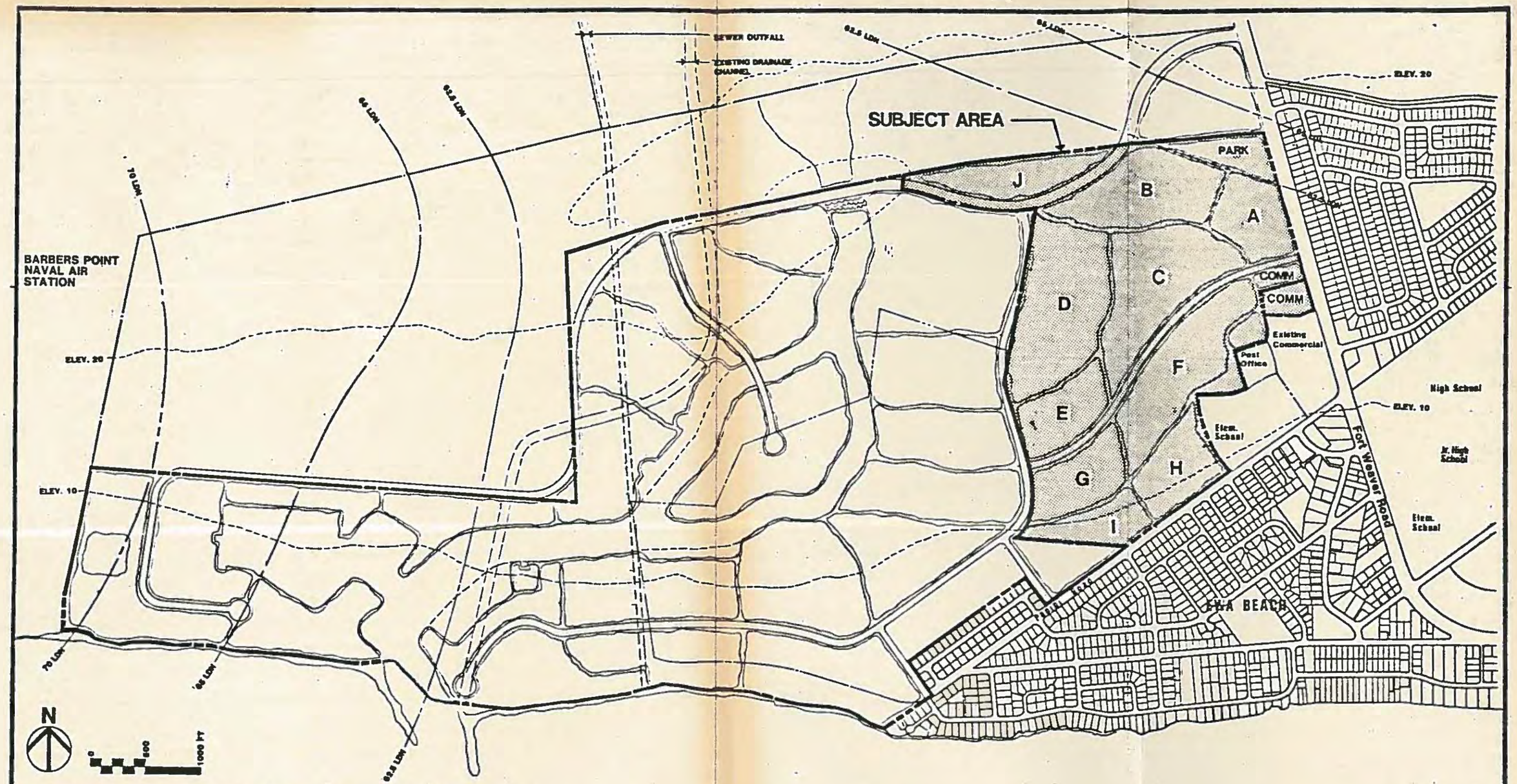
MSM & ASSOCIATES INC
MASTER DEVELOPERS

PEARSON & WUESTHOFF AIA AICP
ARCHITECTS PLANNERS

DATE August 83
PLATE NUMBER
PZ-1

EXHIBIT 9

LAND USE SUMMARY MAP



LAND USE SUMMARY - SUBJECT AREA

EXHIBIT 9

AREA SUMMARY

RESIDENTIAL		: 154.2 ac
R-6	143.0 ac	
A-1	11.2 ac	
COMMERCIAL		: 5.0 ac
PARK		: 5.7 ac
ROADS		: 9.8 ac

TOTAL (SUBJECT AREA) 174.7 ac

LAND USE SUMMARY

PARCEL A	10.0 ac : 10 u/ac	:100 units	PARCEL F	24.5 ac : 5 u/ac	:122 "
B	18.4 ac : 10 u/ac	:184 "	G	10.9 ac : 5 u/ac	: 54 "
C	23.6 ac : 5 u/ac	:118 "	H	11.2 ac : 11.6 u/ac	:130 "
D	25.9 ac : 5 u/ac	:129 "	I	8.3 ac : 8 u/ac	: 66 "
E	10.2 ac : 5 u/ac	: 51 "	J	11.2 ac : 30 u/ac	:336 "

TOTAL (SUBJECT AREA) 154.2 R-ACRES, 1290 R-UNITS

EWA MARINA COMMUNITY
OAHU HAWAII

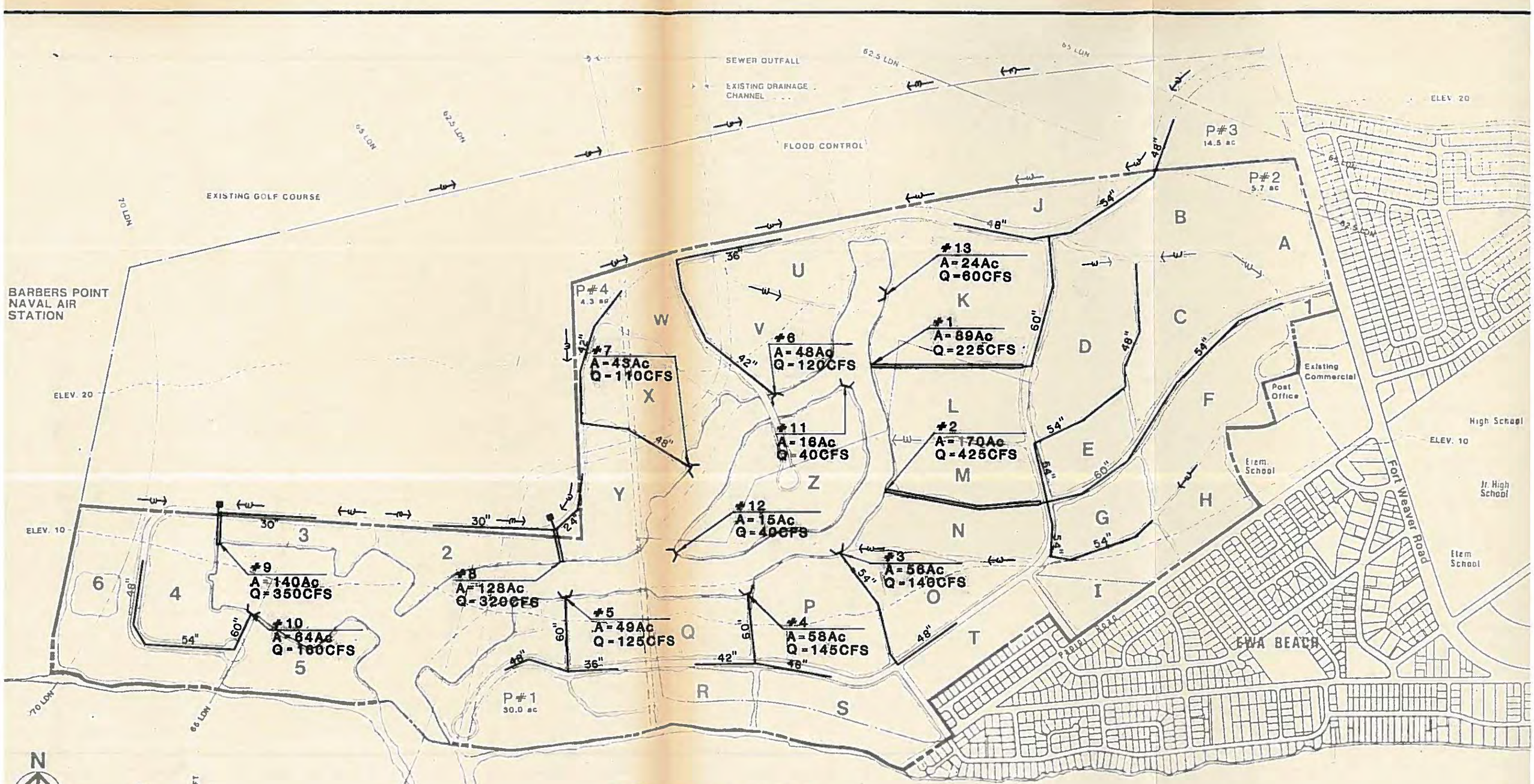
MSM & ASSOCIATES INC
MASTER DEVELOPERS

PEARSON & WUESTHOFF AIA AICP
ARCHITECTS PLANNERS

DATE August 83
PLATE NUMBER
LU-1

EXHIBIT 10

DRAINAGE MASTER PLAN



DESIGN STORM Tm=10 YRS.

EXHIBIT 10

EWA MARINA COMMUNITY

DRAINAGE MASTER PLAN

M&E PACIFIC, INC.

MAR

EXHIBIT 10a

DRAINAGE MASTER PLAN - INCREMENT I

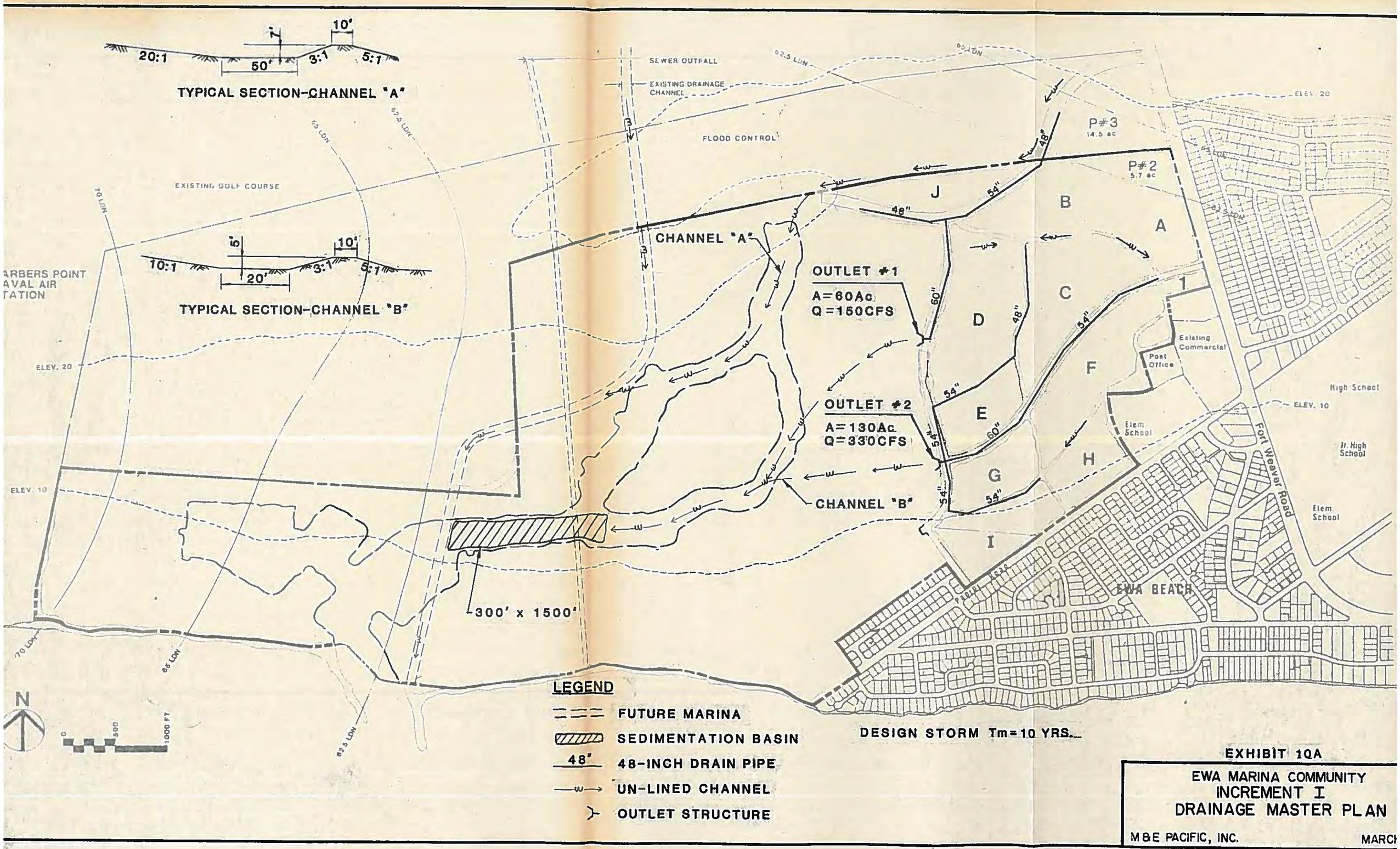


EXHIBIT 10A

EWA MARINA COMMUNITY
INCREMENT I
DRAINAGE MASTER PLAN

M&E PACIFIC, INC.

MARCH

EXHIBIT 11

DRAINAGE CATCH BASIN - PLAN

DRAINAGE CATCH BASIN (TYPICAL)

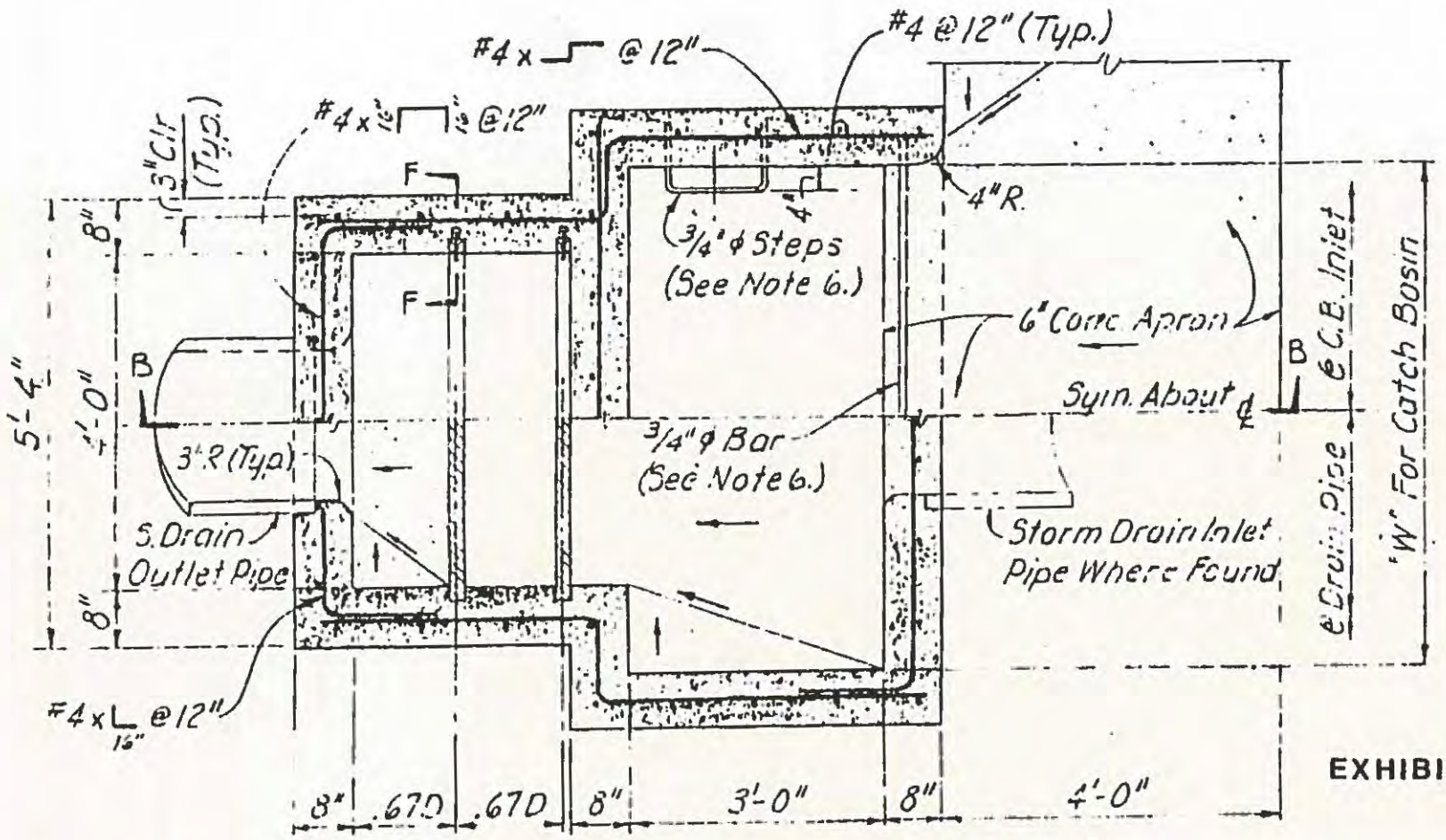


EXHIBIT 11

PLAN

EXHIBIT 12

DRAINAGE CATCH BASIN - SECTION B-B

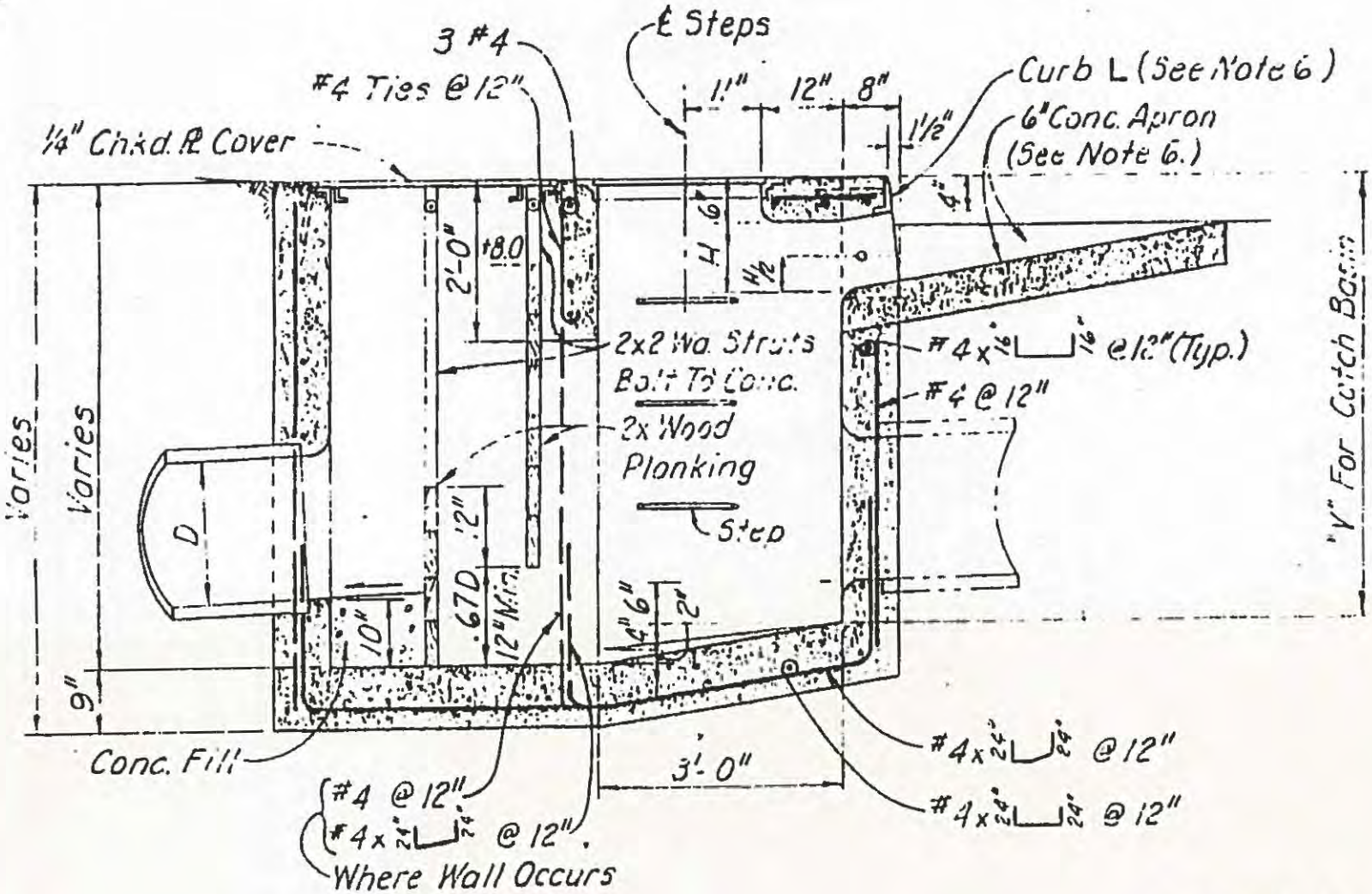


EXHIBIT 12

SECTION 3-3

CATCH BASIN/BAFFLED BOX - TYPE B

(TYPICAL)

EXHIBIT 13

SOILS & GEOLOGY

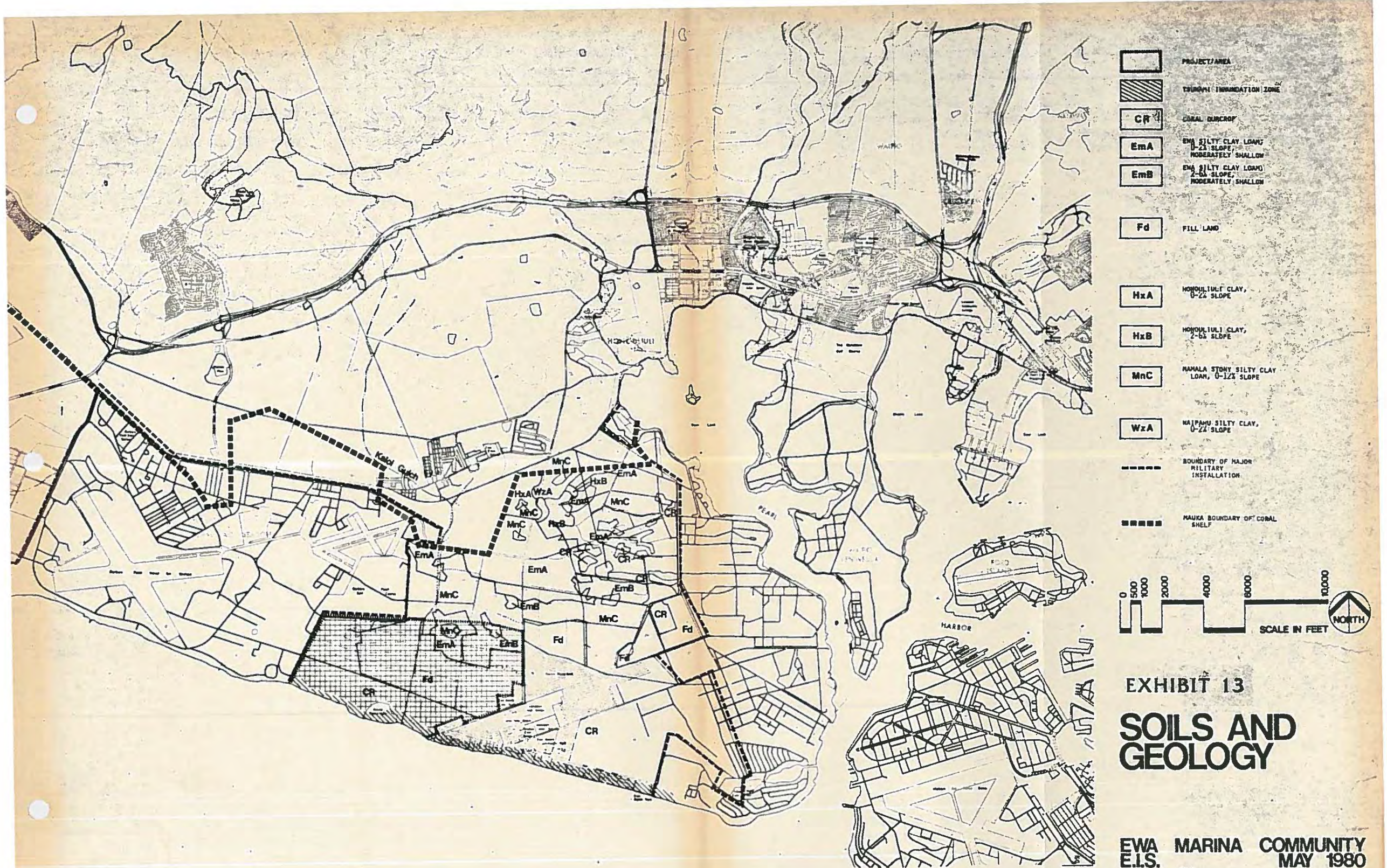


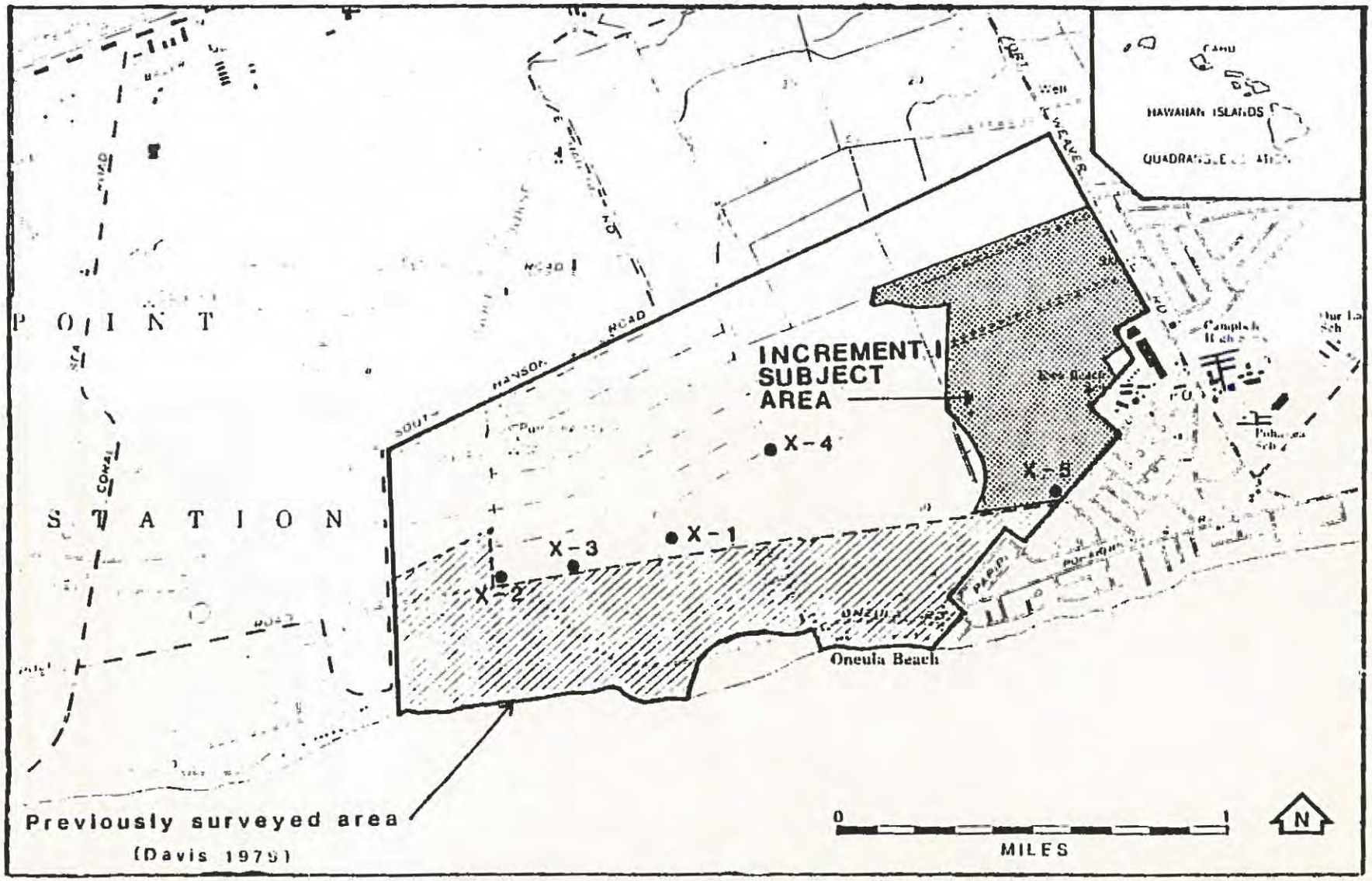
EXHIBIT 13

SOILS AND GEOLOGY

EWA MARINA COMMUNITY
E.I.S. MAY 1980

EXHIBIT 14

PROJECT AREA SHOWING EXCAVATION UNIT LOCATIONS

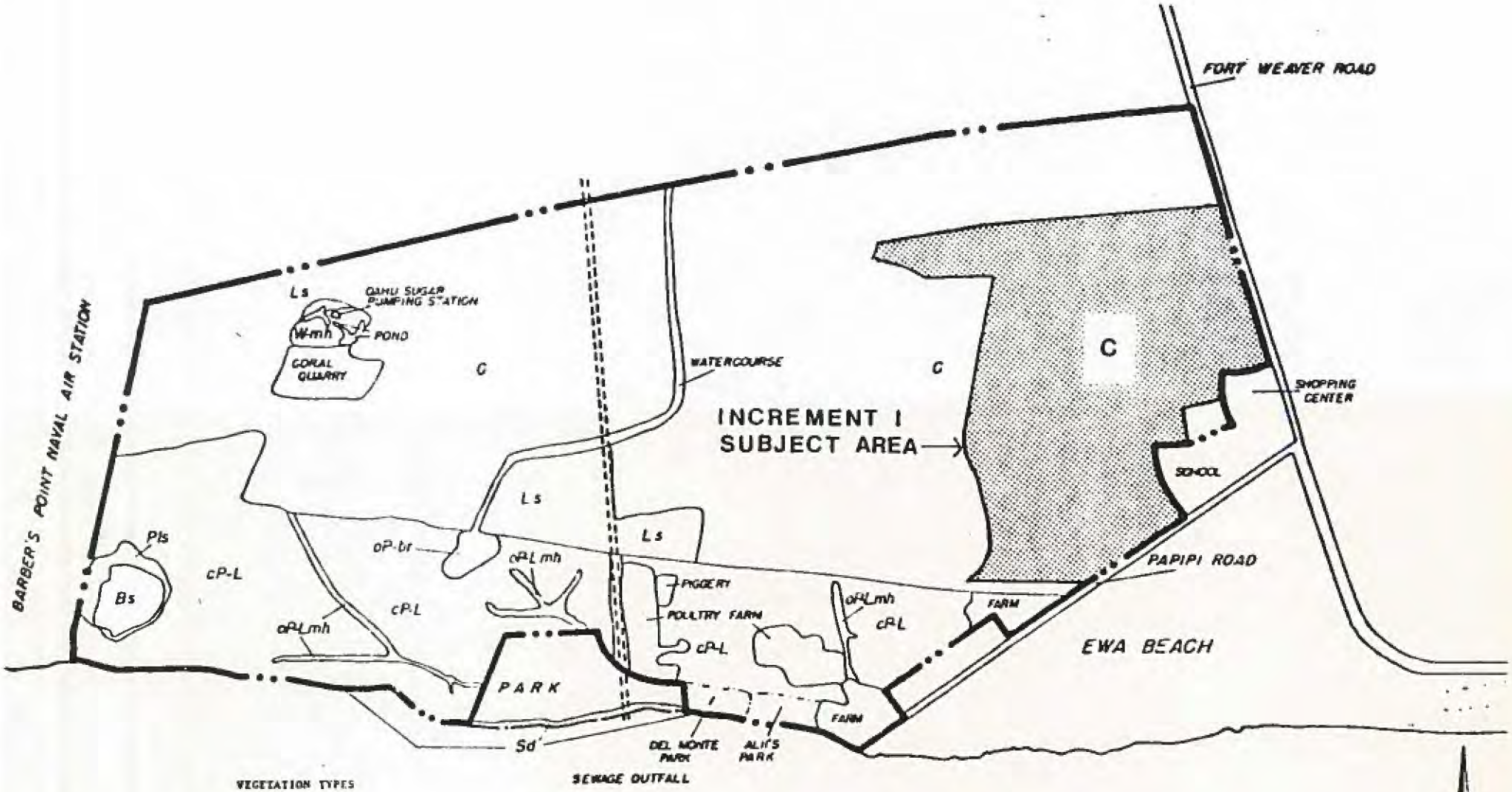


Project area showing excavation unit locations **EXHIBIT 14**

From U.S.G.S. 7.5' Ewa & Puuloa Quadrangles

EXHIBIT 15

VEGETATION TYPES OF THE EWA MARINA COMMUNITY



VEGETATION TYPES

Sd	Strand vegetation
Bs	Batis swamp
cP-L	closed Prosopis, Leucaena subcanopy
oP-Lmh	open Prosopis, Leucaena subcanopy, mixed herb layer
oP-Br	open Prosopis, Brachiari, groundcover
Ls	Leucaena scrub
Pls	Pluchea scrub
W-mh	Weedy community, mixed herbs
C	Cultivated, sugar cane fields

EXHIBIT 15

0 1000'

VEGETATION TYPES OF THE EWA MARINA COMMUNITY PROJECT AREA

EXHIBIT 16

EWA MARINA SEWER MASTER PLAN

EWA MARINA SEWER MASTER PLAN

DEVELOPER: MSM & ASSOCIATES, INC.
PREPARED BY: PARK ENGINEERING, INC.
DATE: JANUARY 18, 1984

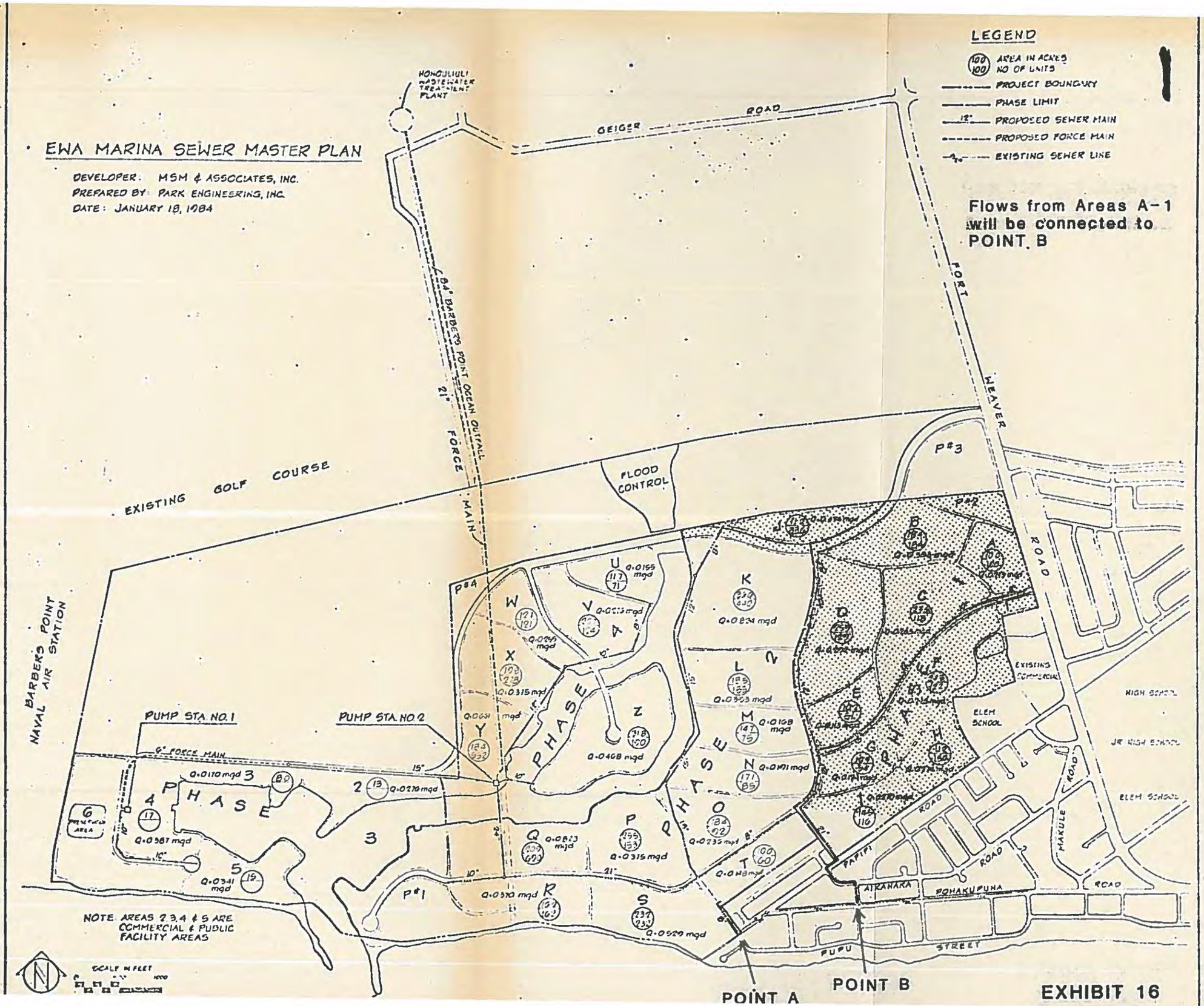


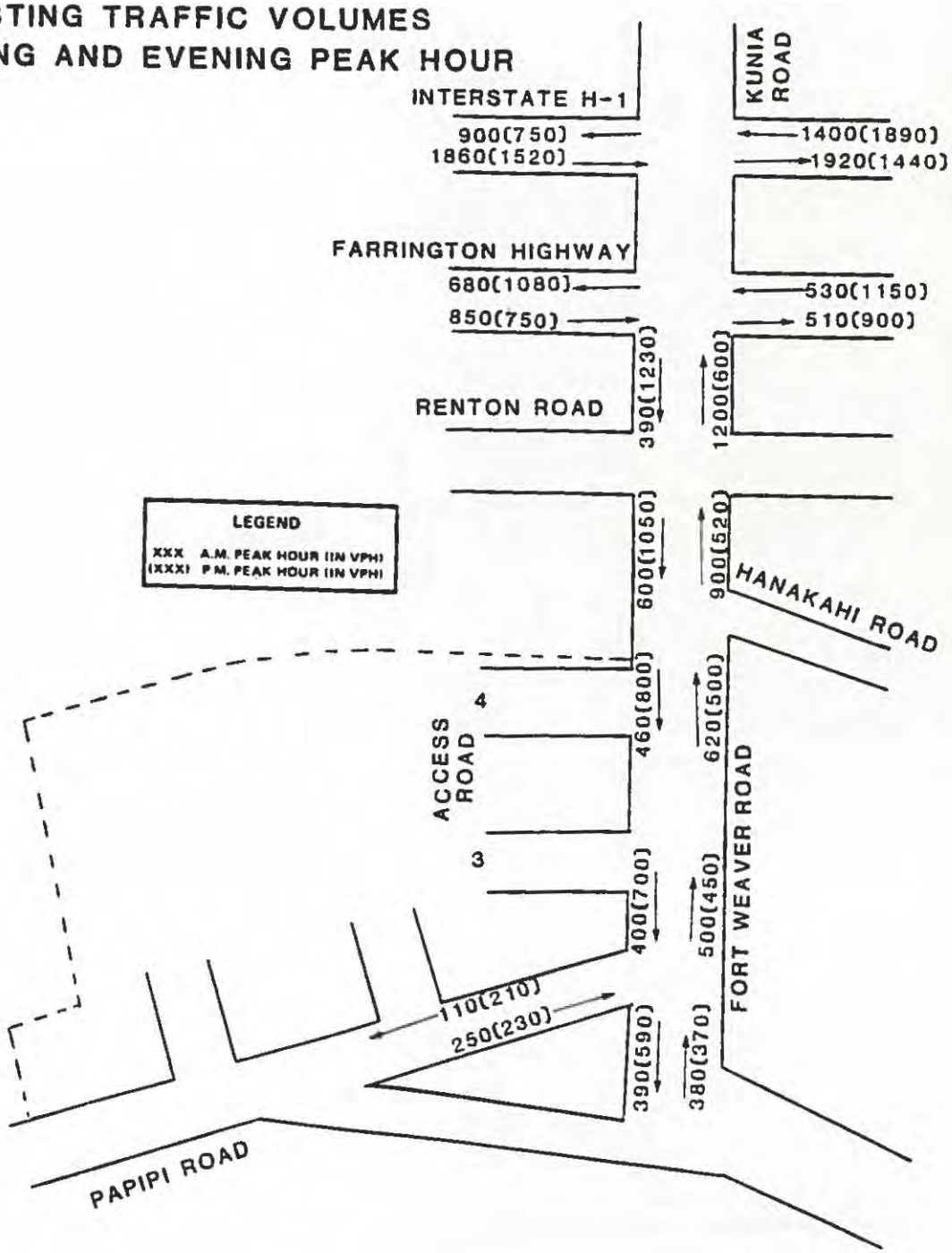
EXHIBIT 16

EXHIBIT 17

EXISTING TRAFFIC VOLUMES: MORNING AND EVENING PEAK HOURS

Exhibit 17

EXISTING TRAFFIC VOLUMES
MORNING AND EVENING PEAK HOUR



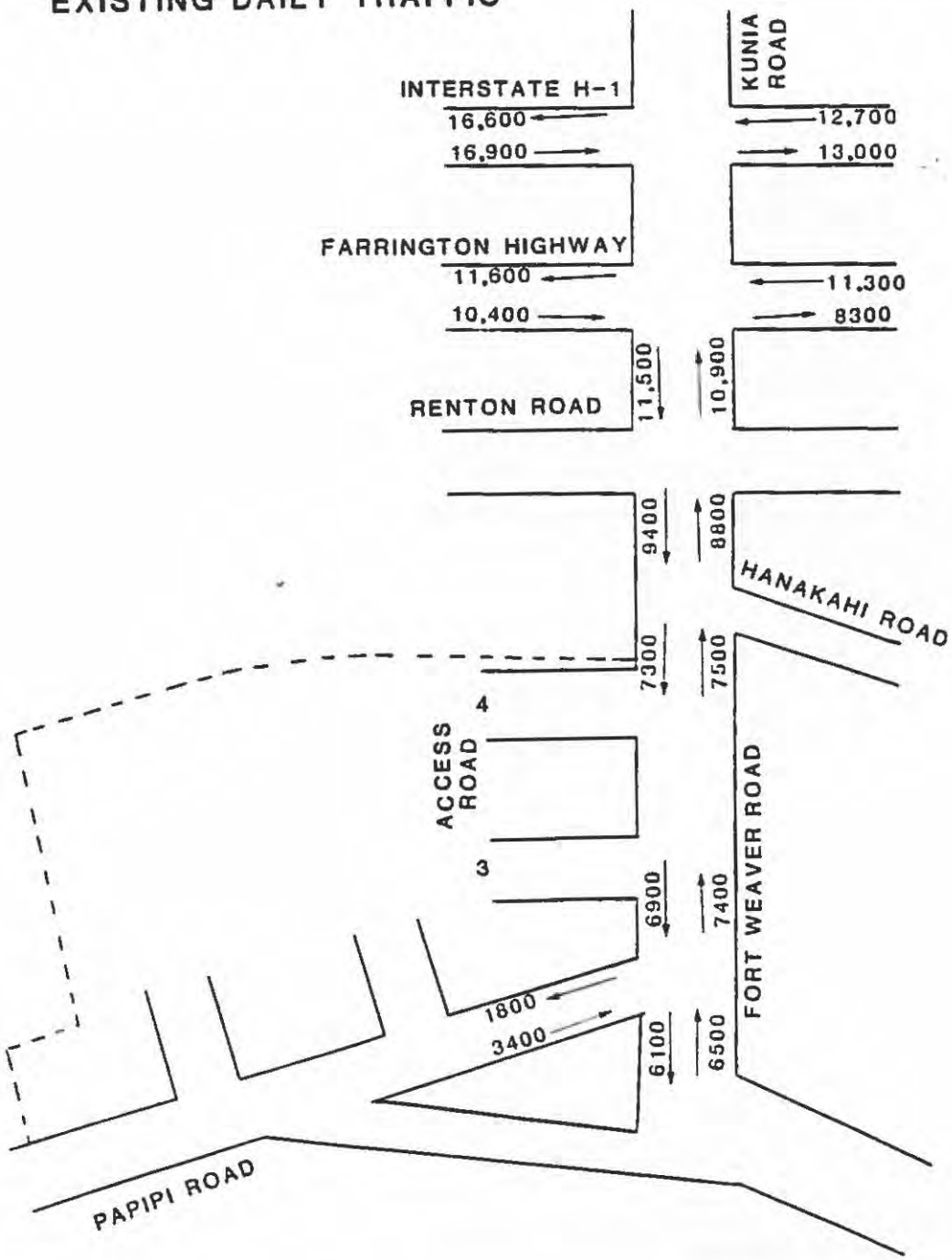
KAKU ASSOCIATES

EXHIBIT 18

EXISTING DAILY TRAFFIC

Exhibit 18

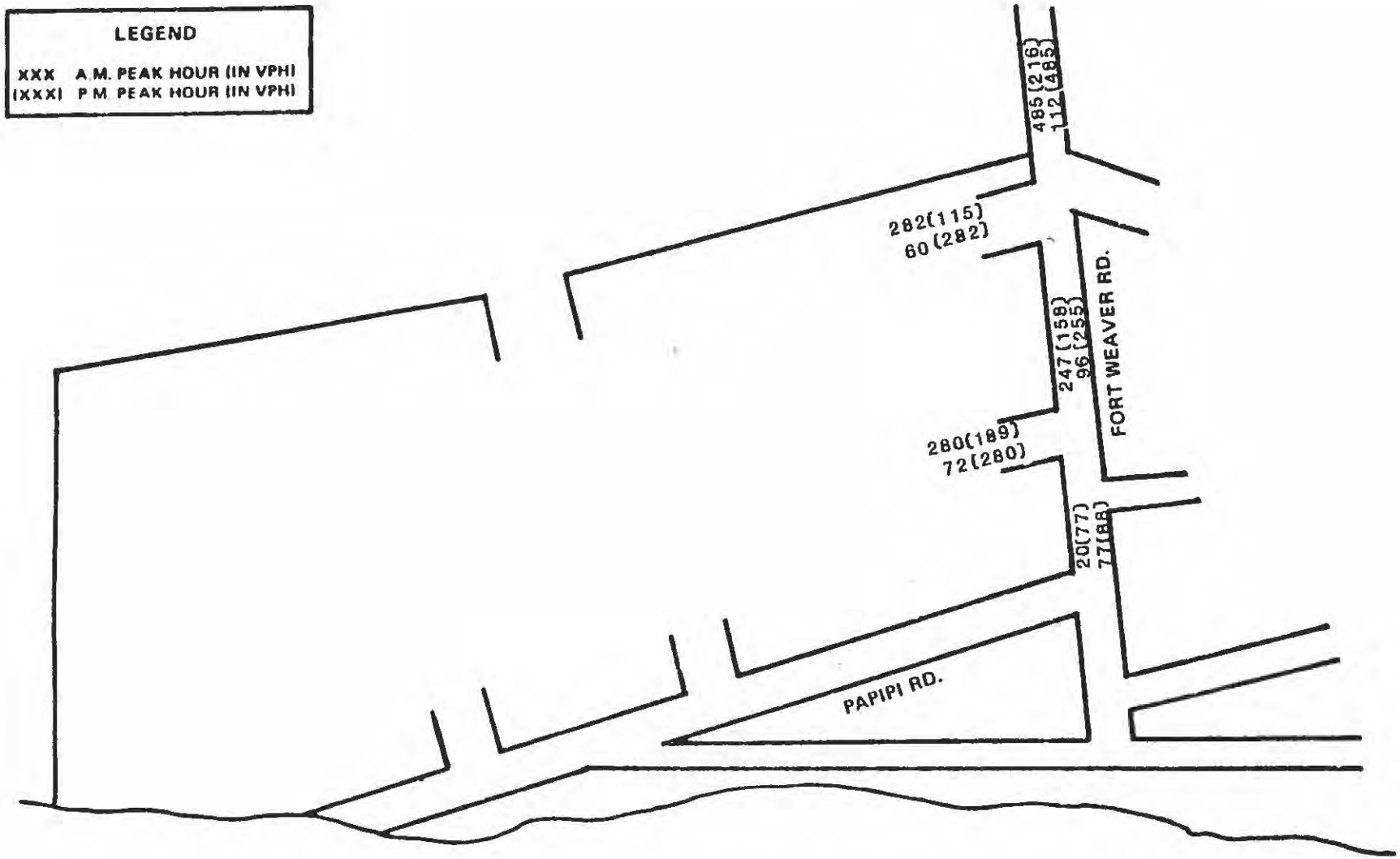
EXISTING DAILY TRAFFIC



KAKU ASSOCIATES

EXHIBIT 19

PROJECT GENERATED TRAFFIC



PROJECT-GENERATED TRAFFIC

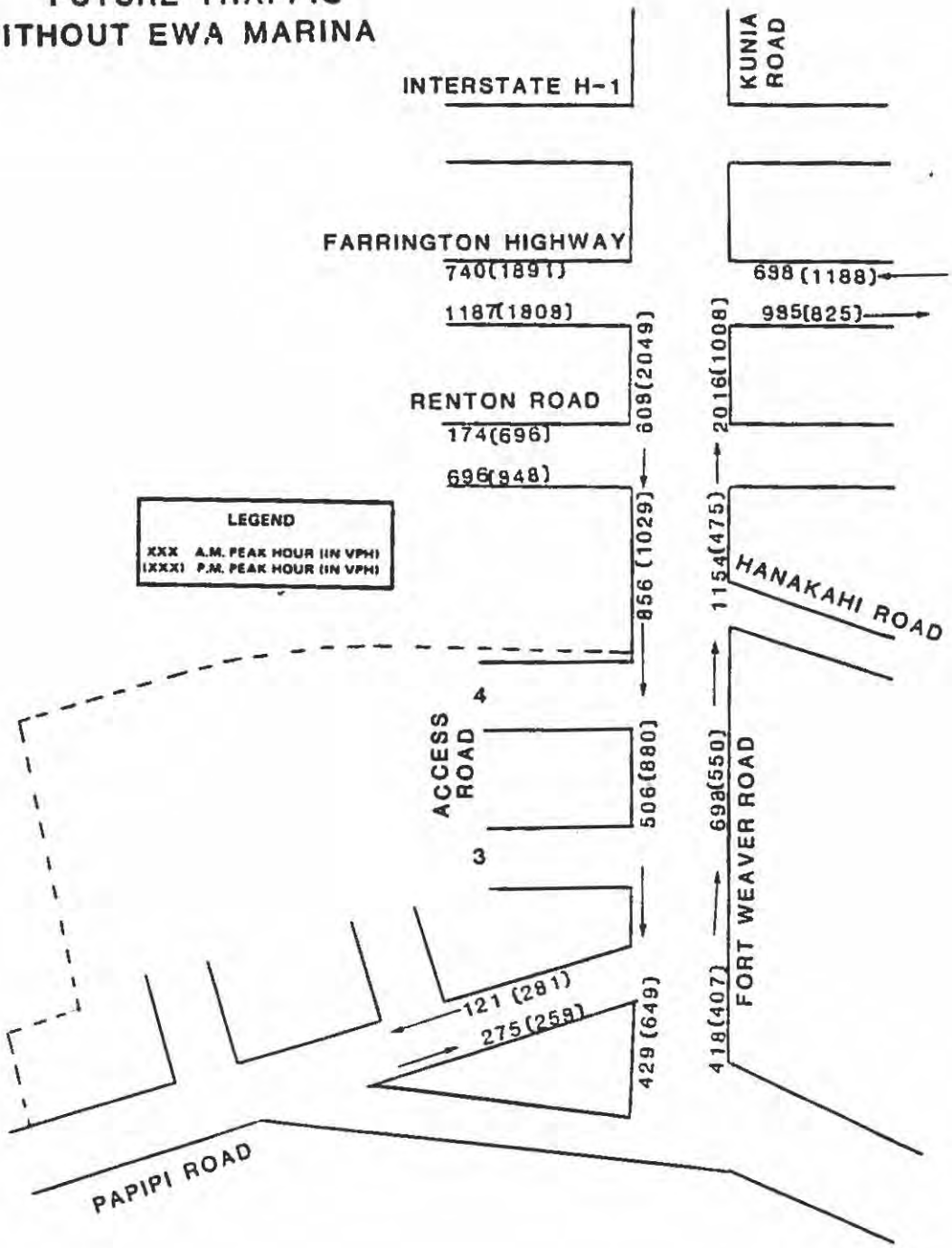
Exhibit 19

EXHIBIT 20

FUTURE TRAFFIC WITHOUT EWA

Exhibit 20

FUTURE TRAFFIC WITHOUT EWA MARINA



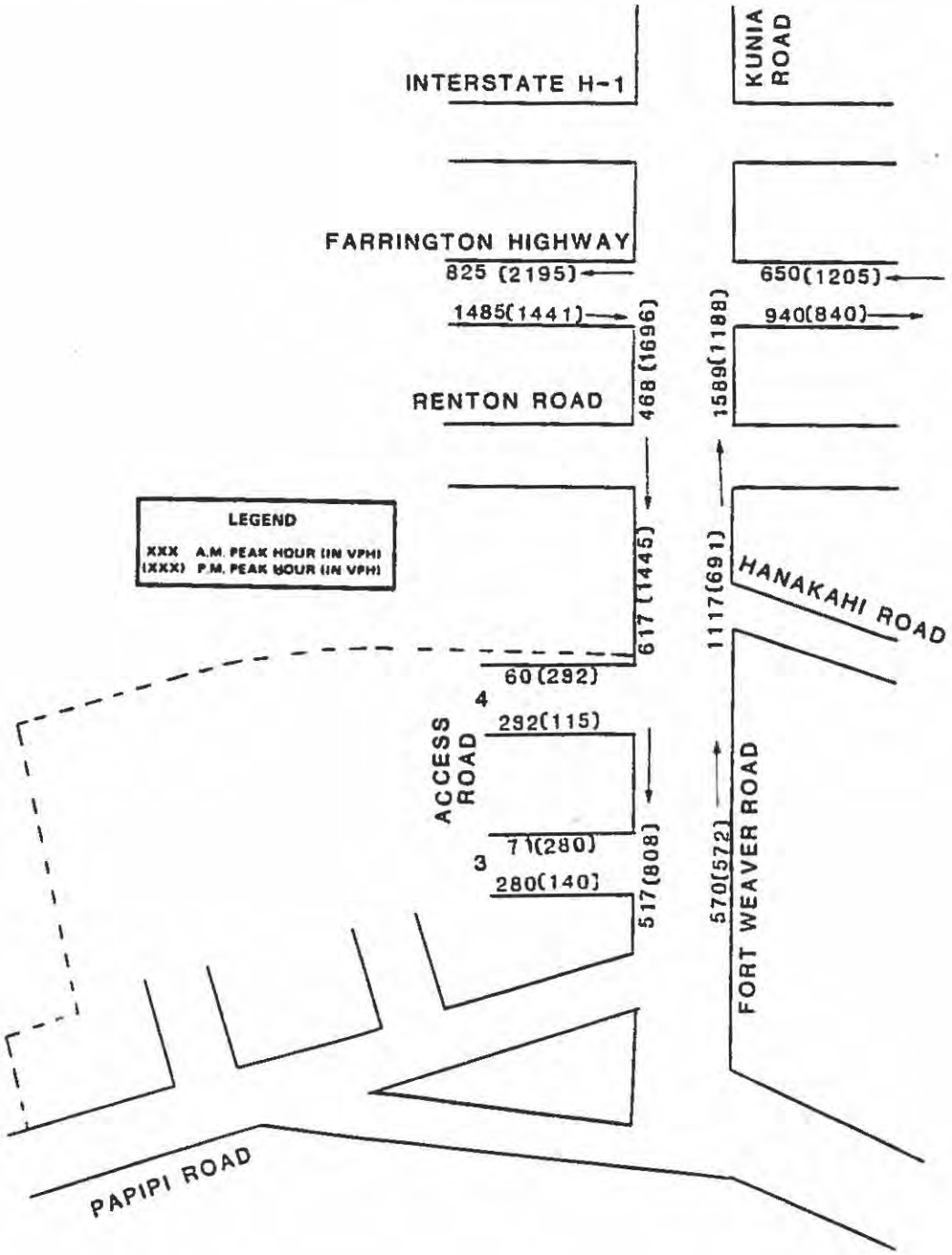
KAKU ASSOCIATES

EXHIBIT 21

TOTAL FUTURE TRAFFIC

Exhibit 21

TOTAL FUTURE TRAFFIC



KAKU ASSOCIATES

EXHIBIT 22

EWA MARINA WATER MASTER PLAN, POTABLE WATER

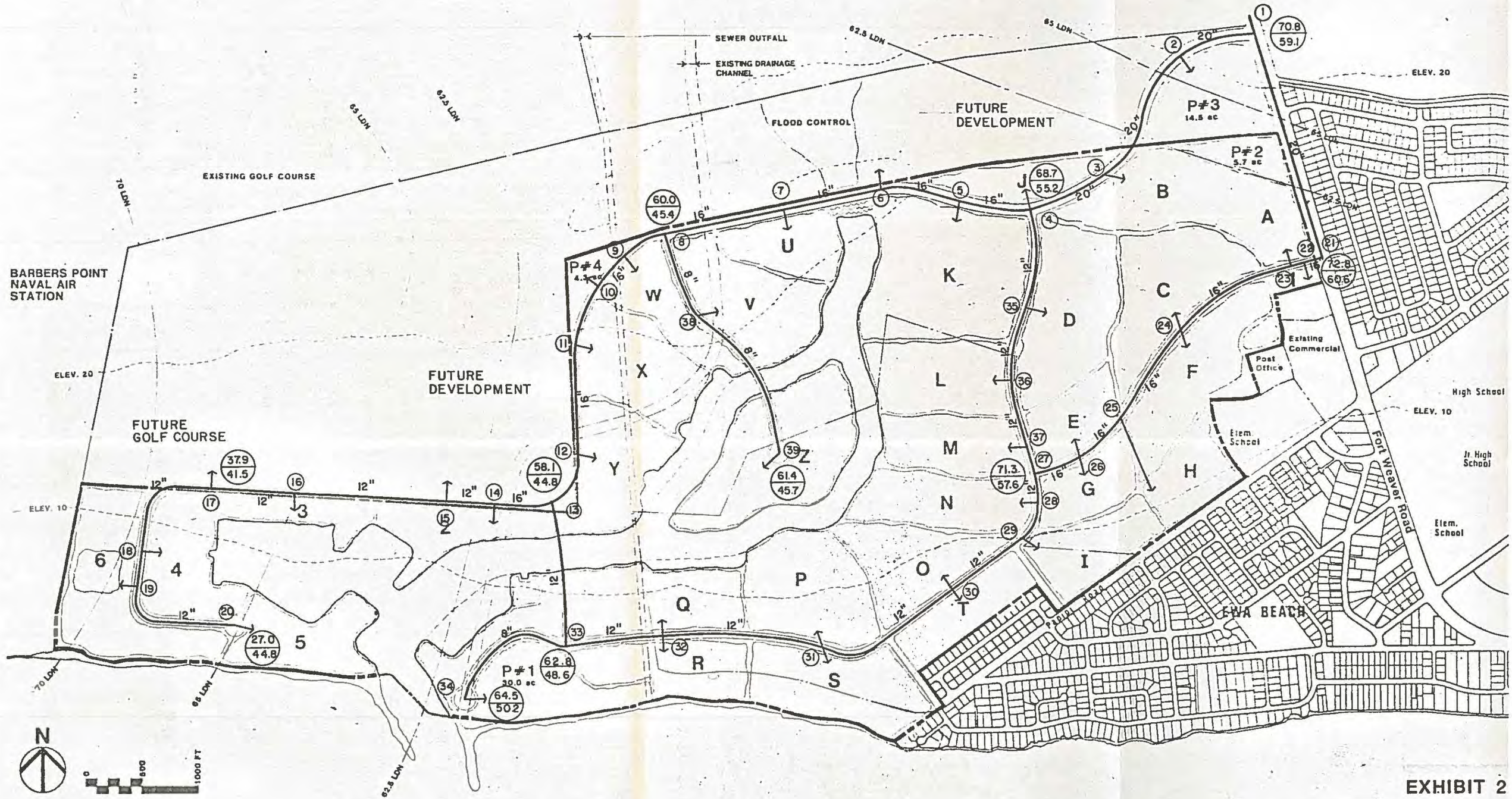


EXHIBIT 2

EWA MARINA COMMUNITY

WATER MASTER PLAN
POTABLE WATER

M&E PACIFIC, INC.

EXHIBIT 23

EWA MARINA WATER MASTER PLAN, NON-POTABLE WATER

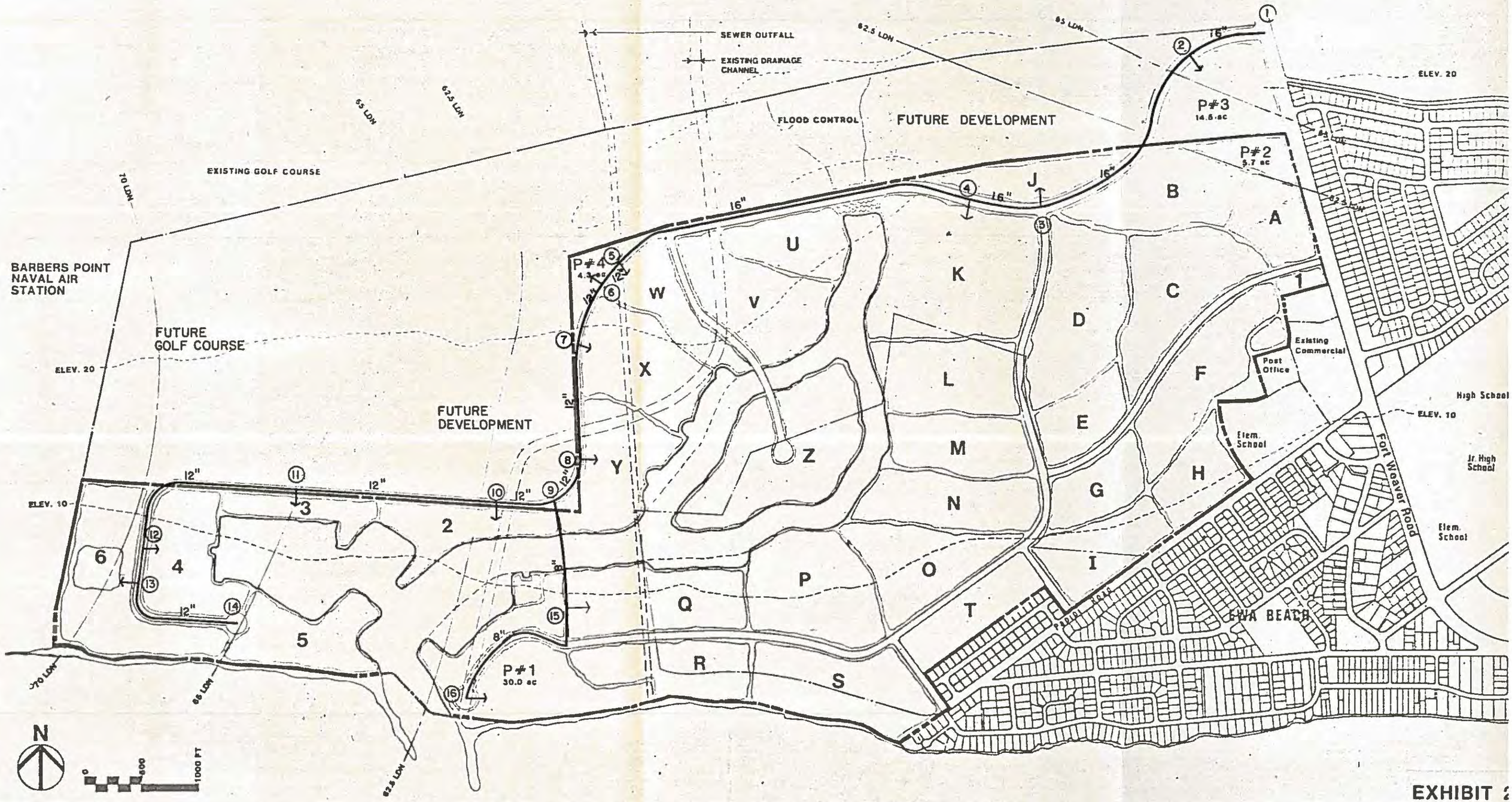


EXHIBIT 2

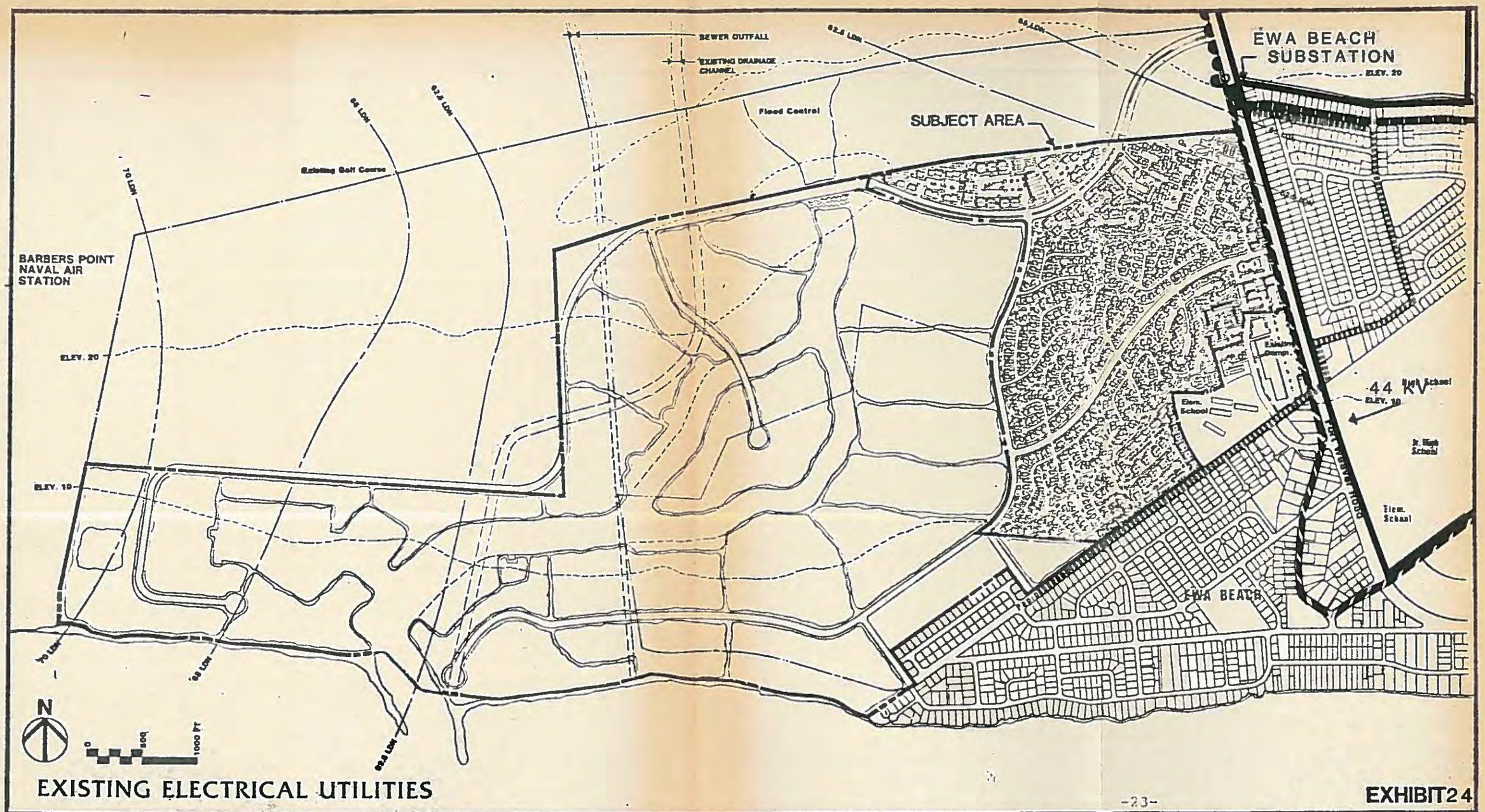
EWA MARINA COMMUNITY

WATER MASTER PLAN
NON-POTABLE WATER

M&E PACIFIC, INC.

EXHIBIT 24

EXISTING ELECTRICAL UTILITIES



EXISTING ELECTRICAL UTILITIES

EXHIBIT 24

EWA BEACH 1 - EWA BEACH 212KV

EWA BEACH 1 - EWA BEACH 112KV

EWA BEACH 1 - EWA BEACH 44KV

EWA BEACH 2 - EWA BEACH 312KV

EWA BEACH 2 - EWA BEACH 412KV

EWA MARINA COMMUNITY
OAHU HAWAII

MSM & ASSOCIATES INC
MASTER DEVELOPERS

PEARSON & WUESTHOFF AIA AICP
ARCHITECTS PLANNERS

DATE August 83
PLATE NUMBER
SP-1

APPENDIX A

DLU October 17, 1983 letter

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813 • (808) 523-4432

EILEEN R. ANDERSON
MAYOR

MICHAEL M. McELROY
DIRECTOR

ROBERT B. JONES
DEPUTY DIRECTOR

83/Z-14(CC)

October 17, 1983

Mr. Tyrone T. Kusao
926 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Kusao:

Ewa Marina Zone Change Application
Tax Map Key 9-1-12: Portion of 5

This is in regard to your application for a zone change for the Ewa Marina development.

Based on the Environmental Impact Statement (EIS) acceptance of February 20, 1981 and a subsequent letter to GACI on December 17, 1981, the Department has determined that a Supplementary Environmental Impact Statement addressing that increment being considered for rezoning and a schedule of subsequent Supplementary EIS to be submitted will be required before we can continue processing your zoning application. Attachment "A" includes a list of studies required, which relates to the first increment of your project. Questions regarding details of these studies should be referred to Mr. Sam Mar at 527-5038.

In addition to agency input which you will obtain in conjunction with the environmental requirements, we will also be requesting specific comments from the State Department of Education, the Police and Fire Departments, and the Neighborhood Boards affected by the project.

Since you are concerned about the processing time involved, we will allow the environmental review and rezoning process to proceed at the same time. The final recommendation for the rezoning, however, cannot be made until the Supplemental EIS is accepted. Based on this, the preparation of the rezoning report may require additional time beyond the 120-day time limit for zone changes, as established in Section 21-1.13 of the Comprehensive Zoning Code.

Should you have any further questions on this matter, please contact Mr. Calvin Ching of my staff at 527-5374.

Very truly yours,

MICHAEL M. McELROY
Director of Land Utilization

MMM:jt
Attach.

STUDIES REQUIRED FOR SUPPLEMENTAL EIS
FOR FIRST INCREMENT - EWA MARINA

1. Drainage/Grading/Soils
2. Archaeological/Historical
3. Flora/Fauna
4. Sewage Disposal/Groundwater Impacts
5. Solid Waste Disposal
6. Review of Recreational Resources
   a. Impact on Existing Resources
   b. Recreational Facilities to be created
7. Visual
8. Traffic/Noise/Air Quality/Circulation
9. Housing - Unit Count/Type
10. Water Commitment
11. Impact to Public Services/Utilities

ATTACHMENT "A"

APPENDIX B

Preparation Notice

Preparation Notice For

Supplemental Environmental Impact Statements

Approving Agency	:	City & County of Honolulu, Department of Land Utilization (DLU)
Applicant	:	MSM & Associates, Inc.
Agent	:	Gerald T. Takano GACI 926 Bethel Street Honolulu, Hawaii 96813
Project Location	:	Honouliuli, Ewa, Oahu
Tax Map Keys	:	9-1-12: Portion of 5
Request pertinent to other Agencies	:	Conservation District Use Application - State Board of Land & Natural Resources Land Use Boundary - Change State Land Use Commission General Plan Amendment - Department of General Planning and City Council NEPA Requirements (including U.S. Army Corps of Engineers Permit) - U.S. Army Corps of Engineers
Determination	:	EIS Required

I. Proposed Action

The subject property, comprising 174 acres, represents the first increment for development of the total Ewa Marina Community project. The applicant proposes the development of a residential community comprised of 1,290 dwelling units housing with approximately 3,870 residents. Commercial facilities and a park site are also included in the development of this increment.

A. Technical Characteristics

1. The development of this initial increment does not involve the Special Management Area nor does it include any portion of the waterways planned for the overall project area.

2. Housing densities within the subject property average 6.78 units per net acre for the residential areas and 30 units per net for the low-density apartment area. Overall, 143 acres are planned for residential use as against 11 acres for apartment development.

3. The proposed commercial area (5 acres) adjoins the existing Ewa Beach Shopping Center thereby providing the opportunity for an enlarged shopping complex.

4. The proposed park site adjoins Fort Weaver Road and is easily accessible to existing as well as future residents.

5. It is projected that the 1,290 dwelling units will be absorbed over a 5 year period.

B. Economic Characteristics

1. The total cost of the proposed project including land acquisition, infrastructure, design and engineering, processing fees, program management, property taxes and contingencies is preliminarily estimated at $23 million.

2. This project will increase short and long term employment. An estimated 2,322 construction jobs could be made available based on 180 construction workers per 100 housing units. Further, some permanent jobs may be added to the employment market due to the expansion of commercial facilities.

C. Social Characteristics

1. The addition of an estimated 3,870 residents over a five-year period will have some impact on the character and culture of the neighborhood. However, due to the rapid growth of the overall Ewa area, the impact resulting from this growth is somewhat lessened.

   The new residents may represent difference cultures and lifestyles, a different economic bracket and will result in more sharing of public facilities. This addition may enhance the neighborhood's diversity thus representing opportunities for social exchange and interaction which would not otherwise be possible.

On the other hand, some people may view this as a threat to existing lifestyles and habits. These people may feel secure in their current social hierarchies and interactions in which case the new faces may create a feeling of insecurity, particularly at the beginning.

2. The development is committed to provide 10% of the total dwelling units of 129 units for low/moderate income housing.

D. Environmental Characteristics

The preceeding supplemental statements will address the following issues for development of Increment I of the total project:

1. Drainage/Grading/Soils
2. Archaeological/Historical
3. Flora/Fauna
4. Sewage Disposal/Groundwater Impacts
5. Solid Waste Disposal
6. Review of Recreational Resources
   a. Impact on Existing Resources
   b. Recreational Facilities to be created
7. Visual
8. Traffic/Noise/Air Quality/Circulation
9. Housing - Unit Count/Type
10. Water Commitment
11. Impact to Public Services/Utilities

II. Affected Environment

The affected property (174 acres) is an irregular-shaped parcel adjoining Fort Weaver and Papipi Roads along portions of its perimeter and is located next to the Ewa Beach Community. It is presently in sugar cane cultivation and the lands to the north and west are also devoted to cane production. The community of Ewa Beach

located east and south from the affected property is developed predominantly with single family residences with a limited amount of commercial developments and public facilities such as school and parks.

Based on Ordinance #83-26, Ewa Development Plan, approved June 6, 1983, the following uses are proposed for the 174 acres site: 143 acres in residential use, 11 acres for low-density apartment, 5 acres for commercial, 6 acres for parks, and 9 acres for roadways.

Resolution #82-188, Amended Draft No. 2 approved December 22, 1982, General Plan of the City and County of Honolulu, has placed the subject property in the urban fringe classification and has designated the near-by West Beach/Makakilo area as the secondary urban center.

A. Major Impacts

The potential environmental impacts, beneficial or adverse, direct or indirect, are briefly identified in the following discussion.

1. The proposed project will create physical impacts to its surroundings during construction and after the project has been completed. The major impact will be the creation of a residential community housing approximately 3,870 residents. The area's land will be converted from agricultural to urban use.

2. Economic impacts resulting from the proposed project would include direct and indirect income generated by the proposed project (community and individual), effects on employment and the labor force, property taxes, and potential government expenditures for constructing or maintaining necessary public facilities and services to support the proposed uses.

   In addition, the supply of housing will increase in the area and will in turn increase land values.

3. A wide range of social impacts may be attributed to the proposed project. The major impact will be the influx of 3,870 additional people, very likely having difference socio-economic characteristics than the existing Ewa Beach community.

Increased demands for public facilities and services such as fire and police protection, medical services, water, electricity, telephone, sewer, and drainage facilities and streets can be anticipated.

B. Mitigation Measures

The applicant must adhere to all applicable City and County of Honolulu and State of Hawaii regulations, which would govern the construction and operation of the proposed project.

In the environmental impact statement, it will be the responsibility of the applicant to address in a comprehensive manner all potential impacts of the proposed project and mitigating measures.

III. Reasons Supporting Determination

The decision to require an EIS was based on the significant criteria found in Section 1:31 of the EIS Regulations. Specific considerations were as follows:

> "In determining whether an action may have significant effect on the environment, the agency shall consider every phase of proposed action, and expected consequence, either primary or secondary or the cumulative as well as the short- or long-term effect of the action."

Additionally, it was found that the project:

A. "Substantially affects economic or sociological activities."

B. "Involves substantial secondary impacts; such as ... effects of public facilities."

C. "Is individually limited but cumulatively has considerable effect on the environment."

D. "Affects air ... quality or ambient noise levels."

Figure I shows project area, Increment I.

APPENDIX C

Preliminary Hydrologic Report for Kaloi Stream Improvement
W. Hee & Associates, March 1982
and
4/11/81 approval by Department of Public Works

PRELIMINARY HYDROLOGIC REPORT

FOR

K A L O I S T R E A M I M P R O V E M E N T

AT HONOULIULI, EWA, OAHU, HAWAII

TAX MAP KEY: 9-1-12 and 9-1-17

For:

M S M

Prepared By:

WILLIAM HEE & ASSOCIATES, INC.
Engineers - Surveyors - Planners
1020 Auahi Street, Building 1
Honolulu, Hawaii 96814

March 1981

101-12-0160

April 1, 1981

William Lee & Associates, Inc.
1020 Auahi Street, Building No. 1
Honolulu, Hawaii 96814

Gentlemen:

Subject: Your Letter of March 4, 1981 regarding the Hydrologic Reports for Kaloi Stream Improvement, Oahu West I and Oahu West II, TMK: 9-1-12 and 9-1-17

The hydrologic reports are acceptable. We will retain the reports for our files.

Mc ke aloha pumehana,

For MICHAEL J. CHUN
Director and Chief Engineer

ST:RYN:pto

bcc: Control Section

PROJECT DESCRIPTION:

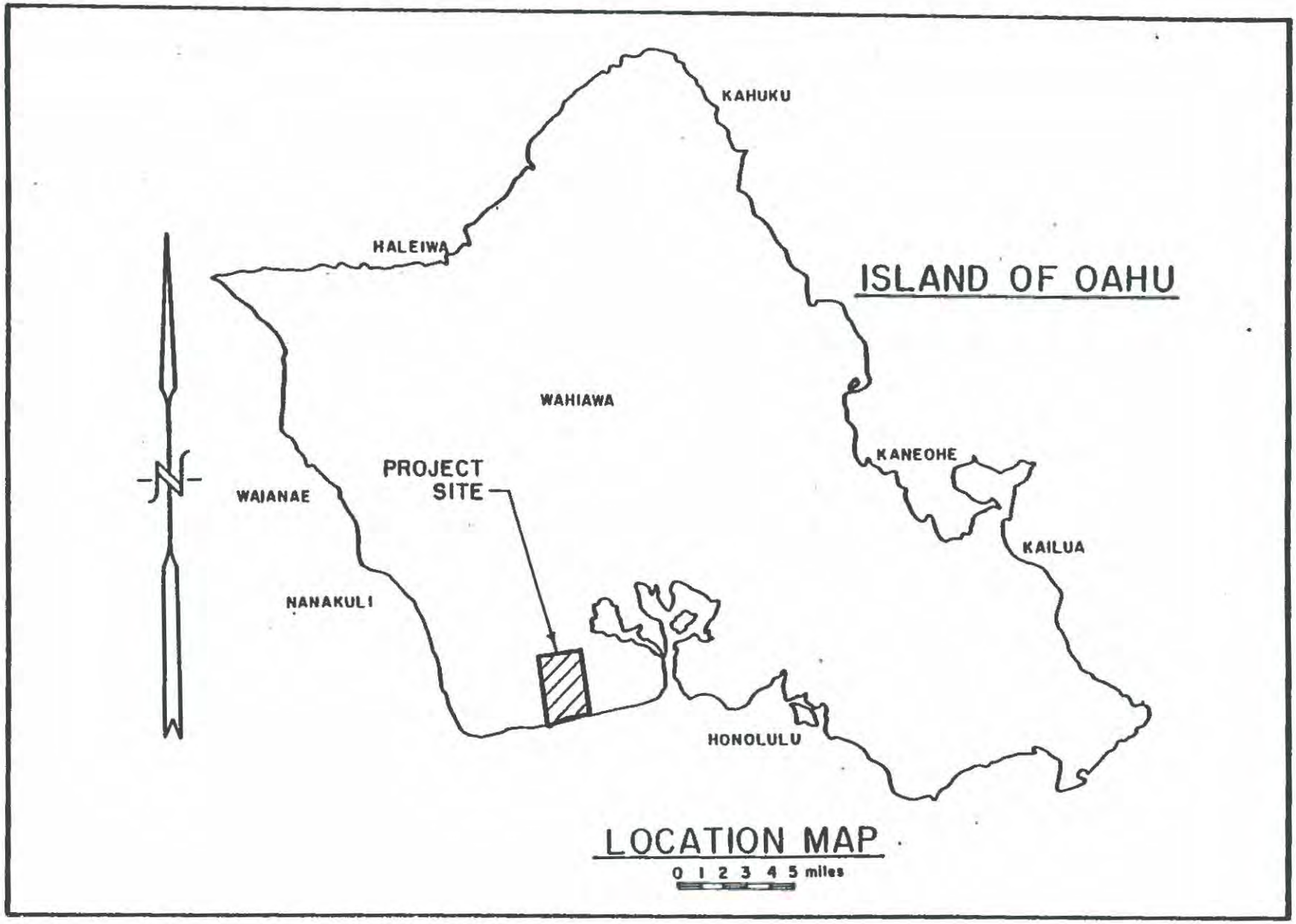
The proposed KALOI STREAM IMPROVEMENT is a part of two planned community developments, (Oahu West Development and Ewa Marina Community Development), on land owned by the Estate of James Campbell. The stream improvements will be integrated with the proposed developments.

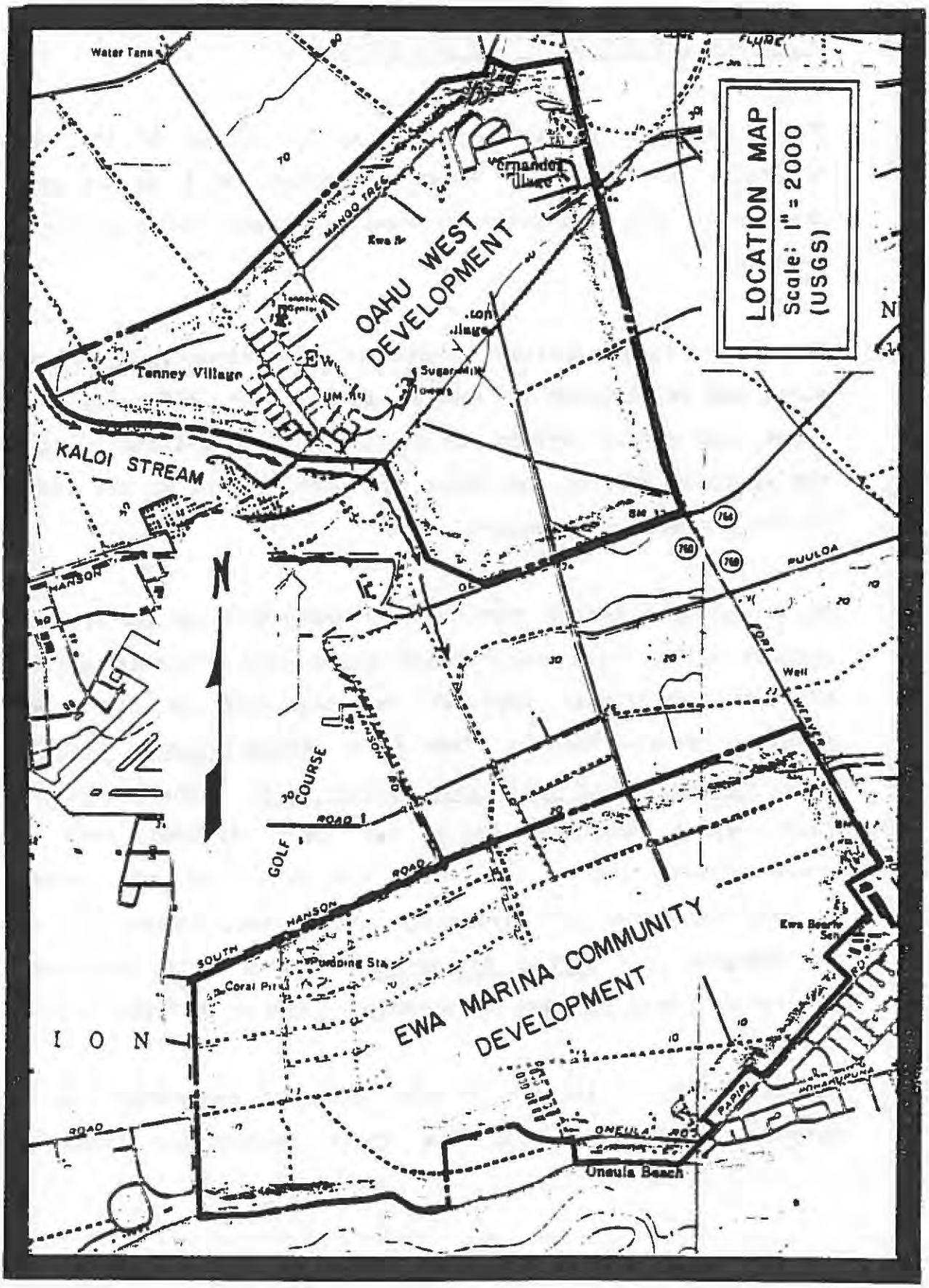
LOCATION:

The project is located in Honouliuli, Ewa, Oahu, Hawaii; Tax Map Key: 9-1-12 and 9-1-17. (See Location Map).

PURPOSE:

The purpose of this report is to establish the hydrologic criteria and the surface storm runoff quantities that will be utilized in the design of major storm drainage facilities including the proposed improvements for Kaloi Stream.


KAHUKU
HALEIWA
ISLAND OF OAHU
WAHIAWA
KANEOHE
PROJECT SITE
WAIANAE
KAILUA
NANAKULI
HONOLULU
LOCATION MAP
0 1 2 3 4 5 miles


LOCATION MAP
Scale: 1" = 2000
(USGS)
OAHU WEST
DEVELOPMENT
EWA MARINA COMMUNITY
DEVELOPMENT
KALOI STREAM
Tenney Village
Water Tank
MANGO TREE
Ewa R.
Sugarmill
Well
PUULOA
HANSON
GOLF COURSE
ROAD
SOUTH
Coral Pit
Pudding Sta
Ewa Beach
ONEULA BCH
Oneula Beach
PAPIPI
N

HYDROLOGIC ANALYSIS:

The storm water runoff generated on the slopes of the Waianae Mountain, in the Kaloi Gulch watershed, will be of primary concern in the estimation of overland runoff flow through the project.

The Kaloi Gulch drainage basin is approximately 11.5 square miles and is composed of several tributaries, differing in soil types, and widely varying ground slopes (from 15% and steeper on the upstream side of the basin, to less than 1% at the vicinity of the proposed developments).

It is apparent that a more refined definition of the hydrologic regimes within this basin would yield more reliable estimates then an approximate regional analysis such as the type of envelope curves shown in Plate 6 in "Storm Drainage Standards" City and County of Honolulu, March 1969. Consequently, the Kaloi Gulch drainage basin has been divided into nine sub-watersheds and an individual hydrologic analysis performed on each using the Unit Hydrograph Peak Runoff Method set forth in "Chapter 21, Design Hydrographs of the Soil Conservation Service National Engineering Handbook, Section 4, Hydrology."

Sub-watersheds 1 through 7 were analized separately for the purpose of designing for the upper development (Oahu West

Development), and sub-watersheds 8 and 9 were added as a supplement, for the lower development (Ewa Marina Community Development).

In using the Unit Hydrograph method of computations, the following assumptions were made:

1. Design Storm = 5-Year Recurrence Interval
   = 10-Year Recurrence Interval
   = 50-Year Recurrence Interval
   = 100-Year Recurrence Interval

2. Six (6) hour storm duration with rainfall amount selected from Weather Bureau Technical Paper No. 43, "Rainfall Frequency Atlas of the Hawaii Islands".

   Exhibits H, I, J, and K.

3. Antecedent Moisture Content (AMC):

   In order to determine the AMC, a 5-day antecedent rainfall must be determined by data provided from measuring gage stations in the area. However, the stations did not have consistent and daily rainfall data recorded, therefore, AMC II was assumed.

4. The runoff Curve Number, CN, is the index for the synthetic Unit Hydrograph used for a particular watershed and it is assumed that drainage basins with the same CN value and time of concentration will yield the same overland runoff flows for any given storm.

S U M M A R Y

DISCHARGE QUANTITY (Q)

IN CFS
(Through Oahu West Development)

SUBWATERSHED	5-Yr.	10-yr.	50-yr.	100-yr.s	C&C's Peak
1	500	1100	2200	2600	4600
2	700	1500	2300	2750	5800
3	1300	1650	2400	2800	3500
4	1000	1300	1900	2200	4500
5	450	600	900	1000	2400
6	400	700	1000	1150	1900
7	700	900	1300	1550	2900
*Overall W.S.	3800	5300	10,100	11,950	12,100

*NOTE: The Q for the overall watershed was obtained by performing an individual analysis using an average CN value of 77, and a time of concentration of 2.0 hours; not merely summing individual subwatersheds.

S U M M A R Y
(Continued)

DISCHARGE QUANTITY (Q)

IN CFS
(To Ewa Marina Community Development)

SUBWATERSHED	5-Yr.	10-yr.	50-yr.	100-yr.s	C&C's Peak
*Overall W.S. (SWS 1 to 9)	4550	6650	11,750	13,700	13,500

*NOTE: The Q for the (11.49 s.m.) overall watershed was obtained by performing the SCS Unit Hydrograph analysis using an average CN value of 79, and a time of concentration of 2.15 hours.

C O N C L U S I O N :

Using the Unit Hydrograph method, the 100-year storm of a six hour duration for the total tributary is estimated to produce approximately 11,950 cfs overland flow through the Oahu West project site as compared with 12,100 cfs peak runoff obtained using the Regional Analysis Envelope Curve presented in the Storm Drainage Standards, City and County of Honolulu, DPW, March 1969 (Exhibit A). A 100 year, 6-hour duration storm will produce overland flow to the Ewa Marina Community project site of approximately 13,700 cfs using the Unit Hydrograph method as compared to 13,500 cfs peak runoff using the Regional Analysis Envelope Curve (City and County of Honolulu).

The City's envelope curve is based upon a peak storm which is generally a storm of a 100 years return period; therefore it can be concluded that the two estimated discharge quantities agree very reasonably with each other.

The recommended design discharge for the design of the major channels for this project shall be the discharge quantities arrived in this report based on the 100-year, six-hour storm.

Construction of a sediment basin is proposed at the entrance of the Kaloi Stream improvement, North of the Oahu West Development. This is to accumulate sediment generated by the

agricultural fields above. Just below the Oahu West Development and North of the Ewa Marina Community Development, a retention basin/sedimentation basin system is proposed (see Exhibit O).

As reported in the Ewa Marina Community Master Plan Report, June 1979, there is evidence that most of the storm water runoff from the Honouliuli Plan is absorbed by the porous substratum. "There is very little evidence of storm water runoff of any measurable amount reaching the sea via Kaloi Gulch." However, as development of the area progresses throughout the plain, this phenomena will change where less absortion will occur, and the need to accommodate the expected storm water runoff and to convey it to the sea must be resolved. City and County standards require consideration of the peak storm (100 year storm ±).

Comparing the Anticipated Flow rate obtained by City and County Drainage Standard Criteria, and the Unit Hydropgraph Method (Normally used by the Soils Conservation Services), the repective Total Discharge Quantity expected are:

1) 12,100 cfs (City and County)* and 11,950 cfs (Unit Hydrograph)*, and
2) 13,500 cfs (City and County)** and 13,700 cfs (Unit Hydrograph)**.

* Through Oahu West Development
** Up to Ewa Marina Community Development

This high rate of flow remain a problem, especially in conveying the runoff to the sea, and the handling of the silt generated by the runoff.

In our opinion, flow rate and sedimentation can be reduced by creating a retention basin system big enough to retain portions of the flow and which will also be used as a settling basin to remove sediment before reaching navigable waters. Recreational areas, such as a golf course complex, generally have a substantial area of grass cover, and if constructed in this locale, would have a desireable infiltration rate.

Grassed recreational fields such as this can be utilized for the temporary detention of portion of the storm water runoff without adversly affecting its primary function.

The recreational area should be designed to handle the smaller runoff rate such as a 10-year storm. Should a storm of greater magnitude occur (say the peak storm), the surface area of the drainage travelway through the retention basin would be wide enough to accommodate the added runoff without flooding developed areas. The down stream end of the basin will be equiped with a wier to control the outlet discharge (which could also control the height of the water surface in the retention basin).

Therefore, using such grass areas for retention of storm water runoff should be considered.

A retention basin, about 125 acres in size is capable of dampening flood waters without exceeding the maximum allowable water surface elevation. The discharge to the north boundary of the Ewa Marina Community Development may be reduced from 13,500 cfs to about 10,000 cfs (see Addendum 1, Flood Routing Study, attached).

A permanent periodic maintenance program (to be monitored and administered by the Developer) to clear the accumulated silt from the retention/siltation basin would be required once under way.

ALTERNATE LOCATION OF RETENTION BASIN CONSIDERED:

This study included investigating an alternate location for the retention basin above the development site (see Exhibit P). However, there were some considerations that precluded this alternate. The following are the factors that influenced not selecting the alternate location of the Retention Basin:

1. The location site is designated for Agricultural use by the State Land Use Commission (the owner has no

immediate intention to apply for redesignation of the land use). The area is also committed by Campbell Estate for continued Agricultural use. Also, the deep excavation required to construct the Retention Basin here, would alter soil conditions at the site. To replace the soil to its original state for continuous agricultural use, would require extensive time and considerable cost.

2. The topography at this alternate location, as compared to the proposed location, indicates steeper terrain (10% - 11%). This would require deeper excavation to create a workable retention basin (possibly 10' - 20' deeper on the upper end of the basin). This would require considerable expense.

3. The channel section, under this alternate, would also have to be extended from Geiger Road to the Ewa Marina Development, for an added distance of about 4,500 ft.

The location of the Retention Basin as shown on Exhibit O, is the recommended location.

RECOMMENDATIONS:

1. The tributary area stretches up to the upper ridges of the mountain range, several miles from the area of the proposed retention basin. Because of this distance, the upper limits of the tributary may experience rain storms while the lower area none. This may result in unexpected, "flash" flooding. Since the basin may also be used for recreational purposes, we highly recommend having high grounds (safety areas) readily accessible in case of such emergencies. These high ground areas should be built up over the anticipated high water elevation of the drainage way.

2. Based on the total runoff quantity, we proposed a composite channel section comprising of a concrete channel to accommodate storms up to and including a 25-year storm; the remaining composition to accommodate a 100-year storm (see Exhibit O, Composite Section 3.)

3. Retention basin be constructed below Geiger Road as show on Exhibit O.

4. Interim Proposal:

   The ultimate drainage plan for this development is dependent on the outlet marina to be developed under another project

(Ewa Marina Development). The time table for development and completion of the Marina is not set as of this writing, however, the Marina will be developed (whether delayed or not). An interim proposal for the discharge of the storm water under this report is hereby proposed.

As mentioned previously in this report, there is evidence that a major portion of the storm water is absorbed by the permeable soil in the area, due to the extensive agricultural use. The entire tributary above the project site (which takes up more than two-thirds of the total tributary area) will remain agricultural and/or conservation for many years before ultimate urbanization of those areas occur. We, therefore, believe that (even after the development of Kaloi Gulch and the Ewa Plantation development), majority of the storm water will continue to percolate into the substratum due to the nature of the soil and its land use.

Therefore, during the period prior to the Marina being developed, we anticipate approximately the same storm conditions that exist today; that flooding down stream of the project to be minimal and non-damaging. The addition of the retention basin will further reduce storm water discharge to the lower lying area. (The Kaloi Stream improvement system as master planned in the report, is

designed for ultimate development of the entire tributary area and designed for theoretical conditions.)

We propose that, with the addition of the 125-acre retention basin and anticipated low flows, the storm water, during interim period, can be discharged into the lower lying area without adversely flooding of the area. With the added retention basin, it would appear that flooding in the lower lying areas would be reduced.

We suggest that the storm water, during the interim, be allowed to discharge into the lower lying area.

PRELIMINARY DEVELOPMENT PHASING: (See Exhibit Q)

Phase I- To be developed generally from North to South.

1- Major Drainage System will be constructed generally from North to South.

2- Temporary Retention Basins will be provided as necessary to handle on-site runoff until the permanent system is completed.

Phase IA- Retention Basin construction: To be started during the latter stages of Phase I above.

Phase II- Kaloi Gulch Improvements and the diversion ditch: To be constructed during this Phase, to coincide with the completion of the Retention Basin.

Phase IIA- Development to continue under this Phase, portion of which will be dependent on this Kaloi Stream Improvements for its drainage system discharges.

The Marina will be developed by others and may be constructed during any of the Phases as described above or after (see interim proposal, under the Recommendations section of this report).

H Y D R A U L I C C A L C U L A T I O N S

Major Drainage Basins

Based On

Unit Hydrograph Peak Discharge

Reference:

Soil Conservation Service

National Engineering Handbook

Section 4

Hydrology

Chapters 9, 10 & 21

D A T A :

$$Tp = 0.7\ Tc$$

$$\text{Rev. } Tp = \frac{To}{(To/Tp)\ \text{Rev.}}$$

$$qp = \frac{484\ A}{\text{Rev. } Tp}$$

$$q = Qqp\ \left(\frac{qc}{qp}\right) \max$$

$$Tc = (0.0136)(L/(S)^{0.5})^{0.77}$$

Where, A	=	drainage area in square miles
q	=	hydrograph rate in cfs
qc	=	hydrograph rate in cfs when Q = 1-inch
qp	=	Hydrograph peak rate in cfs when Q = 1-inch
Q	=	design storm runoff in inches
Rev tp	=	revised time in peak hours
Tc	=	time of concentration in minutes
L	=	maximum length of travel in feet
S	=	average slope in drainage area
To	=	duration of excess rainfall in hours
(To/Tp) Rev	=	revised ratio from Table 21-16
Tp	=	time in peak in hours

TIME OF CONCENTRATION (Tc):

L = maximum length of travel in feet

H = difference in elevation between most remote point and outlet in feet

S = Slope, H/L in foot per foot

Tc = time of concentration in minutes
$= (0.0136)(L/(S)^{0.5})^{0.77}$

SUBWATERSHED	L (ft.)	H (ft.)	S =(H/L) (ft/ft.)	T_c (min)	Tc (hr)
Overall					
No. 1	14,500	(2320 - 200) 2120	0.146	45.63	0.761
No. 2	18,100	(2600 - 200) 2400	0.133	56.21	0.937
No. 3	12,000	(920 - 60) 860	0.072	51.91	0.87
No. 4	16,000	(400 - 60) 340	0.021	103.44	1.72
No. 5	9,000	(60 - 35) 25	0.003	145.37	2.42
No. 6	10,000	(180 - 60) 120	0.012	89.75	1.50
No. 7	7,500	(60 - 33) 27	0.004	114.33	1.91
OVERALL*	35,600	(2600 - 33) 2567	0.072	119.63	2.0

* Through Oahu West Development

SUBWATERSHED	L (ft.)	H (ft.)	S =(H/L) (ft/ft.)	T_c (min)	Tc (hr)
No. 8	8,300	(55 - 20) 35	0.004	116.31	1.94
No. 9	7,000	(42 - 20) 22	0.003	114.23	1.90
OVERALL**	38,000	(2600 - 20) 2580	0.068	128.74	2.15

** Up to Ewa Marina Community Development

RUNOFF CURVE NUMBER DETERMINATION:

The runoff Curve Number, CN, is dependent upon the type of soil present, projected land use, and the hydrologic condition prevailing.

The type of soils present were determined by using the appendix in the "Soil Survey of (the) State of Hawaii, "United States Department of Agriculture, Soil Conservation Service, Issued August 1972.

The projected land use for the upstream drainage basin is assumed to be undeveloped woodlands (Exhibit B-1). The rest of this Watershed is projected to be cultivated with sugar cane with limited cover and straight rows (Exhibit B-2).

The hydrologic conditions chosen in all cases were based on the worst condition forseeable and thus fall on the conservative side.

Determination of the Curve Number was derived using the above data and the estimation method described in the SCS, National Engineering Handbook, "Hydrology", Chapters 7, 9, and 10.

CN Calculation for SWS Through Oahu West Development

S W S	HYDROLOGIC SOIL GROUP A	B	C	D	CN
1		90%	10%		67
2		90%	10%		67
3		45%	8%	47%	84
4		49%	3%	48%	83
5		10%		90%	88
6			35%	65%	88
7		16%	3%	81%	87

The CN values for the subwatersheds were computed using the weighting function:

CN = _____% A + _____% B + _____% C + _____% D

The CN value of 77 for the overall watershed was obtained by considering the characteristics of the subwatersheds and their drainage areas in relation to the entire basin.

S W S	CN	Area (S. Mi.)	% of Watershed	Partial CN
1	67	1.84	18.7	12.5
2	67	2.51	25.5	17.1
3	84	1.29	13.1	11.0
4	83	1.72	17.4	14.4
5	88	0.83	8.4	7.4
6	88	0.62	6.3	5.5
7	87	1.05	10.6	9.2
OVERALL W.S.		9.86	100%	77

CN Calculation for SWS up to Ewa Marina Community Development

S W S	HYDROLOGIC SOIL GROUP A	B	C	D	CN
1		90%	10%		67
2		90%	10%		67
3		45%	8%	47%	84
4		49%	3%	48%	83
5		10%		90%	88
6			35%	65%	88
7		16%	3%	81%	87
8			25%	75%	88
9		35%		65%	85

The CN values for the subwatersheds were computed using the weighting function:

CN = _____% A + _____% B + _____% C + _____% D

The CN value of 79 for the overall watershed was obtained by considering the characteristics of the subwatersheds and their drainage areas in relation to the entire basin.

S W S	CN	Area (S. Mi.)	% of Watershed	Partial CN
1	67	1.84	16.0	10.7
2	67	2.51	21.8	14.6
3	84	1.29	11.2	9.4
4	83	1.72	15.0	12.4
5	88	0.83	7.2	6.4
6	88	0.62	5.4	4.8
7	87	1.05	9.1	8.0
8	88	0.86	7.5	6.6
9	85	0.77	6.7	5.7
OVERALL W.S.		11.49	100%	78.6 = 79

UNIT HYDROGRAPH PEAK DISCHARGE

5-YEAR RECURRENCY, 6-HOUR RAINFALL

C A L C U L A T I O N S :

DISCHARGE FOR KALOI GULCH - OVERALL*

a. Drainage Area = 9.86 s.m.

b. Time of Concentration (Tc) = 2.0 hours

c. 6-Hour Rainfall (5-year recurrency) P = 4.5 inches
(See Exhibit H)

d. Curve Number, Cn = 77

Land Use = Sugarcane, woods

Hydrologic Condition = Poor

Soil Group = Mixture of 55% "B", 10% "C", and 35% "D"

1. Determine the 6-hour design storm rainfall, P (5-year recurrency.

P = 4.5 inches (Exhibit H)

2. Determine the areal rainfall amount. A < 10 s.m.

No determination necessary since the area is less than 10 square miles.

3. Make the duration adjustment of rainfall amount.

No adjustment is made because the time of concentration is not over 6 hours.

* Through Oahu West Development. For calculations to Ewa Marina Community Development see supplemental Calculation at the end of this section.

4. <u>Determine the runoff amount, "Q".</u>

with P = 4.5 and Cn = 77

then Q = 2.2 inches (See Exhibit C)

5. <u>Determine the hydrograph family.</u>

with P = 4.5 and Cn = 77

then Hydrograph Family #3 (See Exhibit D)

6. <u>Determine the duration of excess rainfall, To.</u>

with P = 4.5 and Cn = 77

then To = 4.5 hours (See Exhibit E)

7. <u>Compute the initial value of Tp.</u>

$Tp = 0.7\ Tc$

$Tp = 0.7\ (2.0\ hr.) = 1.40$ hours

8. <u>Compute the To/Tp ratio</u>

$$\frac{To}{Tp} = \frac{4.5}{1.40} = 3.2$$

9. <u>Select a revised To/Tp ratio from Table 21.16.</u>

$$\left(\frac{To}{Tp}\right)_{rev.} = 3$$ (See Exhibit F)

10. <u>Compute Rev. Tp.</u>

$$\text{Rev Tp.} = \frac{To}{(To/Tp)\ rev.}$$

$$\text{Rev. Tp} = \frac{4.5}{3} = 1.500 \text{ hours}$$

11. <u>Compute qp</u>.

$$qp = \frac{484\ A}{Rev.\ Tp}$$

$$qp = \frac{484\ (9.86)}{1.500} = 3181 \text{ cfs/inch of runoff}$$

12. <u>Compute Q qp</u>.

$$Q\ qp = Q \times qp$$

$$Q\ qp = (2.2) \times (3181) = 6999 \text{ cfs}$$

13. <u>Compute q</u>.

$$q = \left(\frac{qc}{qp}\right)_{max} Q\ qp$$

With Hydrograph Family #3 and (To/Tp) rev. = 3
then (qc/qp) max = 0.543 (See Exhibit G)

$$q = (0.543) \times (6999) = 3801 \text{ cfs}$$

14. <u>Use for design (q)</u>.

q (peak) = 3800 cfs

MAJOR DRAINAGE BASINS - UNIT HYDROGRAPH PEAK DISCHARGE

5-YEAR RECURRENCY, 6-HOUR RAINFALL

	SUBWATERSHED (SWS)							
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	Overall
a. Drainage Area (s.m.)	1.84	2.51	1.29	1.72	0.83	0.62	1.05	9.86
b. Time of Concentration (Tc hours)	0.761	0.937	0.87	1.72	2.42	1.50	1.91	2.0
c. 6-Hour Rainfall, P (in.) (See Exhibit H)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
d. Curve Number, Cn, (Exhibit B)	67	67	84	83	88	88	87	77
Land Use	Woods	Woods	No. 3 to 7: Sugarcane, with limited cover and planted in straight rows.					
Hydrologic Condition =	Poor							
Soil Group, Varies (Exhibit M)								
1. Determine 6-hour rainfall, P (inch)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
2. Determine areal rainfall amount	No determination is necessary drainage areas of less than 10 square miles.							
3. Make duration adjustment of rainfall amount	No adjustment is made because the time of concentration is not over 6 hours							

MAJOR DRAINAGE BASINS - UNIT HYDROGRAPH PEAK DISCHARGE

5-YEAR RECURRENCY, 6-HOUR RAINFALL (CONTINUED)

	SUBWATERSHED (SWS)							
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	Overall
4. Determine the runoff amount "Q" Q (inch) (Exhibit C)	1.5	1.5	2.8	2.7	3.2	3.2	3.1	2.2
5. Determine the Hydrograph Family Hydrograph Family (Exhibit D)	4	4	2	2	2	2	2	3
6. Determine the duration of excess rainfall To To (Hour) (Exhibit E)	4.0	4.0	5.0	5.0	5.2	5.2	5.1	4.5
7. Compute initial value of Tp Tp (hours) = 0.7 Tc	0.532	0.658	0.609	1.20	1.69	1.05	1.34	1.40
8. Compute To/Tp ratio	7.5	6.1	8.2	4.2	3.1	4.95	3.8	3.2
9. Select a revised To/Tp ratio (Exhibit F)	6	6	10	4	3	4	4	3

MAJOR DRAINAGE BASINS - UNIT HYDROGRAPH PEAK DISCHARGE

5-YEAR RECURRENCY, 6-HOUR RAINFALL (CONTINUED)

	SUBWATERSHED (SWS)							
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	Overall
10. Compute Rev. Tp. Rev. Tp (Hour) = $\frac{To}{(\frac{To}{Tp})\ rev}$	0.667	0.667	0.500	1.250	1.733	1.300	1.275	1.500
11. Compute qp qp (cfs/inch of runoff) = $\frac{484\ A}{Rev.\ Tp}$ =	1336	1822	1249	666	232	231	399	3181
12. Compute Qqp								
$Qqp_{(cfs)} = Q\ (qp)$	2003	2733	3496	1798	742	739	1236	6999
13. Compute q.								
$(\frac{qc}{qp})max$ Exhibit G	0.250	0.250	0.364	0.550	0.615	0.550	0.550	0.543
q cfs = $(\frac{qc}{qp})$ max Qqp	501	683	1273	989	456	406	680	3801
14. Use q (cfs)	500	700	1300	1000	450	400	700	3800

UNIT HYDROGRAPH PEAK DISCHARGE

10-YEAR RECURRENCY, 6-HOUR RAINFALL

C A L C U L A T I O N S :

DISCHARGE FOR KALOI GULCH - OVERALL*

a. Drainage Area = 9.86 s.m.

b. Time of Concentration (Tc) = 2.0 hours

c. 6-Hour Rainfall (10-year recurrency) P = 5.5 inches
(See Exhibit I)

d. Curve Number, Cn = 77

Land Use = Sugarcane, woods

Hydrologic Condition = Poor

Soil Group = Mixture of 55% "B", 10% "C", and 35% "D"

1. Determine the 6-hour design storm rainfall, P (10-year recurrency.

P = 5.5 inches (Exhibit I)

2. Determine the areal rainfall amount. A < 10 s.m.

No determination necessary since the area is less than 10 square miles.

3. Make the duration adjustment of rainfall amount.

No adjustment is made because the time of concentration is not over 6 hours.

* Through Oahu West Development. For calculations to Ewa Marina Community Development see supplemental Calculation at the end of this section.

4. <u>Determine the runoff amount, "Q".</u>

with P = 5.5 and Cn = 77

then Q = 3.2 inches (See Exhibit C)

5. <u>Determine the hydrograph family.</u>

with P = 5.5 and Cn = 77

then Hydrograph Family #3 (See Exhibit D)

6. <u>Determine the duration of excess rainfall, To.</u>

with P = 5.5 and Cn = 77

then To = 4.7 hours (See Exhibit E)

7. <u>Compute the initial value of Tp.</u>

$Tp = 0.7\ Tc$

$Tp = 0.7\ (2.0\ hr.) = 1.40$ hours

8. <u>Compute the To/Tp ratio</u>

$$\frac{To}{Tp} = \frac{4.7}{1.40} = 3.4$$

9. <u>Select a revised To/Tp ratio from Table 21.16.</u>

$$\left(\frac{To}{Tp}\right)_{rev.} = 3$$ (See Exhibit F)

10. <u>Compute Rev. Tp.</u>

$$\text{Rev Tp.} = \frac{To}{(To/Tp)\ rev.}$$

$$\text{Rev. Tp} = \frac{4.7}{3} = 1.567 \text{ hours}$$

11. <u>Compute qp</u>.

$$qp = \frac{484\ A}{Rev.\ Tp}$$

$$qp = \frac{484\ (9.86)}{1.567} = 3046 \text{ cfs/inch of runoff}$$

12. <u>Compute Q qp</u>.

$$Q\ qp = Q \times qp$$

$$Q\ qp = (3.2) \times (3046) = 9{,}748 \text{ cfs}$$

13. <u>Compute q</u>.

$$q = \left(\frac{qc}{qp}\right) \max\ Q\ qp$$

With Hydrograph Family #3 and (To/Tp) rev. = 3
then (qc/qp) max = 0.543 (See Exhibit G)

$$q = (0.543) \times (9{,}748) = 5293 \text{ cfs}$$

14. <u>Use for design (q)</u>.

q (peak) = 5300 cfs

MAJOR DRAINAGE BASINS - UNIT HYDROGRAPH PEAK DISCHARGE

10-YEAR RECURRENCY, 6-HOUR RAINFALL

	SUBWATERSHED (SWS)							
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	Overall
a. Drainage Area (s.m.)	1.84	2.51	1.29	1.72	0.83	0.62	1.05	9.86
b. Time of Concentration (Tc hours)	0.761	0.937	0.87	1.72	2.42	1.50	1.91	2.0
c. 6-Hour Rainfall, P (in.) (See Exhibit H)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
d. Curve Number, Cn, (Exhibit B)	67	67	84	83	88	88	87	77
Land Use	Woods	Woods	No. 3 to 7: Sugarcane, with limited cover and planted in straight rows.					
Hydrologic Condition = Poor								
Soil Group, Varies (Exhibit M)								
1. Determine 6-hour rainfall, P (inch)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
2. Determine areal rainfall amount	No determination is necessary for drainage areas of less than 10 square miles.							
3. Make duration adjustment of rainfall amount	No adjustment is made because the time of concentration is not over 6 hours							

MAJOR DRAINAGE BASINS - UNIT HYDROGRAPH PEAK DISCHARGE

10-YEAR RECURRENCY, 6-HOUR RAINFALL (CONTINUED)

	SUBWATERSHED (SWS)							
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	Overall
4. Determine the runoff amount "Q" Q (inch) (Exhibit C)	2.2	2.2	3.7	3.6	4.2	4.2	4.1	3.2
5. Determine the Hydrograph Family Hydrograph Family (Exhibit D)	3	3	2	2	2	2	2	3
6. Determine the duration of excess rainfall To To (Hour) (Exhibit E)	4.2	4.2	5.1	5.1	5.3	5.3	5.3	4.7
7. Compute initial value of Tp Tp (hours) = 0.7 Tc	0.532	0.658	0.609	1.20	1.69	1.05	1.34	1.40
8. Compute To/Tp ratio	7.9	6.4	8.4	4.2	3.1	5.05	4.0	3.4
9. Select a revised To/Tp ratio (Exhibit F)	6	6	10	4	3	6	4	3

MAJOR DRAINAGE BASINS - UNIT HYDROGRAPH PEAK DISCHARGE

10-YEAR RECURRENCY, 6-HOUR RAINFALL (CONTINUED)

	SUBWATERSHED (SWS)							
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	Overall
10. Compute Rev. Tp. Rev. Tp (Hour) = $\frac{To}{(\frac{To}{Tp})_{rev}}$	0.700	0.700	0.510	1.275	1.767	0.883	1.325	1.567
11. Compute qp qp (cfs/inch of runoff) = $\frac{484\ A}{Rev.\ Tp}$ =	1272	1735	1224	653	227	340	384	3046
12. Compute Qqp								
$Qqp_{(cfs)} = Q\ (qp)$	2799	3818	4530	2351	955	1427	1573	9748
13. Compute q.								
$(\frac{qc}{qp})max$ Exhibit G	0.390	0.390	0.364	0.550	0.615	0.464	0.550	0.543
q cfs = $(\frac{qc}{qp})$ max Qqp	1091	1489	1649	1293	587	662	865	5293
14. Use q (cfs)	1100	1500	1650	1300	600	700	900	5450

UNIT HYDROGRAPH PEAK DISCHARGE

50-YEAR RECURRENCY, 6-HOUR RAINFALL

C A L C U L A T I O N S :

DISCHARGE FOR KALOI GULCH - OVERALL*

a. Drainage Area = 9.86 s.m.

b. Time of Concentration (Tc) = 2.0 hours

c. 6-Hour Rainfall (50-year recurrency) P = 7.5 inches
(See Exhibit J)

d. Curve Number, Cn = 77

Land Use = Sugarcane, woods

Hydrologic Condition = Poor

Soil Group "B" = Mixture of 55% "B", 10% "C", and 35% "D"

1. Determine the 6-hour design storm rainfall, P (50-year recurrency.

P = 7.5 inches (Exhibit J)

2. Determine the areal rainfall amount. A < 10 s.m.

No determination necessary since the area is less than 10 square miles.

3. Make the duration adjustment of rainfall amount.

No adjustment is made because the time of concentration is not over 6 hours.

* Through Oahu West Development. For calculations to Ewa Marina Community Development see supplemental Calculation at the end of this section.

4. Determine the runoff amount, "Q".

with P = 7.5 and Cn = 77

then Q = 4.8 inches (See Exhibit C)

5. Determine the hydrograph family.

with P = 7.5 and Cn = 77

then Hydrograph Family #2 (See Exhibit D)

6. Determine the duration of excess rainfall, To.

with P = 7.5 and Cn = 77

then To = 5.0 hours (See Exhibit E)

7. Compute the initial value of Tp.

$$Tp = 0.7\ Tc$$

$$Tp = 0.7\ (2.0\ hr.) = 1.40\ hours$$

8. Compute the To/Tp ratio

$$\frac{To}{Tp} = \frac{5.0}{1.40} = 3.6$$

9. Select a revised To/Tp ratio from Table 21.16.

$$\left(\frac{To}{Tp}\right)_{rev.} = 4$$ (See Exhibit F)

10. Compute Rev. Tp.

$$Rev\ Tp. = \frac{To}{(To/Tp)\ rev.}$$

$$Rev.\ Tp = \frac{5.0}{4} = 1.250\ hours$$

11. <u>Compute qp</u>.

$$qp = \frac{484\ A}{Rev.\ Tp}$$

$$qp = \frac{484\ (9.86)}{1.250} = 3818 \text{ cfs/inch of runoff}$$

12. <u>Compute Q qp</u>.

$$Q\ qp = Q \times qp$$

$$Q\ qp = (4.8) \times (3818) = 18{,}325 \text{ cfs}$$

13. <u>Compute q</u>.

$$q = \left(\frac{qc}{qp}\right)_{max} Q\ qp$$

With Hydrograph Family #2 and (To/Tp) rev. = 4
then (qc/qp) max = (0.550) (See Exhibit G)

$$q = (0.550) \times (18{,}325) = 10{,}079 \text{ cfs}$$

14. <u>Use for design (q)</u>.

q (peak) = 10,100 cfs

MAJOR DRAINAGE BASINS - UNIT HYDROGRAPH PEAK DISCHARGE

50-YEAR RECURRENCY, 6-HOUR RAINFALL

	SUBWATERSHED (SWS)							
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	Overall
a. Drainage Area (s.m.)	1.84	2.51	1.29	1.72	0.83	0.62	1.05	9.86
b. Time of Concentration (Tc hours)	0.761	0.937	0.87	1.72	2.42	1.50	1.91	2.0
c. 6-Hour Rainfall, P (in.) (See Exhibit H)	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
d. Curve Number, Cn, (Exhibit B)	67	67	84	83	88	88	87	77
Land Use	Woods	Woods	No. 3 to 7: Sugarcane, with limited cover and planted in straight rows.					

Hydrologic Condition = Poor

Soil Group, Varies (Exhibit M)

1. Determine 6-hour rainfall, P (inch)	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
2. Determine areal rainfall amount	No determination is necessary for drainage areas of less than 10 square miles.							
3. Make duration adjustment of rainfall amount	No adjustment is made because the time of concentration is not over 6 hours							

MAJOR DRAINAGE BASINS - UNIT HYDROGRAPH PEAK DISCHARGE

50-YEAR RECURRENCY, 6-HOUR RAINFALL (CONTINUED)

	SUBWATERSHED (SWS)							
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	Overall
4. Determine the runoff amount "Q" Q (inch) (Exhibit C)	3.7	3.7	5.6	5.5	6.1	6.1	6.0	4.8
5. Determine the Hydrograph Family Hydrograph Family (Exhibit D)	3	3	2	2	1	1	1	2
6. Determine the duration of excess rainfall To To (Hour) (Exhibit E)	4.6	4.6	5.3	5.3	5.5	5.5	5.5	5.0
7. Compute initial value of Tp Tp (hours) = 0.7 Tc	0.532	0.658	0.609	1.20	1.69	1.05	1.34	1.40
8. Compute To/Tp ratio	8.7	7.0	8.7	4.4	3.2	5.2	4.1	3.6
9. Select a revised To/Tp ratio (Exhibit F)	10	6	10	4	3	6	4	4

MAJOR DRAINAGE BASINS - UNIT HYDROGRAPH PEAK DISCHARGE

50-YEAR RECURRENCY, 6-HOUR RAINFALL (CONTINUED)

	SUBWATERSHED (SWS)							
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	Overall
10. Compute Rev. Tp. Rev. Tp (Hour) = $\frac{To}{(\frac{To}{Tp})\ rev}$	0.46	0.767	0.530	1.325	1.833	0.917	1.375	1.250
11. Compute qp qp (cfs/inch of runoff) = $\frac{484\ A}{Rev.\ Tp}$ =	1936	1585	1178	628	219	327	370	3818
12. Compute Qqp								
$Qqp_{(cfs)} = Q\ (qp)$	7136	5863	6597	3456	1337	1997	2218	18,325
13. Compute q.								
$(\frac{qc}{qp})max$ Exhibit G	0.303	0.390	0.364	0.550	0.650	0.497	0.585	0.550
q cfs = $(\frac{qc}{qp})$ max Qqp	2170	2287	2401	1901	869	992	1297	10,079
14. Use q (cfs)	2200	2300	2400	1900	900	1000	1300	10,100

UNIT HYDROGRAPH PEAK DISCHARGE

100-YEAR RECURRENCY, 6-HOUR RAINFALL

C A L C U L A T I O N S :

DISCHARGE FOR KALOI GULCH - OVERALL*

a. Drainage Area = 9.86 s.m.

b. Time of Concentration (Tc) = 2.0 hours

c. 6-Hour Rainfall (100-year recurrency) P = 8.5 inches
(See Exhibit K)

d. Curve Number, Cn = 77

Land Use	=	Sugarcane, woods
Hydrologic Condition	=	Poor
Soil Group "B"	=	Mixture of 55% "B", 10% "C", and 35% "D"

1. Determine the 6-hour design storm rainfall, P (100-year recurrency.

   P = 8.5 inches (Exhibit K)

2. Determine the areal rainfall amount. A < 10 s.m.

   No determination necessary since the area is less than 10 square miles.

3. Make the duration adjustment of rainfall amount.

   No adjustment is made because the time of concentration is not over 6 hours.

* Through Oahu West Development. For calculations to Ewa Marina Community Development see supplemental Calculation at the end of this section.

4. Determine the runoff amount, "Q".

with P = 8.5 and Cn = 77

then Q = 5.8 inches (See Exhibit C)

5. Determine the hydrograph family.

with P = 8.5 and Cn = 77

then Hydrograph Family #2 (See Exhibit D)

6. Determine the duration of excess rainfall, To.

with P = 8.5 and Cn = 77

then To = 5.1 hours (See Exhibit E)

7. Compute the initial value of Tp.

$$Tp = 0.7\ Tc$$

$$Tp = 0.7\ (2.0\ hr.) = 1.40\ hours$$

8. Compute the To/Tp ratio

$$\frac{To}{Tp} = \frac{5.1}{1.40} = 3.6$$

9. Select a revised To/Tp ratio from Table 21.16.

$$\left(\frac{To}{Tp}\right)_{rev.} = 4$$ (See Exhibit F)

10. Compute Rev. Tp.

$$Rev\ Tp. = \frac{To}{(To/Tp)\ rev.}$$

$$Rev.\ Tp = \frac{5.1}{4} = 1.275\ hours$$

11. <u>Compute qp</u>.

$$qp = \frac{484\ A}{Rev.\ Tp}$$

$$qp = \frac{484\ (9.86)}{1.275} = 3743 \text{ cfs/inch of runoff}$$

12. <u>Compute Q qp</u>.

$$Q\ qp = Q \times qp$$

$$Q\ qp = (5.8) \times (3743) = 21{,}709 \text{ cfs}$$

13. <u>Compute q</u>.

$$q = \left(\frac{qc}{qp}\right) \max\ Q\ qp$$

With Hydrograph Family #2 and (To/Tp) rev. = 4
then (qc/qp) max = (0.550) (See Exhibit G)

$$q = (0.550) \times (21{,}709) = 11{,}940 \text{ cfs}$$

14. <u>Use for design (q)</u>.

q (peak) = 11,950 cfs

MAJOR DRAINAGE BASINS - UNIT HYDROGRAPH PEAK DISCHARGE

100-YEAR RECURRENCY, 6-HOUR RAINFALL

	SUBWATERSHED (SWS)							
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	Overall
a. Drainage Area (s.m.)	1.84	2.51	1.29	1.72	0.83	0.62	1.05	9.86
b. Time of Concentration (Tc hours)	0.761	0.937	0.87	1.72	2.42	1.50	1.91	2.0
c. 6-Hour Rainfall, P (in.) (See Exhibit H)	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
d. Curve Number, Cn, (Exhibit B)	67	67	84	83	88	88	87	77
Land Use	Woods	Woods	No. 3 to 7: Sugarcane, with limited cover and planted in straight rows.					
Hydrologic Condition = Poor								
Soil Group, Varies (Exhibit M)								
1. Determine 6-hour rainfall, P (inch)	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
2. Determine areal rainfall amount	No determination is necessary for drainage areas of less than 10 square miles.							
3. Make duration adjustment of rainfall amount	No adjustment is made because the time of concentration is not over 6 hours							

MAJOR DRAINAGE BASINS - UNIT HYDROGRAPH PEAK DISCHARGE

100-YEAR RECURRENCY, 6-HOUR RAINFALL (CONTINUED)

	SUBWATERSHED (SWS)							
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	Overall
4. Determine the runoff amount "Q" Q (inch) (Exhibit C)	4.5	4.7	6.6	6.5	7.1	7.1	7.0	5.8
5. Determine the Hydrograph Family Hydrograph Family (Exhibit D)	3	3	2	2	1	1	1	2
6. Determine the duration of excess rainfall To To (Hour) (Exhibit E)	4.7	4.7	5.4	5.4	5.6	5.6	5.5	5.1
7. Compute initial value of Tp Tp (hours) = 0.7 Tc	0.53	0.66	0.61	1.20	1.69	1.05	1.34	1.40
8. Compute To/Tp ratio	8.8	7.1	8.9	4.5	3.3	5.3	4.1	3.6
9. Select a revised To/Tp ratio (Exhibit F)	10	6	10	4	3	6	4	4

MAJOR DRAINAGE BASINS - UNIT HYDROGRAPH PEAK DISCHARGE

100-YEAR RECURRENCY, 6-HOUR RAINFALL (CONTINUED)

	SUBWATERSHED (SWS)							
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	Overall
10. Compute Rev. Tp. Rev. Tp (Hour) = $\frac{To}{(\frac{To}{Tp})\ rev}$	0.470	0.783	0.540	1.350	1.87	0.933	1.375	1.275
11. Compute qp qp (cfs/inch of runoff) = $\frac{484\ A}{Rev.\ Tp}$ =	1895	1551	1156	617	215	322	370	3743
12. Compute Qqp								
$Qqp_{(cfs)} = Q\ (qp)$	8527	7289	7631	4008	1528	2283	2587	21,709
13. Compute q.								
$(\frac{qc}{qp})max$ Exhibit G	0.303	0.390	0.364	0.550	0.650	0.497	0.585	0.550
q cfs = $(\frac{qc}{qp})$ max Qqp	2584	2842	2778	2205	993	1135	1514	11,940
14. Use q (cfs)	2600	2850	2800	2200	1000	1500	1550	11,950

MAJOR DRAINAGE BASINS - UNIT HYDROGRAPH PEAK DISCHARGE

OVERALL WATERSHED (SWS 1 TO 9)**

	Tr - STORM RETURN PERIOD			
	5 Yr.	10 Yr.	50 Yr.	100 Yr.
a. Drainage Area (s.m.)	11.49	11.49	11.49	11.49
b. Time of Concentration (Tc hours)	2.15	2.15	2.15	2.15
c. 6-Hour Rainfall, P (in.) (See Exhibit H)	4.5	5.5	7.5	8.5
d. Curve Number, Cn, (Exhibit B)	79	79	79	79
Land Use	Sugarcane, with limited cover and planted in straight rows.			
Hydrologic Condition = Poor				
Soil Group, Varies (Exhibit M)				
1. Determine 6-hour rainfall, P (inch)	4.5	5.5	7.5	8.5
2. Determine areal rainfall amount (Exhibit N) (Factor = 0.97 x P)	4.37	5.34	7.28	8.25
3. Make duration adjustment of rainfall amount	No adjustment is made because the time of concentration is not over 6 hours			

MAJOR DRAINAGE BASINS - UNIT HYDROGRAPH PEAK DISCHARGE

OVERALL WATERSHED (SWS 1 TO 9)** (CONTINUED)

	Tr - STORM RETURN PERIOD			
	5 Yr.	10 Yr.	50 Yr.	100 Yr.
4. Determine the runoff amount "Q" Q (inch) (Exhibit C)	2.3	3.1	4.8	5.7
5. Determine the Hydrograph Family Hydrograph Family (Exhibit D)	3	2	2	2
6. Determine the duration of excess rainfall To To (Hour) (Exhibit E)	4.6	4.8	5.0	5.1
7. Compute initial value of Tp Tp (hours) = 0.7 Tc	1.3505	1.505	1.505	1.505
8. Compute To/Tp ratio	3.1	3.2	3.3	3.4
9. Select a revised To/Tp ratio (Exhibit F)	3	3	4(Conservative Value)	4(Conservative Value)

MAJOR DRAINAGE BASINS - UNIT HYDROGRAPH PEAK DISCHARGE

OVERALL WATERSHED (SWS 1 TO 9)** (CONTINUED)

	Tr - STORM RETURN PERIOD			
	5 Yr.	10 Yr.	50 Yr.	100 Yr.
10. Compute Rev. Tp.				
Rev. Tp (Hour) = $\frac{To}{(\frac{To}{Tp})\ rev}$	1.533	1.600	1.667	1.275
11. Compute qp				
qp (cfs/inch of runoff) = $\frac{484\ A}{Rev.\ Tp}$ =	3627	3476	3337	4362
12. Compute Qqp				
$Qqp_{(cfs)} = Q\ (qp)$	8342	10,775	16,016	24,862
13. Compute q.				
$(\frac{qc}{qp})max$ Exhibit G	0.543	0.615	0.550	0.550
q cfs = $(\frac{qc}{qp})$ max Qqp	4530	6627	11,745	13,674
14. Use q (cfs)	4550	6650	11,750	13,700

** Discharge at Ewa Marina Community Development.

MAJOR DRAINAGE BASINS - UNIT HYDROGRAPH PEAK DISCHARGE

100-YEAR RECURRENCY, 6-HOUR RAINFALL**

	SUBWATERSHED (SWS)		
	No. 8	No. 9	Overall
a. Drainage Area (s.m.)	0.86	0.77	11.49
b. Time of Concentration (Tc hours)	1.94	1.90	2.15
c. 6-Hour Rainfall, P (in.) (See Exhibit H)	8.5	8.5	8.5
d. Curve Number, Cn, (Exhibit B)	88	85	79

Land Use — Sugarcane, with limited cover and planted in straight rows.

Hydrologic Condition = Poor

Soil Group, Varies (Exhibit M)

1. Determine 6-hour rainfall, P (inch)	8.5	8.5	8.5
2. Determine areal rainfall amount (Exhibit N)	8.5	8.5	8.25 (Areal correction factor = 0.97 x P)
3. Make duration adjustment of rainfall amount	No adjustment is made because the time of concentration is not over 6 hours		

MAJOR DRAINAGE BASINS - UNIT HYDROGRAPH PEAK DISCHARGE

100-YEAR RECURRENCY, 6-HOUR RAINFALL** (CONTINUED)

	SUBWATERSHED (SWS)		
	No. 8	No. 9	Overall
4. Determine the runoff amount "Q" Q (inch) (Exhibit C)	7.1	6.7	5.7
5. Determine the Hydrograph Family Hydrograph Family (Exhibit D)	1	2	2
6. Determine the duration of excess rainfall To To (Hour) (Exhibit E)	5.6	5.4	5.1
7. Compute initial value of Tp Tp (hours) = 0.7 Tc	1.36	1.33	1.505
8. Compute To/Tp ratio	4.1	4.1	3.4
9. Select a revised To/Tp ratio (Exhibit F)	4	4	4 (Conservative Value)

MAJOR DRAINAGE BASINS - UNIT HYDROGRAPH PEAK DISCHARGE

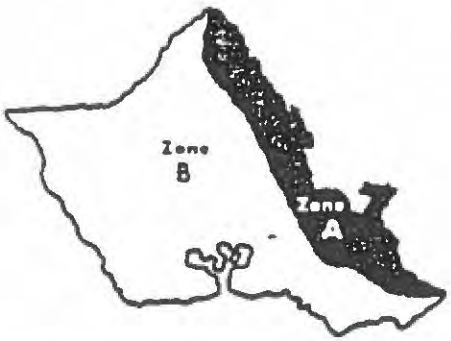
100-YEAR RECURRENCY, 6-HOUR RAINFALL** (CONTINUED)

	SUBWATERSHED (SWS)		
	No. 8	No. 9	Overall
10. Compute Rev. Tp. Rev. Tp (Hour) = $\frac{To}{(\frac{To}{Tp})\ rev}$	1.400	1.350	1.275
11. Compute qp qp (cfs/inch of runoff) = $\frac{484\ A}{Rev.\ Tp}$ =	297	276	4362
12. Compute Qqp			
$Qqp_{(cfs)} = Q\ (qp)$	2111	1850	24862
13. Compute q.			
$(\frac{qc}{qp})max$ Exhibit G	0.585	0.550	0.550
q cfs = $(\frac{qc}{qp})$ max Qqp	1235	1017	13,674
14. Use q (cfs)	1250	1050	13,700

** Discharge at Ewa Marina Community Development.

E X H I B I T S

Plate 6 DESIGN CURVES FOR PEAK DISCHARGE VS. DRAINAGE AREA (more than 100 acres)



- CURVES ARE FOR STREAM CHANNELS AND DRAINAGE STRUCTURES.
- THESE CURVES ARE NOT APPLICABLE TO KALIHI STREAM WATERSHED.

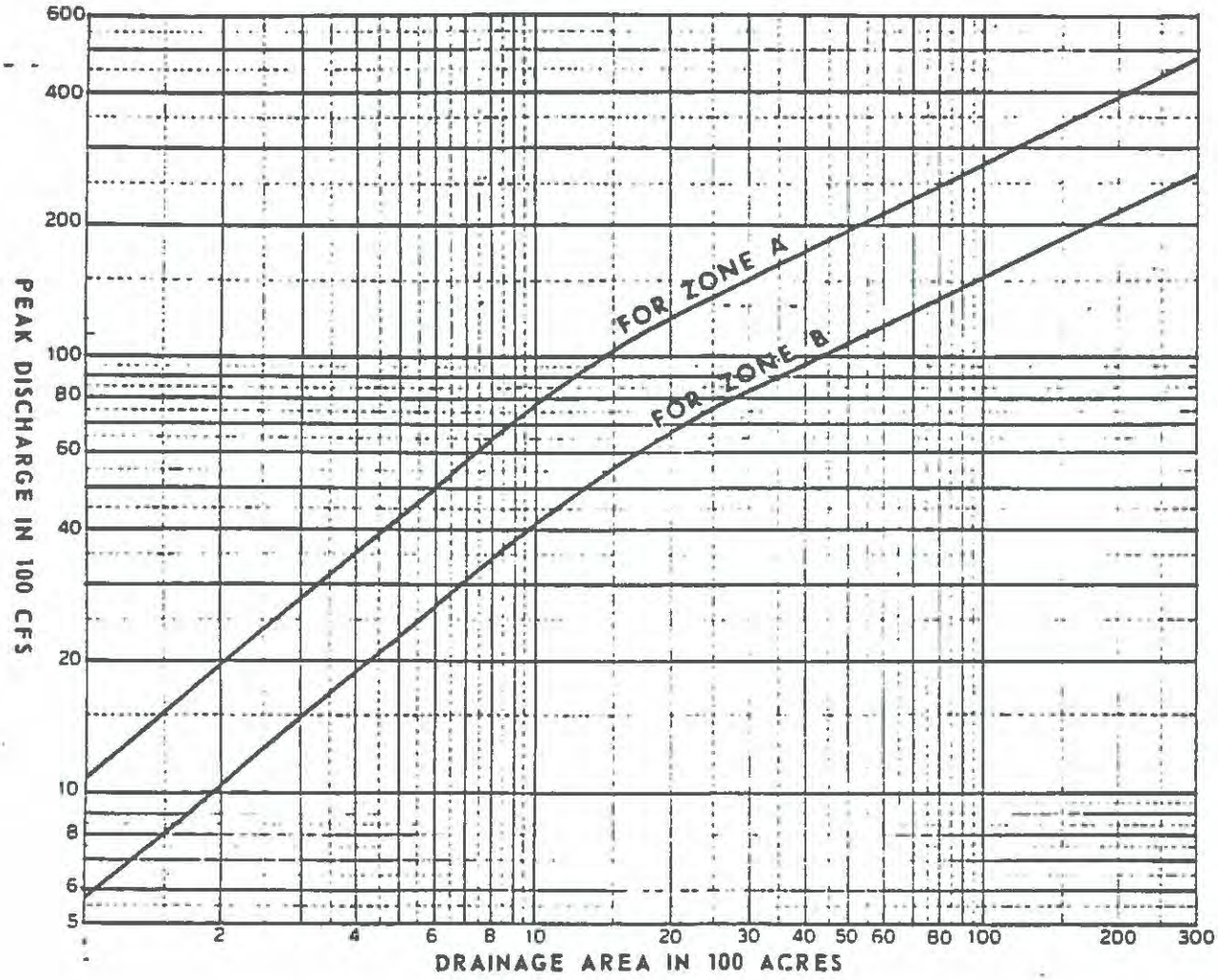


EXHIBIT A

Table 9.1.--Runoff curve numbers for hydrologic soil-cover complexes

(Antecedent moisture condition II, and $I_a = 0.2\ S$)

Land use	Cover: Treatment or practice	Cover: Hydrologic condition	Hydrologic soil group A	B	C	D
Fallow	Straight row	----	77	86	91	94
Row crops	"	Poor	72	81	88	91
	"	Good	67	78	85	89
	Contoured	Poor	70	79	84	88
	"	Good	65	75	82	86
	"and terraced	Poor	66	74	80	82
	" " "	Good	62	71	78	81
Small grain	Straight row	Poor	65	76	84	88
		Good	63	75	83	87
	Contoured	Poor	63	74	82	85
		Good	61	73	81	84
	"and terraced	Poor	61	72	79	82
		Good	59	70	78	81
Close-seeded legumes 1/ or rotation meadow	Straight row	Poor	66	77	85	89
	" "	Good	58	72	81	85
	Contoured	Poor	64	75	83	85
	"	Good	55	69	78	83
	"and terraced	Poor	63	73	80	83
	"and terraced	Good	51	67	76	80
Pasture or range		Poor	68	79	86	89
		Fair	49	69	79	84
		Good	39	61	74	80
	Contoured	Poor	47	67	81	88
	"	Fair	25	59	75	83
	"	Good	6	35	70	79
Meadow		Good	30	58	71	78
Woods		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	25	55	70	77
Farmsteads		----	59	74	82	86
Roads (dirt) 2/		----	72	82	87	89
(hard surface) 2/		---	74	84	90	92

1/ Close-drilled or broadcast.
2/ Including right-of-way.

Table 9.5.--Runoff curve numbers; tentative estimates for sugarcane hydrologic soil-cover complexes in Hawaii (antecedent moisture condition II, and $I_a = 0.2\ S$).

Cover and treatment	Hydrologic soil group			
	A	B	C	D
Sugarcane:				
Limited cover, straight row	67	78	85	89
Partial cover, straight row	49	69	79	84
Complete cover, straight row	39	61	74	80
Limited cover, contoured	65	75	82	86
Partial cover, contoured	25	59	75	83
Complete cover, contoured	6	35	70	79

Limited cover.--Cane newly planted, or ratooned cane with a limited root system; canopy over less than 1/2 the field area.

Partial cover.--Cane in the transition period between limited and complete cover; canopy over 1/2 to nearly the entire field area.

Complete cover.--Cane from the stage of growth when full canopy is provided to the stage at harvest.

Straight-row planting is up and down hill or cross-slope on slopes greater than 2 percent. Contoured planting is the usual contouring or cross-slope planting on slopes less than 2 percent.

* * * *

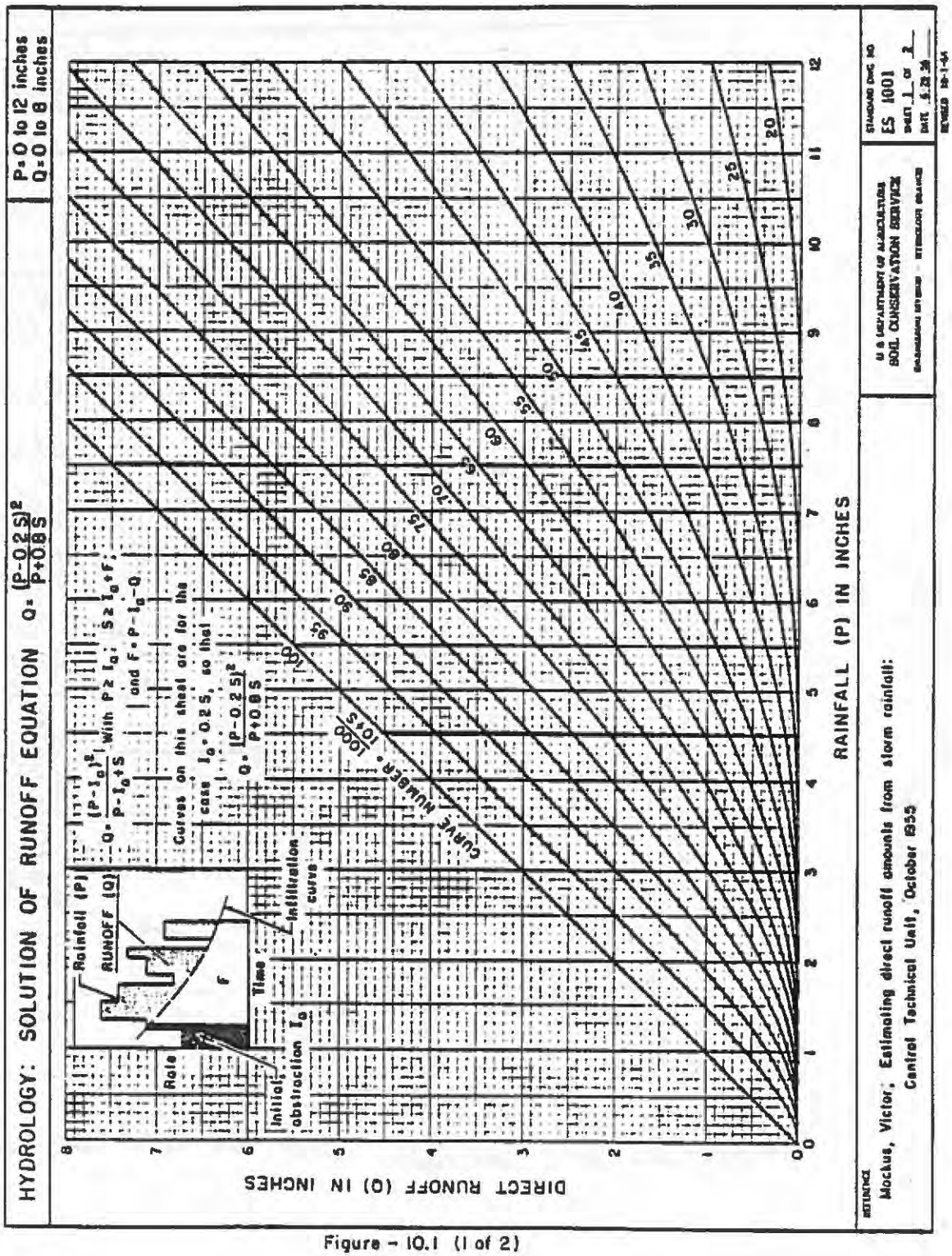


Figure – 10.1 (1 of 2)

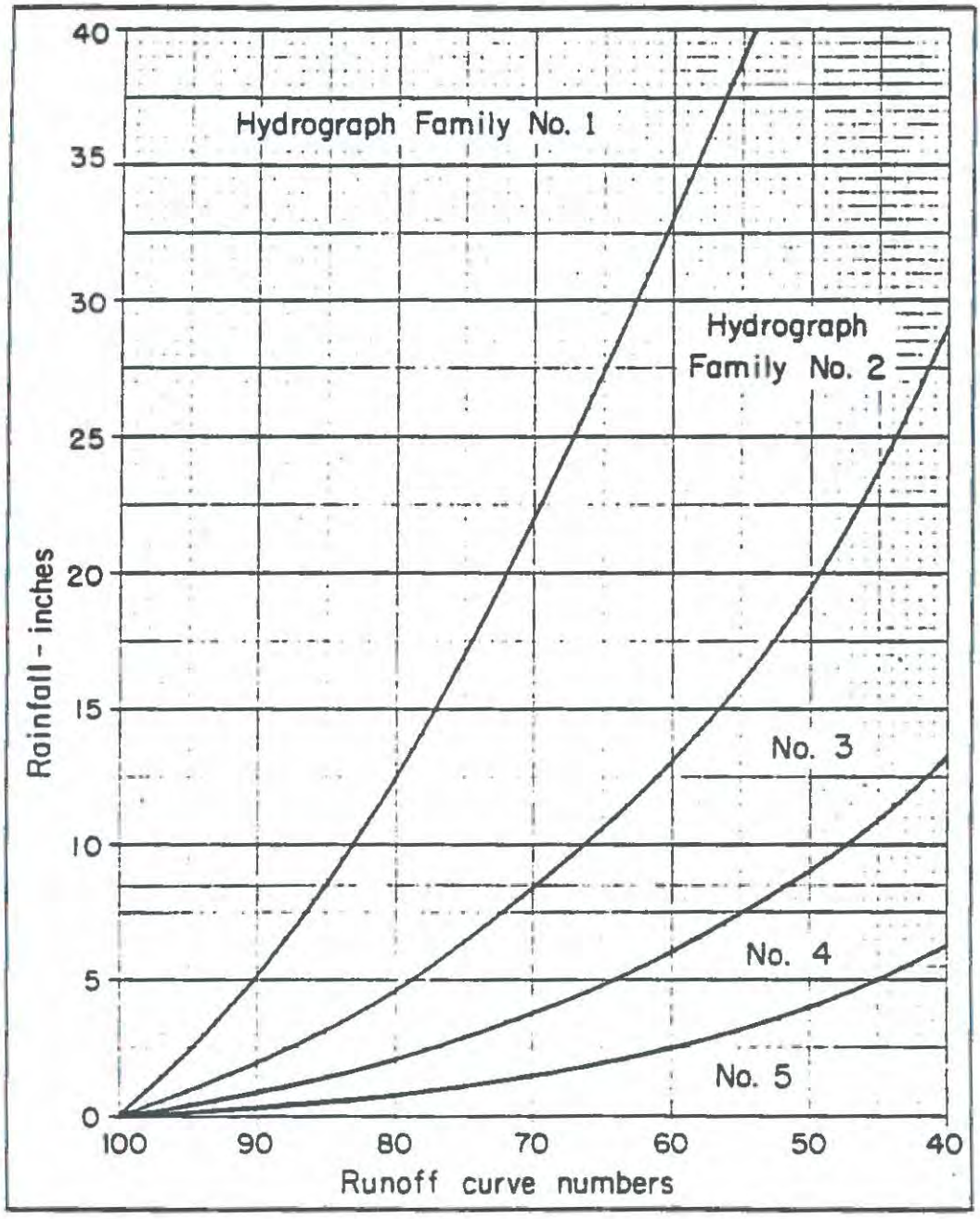


Figure 21-3. Chart for selecting a hydrograph family for a given rainfall and runoff curve number.

EXHIBIT D

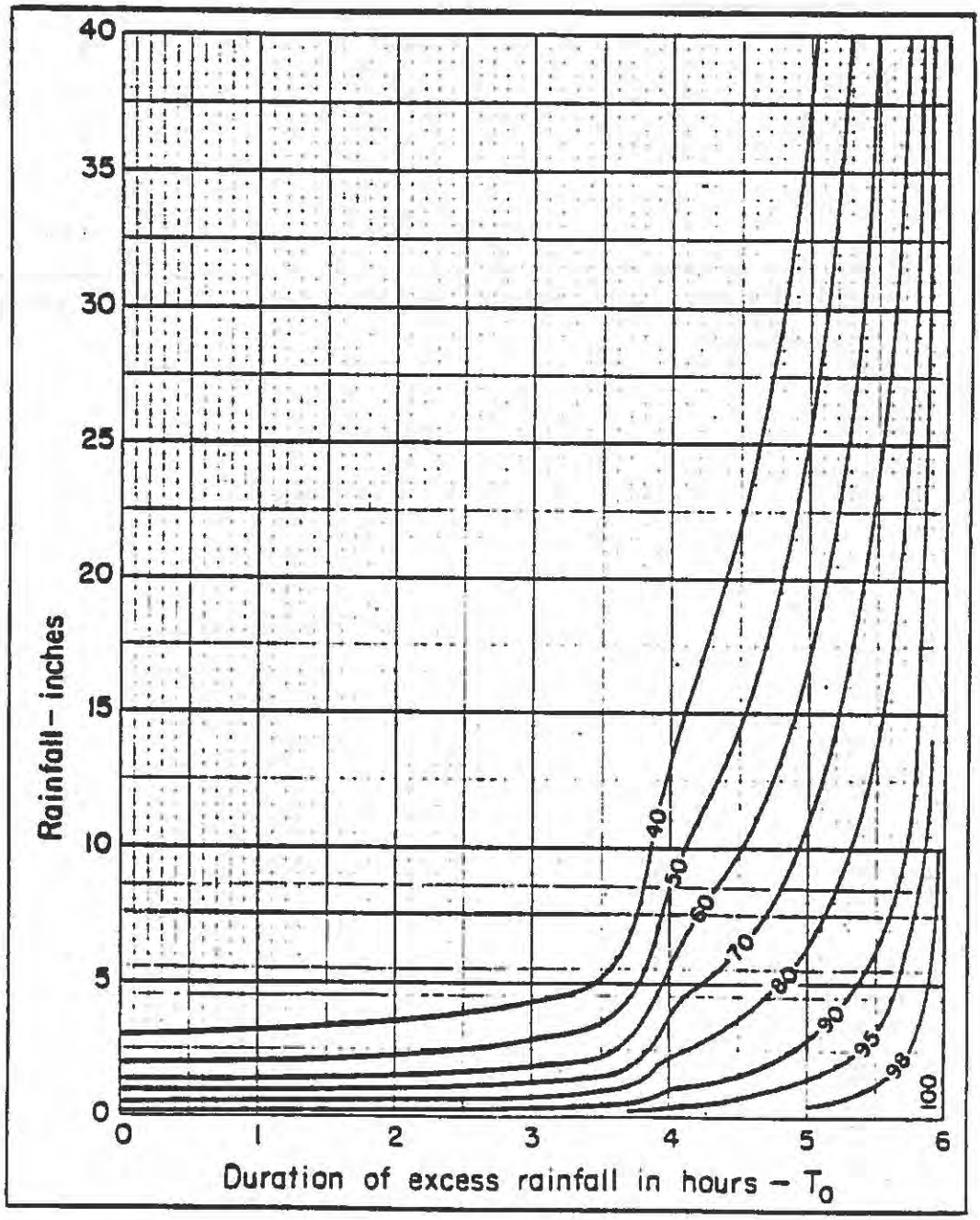


Figure 21-4. Duration of excess rainfall for a 6-hour rainfall and for runoff curve numbers 40 to 100.

EXHIBIT E

Table 21.16.--Hydrograph families and T_o/T_p ratios for which dimensionless hydrograph ratios are given in table 21.17

Hydrograph Family	T_o/T_p 1	1.5	2	3	4	6	10	16	25	36	50	75
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*
4	*	*	*	*	*	*	*	*	*	*	*	
5	*	*	*	*	*	*	*	*	*	*	*	

Asterisks signify that dimensionless hydrograph tabulations are given in table 21.17.

(qc/qp) MAX FOR VARIOUS HYDROGRAPH FAMILIES AND To/Tp RATIOS

Hydrograph Family	To/Tp											
	1	1.5	2	3	4	6	10	16	25	36	50	75
1	.901	.815	.740	.650	.585	.497	.394	.309	.232	.177	.1330	.0900
2	.885	.790	.715	.615	.550	.464	.364	.277	.210	.157	.1184	.0790
3	.844	.734	.657	.543	.478	.390	.303	.230	.173	.130	.0972	.0667
4	.830	.686	.567	.422	.340	.250	.177	.128	.092	.0672	.0464	--
5	.848	.737	.642	.509	.427	.324	.212	.137	.088	.0603	.0433	--

REFERENCE: Soil Conservation Service National Engineering Handbook pp. 21.60 - 21.79.

EXHIBIT G

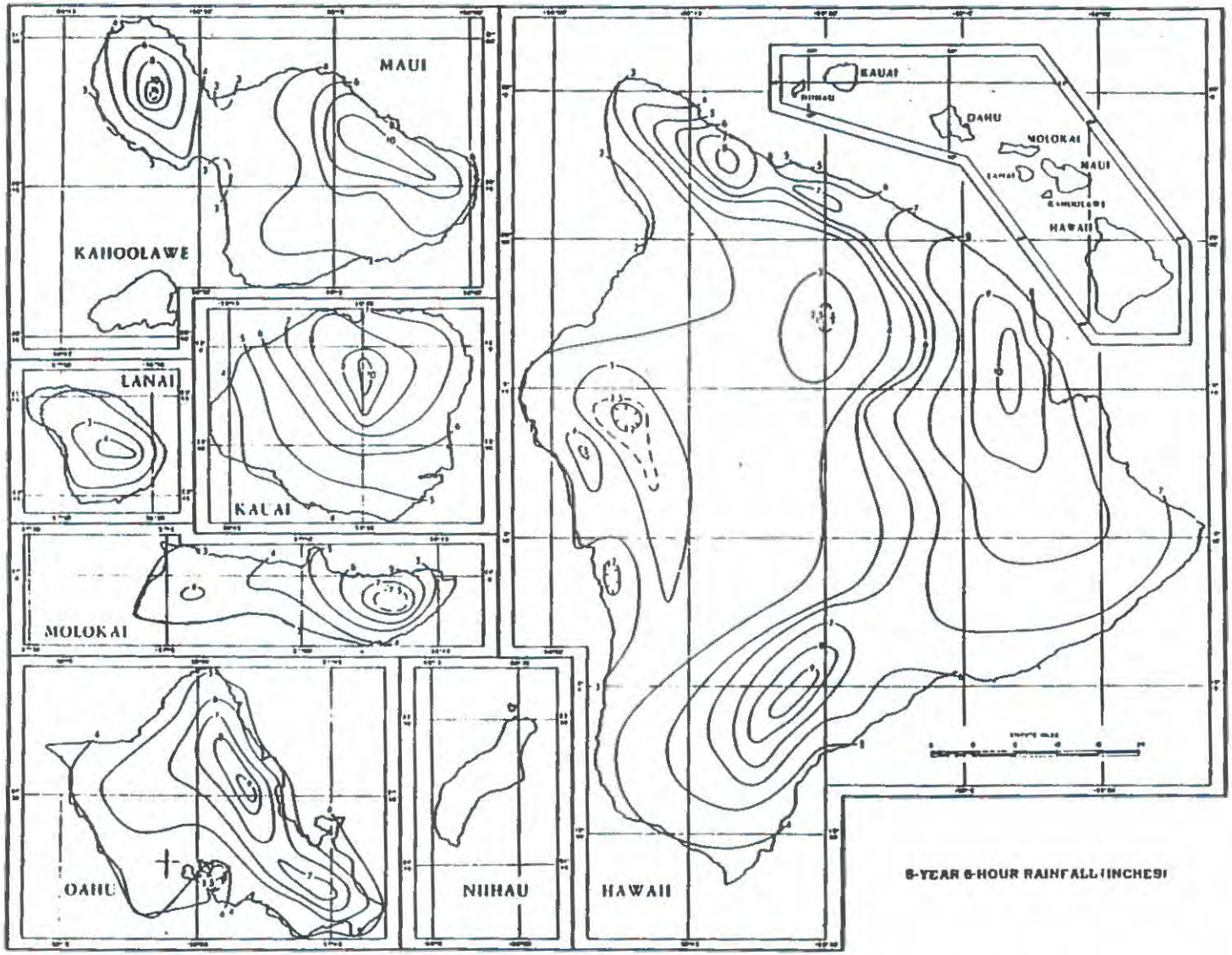


FIGURE 38.—5-yr. 6-hr. rainfall (in.)

EXHIBIT H

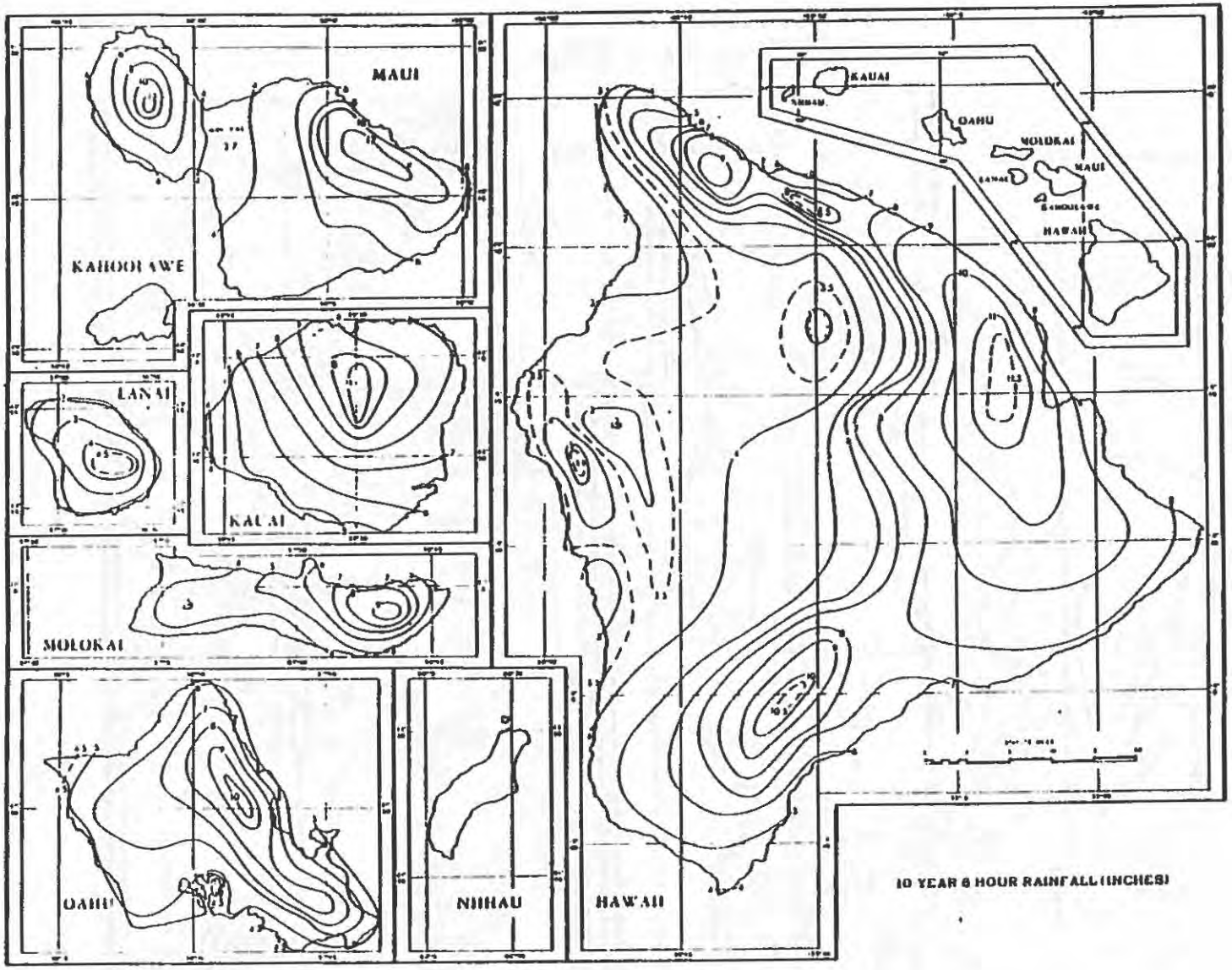


Figure 39.—10-yr. 6-hr. rainfall (in.)

EXHIBIT 1

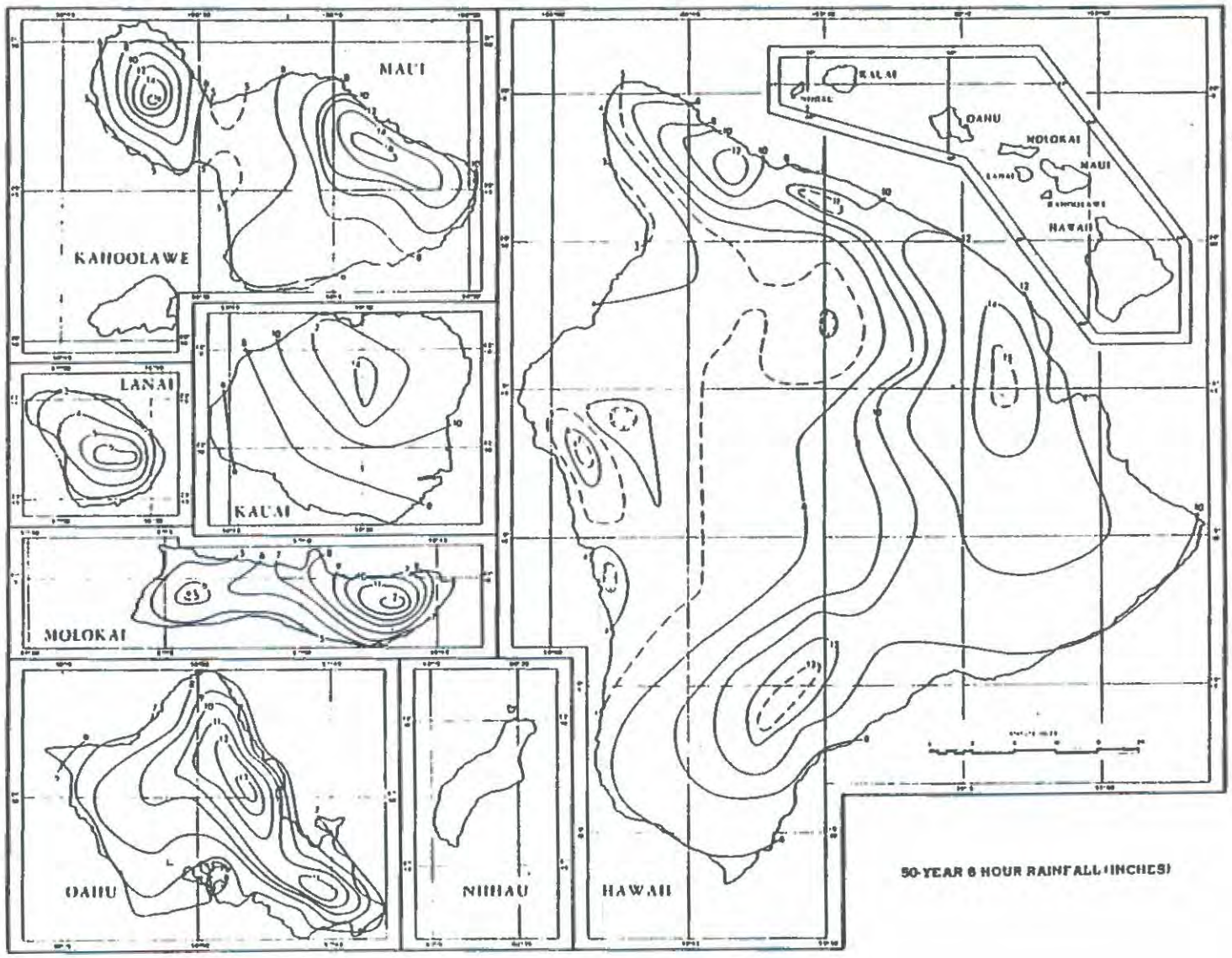


FIGURE 11.—50-yr 6-hr rainfall (in.)

EXHIBIT J.

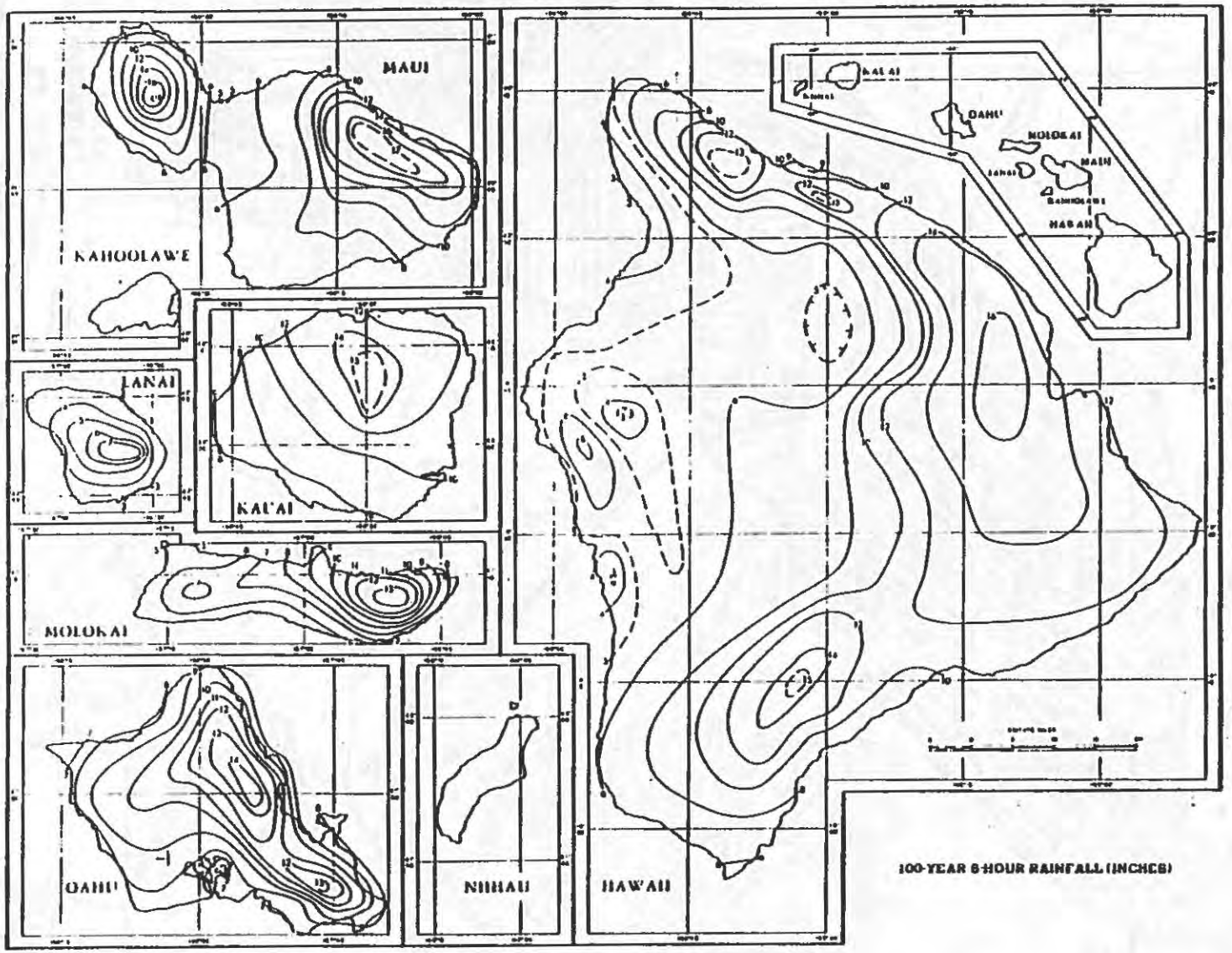
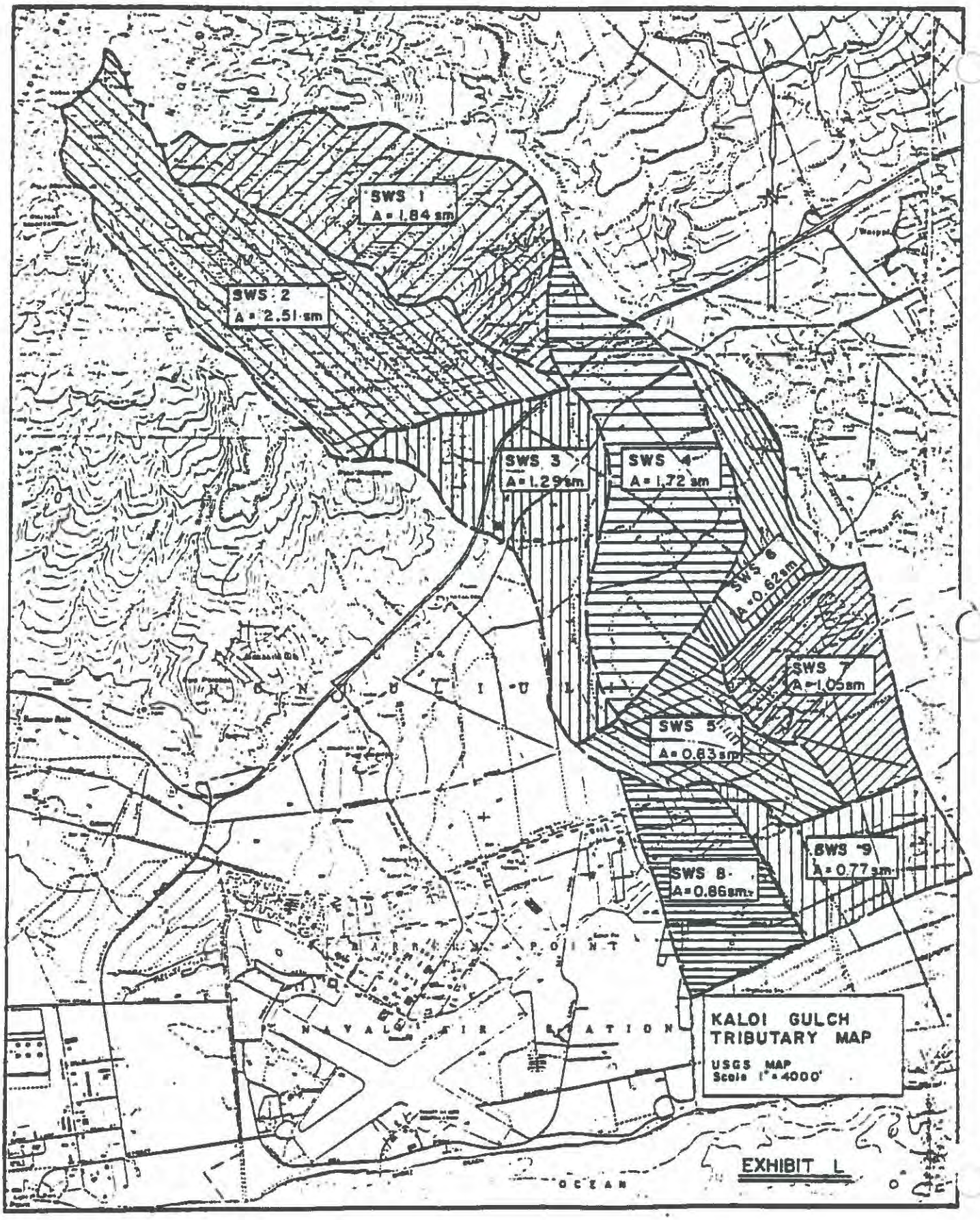


FIGURE 42—100-yr. 6-hr. rainfall (in.)

EXHIBIT K


SWS 1
A = 1.84 sm
SWS 2
A = 2.51 sm
SWS 3
A = 1.29 sm
SWS 4
A = 1.72 sm
SWS 6
A = 0.62 sm
SWS 7
A = 1.05 sm
SWS 5
A = 0.83 sm
SWS 8
A = 0.86 sm
SWS 9
A = 0.77 sm
KALOI GULCH
TRIBUTARY MAP
USGS MAP
Scale 1" = 4000'
EXHIBIT L

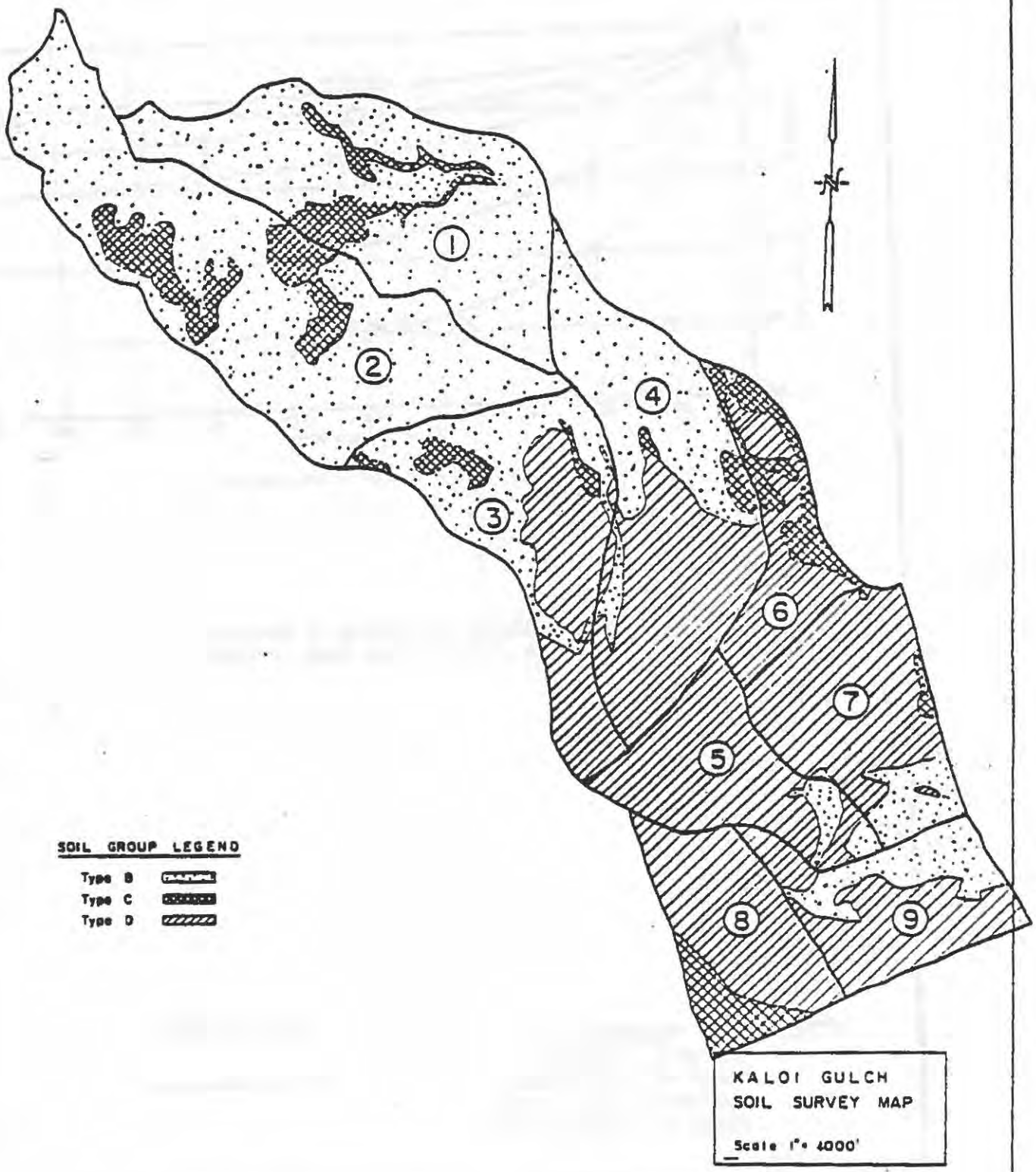

1
2
3
4
5
6
7
8
9
N
SOIL GROUP LEGEND
Type B
Type C
Type D
KALOI GULCH
SOIL SURVEY MAP
Scale 1" = 4000'

EXHIBIT M

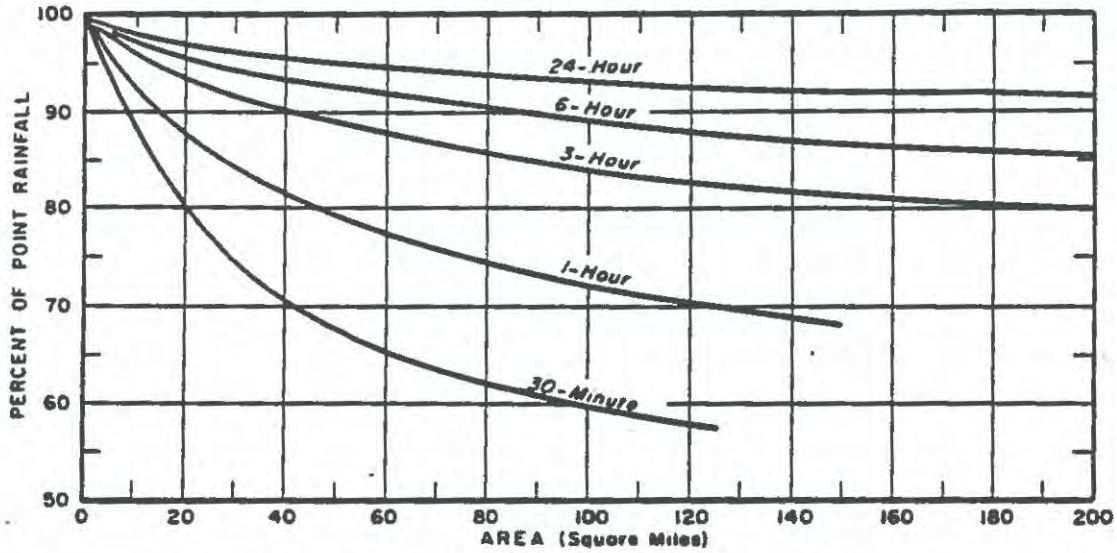


FIGURE 6.—Depth-area curves for rainfall-frequency data

NOTE: No areal rainfall correction is necessary for drainage areas of less than 10 square miles.

SOURCE: U.S. Department of Commerce, Technical Paper No. 43,"Rainfall-Frequency Atlas of the Hawaiian Islands," p.7.

AREAL RAINFALL

EXHIBIT N

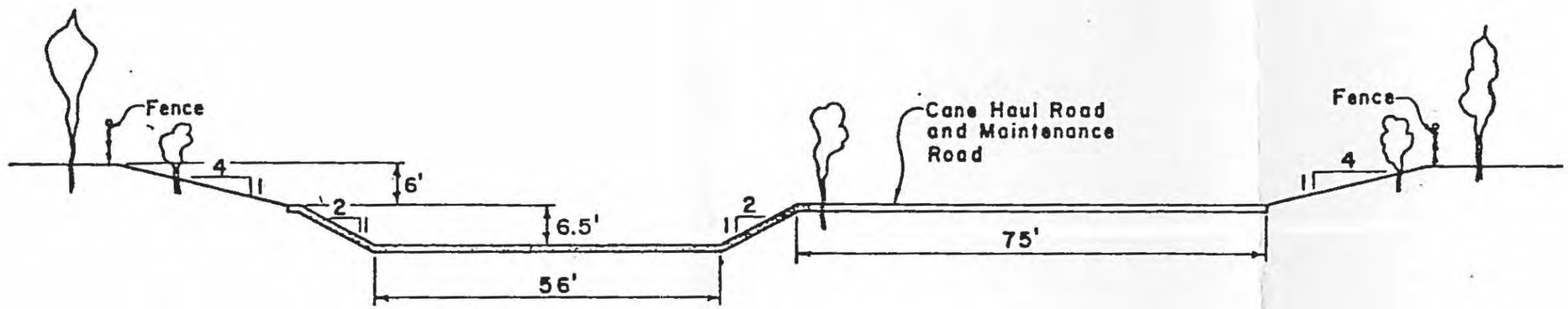
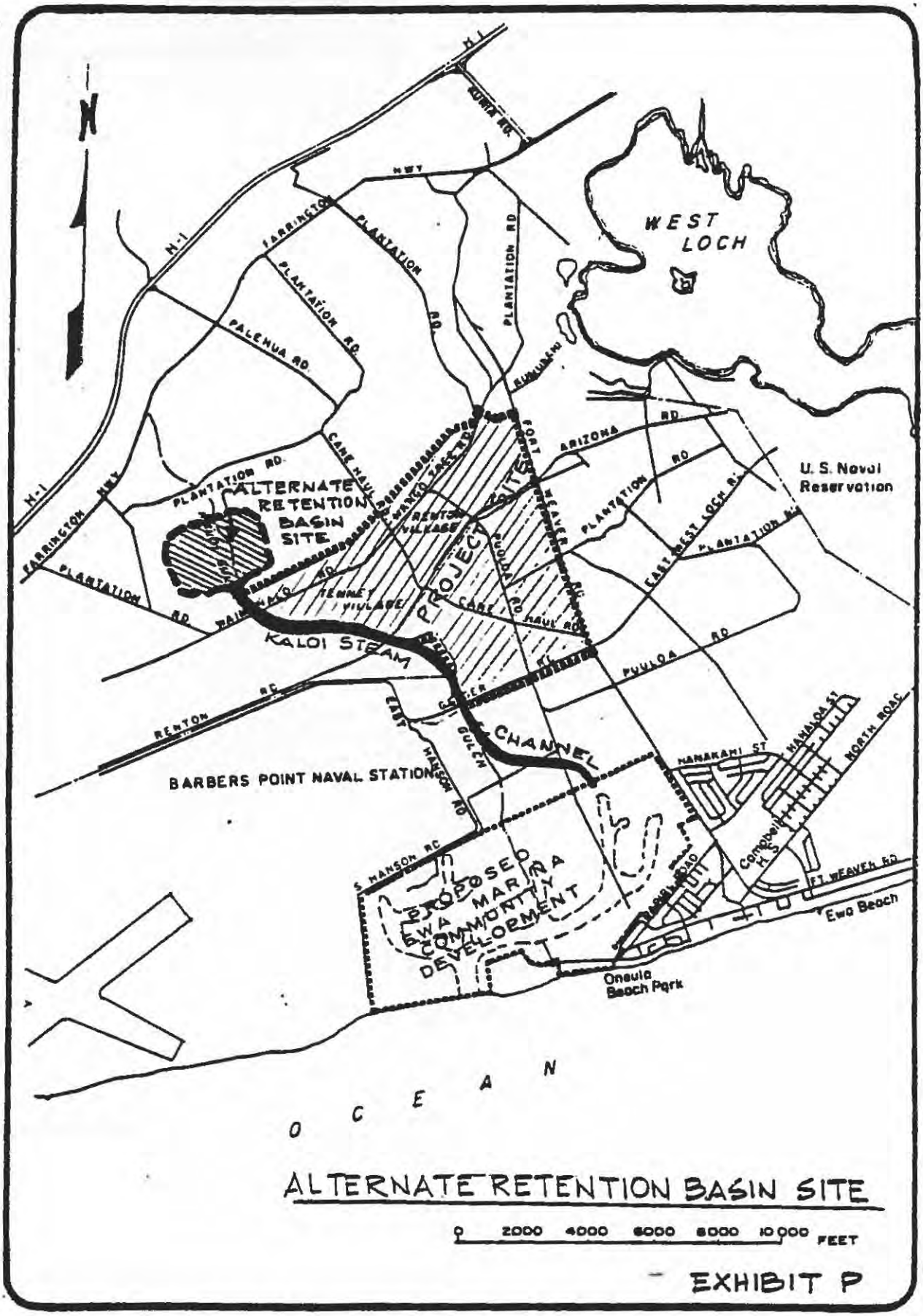


EXHIBIT O

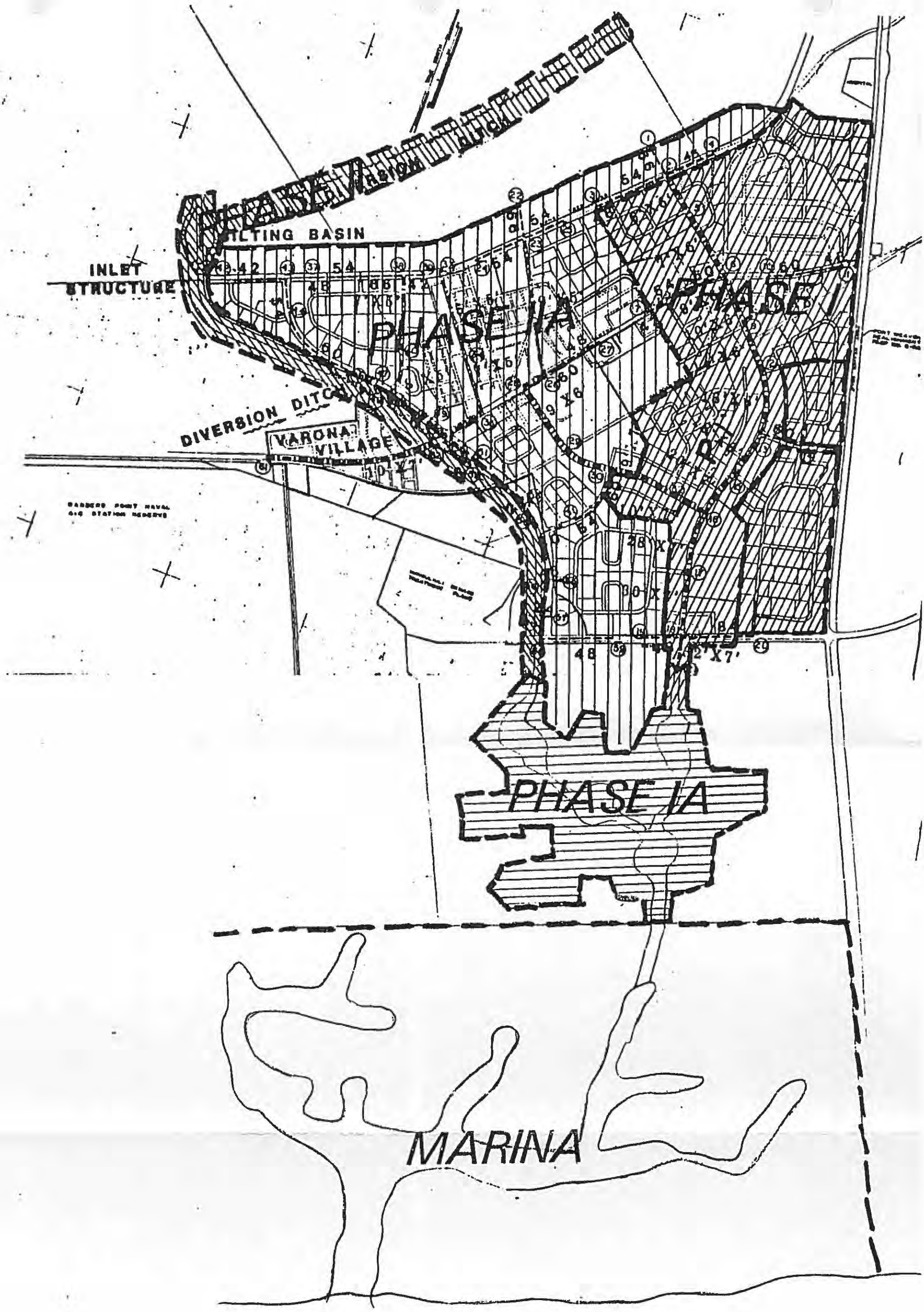
RECOMMENDED COMPOSITE SECTION 3



ALTERNATE RETENTION BASIN SITE

0 2000 4000 6000 8000 10,000 FEET

EXHIBIT P



PHASING MAP

EXHIBIT Q

ADDENDUM NO. 1 TO
PRELIMINARY HYDROLOGIC REPORT
FOR
KALOI STREAM IMPROVEMENT

AT HONOULIULI, EWA, OAHU, HAWAII
TAX MAP KEY: 9-1-12 and 9-1-17

Prepared by:
FUKUNAGA & ASSOCIATES, INC.
Consulting Engineers
2615 South King Street, Room 2B
Honolulu, Hawaii 96826

January 1981

INTRODUCTION:

In the "Preliminary Hydrologic Report for Kaloi Stream Improvement", peak design storm flows up to 13,700 cfs were computed. The high peak flow rates present problems, especially in conveying the runoff to the ocean and in handling the sediment carried by the runoff. The installation of a retention basin system is proposed to dampen peak flows and absorb some of the sediment load.

The proposed retention basin system shall be constructed within recreation areas such as a golf course complex, or open, grassed fields. (Exhibit 1A) These areas can be utilized for temporary stormwater detention with minimal adverse effects. The system should be capable of dampening peak stormflows by retaining portions of the runoff without flooding surrounding developed areas.

PURPOSE:

The purpose of this study is to estimate the effectiveness of the proposed retention basin system for the Kaloi Stream Improvement, primarily to determine the flood peak dampening capability and the maximum expected basin water surface elevation. In addition to the system effectiveness, this study will consider preliminary basin sizing and initial design of basin characteristics, thus providing general guidelines for future, more detailed design.

ANALYSIS:

The evaluation of the flood dampening effectiveness involves a flood routing analysis of the proposed retention basin system. The flood routing analysis requires a predetermination of several hydrologic and basin characteristics.

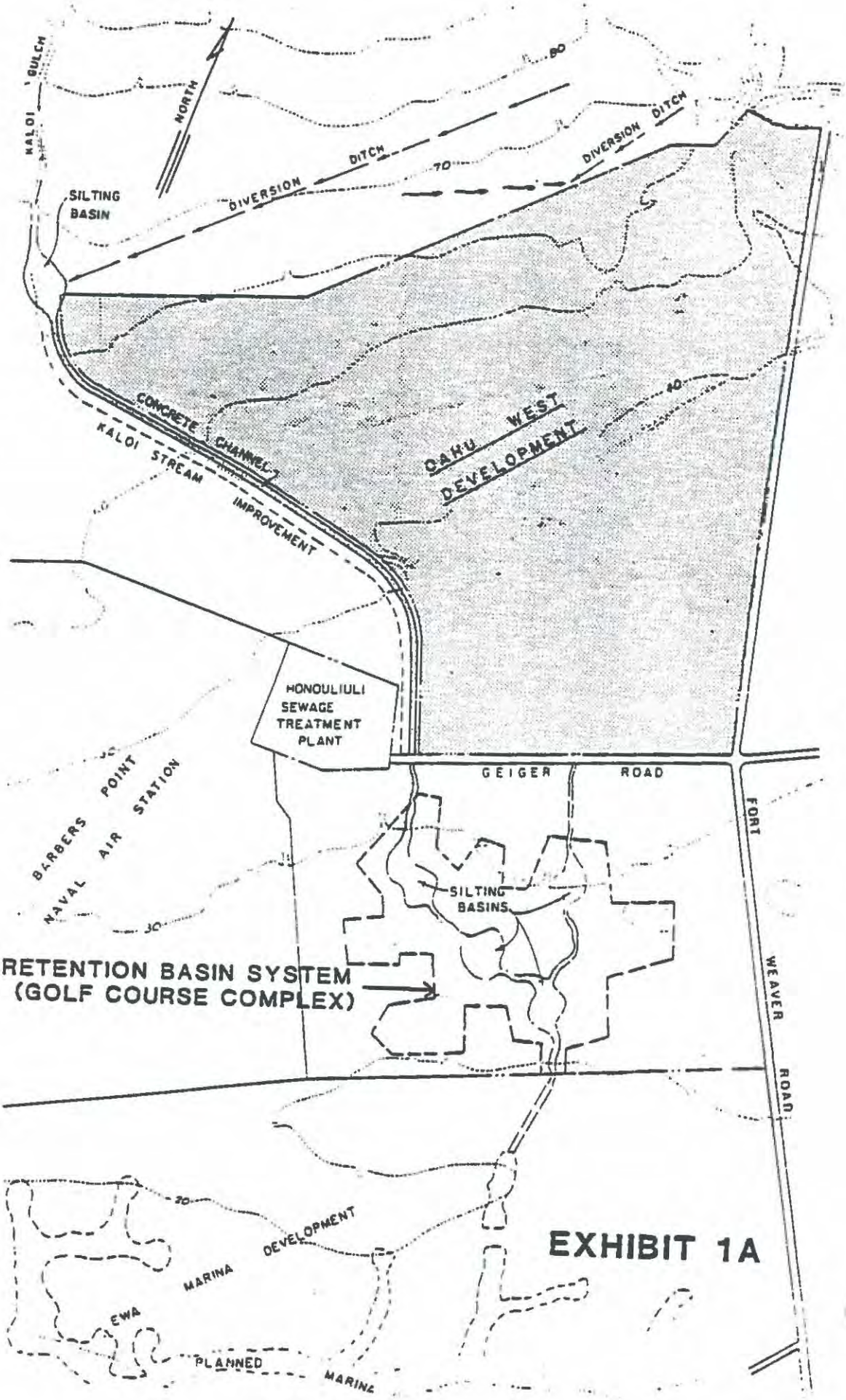

KALOI GULCH
NORTH
SILTING BASIN
DIVERSION DITCH
DIVERSION DITCH
80
70
60
40
30
CONCRETE CHANNEL
KALOI STREAM IMPROVEMENT
OAHU WEST DEVELOPMENT
HONOULIULI SEWAGE TREATMENT PLANT
GEIGER ROAD
FORT WEAVER ROAD
BARBERS POINT NAVAL AIR STATION
SILTING BASINS
RETENTION BASIN SYSTEM (GOLF COURSE COMPLEX)
MARINA DEVELOPMENT
EWA
PLANNED MARINA

EXHIBIT 1A

These include:

1) Design inflow hydrograph

2) Basin configuration - storage characteristics

3) Outlet conditions

The basic hydrologic analysis was performed in the "Preliminary Hydrologic Report for Kaloi Stream Improvements" and was used to generate the design inflow hydrograph. The ultimate basin characteristics will depend on the final design of the retention basin system-golf course complex. At this preliminary stage, detailed basin characteristics have not been established; instead, generalized basin configuration and outlet conditions were assumed and analyzed.

Design Inflow Hydrograph - The recommended design discharge for the design of the major channels for this project are the discharge quantities arrived in the preliminary hydrologic report, based on a 100-yr., six hour storm. Therefore, the same design storm was selected for the design inflow hydrograph into the proposed retention basin system. All of the necessary parameters for the hydrograph computation were calculated in the preliminary hydrologic report. The design inflow hydrograph is shown in Exhibit 1B and the computations are included in Appendix 1A.

Basin Characteristics - Following several trial alternatives for basin storage characteristics and outlet conditions, a 125-acre basin was found to be capable of providing adequate flood dampening without exceeding maximum allowable water surface elevations. (The maximum design peak outlet discharge to the Ewa Marina is about 10,000 cfs and the maximum allowable water surface elevation is 20 ft. MSL.) The assumed basin configuration is shown in Exhibit 1C.

EXHIBIT 1B

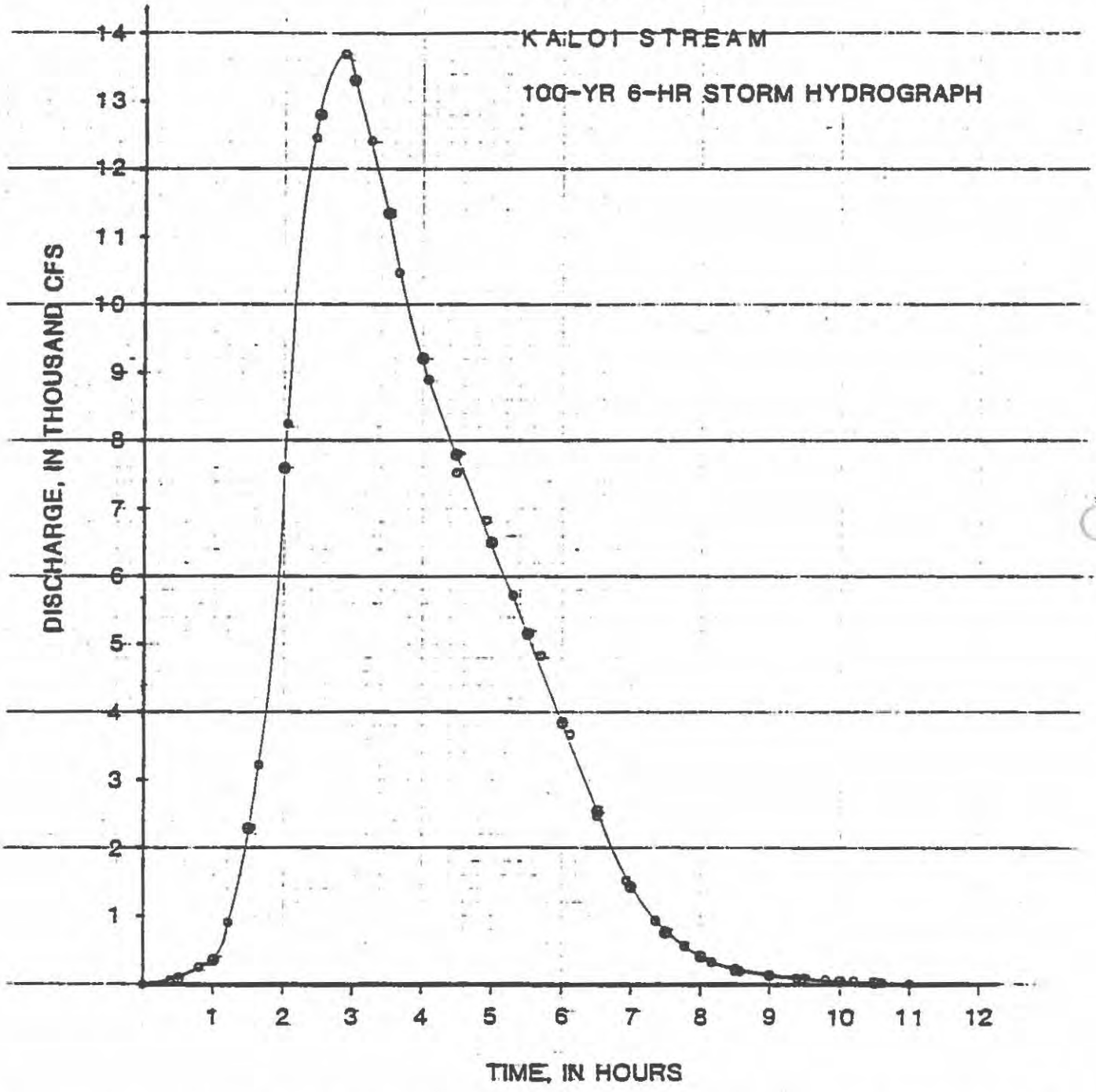
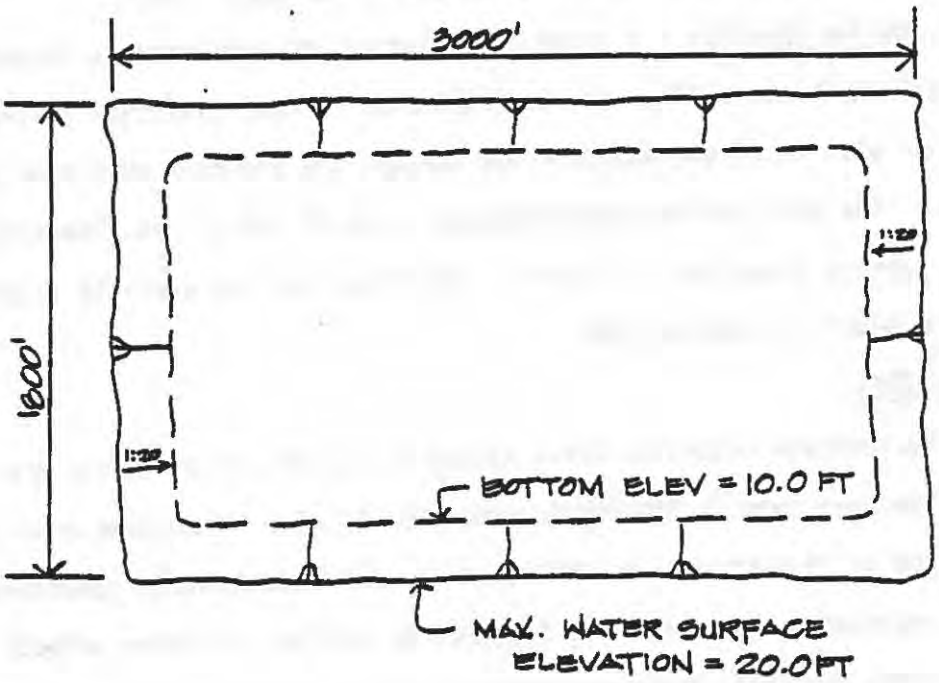

KALOI STREAM
100-YR 6-HR STORM HYDROGRAPH
DISCHARGE, IN THOUSAND CFS
14
13
12
11
10
9
8
7
6
5
4
3
2
1
1
2
3
4
5
6
7
8
9
10
11
12
TIME, IN HOURS

EXHIBIT 1C

ASSUMED BASIN CONFIGURATION

MAX. WATER SURFACE AREA = 125 ACRES



ASSUMED OUTLET CONDITIONS

PIPE CULVERTS

8 - 60" DIAM. PIPES @ INV. = 10.0 FT

ASSUME ENTRANCE CONTROL

REF: C&C STORM DRAINAGE STANDARDS PLATE 19 - "NOMOGRAPH FOR PIPE CULVERTS WITH ENTRANCE CONTROL" FOR PIPE FLOW QUANTITIES FOR GIVEN HEADWATER DEPTHS.

SPILLWAY WEIR

CREST ELEV = 13.0 FT CREST LENGTH = 150 FT

$Q = cLH^{3/2}$ WHERE: c = WEIR COEFFICIENT = 3.0

L = CREST LENGTH

H = WATER DEPTH OVER CREST

The preliminary outlet design for the retention basin system involves eight 60 in. diameter pipe culverts at invert ELEV. 10 ft. and a 150 ft. long broad-crested spillway weir at crest ELEV. 13 ft. The pipe culverts are intended to handle smaller stormflows and to prevent excessive standing water. The spillway weir will handle larger peak flows.

Flood Routing Analysis - A graphical solution was performed to determine the estimated peak outflow and maximum water surface elevation resulting from the passing of the design flood through the proposed retention basin system. The peak outflow was estimated to be 10,000 cfs at a maximum water surface elevation of 19.9 ft. The flood routing analysis is presented in more detail in Appendix 1B.

CONCLUSIONS:

The proposed retention basin system is capable of dampening the 100-yr. flood peak from 13,700 cfs to about 10,000 cfs. A maximum water surface elevation of 19.9 ft. MSL is estimated for the assumed basin configuration. By maintaining a level below 20 ft. MSL, no adverse backwater effects are anticipated for other drainage facilities which discharge into the retention system.

The routing analysis is based on the preliminary, simplified basin configuration. The ultimate flood dampening characteristics are dependent on the final retention basin system-golf course complex design. However, similar, or possibly more effective, flood dampening can be expected if the storage capabilities of the final retention system can equal or exceed those of the simplified basin.

APPENDIX 1A

HYDROGRAPH COMPUTATION*

Drainage Area = 11.49 sq. mi.

T_c = 2.15 hrs.

P = 8.5 in. (100 yr., 6 hr.)

C_n = 79

Q = 5.7 in.

Hydrograph Family No. 2

Computed T_p = 1.505 hrs.

T_o = 5.1 hrs.

T_o/T_p = 3.4

Selected T_o/T_p = 4

Revised T_p - 1.275

q_p = 4362

Qq_p = 24862

$t = (t/T_p)$ Rev. T_p

$q = (q_c/q_p)\ (Qq_p)$

*Ref. - "PRELIMINARY HYDROLOGIC REPORT FOR KALOI STREAM IMPROVEMENTS", prepared by William Hee & Associates, Inc., p. 44 - 46.

HYDROGRAPH COMPUTATION

LINE	t/T_p	t, HOURS	q_c/q_p	q, CFS	Q_t/Q	Q_t, IN.
1	0	0	0	0	0	0
2	0.32	0.41	0.002	50	0	0
3	0.64	0.82	0.009	224	0.002	0.01
4	0.96	1.22	0.036	895	0.007	0.04
5	1.28	1.63	0.129	3207	0.026	0.15
6	1.60	2.04	0.332	8254	0.081	0.46
7	1.92	2.45	0.501	12456	0.179	1.02
8	2.24	2.86	0.550	13674	0.303	1.73
9	2.56	3.26	0.500	12431	0.426	2.43
10	2.88	3.67	0.422	10492	0.535	3.05
11	3.20	4.08	0.356	8901	0.627	3.57
12	3.52	4.49	0.302	7508	0.705	4.02
13	3.84	4.90	0.274	6812	0.773	4.41
14	4.16	5.30	0.230	5718	0.832	4.74
15	4.48	5.71	0.195	4848	0.882	5.03
16	4.80	6.12	0.147	3655	0.922	5.26
17	5.12	6.53	0.099	2461	0.951	5.42
18	5.44	6.94	0.061	1517	0.970	5.53
19	5.76	7.34	0.037	920	0.982	5.60
20	6.08	7.75	0.023	572	0.989	5.64
21	6.40	8.16	0.013	323	0.993	5.66
22	6.72	8.57	0.008	199	0.996	5.68
23	7.04	8.98	0.005	124	0.997	5.68
24	7.36	9.38	0.004	99	0.998	5.69
25	7.68	9.79	0.003	75	0.999	5.69
26	8.00	10.20	0.002	50	1.0	5.70
27	8.32	10.61	0.001	25	1.0	5.70
28	8.64	11.02	0	0	1.0	5.70

DESIGN INFLOW QUANTITIES

(1/2 HR INCREMENTS)

t, HRS	q, CFS	ΔQ INFLOW FOR ½ HR PD. CAVIO'
0.5	75	0.0675
1.0	350	0.3825
1.5	2280	2.367
2.0	7600	8.892
2.5	12800	18.360
2.56 *	13700 *	17.172 0.301
3.0	13300	23.976
3.5	11350	22.185
4.0	9200	18.495
4.5	7800	15.300
5.0	6500	12.870
5.5	5150	10.485
6.0	3850	8.100
6.5	2550	5.760
7.0	1450	3.600
7.5	780	2.007
8.0	400	1.062
8.5	200	0.540
9.0	120	0.288
9.5	80	0.180
10.0	60	0.126
10.5	30	0.081
11.0	0	0.027
* Peak Discharge		

APPENDIX 1B

FLOOD ROUTING COMPUTATIONS

BASIN W.S. ELEV FT	10	11	12	13	14	15	16	17	18	19	20
BASIN W.S. AREA $\times 10^6$ FT^2	3.64	3.80	3.97	4.13	4.31	4.48	4.66	4.84	5.02	5.21	5.40
AVE BASIN AREA $\times 10^6$ FT^2	–	3.72	3.89	4.05	4.22	4.40	4.57	4.75	4.93	5.12	5.31
STOR. PER FT $\times 10^6$ CF	–	3.72	3.89	4.05	4.22	4.40	4.57	4.75	4.93	5.12	5.31
S = STOR. ABOVE ELEV. 10' $\times 10^6$ CF	–	3.72	7.61	11.66	15.88	20.28	24.85	29.60	34.53	39.65	44.96
CULVERT DISCH. CFS	–	–	200	440	720	1000	1210	1450	1640	1840	2000
SPILLWAY DISCH. CFS	–	–	–	–	450	1270	2340	3600	[illegible]	[illegible]	[illegible]
O = TOTAL OUTLET DISCHARGE CFS	–	–	200	440	1170	[illegible]	3550	[illegible]	[illegible]	[illegible]	[illegible]
ΔQ = DISCH. FOR 1/2 HR. PD. $\times 10^6$ CF	–	–	0.360	0.792	2.106	4.086	6.394	9.36	[illegible]	[illegible]	[illegible]
$\Delta Q/2$ $\times 10^6$ CF	–	–	0.180	0.396	1.053	2.043	3.202	4.672	[illegible]	[illegible]	[illegible]
$S + \Delta Q/2$	–	3.72	7.79	12.06	16.93	22.32	28.07	34.17	40.53	47.26	54.26
$S - \Delta Q/2$	–	3.72	7.43	11.26	14.83	18.24	21.63	25.03	28.53	32.05	35.66

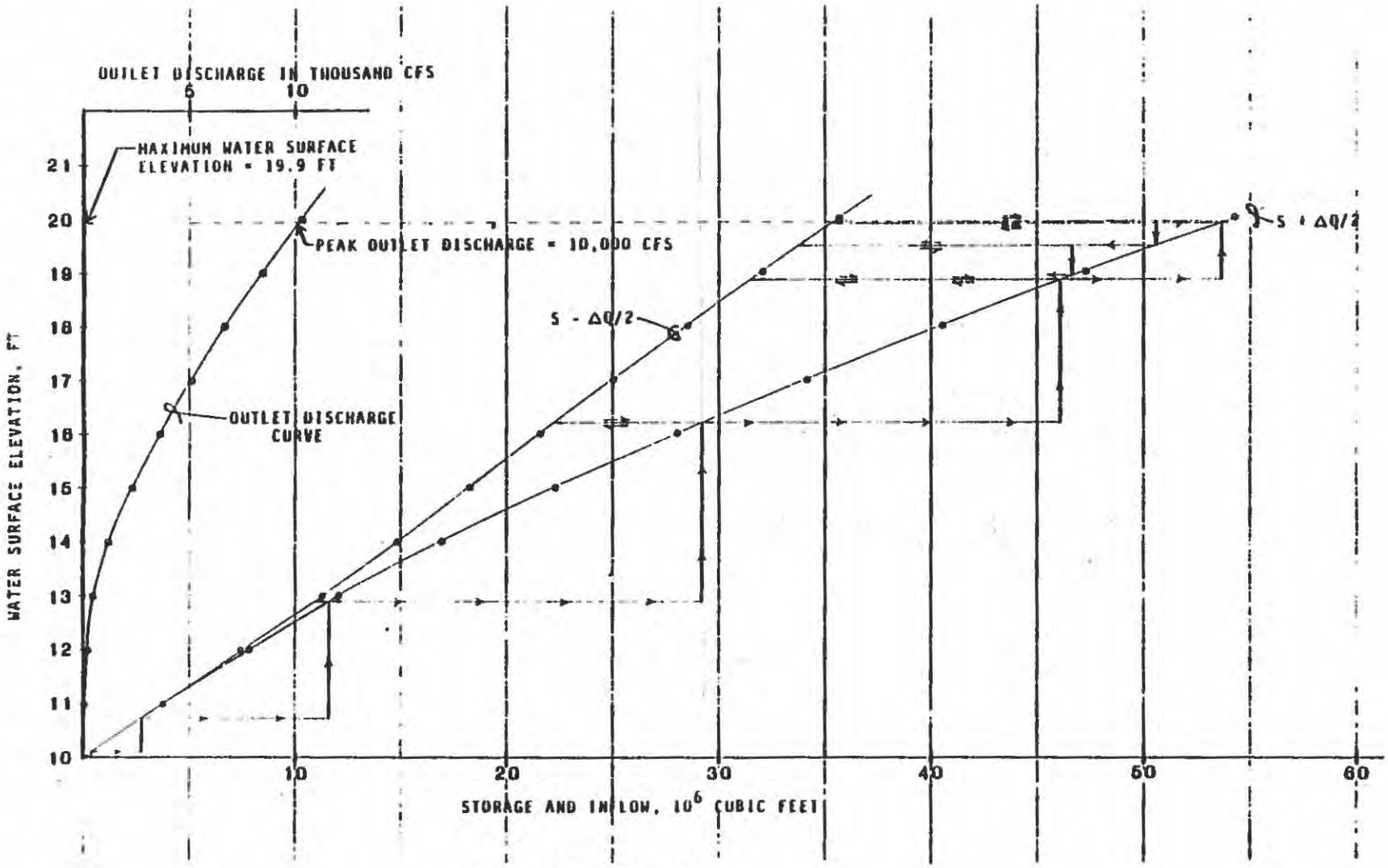

OUTLET DISCHARGE IN THOUSAND CFS
5
10
MAXIMUM WATER SURFACE ELEVATION = 19.9 FT
PEAK OUTLET DISCHARGE = 10,000 CFS
S - ΔQ/2
S + ΔQ/2
OUTLET DISCHARGE CURVE
WATER SURFACE ELEVATION, FT
21
20
19
18
17
16
15
14
13
12
11
10
10
20
30
40
50
60
STORAGE AND INFLOW, 10^6 CUBIC FEET

EXHIBIT 1D

APPENDIX D

Science Management letter to Bishop Museum dated
January 25, 1984

Mr. Aki Sinoto
Assistant Contract Manager
Department of Anthropology
B. P. Bishop Museum
P. O. Box 19000-A
Honolulu, Hawaii 96819

Subject: Review of Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project.

Dear Mr. Sinoto:

Pursuant to your review of the archaeological section of the subject document, we have the following comments.

The archaeological section that you reviewed consists of paraphrased excerpts from a report entitled "Archaeological Test Excavations at the Proposed Ewa Marina Community Development Area, Ewa Oahu, Hawaii (Hommon and Ahlo 1983), which is a supplement to "Report on Archaeological Survey of the Proposed Ewa Marina Community Development; Ewa Beach, Oahu Island" (Davis 1979). Relevant portions of the latter report, including Table 1, describing all of the archaeological features discovered, are included in the Ewa Marina Community E.I.S. The present document is a supplement to the original E.I.S.

Because both supplemental documents build upon the original E.I.S. and orignal archaeological report, an objective review of them must take into account information available in the original archaeological report and E.I.S. as well. Unfortunately, the Hommon and Ahlo 1983 report was not forwarded to you with the draft supplemental E.I.S. an oversight that was rectified by providing you with a copy shortly thereafter and by including the entire text thereof in this document as Appendix ___.

The questions and concerns you express that relate to matters of historic preservation are addressed in the two archaeological reports and the original E.I.S. and Supplemental E.I.S. as follows:

1. General Comments
   (a) The "pertinent references" can be found in Hommon and Ahlo 1983; included here as an appendix.
   (b) The results of historic documentary research can be found in Davis 1979 (pp. 6 and 19).

2. Specific Comments (identified by page/paragraph/line)
   (a) Comment 12/1/2: References can be found in Hommon and Ahlo 1983:6. The statement that sink holes are relatively small and numerous is supported by data collected during the

archaeological survey of the 296.5 acre coastal portion the Ewa Marina Community Property surveyed by Davis in 1979. That portion of the entire project area is a relatively undisturbed strip of land adjacent to the entire seaward boundary of the cane field land under consideration here. This coastal portion is roughly 27% of the total Ewa Marina Community Property.

While Davis (1979:Table 1, pp. 25-35) lists no sinkholes among his 107 archaeological features he does note two sinkholes that may contain archaeological and/or paelontological materials (Davis 1979:28,32). In addition, he reports one possible filled sinkhole and "at least 1 modified sinkhole" (Davis 1979:27,35). The two measured sinkholes have areas of 3.4 and 2.5 square meters. Summarizing Davis's data, the coastal area includes about 2 to perhaps 6 sinkholes totalling about 8.9 to 25.8 square meters or 95.8 to 277.6 square feet in area. This means that the coastal area includes an average of about 1 sinkhole, (averaging 3 to 4.3 square meters [32.3 to 46.3 square feet] in area), for every 49 to 99 acres.

We consider it is reasonable to suggest that the size of sinkholes and their number per unit area in the canefield area under consideration here, are roughly the same as found in the adjacent coastal area. In other words, sinkholes are probably relatively small and extremely sparsely distributed in the canefield area. The data used to arrive at this statement were avaialble in the supplemental E.I.S. and the orignal E.I.S. as well as in Davis 1979.

(b) Comment 16/1/1. We agree that the lower portions of a few sinkholes probably exist intact under bulldozed rubble and the imported soil of the canefields.

(c) Comment 16/2. Answers to these questions can be found in Hommon and Ahlo 1983, included here as Appendix ___.

(d) Comments 16/3, 17/1 and 17/1/2 (Note that the page 17 text references are in error since the page is a map rather than text). The concerns expressed here can be addressed by objective consideration of the facts that were available to the reviewer, supplemented by Hommon and Ahlo 1983.

The entire subject area was cleared of vegetation and graded level and then covered with soil carried in from elsewhere in preparation for planting of sugar cane. As the reviewer seems to recognize (comment 18/3), it is extremely improbable that surface structures or shallow deposits similar to the 107 recorded archaeological features in the adjacent coastal area remained intact after such surface disturbance followed by at lease 20 years of cultivation. The floors of sinkholes situated lower than the zone of grading disturbance, then, would be the only locations in the subject area where intact archaeological and/or paleontological deposits might still be present. As we have shown above, data from the coastal area indicate that sinkholes in the subject area are probably very few and of small size. They constitute no more than 1/500 of 1% (i.e., about .002%) of the total area. It should also be mentioned that only one of the known or possible sinkholes counted for this maximum figure is actually known to be an archaeological feature.

Given these facts, a conventional archaeological surface survey would obviously by unwarranted and pointless, particularly in view of the fact that almost the entire study area is currently covered with mature sugar cane. We chose, on the recommendation and with the concurrence of the State Historic Preservation Office, to conduct limited test excavations and to inspect the general area to ensure that the available information bearing on the probable presence of intact archaeological resources was correct.

In comment 16/3, the reviewer refers to the "cane roads, dump and quarry area" as "the only areas of obvious disturbance." In fact, the entire area has been severely disturbed, as we have noted. The roads and other areas extend throughout the canefield area allowing efficient inspection of a sufficient portion of the area to confirm data from our five test excavations and from previous sources. As noted in Hommon and Ahlo 1983 (p. 9), this inspection included the pedestrian survey of about 1.5 miles of roads and the survey of an additional 6 miles of road from a slowly moving automobile. The latter method is admitedly unconventional. However, given the situation, which included almost total destruction of the origi-

nal landscape and surface archaeological resources, the extremely small number of archaeological sinkholes expected, the deposition of imported soil and the total absence of archaeologically useful data in test trenches and in areas searched on foot, it was a reasonable and efficient inspection technique. At the risk of further belaboring the obvious, items such as artifacts, midden materials or soil strata along the roads would be quite visible from an automobile. In fact, on several occasions, we stopped the car to inspect items that appeared at first sight to be small fragments of mollusc shell.

(e) Comment 18/2: The "other data" are noted in Hommon and Ahlo 1983:10.

(f) Comment 18/3: This comment has been addressed throughout this response.

The reviewer states that archaeological monitoring of "construction-related excavation activities should also be recommended." Monitoring was not recommended because, for the reasons discussed in the four relevant documents and in this letter, the probability of discovering significant archaeological resources in the subject area during ground preparation is extremely low. This conclusion would stand whatever had been the results of Davis' survey of the coastal portion of the project area (except for the data on the number of sinkholes). However, it should be noted as a related issue that despite the negative results of the inspection of the canefield area, development of the Ewa Marina Community as a whole will almost certainly entail collection and analysis of information pertinent to the history and prehitory of the area as the adverse effects of the development on the coastal portion of the the planned community are mitigated (Davis 1979:21-22).

One further remark regarding comment 18/3 is appropriate. Given the likelihood that the only features likely to have survived the land disturbance documented for the area are sinkholes and that sinkholes of archaeological and/or paleontological significance probably constitute less than .002% of the subject area, we know of no "form of systematic testing" that would yield statistically reliable results unless it entailed removal of all the fill material overlying the corraline bedrock from hundreds of acres canefield. We suggest that such a procedure, particularly with a backhoe or auger as suggested by the reviewer is ridiculous at best.

A final statement is necessary. The reviewer's comments appear to be based only on a very cursory inspection of the supplemental E.I.S. and none of the other material available to him. A responsible, informed and constructive review would have batter served to further the intent of the E.I.S. review process

and the concerns for archaeological and historical preservation the reviewer professes.

Sincerely,

MSM

APPENDIX E

Davis Report, Archaeological Survey,
November 1979

REPORT ON ARCHAEOLOGICAL SURVEY

OF THE PROPOSED EWA-MARINA COMMUNITY DEVELOPMENT

EWA BEACH, OAHU ISLAND

By Bertell D. Davis

November, 1979

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

Archaeological survey at Ewa Beach, Oahu, has documented the presence of 107 cultural features in the proposed Ewa-Marina Community development area. These features are inferred to have once been part of an extensive late prehistoric/early historic settlement along the coast of the Ewa plain. The survey results compliment those already obtained at Barbers Point where current research is focusing on the nature of human settlement and environmental change in presumably marginal leeward regions of the high Hawaiian Islands. The following report (a) summarizes the field results, (b) assesses potential significance and possible impacts, and (c) discusses recommendations for National and State Register nomination, and for mitigation.

INTRODUCTION AND BACKGROUND

Development of a marina-residential community has been proposed at Ewa Beach in southwestern Oahu. The proposed project area is located on the coast of the ahupuaa of Honouliuli which extends west from Puuloa to the Barbers Point Naval Air Station. Currently the area is divided between a wide coastal tract of dry kiawe-koa haole forest, behind which are sugar cane lands of the Ewa Plantation (see Figures 1 and 2).

Hawaii Marine Research, Inc., was contracted to conduct an archaeological survey to determine the presence, extent and potential significance of cultural/historic resources in the project area. The survey was to fulfill two broad requirements for inclusion in an Environmental Impact Statement:

1) That the entire project area be examined for archaeological remains; and

2) That sufficient data be recovered from which to assess the eligibility of any archaeological sites located for inclusion on the National Register of Historic Places and the Hawaii State Register.

Archaeological information on Ewa Beach was limited, although data was available from environmentally similar areas at West Beach (Barrera 1979) and at Barbers Point (Sinoto 1976, 1978; Davis and Griffin 1978; Davis ms.) (see Figure 1). A brief reconnaissance by the Bishop Museum noted the presence of eight cultural features in the project area (Jourdane 1979:2-3). This report documents a total of 107 late prehistoric and early historic features located in the forested portion of the project area. No archaeological remains were found in those areas now or formerly under sugar cane cultivation.

The following discussion of the field methods and the limitations of the survey concludes this introductory section. Section two of the report describes the natural setting of the project area in the context of its surrounding region. Several aspects of this overview which have direct relevance to the Ewa settlement in terms of subsistence and material resources are elaborated. The third section discusses the research design. It defines the nature of the data required of the survey and the terminology employed. A general description of the archaeological remains is also

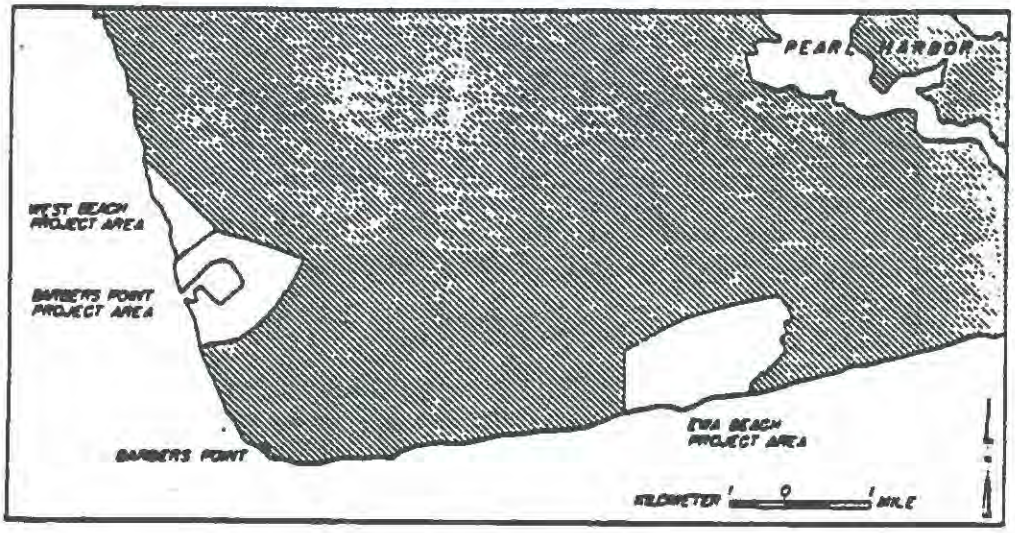

PEARL HARBOR
WEST BEACH PROJECT AREA
BARBERS POINT PROJECT AREA
BARBERS POINT
EWA BEACH PROJECT AREA
KILOMETER 1 0 1 MILE

Figure 1.

presented here: the survey data are available in the table at the end of the report. Conclusions regarding the nature of the Ewa settlement inferred from these data and the significance of the remains are discussed in the final section. Potential negative impacts are assessed and several possible avenues for mitigation are offered for initial consideration. Finally, recommendations concerning National and State Register eligibility are presented.

Archaeological Field Methods

The project area totals approximately 445 hectares (c. 1099 acres), of which 120 hectares are covered by the forest. The project area was divided into four survey zones (see Figure 2) for ease of locational reference and control over the progress of fieldwork. Areas of spatial discontinuity resulting from recent land-use activities were used to define these zones and thus avoid separating component features of possible surviving clusters into different recording units. The survey zones are defines as follows.

Survey Zone I - is located in the sourhwest corner of the project area. The ocean is on the south, the Barbers Point Naval Air Station is to the west, and the sugar cane fields are on the north. The east side is adjacent to Survey Zone II, from which it is separated by a corridor of disturbance dating to military use of the area.

Survey Zone II - extends eastward from Zone I to an existing chicken farm near the present Oneula Beach Park.

Survey Zone III - completes the remainder of the forested area between the chicken farm and the present Ewa Beach community. In both Zones II and III the ocean and the sugar cane fields mark the south and north boundaries, respectively.

Survey Zone IV - comprises the remaining portion of the project area inland of the forest and now under sugar cane cultivation.

Fieldwork was carried out over a total of 15 working days through September and October 1979. The survey team included Michael Kaschko (Field Director), Farley Watanabe, and Grace Tao. Additional assistance was available on several occasions from Charles Streck and Marcus Child, all employees of Hawaii Marine Research, Inc. The author also spent four days in the field at Ewa, in part assisting with the survey.

Field procedures were as follows. Walking sweeps were made at regular intervals through the project area to locate and initially appraise archaeological features for recording. After completing reconnaissance in each of the survey zones, individual features were then sketch mapped and recorded on prepared field data forms. Feature drawings were made to scale using tape and hand bearing compass. Locations were controlled with reference to conspecuous "datum" points identified from aerial photographs pro-

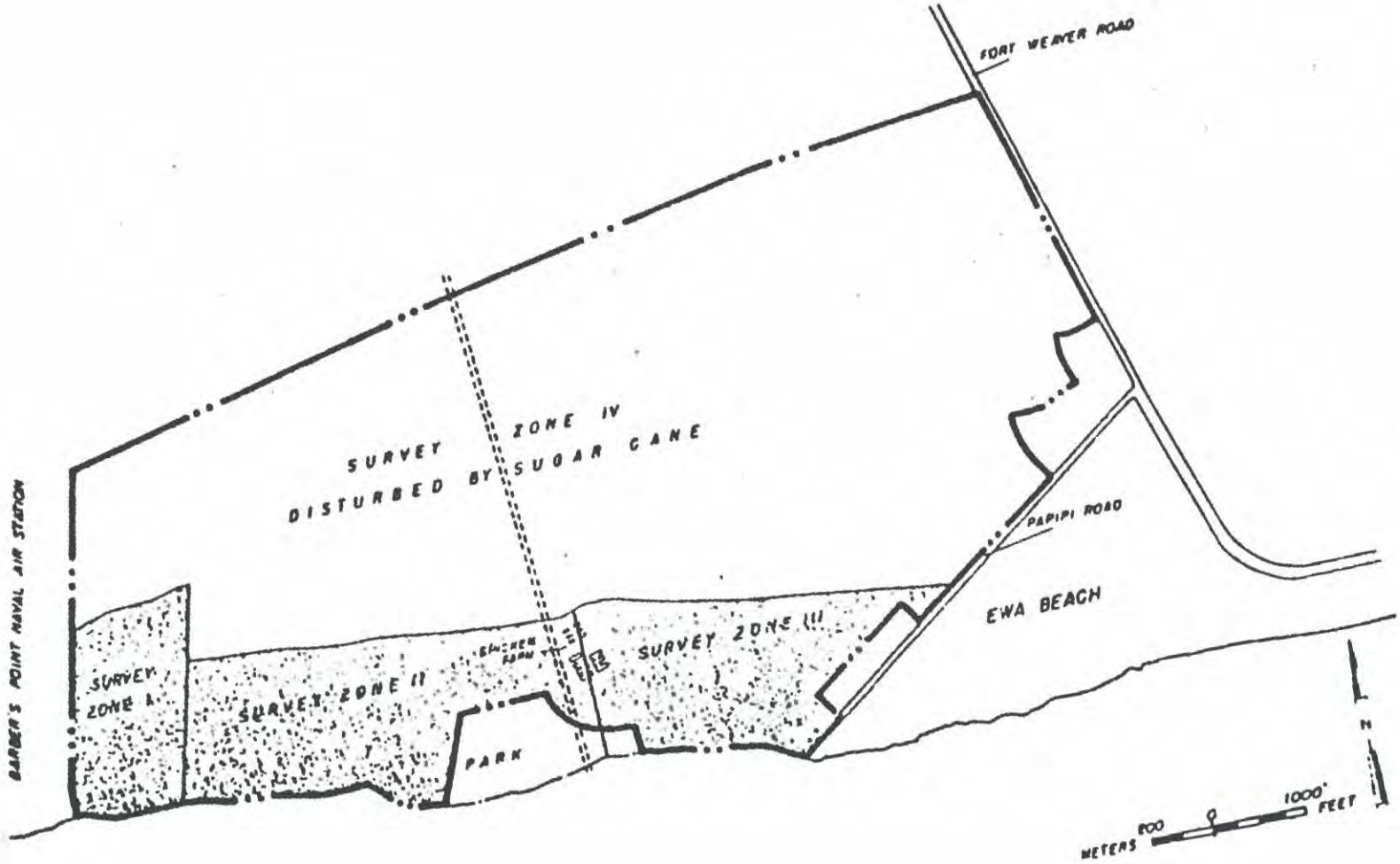

FORT WEAVER ROAD
SURVEY ZONE IV
DISTURBED BY SUGAR CANE
PAPIPI ROAD
EWA BEACH
BARBER'S POINT NAVAL AIR STATION
SURVEY ZONE I
SURVEY ZONE II
SURVEY ZONE III
PARK
N
METERS 100 0 1000' FEET

Figure 2.

vided for the survey. Black and white photographs of various features were taken as appropriate.

Limitations of the Survey

The above procedures allowed for at least initial coverage of the entire project area as required. However, the level of completeness, and of confidence in the data collected, gradually diminished as site recording progressed. Available time under rather arduous conditions proved to be a major limitation of the survey. The density of vegetation, the number of sites encountered, and the extensiveness of many of the feature clusters impeded site recording. Lack of time particularly did not allow for clearing sites for systematic examination of structural remains and/or the surrounding ground surface for cultural debris, such as bone and shell midden.

In addition to covering vegetation, the character of the ground surface itself was also a limiting factor. The similarity between Ewa Beach and Barbers Point includes the nature of the archaeological remains as well as the local environment. Recently, excavations in outwardly minimal architectural features at Barbers Point have yielded large quantities of midden and volcanic glass associated with cooking hearths and stone-lined fireplaces (Davis ms.). Only one of these sites had any surface debris to indicate the underlying deposit. For the most part, such evidence was obscured by a mat of recent forest litter forming much of the present "ground surface". Without an appropriate method of "surface collection", data supportive of inferences derived from structural attributes alone are generally not available.

It is essential that the reviewer keep these points in mind when evaluating the results of the survey and the following assessments of National and State Register eligibility. Regardless of the comparability of the Ewa Beach project area to Barbers Point, the level of data recordation is not consistent throughout the present survey area. Omissions of potentially significant data are to be anticipated.

THE NATURAL SETTING OF THE EWA BEACH SURVEY

This section describes the natural setting of the project area in the context of its surrounding region. The salient features are summarized from a variety of sources (see Davis and Griffin 1978, for references and a discussion of the Barbers Point research area). Several aspects of this overview have direct relevance to the Ewa settlement in terms of subsistence and material resources, and are elaborated below.

The Ewa Plain

Ewa Beach is a part of the Ewa plain in leeward Oahu (see Figure 1). It is a semi-arid region characterized by intense sunshine, persistent tradewinds, and low annual rainfall. Although air temperatures are relatively moderate, ground temperatures often become quite high: exceeding 55°C (c. 130°F). While perhaps not as pronounced in the Ewa region as

elsewhere on the island, seasonal variation does occur. During the winter months of October thru March frequent kona storms from the south and southwest account for most of the limited annual precipitation and generally cooler conditions.

The plain is a broad, emergent coral reef dating to post-Pleistocene sea-level subsidence. It extends across most of the southern coast of Oahu. The substrate is composed of fossiliferous, weathered, calcareous material on which post-emergence modifications have formed a hard but permeable surface. Relative isolation of the coast from extensive alluvial encroachment from the Waianae uplands has allowed the exposed limestone to develop a shallow karst topography marked by numerous sinkholes of varying depths which have dissolved out of the limestone. The terrain is quite regular from the coast up to the foot of the Waianae Mountains, with few features to interrupt the monotony of this landscape. Only the low eroded bluffs above the West Loch of Pearl Harbor, and the two volcanic cones of Puu Kapolei and Puu Palailai stand out in relief.

Soils of the region are generally characterized as Lithosols, rockland types, with Mamala soil material of red or brown friable clayey sediments concentrated in depressions. These are loose and well aerated soils, but have poor moisture retention qualities unless frequently replenished with humus. Near the coast these soils occur only sporadically among the limestone outcrops.

There are no well developed surface drainages in the seaward portion of the Ewa plain. Honouliuli and attendent streams above Pearl Harbor are conspccuous exceptions. During the rainy season, however, prolonged rains may exceed the absorptive capacity of the coral substrate and localized runoff will occur. It seems likely that this sheet wash was a significant source of the sediments described above. There is considerable evidence for such conditions in the project area, and at Barbers Point, both in the presence of a large swamp near the coast and in inland areas where silts have been deposited on the bols of trees. The latter instance may result entirely from irrigation outflow from the adjacent sugar cane fields, but this is uncertain.

Ground water in the coastal portion of the plain is assumed to be within 2-4m below ground level. This would make the water table generally accessible through many of the deeper sinkholes were it not for the accumulated rock fall and other detritus. Indeed, flooded sinkholes were found both at Barbers Point and Ewa Beach. Moreover, the water contained in several sinks at Barbers Point was found to be fresh or only slightly brackish despite the proximity of the ocean, or its tidal effect on the water table.

Early historic references to the vegetation of the Ewa plain reflect the prevailing aridity. Shortly after European contact (A.D. 1778), the region was described as "composed of one very barren rocky waste, nearly destitute of verdure, cultivation of inhabitants, with little variation all the way to the west point of the island" (Vancouver 1798, II:217). Later authorities reconstructed the aboriginal vegetation as an open grassland, or savannah of ohe dotted with wiliwili trees (rf. Frierson 1972:4-6). If so, nothing of this plant community has survived except for

a few scattered wiliwili in the Barbers Point area. With the exception of the areas under sugar cane cultivation, the modern vegetation of the region is dominated by hearty exotics, principally in mixed forests of kiawe and koa haole. The only indication of what traditional economic plants may have existed in or around the prehistoric settlements are isolated survivals of kukui, klu, noni and ti (Miura and Sato 1978:88-97).

The Ewa Coast

The strand is composed almost entirely of weathered limestone masses interspersed with usually poorly developed calcareous sand beaches. The only significant variation occurs at the estuarine outflow of Pearl Harbor, and at the limestone/basalt interface in the West Beach area. Extensive coastal sand dunes are not a conspicuous feature of this shoreline, except perhaps along portions of the west coast. There is a well developed fringing reef off the south coast of Ewa, but no barrier reef. The reef supports an extensive inshore faunal community in which reef and silt/sand bottom species expectedly predominate. The fringing reef continues only intermittantly along the west coast of the plain where there is a concommitant shift in the relative distribution between inshore and offshore species.

An Ewa Rookery?

This aspect of the natural setting is entirely speculative, suggested as it is by very preliminary data. Excavations conducted by the Bishop Museum at Barbers Point yielded the skeletal remains of previously unknown extinct avifauna, including an eagle, a crow, several passerines, and two flightless forms of goose (Sinoto 1976, 1978). Numerous remains of modern sea birds, particularly petrel and shearwater, were also recovered. These discoveries were made in a number of widely separated localities suggesting that similar remains may be extensively deposited in surviving undeveloped areas across the plain. In three instances this material was recovered from excavations in cultural sites, although the relationship between the extinct avifauna and the cultural deposits is still uncertain. The region today is not a major rookery, but the initial data suggest that the region did support a potentially significant bird population which may have been present at the time of human settlement on the island.

Implications for the Ewa Settlement

In terms of the human settlement at Ewa Beach, several aspects of this environmental picture are of interest in defining possible subsistence and material resources available during the prehistoric and early historic periods. Apart from the obvious potential contribution of the marine-strand zone to the local economy, there is that of (a) the terrestrial zone at the time of initial settlement in the region, (b) the aboriginally altered terrestrial zone, (c) the swamp or inland pond zone, and finally, (d) Puu Palailai.

a) The pristine terrestrial environment, and the possible existence of a major rookery prior to and early in the settlement period, has been

discussed as fully as the present data will allow. If the rookery was present during initial settlement, then birds and bird eggs would likely have been an important, though perhaps short-lived, source of protein in the local diet. If so, then exploitation of this resource may have been a significant contributor to the local extinction of selected species.

b) The aboriginally altered terrestrial zone is specifically that inferred to have been modified for the cultivation of food crops. While it seems certain that the availability of fresh water alone was not a major constraint, the alkalinity of the coral substrate would have had greater affect on horticultural activities. This condition commonly causes the disease chlorosis in cultivated plants originally adapted to more acidic volcanic soils. The usual strategy for overcoming this problem is continuous mulching in garden pits dug down to the water table (Barrau 1961). This is a rather labor intensive technique, but one that is commonly practiced in many areas of the tropical Pacific. Initial data from Barbers Point suggest a similar strategy was employed substituting many of the sinkholes in the seaward portion of the area for excavated pits. Use of the pit gardens was apparently augmented with sheet-washed sediments concentrated in depressions which had been cleared of loose surface rocks. These rocks were generally found piled on adjacent limestone outcrops. A variety of other moisture conservation strategies are also indicated, including the building of low windbreaks (semi-circular stone walls) around the sinkholes and sediment-filled depressions. Mulching techniques and windbreaks are known to have been utilized in drier regions on the island of Hawaii. It is presumed that the residents of the Ewa plain were also familiar with such practices.

c) The swamp, or anchialine pond zone, is found in only a few localities, one of which is in the southwest corner of the Ewa survey area. Anchialine refers to a coastal pond which has no direct surface connection with the sea. There is standing water in the swamp today, but the modern water level may reflect historic disturbances in the swamp's recharge basin, possibly combined with long-term siltation and the affect of the extensive kiawe forests on the water table of the region. It is presumed that the water table had been higher during the prehistoric period, and that as an inland pond, this would have been a potentially rich resource zone.

d) Finally, Puu Palailai is located about 6km northwest of the project area. This is a volcanic ash and cinder cone which is one of only three known sources of volcanic glass on Oahu (Manhoff and Uyehara 1976:46). Volcanic glass is a seemingly ubiquitous artifact material, nearly 2000 pieces of which have been recovered from a half-dozen house sites at Barbers Point alone (Davis ms.). Preliminary inspection indicates the Kolekole dike system in Waianae as one probable source of this material (Olson, letter, 1979). Puu Palailai is presumed to have been another.

THE RESEARCH DESIGN AND FIELD RESULTS

The following section outlines the research design employed at Ewa Beach. It defines the nature of the data required of the survey and the terminology used in the descriptions of the archaeological remains. The

methods of analysis and initial results are also summarized. Descriptions of the cultural remains are presented at the level of the feature cluster, or complex. Only the more prominant features are discussed individually. A detailed list of individual features recorded by the survey is found in the table at the end of the report.

The Research Design

The preceeding discussion of the natural setting emphasized the similarity of the Ewa Beach project area to that at Barbers Point where considerable research has been carried out over the past three years. The strategy of the Ewa survey was therefore adapted from the research designs utilized at Barbers Point. In doing so, it was assumed that strategies developed from the design perspective of a larger project in the same region would yield comparable archaeological data (Goodyear 1975).

Research at Barbers Point is directed towards developing a tentative model for explicating the nature of human settlement and environmental change in presumably marginal leeward regions of the high Hawaiian Islands.

Marginality is used here as a relative measure of constraint the habitat imposes upon its human population. The term itself implies an element of risk. Appropriate demographic and productive strategies would be required to (a) minimize risk over the long term, or (b) optimize or maximize seasonal or localized resources (production) for short-term gain (Gould 1975, 1977). This perspective explicitly ties residence in the region to the availability and/or predictability of essential resources and the mode of exploitation. Thus, although seasonal or localized abundance of important resources might have enhanced the prospects of an optimizing or maximizing strategy, it is likely that such a strategy would have only allowed for temporary occupancy in the region. Conversely, permanent residence would most probably have been viable only within a risk-minimizing framework.

The distinction is important when it is questioned why these marginal regions were ever settled in the first place, particularly in view of the high productivity generally assumed for those regions under intensive irrigated taro cultivation. Indeed, although perhaps largely a problem of sampling, there is nevertheless little evidence for settled occupation of these marginal regions prior to A.D. 1200. Yet within the next two centuries there is apparently a phenomenal expansion of settlement into nearly all leeward areas of the islands. This suggests a very fundamental reorientation of settlement in response to population-resource imbalances stemming from actual growth of earlier settlements, or from increasingly differential access to resources and to decision making, or perhaps from other factors yet to be determined (Cordell and Plog 1979:411-412).

From this rather broad statement of research interest, a number of more specific problem domains may be defined which are amenable to direct investigation. These are:

1) What was the nature of the leeward lowland forest and/or grasslands prior to and during the per lod of Hawaiian settlement on the Ewa plain?

2) What resources within the region were available to and exploited by the local settlements; is there evidence for trade or exchange between settlements within the region, or with settlements outside the region?

3) In terms of human subsistence, what was the relative importance of competing and/or integrating sectors of the economy for net productivity of the settlement and the size of the resident population?

4) What was the nature of settlement in terms of permanent or temporary residence, and what was the local residence pattern and its implications for social and political organization?

5) Finally, what is the time depth of settlement on the plain; how does this fit into the overall sequence of settlement in Hawaii, particularly the seemingly rapid expansion during the thirteenth and fourteenth centuries?

To address such questions at Barbers Point, and now also at Ewa Beach, a settlement-pattern approach to the archaeological site survey was clearly most desirable. The strategy presupposes a systematic relationship between human behavior and (a) the natural and social context of that behavior, and (b) the material remains of that behavior, only a part of which survives in the archaeological record. Thus, at the survey level of research, particularly in Polynesia, a settlement-pattern approach allows for the identification of probable behavioral patterns of social, economic and political activity from the archaeological remains when there is often a paucity of portable artifacts, but an abundance of architectural features (Green 1970: 13).

Date Required of the Survey

As at Barbers Point, the Ewa survey aimed especially at distinguishing between a residence pattern characterized by dispersal from one in which house sites occur in multi-feature clusters. Such clusters are explicitly assumed to reflect a level of social integration beyond that of the individual household in which the integration is seen to be one of function. That is, the various features of the cluster serve a range of uses which, in combination, encompass a set of activities that defines a residence group. For this, data were required to determine (a) the total population of cultural features in the survey area, (b) the range of functional variation exhibited by the features, and (c) the spatial distribution of the features with respect to other features and to the immediate landscape.

Such data required explicit definition prior to fieldwork. Although treated more extensively in the Barbers Point survey report (Davis 1978), these definitions are summarized below for ease of reference.

1) The type of feature - is a field designation based on structural form, which may, but does not necessarily, equate with function. There are four broad categories: presumed habitation features, or house sites; sinkholes, modified or otherwise; mounded features;

and miscellaneous. The feature types as recorded in the field, and as used in the data table, are defined as follows.

a) Enclosure - includes rectangular, oval and irregularly shaped walled structures enclosing an interior floor space.

b) C-shape - structures are semi-circular walls, or variants thereof, delimiting but not completely enclosing an interior floor space.

c) Platform - is any structurally elevated floor, which may or may not be stablized by a formal stone facing around the perimeter, and which is presumed to have served as the foundation for another structure built of more perishable material.

d) Modified sinkhole - is a natural feature of the landscape which has been structurally modified by building partially enclosing rock walls around the rim of the opening, or stone alignments within.

e) Ahu - is the Hawaiian term for rock mound, and is used here to distinguish a generally large mounded structure of formalized construction from smaller and more numerous "piles" of rock. These usually served as boundary markers, trail markers or burial cysts, or often as alters when associated with larger structures. In addition to formal construction style, minimum criteria defining an ahu in this study is that they exceed 60cm in height.

f) Mound - is also a deliberately built feature, although less formalized. These are smaller features and are generally found on the limestone outcrops adjacent to cleared pockets of clayey-humic sediments. They are therefore presumed to be the result of clearing the loose surface rocks from the sediment deposits (see item 1h below).

g) Wall - is a free-standing structure of stacked or piled stone which is not otherwise a part of another feature type. These features vary greatly in length as they are often only remnants of once longer walls.

h) Garden area - is a rather amorphous feature in which loose surface rocks have been cleared away from pockets of clayey-humic sediments (see item 1f above).

i) Midden deposit - is a surface exposure of cultural refuse, including bone and shellfish remains and other debris (see item 5g below).

j) Trail - is a feature type which is self-explanatory.

k) Structure - is a classification in which a feature, although of reasonably certain cultural origin, cannot otherwise be formally identified because of insufficient data.

2) The length and width (or diameter) of the feature - are the external dimensions of the feature. Wall dimensions are treated separately below.

3) The height or depth of the feature - is recorded only for platform, ahu, and mound features, and for sinkhole features, respectively.

4) Wall width and wall height - includes both free-standing walls and the structural walls of other feature types.

5) In addition to the typological and metrical data, recording of specific diagnostic attributes included:

   a) The material and method of construction - the local limestone was the only construction material utilized: however, methods included simple alignments, piling, multiple stacking, core filling (that is, two facings of set stone with a hollow core filled by pebbles and cobbles), or large slabs set up-right on edge.

   b) The presence and number of corners - and therefore the number of walls or facings in the structure, is important in ambiguous case for determining the original architectural form.

   c) The presence and orientation of doorways in enclosure walls - may reflect aspects of social organization, or merely responses to local environmental conditions.

   d) The orientation of semi-circular walls around sinkholes and in C-shaped structures - may, as with doorways in enclosures, also reflect patterns of social behavior or responses to local conditions.

   e) The presence of interior and/or exterior contiguous sub-features - including multiples floor levels, formal hearths or simple fireplaces, walls or alignments dividing interior floor space, contiguous exterior walls or platforms, and discrete activity areas among others, indicates the relative complexity of a feature.

   f) The presence of an elevated interior floor - suggests the possibility of a well developed cultural deposit. And,

   g) The presence of surface debris resulting from human activity - including fire-cracked rock (coral and basalt), basalt cobbles and flakes, shell and bone midden, vegetal remains exotic to the area (such as kukui nut endocarp or the "keys" of pandanus fruit), and portable artifacts indicates something of the kinds of activities carried out in various house sites. As much of this material was identified in the field as possible. Surface collection was limited to artifacts exposed to potential looting, or when material was not readily identifiable.

Description of the Archaeological Remains

The survey identified 107 cultural features in the forested portion of the project area: Survey Zones I-III. No surviving cultural features were found in the inland areas now or formerly under sugar cane cultivation: Survey Zone IV. These features are generally found in clusters, or feature complexes, each designated by a State Historic Preservation Office site number (Sites 3201-3218). All sites discussed herein are prefixed with a two number code 80-12* in the state system, but this has been omitted from the discussion for simplicity.

A detailed data listing for 97 features recorded by the survey is given in tabular form at the end of the report. Information on the remaining 10 features is limited to noting only their presence and architectural form, that is, walled enclosure, C-shaped shelter, or platform.

Features Recorded in Survey Zone I (see Figure 3). Survey Zone I is of particular interest in that it contains most of the sites in the project area, with a total of 64 features recorded in six feature complexes (Sites 3201-3205, and 3208). The swamp is also located in this zone, around which all but three features (in Site 3208) appear intentionally situated. Indeed, a deteriorated rock wall (Feature 3203-A_2) extends discontinuously for nearly 200m around the inland side of the swamp, and it seems likely that it once completely ringed the swamp. On the east side of the swamp the wall adjoins several similar wall segments which enclose a large, and presumably early historic, habitation platform (Feature 3203-A_1). Sites 3203, 3204 and 3205 are all located north and east of the swamp near the perimeter wall. Sites 3201 and 3202 are located on the south near the beach. The implications of this are as yet uncertain, although it does suggest the swamp may have been functionally integrated into the settlement, perhaps as an important resource zone in the local economy.

Only the few isolated features of Site 3208 are removed from the vicinity of the swamp. These are apparently linked to the latter by a possibly historic trail (Feature 3208-C) which can be traced for 300m from Site 3208 to the inland side of the swamp. The trail and the perimeter wall may not be contemporaneous, however, as the trail seems to breach the wall rather than pass through a "gate".

Of the 64 features in Zone I, there are 31 presumed habitation structures: 10 platforms, 9 walled enclosures, and 12 C-shaped shelter walls. With the exception of Features 3203-A_1 and 3203-F, all of the platforms are found near the beach, and except for Feature 3201-J, the enclosures are all located inland of the swamp. Moreover, all but one of the C-shapes (Feature 3202-C) are also found inland. The implications of this patterning are again uncertain, although there may be temporal differe nces between the coastal and inland features.

The only clearly definable gardening areas in this zone are Features 3202-H and 3202-I. Combined, they have an approximate area of 1700m^2, or

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* 80 for the island of Oahu, and 12 for the Ewa Quadrangle of the U.S.G.S., 7.5' topographic series.

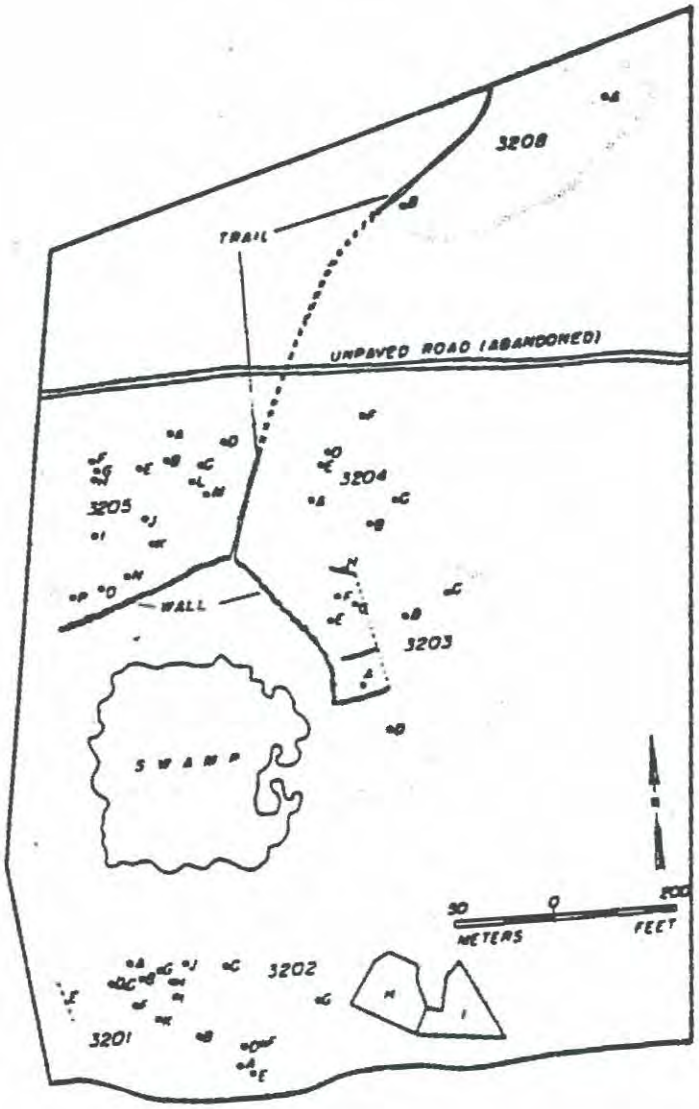
3208
TRAIL
UNPAVED ROAD (ABANDONED)
3204
3205
WALL
3203
SWAMP
50
0
200
METERS
FEET
3202
3201

Figure 3.

a half-acre. This is not all cultivable land, but it is useful for comparison with other planting areas.

Another possible garden area is the margin of the swamp where root crops like swamp taro may have been cultivated, which may also account for the perimeter wall described above. For this reason, and because of the possibility that the swamp conditions today may represent the historic deterioration of an earlier pond environment, investigation of the natural history of the swamp and its relationship to the human settlement on its periphery is of the utmost interest.

Two pieces of volcanic glass were collected from the surface: one from a C-shaped shelter (Feature 3204-B) and the other from a platform (Feature 3206-B). Although any age determination of material found in disturbed contexts must be treated with caution, it is nevertheless of interest to note that Feature 3204-B is quite similar to surprisingly productive features at Barbers Point, one of which has yielded more than 900 pieces of volcanic glass from a cultural deposit only 10cm in average depth (Davis ms.).

Features Recorded in Survey Zone II (see Figure 4). The data from Survey Zone II is considerably less secure than is the case for Zone I. From eight quite extensive feature clusters (Sites 3206-3207, 3209-3210, and 3214-3218), only 24 structures were recorded in detail. Of these, 17 are inferred to be habitation structures. All are C-shapes except for one platform and three walled enclosures. Although the data are limited, the enclosures again appear to be located inland away from the coast.

Regarding the 10 features noted but not recorded by the survey, these are located in six of the features complexes (Sites 3210, and 3214-3218). The complexes are primarly extensive clusters of low rock mounds and adjacent clearings of accumulated sediments inferred to be horticultural plots, among which are scattered the habitation features. Although the data are incomplete, these complexes are estimated to comprise a total area of about 5.1 hectares (12.5 acres).

One platform (Feature 3209-A) in Zone II is presently the largest known surviving archaeological structure in the Ewa region. It is apparently a two-tiered structure measuring 8 x 8m at the base, 5.7 x 5.7m on the upper tier, and standing nearly 2m in height. The estimated volume of stone in excess of $65m^3$ represents a considerable investment of labor suggesting that several households may have shared in its construction. In any event, it seems clear that this is a functionally specialized structure, most probably ritually oriented. Just how far this inference may be taken is uncertain at this time. But one suggestion, that it is a possible burial platform, seems unlikely if it dates to the prehistoric period, given the traditional concern about desecration of the dead, unless it is of historic date when desecration presumably became less worrisome (Bowen 1961, 1974).

Features Recorded in Survey Zone III (see Figure 5). This is the most disturbed zone in the project area. Numerous dirt roads have been cut at regular intervals, not to mention a pig farm and the fact that local Ewa

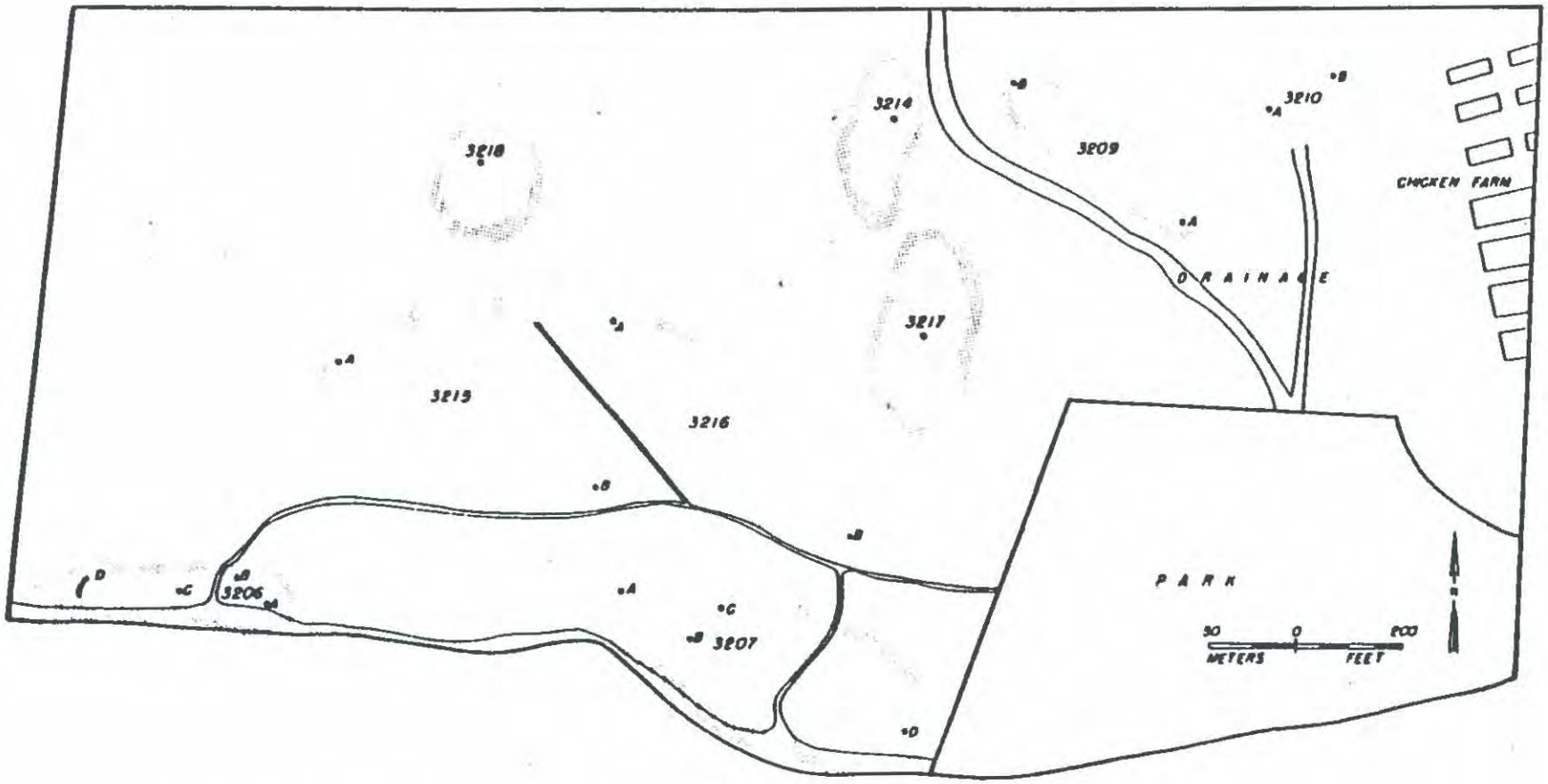
3218
3214
3209
3210
CHICKEN FARM
DRAINAGE
3217
3215
3216
PARK
3206
3207
50
0
100
METERS
FEET

Figure 4.

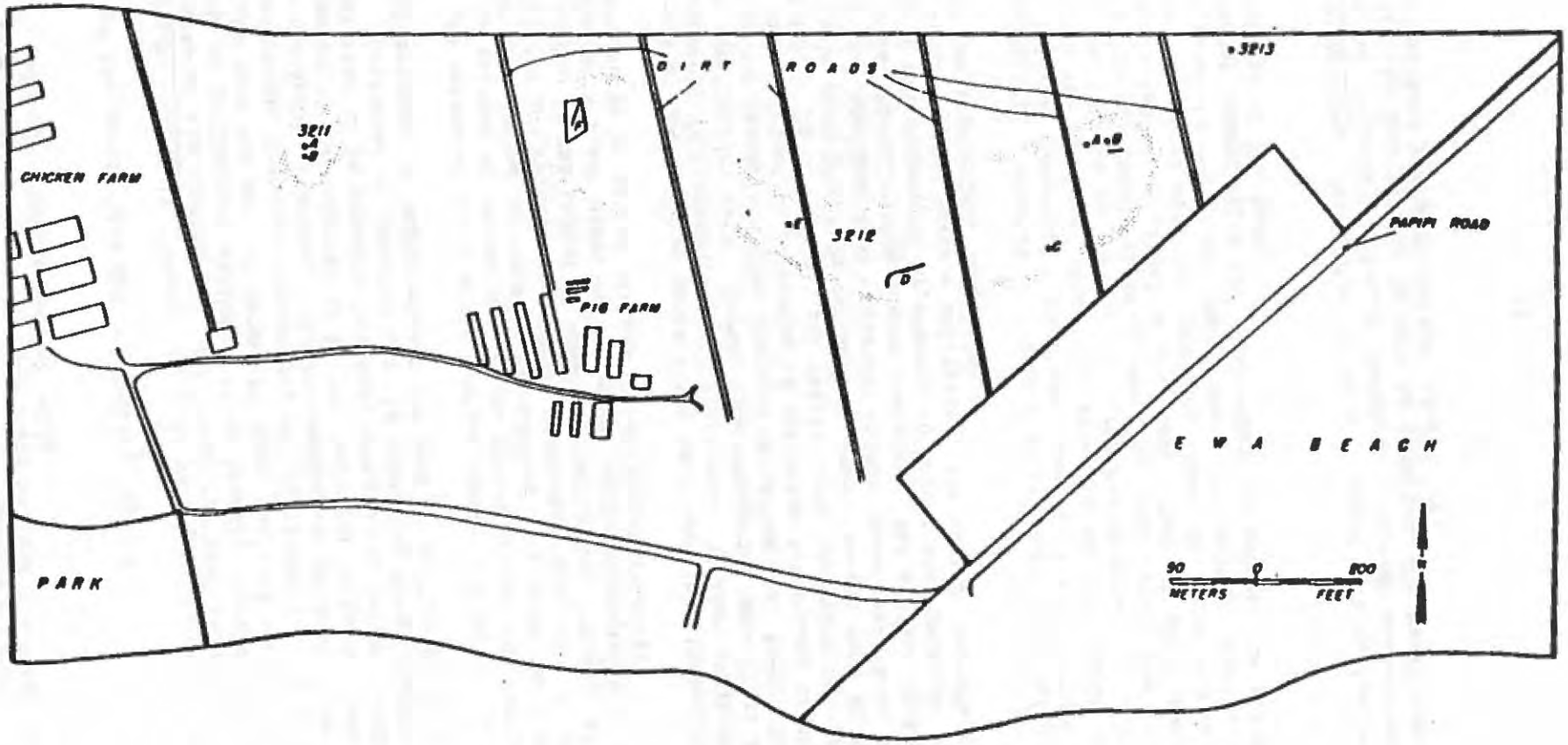
CHICKEN FARM
PARK
3211
DIRT ROADS
PIG FARM
3212
3213
PAPAPI ROAD
EWA BEACH
90
0
200
METERS
FEET
N

Figure 5.

Beach residents constantly use this area for gardening today. Only nine features were recorded here, of which there was one platform, one walled enclosure, and four C-shaped shelter walls.

Analysis of the Survey Data and Preliminary Results

Functional Analysis. Formal criteria were applied to the archaeological features at the beginning of the survey to facilitate recording. For the purpose of preliminary analysis, three broadly functional categories were defined from the initial formal typology outlined above. (a) The walled enclosures, C-shaped structures, and platforms are inferred to be primarily habitation features. (b) The mounds and adjacent areas of sediment accumulation are inferred to be horticultural features. And (c) the ahu are inferred to be possible boundary markers, or perhaps burial features. Inferences of function for the remaining formal categories are either self-evident, or indeterminant for lack of sufficient data.

Only the potential house sites provide enough information at the survey level to attempt to refine inferences regarding feature function. Methods for determining variation were modified from those outlined by Kirch (1971) for the Palauea settlement at Makena, Maui, and by Cordy et al. (1975) at kaloko on the island of Hawaii. Statistical criteria of structural size, particularly floor area, were combined with the presence or absence of specific attribures to define classes of habitation features.

Fifty-one of the inferred house sites were used in this analysis: 13 walled enclosures, 24 C-shapes, and 13 platforms. Fifteen structures were omitted for insufficient data. Formal type categories were first analyzed separately on the assumption that function co-varies with form. Formal types were then combined to determine if variation may relate to size regardless of form. In both cases, the results were inclusive as a statistically reliable discrimination was not obtained. Recent work at Barbers Point (Davis ms.) confirms that variation within house sites does exist: these are not functionally homogeneous features. But surface data may not be sufficiently discriminating at present to detect the variation. Without some method of controlled surface collection, the lack of temporal control must certainly be a principal limitation.

Spatial Analysis. Insufficient data also precluded meaningful results from spatial analysis, especially in Survey Zones II and III. Even in Zone I where coverage was complete, recent disturbances and the limited success of functional analysis allow for only the broadest observations. That it, that the platforms are found primarily near the beach, while the C-shapes and walled enclosures occur inland of the swamp. Many of the C-shapes also appeared to be associated with the gardening areas, but this relationship in functional terms is yet to be demonstrated. Ultimately, spatial analysis also proved rather inconclusive for determining the presence or absence of residence groupings at Ewa Beach.

Age Determinations. Two flakes of volcanic glass were collected from the surface of two presumed habitation features. Although the archaeological context of this material may be open to question, the results of hydration-rind analysis are nevertheless informative.

Analysis of one flake from a C-shaped shelter (Feature 3204-B) yielded a date of A.D. 1769 ± 36. This date ranges from 1733 to 1805, thus spanning the period of initial European contact. It also fits quite comfortably within the 1600-1870 time span presently available for the settlement at Barbers Point.

The second piece of glass was not datable because the sample proved to be opaque, and would not transmit light in thin-section. As discussed above, ten volcanic glass samples from recent excavations at Barbers Point also proved to be opaque. Preliminary examination suggested that the Kolekole dike system in Waianae, which frequently produces characteristically opaque material, is the most likely source for these ten samples. The undated sample from Ewa Beach may therefore also be from the Waianae source. If so, then some form of exchange with settlements beyond Ewa and Barbers Point may have been important in the prehistoric economy.

Archival Documents. No Land Commission Awards are listed for the immediate vicinity of the project area (Indices 1929), nor are any settlements shown on W.D. Alexander's original Honouliuli *ahupuaa* survey map of 1873. However, records of the Division of Land Management show that a three-quarter-acre parcel at Oneula, being *Apana* 8 of Royal Patent (School) Grant No. 30, was set aside for the Board of Education in 1852. This lot and two others at Kualakai and Waimanalo were eventually abandoned by the turn of the century. A Territorial Land Court boundary map for Honouliuli, dated 1933-34, shows this parcel is located in the present Oneula Beach Park.

Finally, reference to the early Ewa-Waianae tax roles shows that fifty-two households in Puuloa to the east and thirteen households at Kualakai to the west were assessed for taxes in 1855.

EWA BEACH AS AN ARCHAEOLOGICAL RESOURCE: DISCUSSION AND RECOMMENDATIONS

Discussion of Significance

The significance of the Ewa Beach survey area lies in its potential for making scientifically meaningful contributions to the natural and cultural history of the Hawaiian Islands.

The Ewa survey has already expanded the data base acquired from previous research at Barbers Point (Lewis 1970; Sinoto 1976, 1978; Davis and Griffin 1978). Results of both intensive site mapping and extensive test and salvage excavations demonstrated a unique opportunity at Barbers Point for investigating the nature of human settlement and environmental change in what outwardly seemed to be extremely marginal conditions. Since these studies constituted the first serious look at the Ewa plain, little other data was available. Initial reconnaissance and survey at West Beach near Nanakuli (Barrera 1979) has started to fill a major gap in our knowledge of the region. The results of the Ewa survey now begin to fill yet another gap.

Building on the Barbers Point research, the survey data from Ewa Beach (a) allow for an assessment of our current understanding regarding the region, which (b) suggests a number of directions for further investigation.

1) The number of cultural features, the size of individual habitation structures, and the extent of the sited areas now indicate that the whole of the coastal portion of the Ewa plain once supported a large and possibly permanently resident prehistoric population.

2) The range of available dates indicate a span of occupation from c. A.D. 1600-1870. This suggests that, except for possibly the established taro lands at Honouliuli village above West Loch, the region may have been among the last to be settled on the island of Oahu. This may not only reflect the presumed marginal conditions of the region for human settlement, but also, and more importantly, other possible factors affecting settlement elsewhere on the island. If so, then settlement in this region represents an end point in the expansion of prehistoric Hawaiian populations on Oahu.

3) Two classes of archaeological features were found at Ewa Beach that are not present at either Barbers Point or West Beach. The first, of which there is only one structure, is a massive two-tiered platform (Feature 3209-A). Its size and the apparent expenditure of labor involved in its construction suggests this is a rather specialized feature, perhaps functioning in a ritual context. The second feature class, represented by twelve structures, is a large habitation platform inferred to be very late prehistoric or early historic in date. If these are historic house sites, then they may be among the last occupied at Ewa, and thus contemporaneous with various archival documents for this area of the Ewa coast.

4) Subsistence at both Barbers Point and Ewa Beach is known to have in part been dependent upon marine-strand resources. At Barbers Point, the apparent pattern of locating residential structures near extensive clusters of sinkholes and areas of accumulated clayey sediments suggested that locally cultivated food plants were integrated with the marine-strand economy. Similar associations between house sites and inferred garden areas were observed at Ewa Beach. Moreover, the numerous house sites situated around the periphery of the swamp suggests this may also have been an important resource area.

5) The swamp is unique in the region for a number of reasons. It is apparently the largest surviving marshland on the plain, and seemingly the least disturbed (relatively speaking). The association between the swamp and the surrounding archaeological remains is only inferential at this time. But it does suggest the possibility that the swamp may rather have been a pond during the prehistoric period. A similar association between prehistoric house sites and an inland pond is recorded for the Barbers Point area (Lewis 1970).

6) As with the Barbers Point area, Ewa Beach is part a broad plain of emergent lithified coral reef which has developed a characteristic shallow karst topography. Such features are typical of tropical Pacific atoll and makatea-type island environments. Little of this rare environment remains in the high volcanic islands of Hawaii beyond these isolated survivals in southwestern Oahu.

7) Lastly, the significance of this karstic environment is the favorable conditions it provides for the preservation of fossil materials. Previous work at Barbers Point recovered the remains of extinct avifauna, some of which heretofore unknown. These were found in widely separated localities suggesting the strong possibility that similar remains are also present in the Ewa project area. The discovery of such extinct birds offers the opportunity for significant contributions to the natural history of the Hawaiian Islands. Furthermore, that some of this material was recovered from excavations in cultural sites raises the question of human predation as a factor in selected avian extinctions.

Assessment of Potential Adverse Impacts

As the development plans now stand for the proposed Ewa Marine Community, the action will entail modification of the entire project area, including the forested portion where the archaeological sites are located. Therefore, it is determined that there will be an adverse impact upon the cultural resources if the development continues as proposed. There are no known cultural remains surviving in the sugar cane lands or in the adjacent Ewa Beach community, and thus no impact is anticipated in these areas.

Mitigation Recommendations

Recommendations for mitigating adverse impacts are offered for initial consideration. A number of alternative actions are possible. It should be kept in mind, however, that (a) only the archaeological sites, and the possible paleontological remains as they relate to the cultural features, are addressed here. And (b) these recommendations are based on an assessment of significance in terms of the scientific data that research in this area is likely to yield (see below).

The alternatives are:

1) Amend the development plans to exclude all, or selected portions, of the archaeological site areas from the proposed development. If the latter is selected, then salvage excavations <u>may</u> be required in those areas not excluded, based on assessment of their significance.

2) Amend the development plans to include selected archaeological site areas into the proposed development as "preserves", with or without stabilization. As with the above, areas not included <u>may</u>

require salvage excavation. If stabilization of preserved areas is chosen, this will also require professional archaeological services.

3) Do not amend the proposed development plans. In this case, an integrated program of research/salvage excavations must be planned and carried out prior to the proposed development.

The above is only a general framework; specific recommendations are beyond the scope of this report. Details regarding implementation of any action, however, should minimally address the statements of significance as outlined above and the project area's potential status in the National Register as defined below.

National and State Register Eligibility. Based on criteria promulgated by the National Park Service, Chapter 1, Title 36 (CFR) Part 60: sites, structures and districts of state or local importance may be eligible for inclusion on the National Register of Historic Places if they have yielded, or may be likely to yield, information important in prehistory or history. On the basis of these criteria, the following conclusions can be made.

1) The entire Survey Zone I, including the swamp and all the surrounding archaeological features, is eligible for inclusion on the National and State Registers based solely on the information obtained during the survey.

2) The large platform structure (Feature 3209-A) located in Survey Zone II is also eligible for inclusion on the National and State Registers.

3) Recommendations regarding eligibility for the remainder of the sites in Survey Zone II, and for the sites in Survey Zone III, are deferred because of insufficient data for the reasons stated previously. This is not to be construed as a negative recommendation. Although the relatively unimpressive architectural features in these zones may, at first glance, appear insignificant, similar structures excavated at Barbers Point have yielded large quantities of midden and volcanic glass thereby providing data of great importance to the prehistory of the region. It is therefore further recommended that the survey of Zones II and III be completed incorporating a method of detailed surface collection designed to evaluate the potential of features in these zones for yielding significant information before assessing eligibility.

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SITE NUMBER	FEATURE	CONFIDENCE LEVEL OF DATA	LOCATION	FEATURE TYPE	LENGTH (M)	WIDTH (M)	DIAMETER (M)	HEIGHT DEPTH (CM)	WALL WIDTH (CM)	WALL HEIGHT (CM)	TOTAL AREA (M^2)	FLOOR AREA (M^2)	REMARKS
1201			Survey Zone I	Complex									A cluster of 12 features located between the coast and the southwest corner of the swamp.
	A	Good		Rectangular Platform	6	3.7		15-30			22.2	22.2	One of three adjacent platforms; a large elevated limestone cobble floor with possible low perimeter wall extending along north side and c. 2.5m beyond the west edge where the wall stands c 60cm high and is 75cm wide at the base; shell midden around all three structures including. Turbo. Nerita. Cypraea. Nerula and Conus; other surface debris includes some fire-cracked basalt and fragments of recent bottle glass.
	B1	Good		Rectangular Platform	4.5	3.5		15-25			15.7	15.7	Second of three adjacent platforms; a large elevated limestone cobble floor with possible low perimeter wall around four sides; base of platform faced with small limestone boulders and at least some upright slabs, C-shaped wall abutting south side of platform; surface debris same as listed above.
	B2	Good		C-shape		2.5			50-100	15-35	9.5	6	Semi-circular wall abutting southeast corner of Platform B1 and extend around south side with the open side of the enclosed floor on the west; wall built with multiple-stacked limestone boulders and cobbles; surface debris as listed above.
	C	Fair		Rectangular Platform	3.7	2.7		15-25			?	10	Third of three adjacent platforms, a small elevated floor of limestone cobbles; structure appears disturbed with extensive rubble around floor; perimeter of original foundation uncertain, therefore, only surviving floor area given; total area of rubble - c. 28m^2, surface debris as listed above.
	D	Incomplete		Midden Deposit				c 20			?		Possible subsurface deposit of unknown extent exposed in recent disturbance c. 7m^2; disturbed material was dark-stained, containing fish bone and fragments of charcoal; this feature is 10m west of the above platforms and could be part of extensive associated deposit.
	E1	Incomplete		Midden Deposit	c.30	c.10					300		Possible subsurface deposit of unknown extent or depth indicated by surface scatter, including Turbo. Nerita picta. N. polita. Littorina. Cypraea. fish bone and some fire-cracked basalt; row of seven probably recent rock mounds across this feature.
	E2	Fair		Mound			1.5-3.5	60-90			1.8-9.6		Seven probably recent rock mounds spaced in a straight line over c. 10m, apparently not associated with possible midden deposit above; may date to military use of the area, size range of mounds given.
	F1	Fair		Structure	10	5			40-150	20-40	50	?	Badly disturbed structure, original shape unknown; remaining wall sections apparently of multiple-stacked and possible core-filled construction; several up-right limestone slabs in what may have been interior of wall; scattered shell midden, including Turbo. Nerita. Strombus and Cypraea caput serpentis; possible hearth located c. 8m southeast of this feature.
	F2	Fair		Hearth	.5	.5		?					Possible small hearth defined by three limestone slabs set on edge into the ground, two at right angles to the third, hearth situated on slight rise c. 20m^2 which may be a remnant structure (platform?).
	G	Fair		Structure	5	4.5			?	40-70	21.5	?	Badly disturbed structure, original shape unknown--although possibly C-shape, remaining wall sections apparently of multiple-stacked construction with several up-right limestone slabs on exterior (?) of wall, scattered surface midden, including Turbo. Nerita. Cypraea. and Tellina shell, fire-cracked basalt and a coral abrader.

Table 1.

SITE NUMBER	FEATURE	CONFIDENCE LEVEL OF DATA	LOCATION	FEATURE TYPE	LENGTH (M)	WIDTH (M)	DIAMETER (M)	HEIGHT DEPTH (CM)	WALL WIDTH (CM)	WALL HEIGHT (CM)	TOTAL AREA (M^2)	FLOOR AREA (M^2)	REMARKS
	H	Fair		Ahu			3.9	55-60			11.9		A low, subrectangular ahu of multiple-stacked limestone cobbles and small boulders, possible remnant facing with some up-right limestone slabs; top of structure roughly flat, some Nerita shell scattered around surface.
	I	Good		Ahu	3.9	3.6		55-85			14		A moderately high, roughly rectangular ahu of multiple-stacked construction with limestone cobbles and small boulders; possible remnant facing with a few up-right slabs; top of structure uneven; no surface midden observed.
	J	Good		Rectangular Enclosure	3.5	3			60-100	35-40	10.5	7.5	Habitation structure recorded as small enclosure, but similar to several c-shape features at Barbar's Point; multiple-stacked cobble walls with up-right limestone slabs--especially interior facing; probable doorway (or open side) to southwest; some Turbo shell midden scattered around surface.
	E	Good		Rectangular Platform	8	4		30-50			32	32	A large elevated limestone cobble floor with remnant facing of small boulders and up-right slabs set in ground; possible extension of floor or a second lower floor (c. 7m x 4m) on east side of platform; some Nerita shell midden scattered around surface; basalt gaming stone (uly raika) or discoidal hammerstone on surface c. 7m to northwest.
3202			Survey Zone 1	Complex									A cluster of 9 features located between the coast and the southeast corner of the swamp.
	A	Good		Rectangular Platform	3.5	3		30-50			10.5	10.5	A small elevated floor of limestone cobbles and multiple-stacked small boulders with remnant facing of small boulders set in place, several up-right limestone slabs apparently part of facing. Fragments of "old" and recent bottle glass around surface with Nerita and Ipona shell midden; possible remnants of small platform c.5m to the west.
	B	Incomplete		Midden Deposit	?	?		?			?		Subsurface deposit of unknown extent or depth exposed by up-root tree. dark-stained sediments include Nerita, Cypraea caputserpentis and pearl shell (Tagaewon?), fish bone and echinoidea (sea urchin), fire-cracked and water-worn basalt, and fragments of charcoal.
	C	Good		C-shape	3.3	3			75-100	30-40	9.9	7.7	Small, angular (2 corners) C-shaped wall of multiple-stacked cobbles and small boulders with possible up-right slabs inside-facing (?); open side to the south; no surface midden observed; ground basalt whetstone fragment c 10m to the south.
	D	Good		Rectangular Platform	8	6		c.35			48	48	Very large elevated floor of limestone cobbles with probable remnant facing of multiple-stacked cobbles and small boulders, three small limestone slabs possibly set into the floor on edge suggesting possible hearth; surface midden scatter includes Nerita and Cypraea caputserpentis shells, fish bone and fire-cracked basalt.
	E	Good		Rectangular Platform	4	3.5		25-40			14	14	Small elevated limestone cobble floor with remnant facing of small boulders and some up-right slabs; possible hearth indicated by roughly square (40cm x 45cm) hole in top of feature, surface scatter includes fragments of bottle glass-pre-1900 (?), body seam with turn top, midden includes Nerita, Cypraea caputserpentis and Brachidontes shell, and fire-cracked basalt.

SITE NUMBER	FEATURE	CONFIDENCE LEVEL OF DATA	LOCATION	FEATURE TYPE	LENGTH (M)	WIDTH (M)	DIAMETER (M)	HEIGHT DEPTH (CM)	WALL WIDTH (CM)	WALL HEIGHT (CM)	TOTAL AREA (M^2)	FLOOR AREA (M^2)	REMARKS
	F	Incomplete		Platform			c.4	c.30			1		A broad indefinite limestone cobble and small boulder mound which appears to possibly be a deteriorated platform, no facings or alignments visible; surface scatter of 19th century bottle glass, fire-cracked basalt, fragments of corroded iron, and a fragment of porcelain bowl, no shell or bone midden observed; features D, E, and F are quite close and could be associated; another possible disturbed platform c.15m to northeast, but this is very uncertain.
	G	Incomplete		Structure	1						1		Either a small platform or rather large, but low ahu of roughly piled limestone cobbles and small boulders; does appear to be artificial, but not the result of bulldozing; up-rooted tree c.15m east exposed possible subsurface deposit of unknown extent or depth; deposit of dark-stained sediment containing fragments of charcoal, and Brachidontes and Tellina shells, this feature at west end of Feature H (below) and deposit may be part of Feature H.
	H	Good		Garden Area	40	35					1400		A broad zone of sediment-humic deposits interspersed with exposed limestone bedrock; loose surface rock apparently removed from sediment areas and stacked on adjacent outcrops forming a series of conspicuous low rock mounds; no surface midden observed; this feature similar to clearings at Barber's Point inferred to be horticultural zones.
	I	Good		Garden Area	30	40					1000		Same as Feature H (above) of which this may just be an extension.
3203			Survey Zone I	Complex									A cluster of 12 features located along the northeast side of the swamp.
	A1	Good		Rectangular Platform	6.5	6.3		30-50			40.9	40.9	A large elevated limestone cobble floor defined on four sides by foundation of small boulders and cobbles set in place--platform and facing in excellent condition, possible alignment of boulders on floor of platform along east and south sides set c.100cm in from outside edge, surface debris includes 19th century bottle glass, a fragment of ceramic bowl, plus echinoidea, Cypraea cinnamomeanta and Nerita shell midden, the platform is located within a large enclosed area (see below).
	A2	Good		Enclosure	c.30	c.20			100-200	30-50	c.600		Several badly disturbed sections of former free-standing wall once enclosing an area ca. 20m x 30m around Platform A1 (above), disturbance of wall makes assessment of construction impossible for the most part, but several sections along south side do show core-filled construction with boulder facing and pebble fill--no evidence of up-right slabs; west wall of enclosure is part of a continuous (although broken) wall extending nearly half-way around the swamp (210 m)--Feature 3203A2 will designate all sections of this continuous wall; three mounds of piled rock c.2-3d x 30 cm high contained within enclosure east of Platform A1, large depression c 3m4 in southwest corner of enclosure indicates possible presence of filled-in sinkhole, or perhaps an imu (earth oven).

SITE NUMBER	FEATURE	CONFIDENCE LEVEL OF DATA	LOCATION	FEATURE TYPE	LENGTH (M)	WIDTH (M)	DIAMETER (M)	HEIGHT DEPTH (CM)	WALL WIDTH (CM)	WALL HEIGHT (CM)	TOTAL AREA (M^2)	FLOOR AREA (M^2)	REMARKS
	B	Incomplete		Structure	c.13	c 10		25-50			c.130	?	A disturbed structure which may be a platform with an abutting C-shaped wall apparently oriented with the open side of the "C" to the southwest; original foundations and construction uncertain, although the floor of the platform area appears to be pebble and cobble fill and several up-right slabs appear to indicate former facings--thus only the overall dimensions of the rubble area given; surface debris includes some Nerita and Conus shell midden; c.10m west is an area with several possible but very disturbed "ahu," evidence only sufficient to suggest that something had once been there.
	C	Good		Ahu			1.6	110			2.1		A large multiple-stacked limestone cobble and boulder ahu with an abutting piled cobble and boulder wall at base; wall measures 150cm long x 100cm wide x c.50cm high; wall located on north side of ahu; large open sinkhole c.225cm x 150cm at the rim and c.160cm deep (to humic fill) located 5m to northwest; no surface debris observed, however, fill of sinkhole exceeds 30cm (length of probe).
	D1	Good		C-shape	5.5	3.5			60-100	35-80	19.3	10	A large disturbed C-shaped shelter of multiple-stacked construction with several up-right limestone slabs on inside of wall; outline somewhat angular with possibly two corners inside, open side of "C" to the southwest; surface midden includes echinoidea, Nerita and Brachidontes shell remains; three ahu located within 10m to south and west.
	D2	Good		Ahu	2.5	2		60			5		Rectangular ahu of multiple-stacked construction; facing on southeast side intact, rest of structure collapsed.
	D3	Fair		Mound	2.4	2.3		40			5.3		Square rock mound with possible remnant facings--may be deteriorated ahu.
	D4	Good		Ahu	3.4	2.5		60			8.5		Large partially collapsed rectangular ahu of multiple-stacked construction--possibly mixed with core-filling as indicated by small boulder facing and mixed boulder-cobble interior.
	E	Incomplete		Structure	9	6.5		30-50			58.5	?	A very disturbed structure, possibly remnant platform; original foundations and construction uncertain--dimensions given only for the extent of limestone rubble; surface remains include Nerita, Cypraea caputserpentis and Tellina shell.
	F	Good		Rectangular Platform	8.5	8		25-40			61	61	A large elevated limestone cobble floor apparently divided into two areas; main floor measures 8.5m x 6m, the adjoining floor measures 5m x 2m; the two floors are separated by a cobble and slab alignment one course (c.15cm) high and c.50cm wide; surface debris includes: water-worn basalt cobbles, possible rough basalt flakes, pre-1900 (?) bottle glass, and Nerita shell and fish bone midden.
	G	Good		Ahu	3.4	2.7		80			7.3		A large oval ahu of multiple-stacked construction and facing of up-right slabs about two-thirds the way around, some collapsedwith uneven top and fallen rubble around base; some recent (?) bottle glass around ground surface.
	H	Good		Wall	25				200	35-85			Remnant section of large core-filled free-standing wall; portions of foundation quite clearly show large slabs set on edge with cobble fill between these parallel alignments, highest surviving point of wall at 85cm.

SITE NUMBER	FEATURE	CONFIDENCE LEVEL OF DATA	LOCATION	FEATURE TYPE	LENGTH (M)	WIDTH (M)	DIAMETER (M)	HEIGHT DEPTH (CM)	WALL WIDTH (CM)	WALL HEIGHT (CM)	TOTAL AREA (M^2)	FLOOR AREA (M^2)	REMARKS
3204			Survey Zone 1	Complex									A cluster of 3 features located on north side of swamp.
	A	Fair		Rectangular Enclosure	5	5			7	35-55	25	7	A large roughly rectangular but disturbed structure; apparently multiple-stacked construction with up-right slabs on exterior facing. Interior floor indefinite and location of doorway uncertain. surface debris includes barbed wire fragments and a fragment of basalt with several ground-polished facets. apparently numerous stacked rock mounds (average size: c.2m x 50cm high) to immediate south of this feature; Wall 3203A2 also passes ca.10m south of structure.
	B	Fair		C-shape	4.5	2.5			35-100	30-45	11.5	3.6	A badly disturbed structure of apparently multiple-stacked construction. several up-right limestone slabs suggest interior facing of wall. structure has at least two walls meeting in a right-angle corner with the open side to the west, although the wall may have extended to this side and since disturbed by growth of a quite large kiawe tree (a circumstance identified in a similar feature--2716-6--at Barber's Point). only surface debris observed was a flake of volcanic glass.
	C1	Good		C-shape	4.7	4.3			100-150	30-50	18.2	8	A large C-shaped shelter of multiple-stacked construction with interior facing of up-right limestone slabs; cement exterior facing of up-right slabs suggests higher wall sections may have also been in part core-filled; open side of shelter to southwest; no surface debris observed; probable shu located on southeast side of shelter.
	C2	Fair		Shu			2.3	65			4.1		Circular shu of multiple-stacked construction with some intact facing (?) including several up-right limestone slabs around north and east sides; top of structure uneven.
	D	Good		Triangular Enclosure	6.5	6			80-120	50-75	34.4	14.3	A large somewhat triangular walled enclosure; walls of multiple-stacked construction with some sections apparently core-filled. several up-right limestone slabs on interior. two openings in wall--one on north side is clear of any rubble suggesting the breach resulted from collapse but the opening lacks a formal "finished" appearance. the other opening on the southwest side does have the squared-off wall end on one side but the other side is disturbed and there is rubble in the opening; surface debris includes fragments of barbed wire and quantities of charcoal; no shell or bone midden observed.
	E	Incomplete		Structure	8	4			50-100	35-45	32	7	Possibly three remnant wall sections of mixed small boulders and cobbles with several up-right limestone slabs; original shape unknown although two of the "walls" do form a C-shape with the open side to the southwest; no bone or shell midden observed.
	F	Incomplete		Structure	4.2	2.3			25-100	35-45	9.7	7	An apparent multiple-stacked C-shaped wall oriented with the open side to the east. wall built with cobbles and small boulders but no clear facing. no bone or shell midden seen.
3205			Survey Zone 1	Complex									A cluster of 10 features located on north side of swamp and west of Site Complex 3204.
	A1	Good		Rectangular Enclosure	5	5			8	45-65	25	7	A large walled enclosure of multiple-stacked construction with several up-right limestone slabs in exterior facing. walls deteriorated with rubble filling enclosed interior foundation and floor area indeterminant; probable C-shaped wall abutting on southwest and apparent door way on southeast side; Nerita shell only surface midden observed.

SITE NUMBER	FEATURE	CONFIDENCE LEVEL OF DATA	LOCATION	FEATURE TYPE	LENGTH (M)	WIDTH (M)	DIAMETER (M)	HEIGHT DEPTH (CM)	WALL WIDTH (CM)	WALL HEIGHT (CM)	TOTAL AREA (M^2)	FLOOR AREA (M^2)	REMARKS
	A2	Fair		C-shape	4	4			1	30-50	16	1	Poorly preserved C-shaped wall abutting Feature A1 (above) and oriented with open side to southeast; little surviving wall section appears to be multiple-stacked construction; original foundations uncertain, therefore, only overall dimensions given.
	B	Good		Rectangular Enclosure	12	7			75-150	30-45	64	c.26	A large two-room enclosure of multiple-stacked construction and some up-right limestone slabs in exterior and interior facings, structure oriented with doorway to each room on west side, floor of west room c.10m^2, floor of east room c.16m^2; probable slab-lined hearth (c 10 x 40cm) located in west room near doorway; a recess (60cm long x 30cm high x 50cm deep) located in exterior face of south wall; fragments of Tellina shell only surface midden observed.
	C	Fair		Structure			6		70-100	35-45	28.3	12	Disturbed structure which appears to be two or three adjoining C-shaped shelters--overall dimensions c.20m x 6m; bestpreserved C-shape (dimensions given at left) of multiple-stacked construction with a few up-right limestone slabs; open side of shelter to the south; surface debris includes: Nerita, Cypraea caputserpentis, Drupa, pearl shell (Isognomon?) and Tellina shell, and fish bone midden.
	D	Incomplete		Structure			3.5		60-70	20-50	9.6	3.7	Another possible series of adjoining C-shaped shelters-overall dimensions c.16m x 5m, best preserved C-shape (dimensions given at left) of multiple-construction with several exterior up-right slabs; open side of "C" on the southwest, no surface midden observed; several low rock mounds (average 3m x 50cm high located c.4m to southeast
	E	Good		Ahu	4	4		80-100			24		Large roughly rectangular ahu of multiple-stacked construction, partially collapsed, but facing on south side intact, surface debris includes rusted cans, rifle cartridges, beach sand (from military sand bags?), and Nerita shell.
	F	Good		Rectangular Enclosure	4.6	3.8			90-110	40-50	17.5	4.1	A walled enclosure of multiple-stacked construction with a few up-right limestone slabs; probable doorway on southeast side; apparently disturbed by military activity as indicated by communications wire and old beer bottles; no surface midden observed.
	G	Good		Ahu			2.7	60-75			5.7		Large circular ahu of multiple-stacked construction with generally well preserved facing of small boulders and up-right limestone slabs; sides straight and slightly sloping up to roughly flat top; slight depression in top of feature suggesting possible interior cavity; small vesicular basalt hammerstone found on ground at base of ahu; no surface midden observed.
	H1	Fair		C-shape	3.5	3			60-80	30-60	10.5	3.6	A somewhat angular C-shaped wall with two probable corners in rear wall section; open side of "C" to southeast; wall built with multiple-stacked limestone cobbles and small boulders; no surface midden observed.
	H2	Incomplete		Mound							?		Several large rock mounds (ca.2m) and other smaller mounds located in poorly delineated area 5-10m west of Features F, G, and H1, possible cultivation (?) mounds.
	I1	Good		C-shape	3.2	2.3			60-70	35-45	7.4	3.3	A small C-shaped shelter wall with at least one corner in back wall; open side of "C" to southwest, wall built with multiple-stacked limestone boulders and possibly using up-right slabs which have since collapsed; surface debris includes Nerita and Drupa shell, and fragments of wire.

SITE NUMBER	FEATURE	CONFIDENCE LEVEL OF DATA	LOCATION	FEATURE TYPE	LENGTH (M)	WIDTH (M)	DIAMETER (M)	HEIGHT DEPTH (CM)	WALL WIDTH (CM)	WALL HEIGHT (CM)	TOTAL AREA (M^2)	FLOOR AREA (M^2)	REMARKS
	I2	Fair		Mound	1.8	1.5		40-45					A low stacked boulder and cobble mound with a central cavity ca. 60cm x 30cm x 40cm deep from top of feature; no surface midden observed.
	J	Good		Triangular Enclosure	6	5.5			100-130	35-50	27.3		Roughly triangular or subcircular walled structure of multiple-stacked construction, possible doorway on west side. surface debris includes: communications wire, wood slats (saw-cut), and Nerita shell midden.
	K1	Incomplete		Structure	6	3			7	10-33	18	7	Badly disturbed multiple-stacked wall of small boulders and what appears to be the remnant "interior" facing formed with up-right limestone slabs; original shape and position of foundation stones uncertain, but structure may have been a C-shaped shelter; no surface midden observed, overall dimensions given.
	K2	Fair		Ahu	4	2		c.60			8	7.8	Rectangular ahu of multiple-stacked construction with small boulders and cobbles.
	L	Incomplete		Structure	7	5.5		7			38.5	7	Badly disturbed structure appears to have possibly been a platform, original shape and foundations uncertain; surface scatter of Nerita shell observed, overall dimensions given, roughly rectangular rock mound (c.2m x 2m x 30-40cm high) located c 6m to west of this feature.
	M	Good		Rectangular Enclosure	4.5	3.9			80-120	35-50	17.6	4.5	Walled enclosure of multiple-stacked construction with interior facing of up-right limestone slabs, somewhat wide (c. 120cm) doorway in southwest corner, surface debris includes Turbo, Nerita, and Branchidontes shell midden.
	N	Fair		Triangular Enclosure	7	6.3			110-130	40-70	40	7	A roughly triangular walled enclosure, badly disturbed with only sections of exterior facing in place-most on east side, extent and shape of interior floor uncertain; construction apparently largely multiple-stacked cobbles and small boulders with some up-right limestone slabs; one large slab (c 100cm x 50cm x 25cm thick) "finishes off" end of wall at probable doorway in northwest corner of structure; a discoidally abraded coral artifact found in the doorway, a discoidally shaped hammerstone or possibly unfinished gaming stone (ulu maika) of vesicular basalt also found on the surface, no surface midden observed, continuation of long wall--feature 1201A2-circling swamp located c.9m south of this feature.
	O	Good		C-shape			c.4.6		100-110	30-40	16.6	10	The remnant (half?) of well-built core-filled C-shaped wall with interior and exterior facings of up-right limestone slabs, size and area dimensions given as estimate of original structure, one end of remnant "finished" indicating the open side of the structure towards the west; surface debris includes: Turbo, Nerita, and Tellina shell midden, continuation of wall--Feature 1[illegible]A1--c.4m south of this feature.
	P	Fair		Structure	7	4		25-45			28	7	A very disturbed rectangular structure--either a platform or possibly a leveled enclosure (feature is near perimeter fence of Barber's Point Naval Air Station); construction type uncertain, but surviving facing at southwest corner suggests multiple-stacking of cobbles and small boulders with some up-right limestone slabs; extensive surface midden includes echinoidea, Nerita, Cypraea capurseerpentis, Brachidontes and Tellina shells; continuation of wall--feature 1201A1--located c.11m south of this feature where the wall begins curving back towards the coast around the west side of the swamp--wall ends at perimeter fence of the NAS where it has been destroyed by recent construction on the air base.

SITE NUMBER	FEATURE	CONFIDENCE LEVEL OF DATA	LOCATION	FEATURE TYPE	LENGTH (M)	WIDTH (M)	DIAMETER (M)	HEIGHT DEPTH (CM)	WALL WIDTH (CM)	WALL HEIGHT (CM)	TOTAL AREA (M^2)	FLOOR AREA (M^2)	REMARKS
3206			Survey Zone II	Complex									A cluster of 4 features located behind the beach and east of Site Complex 3202.
	A	Fair		Rectangular Enclosure	8	4			60-120	35-65	32	25	A disturbed, roughly rectangular walled enclosure of multiple-stacked construction with some possible up-right limestone slab facing. east wall badly collapsed, but no clear evidence of doorway in other walls. extensive surface scatter of Cellana, Turbo, Nerita, Cypraea caputserpentis, Conus and Tellina shell midden. other surface debris includes recent trash, historic (pre-1900?) bottle glass, and sherds of kerosene lantern glass. historic well with mortared stone wall surrounding a natural sinkhole (with standing water) located c 5½m to the east
	B	Fair		Rectangular Platform	7.1	5.2		30-40			36.9	36.9	Large elevated floor of small boulders and cobbles defined in part by facing of multiple-stacked construction--possibly with some up-right limestone slabs, natural sinkhole (c.1.8m x 195 cm deep) with standing water located 3m to southwest, extensive surface scatter of Turbo and Nerita shell, and possibly fire-cracked basalt cobbles; one flake of volcanic glass collected from surface on west side of platform.
	C	Fair		C-shape	5.5	4.5			60-150	30-45	22.5	11	Large disturbed C shaped wall of multiple-stacked construction with several up-right limestone slabs, open side of structure towards the southeast, adjacent sand beach dark with possible charcoal staining. scattered Cypraea shell only surface midden observed.
	D	Incomplete		Wall	5				7	7			Segment of free standing, core-filled wall oriented perpendicular to the coast, located just behind the beach and c 5½m west of Feature 3206C.
3207			Survey Zone II	Complex									A cluster of 4 features located behind the beach and east of Site Complex 3206
	A	Incomplete		C-shape			6.4		80-100	20-80	32.2	15.6	Large C-shaped wall of multiple-stacked construction with open side to the south. barbed wire fence on west side of structure, no surface midden observed.
	B	Incomplete		Structure	5.5	5.1			65-80	20-30	28.1	20	Possible disturbed rectangular platform--appears to be an elevated floor of small boulders and cobbles with a raised wall (?) on the south and west sides, no surface midden observed, except for recent trash.
	C	Incomplete		Structure	3.7	2.6			60-80	20-30	8.9	3.6	Possible disturbed C-shaped or oval enclosure of multiple-stacked construction, no surface midden observed, except for recent trash
	D	Incomplete		Structure	3	2.6		40-50			7.2		Possible remnant ahu or small platform of multiple-stacked construction, remnant facing (?) of up-right limestone slabs in northwest corner, no surface midden observed.
3208			Survey Zone I	Complex									A cluster of 4 features located at the northern edge of Survey Zone I
	A1	Good		C-shape			3		50-60	40-50	7.1	3.7	A C-shaped shelter wall of multiple-stacked construction; open side of "C" on the southeast, no surface midden observed except for World War II vintage bottle glass--this and orientation of wall suggests possible recent date for this structure.
	A2	Good		C-shape			2.5		50-60	40-50	4.9	1.1	Same as Feature 3208A1, except open side is towards the east.
	B	Good		Ahu	3	2		35-60			6		A large oval ahu of stacked limestone cobbles and small boulders, slight depression in top of structure, no surface midden observed.

SITE NUMBER	FEATURE	CONFIDENCE LEVEL OF DATA	LOCATION	FEATURE TYPE	LENGTH (M)	WIDTH (M)	DIAMETER (M)	HEIGHT DEPTH (CM)	WALL WIDTH (CM)	WALL HEIGHT (CM)	TOTAL AREA (M^2)	FLOOR AREA (M^2)	REMARKS
	C	Good		Trail		.75-1.0							Sections of a probable historic trail extending from area of Site Complex 3208 south towards the swamp passing between Site Complexes 3204 and 3205; in that area the trail apparently cuts through the wall--Feature 3203A2--surrounding the swamp; trail is destroyed or terminates just beyond that wall. north section of trail c 2m west of Feature 3208A, south section of trail c.35m east of Feature 3205D.
3209			Survey Zone II	Complex									Two features located at northern edge of Survey Zone II and east of drainage ditch.
	A	Good		Rectangular Platform	8	8		160-175			64	32.5	A very large, square, two-tiered platform built on limestone outcrop which forms the lower tier; although main structure considerably collapsed with the rubble burying most of the outcrop, exposed section on east side has apparently been paved and the edge faced with multiple-stacked rock to form a more regular foundation for the main structure; bedrock foundation c.30cm high; main unit of platform is approximately centered on the foundation and measures 5.2m x 5.7m; it is multiple-stacked construction using large and small limestone boulders and cobble fill to even out a generally flat top; there is a slight depression (c.125cm x 25 cm deep) in the top center. a niche (c.50cm wide x 100cm high) is built into (or has collapsed from) the east side c.125cm deep; two large (c 100cm x 50cm x 20cm thick) up-right slabs are set along the south face of the niche suggesting the structure may have been enlarged upon after initial construction; no surface midden observed--there is, however, evidence of considerable flooding from overflow of a nearby drainage ditch.
	B	Fair		C-shape	5	3.2			40-100	30-90	16	9.6	Large angular C-shape with two corners in rear wall; open side toward southwest, multiple-stacked construction; no surface midden observed--however, some extensive flooding as around Platform A above.
3210		Incomplete	Survey Zone II	Complex	c.70	c.50					3500		An area of probable cultivation mounds and clearings located in the northeast corner of Survey Zone II to the east of Site 3209 and west of the chicken farm. overall data level incomplete for this site. at least 1 enclosure, 4 C-shapes and 2 ahu were recorded in this area, but specific information limited to gross size, morphology and (in 2 features only) presence or absence of surface midden.
	A	Fair		Rectangular Enclosure	3.4	3			50-60	70-55	10.2	4.6	A small rectangular enclosure of multiple-stacked construction with apparently interior facing of up-right limestone slabs. narrow doorway (c.35 cm wide) in southeast wall, no surface midden observed.
	B	Incomplete		C-shape	5	3.3			60-70	15-40	13.5	6.4	A C-shaped shelter wall of multiple-stacked construction with open side towards northeast; no surface midden observed.
	C	Incomplete		C shape	5.2	4.5			90-150	40-65	18.5	7.4	A C-shaped wall of multiple-stacked construction; orientation unknown.
	D	Incomplete		C-shape	3.9	3.5			60-70	30-90	10.7	4.5	A C-shaped wall of multiple-stacked construction; orientation unknown.
	E	Incomplete		C-shape			3.4		c.70	7	9.1	4.6	A C-shaped wall of multiple-stacked construction; orientation unknown.
	F	Fair		Ahu	2.4	1.8		90			4.3		Rectangular ahu of stacked boulders and cobbles.
	G	Fair		Ahu	3.6	3.3		75			11.9		Rectangular ahu of stacked boulders and cobbles with slight depression in top.

SITE NUMBER	FEATURE	CONFIDENCE LEVEL OF DATA	LOCATION	FEATURE TYPE	LENGTH (M)	WIDTH (M)	DIAMETER (M)	HEIGHT DEPTH (CM)	WALL WIDTH (CM)	WALL HEIGHT (CM)	TOTAL AREA (M^2)	FLOOR AREA (M^2)	REMARKS
3211			Survey Zone III	Complex									Two C-shaped shelters located in the northwest corner of Survey Zone III.
	A	Fair		C-shape	3.3	1.7			c.40	30-40	8	3.2	C-shaped wall of multiple stacked construction; open side of "C" towards the southwest, no surface midden observed.
	B	Fair		C-shape	3.4	2.5			c.80	c.30	9.1	5.8	C-shaped wall of multiple-stacked construction; opening towards the south; no surface midden observed.
3212			Survey Zone III	Complex									A cluster of 6 features in the northeast sector of Survey Zone III.
	A	Good		Rectangular Platform	4.3	3.5		35-90			15.1	13.1	An elevated rectangular floor of small limestone boulders and cobbles with relatively high multiple-stacked facing, slight depression in center of floor; given height of nearly 1m, this may be a rather large ahu, no midden observed on the surface; although measurements are different, this may be Bishop Museum Site 5 (Jourdane 1979:3).
	B	Good		Wall	6.5				c.135	c.50			Remnant of multiple-stacked, free-standing wall; no surface midden observed.
	C	Good		Rectangular Enclosure	5.3	4.8			90-130	30-50	25	7.3	Large walled enclosure of mixed core-filled and multiple-stacked construction with some interior and exterior facing of up-right limestone slabs, possible doorway in northeast wall, an amorphous rubble mound (fire-cracked limestone?) c 24m² in area adjacent to southwest corner--slight depression (c 2m x 40cm deep) in mound suggests possibility of an imu, or earth oven; surface debris includes Cerithe, Cypraea, Conus, Brachidontes and Tellina shell, and fish bone midden, this seems to be Bishop Museum Site 1 (Jourdane 1979:3).
	D	Good		Wall	59				c.60	40-50			Section of free-standing, multiple-stacked limestone boulder wall with occasional up-right slabs; no surface midden observed.
	E	Good		Ahu	3	2		c.60			6		Large rectangular ahu of multiple-stacked construction with small boulder facing and mixed boulder/cobble fill; broken bottles only surface debris observed.
	F	Good		Garden Area	25	10					250		A cluster of 12 somewhat oval rock mounds ranging in size from 1.5m x 1m to 4m x 1.8m and from 30 cm to 55cm high, the mounds are piled up on limestone outcrops adjacent to deposits of humic sediments from which the rock for the mounds was taken, this feature is quite similar to those at Barber's Point inferred to be horticultural features, no surface midden observed.
3213	A	Fair	Survey Zone III	C-shape	7.7	6.5			80-130	30-70	37.2	22.1	Very large C-shape, east side of Zone III, multiple-stacked wall built of limestone cobbles and small boulders with open side towards east; apparent accumulation of sand on interior floor, no surface midden observed.
3216		Incomplete	Survey Zone II	Complex	60	40					2400		Extensive area of probable cultivation mounds and clearings west of Site 3209, as with Site Area 3210, overall data incomplete, at least 1 enclosure and a C-shaped structure were located, specific data available for C-shape only.
	A	Fair		C-shape	2.3	1.9			50-100	40-60	4.4	1.2	A somewhat angular C-shaped shelter wall of multiple-stacked construction with several up-right limestone slabs at ends of wall on open side, open side towards the north; no surface midden observed--however, evidence of extensive flooding from overflow of drainage ditch to north.

SITE NUMBER	FEATURE	CONFIDENCE LEVEL OF DATA	LOCATION	FEATURE TYPE	LENGTH (M)	WIDTH (M)	DIAMETER (M)	HEIGHT DEPTH (CM)	WALL WIDTH (CM)	WALL HEIGHT (CM)	TOTAL AREA (M^2)	FLOOR AREA (M^2)	REMARKS
3215		Incomplete	Survey Zone E1	Complex	180	100					18000		Another extensive area of probable cultivation mounds and clearings located ca 90m west of Site 3214 and c 90m northeast of Site 3206, again the general level of data is incomplete for this complex, at least 1 enclosure, 2 C-shaped walls and an ahu were noted within the complex, but specific information limited to the C-shapes.
	A	Fair		C-shape	4.2	3			80-100	30-35	10.2	5.4	Deteriorated C-shaped shelter of multiple-stacked construction, apparently with some interior facing of up-right limestone slabs, open side of shelter towards the northwest, no surface midden observed.
	B	Fair		C-shape	5	3.2			70-80	50-60	16	8.8	A C-shaped shelter wall of multiple-stacked construction and apparently some core-filling in back wall, also remnant interior facing of up-right limestone slabs; open side of shelter to southeast; no surface midden observed.
3216		Incomplete	Survey Zone E1	Complex	200	80					16000		An extensive area of probable cultivation mounds and clearings to the northeast of Site 3215, the overall data level in this complex is again largely incomplete; at least 1 free-standing wall possibly enclosing some of the garden features, a platform, and two C-shaped walls were noted in the area, but data available only for the C-shapes.
	A	Fair		C-shape	6	3.7			120-200	30-70	18.5	8.4	A C-shaped wall of largely piled rock with some multiple-stacked cobbles and small boulders, open side of structure to the south, no surface midden observed.
	B	Good		C-shape	3.5	3.5			90-120	30-60	19.3	10.6	Apparently a remnant of a large angular C-shape or possible enclosure--only northwest and northeast walls with the north corner surviving, walls of multiple-stacked construction with some interior facing of up-right limestone slabs, scattered surface midden includes Nerita and Conus shell.
3217		Incomplete	Survey Zone E1	Complex	c.120	c.50					6000		Another extensive area of probable cultivation mounds and clearings to the north of Site 3216, overall data level incomplete for this area; at least 2 enclosures, a C-shaped shelter, and 2 free-standing wall sections were noted within the complex, but specific information available for only one of the enclosures.
	A	Fair		Rectangular Enclosure	4.8	4.2			70-120	35-60	20.2	11.5	Remnants of a probable rectangular enclosure of multiple-stacked construction with interior facing of several up-right limestone slabs; position of door unknown, no surface midden observed--however, evidence of extensive flooding around structure.
3218		Incomplete	Survey Zone E1	Complex	c 100	c.32					3200		An extensive area of probable cultivation mounds and clearings northwest of Site 3217; overall level of data incomplete for this complex; at least 1 modified sinkhole and a C-shaped shelter noted among the garden features, specific information given for the C-shape only.
	A	Good		C-shape	5.1	3.3			100-125	30-50	13.8	7.8	A disturbed C-shaped shelter wall of multiple-stacked construction with remnant interior facing of up-right limestone slabs, open side of structures towards the west, surface debris includes Nerita, pearl shell (Isognomon?) and Tellina shell midden, and apparently fresh (not lithified) fragments of coral..

APPENDIX F

DPW letter on Sewer Concurrence
May 26, 1983

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

RECEIVED
JUN 1 1983
GACI, INC.

EILEEN R. ANDERSON
MAYOR

MICHAEL J. CHUN
DIRECTOR AND CHIEF ENGINEER

MAURICE H.
DEPUTY DIRECTOR

WPP 83

May 26, 1983

Mr. Walter K. Tagawa
President
M.S.M. and Associates, Inc.
33 S. King Street, Rm. 410
Honolulu, Hawaii 96813

Dear Mr. Tagawa:

Subject: Rezoning of Ewa Marina Community
TMK: 9-1-12

We wish to clarify our comments in our letter of May 9, 1983 (301-14-0344). Although the public sewers are inadequate to accommodate the entire Ewa Marina Development, the existing Ewa Interceptor Sewer was designed to handle anticipated flows from the approximately 180 acres of R-6 zoned properties shown in yellow on the attached map. You may construct a sewer line to the existing Honouliuli Wastewater Treatment Plant to service the rest of the proposed development.

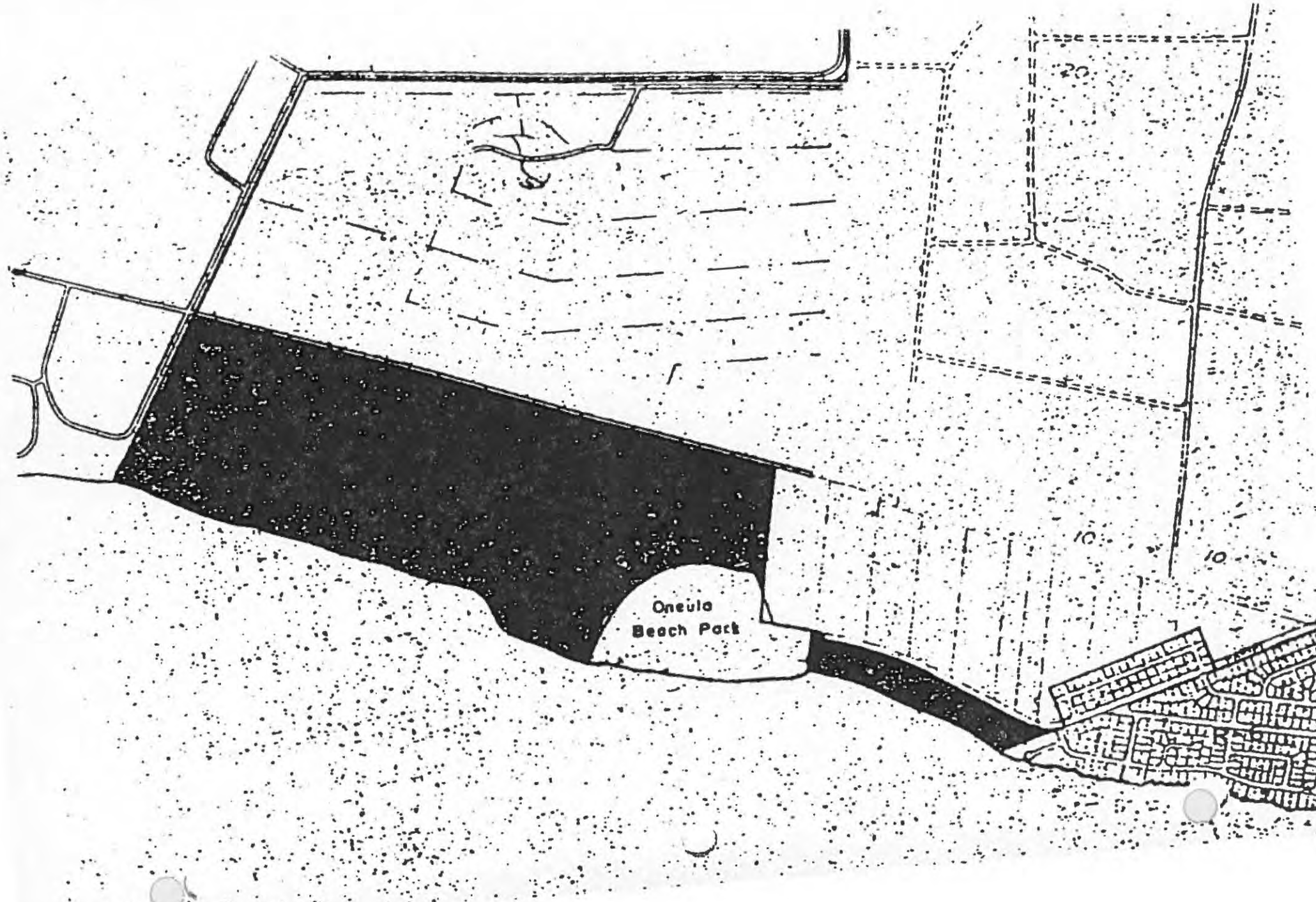
If there are any questions, please call Jay Hamai at 523-4067.

Me ke aloha pumehana,

for MICHAEL J. CHUN
Director and Chief Engineer

Attachment

cc: Dept. of Land Utilization
Division of Engineering
Public Service Section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Oneula
Beach Park

APPENDIX G

DPW letter on Soiled Waste Disposal
May 9, 1983

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

EILEEN R. ANDERSON
MAYOR

MICHAEL J. CHUN,
DIRECTOR AND CHIEF E
MAURICE H. I
DEPUTY DIRECTO

301-14-034

May 9, 1983

Mr. Walter K. Tagawa, President
M.S.M. & Associates, Inc.
33 South King Street, Room 410
Honolulu, Hawaii 96813

Dear Mr. Tagawa:

Subject: Your Letter 97878 of April 18, 1983, Relating to the Rezoning of Ewa Marina Community
TMK: 9-1-12

We have reviewed your proposal to rezone the Ewa Marina Community and have the following comments to assist you in your rezoning application:

Engineering:

We have no comment.

Refuse Collection & Disposal:

We can provide refuse collection to this large development if we assume that necessary increases in personnel and trucks will be approved.

Sanitary Sewers:

Public sewers are inadequate to handle the increase in flows from the proposed development.

Me ke aloha pumehana,

MICHAEL J. CHUN
Director and Chief Engineer

cc: Division of Refuse Collection and Disposal
Division of Wastewater Management
Department of Land Utilization

APPENDIX H

Traffic Analysis for the Ewa Marina Community
PRC Voorhees,
October, 1980

A TRAFFIC ANALYSIS FOR THE EWA MARINA COMMUNITY

October, 1980

Prepared for
MSM, Inc.

prc
A Planning Research Company

PRC VOORHEES
Transportation, Environmental, and Urban Planning Consultants

10960 Wilshire Boulevard, Los Angeles, California 90024

Exhibit O

A TRAFFIC ANALYSIS FOR THE EWA MARINA COMMUNITY

OCTOBER 1980

PREPARED FOR

MSM, INC.

PREPARED BY

PRC VOORHEES
10960 Wilshire Boulevard
Los Angeles, California 90024

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I. INTRODUCTION

The purpose of this report is to document the results of a traffic study prepared for the Ewa Marina Community. The traffic study was conducted in two phases:

Phase I: 700 acres of the 1,000-acre parcel by 1991

Phase II: 300 acres remaining by 1995

The scope of work for this study included a review of all previously conducted studies and a review of current plans for the community. Also, a survey of existing and proposed land uses and traffic volumes was undertaken. An estimate of the magnitude and geographic distribution of traffic from the development was made and an analysis of impacts and recommended mitigating measures is also provided.

The proposed 1,000-acre Ewa Marina Development is located in Ewa, Oahu and is surrounded by the Pacific Ocean to the south, Fort Weaver Road to the east, Barber's Point Naval Air Station to the west and agricultural land to the north. The location of the project site is illustrated in Figure 1.

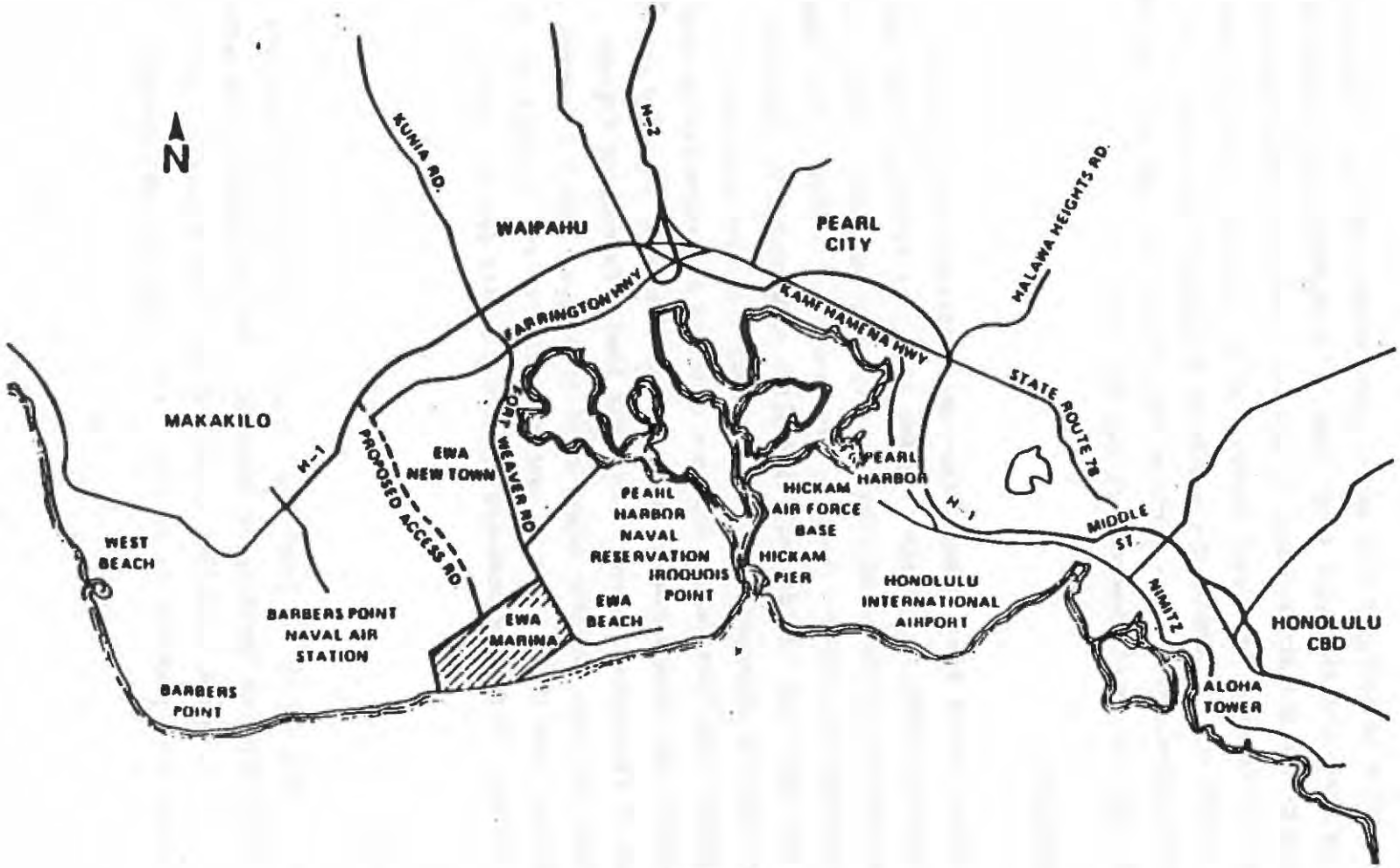


Figure 1

PROJECT SITE LOCATION

II. EXISTING CONDITIONS

The project site is isolated from major urban communities and is currently situated on agricultural (sugar cane) land. The Barbers Point Naval air station abutts the western boundary of the site, while the Ewa Beach community and the Pearl Harbor Naval Reservation at Iroquois Point surround the site on the east. Forming the southeast boundary of the site is a small housing community. Areas north of the project site are agricultural land except for the small community of Ewa New Town.

HIGHWAY FACILITIES

Currently, Fort Weaver Road, a major two-lane undivided rural arterial is the only facility providing access from Ewa Beach and Iroquois Point residential and military areas to Waipahu and east, west and Central Oahu via Farrington Highway and the H-1 freeway, respectively. Access to Fort Weaver Road from the sugar cane fields and residential communities is currently provided by numerous plantation and minor county collector roadways. Traffic signals along Fort Weaver Road are provided at intersections with Papipi, Iroquois and Renton roads. Another signal is also provided at the intersection of Farrington Highway with Kunia Road. Farrington Highway and Kunia Road are both two-lane major urban arterials. The H-1 freeway is a major facility with three lanes in each direction at the vicinity of the Kunia interchange. The major roadways providing access are also shown in Figure 1.

TRANSIT SERVICE

Current transit service to Ewa Beach and Iroquois Point is being provided by the City and County of Honolulu by route 50. This route has three sublines which serve Iroquois Point/Ewa Beach, Ewa Mill and Makakilo. Additional service is also provided to Waipahu. The route provides service

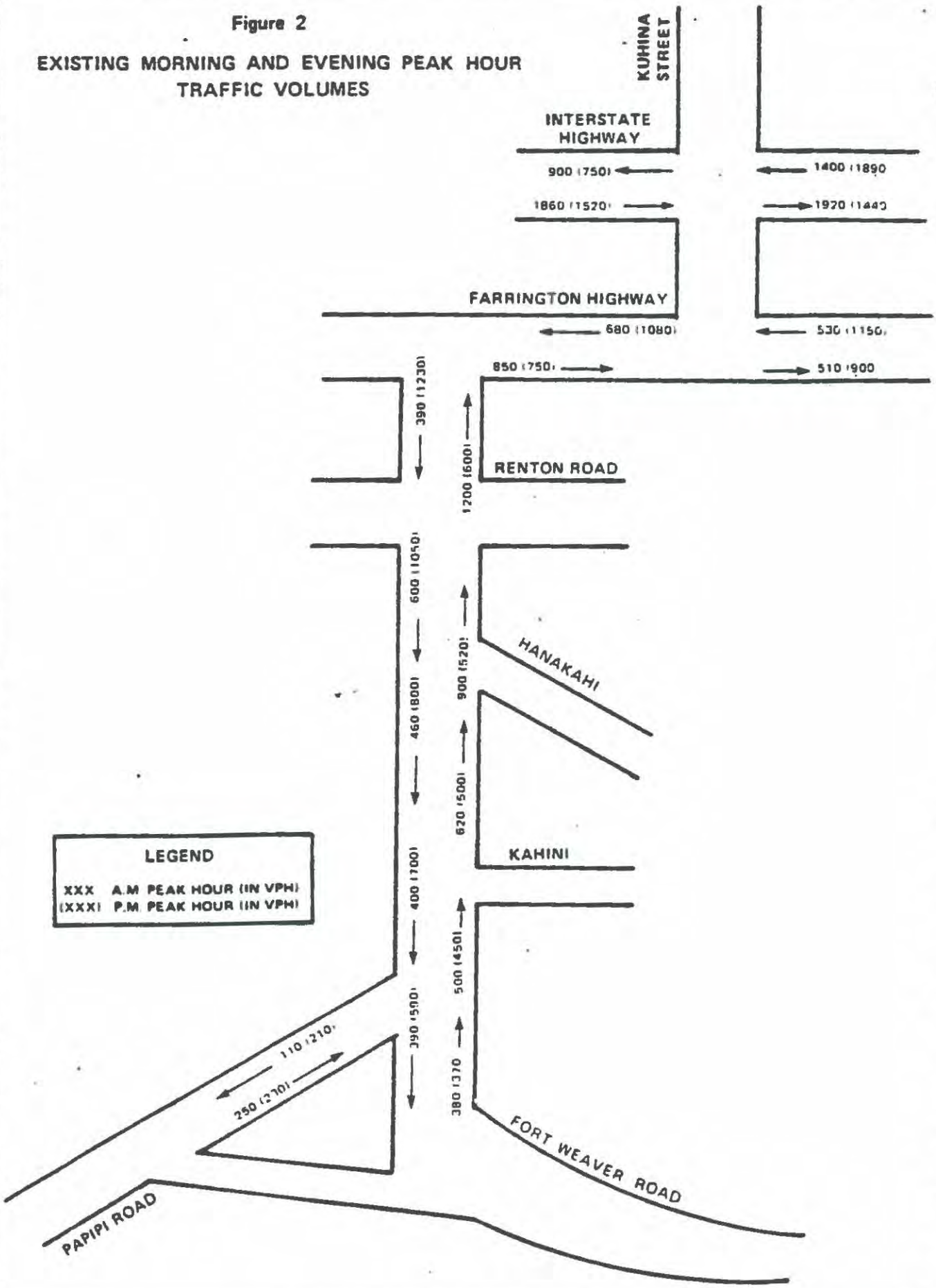
from these areas via routes along Fort Weaver Road, Farrington Highway, Kamehameha Highway and Dillingham Boulevard to major employment and shopping areas in Honolulu. Currently, three buses per hour are provided during the morning and evening peak hours to and from Honolulu.

Existing Traffic Volumes

Existing traffic counts taken along various intersections during July and August of 1979 along Fort Weaver Road were obtained from the State Department of Transportation. The results of these counts taken for the morning and evening peak hours and for 24 hours of the day, adjusted to reflect school season volumes along Fort Weaver Road, are illustrated in Figures 2 and 3.

Figure 2

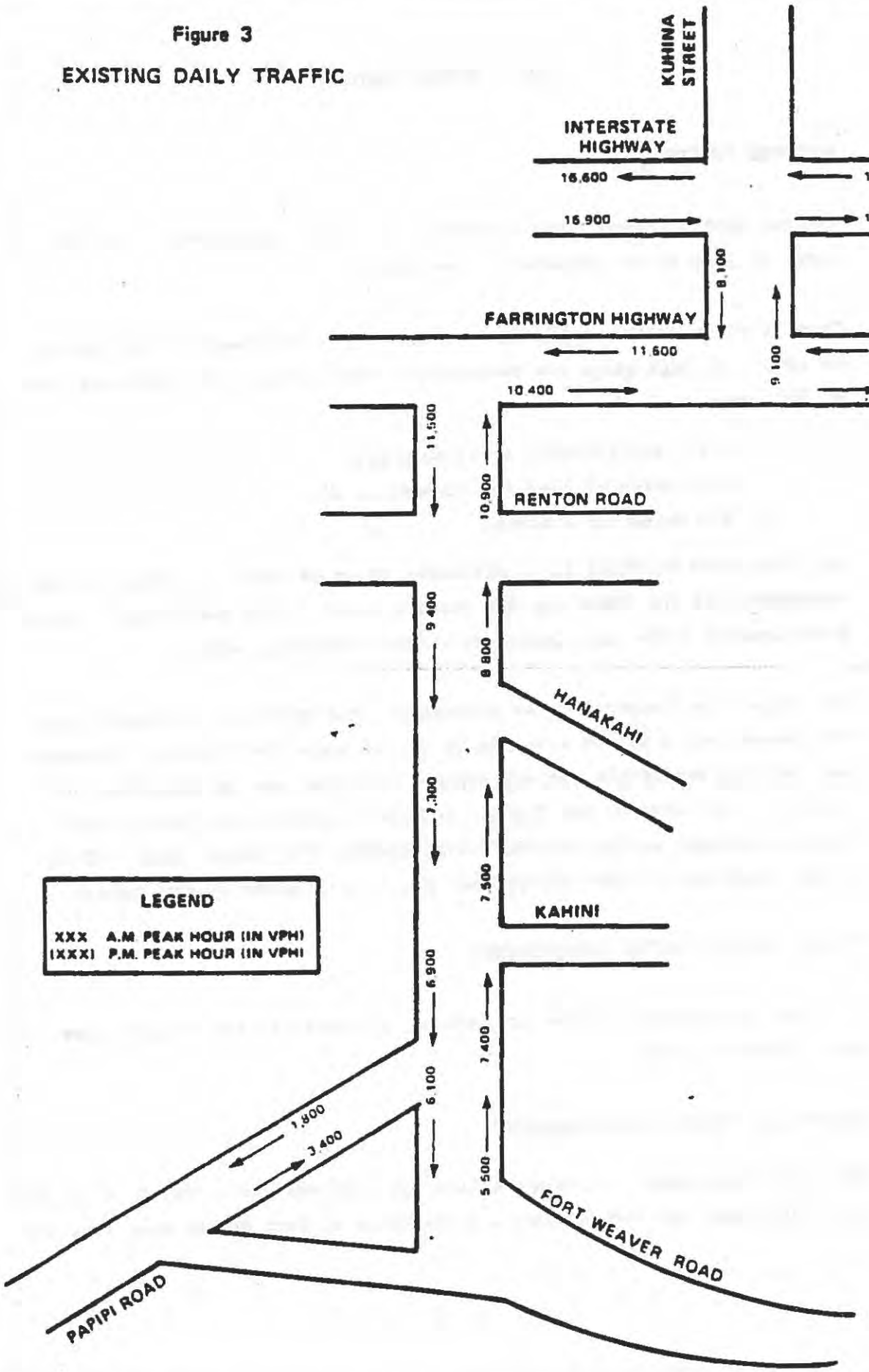
EXISTING MORNING AND EVENING PEAK HOUR TRAFFIC VOLUMES



Alan M. Voorhees & Associates, Inc.

Figure 3

EXISTING DAILY TRAFFIC



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III. FUTURE CONDITIONS

PROPOSED DEVELOPMENT

The Ewa Marina Community is a marina subdivision development on 1,000 acres of land to be completed in two phases.

Phase I of the proposed Ewa Marina Community is estimated to be completed by 1991. At this stage the development would include the following uses on 700 acres of land:

- 4,850 multi-family dwelling units
- 35.6 acres of land for commercial use
- 9.8 acres for a school

The completion of Phase II is estimated to be in 1995. It would include the development of the remaining 300 acres of land. This phase would include approximately 2,350 additional multi-family dwelling units.

The project is planned with an absorption rate which is relatively slow and spaced over a period covering up to ten years for Phase I. A conceptual description of the various parcels and land uses is indicated in Figure 4. As shown in the figure, proposed access to the development would be through various roadways intersecting Fort Weaver Road. These access locations to Fort Weaver Road would be as shown in the figure.

FUTURE TRANSPORTATION IMPROVEMENTS

Proposed improvements to the transportation system in the project area are described below.

Highway and Roadway Improvements

The State Department of Transportation has scheduled for completion by 1983 major widening improvements and a realignment of Fort Weaver Road to align

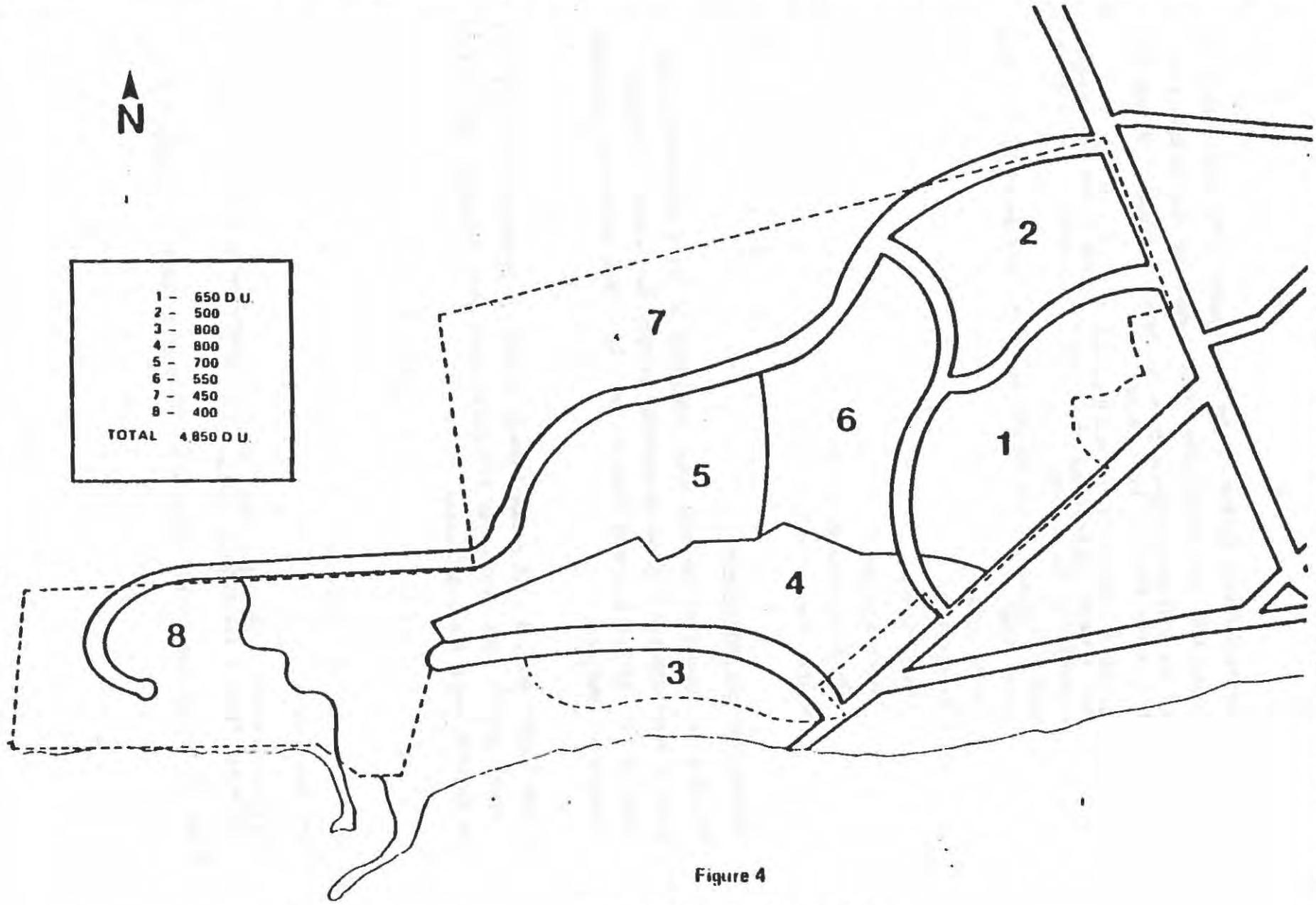


Figure 4

CONCEPTUAL DESCRIPTION

with and provide direct access to the H-1 Freeway. The characteristics of Fort Weaver Road upon completion would consist of the following:[1/]

- o 4-lane undivided highway from Ewa Beach to Hanakahi Street with provisions for left turn lanes.
- o 4-lane divided highway from Hanakahi Street to the H-1 Freeway with a major interchange above the the intersection of Farrington Highway with Kunia Road.
- o Traffic signals at the following street intersections with Fort Weaver Road.
  - North Road
  - Papipi Road
  - Kuhina Street
  - Hanakahi Street
  - Geiger/Iroquois Point Road
  - Renton Road

Transit Service Improvements

The City and County of Honolulu have indicated in their short-range bus plans a provision for 3 buses to provide express bus service from Ewa Beach to the Central Business District of Oahu. This service is scheduled to begin by 1980.[2/]

In the longer term, a rail rapid transit system is proposed from Hawaii Kai to Pearl City.[3/] Ewa Beach area residents would have access to this system via express buses and local buses.

[1/] Don Lee SDOT

[2/] City and County of Honolulu DTS, "Honolulu Short-Range Bus Plan Update" Technical Report, March 1978, Table 6.4, pg. 6-9.

[3/] AMV, Patronage and Revenue Estimates, "Technical Report," November 1974.

FUTURE TRAFFIC CONDITIONS

Through-traffic volume forecasts have been prepared by the State Department of Transportation. However, the reasonableness of these forecasts has been questioned. It was felt that the land use forecasts originally utilized by the State in the traffic forecasting process were not properly reflecting the pattern of growth which is occurring in Central and West Oahu. Therefore, a procedure, utilizing procedures of trip generation, distribution, mode split and traffic assignment, was used to estimate the incremental traffic generated by expected new development in the region. These incremental volumes were then added to those existing to provide projected peak hour traffic volumes. The basic premise is that new development would incrementally add to existing traffic volumes.

As part of the procedure, a scenario of future land uses which could reasonably be expected for Central and West Oahu was developed in consultation with cognizant agencies. A description of the anticipated land used, the generation and distribution of trips, and the projected traffic volumes without the proposed Ewa Marina development follows.

Land Use Forecasts

The first task was the development of a reasonable land use forecast for 1990. Residential development is expected to have the major impact upon traffic volumes in the area, with other land uses having relatively minor impact. A list of major residential developments which could be reasonably expected in the area by 1990 was based upon conversations with staff members of the U.S. Department of Housing and Urban Development (HUD), the City and County of Honolulu Department of General Planning (DGP), and private developers. In addition, estimates of general growth which can be expected for certain areas were also developed. The list is summarized in Table 1.

Table 1

FORECAST OF MAJOR LAND USE CHANGES IN
CENTRAL AND LEEWARD OAHU
1978-1990

REGION	ADDITIONAL HOUSEHOLDS
North Shore	1045
Wahiawa	0
Mililani	5000
Waianae Coast	1600
Makakilo	4000
Village Park	1750
Ewa Beach	350
Waipio-Gentry	1000 1/
Ewa Village	7000
West Beach	3000

1/ With 120 acres for a light industrial park.

Source: Conversations with staff members of HUD, DGP, and private developers.

Development on Central and North Oahu is expected to have an impact upon the H-2/Kamahameha corridor, and the Waiawa Interchange, and was included in this study for this reason. Development on Leeward Oahu is expected to have an impact upon H-1, Farrington Highway, and the Waiawa Interchange. An additional 7,400 households are expected in the area between now and 1990, with much of the growth centered in Makakilo and Village Park.

In addition to residential development, the impact of the Campbell Industrial Park expansion, the new Barber's Point harbor, and an amusement park were also considered. Although two parks are proposed for Leeward Oahu, it is felt that only one would be implemented. The traffic projections for these projects were taken from previous studies.

Table 2 compares the residential land use forecasts developed in this study and the land use forecasts used to develop the SDOT forecasts. The latter forecast was made at the census tract level; therefore, SDOT-developed factors were used to find the number of residences in smaller areas within a census tract. For this reason, the numbers shown in Table 2 should be considered as only approximate values. In general, the land use forecasts developed in this study for Central Oahu and North Shore are equal to or higher than the land use forecasts used by the SDOT. In fact, the 1995 dwelling unit forecasts are only slightly higher than the existing residential development in these areas.

Traffic Analysis

The volumes and distribution of trips generated by the residential developments were estimated using standard procedures. Standard trip generation rates (as shown on Table 3) were used to forecast the number of trips generated during the AM and PM peak hour from each development. Assumptions were made regarding the proportion of single-family and multi-family units in each development. The total number of trips generated by each development is shown in Table 4.

Table 2

COMPARISON OF RESIDENTIAL LAND USE FORECASTS
DEVELOPED BY AMV AND SDOT

Region	1990 AMV	1995 1/ SDOT
North Shore	6,100	6,800
Wahiawa	9,600	9,900
Mililani	10,200	7,800
Gentry/Crestview	2,200	1,800
Waianae Coast	10,900	11,600
Makakilo	6,600	10,500
Ewa	3,250	3,400
Waipahu	6,100	4,700

1/ 1995 Land Use Forecasts developed in 1972 and used for the PEEP analysis. In several instances, the SDOT Census Tract projections were factored into smaller zones using zone equivalence factors developed by the SDOT.

Table 3

TRIP GENERATION FACTORS[1/]

Land Use	Daily (vehicles per day)	Peak Hour (vehicles per hour) A.M. In	A.M. Out	P.M. In	P.M. Out
Residential (trips per dwelling unit)	10.0	0.3	0.6	0.7	0.4
Apartment - Low Density (trips per dwelling unit)	6.1	0.1	0.4	0.6	0.4
Apartment - Medium Density (trips per dwelling unit)	5.4	0.1	0.4	0.4	0.2
Light Industrial (trips per acre)	60.0	7.4	1.9	3.0	9.0
Commercial - Shopping (trips per 1,000 square foot GLA)	60.4	--	--	2.6	2.9

1/ Institute of Transportation Engineers Informational Report, "Trip Generation," 1976.

Table 4

TRIP GENERATION CHARACTERISTICS

Development	A.M. Peak Hour In	A.M. Peak Hour Out	A.M. Peak Hour Total	P.M. Peak Hour In	P.M. Peak Hour Out	P.M. Peak Hour Total	Daily
North Shore	295	610	905	420	305	725	10,080
Mililani	810	2,310	3,120	2,000	1,160	3,160	36,200
Waianae Coast	420	900	1,320	640	450	1,090	14,840
Makakilo	1,185	2,390	3,575	1,600	1,190	2,790	39,780
Village Park	525	1,050	1,575	700	525	1,225	17,500
Ewa Beach	105	250	355	140	105	245	3,500
Campbell Industrial Park/Harbor 1/	1,240	80	1,320	290	740	1,030	9,400
Caneland 2/	--	--	--	100	180	280	1,800
Waipio Gentry	1,200	820	2,020	1,060	1,480	2,540	17,200
Ewa Village	700	2,800	3,500	4,200	2,800	7,000	42,700
West Beach	900	1,800	2,700	2,100	1,200	3,300	30,000
Total	7,380	13,010	20,390	13,250	10,135	23,385	222,940

1/ AMV, "Analysis of Harbor Traffic Impact and Waterborne Systems Patronage, Hawaii Statewide Harbor System Plan," 1977.

2/ Au, H. T. "Traffic Impact Statement for Kahe Point Theme Park," 1976.

Trip distribution percentages for each development were estimated using information from previous studies. The trips generated from each development were then distributed to the major areas of Oahu, using the percentages shown in Table 5.

Consideration was also given to internal trips and transit mode split which would reduce the volume of auto vehicle trips. The proportion of internal trips is dependent upon the size of development and the amount of nonresidential activity within the development. High transit patronage was expected for work trips made to Honolulu. Furthermore, the transit mode share decreased with increasing distance from the CBD. Mode shares ranged from ten percent for Mililani and Makakilo to zero percent in the North Shore.

The assignment of trips to the highway network is a straightforward method. The incremental traffic volumes from each development were then added to the existing traffic volumes to obtain the 1990 forecast year assignment.

The projected peak hour volumes along Fort Weaver Road and Kunia Road are indicated in Figure 5.

Table 5

TRIP DISTRIBUTION PERCENTAGES

Development	Major Area						
	Honolulu	Pearl City	Waipahu	Makakilo	Ewa Beach	Waianae Coast	Wahiawa/ Mililani
North Shore	30	5	7	3	3	2	50
Mililani	68	2	3	2	2	3	20
Waianae Coast	40	2	9	10	9	27	3
Makakilo	60	5	10	4	4	6	10
Village Park	60	5	10	4	4	6	10
Ewa Beach	53	5	10	7	15	2	8
Campbell Industrial Park/Harbor	53	5	10	7	15	2	8
Waipio-Gentry	68	2	3	2	2	3	20
Ewa Village	53	5	10	7	15	2	8
West Beach	53	5	10	7	15	2	8

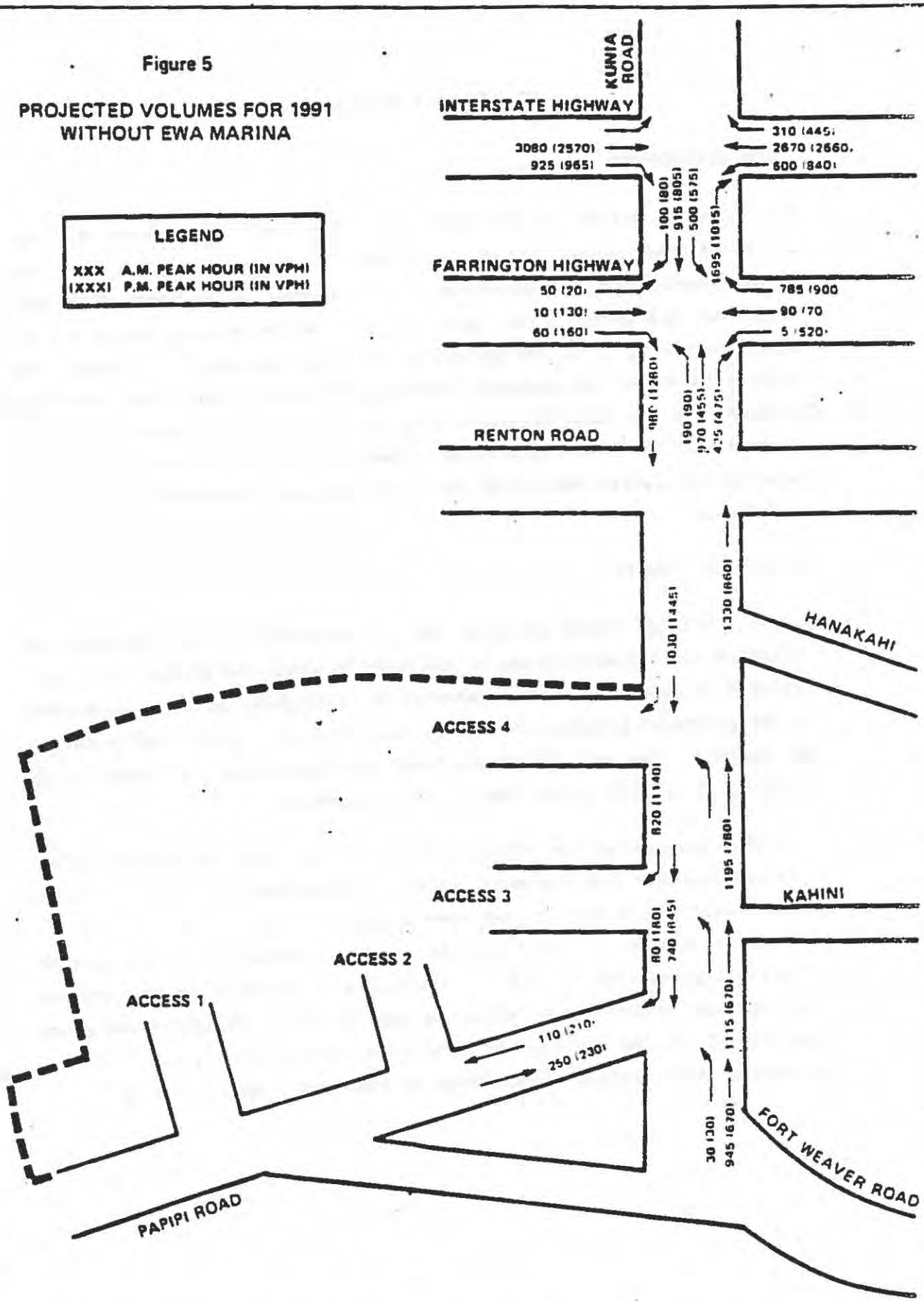
Sources: AMV, "A Traffic Study for the Gentry-Waipio Development" 1978.

AMV, "A Traffic Study Fort Weaver Road-Farrington Highway Intersection," July 1978.

AMV/PBQD, Unpublished person trip tables used for the TH3 environmental impact statement study.

Figure 5

PROJECTED VOLUMES FOR 1991
WITHOUT EWA MARINA



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IV. PHASE I TRAFFIC IMPACT

STUDY METHODOLOGY

The following section of the report describes the traffic impact of Phase I of the proposed project on selected roadway facilities. The traffic impact of the proposed project was determined by estimating the generation, distribution and assignment of the auto traffic from the project during the peak hours and adding it to the projected 1990 peak hour traffic volumes. The traffic impact of the proposed Ewa Marina Community development was analyzed by comparing the total projected traffic volumes with the capacity of the planned transportation facilities. These volume-to-capacity ratios at selected facilities were developed using standard transportation engineering techniques.

DEVELOPMENT TRAFFIC

Before a traffic impact analysis could be conducted, it was necessary to determine the characteristics of the traffic which the project would be expected to generate. These characteristics include the total magnitude of the generated traffic, the hourly distribution of this traffic during the course of the day, the geographical distribution of the trips and the potential diversion to bus transit of these trips.

A careful analysis of the project and of traffic conditions which currently exist indicate that the most critical time periods relative to traffic impact would be the morning and evening peak periods on the adjacent streets and highways. These periods are not necessarily the peak period of traffic generation for specific land uses in the development; however, they are the periods during which the combination of projected and generated traffic by the development would have the highest volumes. The remainder of this section concentrates on these two time periods.

TRIP GENERATION

For the study it was determined that the major trip-generating land uses during the morning and evening peak periods would be the residential and commercial land uses. For Phase I of the project, it was assumed that the project would consist of a total of 4,850 multi-family dwelling units and 150,000 square feet of shopping areas.

Traffic studies conducted in Honolulu and many mainland cities indicate that each specific land use has associated with it, its own identifiable traffic-generating characteristics. These relate to the magnitude of the daily traffic, the peak periods of traffic and the geographical distribution of arrivals and departures. For the development, the trip generating characteristics of the various types of land use which are considered in the potential development were based on an average of these studies. The rates used are summarized in Table 6 below.

Table 6

TRIP GENERATION RATES

			Trip Rates				
			A.M Peak Hr.		P.M. Peak Hr.		
Phase	Land Use	Rate	In	Out	In	Out	Daily
I	4,850 multi-family dwelling units	Trips/d.u.	0.1	0.4	0.4	0.2	6.1
I	150,000 sq. ft. shopping center	Trips/1,000 sq. ft.	—	—	2.6	2.9	6.0

Source: "Trip Generation" Institute of Transportation Engineers Informational Report 1976.

The rates shown in the table were used to develop an estimate of the traffic expected to be generated by the development in Phase I. The estimates are summarized in Table 7 as shown.

Table 7

GENERATED TRIP VOLUMES

Phase	Land Use	A.M. Peak Hour In	A.M. Peak Hour Out	A.M. Peak Hour Total	P.M. Peak Hour In	P.M. Peak Hour Out	P.M. Peak Hour Total	Daily
I	4,850 multi-family dwelling units	485	1,940	2,425	1,940	970	2,910	31,360
I	150,000 sq. ft. shopping center	--	--	--	390	430	820	9,000
	Total	485	1,940	2,425	2,330	1,400	3,730	40,360

Internal Trips

The nature of the various types of development and their respective traffic-generating characteristics is such that a percentage of the trips generated by the residential land use would be a duplication of trips generated by the commercial land uses. The magnitude of trips was estimated and eliminated from the calculation.

Transit Trips

The degree to which trips are diverted to the bus transit system is dependent upon many factors. These factors include the fare and level of service of the bus system; the cost of operating an automobile, the level of congestion of the street system, the income of the trip maker, and the trip purpose. Based on a review of present bus patronage and in consideration of proposed transit express service during peak periods, estimates were made of the diversion to transit for each trip, purpose of trips generated by the proposed project. These varied from 10 percent for work trips from dwelling units in the development to employment centers in Central Honolulu, to zero diversion of any shopping trips.

External Trips

These factors were used to determine the total number of trips into and out of the development by land use type and by time of day. The results are summarized in Table 8.

Table 8

TOTAL GENERATED TRIPS EXTERNAL TO PROJECT

Phase I

Land Use	Morning		Evening	
	In	Out	In	Out
Multi-Family Residential	485	1,745	1,540	740
Shopping	--	--	110	100
Total	485	1,745	1,650	840

TRIP DISTRIBUTION

The geographical distribution of the traffic which would be attracted or produced by the development is dependent upon various factors. These would include factors such as places of employment, school locations, shopping and commercial areas, dwelling units, and relative distances to these land uses. Based on the results of unpublished, person trip tables[1/] which include the impact of the newly adopted Oahu General Plan, estimates were made of the distribution of residential peak hour trips generated by the proposed development. The resulting trip distribution patterns are summarized in Table 9 as percentages. They represent the percentage of residential trips which would go to or come from each of the areas indicated. The table indicates that 85 percent of trips would have destinations north of the project site, while 15 percent would remain within Ewa Beach. The trips within Ewa Beach were distributed in relation to the following distribution of employment in surrounding areas:

1/ Unpublished person trip tables developed for "Interstate Route H-3 Alternatives Study, Travel Demand Analysis." September 1977, Alan M. Voorhees and Associates/Parsons, Brinckerhoff-Quade and Douglas.

Table 9

TRIP DISTRIBUTION PERCENTAGES
FOR EWA MARINA

Major Area	Percentage
Honolulu	53%
Pearl City	5
Wahiawa/Mililani	8
Waipahu	10
Makakilo	7
Waianae Coast	2
Ewa Beach	15
Total	100%

- 20 percent to the Pearl Harbor Naval Reservation
- 30 percent to areas along Ewa Beach
- 50 percent of areas within the Barbers Point Naval Air Station

It was assumed that all commercial shopping trips would remain within the Ewa Beach area and that they would be distributed in relation to the following distribution of existing dwelling units in Ewa Beach.

- 47 percent to the Pearl Harbor Naval Reservation
- 37 percent to areas along Ewa Beach itself
- 16 percent to areas within the Barbers Point Naval Air Station

These figures were used with the estimate of external trips to estimate the total number of trips to each area. The resulting distribution of generated traffic on the various facilities is shown in Figure 6.

TRAFFIC ASSIGNMENT

The assignment of the generated traffic to the transportation facilities was relatively straightforward since the realigned and improved Fort Weaver Road would be the only major facility which traffic would need to utilize to gain access to the project from various areas north of the site. Access to areas internal to the site would be via four proposed roadways. All northern traffic to and from the site would utilize Fort Weaver Road and would disperse to areas north, east or west of the project via the various ramps at the present Kunia Interchange, Renton Road, and Farrington Highway. The distribution of generated peak hour trips as shown in Figure 6 was added to those projected without the development, as previously shown in Figure 5. The resulting total projected peak hour volumes with the development are shown in Figure 7.

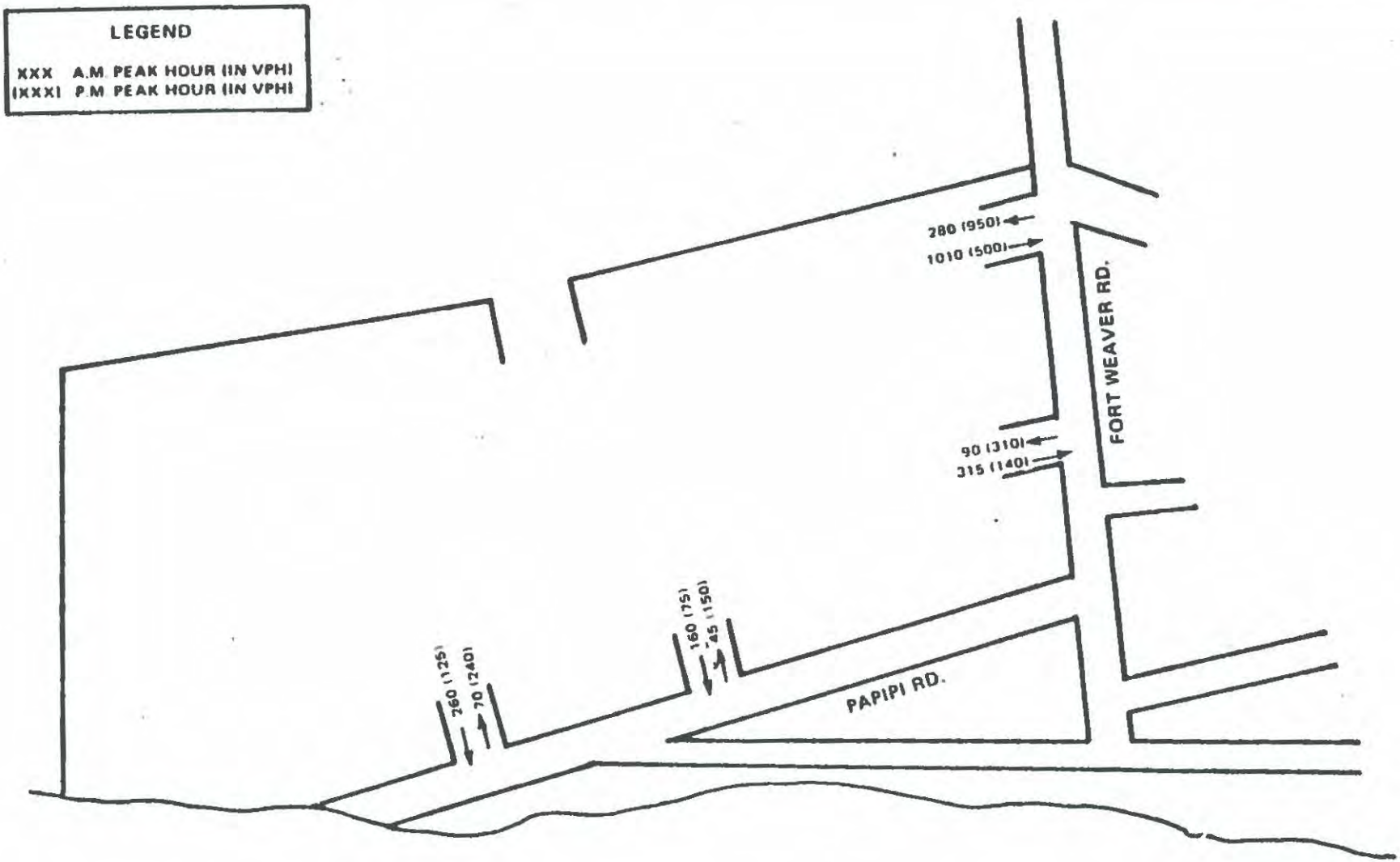
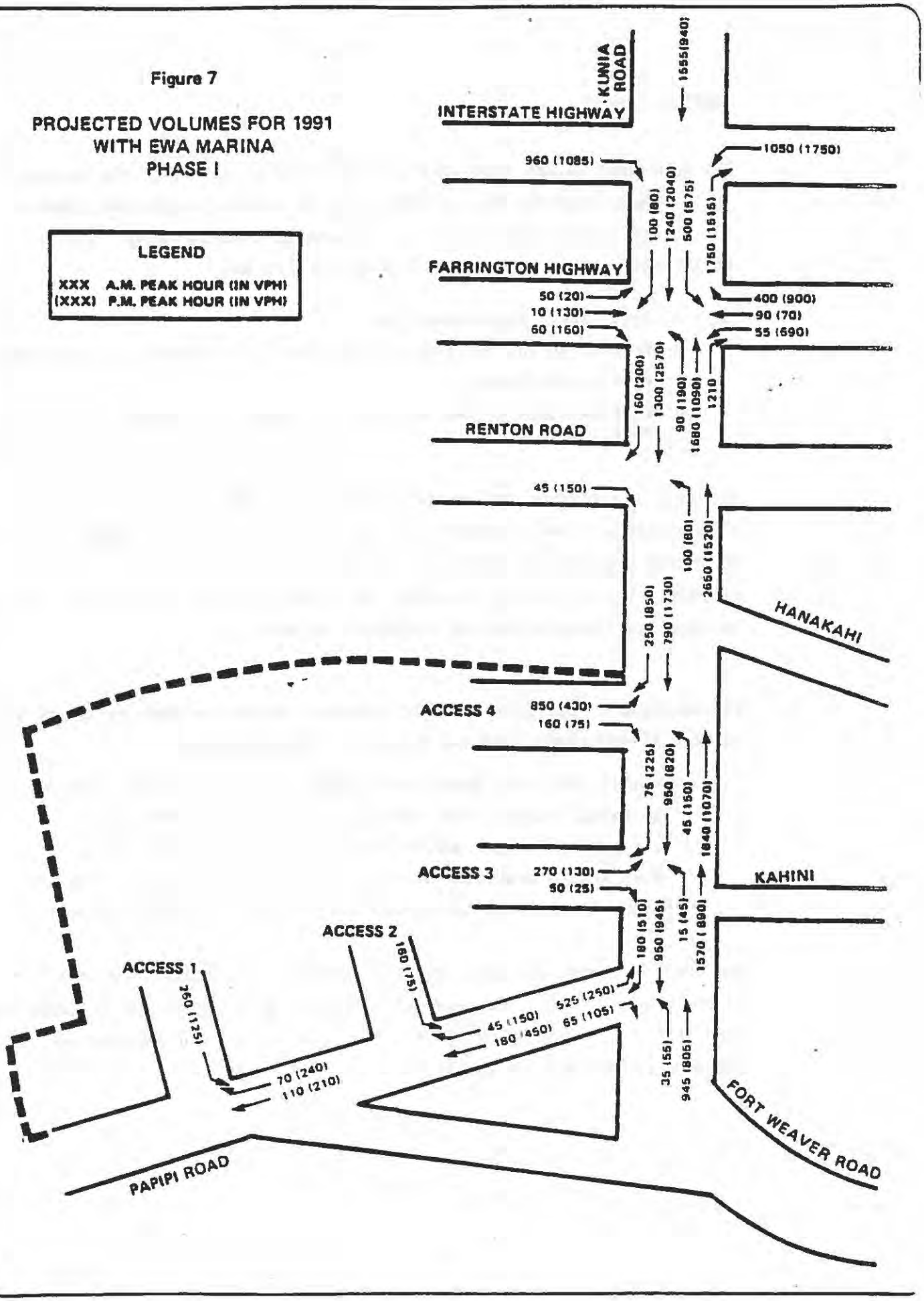


Figure 6

PEAK HOUR TRAFFIC EXTERNAL TO SITE
GENERATED BY EWA MARINA
PHASE I

Figure 7

PROJECTED VOLUMES FOR 1991
WITH EWA MARINA
PHASE I



TRAFFIC IMPACT

The peak hour volume forecasts were analyzed to determine the ability of the streets, highways and intersections to provide sufficient capacity for the projected traffic. It was detemined that the major impacts would occur at or along the following facilities:

- Fort Weaver Road/Kunia Road
- Various on and off ramps of the Kunia Interchange at Interstate H-1
- Farrington Highway
- Various ramps of the Farrington Highway/Fort Weaver Road Interchange

Figure 8 illustrates the locations which were identified as potential problem sites. The volumes projected at these sites were compared to the estimated capacity of each, and a volume to capacity (v/c) ratio was calculated. The v/c ratios indicate the degree to which each is able to accommodate the existing and projected volumes.

The analysis of the generated and assigned traffic volumes on the various facilities was based upon the following considerations:

- Double left turn lanes were assumed at Access Roads 3 and 4 to permit access from the project onto Fort Weaver Road.
- Separate left turn and/or right turn storage lanes along Fort Weaver Road were assumed at the intersections of Papipi Road, Renton Road and Access Roads 3 and 4 into the project site.

The above features are not currently included in the plans for the Fort Weaver Road widening. However, these minor improvements can be added at very little cost and would provide the additional capacity required to accommodate the project traffic.

Figure 8

LOCATION OF POTENTIAL CAPACITY PROBLEMS

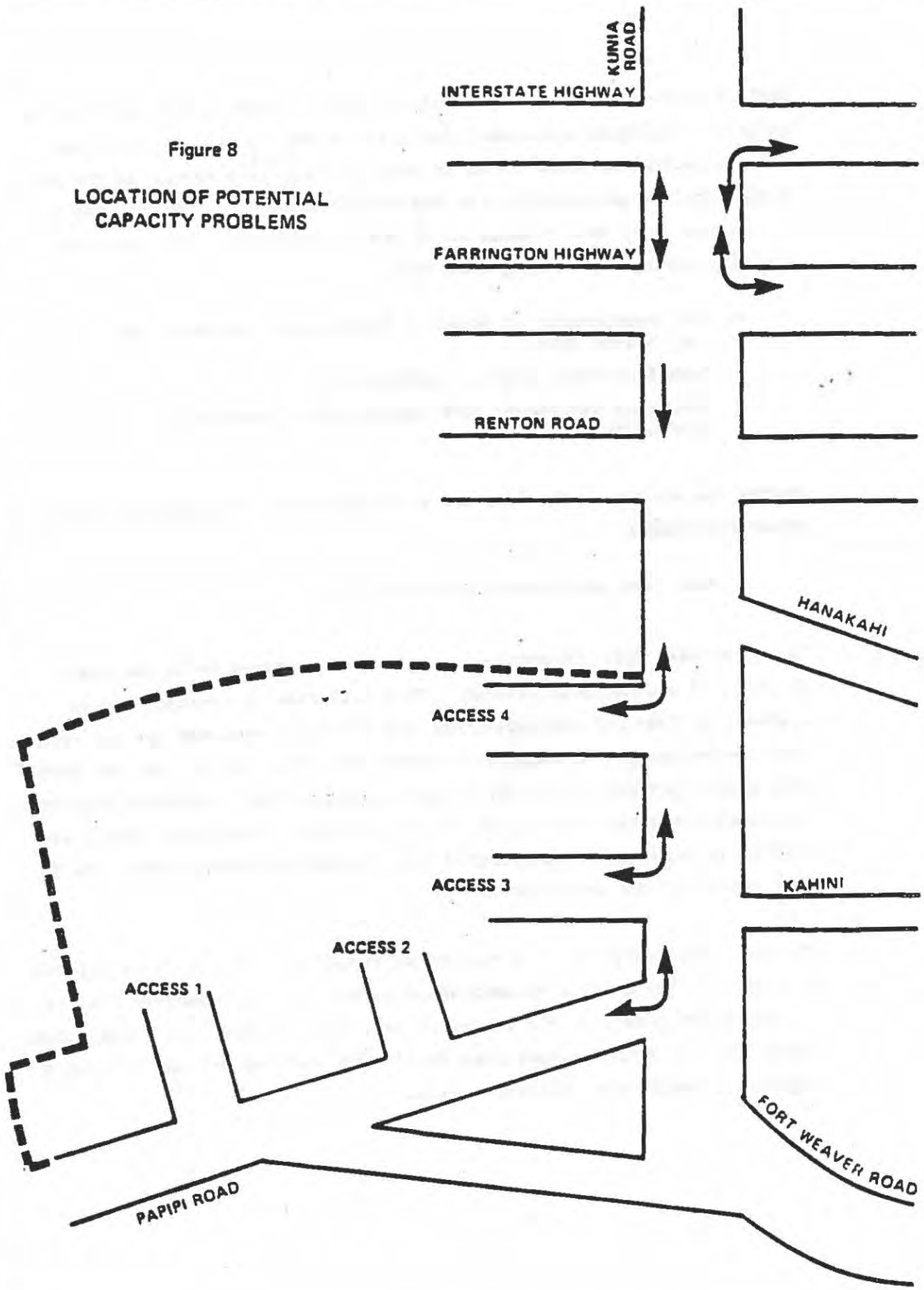


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Table 10 summarizes the results of the volume/capacity analysis for the critical facilities previously identified. The table indicates that several facilities would be at or near capacity as a result of the additional traffic generated by the Ewa Marina Community. The following facilities would have volumes of at least 95 percent of the estimated capacity during the morning peak hour:

- The intersection of Access 4 (northernmost access) and Fort Weaver Road
- Ramp from Kunia Road to eastbound H-1
- Ramp from northbound Fort Weaver Road to eastbound Farrington Highway

During the evening peak hour, the following would be operating under these conditions:

- Ramp from eastbound H-1 to Kunia Road

It can be seen that the morning peak hour is expected to be the more critical of the two peak periods. This situation is typical of most highways on Oahu and indicates that the potential problems are not necessarily surprising. An especially significant fact is that the Ewa Marina adds only 6 percent to the total traffic on the ramp from Kunia Road onto eastbound Interstate H-1. This occurs because a significant volume of traffic is expected to be diverted onto Farrington Highway away from H-1 as a result of the development.

This is a manifestation of a phenomenon resulting from the "leveling off" of traffic. The traffic volumes would divert to less congested facilities as congestion levels on the preferred facility increase. In actual conditions, the v/c ratios of parallel facilities, such as H-1 and Farrington Highway, normally are relatively equal.

Table 10

SUMMARY OF VOLUME-TO-CAPACITY ANALYSIS
Phase I

Site	Volume-to-Capacity Ratio[1/]					
	Morning Peak			Evening Peak		
		Development			Development	
	Existing	Without	With	Existing	Without	With
Papipi/Fort Weaver	0.46	0.53	0.63	0.64	0.53	0.70
Access 3/Fort Weaver	2/	2/	0.75	2/	2/	0.48
Access 4/Fort Weaver	2/	2/	0.93	2/	2/	0.82
Kunia Road (peak direction)	0.34	0.69	0.88	0.30	0.56	0.84
Kunia Interchange						
On-Ramp to H-1 (east)	0.42	0.94	0.97	0.30	0.56	0.84
On-Ramp to H-1 (west)	0.15	0.58	0.69	0.23	0.52	0.57
Off-Ramp from H-1 (east)	0.17	0.51	0.55	0.39	0.47	0.97
Off-Ramp from H-1 (west)	0.33	0.44	0.66	0.21	0.54	0.63
Ramp from NB Fort Weaver to EB Farrington	2/	0.35	0.99	2/	0.40	0.47
Ramp from WB Farrington to NB Fort Weaver	2/	0.65	0.33[3/]	2/	0.75	0.75
Ramp from WB Farrington to SB Fort Weaver	2/	0.10	0.10	2/	0.43	0.58

Note: Projected roadway conditions include realignment and improvement of Fort Weaver Road.

1/ At level of Service D.
2/ Does not exist currently.
3/ Assumes diversion of traffic from eastbound H-1 onto eastbound Farrington Highway.

APPENDIX I

Declaration of Covenants (Sample)

DECLARATION OF COVENANTS

KNOW ALL MEN BY THESE PRESENTS:

WHEREAS, _____, hereinafter referred to as the "DECLARANT", is the owner of that certain real property more fully described in Exhibit "A" attached hereto and by reference made a part hereof;

WHEREAS, said real property is located within an area of potential exposure to aircraft noise as defined in Land Use Guidance Chart I, Airport-Land Use Compatability Planning, AC 150/5050-6, U.S. Department of Transportation, Federal Aviation Administration, December 30, 1977 and said property may, on occasion, be subject to day-night average sound levels as defined therein and other forms of disturbances;

WHEREAS, Declarant's decision to utilize said property for urban uses may subject the users thereof to various effects which may result from the use and operation of government airports in the vicinity thereof, e.g., the Honolulu International Airport and the Barbers Point Naval Air Station.

NOW, THEREFORE, in full acknowledgement of the stated potential for noise, fumes, soot, smoke, vibration and other intrusions from aircraft using the government airports, existing or to be built, in the area, and in order to induce the withdrawal of any objection to the urban use of the land by the State of Hawaii Department of Transportation, said Declarant covenants and agrees as follows:

1. That the said Declarant hereby releases and shall not file any claim, action or lawsuit for any kind of relief, legal or equitable, against the City and County of Honolulu, the State of Hawaii, the Federal Government or any agency thereof or any person or legal entity using the aforesaid government airports or any other government airport, existing or to be built, for costs or damages resulting from noise, fumes, soot, smoke, vibration or any other forms of disturbances caused by the establishment or operation of any government airport, existing or to be built, or by any aircraft, now known or hereafter used or operating to, from or at the aforesaid government airports or any other government airports existing or to be built;

2. That the Declarant shall indemnify, forever hold harmless and defend the City and County of Honolulu, the State of Hawaii and Federal governments and the users of the aforesaid government airports and any other government airports, existing or to be built, from any and all liability resulting from said noise, fumes, soot, smoke, vibration and any other incidences of flight or other users of government airports affecting the aforesaid real property;

3. That this Declaration shall be recorded or filed with the Bureau of Conveyances of the State of Hawaii by _____, included in any conveyance or other disposition of the said real property by Declarant or its successors or assigns, and shall be deemed to be covenants running with the land and as such shall be binding

APPENDIX J

M & E Pacific report on Air Quality

JAN 1 9 1984

M&E Pacific, Inc.

Engineers & Architects

Suite 500, Pauahi Tower
1001 Bishop Street
Honolulu, Hawaii 96813
(808) 521-3051 Telex 7430065

RECEIVED
MAR 1 9 1984
GACI, INC.

March 19, 1984

Mr. Gerald T. Takano
GACI, Inc.
926 Bethel Street
Honolulu, Hawaii 96813

SUBJECT: Draft Supplemental Environmental Impact Statement for Increment I, Ewa Marina Community Project
TMK: 9-1-12, portion of 5

Transmitted herewith is a draft of our suggested response to the comments made by the American Lung Association of Hawaii, dated March 9, 1984, on our air quality report for the subject project.

The original air quality study, dated December 1983, has been revised to incorporate the American Lung Association of Hawaii's comments and are also transmitted for your use.

Please call us if you have any questions.

Ken Ishyle

for JAMES S. KUMAGAI, Ph.D.
Vice President

RM/bs

Encl.

EWA MARINA COMMUNITY AIR QUALITY ANALYSIS

SUPPLEMENT FOR INCREMENT I DEVELOPMENT

DRAFT SUBMITTAL

Prepared for:

GACI, Inc.
Honolulu, Hawaii

Prepared by:

M&E Pacific, Inc.
Engineers & Architects
1001 Bishop Street
Honolulu, Hawaii 96813

December 1983

EWA MARINA COMMUNITY AIR QUALITY ANALYSIS-

SUPPLEMENT FOR INCREMENT I DEVELOPMENT

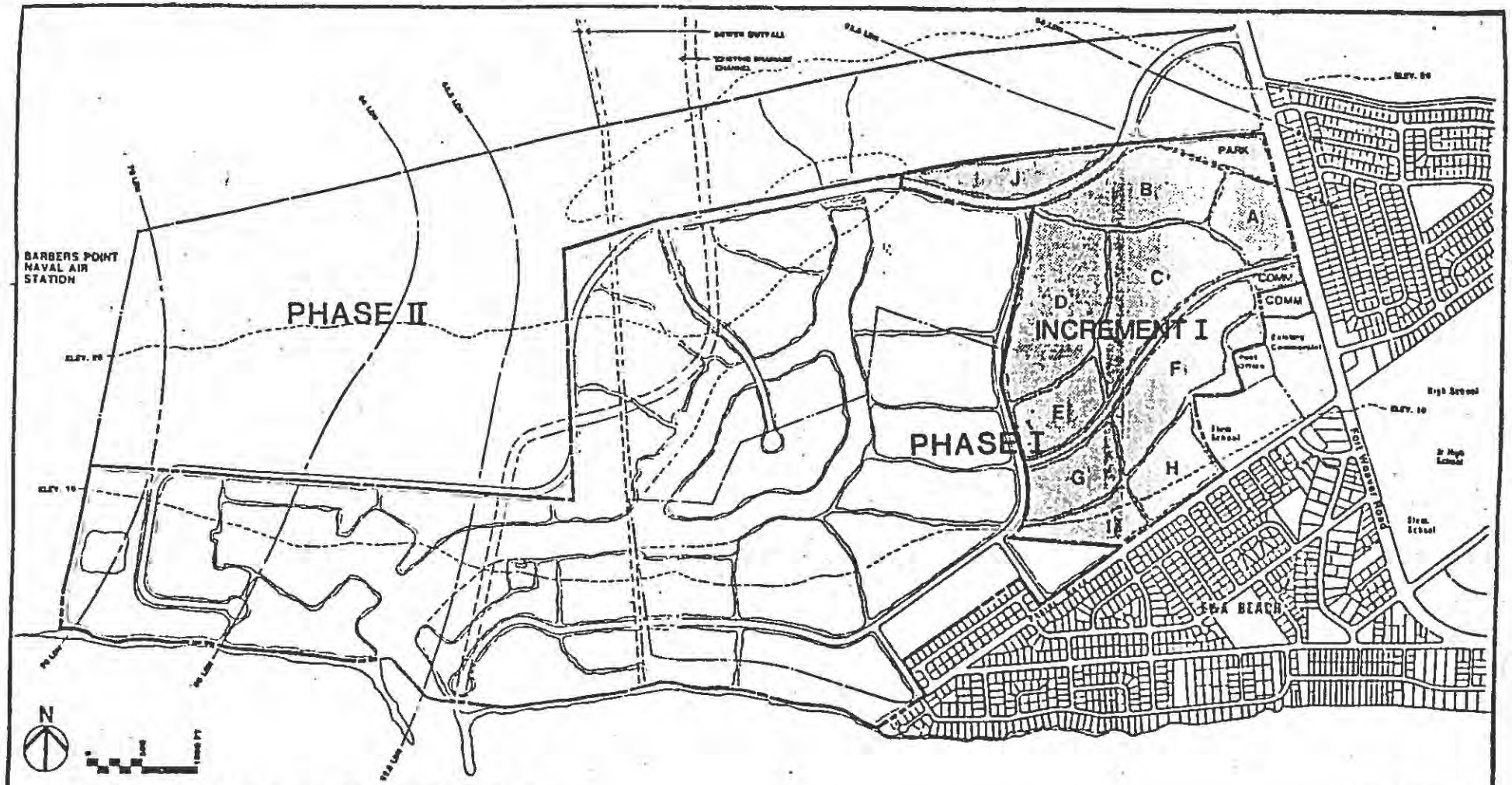
PURPOSE

Two previous air quality impact analyses for the proposed Ewa Marina community (Morrow, 1979; and Root, 1979) have been predicted on the assumption that the project was to proceed in two major construction phases. Phases I, originally slated for completion in 1992, was to encompass 700 acres and called for the construction of 5,300 family units. Phase II, slated for completion in 1996, was to cover 300 acres and called for 2,300 additional family units. The studies cited above have both identified motor vehicles of the development residents as the major source of air pollutants from the residential project. Their conclusions were based on studies of traffic flow, meteorological conditions, anticipated air pollution emission rates from five major sources, field studies and numerical models.

The present study is limited to construction of Increment I of Phase I. Increment I is comprised of 1,290 family units on 175 acres compared with the 5,300 units on 700 acres for Phase I. The significant reductions in scope and resulting population are anticipated to have a linear impact in the reduction of air pollutants. This report identifies and quantifies this reduction in emissions and projects the air quality impacts of Increment I at its completion in 1990-91. Increment I is shown in relation to Phase I and Phase II in Figure 1.

PROPOSED DEVELOPMENT

Increment I is proposed for the northeast corner of the original Phase I Development. Construction is estimated to take 5 years beginning in 1985. It is assumed, for this supplementary report, that the reduction in family units from those projected for Phase I to those of Increment I will result in a linear reduction of motor vehicles and their emissions. Thus, a reduction factor of 1,290 Family Units/5,300 Family Units = 0.243 is proposed as the modifier for Phase I traffic flows and projected emissions to project air quality impacts for Increment I.



LAND USE SUMMARY - SUBJECT AREA

FIGURE 1

AREA SUMMARY

RESIDENTIAL		: 154.3 ac
R-6	143.0 ac	
A-1	11.2 ac	
COMMERCIAL		: 5.0 ac
PARK		: 5.7 ac
ROADS		: 9.8 ac

TOTAL (SUBJECT AREA) 174.7 ac

LAND USE SUMMARY

PARCEL A	10.0 ac	: 10 u/ac	:100 units	PARCEL F	24.5 ac	: 5 u/ac	:122 "
B	18.4 ac	: 10 u/ac	:184 "	G	10.9 ac	: 6 u/ac	: 64 "
C	23.6 ac	: 5 u/ac	:118 "	H	11.2 ac	: 11.6 u/ac	:130 "
D	25.9 ac	: 5 u/ac	:129 "	I	8.3 ac	: 8 u/ac	: 66 "
E	10.2 ac	: 5 u/ac	: 51 "	J	11.3 ac	: 30 u/ac	:339 "

TOTAL (SUBJECT AREA) 154.2 R-ACRES, 1290 R-UNITS

EWA MARINA COMMUNITY
OAHU HAWAII

MSM & ASSOCIATES INC
MASTER DEVELOPERS

PEARSON & WUESTHOFF AIA AICP
ARCHITECTS PLANNERS

DATE Revised 9/9
PLATE NUMBER LU-1

TRAFFIC ANALYSIS

An earlier traffic study (Voorhees, 1979) has projected that by 1995 the originally proposed Phase I development would generate 41,000 daily vehicle trips, with 2,500 vehicle trips during the morning peak hour and 3,800 vehicles trips during the evening peak hour. Four intersections at the project site were identified as "critical" in that study; i.e., the traffic volume to roadway capacity ratio (vehicle capacity ratio) was greater than 0.95, resulting in a high probability of queuing. A conservative extrapolation of the vehicle capacity ratio from Phase I in 1995 to Increment I in 1991 indicates that "critical" conditions are not expected to occur, as shown in Table 1. This extrapolation is generated by multiplying the increment change of vehicles capacity ratios in 1995 (with and without Phase I) by the previously mentioned reduction factor to approximate conditions resulting from Increment I.

AIR QUALITY ANALYSIS

Previous air quality studies (Root, 1979 and Morrow, 1979) have identified five categories of potential air pollution sources associated with the Ewa Marina Community: (1) short term fugitive dust emissions from construction activities, (2) electric power generation, (3) solid waste incineration, (4) power boats, and (5) motor vehicles. Both studies have shown that sources 1 through 4 are either of negligible impact or can be mitigated by typical control techniques. Motor vehicle emissions, however, were identified as the principle source of air pollutants. These pollutants include: Carbon Monoxide (CO), Nitrogen Oxides (NO_x), Hydrocarbons (HC), Sulfur Oxides (SO_x), Lead (Pb), and Particulate Matter (PM). CO is a relatively inert combustion product and comprises the largest fraction of motor vehicle emissions; therefore, it is generally selected as the input parameter of choice in atmospheric pollutant dispersion model studies.

Both the Root(1979) and Morrow (1979) studies utilize CO as the selected input parameter. Specifics of their computer models and associated assumptions are discussed in detail in these reports. For this supplemental analysis a correction factor is used to modify the pollutant emissions projected for Phase I in 1992, in order to estimate the pollutant emissions

TABLE 1

VOLUME CAPACITY RATIOS (VCR)

Site	Time of Traffic Peak	1979 VCR	1995 VCR Without Development	1995 VCR Phase I	1991 VCR Increment I
Kunia Interchange On-Ramp to H-1 East	Morning	0.42	0.94	1.00*	0.95
Kunia Interchange Off-Ramp from H-1 East	Evening	0.39	0.47	1.00	0.60
Ramp from Northbound Ft. Weaver Rd. to East Bound Farrington Highway	Morning	**	0.35	0.97*	0.50
Northern Most Ewa Marina Community Access Road to Ft. Weaver Road	Morning	**	**	0.98	0.24

* = Excess traffic diverted to Farrington Highway during queuing events.

** = Roadway does not currently exist or will not exist.

Source: Alan M. Voorhees & Associates, Inc. January 1979.

associated with Increment I in 1991. The correction factor is based on the same assumption used in the traffic volume reduction described previously; namely, a linear decrease in relation to the number of residential units in Increment I. Revised CO emissions at two potentially "critical" sites (noted in the traffic analysis) are presented in Table 2. The values are developed by multiplying the incremental change in CO emissions at the sites (with and without Phase I) by the correction factor and adding this amount to anticipated background emissions without the development.

CONCLUSION

Tables 1 and 2 indicate reductions in both total motor vehicles and their emissions by the replacement of Phase I construction with Increment I. Vehicle capacity ratios associated with Phase I suggested that queuing may occur at the freeway on/off ramps during peak traffic hours. The vehicle capacity ratios associated with Increment I, however, suggest that no queuing will occur. Similarly, although CO emissions during "worst case" meteorological conditions from Phase I indicate that the Department of Health's ambient air quality standards (Chapter 59 of Title 11, Administrative Rules) may occasionally be exceeded, emission standards are not expected to be exceeded as a result of Increment I development. Air quality monitoring during and following Increment I construction may be initiated to verify these projections.

The linear reduction approximations applied here are considered conservative for they do not reflect increased use of mass transportation services and development of the Barber's Point Deep Draft Harbor with a resulting decrease in eastbound traffic. Additionally, "worst case" meteorological conditions are expected to occur less than 10% of the time and will coincide with peak traffic (when maximum emissions are generated) only a small fraction of this percentage.

Although any degree of development and population would inevitably result in some abridgement of air quality, impacts from the construction and occupancy of Increment I of the Ewa Marina Community should be relatively minor. Short term impacts are primarily limited to fugitive dust emissions (as discussed in the previously cited reports). These impacts are expected to be mitigated by site specific control measures.

TABLE 2

AMBIENT CO CONCENTRATION ESTIMATES*

Site	1992 Without Development	1992 With Phase I	1991 With Increment I
Kunia Interchange	1-Hour = 3.3+	3.6	3.4
Northern Most	1-Hour = 2.2	15.1	5.3
Ewa Marina Access Road to Ft. Weaver Road	8-Hour = 0.9	5.8	2.1

* CO concentrations at each site are the highest projected for "worst case" meteorological conditons.

\+ Emissions reported as mg/m^3

Source: J.M. Morrow, Air Quality Impact Analysis for Ewa Marina Community, 1979.

LITERATURE CITED

Morrow, J.W., Air Quality Impact Analysis-Ewa Marina Community, 1979.

Root, B.D., Ewa Marina Community Air Quality Analysis, 1979.

Voorhees and Associates, A Traffic Study for the Ewa Marina Community, 1979.

APPENDIX K

Draft Ewa Water Master Plan, 1985-2000
Campbell, Estate
March 1984

DRAFT

EWA WATER MASTER PLAN

1985 to 2000

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ACRONYMS USED IN THIS REPORT

BWS	Honolulu Board of Water Supply
GPM	Gallons Per Minute
MG	Million Gallons
MGD	Million Gallons Per Day
JCIP	James Campbell Industrial Park
OSCO	Oahu Sugar Company

INTRODUCTION

Major developments planned for Campbell Estate lands in Ewa will require a water supply of almost 20 million gallons per day (MGD) by the year 2000. These projects and their projected water requirements are:

Project	Projected Water Requirement* (Million Gallons Per Day)
West Beach	5.9
Campbell Industrial Park Expansion	0.7
Makakilo Expansion	1.7
Ewa Plantation	5.6
Ewa Village	0.4
Ewa Marina	4.3
ALL PROJECTS COMBINED	18.6

* Water requirements are the total of potable and non-potable supply for the planned dual water system. They do not include supply requirements of private irrigation systems.

In order to meet the needs of these projects, major expansion of water storage and conveyance facilities and installation of new wells will be required. This report presents a plan of expansion based on each project's schedule of development and its corresponding water supply requirements. It is expected that Board of Water Supply (BWS) may wish to oversize some of the proposed facilities to anticipate other growth in the region and to improve supply to its present service areas.

This report consists of five sections: design criteria; projected water requirements; plan for new sources of supply; plan of new off-site storage tanks and pipelines; and plan of on-site distribution systems. The design criteria are based on use of a dual water system, one for potable consumption and the other for non-potable uses. The non-potable system will be supplied by brackish water sources. Both systems would be built to BWS standards in order to be dedicated to that agency. BWS urged consideration of a dual system to conserve available potable supply. After an evaluation of its consequences, the developers have accepted the dual system concept.

DESIGN CRITERIA FOR THE DUAL WATER SYSTEM

Alternative sets of water use criteria to determine potable and non-potable supply requirements were initially proposed by BWS; these are identified as Alternatives A and B on Table 1. The dual system designed by Alternative A criteria would utilize potable water inside residential, commercial, and business structures; the non-potable system would supply uses outside buildings. The dual system of Alternative B would make more extensive use of non-potable water by supplying toilets inside living units, a use which BWS estimates amounts to 27 percent of all residential water consumption. Since respective amounts of water use inside and outside structures can only be estimated, BWS added 20 percent to the design water use criteria of both potable and non-potable systems (compare Alternative A and B to single system criteria listed on Table 1). This provides additional capacity in case the distribution between actual potable or non-potable use deviates from the design criteria.

After evaluating all consequences of the dual system, and after receiving assurance from BWS that a Plumbing Code amendment would not be required to implement the dual system, the developers adopted Alternative A design criteria with the following modifications:

1. At the option of the developer, single-family residential areas can be supplied totally by the potable system. This avoids any legal and marketing liability posed by children drinking non-potable water from hose bibs in yards.

2. Private brackish water irrigation systems can be utilized wherever possible rather than the public non-potable system. Planned golf courses of West Beach, Ewa Plantation, and Ewa Marina would have the most significant private non-potable systems.

3. Projects which have already invested in off-site water facilities sized for a conventional potable system or are at a stage in planning and engineering as to be financially committed to it can proceed on that basis. Expansion in Makakilo and the first increment of Ewa Village are in this category.

	SINGLE SYSTEM	DUAL SYSTEM			
		Alternative A		Alternative B	
	gal/unit	Potable gal/unit	Non-Potable gal/unit	Potable gal/unit	Non-Potable gal/unit
Single Family Duplex	500	414	186	252	348
Multi Family Low Rise	400	331	149	202	278
Multi Family High Rise	300	248	112	151	209

	Single	Potable	Non-Potable
Commercial	3,000 gal/acre	2,160	1,440
Resort	350 gal/unit	244	176
	4,000 gal/acre	2,784	2,016
Golf Course & Parks	4,000 gal/acre	720	4,080
School	60 gal/student	42	30
Light Industry	4,000 gal/acre	1,421	3,379
Commercial/ Industrial	100 gal/1000 ft^2	72	48
Commercial/ Residential	120 gal/1000 ft^2	100	44

Heavy Industry - Where heavy demand for high quality water is required, it will be subject to special review and control by the Manager.

Fire Flow Requirements shall be met in the design of the non-potable system according to present standards.

System Capacity of the non-potable system shall deliver the maximum daily demand simultaneously with the required fire flow.

Demand Factors - Maximum Day Demand = 1.5 x Average Day for both systems.

Table 1
Tabular Summary of BWS Water Supply Criteria for Single and Dual Systems

4. Fire flow requirements can be met by either the potable or non-potable system. In general, Alternative A design criteria results in greater tank and pipeline sizes in the potable system. These are more suitable to meet fire flow requirements.

All other design standards not listed in Table I or modified above are the same as set out in BWS' "Water System Standards."

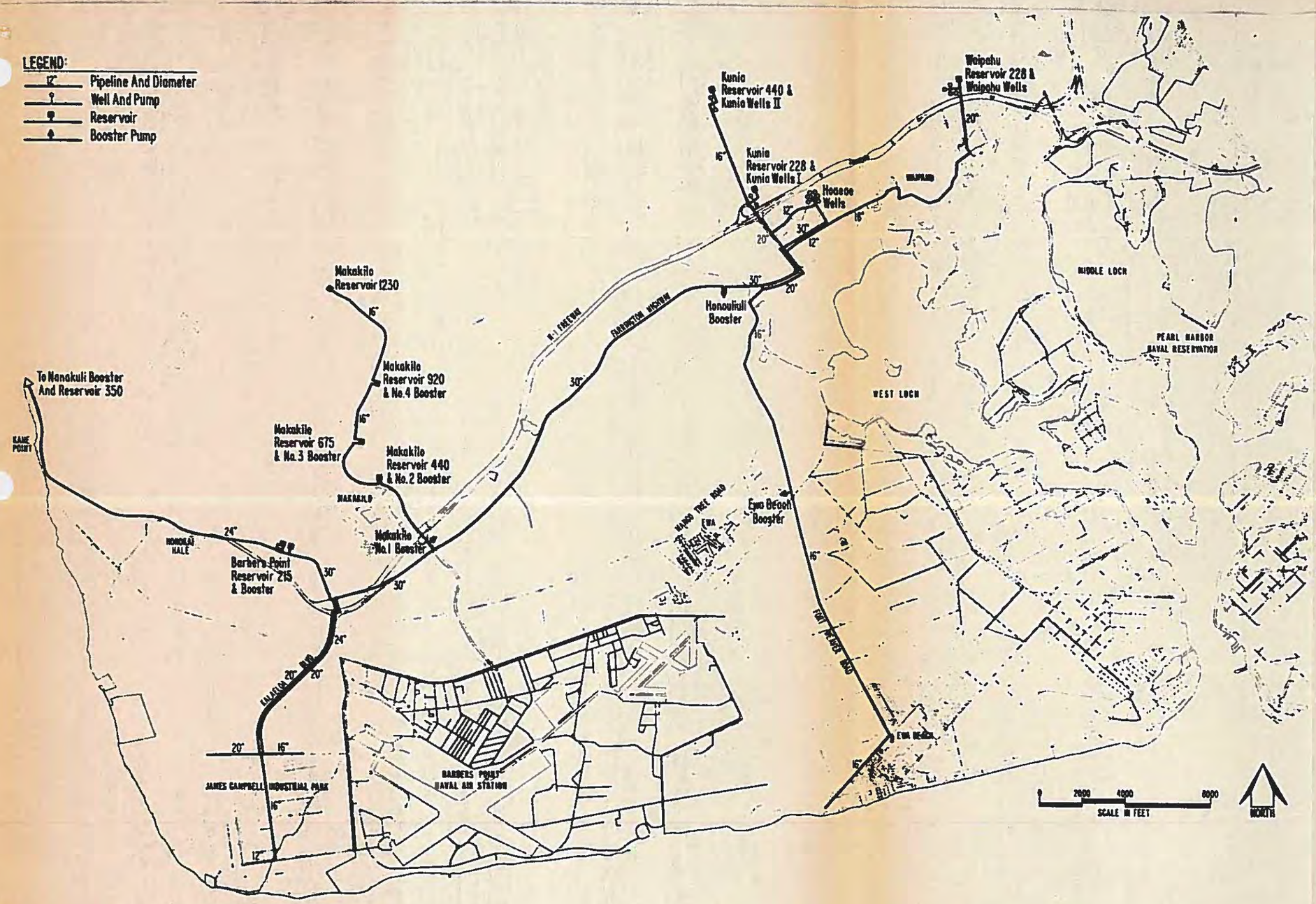
PRESENT WATER USE AND PROJECTED WATER REQUIREMENTS

Present Usage Amounts

Major elements of BWS' system in Ewa are shown on Figure I. The largest service areas are Ewa Beach, Makakilo, James Campbell Industrial Park (JCIP), and export of water to Nanakuli. All supply comes from BWS wells in Waipahu, primarily from the Kunia I and Hoaeae wells. The Kunia 228 reservoir "floats" on the system to regulate pressure.

To supply the Ewa Beach community, there is a 16-inch pipeline which branches off the Farrington Highway main and runs the length of Fort Weaver Road. There is a minor amount of use from this 16-inch main in Honouliuli; consumption in Ewa Beach is metered at the Ewa Beach Line Booster Station. The station's record indicates peak flow in the 16-inch pipeline is about 5.5 MGD. Year-round average use is approximately 2.1 MGD. It is assumed for this master plan that the Fort Weaver Road main has no capacity to supply planned development.

Makakilo is supplied by a series of booster pumps which draw water from the 30-inch Farrington Highway main. The community is now comprised of 1,546 single-family residential units, 878 multi-family units, 4.5 acres of commercial development, 17.0 acres of park, 5.1 acres of-public service facilities, and two schools on sites with a combined area of 14.2 acres. Water use averages approximately 1.0 MGD. Existing pipelines, booster pumps, and storage tanks have been sized for planned development through year 2000 using a conventional, all potable system. A premise of this master plan is that Makakilo's water system will continue to be all potable; it will not have a dual system. This means that its participation in proposed water system improvements will be limited to source development.



RESERVOIRS:

Name	Capacity (Million Gallons)	Floor Elevation (Ft. MSL)	Spillway Elevation (Ft. MSL)
Waipahu 228	1.5	203	228
Kunia 228	1.5	203	228
Kunia 440	1.5	420	440
Makakilo 440	1.0	420	440
Makakilo 675	2 at 0.5 each	657	675
Makakilo 920	1.5	900	920
Makakilo 1230	2.0	1200	1230
Barbers Point 215	4.0	185	215
Barbers Point 215	5.0	185	215

SUPPLY WELLS

Name	Number Of Wells	Rated Capacity Flowrate (GPM)	Rated Capacity Head (Ft.)	GWCA Certified Pumpage (MGD)
Waipahu	4	1900	230	4.88
Hoaeae	2	1500	233	6.61
	4	1750	230	
Kunia I	2	1750	233	4.81
	2	1750	245	
Kunia II	2	1750	462	0.96

BOOSTER PUMPING STATIONS

Name	Number Of Pumps	Rated Capacity Flowrate (GPM)	Rated Capacity Head (Ft.)
Honouliuli Line Booster	4	4900	110
Ewa Beach Line Booster	1	4900	90
Makakilo No.1 Booster	3	2500	255
Makakilo No.2 Booster	3	2000	270
Makakilo No.3 Booster	3	1750	260
Makakilo No.4 Booster	3	1300	330
Barbers Point Booster	3	2800	155

FIGURE 1

MAJOR ELEMENTS OF THE HONOLULU BOARD OF WATER SUPPLY SYSTEM IN EWA

The first development increment of JCIP encompasses the 1,320 acres makai of Malakole Road. Its water use currently averages about 3.5 MGD. It is comprised of one large user, Standard Oil on a 250-acre site, and a number of smaller tenants which occupy a total of 765 acres. About 300 acres are not occupied. Standard Oil uses an average of 2.2 MGD without substantial variation during the day or throughout the year. Other tenants average about 1,300 gallons per acre per day. JCIP Increment I usage patterns were studied during preparation of a 1978 master plan by M&E Pacific, Inc. Its findings and design recommendations, previously reviewed by BWS, have been incorporated in this plan.

In addition to JCIP Increment I, other uses supplied from the Barbers Point 215 tanks are Honokai Hale and export to Nanakuli. Honokai Hale is a subdivision of 286 single-family residential units. Booster pumping from Barbers Point to Nanakuli currently averages about 5.0 MGD and reaches a daily maximum of 7.5 MGD. BWS plans to outfit test wells in Makaha in the late 1980's and to develop wells in Waianae thereafter. A portion of supply from these wells will be used to reduce pumpage from the Barbers Point tanks. Specific dates for outfitting these wells have not been set. However, a reasonably flexible scenario for the reduction of pumpage based on BWS plans and discussions with its personnel has been assumed for this master plan.

Design Water Requirements

Water requirements of existing Ewa communities and planned development which are the basis of this master plan are compiled on Tables 2 through 9. Table 2 sets out design flowrates for existing communities. Table 3 lists total year-by-year supply requirements of planned development. Tables 4 through 9 provide breakdowns of supply requirements by land use for each development project.

PLAN FOR NEW SOURCES OF SUPPLY

The master plan provides for installation of new potable and non-potable wells for all water requirements on Table 3. Source development projects which BWS may undertake outside the Ewa area, Waiau tunnel, for example, could ultimately provide some water in the later stages of the planning period. If this occurs, some of the post-1990 wells listed herein may not be installed. However, design of pipelines from well fields to storage tanks is based on all supply provided by the new wells described below.

Table 2. Design Water Supply Requirements of Existing Ewa Communities

Service Area	Design Flowrates (in MGD) Average Day	Maximum Daily	Peak	Basis of Design Amounts
Ewa Beach	2.2	N/A	5.5	BWS measurements at the Honouliuli line booster
Makakilo				
1,546 SF Residential	0.773	1.160	2.319	
878 MF Residential	0.351	0.527	1.054	
4.5 Ac. Commercial	0.014	0.020	0.041	BWS design criteria applied
17 Ac. Park	0.068	0.102	0.204	to current community size
5.1 Ac. Public	0.020	0.031	0.061	
Schools - 1,280 Students	0.077	0.115	0.230	
TOTAL	1.303	1.955	3.909	
JCIP Increment I				
Standard Oil	2.20	2.50	3.00	Based on actual flow measure-
Remain Tenants	3.08	4.62	9.24	ments. About 3000 GPAD and 1.5/3.0 factors
TOTAL	5.28	7.12	12.24	
Honokai Hale Subdivision	0.143	0.215	0.429	BWS criteria for 286 single-family residential units
Nanakuli Export				
Up to 1989	5.0	7.5	N/A	BWS' 1981 "Municipal Water
1989 - 1990	2.0	3.0	N/A	Use Plan" and discussions with
After 1990	1.0	1.5	N/A	BWS personnel

Notes:

1. JCIP flow figures taken from M&E Pacific's 1978 "Water System Master Plan for James Campbell Industrial Park":

   Total Acres, Increment I = 1,320

   At 4,000 GPAD, Ave. day = 5.28 MGD
   Use @ 250-Ac. Std. Oil Lot = 2.20

   Balance for Remaining 1,070 Ac. = 3.08 MGD

   Equivalent Use Rate for Remaining Acre: 3,080,000 ÷ 1,070 = 2,880 GPAD

   Peaking factors for Standard Oil are also taken from the 1978 Master Plan. The computed use rate for remaining Increment I tenants is more than twice the actual usage rate, making it a conservative design figure.

2. Exports to Nanakuli assume that supply by Makaha wells will reduce exports by 3.0 MGD in 1989 and that development of Waianae wells will reduce exports by another 1.0 MGD in 1991.

Table 3. Design Water Supply Requirements of Planned Ewa Development Based on Dual System Criteria

Year	West Beach[1]		Expansion of Campbell Industrial Park		Expansion of Makakilo[2]		Ewa Plantation		Ewa Village[3]		Ewa Marina	
	Potable	Non-Potable	Potable	Non-Potable	Potable	Non-Potable	Potable	Non-Potable	Potable	Non-Potable	Potable	Non-Potable
1985	0.502	0.383	0.0718[4]	0.0282	0.19		0.1959	0.1257	0.324	0.000	0.10	0.02
1986	0.252	0.168	0.0118	0.0282	0.19		0.3436	0.1547			0.15	
1987	0.147	0.066	0.0118	0.0282	0.19		0.1748	0.0787			0.23	
1988	0.006		0.0118	0.0282	0.19		0.3038	0.2206			0.30	0.14
1989	0.578	0.329	0.0118	0.0282	0.19		0.1508	0.0712			0.26	0.03
1990			0.0118	0.0282	0.19		0.1291	0.0581			0.23	0.11
1991	0.462	0.290	0.0128	0.0304	0.17		0.2310	0.1040			0.22	0.07
1992	0.548	0.253	0.0128	0.0304	0.17		0.1262	0.2821	0.041	0.019	0.23	0.10
1993			0.0128	0.0304	0.17						0.18	0.08
1994	0.183	0.138	0.0128	0.0304			0.4637	0.2083			0.12	0.03
1995	0.319	0.137	0.0128	0.0304			0.7452	0.3348			0.12	
1996	0.220	0.093	0.0116	0.0277			0.7535	0.3385			0.13	0.19
1997	0.166	0.074	0.0117	0.0277							1.25	
1998	0.165	0.075	0.0116	0.0277								
1999	0.166	0.075	0.0117	0.0277								
2000	0.099	0.045	0.0116	0.0277								
TOTALS	3.813	2.126	0.2530	0.4597	1.65	0.000	3.6176	1.9767	0.365	0.019	3.52	0.77

[1] West Beach golf courses to be constructed in 1985 and 1992 will be irrigated by private systems. Their irrigation supply requirements are not included herein.

[2] Makakilo will be supplied entirely by a conventional, potable system.

[3] Initial development in Ewa Village will be supplied by an all potable system. The water allocation for 1985 is comprised of: hook-up of 360 existing single-family units; development of 240 new multi-family residential units; and hook-up of existing Ewa School with 800 student maximum enrollment; development in 1992 would add 100 single-family units supplied by a dual system.

[4] Expansion of JCIP includes 0.06 MGD for the deep draft harbor. This would be supplied through a connection to the existing main in Malakole Road.

Table 4. Projected Water Requirements of the West Beach Project

Year	Land Use	No. of Units	Acres	Projected (Ave. Daily) Demand	
				Potable Water (MGD)	Non-Potable Water (MGD)
85	Resort/Hotel	1,340	--	0.3270	0.2358
	Park	--	18.5	0.0133	0.0747
	Golf Course	--	170.5	0.1228	0.0000*
	HCC	--	21.8	0.0327	0.0540
	Circulation	--	15.8	0.0000	0.0174
	Beach Club	--	2.2	0.0066	0.0022
86	Low Density Apartments	150	--	0.0497	0.0224
	Resort/Hotel	830	--	0.2025	0.1461
87	Low Density Apartments	445	--	0.1473	0.0663
88	Commercial	--	2.0	0.0060	0.0000
89	Resort/Hotel	930	--	0.2269	0.1637
	Low Density Apartments	445	--	0.1473	0.0663
	High Rise Apartments	700	--	0.1736	0.0784
	Commercial	--	10.0	0.0300	0.0000
	Circulation	--	18.5	0.0000	0.0204
91	Resort/Hotel	900	--	0.2196	0.1584
	High Rise Apartments	960	--	0.2381	0.1075
	Park	--	5.8	0.0042	0.0237
92	Low Density Apartments	310	--	0.1026	0.0462
	High Rise Apartments	1,220	--	0.3026	0.1366
	Park	--	10.2	0.0073	0.0416
	Golf Course	--	170.0	0.1224	0.0000*
	School (300 Students)	--	6.9	0.0126	0.0228
	Circulation	--	5.2	0.0000	0.0057
94	Low Density Apartments	150	--	0.0497	0.0224
	High Rise Apartments	420	--	0.1042	0.0470
	Commercial	--	5.8	0.0174	0.0000
	Park	--	16.9	0.0122	0.0690
95	Low Density Apartments	500	--	0.1655	0.0745
	High Rise Apartments	400	--	0.0992	0.0448
	Marina	--	18.1	0.0543	0.0181
96	Low Density Apartments	500	--	0.1655	0.0745
	Marina	--	18.2	0.0546	0.0182
97	Low Density Apartments	500	--	0.1655	0.0745
98	Low Density Apartments	500	--	0.1655	0.0745
99	Low Density Apartments	500	--	0.1655	0.0745
00	Low Density Apartments	300	--	0.0993	0.0447
TOTAL FOR WEST BEACH, 1985-2000				3.8135	2.1269

* The golf course will be irrigated by private, on-site wells.

Table 5. Projected Water Requirements of Planned Expansion of James Campbell Industrial Park (JCIP)

Period	Land Use	Acres	Projected (Ave. Daily) Demand	
			Potable Water (MGD)	Non-Potable Water (MGD)
1985-1990	Industrial	50	0.071	0.169
	Deep Draft Harbor	--	0.060	0.000
1990-1995	Industrial	45	0.064	0.152
1995-2000	Industrial	41	0.058	0.139
TOTAL FOR ALL DEVELOPMENT, 1985-2000			0.253	0.460

Table 6. Projected Water Requirements of Planned Expansion of the Makakilo Community

Period	Land Use	No. of Units	Projected (Ave. Daily) Potable Water Demand (MGD)
1985-1990	Single-Family Residential	1,014	0.507
	Townhouse	778	0.311
	Apartments	1,073	0.322
1991-1993	Single-Family Residential	592	0.296
	Townhouse	535	0.214
TOTAL FOR 1985-1993 PERIOD			1.650

Table 7. Projected Water Requirements of Ewa Plantation

Year	Land Use[1]	No. of Units	Acres	Projected (Ave. Daily) Demand	
				Potable Water (MGD)	Non-Potable Water (MGD)
85	Multi-Family Residential	570	--	0.1887	0.0849
	Park	--	10	0.0072	0.0408
86	Multi-Family Residential	1,038	--	0.3436	0.1547
87	Multi-Family Residential	528	--	0.1748	0.0787
88	Multi-Family Residential	766	--	0.2535	0.1141
	Park	--	24	0.0173	0.0979
	Commercial	--	6	0.0130	0.0086
	Golf Course[2]	--	--	0.0200	0.0000
89	Multi-Family Residential	410	--	0.1357	0.0611
	Commercial	--	7	0.0151	0.0101
90	Multi-Family Residential	390	--	0.1291	0.0581
91	Multi-Family Residential	698	--	0.2310	0.1040
92	Multi-Family Residential	316	--	0.1046	0.0471
	Commercial	--	10	0.0216	0.0144
Sub-total for 1985-1992				1.6552	0.8745
94	Single-Family Residential	1,120	--	0.4637	0.2083
95	Single-Family Residential	1,800	--	0.7452	0.3348
96	Single-Family Residential	1,820	--	0.7535	0.3385
TOTAL FOR 1985-1996				3.6176	1.7561

[1] All multi-family residential are low rise development.

[2] The golf course would be irrigated by on-site wells drawing water from the limestone aquifer. The water demand listed here is for the clubhouse.

Table 8. Projected Water Requirements of Ewa Village

Year	Land Use	No. of Units	Projected (Ave. Daily) Demand	
			Potable Water (MGD)	Non-Potable Water (MGD)
1985	(Existing) Single-Family Residential	360	0.1800	0.0000
	Multi-Family Residential	240	0.0960	0.0000
	Ewa School (800 max. enrollment)	--	0.0480	0.0000
1992	Single-Family Residential	100	0.0414	0.0186
TOTAL FOR EWA VILLAGE			0.3654	0.0186

Table 9. Projected Water Requirements of Ewa Marina

Year	Land Use	No. of Units	Acres	Projected (Ave. Daily) Demand	
				Potable Water (MGD)	Non-Potable Water (MGD)
85	Single-Family Residential	200	--	0.100	0.000
	Park	--	5.7	0.004	0.023
86	Single-Family Residential	300	--	0.150	0.000
	Commercial/Public	--	2.0	0.004	0.003
87	Single-Family Residential	450	--	0.225	0.000
88	Single-Family Residential	454	--	0.227	0.000
	Multi-Family Residential	146	--	0.048	0.022
	Park	--	30.0	0.022	0.122
89	Single-Family Residential	400	--	0.200	0.000
	Multi-Family Residential	190	--	0.063	0.028
90	Single-Family Residential	244	--	0.122	0.000
	Multi-Family Residential	306	--	0.101	0.046
	Park	--	14.5	0.010	0.059
91	Single-Family Residential	110	--	0.055	0.000
	Multi-Family Residential	490	--	0.162	0.073
92	Single-Family Residential	85	--	0.043	0.000
	Multi-Family Residential	565	--	0.187	0.084
	Park	--	4.3	0.004	0.018
93	Multi-Family Residential	534	--	0.177	0.080
94	Single-Family Residential	114	--	0.057	0.000
	Multi-Family Residential	186	--	0.062	0.028
95	Single-Family Residential	76	--	0.038	0.000
	Marina (1600 Boats)	--	--	0.082	0.000
96	Park	--	27.5	0.020	0.112
	Commercial/Public	--	51	0.110	0.073
Sub-Total, 1985-1996				2.273	0.771
Post '96	Single-Family Residential	2,244	--	1.122	0.000
	Golf Course	--	180	0.130	0.000*
TOTAL FOR EWA MARINA PROJECT				3.525	0.771

* Golf course will be irrigated by private, on-site wells.

Potable Wells at 280-Foot Elevation in Kunia

A new Kunia well field, ultimately consisting of up to 10 wells, will supply the potable water requirements of the West Beach, Ewa Village, Ewa Plantation, and Ewa Marina projects. Recommended layout of the Kunia wells above H-1 freeway follows the 280-foot elevation contour and is generally parallel to the freeway (see Figure 2). Because the wells would be located at a higher elevation than the tank they will pump into, pressure sustaining valves(s) will be required on the transmission pipeline next to the tank. Typical well spacing would be 500 to 600 feet. Three 14-inch wells outfitted with 1,750 GPM vertical line shaft turbine pumps would be installed initially. Based on BWS' criterion of pumping the maximum daily use in 16 hours, the initial supply capacity would be 3.36 MGD. Interconnections with the existing Kunia I and Hoaeae wells in Waipahu will provide standby capacity. A tentative schedule for installation of subsequent Kunia 280-foot wells is depicted on Figure 3.

A test hole at the first well site is required to establish the quality of groundwater at this location. The quality of water pumped from OSCO's Ewa Shaft (well 2202-21) and BWS' Kunia I wells (2302-01 and -02) indicates that the chloride content of water from the new wells should be in the range of 140 to 180 MGL. It is expected that all wells in this Kunia field will penetrate the Koolau basalt aquifer.

Makakilo Potable Wells

Campbell Estate has drilled well 2004-04 near the Makakilo exit of H-1 freeway and outfitted it with a 1,050 GPM pump. Based on an agreement with BWS, a 0.5 MGD supply capacity has been established for the well. This amount is greater than projected potable supply requirements for JCIP to year 2000, including an allocation for the deep draft harbor's shoreside facilities (refer back to Tables 3 and 5).

To supply planned expansion of the Makakilo community, two wells adjacent to BWS' Makakilo 920 Reservoir are proposed. Each well would pump 1,300 GPM, providing a total reliable supply of 1.66 MGD. One well would be installed initially and the other in about 1989. These wells would tap a new resource area. Their location will avoid the sequence of booster pumping lifts to provide new supply to upper Makakilo areas. It will also preserve transmission capacity in the 30-inch Farrington Highway main for West Beach and expansion of JCIP.

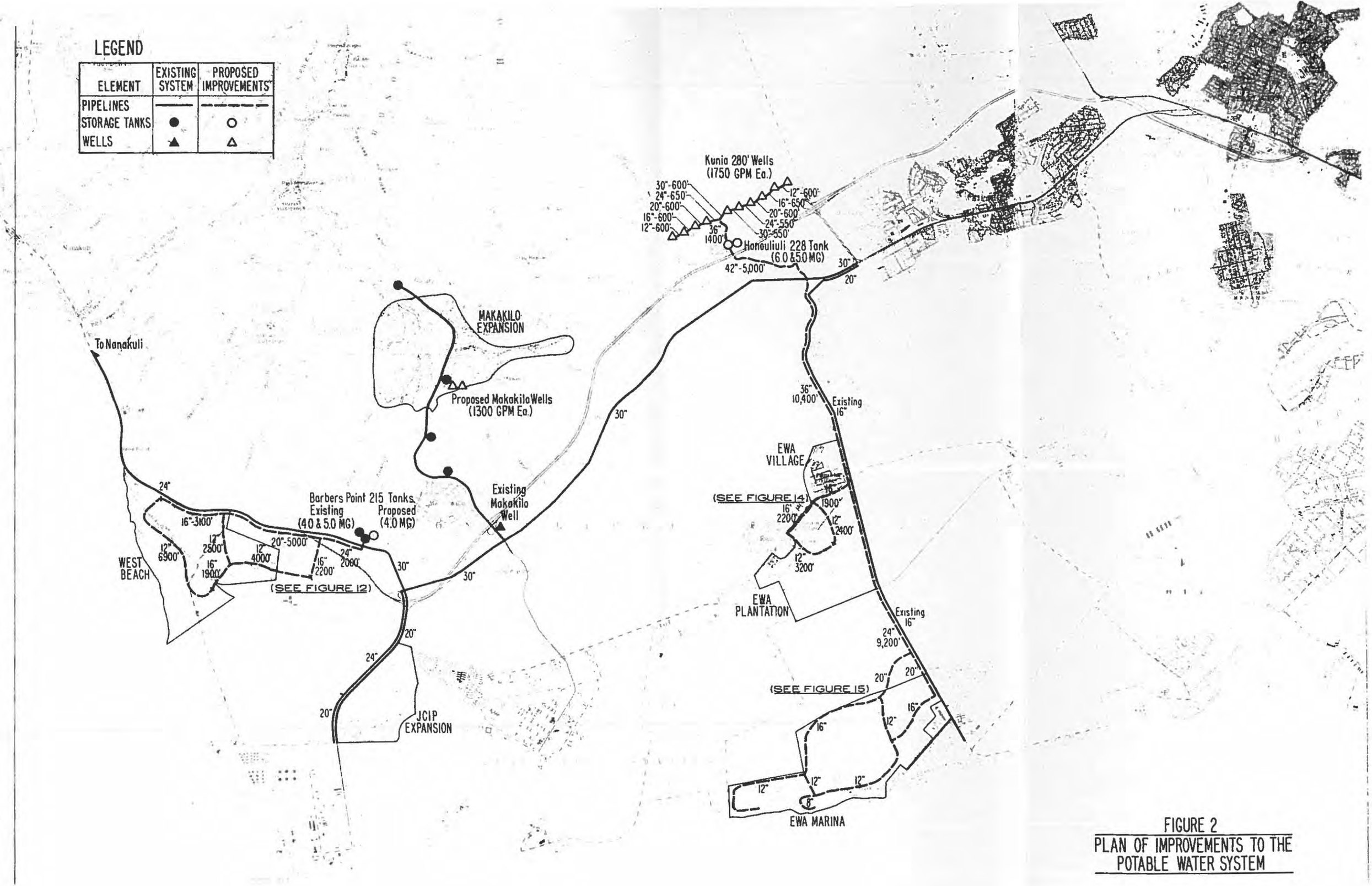


FIGURE 2
PLAN OF IMPROVEMENTS TO THE POTABLE WATER SYSTEM

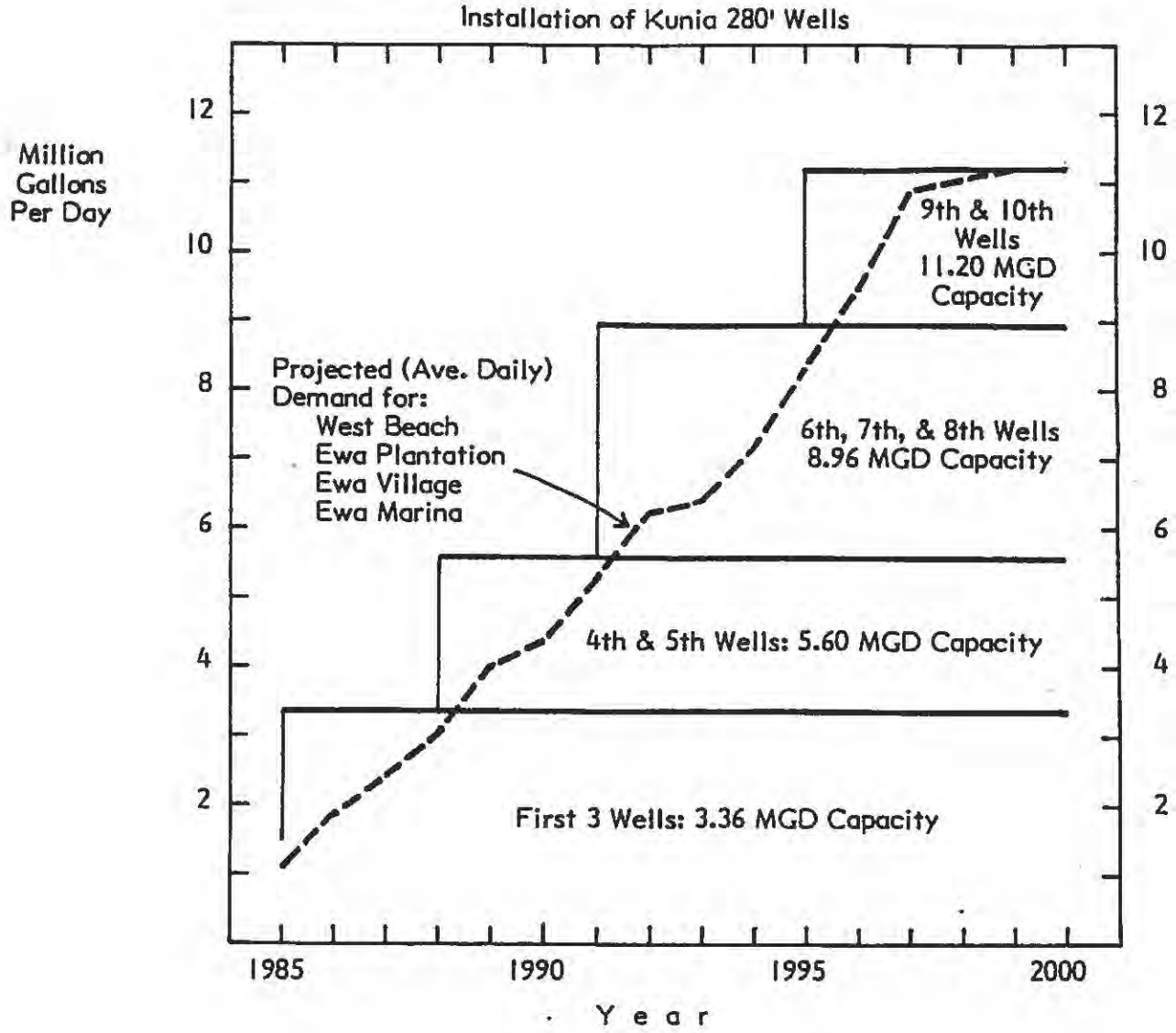


Figure 3
Incremental Development of Kunia 280' Wells

The quality of groundwater at this location in the Waianae basalt aquifer must be demonstrated by a test well. However, the site chosen is considerably inland of the existing Makakilo well so its water should be fresher. Chloride content of 200 MGL or less is expected, satisfactory for potable consumption without blending with fresher water.

Honouliuli Non-Potable Wells

Sources of supply for the non-potable system which will serve the Plantation, Village, and Marina projects along Fort Weaver Road would be new wells at about 100-foot elevation near Honouliuli (see Figure 4). They would be located along a cane haul road at a spacing of about 1,000 feet between wells. Salinity of the well water should be less than OSCO's nearby EP 7 & 8 wells (nos. 2202-15 to -20) which draw water at great depth within the Koolau basalt aquifer. Two 1,500 GPM vertical line shaft turbine pumps would be installed initially in 14-inch casing wells to provide a supply capacity of 0.96 MGD (one well would be standby). A tentative schedule for installation of subsequent wells is shown on the upper graph of Figure 5.

Barbers Point Non-Potable Wells

Non-potable supply for the system which will serve West Beach and JCIP expansion would be provided by the Barbers Point wells shown on Figure 4. Two 1,350 GPM vertical line shaft turbine pumps would be installed initially in 14-inch casing wells to provide a capacity of 0.86 MGD (one well would be standby). A tentative schedule for installation of subsequent wells is depicted on the lower graph of Figure 5.

PLAN OF NEW OFF-SITE STORAGE TANKS AND PIPELINES

Proposed Potable System Improvements

Proposed additions to BWS' existing potable system are sized for the supply requirements listed in Table 3. Even if BWS elects not to participate in oversizing any of the tanks or pipelines shown herein, these improvements will enhance its operating flexibility in the Ewa area. Key assumptions for sizing the pipelines shown on Figure 3 are: (1) New storage tanks built in conjunction with the Kunia 280-foot well field will

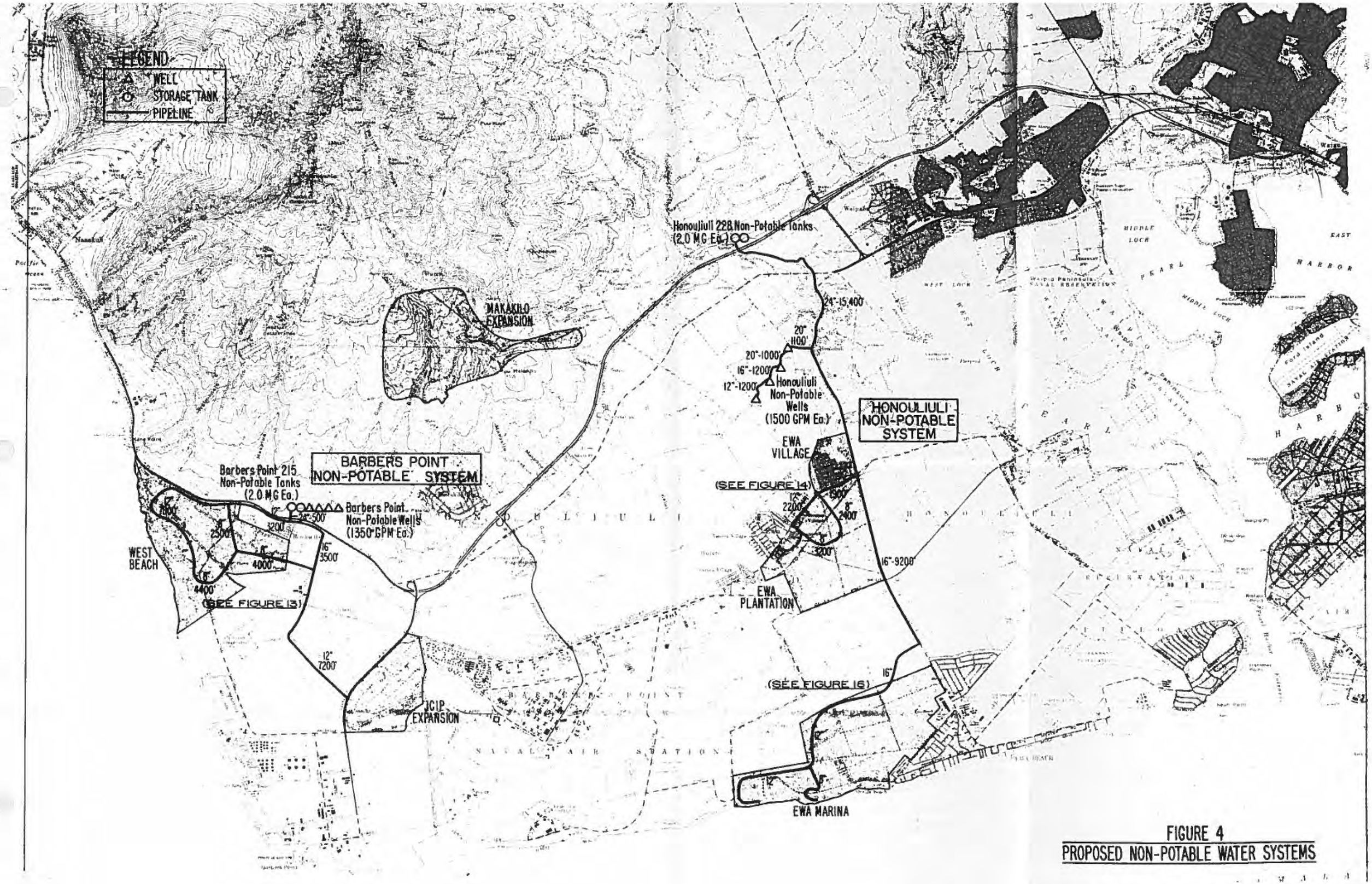
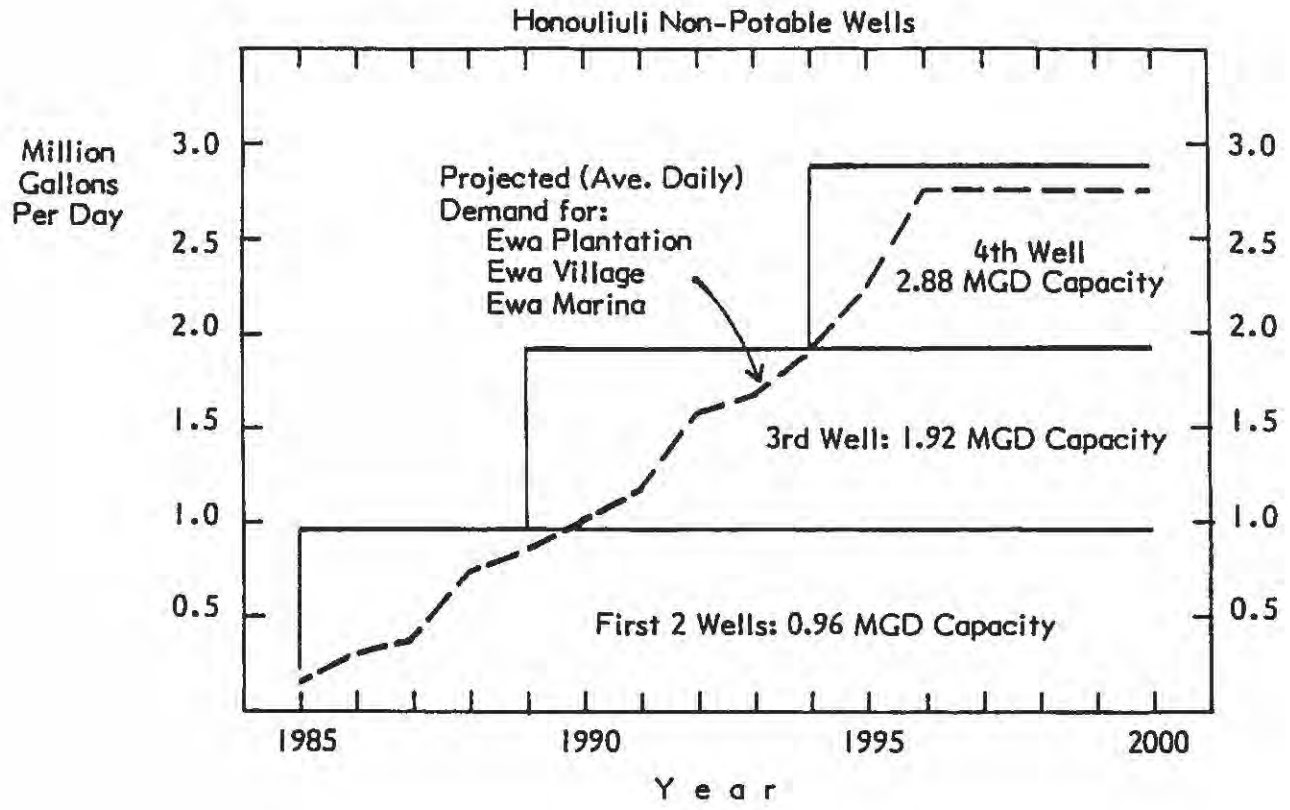


FIGURE 4
PROPOSED NON-POTABLE WATER SYSTEMS



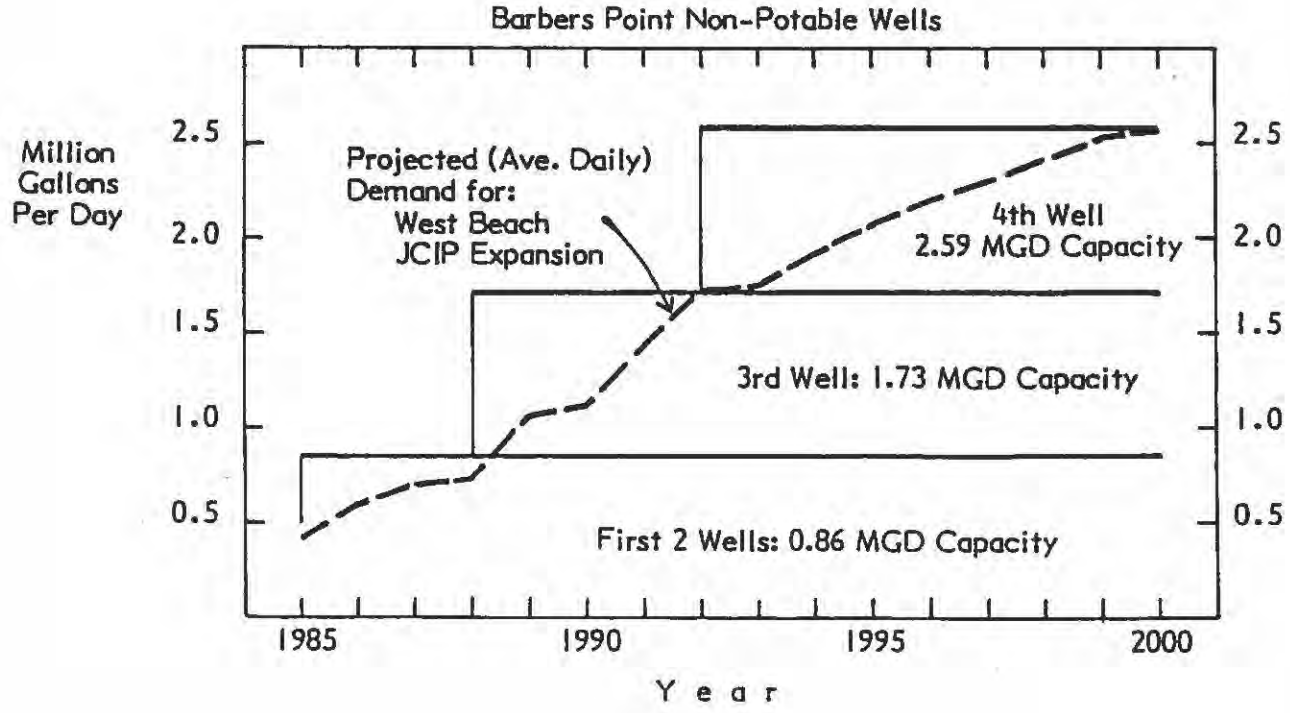


Figure 5
Incremental Development of Non-Potable Wells

be at the same elevation as the Kunia 228 tank in Waipahu. (2) No capacity is available in the existing 16-inch Fort Weaver Road main to serve planned Ewa development. (3) Reduction of export to Nanakuli will be accomplished within the planning period to release capacity in the 30-inch Farrington Highway main for Ewa development. The basis for sizing proposed tanks and pipelines is described below.

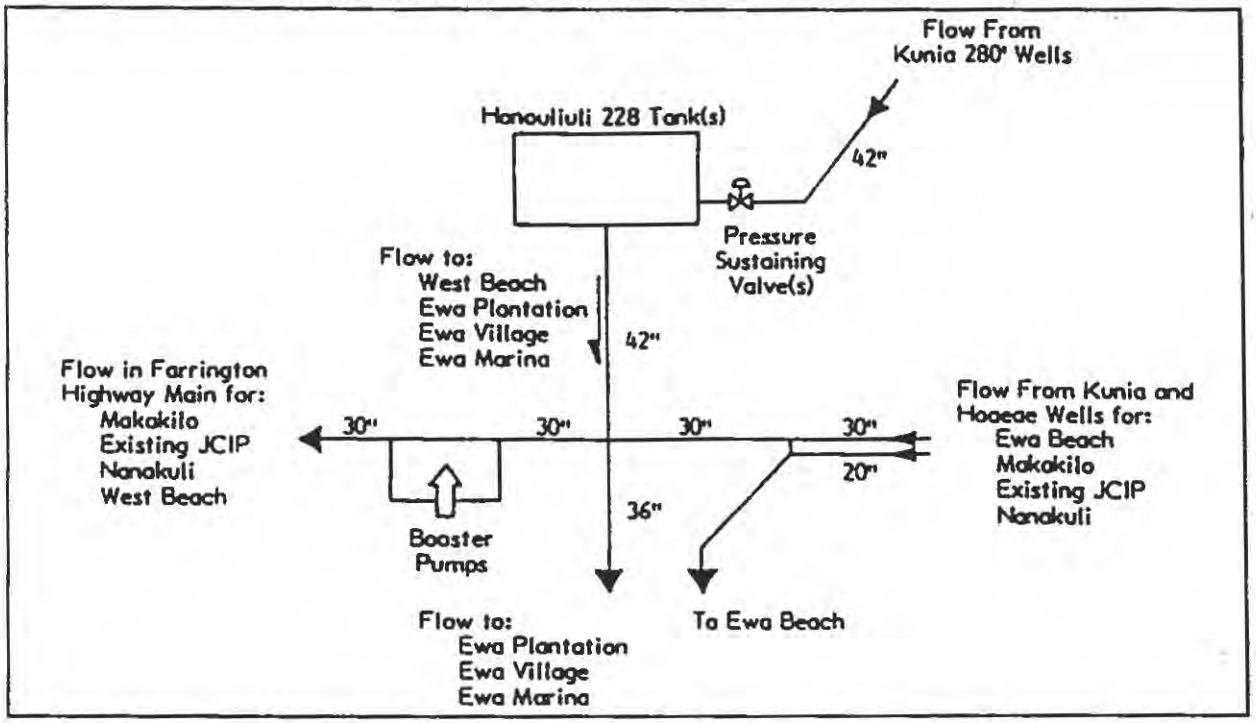
Honouliuli 228 Storage Tanks. Two storage tanks located just above H-1 freeway near Honouliuli Gulch are proposed. A 6.0 MG tank would be installed initially; based on present development schedules, a second 5.0 MG tank would be added in 1992. Both tanks would have 203- and 228-foot floor and spillway elevations, respectively. These tanks would receive water from the Kunia 280-foot wells to supply four projects: West Beach, Ewa Plantation, Ewa Village, and Ewa Marina. The Plantation, Village, and Marina projects will be supplied from the Honouliuli 228 tanks via a new distribution main along Fort Weaver Road. Supply from the tanks to West Beach will be by the existing 30-inch Farrington Highway main. Proposed volume of the Honouliuli 228 tanks is equivalent to the maximum daily water use of the three projects along Fort Weaver Road. Figure 6 illustrates that during the most extreme draft from the tanks -- delivery of the entire maximum daily water use amount at the peak hour rate over a 12-hour period -- there would be more than adequate storage for transmission to West Beach via the 30-inch Farrington Highway main. Fire protection to the projects along Fort Weaver Road is also provided by these tanks; its volume requirement is substantially less than the maximum daily use volume, even without credit for well inflow.

Fort Weaver Road Distribution Main. The 24,600-foot pipeline from the Honouliuli 228 tanks to the Ewa Marina project would be comprised of three segments: (1) a 42-inch, 5,000-foot pipeline from the tanks to Farrington Highway which would carry peak flow to the three projects along Fort Weaver Road with the maximum daily flowrate to West Beach; (2) a 36-inch 10,400-foot pipeline from Farrington Highway to Ewa Plantation sized for the peak flowrate to the three projects along Fort Weaver Road; and (3) a 24-inch, 9,200-foot pipeline to Ewa Marina and sized for that project alone. Pipe sizes are based on flowrates in year 2000. Figure 7 summarizes design flowrates, friction losses, and residual pressures in the main.

30-Inch Farrington Highway Main. Implementation of the dual system, installation of Makakilo wells to supply JCIP and Makakilo expansion, and reduction of pumpage to Nanakuli will all limit transmission requirements of potable water from

FIGURE 6

Maximum Draft from the Honouliuli 228 Tanks



Maximum (12-Hour) Draft from 6.0 MG Storage in 1992

Outflow (Qo) for 12 Hours:		MG	Inflow (Qi) for 12 Hours:
Ewa Plantation at Peak Rate	=	2.48	8 Wells @ 1700 GPM for
Ewa Village at Peak Rate	=	0.55	12 Hours = 9.79 MG
Ewa Marina at Peak Rate	=	2.58	
West Beach at Max. Day Rate	=	1.87	
Qo	=	7.48	

Net Draft from Storage = Qo - Qi = (7.48 - 9.79) MG = -2.31 MG

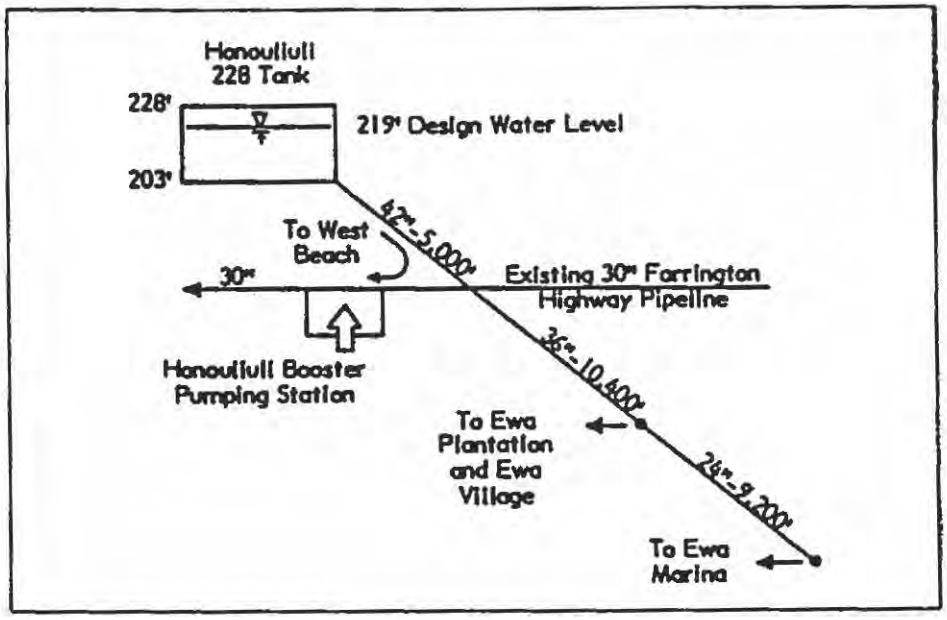
Maximum (12-Hour) Draft from 11.0 MG Storage in 2000

Outflow (Qo) for 12 Hours:		MG	Inflow (Qi) for 12 Hours:
Ewa Plantation at Peak Rate	=	5.43	10 Wells @ 1700 GPM for
Ewa Village at Peak Rate	=	0.55	12 Hours = 12.24 MG
Ewa Marina at Peak Rate	=	5.28	
West Beach at Max. Day Rate	=	2.86	
Qo	=	14.12	

Net Draft from Storage = Qo - Qi = (14.12 - 12.24) MG = 1.88 MG

FIGURE 7

Design of the Fort Weaver Road Potable Main



Sizing Criterion	Location	Connecting Pipeline	Year 2000 Design Flowrates MGD	Component Flows	H_f (feet)	Residual HGL (feet)	Pressure in Pipeline (PSI)
Peak Flow	Storage Tank					219.00	--
		42"-5,000'	28.23	Maximum daily flowrate for West Beach; Peak flowrate for Plantation, Village, and Marina	7.04		
	Farrington Hwy.					211.96	44.1
		36"-10,400'	22.51	Peak flowrate for Plantation, Village, and Marina	20.41		
	Plantation					191.55	63.4
		24"-9,200'	10.56	Peak flowrate for Ewa Marina	32.07		
	Marina					159.48	60.4
Max. Day Plus Fire Flow (FF = 2.88 MGD)*	Storage Tank					219.00	--
		42"-5,000'	19.85	Maximum daily flowrate for West Beach; Maximum daily flowrate and fire flow for Plantation, Village, and Marina	3.67		
	Farrington Hwy.					215.33	45.6
		36"-10,400'	14.13	Maximum daily flowrate and fire flow for Plantation, Village, and Marina	8.62		
	Plantation					206.71	70.0
		24"-9,200'	8.16	Maximum daily flowrate plus fire flow for Ewa Marina	19.90		
	Marina					186.81	72.2

* Fire flowrate is 2000 GPM.

Honouliuli to Makakilo/Barbers Point. Figure 8 and its accompanying table illustrate that transmission requirements through year 2000 can be handled by the 19.3 MGD capacity of the existing 30-inch Farrington Highway pipeline.

Barbers Point 215 Storage Tanks. Providing storage volume at Barbers Point equivalent to maximum daily use of West Beach and JCIP is more than adequate to operate the booster pumps for export to Nanakuli. The existing 9.0 MG storage built by Campbell Estate is sufficient through 1988; adding a 4.0 MG tank in 1989 will provide adequate storage through year 2000. The schematic diagram and calculations on Figure 9 show that the most extreme draft from storage -- drawing maximum daily use entirely in a 12-hour period -- requires substantially less volume than the storage proposed herein.

Honouliuli Non-Potable System

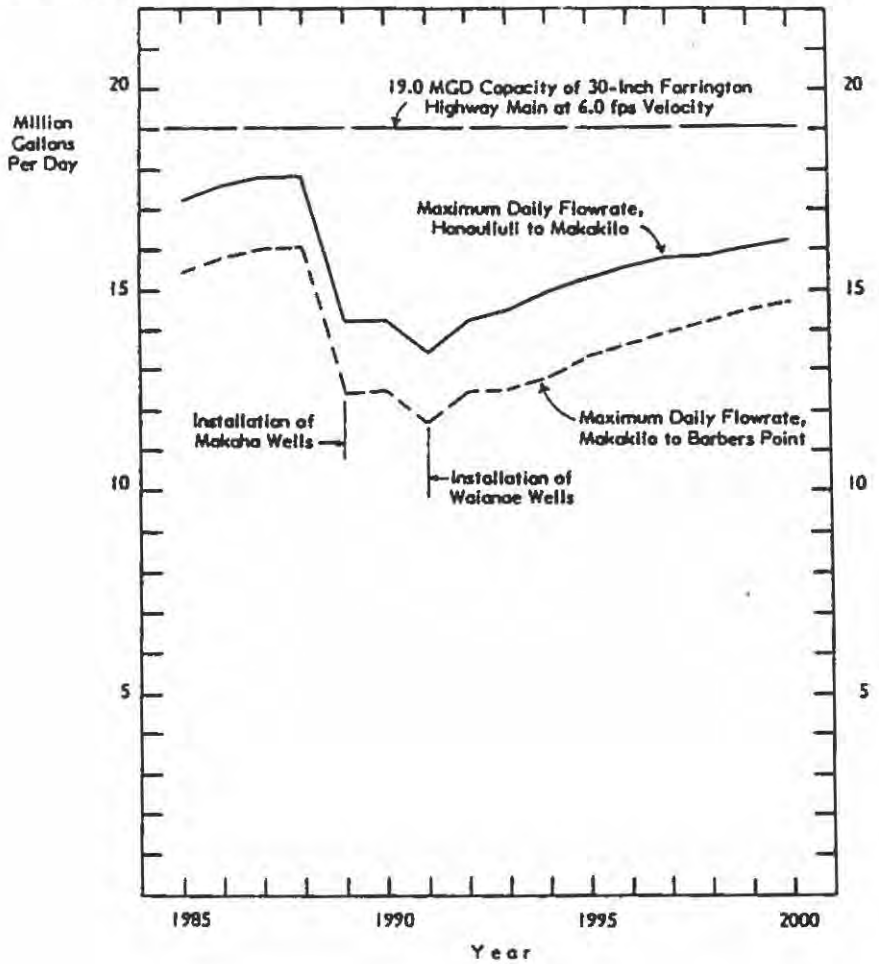
The proposed Honouliuli non-potable system to supply the Plantation, Village, and Marina projects would be comprised of: (1) a well field at 100-foot elevation located west of Fort Weaver Road; (2) storage tanks above H-1 freeway near Honouliuli Gulch; and (3) a pipeline running the length of Fort Weaver Road. The layout of these improvements is shown on Figure 4. Incremental development of the well field is depicted on Figure 5. Sizing of other elements is described below.

Honouliuli 228 Storage Tanks. Two 2.0 MG storage tanks are proposed, one to be built initially and the second in 1992. Floor and spillway elevations would be 203 and 228 feet, respectively, identical to the adjacent potable system tanks proposed herein. Storage volume is based on the maximum daily water use of the Plantation, Village, and Marina projects. These tanks do not provide fire protection.

Fort Weaver Road Distribution Main. Required pipe sizes, design flowrates, friction losses, and residual pressures in the pipeline along Fort Weaver Road are illustrated on Figure 10. Required size for the 9,200-foot long pipe section from Ewa Plantation to Ewa Marina is 16 inches, identical to the existing potable main in this location. It would be possible to oversize the proposed potable main for this segment, increasing it from 24 to 30 inches, to connect services from the existing 16-inch potable line to the new 30-inch main, and then incorporate the existing 16-inch main into the non-potable system. The benefits of this would be significant: (1) there would

FIGURE 8

Required Transmission Flowrate in the 30-Inch Farrington Highway Main to Year 2000



Year	Maximum Daily Flowrate, Honouliuli to Makakilo (MGD)					Maximum Daily Flowrate, Makakilo to the Barbers Point Tanks (MGD)
	West Beach	JICP and Honokai Hale	Makakilo	Export to Nanakuli	Total	
85	0.753	7.34	1.955	7.50	17.548	15.701
86	1.131	7.34	1.955	7.50	17.926	16.097
87	1.352	7.34	1.955	7.50	18.147	16.335
88	1.361	7.34	1.955	7.50	18.156	16.362
89	2.228	7.34	1.955	3.00	14.523	12.747
90	2.228	7.34	1.955	3.00	14.523	12.765
91	2.921	7.34	1.955	1.50	13.716	11.977
92	3.743	7.34	1.955	1.50	14.538	12.818
93	3.743	7.34	1.955	1.50	14.538	12.837
94	4.017	7.34	1.955	1.50	14.812	13.130
95	4.496	7.34	1.955	1.50	15.291	13.629
96	4.826	7.34	1.955	1.50	15.621	13.976
97	5.075	7.34	1.955	1.50	15.870	14.242
98	5.322	7.34	1.955	1.50	16.117	14.507
99	5.571	7.34	1.955	1.50	16.366	14.773
00	5.720	7.34	1.955	1.50	16.515	14.940

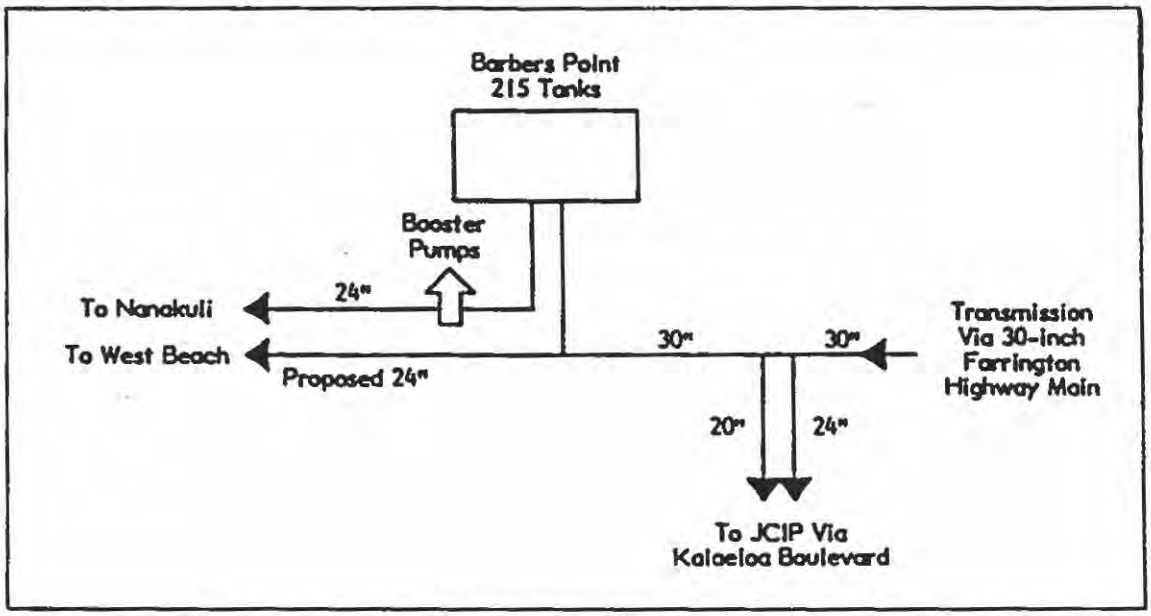
Notes on the table

1. Since the expansion of JCIP and Makakilo will be supplied by wells in the Makakilo area, transmission requirements from Honouliuli to Makakilo for these projects will remain at their respective existing rates through the planning period.

2. Transmission beyond Makakilo to Barbers Point is calculated as the total from Honouliuli to Makakilo, less usage by Makakilo, and plus the supply provided by the Makakilo well for JCIP expansion.

FIGURE 9

Maximum Draft from the Barbers Point 215 Tanks



Maximum (12-Hour) Draft from 9.0 MG Storage Tanks in 1988

Outflow (Qo) for 12 Hours:		MG
West Beach at Peak Rate	=	1.36
Existing JCIP at Peak Rate	=	6.12
JCIP Expansion at Peak Rate	=	0.16
Nanakuli at Max. Day Rate	=	3.75
Qo	=	11.39

Inflow (Qi) for 12 Hours:

Max. Daily Flowrate in 1988 (from Figure 10) for 12 hours = 8.07 MG

Net Draft from Storage = Qo - Qi = (11.39 - 8.07) MG = 3.32 MG

Maximum (12-Hour) Draft from 13.0 MG Storage Tanks in 2000

Outflow (Qo) for 12 Hours:		MG
West Beach at Peak Rate	=	5.72
Existing JCIP at Peak Rate	=	6.12
JCIP Expansion at Peak Rate	=	0.38
Nanakuli at Max. Day Rate	=	0.75
Qo	=	12.97

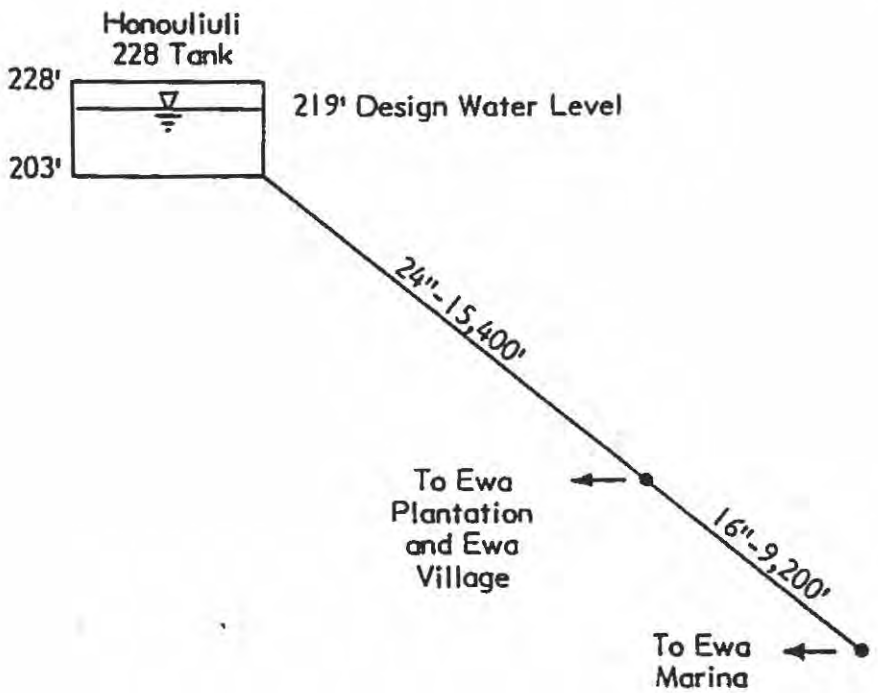
Inflow (Qi) for 12 Hours:

Max. Daily Flowrate in 2000 (from Figure 10) for 12 hours = 7.36 MG

Net Draft from Storage = Qo - Qi = (12.97 - 7.36) MG = 5.61 MG

FIGURE 10

Design of the Honouliuli - Fort Weaver Road Non-Potable System



Sizing Criterion	Location	Connecting Pipeline	Design Flowrate		H_f (Feet)	Residual HGL (Feet)	Pressure in Pipeline (PSI)
			MGD	Component Flows			
Peak Flowrate in Year 2000	Tank(s)					219.00	--
		24"-15,400'	8.30	Peak Flowrate of Plantation, Village, and Marina Projects	34.38		
	Plantation					184.62	60.4
		16"-9,200'	2.31	Peak Flowrate of Ewa Marina	16.10		
	Marina					168.52	64.3

be a savings in initial construction since oversizing the potable main would cost less than installation of a new 16-inch pipeline; (2) there would be greater potable system capacity in the 30-inch main than in the combined capacity of the existing 16- and proposed 24-inch mains (refer to the friction loss comparison below); and (3) a substantial reduction in operating time of the Ewa Beach line booster pumps would be realized by the improved hydraulic capacity. This plan recommends oversizing the potable main and incorporating BWS' 16-inch main into the non-potable system.

Design (Peak) Flowrates in Potable Mains

5.5 MGD to Ewa Beach in Existing 16-Inch Main

10.56 MGD in Proposed 24-Inch Pipeline to Ewa Marina (Fig. 7)

Comparison of Friction Loss in 9200-Foot Pipeline Section

24-Inch @ 10.56 MGD & C = 130	Hf = 32.07 ft.
16-Inch @ 5.5 MGD & C = 120	Hf = 80.14 ft.
30-Inch @ 16.06 MGD (8.16 = 5.5) & C = 130	Hf = 23.49 ft.

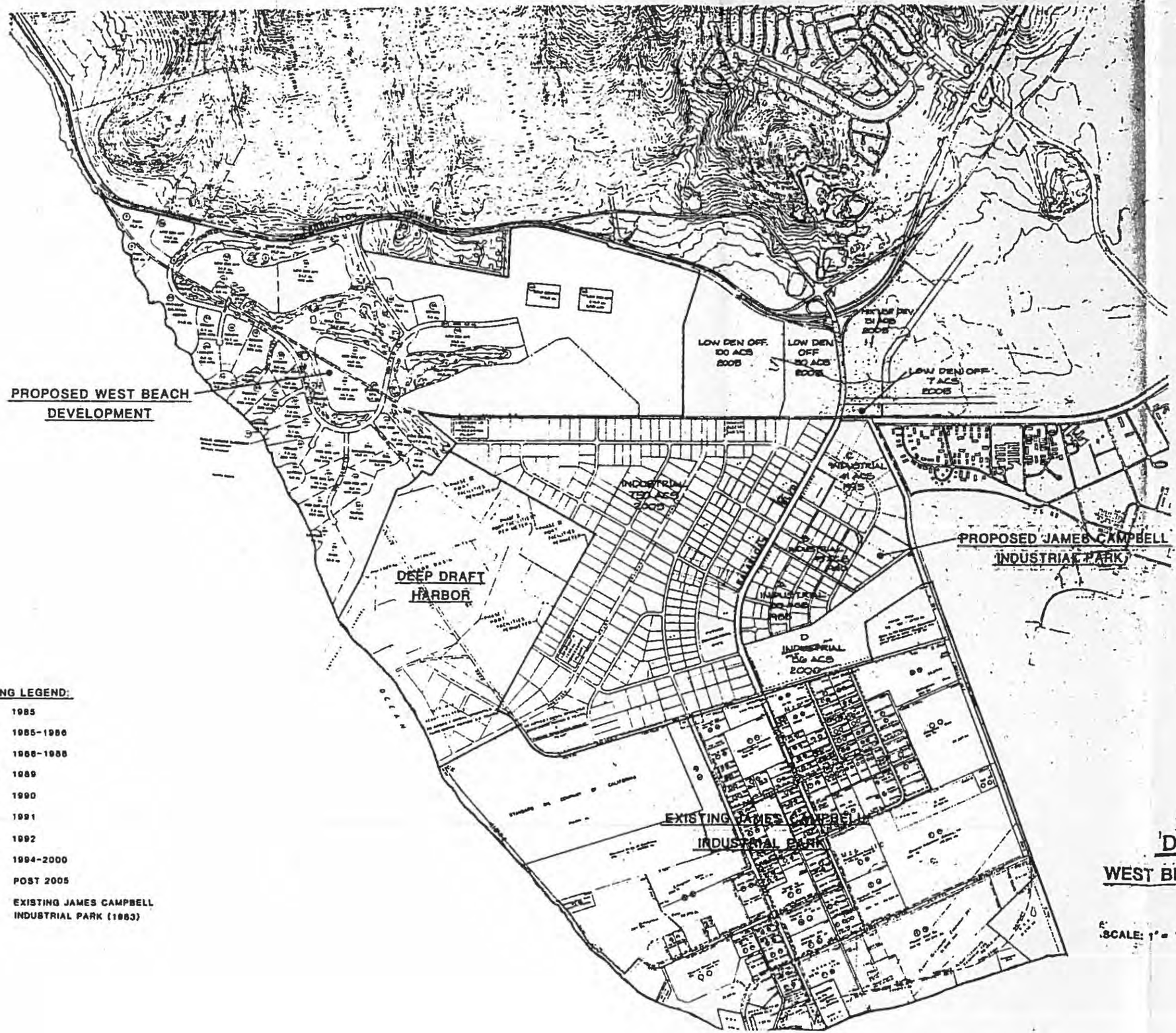
Barbers Point Non-Potable System

The proposed Barbers Point non-potable system would be comprised of: (1) wells at 185-foot elevation just mauka of Honokai Hale subdivision; (2) storage tanks adjacent to the wells; (3) distribution pipelines to West Beach and JCIP. These improvements are shown on Figure 4. Scheduled installation of wells is depicted on Figure 5. Two 2.0 MG storage tanks are proposed, one to be built initially and the second one in 1991. Storage volume is based on the maximum daily water use criterion. Floor and spillway elevations would be 185 and 210 feet, respectively. The distribution pipeline network is considered to be an on-site improvement and thus has not been shown on this plan of off-site improvements.

PLAN FOR ON-SITE DISTRIBUTION SYSTEMS

West Beach and James Campbell Industrial Park

Figure 11 is a development phasing map for West Beach, JCIP, and the Barbers Point Deep Draft Harbor. All of West Beach would be developed within the 1985 to 2000 planning period. Expansion of JCIP in this period would be limited to the area



PHASING LEGEND:

- 1985
- 1985-1986
- 1986-1988
- 1989
- 1990
- 1991
- 1992
- 1994-2000
- POST 2005
- EXISTING JAMES CAMPBELL INDUSTRIAL PARK (1983)

FIGURE II

DEVELOPMENT PHASING MAP

WEST BEACH, JAMES CAMPBELL INDUSTRIAL PARK AND DEEP DRAFT HARBOR

SCALE: 1" = 1000'

FEB. 24, 1984

east of Kalaeloa Boulevard and north of Malakole Road. Figure 11 also shows areas of JCIP expansion which would occur after the planning period. However, no source, storage, or pipeline capacity has been allocated for this future growth. For purposes of the master plan, development of the shoreside facilities for the deep draft harbor are shown to occur in 1985.

Potable Distribution System. Figure 12 illustrates the proposed potable distribution system for West Beach and JCIP; it also shows design flowrates in each pipeline segment and resulting residual pressures. Fire protection would be provided by the potable distribution system but pipe sizes are based on peak hour flowrates (at 3.0 times average day) as the governing sizing criterion. Development schedules of West Beach and JCIP result in separate distribution networks for each project although both would be supplied from the Barbers Point 215 tanks. Post-2000 development of JCIP will ultimately link the distribution networks but this eventual hydraulic advantage is not reflected in proposed pipe sizes.

All of the West Beach distribution network would be new pipelines. The limited amount of development planned for JCIP can be readily supplied by the existing 20- and 24-inch mains in Kalaeloa Boulevard. It should be noted that an extension of JCIP's existing distribution system along Malakole Road to the deep draft harbor's shoreside facilities is not shown on Figure 12 pending a decision on fire protection. Salt water pumping may be employed rather than the potable pipeline system.

Non-Potable Distribution System. The proposed non-potable distribution system and its relevant design data are presented on Figure 13. This system would be supplied from a new storage tank located across H-1 freeway from Honokai Hale. Pipe sizes are based on peak flowrates as this system does not provide fire protection. The peaking factor used for West Beach development is 2.0; this anticipates controlled irrigation use by various multi-family and resort parcels. A 3.0 peaking factor is used for JCIP to provide flexibility for water use by its individual tenants.

Ewa Plantation and Village Distribution Systems

Water requirements of the Ewa Plantation and Village projects are listed on Tables 7 and 8. For this draft of the master plan, parcel-by-parcel land use and corresponding water requirements within the project area has not been provided. Sizes

EXIST STORAGE 9.0 MG
EXIST JCIP 7.1 MG
AVAILABLE STORAGE 1.9 MG

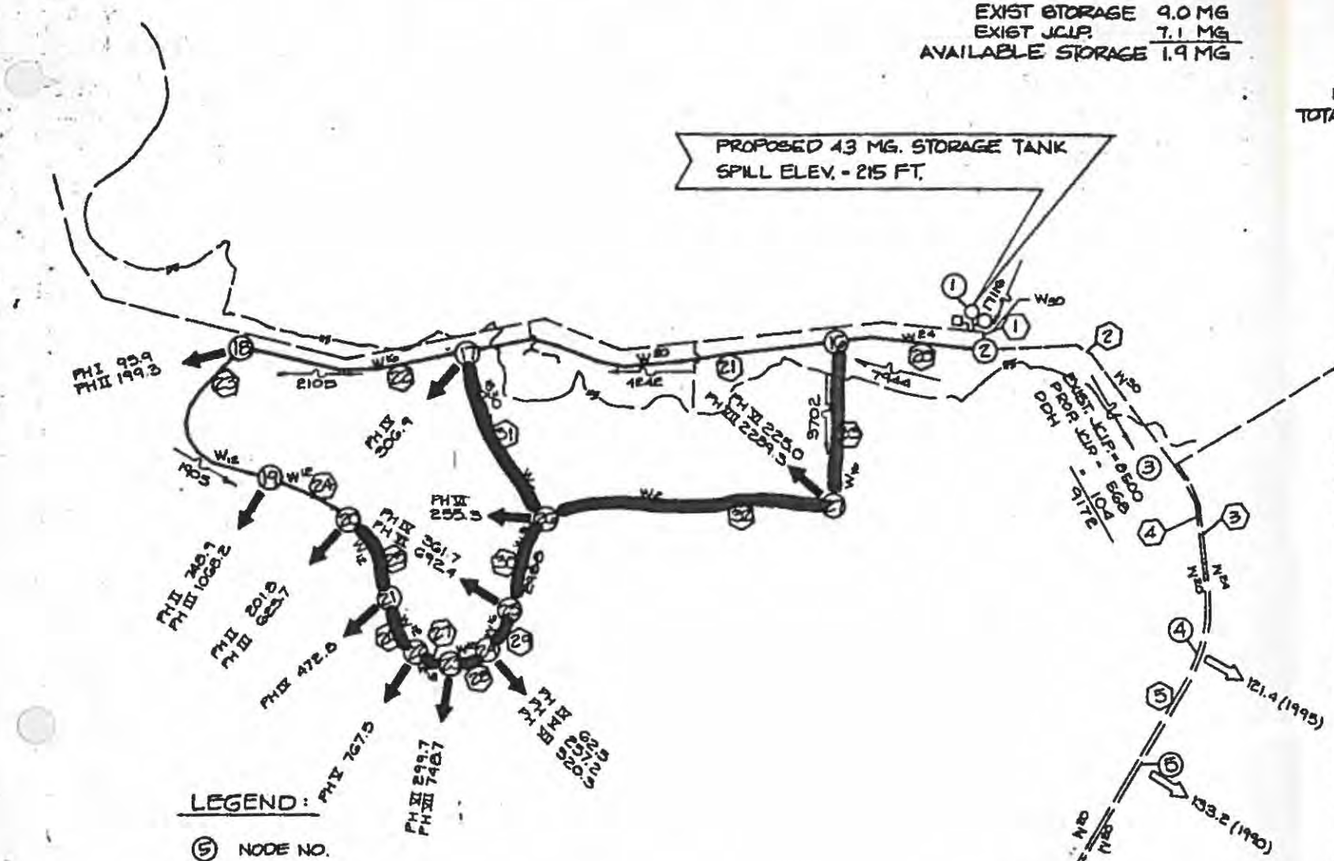
STORAGE SUMMARY

LOCATION	STORAGE
WEST BEACH	5.7 MG
PROP JCIP	0.4 MG
DEEP DRAFT HARBOR	0.1 MG
TOTAL	6.2 MG
LESS AVAILABLE STORAGE	1.9 MG
TOTAL NET STORAGE REQUIRED	4.3 MG.

NOTE: STORAGE REQUIREMENTS BASED ON MAX DAY DEMAND

FLOW SUMMARY

LOCATION	AVG. DAY (GPD)	PEAK HOUR (GPD)
EXIST JCIP	5,280,000	12,240,000
PROP JCIP	272,832	818,496
TOTAL JCIP	5,552,832	13,058,496
WEST BEACH	3,813,268	11,439,804
DEEP DRAFT HARBOR	50,000	150,000
TOTAL	9,416,100 GPD	24,648,300 GPD
OR	6,539.0 GPM	OR 17,117 GPM



LEGEND:

- (5) NODE NO.
- (5) PIPE NO.
- W_{24} 24" WATER LINE
- DRAW POINT IN GPM (WEST BEACH)
- DRAW POINT IN GPM (J.C.I.P. AND DEEP DRAFT HARBOR)
- EXIST. PIPE
- PROPOSED PIPE
- 500 FLOW IN LINE (GPM)

NOTES:

1. PHASES I TO VII REFERS TO WEST BEACH DEVELOPMENT PLANS.
2. YEAR IN PARENTHESIS REFERS TO THE YEAR THAT DEMAND IS EXPECTED TO OCCUR (JCIP)
3. FLOW RATES SHOWN ARE PEAK HOUR FLOWS
4. FLOW RATES SHOWN AT DRAW POINTS ARE CUMULATIVE BY PHASE AND NOT THE FLOW FOR EACH PHASE.

PROJECT TITLE:WB/EX & PROP JCIP/DDH POT-PHX92-20

FLOWRATES ARE EXPRESSED IN GPM AND PRESSURE IN PSIG

TRIAL NUMBER 1 — FLOW CORRECTION 0.001

THERE ARE THE RESULTS OF TRIAL NUMBER 1

PIPE NO.	END NODES		LENGTH (FT)	DIA. (IN)	FLOWRATE	VELOC. (FPS)	HEAD LOSS	PUMP HEAD	MINOR LOSS	HG LINE /1000 FT
1	1	2	300.00	30.00	17115.98	7.76	3.23	0.00	0.00	6.4[illegible]
2	2	3	3000.00	30.00	9172.39	4.16	6.33	0.00	0.00	1.0110
3	3	5	4400.00	24.00	5041.62	3.58	7.70	0.00	0.00	1.7[illegible]
4	3	4	2500.00	20.00	4120.73	4.20	8.44	0.00	0.00	3.3773
5	4	15	3900.00	20.00	3999.33	4.08	12.44	0.00	0.00	3.1914
6	5	6	4250.00	20.00	4910.43	5.02	19.89	0.00	0.00	4.6403
7	15	6	2250.00	20.00	3851.33	3.93	6.70	0.00	0.00	2.7810
8	6	7	1500.00	20.00	3457.65	3.53	3.66	0.00	0.00	2.4464
9	7	8	2000.00	12.00	1270.15	3.60	10.76	0.00	0.00	5.3820
10	9	8	1500.00	12.00	643.81	1.82	2.28	0.00	0.00	1.5265
11	6	9	1500.00	16.00	3237.28	5.16	12.14	0.00	0.00	6.2915
12	8	11	1500.00	12.00	1111.87	3.15	5.04	0.00	0.00	4.2032
13	10	11	1500.00	12.00	427.74	1.21	1.07	0.00	0.00	0.7171
14	9	10	1500.00	16.00	2899.12	4.62	6.25	0.00	0.00	4.2150
15	11	12	1000.00	12.00	734.91	2.09	1.96	0.00	0.00	1.9643
16	13	12	1500.00	12.00	446.13	1.26	1.16	0.00	0.00	0.7752
17	10	13	1000.00	16.00	1657.31	2.64	1.87	0.00	0.00	1.8771
18	12	14	1000.00	12.00	380.95	1.08	0.57	0.00	0.00	0.5702
19	13	14	2500.00	12.00	421.14	1.19	1.74	0.00	0.00	0.6966
20	2	16	2000.00	24.00	7944.19	5.63	8.15	0.00	0.00	4.0783
21	16	17	5000.00	20.00	4241.80	4.33	19.78	0.00	0.00	3.5571
22	17	18	2100.00	16.00	2104.65	3.35	8.92	0.00	0.00	2.8.74
23	18	19	2700.00	12.00	1905.36	5.40	30.79	0.00	0.00	11.4062
24	19	20	1200.00	12.00	837.15	2.37	2.98	0.00	0.00	2.4874
25	20	21	1200.00	12.00	213.46	0.60	0.23	0.00	0.00	0.1979
26	21	22	800.00	12.00	-257.26	-0.72	-0.22	0.00	0.00	-0.2090
27	22	23	500.00	12.00	-1026.76	-2.91	-1.81	0.00	0.00	-3.6[illegible]
28	23	24	500.00	12.00	-1775.46	-5.03	-5.00	0.00	0.00	-10.0175
29	24	25	500.00	16.00	2295.76	3.64	1.69	0.00	0.00	3.3[illegible]
30	25	26	1400.00	16.00	-2900.16	-4.76	-7.71	0.00	0.00	5.5135
31	17	26	2500.00	12.00	1030.27	5.19	26.46	0.00	0.00	10.5867
32	27	26	4000.00	12.00	1413.11	6.00	26.22	0.00	0.00	6.5566
33	16	27	2200.00	16.00	3702.41	5.90	18.02	0.00	0.00	8.1937
34	6	28	1000.00	16.00	1107.10	1.76	0.87	0.00	0.00	0.8773
35	28	9	2700.00	12.00	1107.10	3.14	11.26	0.00	0.00	4.1727

WB/EX & PROP JCIP/DDH POT-PHX92-20

NODE NUMBER	ELEVATION	PRESSURE	GRADE LINE	FLOWRATE TERM.NODE
1	215.00	0.00	215.00	
2	140.00	71.69	211.76	0.0000
3	80.00	54.24	205.42	0.0000
4	60.00	[illegible]	194.98	121.4000
5	50.00	64.00	197.71	133.2000
6	20.00	60.[illegible]	177.12	967.9000
7	20.00	66.79	174.11	157.2000
8	20.00	62.13	163.27	835.1000
9	20.00	67.12	161.46	802.1000
10	15.00	62.15	159.42	669.1000
11	15.00	[illegible].11	158.35	802.1000
12	10.00	55.43	154.39	802.1000
13	10.00	63.93	157.54	802.1000
14	10.00	63.18	155.81	802.1000
15	25.00	69.12	184.53	148.0000
16	150.00	23.22	203.40	0.0000
17	95.00	39.35	195.82	306.9000
18	50.00	54.99	176.90	199.2000
19	20.00	54.63	144.09	1048.2000
20	20.00	63.34	143.11	623.7000
21	20.00	53.24	142.87	472.8000
22	20.00	63.34	143.10	767.9000
23	20.00	54.13	134.92	748.7000
24	20.00	64.30	149.93	520.3000
25	25.00	54.07	151.63	292.4000
26	25.00	50.21	159.35	255.3000
27	40.00	54.41	105.57	1269.3000
28	20.00	68.00	174.94	0.0000

PHASING LEGEND

- 1985
- 1985-1986
- 1986-1988
- 1989
- 1990
- 1991
- 1992
- 1994-2000

SCALE: 1"=1000'

FIGURE 12

PRELIMINARY POTABLE SYSTEM PLAN

(BASED ON PEAK HOUR FLOW)

(WEST BEACH, EXIST. J.C.I.P. & PROPOSED J.C.I.P., AND DEEP DRAFT HARBOR)

FEB. 24, 1984

STORAGE AND PUMP SUMMARY

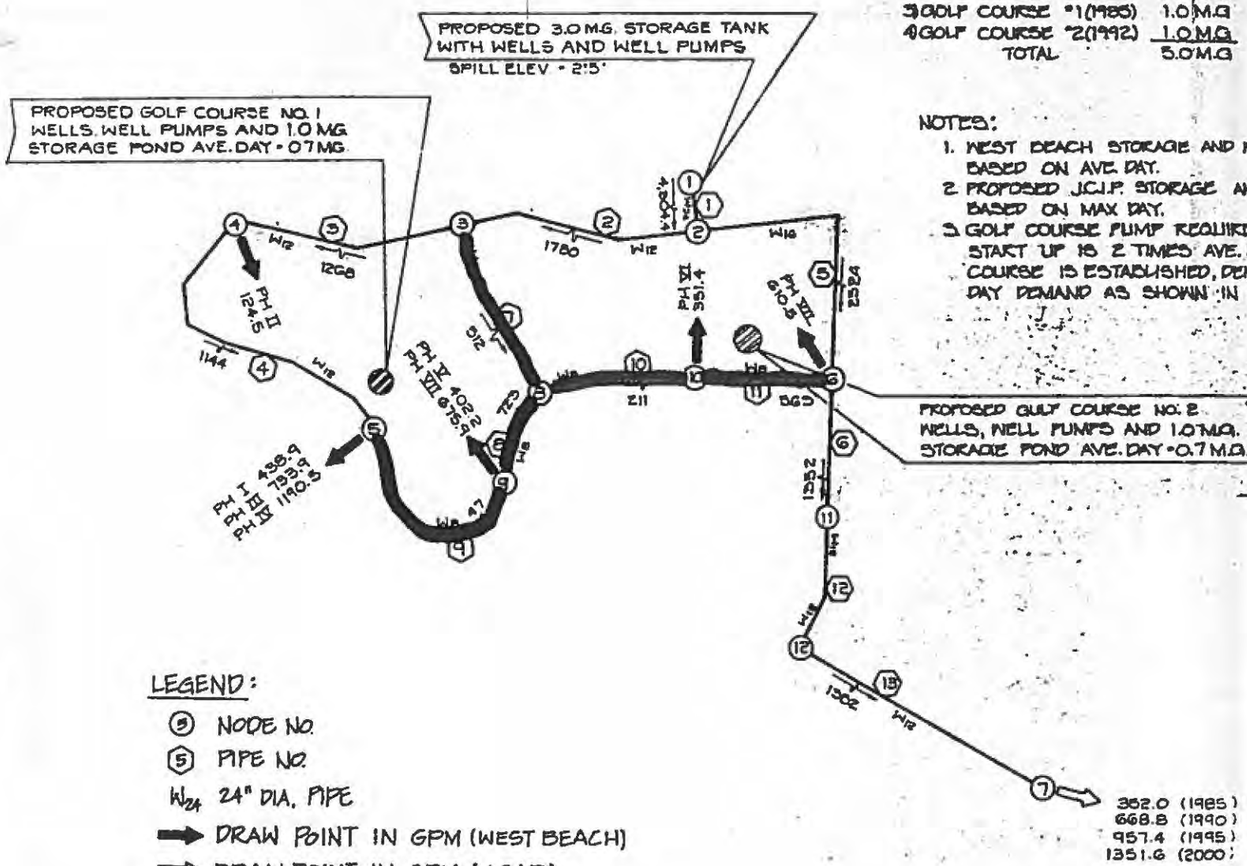
LOCATION	STORAGE	PUMP
1) WEST BEACH	2.0 M.G.	2225 GPM
2) PROPOSED JCIP	1.0 M.G.	1025 GPM
TOTAL	3.0 M.G.	3,250 GPM
3) GOLF COURSE #1 (1985)	1.0 M.G.	725 GPM
4) GOLF COURSE #2 (1992)	1.0 M.G.	723 GPM
TOTAL	5.0 M.G.	7,948 GPM

FLOW SUMMARY

LOCATION	AVE. DAY (GPD)	PEAK HOUR (GPD)
1) WEST BEACH	2,126,047	4,252,094
2) PROPOSED JCIP	648,768	1,946,304
TOTAL	2,774,815 GPD	6,198,398 GPD
	OR 1,927 GPM	OR 4,304 GPM

NOTES:

1. WEST BEACH STORAGE AND PUMP REQUIREMENTS BASED ON AVE. DAY.
2. PROPOSED J.C.I.P. STORAGE AND PUMP REQUIREMENTS BASED ON MAX DAY.
3. GOLF COURSE PUMP REQUIREMENT FOR INITIAL START UP IS 2 TIMES AVE. DAY DEMAND. ONCE COURSE IS ESTABLISHED, DEMAND DROPS TO AVE. DAY DEMAND AS SHOWN IN SUMMARY.



LEGEND:

- (9) NODE NO.
- (5) PIPE NO.
- W_{24} 24" DIA. PIPE
- DRAW POINT IN GPM (WEST BEACH)
- DRAW POINT IN GPM (JCIP)
- PROPOSED PIPE
- FLOW IN PIPE (GPM)

NOTE:

1. TRANSMISSION MAINS BASED ON PEAK HOUR FLOW RATE OF 2.0 × AVG. DAY (WEST BEACH)
2. TRANSMISSION MAINS BASED ON PEAK HOUR FLOW RATE OF 3.0 × AVG. DAY (PROPOSED JCIP)
3. GOLF COURSE STORAGE WITHIN GOLF COURSE POND, DOES NOT ENTER INTO FLOW CALCULATIONS SINCE GOLF COURSE IS SEPARATE STORAGE AND TRANSMISSION SYSTEM.
4. FIRE FLOW PROVIDED BY POTABLE SYSTEM
5. FLOW RATES SHOWN ARE PEAK HOUR FLOWS
6. PHASES I TO VII REFER TO WEST BEACH DEVELOPMENT PLANS
7. YEAR IN PARENTHESIS REFERS TO THE YEAR THAT DEMAND IS EXPECTED TO OCCUR FOR PROPOSED J.C.I.P.
8. FLOW RATES SHOWN AT DRAW POINTS ARE CUMULATIVE BY PHASE AND NOT THE FLOW FOR EACH PHASE

PHASING LEGEND

- 1985
- 1985-1986
- 1986-1988
- 1989
- 1990
- 1991
- 1992
- 1994-2000

PROJECT TITLE: WB/PROP JCIP IRR - PH(1997-2000)

FLOWRATES ARE EXPRESSED IN GPM AND PRESSURE IN PSIG

TRIAL NUMBER	FLOW CORRECTION
10	0.067
11	0.023

THESE ARE THE RESULTS OF TRIAL NUMBER 11

PIPE NO.	END NODE		LENGTH (FT)	DIA. (IN)	FLOWRATE	VELOC. (FPS)	HEAD LOSS	PUMP HEAD	MINOR LOSS	TO LOSS (FT)
1	1	2	500.00	24.00	4354.19	2.05	0.68	0.00	0.00	1.3692
2	2	3	3700.00	12.00	1779.67	5.04	32.14	0.00	0.00	10.0508
3	3	4	3000.00	12.00	1267.96	3.59	16.04	0.00	0.00	5.0644
4	4	5	4800.00	12.00	1143.54	3.24	21.26	0.00	0.00	4.4303
5	2	6	2500.00	16.00	2524.51	4.02	16.56	0.00	0.00	4.7334
6	6	11	1900.00	12.00	1351.60	3.83	11.47	0.00	0.00	6.0390
7	3	8	2500.00	6.00	511.75	3.26	17.99	0.00	0.00	7.1984
8	5	8	1400.00	8.00	-722.84	-4.61	-19.10	0.00	0.00	-13.6470
9	7	9	2900.00	8.00	-46.94	-0.29	-0.25	0.00	0.00	-0.0642
10	8	10	2900.00	8.00	211.09	-1.34	-1.14	0.00	0.00	-1.3963
11	9	10	3200.00	8.00	562.50	3.59	27.14	0.00	0.00	8.5787
12	11	12	1600.00	12.00	1351.60	3.83	9.16	0.00	0.00	6.0375
13	12	7	3700.00	12.00	1351.60	3.83	22.14	0.00	0.00	6.0375

WB/PROP JCIP IRR - PH(1997-2000)

NODE NUMBER	ELEVATION	PRESSURE	GRADE LINE	FLOWRATE TERM.NODE
1	215.00	0.00	215.00	
2	180.00	14.87	214.32	0.0000
3	95.00	37.74	182.16	0.0000
4	50.00	50.29	166.07	124.5000
5	20.00	54.08	144.81	1190.5000
6	60.00	59.69	197.75	610.5000
7	25.00	56.02	154.26	1351.6000
8	21.00	60.30	164.16	0.0000
9	25.00	52.09	145.06	675.9000
10	61.00	45.63	170.20	251.4000
11	40.00	43.39	184.28	0.0000
12	25.00	61.36	176.62	0.0000

FIGURE 6

PRELIMINARY

IRRIGATION SYSTEM PLAN

(WEST BEACH AND PROPOSED J.C.I.P.)

SCALE: 1" = 1000' FEB. 24, 1993

of pipelines comprising the potable and non-potable distribution systems shown on Figure 14 are based on preliminary calculations. A land use map and pipelines sized by Hardy Cross analysis will be submitted in the final master plan. The preliminary sizes shown here are based on peak hour flowrates defined as 3.0 times average day water use for both the potable and non-potable systems.

Based on preliminary analysis, the potable system's pipeline loop would consist of 16-inch pipe in Renton Road and 12-inch pipe in Roads "A" and "B". The loop would be connected to the new Fort Weaver Road potable main utilizing an existing 16-inch pipeline. The non-potable pipeline loop would be comprised of 12- and 8-inch pipes and would connect to the Fort Weaver Road non-potable main by a 12-inch pipe.

Ewa Marina Distribution Systems

Potable System. Table 10 lists the land use, number of units, and potable water design flowrates for each parcel within the development. Figure 15 presents the proposed potable distribution system and identifies residual pressures at various locations for the peak hour and maximum day plus fire flowrate sizing criteria.

Non-Potable System. Twenty single-family parcels and a 2-acre commercial site would be supplied entirely by the potable system. The remaining fifteen Ewa Marina parcels are listed on Table 11 with their respective land use, number of units, and non-potable design flowrates. Proposed pipelines for this non-potable supply are shown on Figure 16. Since these pipelines would not provide fire protection, they are sized for peak hour flowrates and a residual pressure of 40 psi or greater. A peak hour flowrate of 2.0 times average daily use has been used.

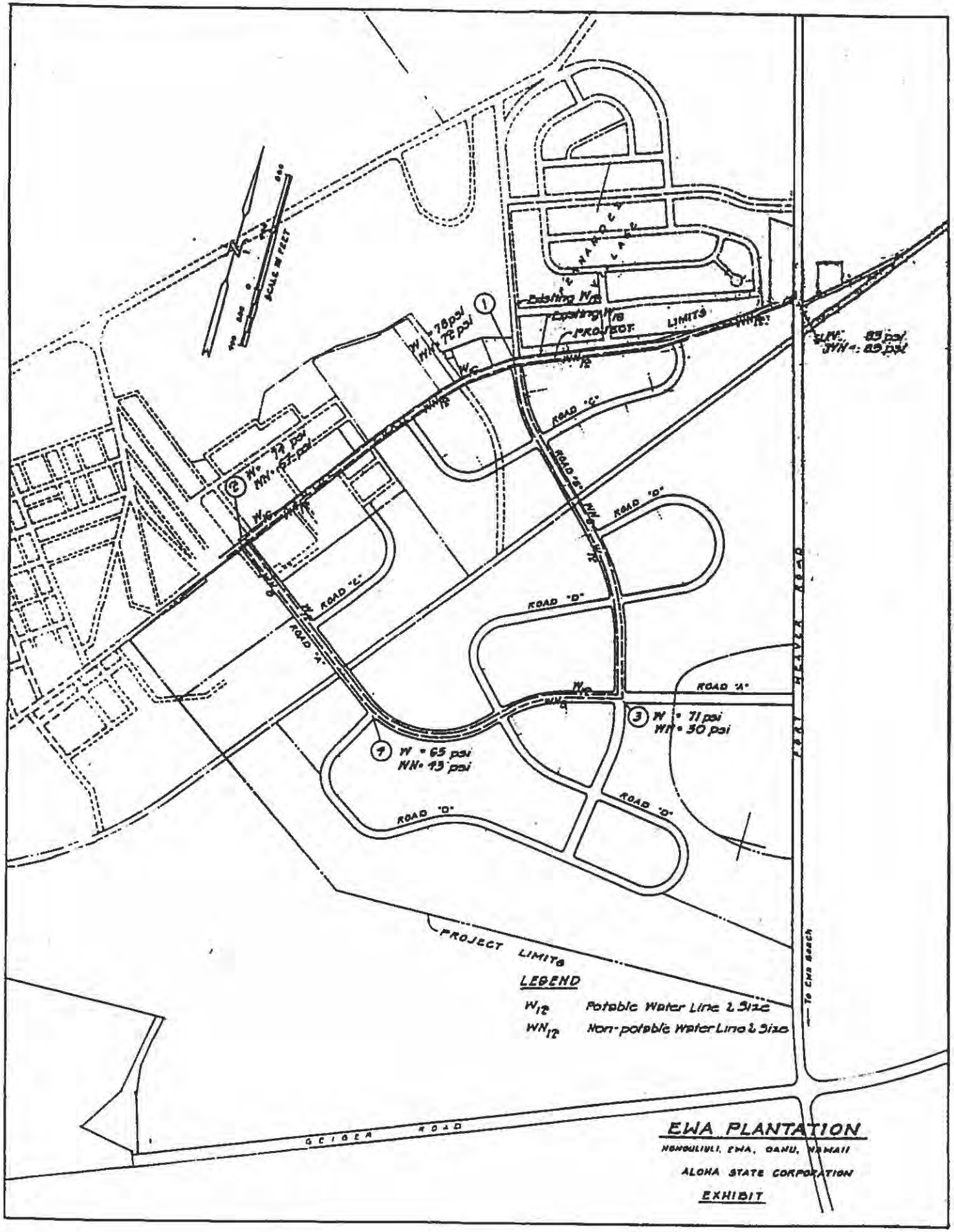

EWA PLANTATION
HONOLULU, EWA, OAHU, HAWAII
ALOHA STATE CORPORATION
EXHIBIT
LEGEND
Potable Water Line & Size
Non-potable Water Line & Size
PROJECT LIMITS
ROAD "A"
ROAD "B"
ROAD "C"
ROAD "D"
FORT WEAVER ROAD
GEIGER ROAD
To Ewa Beach
SCALE IN FEET
W = 65 psi
WN = 43 psi
W = 71 psi
WN = 50 psi
W = 78 psi
WN = 72 psi
W = 73 psi
WN = 67 psi
WN = 85 psi

Figure 14

Table 10

Ewa Marina Community
Projected Potable Water Demand

Parcel	Type	No. of Units	Flow/Unit (GPD)	Ave. Flow (MGD)	Max. Flow (MGD)	Peak Flow (MGD)	Point of Draft
A	SF	100	500	0.05	0.08	0.16	23
B	SF	184	500	0.09	0.14	0.28	3
C	SF	118	500	0.06	0.09	0.18	24
D	SF	129	500	0.06	0.10	0.20	35
E	SF	51	500	0.03	0.04	0.08	26
F	SF	122	500	0.06	0.09	0.18	24
G	SF	54	500	0.03	0.04	0.08	26
H	SF	130	500	0.06	0.09	0.18	25
I	SF	116	500	0.06	0.09	0.18	29
J	LD	336	331	0.11	0.17	0.34	4
K	LD	440	331	0.15	0.22	0.44	5
L	SF	185	500	0.09	0.14	0.28	36
M	SF	75	500	0.04	0.06	0.12	37
N	SF	85	500	0.04	0.06	0.12	28
O	SF	92	500	0.05	0.07	0.14	30
P	SF	153	500	0.08	0.12	0.24	31
Q	MD	690	331	0.23	0.34	0.68	32
R	SF	162	500	0.08	0.12	0.24	32
S	SF	232	500	0.12	0.17	0.34	31
T	SF	60	500	0.03	0.04	0.08	30
U	SF	71	500	0.04	0.05	0.10	7
V	SF	124	500	0.06	0.09	0.18	38
W	LD	121	331	0.04	0.06	0.12	9
X	LD	278	331	0.09	0.14	0.28	11
Y	MD	552	331	0.18	0.27	0.54	12
Z	SF	190	500	0.10	0.14	0.28	39
1	COMM	2 AC	3000/AC	0.006	0.01	0.02	22
2	COMM	13 AC	2160/AC	0.03	0.04	0.08	14
3	COMM	8 AC	2160/AC	0.02	0.03	0.06	16
4	COMM	17 AC	2160/AC	0.04	0.06	0.12	18
5	COMM	15 AC	2160/AC	0.03	0.05	0.10	20
6	PRESERV.	27.5 AC	720/AC	0.02	0.03	0.06	19
P-1	PARK	30 AC	720/AC	0.02	0.03	0.06	34
P-2	PARK	5.7 AC	720/AC	0.004	0.006	0.01	2
P-3	PARK	14.5 AC	720/AC	0.01	0.02	0.04	2
P-4	PARK	4.3 AC	720/AC	0.003	0.005	0.01	10
	BOATS	1600	50/BOAT	0.08	0.12	0.24	20
			SUBTOTAL	2.27	3.42	6.84	
FUTURE DEVELOP	SF	2244	500	1.12	1.68	3.36	6,15
			SUBTOTAL	3.39	5.10	10.20	
FUTURE GOLF COURSE	PARK	180 AC	720/AC	0.13	0.19	0.38	17
			TOTAL	3.52	5.29	10.58	

Source: M & E Pacific, Inc.

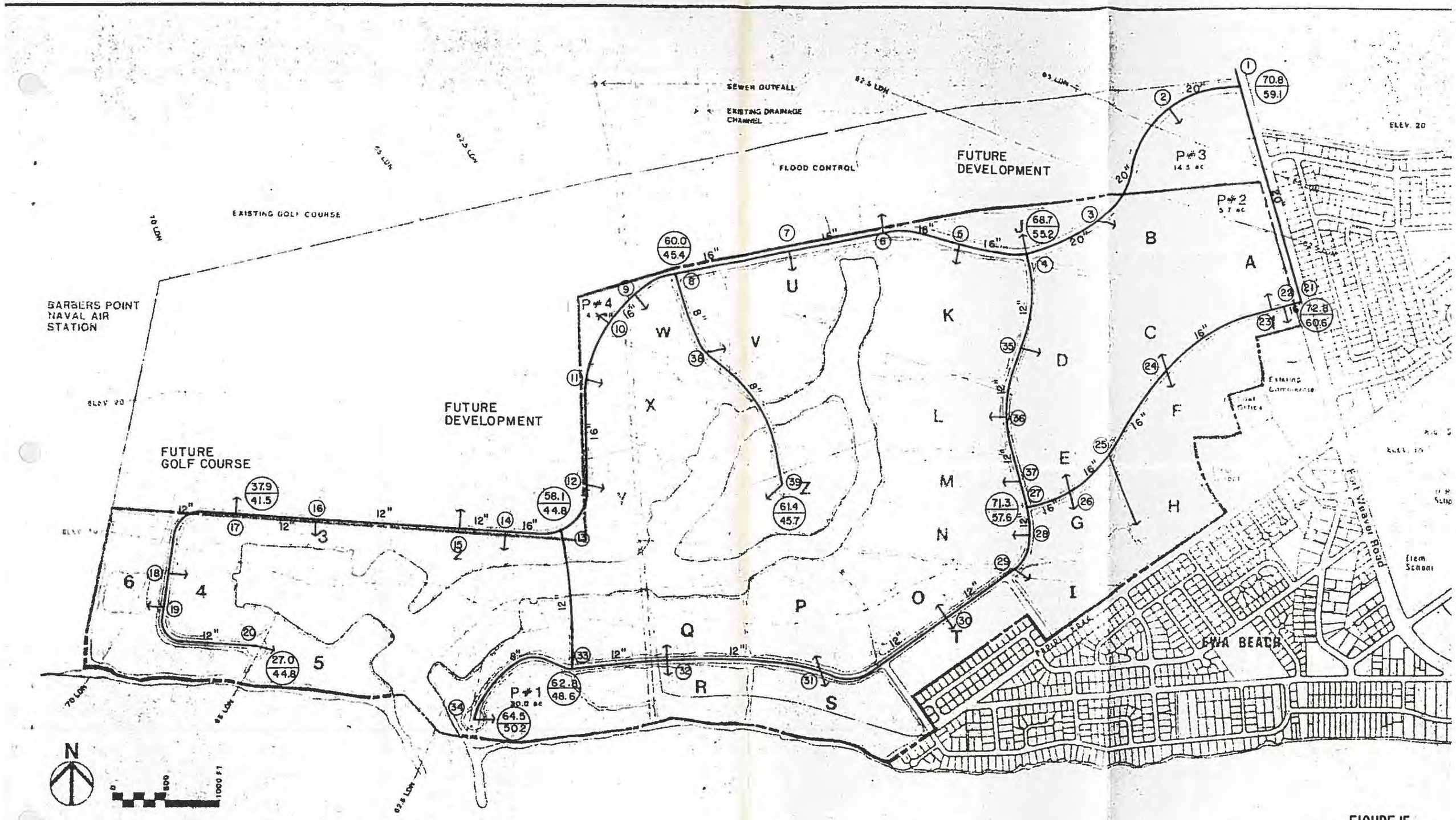


FIGURE 15

EWA MARINA COMMUNIT

WATER MASTER PLA

POTABLE WATER

M&E PACIFIC, INC.

Table 11

Ewa Marina Community
Projected Non-Potable Water Demand

Parcel	Type	No. of Units	Flow/Unit (GPD)	Ave. Daily Demand (MGD)	Peak Flow (MGD)	Point of Draft
J	LD	336	149	0.05	0.10	3
K	LD	440	149	0.07	0.14	4
Q	MD	690	149	0.10	0.20	15
W	LD	121	149	0.02	0.04	5
X	LD	278	149	0.04	0.08	7
Y	MD	552	149	0.08	0.16	8
2	COMM	13 AC	1440/AC	0.02	0.04	10
3	COMM	8 AC	1440/AC	0.01	0.02	11
4	COMM	17 AC	1440/AC	0.02	0.04	12
5	COMM	15 AC	1440/AC	0.02	0.04	14
6	PRESERV.	27.5 AC	4080/AC	0.11	0.22	13
P-1	PARK	30 AC	4080/AC	0.12	0.24	16
P-2	PARK	5.7 AC	4080/AC	0.02	0.04	2
P-3	PARK	14.5 AC	4080/AC	0.06	0.12	2
P-4	PARK	4.3 AC	4080/AC	0.02	0.04	6
		TOTAL		0.76	1.52	

Source: M & E Pacific, Inc.

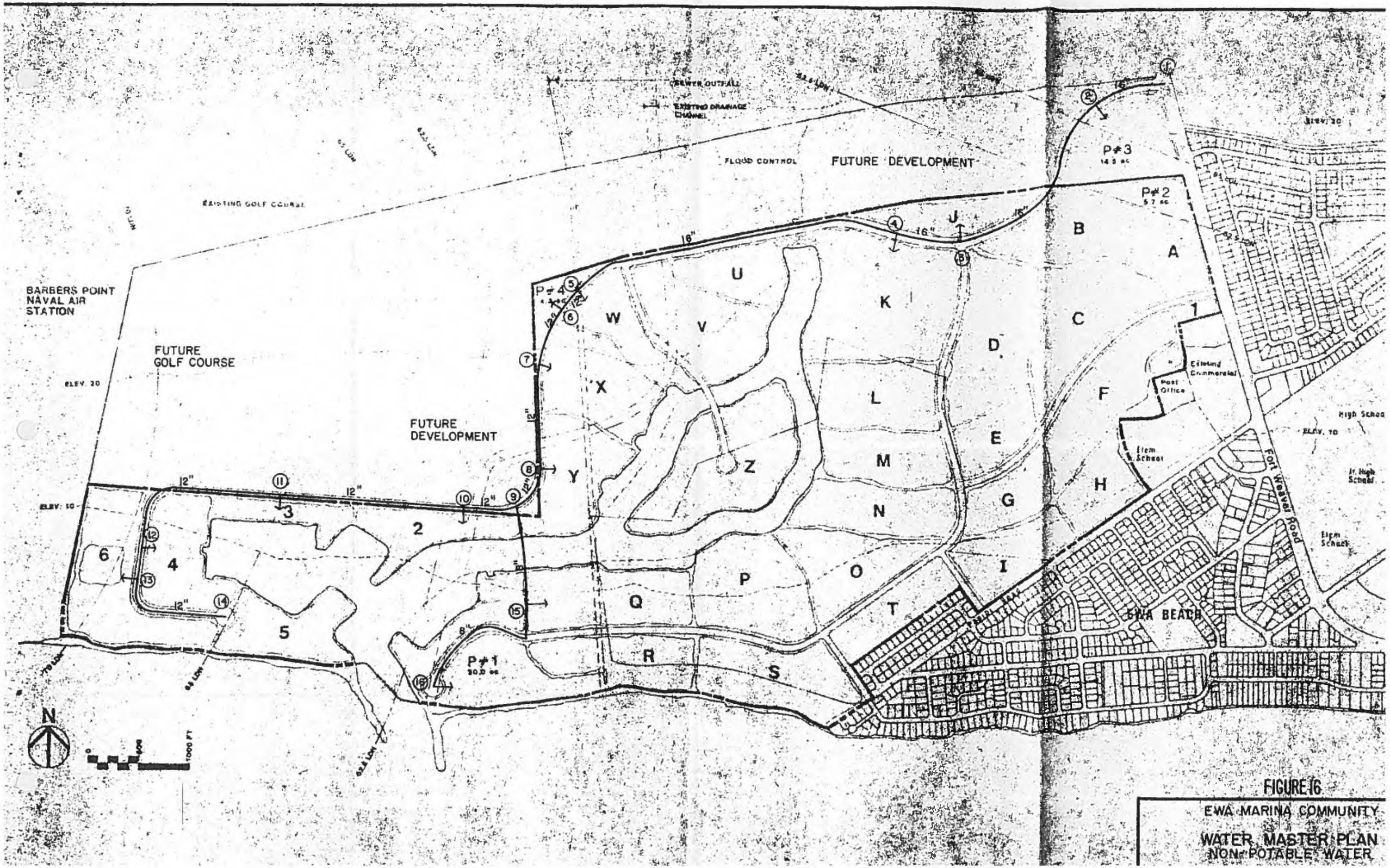


FIGURE 16

EWA MARINA COMMUNITY

WATER MASTER PLAN
NON-POTABLE WATER

APPENDIX L

Board of Water Supply March 6, 1984 letter regarding
Availability of Water

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA
HONOLULU, HAWAII 96843

March 6, 1984

Mr. Tyrone T. Kusao
926 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Kusao:

Subject: Your Verbal Request of March 6, 1984 Regarding the Availability of Water for Ewa Marina

We confirm that our water development program relative to West Beach also applies to Ewa Marina.

As we indicated to the developer of West Beach, the present policy of the City and County of Honolulu, as expressed through its General Plan and Ewa Development Plan, is to develop a secondary urban center in the West Beach-Makakilo-Ewa area. Because of this policy, it is the responsibility of the Honolulu Board of Water Supply to support this effort by insuring that the necessary water facilities to support this secondary urban center are provided. Consequently, our resources and capital improvement program have been directed toward meeting that obligation.

Projected potable water requirements for the total proposed development in the Ewa area (including West Beach) approximates 20 million gallons per day (mgd). However, we propose to reduce this amount substantially through use of a dual water system. In contrast to single systems that provide only potable water, dual systems for Ewa involves the distribution of two grades of water, potable and non-potable. The non-potable water will have higher salinity and total dissolved solids but will not otherwise have adverse health effects. The potable water is provided for drinking, cooking, and cleansing. The non-potable water is provided for irrigation and other non-potable uses. Depending on the degrees of implementation, such a plan can reduce the potable water requirement by half. Use of dual systems will give better assurance that the water needs will be met for the total development.

Ewa is in an agricultural area with supplies of brackish groundwater that is currently being used for cane irrigation. As the agricultural land is converted to urban use, these brackish water supplies should become available for use in a dual water system.

The required potable water can be made available through one or both of the following means:

1. Capture of Waiau spring water.

   The HECO Waiau spring presently leaks approximately 5-8 mgd of potable water into Pearl Harbor. We are providing for means to capture this water and make it available to help meet Ewa's future potable demand.

2. Reduction in export from the basin by imports to Honolulu from Windward sources.

   Presently, approximately 40.0 mgd are exported from the Pearl Harbor Basin to Honolulu. The reductions in export from the Pearl Harbor Basin by imports to Honolulu from Windward sources are contingent on the results from our exploratory well development program. Source potential exists although individual developments tend to be small. Collectively, if the planned sources were to be developed and estimated yields prove correct, excess water, estimated at 10.0 mgd, could be diverted to Honolulu by 1990, which in turn, would allow us to reduce export from the Pearl Harbor basin and to use the water for proposed developments in the basin, including the Ewa, Makakilo, Campbell Industrial areas.

3. Reduction in pumpages to the Waianae-Makaha area with development of wells at Makaha and Waianae.

   The Board plans to develop wells both at Makaha and Waianae with a total potential yield of 6.0 mgd. If successful, the development of the wells would allow the Board to reduce export to these areas and make the water available to the Ewa plain area.

March 6, 1984

We hope this clarifies our plan for providing water service to the Ewa area to meet the goals and objectives of the General Plan and Ewa Development Plan of the City and County of Honolulu.

If you have any questions, please contact Herbert H. Minakami at 527-6183.

Very truly yours,

Leroy G. Rathburn
for KAZU HAYASHIDA
Manager and Chief Engineer

APPENDIX M

Preparation Notice Responses
(November 8 - December 8, 1983)

POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU
1455 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96814 • AREA CODE (808) 943-3111

EILEEN R. ANDERSON
MAYOR

DOUGLAS G. GIBB
CHIEF

WARREN FERREIRA
DEPUTY CHIEF

OUR REFERENCE EC-JS

November 14, 1983

Mr. Walter K. Tagawa
M.S.M. & Associates, Inc.
33 South King Street, Room 410
Honolulu, Hawaii 96813

Dear Mr. Tagawa:

Subject: Preparation Notice for Supplemental Environmental Impact Statements pertaining to Increment I, Ewa Marina Community Project

The Honolulu Police Department will be interested in the progress of this development, especially as it relates to the impact on traffic safety and public services. We would appreciate receiving the supplementary statements as they are developed and will reserve comment until that time.

Sincerely,

DOUGLAS G. GIBB
Chief of Police

By Edwin Ross
EDWIN ROSS
Assistant Chief of Police
Administrative Bureau

G A C I
926 BETHEL STREET HONOLULU, HAWAII 96813 TELEPHONE (808) 533-1725

December 2, 1983 Ref: 05783

Mr. Douglas G. Gibb
Chief of Police
Police Department
City & County of Honolulu
1455 South Beretania Street
Honolulu, Hawaii 96814

Dear Mr. Gibb:

Subject: Preparation Notice for Supplemental Environmental Impact Statements pertaining to Increment I, Ewa Marina Community Project

Pursuant to your November 14, 1983 letter in response to subject project, please be apprised that comments will be welcomed during the public inspection period after the submittal of the Supplemental Environmental Impact Statement.

Your interest and concern in the progress of this project is greatly appreciated.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:it

GEORGE R. ARIYOSHI
GOVERNOR

RECEIVED
NOV 21 1983
GACI, INC.

HIDEO MURAKAMI
COMPTROLLER

MIKE N. TOKUNAGA
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
DIVISION OF PUBLIC WORKS
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO. (P) 1925.3

NOV 18 1983

Mr. Gerald Takano
Group Architects Collaborative, Inc.
926 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Takano:

Subject: Ewa Marina Community Project, Increment I
Preparation Notice for Supplemental
Environmental Impact Statements

We have reviewed the subject preparation notice and would like to be a consulted party in the preparation of the supplemental environmental impact statement.

If there are any questions, please call Mr. Herbert Ishida of the Planning Branch at 548-3921.

Very truly yours,

RIKIO NISHIOKA
State Public Works Engineer

HI:jl

G A C I
926 BETHEL STREET HONOLULU, HAWAII 96813 TELEPHONE (808) 533-1725

December 2, 1983 Ref: 05783

Mr. Rikio Nishioka
State Public Works Engineer
Division of Public Works
Department of Accounting & General Services
State of Hawaii
P. O. Box 115
Honolulu, Hawaii 96810

Dear Mr. Nishioka:

Subject: Ewa Marina Community Project, Increment I
Preparation Notice for Supplemental Environmental
Impact Statements

Pursuant to your November 8, 1983 request to be a consulted party for the subject project, please be apprised that we have contacted Mr. Herbert Ishida in this regards. As such, we have informed Mr. Ishida that the Division of Public Works will be able to directly comment on the specific concerns during the public inspection period of the EIS Supplement.

Thank you very much for your interest on the subject project.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:it

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

EILEEN R. ANDERSON
MAYOR

EMIKO I. KUDO
DIRECTOR

SAM L. CARL
DEPUTY DIRECTOR

OSCAR K. ABANINA
EXECUTIVE ASSISTANT

November 17, 1983

Mr. Gerald Takano
GACI
926 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Takano:

SUBJECT: PREPARATION NOTICE FOR SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
EWA MARINA COMMUNITY PROJECT, INCREMENT I
TMK: 9-1-12

We have reviewed the Preparation Notice for Supplemental Environmental Impact Statements for the Ewa Marina Community Project, Increment I, and offer the following comments.

We have determined that the proposed park site as shown on Plate LU-1 is acceptable. Since the number of dwelling units proposed for development in the 174-acre project area has been established, the planning of the size and configuration of the proposed park site should begin. It is important that the park site meet City and park dedication requirements. Please contact Mr. Jason Yuen of our Advance Planning Section at 527-6315 to discuss the park requirements.

Early approval of the park site will make the planning process of the project easier.

Thank you for the opportunity to comment on the Ewa Marina Community Project.

Sincerely yours,

Emiko I. Kudo

(Mrs.) EMIKO I. KUDO, Director

EIK:vc

G A C I
926 BETHEL STREET HONOLULU, HAWAII 96813 TELEPHONE (808) 533-1725

December 2, 1983 Ref: 05783

Mrs. Emiko I. Kudo
Director
Department of Parks & Recreation
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mrs. Kudo

Subject: Preparation Notice for Supplemental Environmental Impact Statement
Ewa Marina Community Project, Increment I

Thank you very much for your November 17, 1983 confirmation of the acceptance of Increment I's proposed park site and subsequent recommendations to proceed with City and park dedication requirements.

Please be apprised that park requirements and coordination with the Department of Parks & Recreation will be discussed in the EIS Supplement. Concurrently, however, Mr. Jason Yuen will be contacted to clarify park requirement details.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:it

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA
HONOLULU, HAWAII 96843

November 18, 1983

RECEIVED
NOV 23 1983
GACI, INC.

Mr. Gerald Takano
GACI
926 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Takano:

Subject: Your Letter of October 27, 1983, on the Preparation Notice for Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project

Thank you for allowing us to review the environmental assessment for Increment I of the Ewa Marina Community Project.

Although the assessment mentions that the environmental impact statement will address sewage disposal/groundwater impacts and public services/utilities impacts, we suggest that the EIS address the following specific items:

1. The alternative of installing a dual water system to meet the demand for the development.

2. The impact on groundwater from the construction of canals, if applicable.

In addition to the foregoing, the developer will be required to install the necessary off-site water facilities in accordance with the water master plan which Campbell Estate is presently preparing for all the proposed developments on their lands in Ewa.

If you have any questions, please contact Lawrence Whang at 527-6138.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

cc: MSM & Assoc., Inc.

G A C I
926 BETHEL STREET HONOLULU, HAWAII 96813 TELEPHONE (808) 533-1725

December 2, 1983 Ref: 05783

Mr. Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96813

Dear Mr. Hayashida:

Subject: Preparation Notice for Supplemental Environmental Impact Statement pertaining to Increment I, Ewa Marina Community Project

Pursuant to your November 18, 1983 response to subject project, please be apprised that item 1, installation of dual water system will be addressed in the EIS Supplement as an approach under consideration with the Board of Water Supply. Item 2, impact on groundwater from construction of canals, will be addressed when Supplemental EIS is prepared for Increment II of the Ewa Marina Community which encompasses the marina.

It is also understood that the developer will be required to install the necessary off-site water facilities in accordance with Campbell Estates water master plan.

Thank you very much for your interest in the subject project.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:it

University of Hawaii at Manoa

Joint Institute for Marine and Atmospheric Research (JIMAR)
1000 Pope Road • Honolulu, Hawaii 96822
Cable Address: UNIHAW

RECEIVED
NOV 28 1983
GACI, INC.

November 22, 1983

GACI
926 Bethel St.
Honolulu, Hawaii 96813
ATTN: Mr. Gerald Takano

Subject: Supplemental EIS, Ewa Marina Community Project, Increment I

Dear Mr. Takano:

We have reviewed your preparation notice on the subject EIS. We offer comments in two areas:

a) Tsunami hazard - although a small portion of the makai section of the increment is in an evacuation zone, there is no significant hazard to structures in the area. The primary impact would be from residents evacuating the Ewa Beach community, upon a tsunami warning.

b) Noise - I note a "62.5 L_{DN}" line across the mauka corner, which is set aside for a park. "62.5" implies an accuracy which is not feasible in aircraft noise projections of this type, but it is probable that the increment is exposed to a level between 60 and 65 dB. This is considered high for residential areas, by most standards (e.g. the EPA levels document). If these data are from the AICUZ study performed several years ago, it should be reviewed and possibly updated, as it was somewhat contraversial at the time.

Sincerely,

George D. Curtis
JIMAR

GD:vo

cc: Dr. Doak Cox, Environmental Center
Cdr. Jon Carlmark, USN Third Fleet

G A C I
926 BETHEL STREET HONOLULU, HAWAII 96813 TELEPHONE (808) 533-1725

December 2, 1983 Ref: 05783

Mr. George D. Curtis
Joint Institute for Marine
and Atmospheric Research (JIMAR)
1000 Pope Road
Honolulu, Hawaii 96822

Dear Mr. Curtis:

Subject: Preparation Notice for Supplemental Environmental Impact Statements pertaining to Increment I, Ewa Marina Community Project

Thank you very much for your November 22, 1983 response to subject project. Pursuant to your comments on item b, noise, please be apprised that the area within the 62.5 LDN designation of the Navy's AICUZ 1976 study has been set aside specifically for a park to ensure that all residential areas are located well within the 62.5 LDN zone. JIMAR, however, will be able to further comment on the subject during the public inspection period of the EIS Supplement.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:it

HEADQUARTERS
NAVAL BASE PEARL HARBOR
BOX 110
PEARL HARBOR, HAWAII 96860

IN REPLY REFER TO:
002A:QLB:jam
Ser 2387

22 NOV 1983

W1/G1
RECEIVED
NOV 23 1983
GACI, INC.

Mr. Gerald Takano
GACI
926 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Takano:

MSM & Associates, Ltd. Request Regarding
Ocean Channel for Proposed Ewa Marina

Thank you for this opportunity for Naval Base Pearl Harbor and Pacific Division, Naval Facilities Engineering Command (PACNAVFACENGCOM) to further respond to the Ewa Marina Development.

The Navy in the past has mainly voiced objections to development on the Ewa Plain due to the noise effects that military and civilian aircraft have had and will have over the area for many years. However, development compatible with current Naval Air Station, Barbers Point (NAS BARPT) operation is possible if land use and design techniques consistent with the upcoming Barbers Point AICUZ are developed.

The Navy's present concern is with the entrance channel project, based on the littoral process and its resultant effects on Nimitz Beach. This beach, located directly adjacent to the development, is an important military recreational area. Any negative impact on this beach environment will severely affect NAS BARPT personnel. If modifications or increased maintenance of the beach and recreational structures are required, the result could be increased costs to NAS BARPT.

Sincerely,

M. M. DALLAM
CAPTAIN, CEC, U. S. NAVY
FACILITIES ENGINEER
BY DIRECTION OF THE COMMANDER

Copy to:
MSM & Associates, Ltd.

G A C I
926 BETHEL STREET HONOLULU, HAWAII 96813 TELEPHONE (808) 533-1725

November 30, 1983 Ref: 05783

Captain Michael Dallam
CEC, U. S. Navy
Facilities Engineer
Headquarters
Naval Base Pearl Harbor
Box 110
Pearl Harbor, Hawaii 96860

Dear Capt. Dallam:

Subject: Preparation Notice for Supplemental EIS for Increment I, Ewa Marina Community Project, Ewa, Oahu, Hawaii

Pursuant to your November 22, 1983 letter regarding subject project, please be apprised that the Supplemental EIS is for Increment I only, comprising of 174 acres of residential, commercial, and park facilities in the northeast section of the total Ewa Marina Community project and does not cover the marina. The marina issue will be addressed when supplemental EIS is prepared for Increment II of the Ewa Marina Community.

Thank you very much for your interest in the project.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:it

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

WT/GT

RECEIVED
NOV 29 1983
GACI, INC.

EILEEN R. ANDERSON
MAYOR

MICHAEL J. CHUN, PH.D.
DIRECTOR AND CHIEF ENGINEER

MAURICE H. KAYA
DEPUTY DIRECTOR

ENV 83-398

November 22, 1983

Mr. Gerald Takano
GACI
926 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Takano:

Re: Preparation Notice for Supplemental EIS for Increment I, Ewa Marina Community Project, Ewa, Oahu, Hawaii

In response to M.S.M. & Associates, Inc.'s letter of October 27, 1983, we request that the following information be discussed in the subject supplemental EIS.

1. The proposed sewer system that will be utilized to convey sewage generated from the project area to the Honouliuli WWTP. For your information, the Ewa Beach sewer system was not designed to accommodate flows from the project area.

2. The proposed drainage system to be constructed for Increment I including major drains proposed to handle the runoff from the entire project area. A drainage master plan should be submitted to the Drainage Section, Division of Engineering, for approval.

Me ke aloha pumehana,

Michael J. Chun

MICHAEL J. CHUN
Director and Chief Engineer

cc: Division of Engineering
Division of Wastewater Management

G A C I
926 BETHEL STREET HONOLULU, HAWAII 96813 TELEPHONE (808) 533-1725

December 7, 1983 Ref: 05783

Mr. Michael J. Chun
Director & Chief Engineer
Department of Public Works
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Chun:

Subject: Preparation Notice for Supplemental EIS for Increment I, Ewa Marina Community Project, Ewa, Oahu, Hawaii

Pursuant to your November 22, 1983 response to subject project, please be apprised that on May 26, 1983 confirmation was obtained on the Ewa Interceptors Sewer capability to handle approximately 180 acres of R-6 zoned properties of total Ewa Marina Community project in area southwest of Increment I. (See attachment) Subsequently, the Wastewater Management Division, Department of Public Works, has determined that wastewater disposal for Increment I was possible if the sewage was discharged into the 24 inch existing interceptor along Pohakupuna Road providing discharge does not exceed .49 MGD.

As such, a new master plan for Increment I and the entire Phase I (730.5 acres) will be submitted to supersede previous May 26, 1983 letter. In addition, a drainage master plan for Increment I is anticipated for submittal to the Drainage Section, Division of Engineering.

Thank you very much for your interest in the project.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:it

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

PROJECT OFFICES

WAIMEA OFFICE
P. O. BOX 125
KAMUELA, HAWAII 96743

KEAUKAHA OFFICE
P. O. BOX 833
HILO, HAWAII 96720

RECEIVED
NOV 28 1983
GACI, INC.

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

PROJECT OFFICES

MAUI OFFICE
P. O. BOX 22
KAHULUI, MAUI 96732

MOLOKAI OFFICE
P. O. BOX 198
HOOLEHUA, MOLOKAI 96729

KAUAI OFFICE
P. O. BOX 332
LIHUE, KAUAI 96766

November 23, 1983

Mr. Gerald Takano
GACI
926 Bethel Street
Honolulu, HI 96813

SUBJECT: Ewa Marina Community Project
Supplemental EIS Preparation Notice

Reference is made to your letter of October 27, 1983 requesting comments on the subject project.

The Department of Hawaiian Home Lands has reviewed the Supplemental EIS Preparation Notice and has no comments to offer at this time as the proposed project does not affect our lands.

Thank you for affording us the opportunity to respond to the EIS.

Sincerely yours,

Melvyn S. Jones
for Georgiana K. Padeken
Chairman

GKP:RF:GW:jk

file

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
AIRPORTS DIVISION
HONOLULU INTERNATIONAL AIRPORT • HONOLULU, HAWAII 96819

DIRECTOR
WAYNE J. YAMASAKI
DEPUTY DIRECTORS
ADAM VINCENT
JONATHAN K. SHIMADA, Ph.D.
CHERYL D. SOON

IN REPLY REFER TO:

November 25, 1983

AIR-EP
83.2958

Mr. Gerald Takano
GACI
926 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Takano:

Subject: Preparation Notice for Supplemental Environmental Impact Statements Pertainint to Increment I, Ewa Marina Community Project

Please be advised that we have forwarded our comments to our Statewide Transportation Planning Office for comment consolidation and submittal to you.

Thank you for the opportunity to comment on this matter.

Very truly yours,

OWEN MIYAMOTO
Airports Administrator

EWA NEIGHBORHOOD BOARD NO. 23
91-784 Makule Road
Ewa Beach, Hawaii 96706

RECEIVED
NOV 30 1983
GACI, INC.

November 28, 1983

GACI
926 Bethel Street
Honolulu, HI 96813

Attention: Mr. Gerald Takano

Gentlemen:

Re: Preparation Notice for Supplemental Environmental Impact Statements Pertaining to Increment I, Ewa Marina Community Project

Reference is made to correspondence dated October 27, 1983 from M.S.M. and Associates, Inc., regarding a preparation notice for Supplemental Environmental Impact Statements pertaining to Increment I of the Ewa Marina Community Project.

The preparation notice was a topic of discussion at the November 10, 1983 meeting of the Ewa Neighborhood Board #23. The Board voted to recommend that the Department of Education be consulted regarding the potential impact of this development upon the public education system. The projected increase in the number of public school students created by this development should be carefully correlated with the expansion of present schools or in the development of new schools.

Thank you for allowing us to offer our comments regarding this matter.

Very truly yours,

Paul T. Oshiro
Chairman
Ewa Neighborhood Board #23

PTO:bn

cc: Neighborhood Commission
Patsy T. Mink

G A C I
926 BETHEL STREET HONOLULU, HAWAII 96813 TELEPHONE (808) 533-1725

November 30, 1983 Ref: 05783

Mr. Paul T. Oshiro
Chairman
Ewa Neighborhood Board #23
91-784 Makule Road
Ewa Beach, Hawaii 96706

Dear Mr. Oshiro:

Subject: Preparation Notice for Supplemental Environmental Impact Statements Pertaining to Increment I, Ewa Marina Community Project

Pursuant to your November 28, 1983 recommendation on the potential impact of subject Increment I on the public education system, please be apprised that the Dept. of Education did report to the Department of General Planning that adequate facilities are available for projected student enrollment generated by the total Ewa Marina project, including Increment I. The Department of Education, however, will be able to directly comment on the subject during the public inspection period of the EIS Supplement.

Thank you for your comments on the subject project.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:it

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813
PHONE 523-4181

EILEEN R. ANDERSON
MAYOR

JOSEPH K. CONANT
DIRECTOR

CHARLES K. TORIGOE
DEPUTY DIRECTOR

November 29, 1983

Mr. Gerald Takano
GACI
926 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Takano:

Subject: Preparation Notice of Supplemental Environmental Impact Statement - Ewa Marina Community Project, Increment I

We have reviewed the subject notice and are pleased that the developer will be providing 10% of the units for low- and moderate-income families. However, we request that the EIS address the following:

1. Definition of "low- and moderate-income housing." These units must be affordable to families earning an average of 80% of the median income.

2. Clarification of where the units will be located, what type of units (apartment or single family) and size (studio, one-bedroom, two-bedroom, etc.) of the units to be provided.

Thank you for informing us of your proposal. We look forward to receiving a copy of the draft EIS.

Sincerely,

JOSEPH K. CONANT

cc: MSM & Associates, Inc.

G A C I
926 BETHEL STREET HONOLULU, HAWAII 96813 TELEPHONE (808) 533-1725

December 8, 1983 Ref: 05783

Mr. Joseph Conant
Department of Housing &
Community Development
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Conant:

Subject: Preparation Notice of Supplemental Environmental Impact Statement, Ewa Marina Community Project, Increment I

Pursuant to your November 29, 1983 letter regarding subject project, please be apprised that "low and moderate income housing" will as prescribed by City & County of Honolulu guidelines and definitions. Any options of provisions for the 10% of units for low and moderate income families, however, will be exercised. In addition, the specific types of units and locations will be detailed subsequent to the subject Supplemental EIS for Increment I.

Thank you very much for your interest in the project.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:it

GEORGE R. ARIYOSHI
GOVERNOR

JACK K. SUWA
CHAIRMAN, BOARD OF AGRICULTURE

SUZANNE D. PETERSON
DEPUTY TO THE CHAIRMAN

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 So. King Street
Honolulu, Hawaii 96814

Mailing Address:
P. O. Box 22159
Honolulu, Hawaii 96822

November 30. 1983

RECEIVED
DEC 2 1983
GACI, INC.

Mr. Gerald Takano
GACI
926 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Takano:

Preparation Notice for Supplemental Environmental Impact Statements Pertaining to Increment I, Ewa Marina Community Project
TMK: 9-1-12: Portion of 5 - 174.7 acres

The Department of Agriculture has reviewed the subject preparation notice and offers the following comments.

According to the application, Increment I consists of 174.7 acres and represents the first phase of development of the total Ewa Marina Community project. The project site is on the easternmost portion of the total proposed project area and abuts Ewa Beach town.

The entire Increment I site is presently in sugarcane cultivation and the lands to the north and west are also devoted to cane cultivation.

The subject property is classified as "Other Important Agricultural Land" according to the Agricultural Lands of Importance to the State of Hawaii (ALISH) system. The Soil Conservation Service Soil Survey identifies the soils as: (1) Fill land (Fd) which is nearly level, (2) Ewa silty clay loam, moderately shallow (EmA) with 0 to 2 percent slopes which is used for sugarcane, truck crops, and pasture, (3) Ewa silty clay loam, moderately shallow (EmB) with 2 to 6 percent slopes which is used for sugarcane, truck crops, and pasture, and, (4) Mamala stony silty clay loam (MnC) with 0 to 12 percent slopes which is used for sugarcane, truck crops, and pasture. EmA, EmB, and MnC soils have crop capability classifications of IIs, IIe, and IIIs, respectively (soils with moderate to severe erosion or excess water problems).

The subject property has Land Study Bureau Overall Productivity Ratings of "B77i" and "C72i". By this method of classification, the property has fair to very good productivity potential for most agricultural uses.

On November 15, 1983, we commented on a petition for an amendment to the State Land Use Agricultural District Boundary for the 181 acre area to the west of the subject property (see attached Memorandum to the Department of Planning and Economic Development, Docket No. A83-558). We noted that Oahu Sugar Company recently reviewed all its cultivated lands to identify those to be kept or phased out of sugar production, on the basis of relative operating costs for irrigation water pumpage, yield potential, and other factors. Most of the Ewa Marina Community project area, including the subject 174.7 acre site, are among the lands to be kept in production.

We concluded that Oahu Sugar Company should be allowed to continue cultivation on the lands within the project area until such time as the land is actually needed for development. We believe that the company should be permitted to continue cultivation in the area surrounding the subject property.

Other issues that should be addressed in the supplemental EIS are the impacts of the subject development upon land productivity, agricultural production, and competition for use of water resources in the region. Specific losses to Oahu Sugar Company in terms of income, employment, and other agricultural factors should be discussed. Explanation should be offered as to why a productive area of the plantation is being developed first, rather than a site closer to the shoreline which is not in sugarcane.

Thank you for the opportunity to comment.

Sincerely,

Jack K. Suwa

JACK K. SUWA
Chairman, Board of Agriculture

Attachment

G A C I
926 BETHEL STREET HONOLULU, HAWAII 96813 TELEPHONE (808) 533-1725

December 7, 1983 Ref: 05783

Mr. Jack K. Suwa
Chairman
Board of Agriculture
Department of Agriculture
1428 South King Street
Honolulu, Hawaii 96814

Dear Mr. Suwa:

Subject: Preparation Notice for Supplemental Environmental Impact Statements Pertaining to Increment I, Ewa Marina Community Project.

Pursuant to your November 30, 1983 letter regarding subject project, please be apprised that the Supplemental EIS for Increment I addresses specific concerns as identified by the Department of Land Utilization, City & County of Honolulu on October 17, 1983.

Other issues such as those presented by the Department of Agriculture, however, will be considered during the public inspection period of the EIS Supplement for Increment I.

Thank you very much for your interest in the subject project.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:it

DEPARTMENT OF GENERAL PLANNING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

EILEEN R. ANDERSON
MAYOR

WILLARD T. CHOW
CHIEF PLANNING OFFICER

RALPH PORTMORE
DEPUTY CHIEF PLANNING OFFICER

November 30, 1983

Mr. Walter K. Tagawa, President
M.S.M. & Associates, Inc.
33 South King Street, Room 410
Honolulu, Hawaii 96813

Dear Mr. Tagawa:

Ewa Marina Community Project, Increment I
Preparation Notice for Supplemental EIS

Items of interest to us are as follows.

1. The relationship of the project to existing and proposed land use plans for the area, e.g., State Land Use Classification, and the City's General Plan, Development Plan, Zoning, etc.

2. The type, timing and costs of additional public services and facilities required to support the project.

3. Description of the surrounding communities and how the proposed project will relate to this setting.

Otherwise, we feel the preparation notice adequately identifies the various environmental concerns on a broad basis. Discussion of the concerns, with the inclusion of information from other detailed studies, should provide an adequate basis for the evaluation of the EIS.

Sincerely,

Ralph Kawamoto

RALPH KAWAMOTO
Planner

APPROVED:

W. T. Chow

WILLARD T. CHOW

cc: Mr. Gerald Takano, GACI

G A C I
926 BETHEL STREET HONOLULU, HAWAII 96813 TELEPHONE (808) 533-1725

December 7, 1983 Ref: 05783

Mr. Ralph Kawamoto
Department of General Planning
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Kawamoto:

Subject: Preparation Notice for Supplemental EIS for Increment I, Ewa Marina Community Project, Ewa, Oahu, Hawaii

Pursuant to your November 30, 1983 letter regarding subject project, please be apprised that the Supplemental EIS for Increment I addresses specific concerns as identified by the Department of Land Utilization, City & County of Honolulu on October 17, 1983. Additional information related to item 1 of your concerns, however, can be obtained from the Petition for Boundary Amendment for Agricultural to Urban, as presented to the Land Use Commission, October 7, 1983. Detailed information on items 2 and 3 will be developed as the project progresses.

Thank you very much for your interest in the project.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:it

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FT. SHAFTER, HAWAII 96858

November 30, 1983

GT/WT
RECEIVED
DEC 6 1983
GACI, INC.

Mr. Gerald Takano
GACI
926 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Takano:

Thank you for the opportunity to review and comment on the preparation notice for a State of Hawaii supplemental EIS for Increment I, Ewa Marina Community Project. The following comments are offered:

a. We have received an application for a Department of the Army permit. The processing of the application has been suspended pending receipt of information from the applicant for the preparation of a Federal EIS.

b. The site of the proposed community development is designated Zone D, or area of undetermined but possible flood hazards, according to the Flood Insurance Study for Oahu prepared by the Federal Insurance Administration (FIA). Under the FIA flood study, flood-prone areas have not been identified for these areas. See enclosure 1 for the project site relative to the coastal flood plain areas which are subject to tsunami inundation.

Sincerely,

Clarence S. Fujii
Acting Chief, Engineering Division

Enclosure

G A C I
926 BETHEL STREET HONOLULU, HAWAII 96813 TELEPHONE (808) 533-1725

December 7, 1983 Ref: 05783

Mr. Clarence S. Fujii
Acting Chief, Engineering Division
Department of Army
Pacific Ocean Division,
Corps of Engineers
Ft. Shafter, Hawaii 96858

Dear Mr. Fujii:

Subject: Preparation Notice for Supplemental Environmental Impact Statements Pertaining to Increment I, Ewa Marina Community Project

Pursuant to your November 30, 1983 letter regarding subject project, please be apprised that the issue of flood prone areas will be further addressed when a supplemental EIS is prepared for Increment II of the Ewa Marina Community. The Supplemental EIS for Increment I addresses other specific issues identified by the Department of Land Utilization, City & County of Honolulu on October 17, 1983.

Thank you very much for your interest in this project.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:it

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HAWAII 96801

CHARLES G. CLARK
DIRECTOR OF HEALTH

In reply, please refer to:
EPHSD-SS

December 6, 1983

Mr. Gerald Takano
GACI
926 Bethel St.
Honolulu, Hawaii 96813

Dear Mr. Takano:

Subject: Request for Comments on Proposed Supplemental Environmental Impact Statement (EIS) for Increment I, Ewa Marina Community Project

Thank you for allowing us to review and comment on the subject proposed supplemental EIS. We have commented previously on the final EIS and have no additional comments to make at this time.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

Sincerely,

For MELVIN K. KOIZUMI
Deputy Director for
Environmental Health

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P.O. BOX 50167
HONOLULU, HAWAII 96850

IN REPLY REFER TO:
ES
Room 6307

RECEIVED
DEC 6 1983
GACI, INC.

DEC 5 1983

Mr. Walter K. Tagawa
M.S.M. and Associates, Inc.
33 South King Street, Room 410
Honolulu, Hawaii 96813

Dear Mr. Tagawa:

The Service has reviewed the Preparation Notice for the Supplemental Environmental Impact Statement pertaining to Increment I, Ewa Marina Community Project, which was forwarded to us with your letter of October 27, 1983. We are concerned about the cumulative effects of the subdivision and marina development on the coastal marine environment as expressed in our letters of March 18, 1980 and July 9, 1980 (Copies enclosed). The comments and concerns of our previous correspondence were not adequately covered in the previous "generic" EIS for the Ewa Marina. Our comments remain valid and need to be addressed in this EIS.

Specifically, the EIS should discuss plants, animals and habitat resources, such as wetlands and sinkholes, present within or adjacent to the project area. Discussion should be expanded to address the primary and secondary effects of:

1. Urban drainage in regard to nutrient enrichment, sedimentation and toxic substances on adjacent coastal water systems.

2. The development of the water supply system on upper watershed areas. Potential water sources need to be identified. If surface water diversion is being considered, the impacts this will have on stream flow and associated fauna should also be discussed.

3. Soil erosion and sedimentation on water resources. The location of sediment berms and basins should be specified in the EIS. We recommend that water, rather than chemicals or petroleum products, be used for dust control.

We appreciate this opportunity to comment.

Sincerely,

Original signed by

William R. Kramer
Acting Project Leader
Office of Environmental Services

Enclosures (2)

cc: GACI, DLU, OEQC, NMFS-WPPO, HDAR, HDF&W

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

ES
Room 6307

March 18, 1980

TRK 3-18

Mr. Richard Senelly
Urban 9
926 Bethel Street
Honolulu, Hawaii 96813

Re: EIS Preparation Notice,
Ewa Marina Community
Project, Ewa, Oahu, HI

Dear Mr. Senelly:

We have reviewed the referenced environmental impact statement preparation notice dated February 27, 1980. The accompanying project description was too brief for us to give specific responses, hence we are providing you with some of our general concerns for the protection of fish and wildlife resources. When these concerns are addressed in the EIS, we will be able to evaluate project impacts in greater detail.

The U.S. Fish and Wildlife Service is generally concerned about the welfare of all fish and wildlife resources and their habitat. With reference to the proposed project, we suggest that you address the following issues and subjects in your EIS.

A survey of the project area should include description of existing upland, wetland, and marine fauna and flora. Special attention should be given to waterbird and endangered species on the fastland, and with the extensive developments proposed on the coast, a nearshore marine survey should be conducted.

Impacts on the existing resource need to be addressed for the terrestrial, freshwater and marine ecosystems.

Terrestrial considerations should discuss the displacement or elimination of species through the replacement of vegetated tracts with developed urban properties. Obviously, many plants and animals will be impacted directly by habitat destruction, but others will be impacted secondarily by construction and urban dirt, noise, and physical proximity.

Water supply needs, solid waste and sewage disposal, residential development and water diversions will affect the surface and groundwater systems, and their impacts must be thoroughly considered. Ideally, the developer should ensure that water leaving the project site is as nearly possible the same quality, volume, and rate of flow as that which prevailed before the development.

Soil disturbances are unavoidable with any construction activity. We believe that the impacts resulting from these disturbances can be minimized by preventing eroding soil losses through prompt revegetation and soil stabilization, the use of soil catchment systems during and after construction, and by limiting disturbed worksites to the smallest areas practicable.

Marinas, docks, piers, and other recreational facilities along the shoreline pose threats to vital habitat areas, water circulation, and water quality. The excavation of canals and boat basins in terrestrial areas is a questionable activity to us for a variety of reasons. These include problems such as accelerated runoff, disruption of natural food chains by creating "sinks" for nutrients and dense saline waters, and the creation of still water areas which become traps for silt and organic ooze which turn anaerobic. These all degrade benthic and water quality. Extensive dredging activities for fill or navigational purposes will degrade coral reef habitat and other submerged vital areas.

We suggest therefore any marina facilities be in well-flushed water areas, and that any structures extending into water areas be on elevated pilings rather than solid fill. Dredging should be performed only where absolutely necessary, and then, spoils should be disposed of in contained upland sites or deep water rather than in wetland areas.

To protect coastal waters from sedimentation, toxic pollution and increased nutrient loads, the development plans for central sewage systems should ensure that no leaching occurs through groundwater systems, and that outfall placement is adequate to provide rapid dispersion and dilution.

You have also suggested that some beach park development will be taking place. This is encouraging, because we believe that facilitation of public entry to shoreline areas should be addressed in the early planning process.

Thank you for the opportunity to comment on this EIS Preparation Notice.

Sincerely yours,

Original Signed by
Maurice H. Taylor

Maurice H. Taylor
Field Supervisor
Division of Ecological Services

cc: DLU, OEQC, NMFS, HDF&G
TRH:kjc:3/17/80

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P.O. BOX 50167
HONOLULU, HAWAII 96850

IN REPLY REFER TO:
ES
Room 6307

July 9, 1980

Office of Environmental Quality Control
Office of the Governor
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Re: Ewa Marina Community DEIS
Honouliuli, Ewa, Oahu

Dear Sir:

We have reviewed the subject DEIS and have the following comments to offer:

General Comments

The materials and conclusions regarding project impacts on fish and wildlife values appear to lack depth and be highly subjective. Based on our review of fieldwork in the area, it appears that the terrestrial regime is not unique, however, marine communities are another issue.

Being familiar with nearshore areas of Hawaii, we believe that the brief fish surveys conducted to date are inadequate to assess potential impacts of the project. Projects of a similar nature such as the boat basin at Hawaii Kai, and numerous marinas in Florida have had significant long-term impacts on the surrounding marine environment.

Based on reconnaissance surveys in the Ewa Beach area, we have observed that coral cover is slight, however, large mats of marine algae provide suitable rearing areas for fish and invertebrates. We do not think that visual observations of 100 fish is a statistically significant sample size or method to compute biomass for the areas. We suggest that the developer coordinate additional studies with this office or Hawaii Division of Fish and Game.

The project plans seem to be no further along than during the EIS preparation notice phase. Material provided for review was conceptual

in nature and could apply to development anywhere. It is difficult to assess potential impacts of the project without sufficient design detail. For example, the sewer outfall siphon under the marina is of concern to environmentalists as well as state engineers and should be reviewed by both groups. However, methodologies of dredging the marina, developmental plans after its construction and contingency plans to assure maintenance of water quality are not presented here for review. This could result in possible complications at a later date when permits are reviewed and methodologies or structures may be unsuitable.

The presentation of several matrices giving the planner's opinion of total project impact is hardly conclusive. We disagree with several of the values assigned in environmental categories and suspect that other values listed can be changed to make one alternative or another seem relatively attractive. We suggest that a session with concerned governmental planners and perhaps a public meeting may be appropriate to define problems and put them in perspective with the proposed project.

Specific Comments

Page 36, Paragraph 2. If the jetties will cause sand accumulations at Oneula Park, will they also cause erosion at Barbers Point?

Page 36, Paragraph 3. The statement comparing the relative value of the existing environment to wildlife to that of a highly urbanized area is highly subjective. The coastal strand and other habitat edges in the project area are valuable to local species and proposed mitigation may be inadequate.

Page 37, Paragraph 5. The DEIS states that the aquifer under the project lands is not going to be developed for a water supply. If this changes in the future, will marina dredging cause salt water intrusion?

Page 38, Paragraphs 3 and 4. The jetties will provide new habitat for marine species. The statement that fish productivity will increase and that rocky substrate will mitigate natural habitat losses is speculative and misleading. We don't agree that the marina, jetty or dredged entrance channel will decrease turbidity or increase primary productivity, in fact the opposite usually occurs (e.g. Hawaii Kai, Ala Moana Park Lagoon).

Page 38, Paragraph 6. What type of artificial recirculation is proposed if turnover is inadequate? Will this be an afterthought or part of a water quality contingency plan?

Page 49, Table 1-11. When we view the "cumulative benefits" of the proposed and alternative plans for development, they all appear to fall into the adverse category. If this is the case, how can the project be justified? This is one table where cumulative values provide insight.

In the other "detailed" alternative matrices cumulative values have little meaning if one factor biases the grouping. For example (in Table 1-2) if dredging a channel and building a jetty destroy local habitat, other lesser perturbances such as boat slips, material deposition and parking lot use can't mitigate or average the impacts caused by dredging and fill operations.

Page 74, Paragraph 2. We believe that the studies conducted should be placed in an appendix to the EIS. As a minimum, studies should be referenced so they can be identified and located.

Page 76, Paragraph 6. We don't agree that the lack of live coral cover necessarily makes the nearshore "an ecologically depressed environment". As previously mentioned, marine algae found in the area may provide valuable habitat.

Page 77, Paragraph 3. Identify the study and provide details.

Page 77, Paragraph 5. A sample size of 100 fish is hardly significant. Crop densities presented with Hawaii Department of Fish and Game studies (Reference?) are misleading.

Page 83, Paragraph 2. Regarding the discussion on longshore transport, the verbal description doesn't appear to be consistent with the contour map in Figure II-5. Have any studies shown that western movement of sand is non-existent or insignificant? If so, what are the details of such studies?

Page 84, Paragraph 1. Earlier, the EIS alluded to possible beach formation and the creation of new surf zones caused by jetty placement. How will these cumulative changes effect wave refraction and subsequent sand transport? If sand movement is onshore and offshore rather than lateral, will there be a constant dredging problem in the marina and entrance channel caused by sand movement?

Page 124, Paragraph 1. On page 5 under the title "Proposed Project: Its Need and Purpose", the statement is made that "...construction of the proposed marina can alleviate the current and anticipated (boat slip) shortage". However, the plan under Marina Description states that 80 percent of the marina will be for the project community residents. We fail to see how this project will alleviate the public's need for dockage in leeward Oahu.

Page 124, Paragraph 4. Is it anticipated that the boat launching sites are truly public, or are they privately managed with public use on a fee basis?

Page 126, Jetty Sections. The typical sections of the entrance channel jetties show a dredged coral core. We would like more information on the suitability of coral for such purpose, and an explanation of containment of coral particles by the armor stone.

Page 131, Paragraph 5. Clark (1977) [1] cites that water replacement times for marinas in the two to four day range are acceptable for maintaining water quality. Ten days or more for replacement is clearly unacceptable. What design or operational alternatives are being explored to reduce the turnover time in upper reaches of the marina? Are dead end channels really necessary for overall project success?

Page 133, Paragraph 2. If the Kalio Gulch is going to present a known water quality problem with occasional flooding, wouldn't a reasonable item of mitigation be to divert the flow to an area outside the marina? If the marina is polluted occasionally by floodwaters, what is the anticipated recovery time for aquatic life therein?

Page 140, Paragraph 4. We don't believe turbidity will decrease in the project area as a result of channel dredging or jetty placement.

Page 142, Paragraph 9. If erosion along channel walls is anticipated, why isn't bank stabilization done during the construction phase?

Additional Comments

To further aid the planner and developer in mitigating project impacts, we recommend the following be considered:

1. The entire perimeter of the marina should have a buffer strip of natural vegetation at least 50 feet wide, to prevent soils and pollutants from entering the marina.

2. The storm water collection system for the proposed development should divert flows to a location(s) outside the marina. This measure will reduce pollutants (fertilizer, petroleum products, paving leachates, silt, etc.) from entering confined marina waters.

3. The project should be constructed in manageable segments so that disturbed areas are minimal in size. They must be stabilized with vegetation immediately following building activity. Temporary silt catchment basins during the construction phase should be used. These measures will prevent excessive sheet erosion and subsequent silting of the marina and nearshore marine waters.

4. Any over-the-water facilities should require such location for operation.

---

1. Clark, John R. 1977. Coastal Ecosystem Management. A Technical Manual for the Conservation of Coastal Zone Resources. Wiley-Interscience. 928 p.

5. Piling-supported docks, floating docks and mooring systems are preferred over solid fill dockage. These measures should allow better circulation, however, extensive dockage areas of any type will reduce wind-induced mixing of marina waters.

6. Materials used in dock construction should not be treated with anti-fouling chemicals, and concrete pilings and posts should be fully cured prior to installation.

7. Haul-out and dry land storage facilities should be explored as an alternative to extensive marina construction.

8. Live-aboard facilities and privileges should not be permitted except for transient boaters.

9. Public access to the marina should be incorporated into a detailed plan for the project. Access should include launching sites for trailerable boats, sufficient parking spaces and developed recreation areas (picnic facilities, restrooms, fishing docks, etc.)

10. Activities in the marina significantly impacting water quality in the marina and surrounding marine waters should be responsive to remedial requirements by public authorities.

11. Dredging materials from the entrance channel of the marina should be stored or used on contained terrestrial areas or disposed of at an approved deepwater site. If studies can show that coral fill will not have a local long-term adverse impact on water quality, such material could be used in jetty construction.

12. Additional studies should be conducted and include comprehensive nearshore physical and biological surveys, modeling studies of sand transport and water turn-over rates to determine the least environmentally damaging project design.

Please contact us if we can be of further assistance in this matter.

Sincerely yours,

Nevin D. Holmberg

Nevin D. Holmberg
Deputy Project Leader
for Ecological Services

cc: ARD-E
HDF&G
NMFS
EPA, San Francisco
USACE

G A C I
926 BETHEL STREET HONOLULU, HAWAII 96813 TELEPHONE (808) 533-1725

December 7, 1983 Ref: 05783

Mr. William R. Kramer
Acting Project Leader
Office of Environmental Services
U.S. Department of Interior
Fish & Wildlife Service
300 Ala Moana Boulevard
P. O. Box 50167
Honolulu, Hawaii 96850

Dear Mr. Kramer:

Subject: Preparation Notice for Supplemental Environmental Impact Statements Pertaining to Increment I, Ewa Marina Community Project

Pursuant to your December 5, 1983 letter regarding subject project, please be apprised that the Supplemental EIS is for Increment I only comprising of 174 acres of residential, commercial, and park facilities in the northeast section of the total Ewa Marina Project adjacent to the existing Ewa Beach Community. Your concerns relative to the Marina will be addressed when Supplement EIS is prepared for Increment II of the Project Community.

Thank you very much for you interest in the project.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:it

University of Hawaii at Manoa

Water Resources Research Center
Holmes Hall 283 • 2540 Dole Street
Honolulu, Hawaii 96822

6 December 1983

Mr. Gerald Takano
GACI
926 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Takano:

SUBJECT: Preparation Notice for Supplemental Environmental Impact Statements Pertaining to Increment I, Ewa Marina Community Project; MSM and Associates; November 1983

We have reviewed the subject preparation notice and offer the following comments:

1. Owing to the relatively flat terrain, there is a potential flood hazard. This will be substantially increased upon urbanization because of reduced infiltrative surfaces attributable to buildings and pavement. In addition, soils brought in to cover the existing highly permeable coral surface can substantially reduce infiltration.

2. With respect to the proposed marina in the remaining portion of the project, it is illogical that on a land-short island, water surface be created from useable well-drained dry land. How many more housing units can be built in the area proposed for the marina? This issue was brought up in the original EIS review.

Thank you for the opportunity to comment. This material was reviewed by WRRC personnel.

Sincerely,

Edwin T. Murabayashi

Edwin T. Murabayashi
EIS Coordinator

ETM:jm

G A C I
926 BETHEL STREET HONOLULU, HAWAII 96813 TELEPHONE (808) 533-1725

December 19, 1983 Ref: 05683

Edwin T. Murabayashi
EIS Coordinator
Water Resources Research Center
University of Hawaii at Manoa
Holmes Hall 283
2540 Dole Street
Honolulu, Hawaii 96822

Subject: Preparation Notice for Supplemental Environmental Impact Statements Pertaining to Increment I, Ewa Marina Community Project

Dear Mr. Murabayashi:

Thank you very much for your December 6, 1983 response to subject project. Although you letter was received after the Supplemental EIS was submitted to appropriate agencies, please be apprised that the proposed disposal of water is through the use of canal-like channels (open or covered) to absorb flows and drain water to the existing drainage channel with ultimate future connection to the proposed Marina.

As per Item 2 of your December 6, 1983 letter, the proposed Marina and subsequent impacts will be addressed in a Supplemental EIS specifically for Increment II.

Please feel free to comment further during the public review period of the Supplemental Environmental Impact Statement for Increment I.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:jw

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU
HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

EILEEN R. ANDERSON
MAYOR

ANDREW I.T. CHANG
MANAGING DIRECTOR

WILLIAM A. BONNET
DIRECTOR

DAIL RHEE
DEPUTY DIRECTOR

RECEIVED
DEC 8 1983
GACI, INC.

December 5, 1983 TE 11/83-4534

Mr. Gerald Takano
GACI
926 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Takano:

Subject: Preparation Notice for Supplemental Environmental Impact Statements Pertaining to Increment I, Ewa Marina Community Project

This supplemental Environmental Impact Statement should address the design of major roadways that would allow for the creation of a north-south roadway system with adjacent lands which will complement Fort Weaver Road. The need for improving Papipi Road should also be addressed at this time.

If there are any questions, please contact Kenneth Hirata of my staff at 523-4190.

Sincerely,

WILLIAM A. BONNET
Director

G A C I
926 BETHEL STREET HONOLULU, HAWAII 96813 TELEPHONE (808) 533-1725

December 20, 1983 Ref: 05683

William A. Bonnet
Director
Department of Transportation Services
City & County of Honolulu
Honolulu Municipal Building
650 S. King Street
Honolulu, Hawaii 96813

Subject: Preparation Notice for Supplemental Environmental Impact Statements Pertaining to Increment I, Ewa Marina Community Project.

Dear Mr. Bonnet:

Thank you very much for your December 5, 1983 response to the subject project. Although your letter was received by our office after the submittal of the Supplemental Environmental Impact Statement to appropriate agencies, please be apprised that emphasis is given to the proposed road improvements to Fort Weaver Road and the provisions to accommodate additional traffic generated by Increment I. Two major east-west roads within Increment I have been identified.

Although the need to improve Papipi road is not addressed in the Supplemental EIS for Increment I, consideration will be given for its inclusion within the subject document.

Please feel free to further comment during the public review period of the Supplemental EIS for Increment I.

Your very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:jw

DEPARTMENT OF THE NAVY
NAVAL AIR STATION
BARBERS POINT, HAWAII 96862

30A:RBA:mlw
11010
Ser 2969
08 DEC 1983

RECEIVED
DEC 9 1983
GACI, INC.

Mr. Gerald Takano
GACI
926 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Takano:

Subj: Preparation Notice for Supplemental Environmental Impact Statements Pertaining to Increment I, Ewa Marina Community Project

Your letter of 1 November 1983 requested review and comment on the subject preparation notice. The notice has been reviewed. The proposed development as stated in the preparation notice is compatible with air operations at Naval Air Station Barbers Point as indicated by our noise study of July 1982 and by the AICUZ study draft of October 1983. However, future development in this region could represent a serious encroachment threat to the air station. Thank you for the opportunity of making comment at this time.

Sincerely,

P. O'CONNOR
Captain, USN
Commanding Officer

Copy to:
COMNAVBASE PEARL HARBOR
PACNAVFACENGCOM

G A C I
926 BETHEL STREET HONOLULU, HAWAII 96813 TELEPHONE (808) 533-1725

December 16, 1983 Ref: 05683

P. O'Connor
Captain, USN
Commanding Officer
Department of the Navy
Naval Air Station
Barbers Point, Hawaii 96862

Subject: Preparation Notice for Supplemental Environmental Impact Statements Pertaining to Increment I, Ewa Marina Community Project

Dear Mr. O'Connor:

Thank you very much for your December 8, 1983 response to subject project. Although your letter was received after our submittal of the Supplemental EIS to appropriate agencies, we appreciate your verification that Increment I, as stated in the preparation notice, is compatible with the operations at the Naval Air Station, Barbers Point per the July 1982 noise study and the October 1983 AICUZ study draft. Future development within the Ewa Marina Community will be discussed in a separate Supplemental EIS for Increment II.

Please feel free to further comment on the Supplemental EIS, Increment I during the public review period.

Very truly yours,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:jw

DEPARTMENT OF PLANNING
AND ECONOMIC DEVELOPMENT
KAMAMALU BUILDING, 250 SOUTH KING ST, HONOLULU, HAWAII
MAILING ADDRESS: P.O. BOX 2359 HONOLULU, HAWAII 96804

RECEIVED
DEC 8 1983
GACI, INC.

Ref. No. 8484

December 7, 1983

Mr. Gerald Takano
GACI
926 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Takano:

Subject: Preparation Notice for Supplemental Environmental Impact Statements Pertaining to Increment I, Ewa Marina Community Project

We have reviewed the subject EIS Preparation Notice (EISPN) and offer the following comments for your consideration.

1. The subject supplemental EIS's should contain a detailed description of the proposed parcelization and development phasing plan for Ewa Marina Community, including parcels identified within the subject EISPN. We note several potential inconsistencies between the subject EISPN, the generic Ewa Marina Community EIS, and the current petition before the State Land Use Commission for a land use boundary amendment with regard to parcelization of lands within the proposed project and implementation of development and construction. (Refer to Ewa Marina Community EIS, pages 232 and 235; and Ewa Marina Community Land Use Boundary Amendment Petition, page 45.) The description should fully assess potential technical, environmental, economic and social impacts associated with revised parcelization, phasing and development plans.

2. The subject supplemental EIS's should fully describe and assess pertinent relationships concerning the implementation of the subject Increment I to the development of the entire Ewa Marina Community project. In particular, we note that several Federal and State permits involving land, submerged land, inland and offshore water uses have not been processed by approving authorities other than the City and County of Honolulu, Department of Land Utilization. In this regard, the subject supplemental EIS's should fully describe when the developer intends to complete applications for required Federal and State permits as these affect the entire Ewa Marina Community project. Further, potential alternative actions by the developer should be disclosed if required permits and authorizations are not approved, or approved with provisional conditions. Additionally, the EIS should note that agency processing of permits may require a State acceptable generic EIS document prepared under provisions of Chapter 343, HRS; as well as a Federal EIS document, subject to requirements contained within the National Environmental Protection Act.

3. The subject supplemental EIS's should fully describe those detailed studies which the Department of Land Utilization identified as required in acceptance of the generic EIS. We are concerned that the subject supplemental EIS's will limit themselves to assessing potential impacts relative only to the proposed Increment I, when there may be considerable cummulative impacts not yet fully described and assessed with regard to development of the entire Ewa Marina Community project.

We hope the above comments will be useful in developing the subject supplemental EIS's. We would appreciate the opportunity to provide further input when the draft supplemental statements are available for review.

Very truly yours,

Kent M. Keith

Kent M. Keith

cc: Dept. of Land Utilization
Office of Environmental Quality Control

G A C I
926 BETHEL STREET HONOLULU, HAWAII 96813 TELEPHONE (808) 533-1725

December 20, 1983 Ref: 05683

Kent M. Keith
Department of Planning & Economic Development
Kamamalu Building
P.O. Box 2359
Honolulu, Hawaii 96804

Subject: Preparation Notice for Supplemental Environmental Impact Statements Pertaining to Increment I, Ewa Marina Community Project

Dear Mr. Keith:

Pursuant to your response regarding subject Supplemental EIS Preparation Notice, please be apprised that your Dec. 7, 1983 letter was unfortunately obtained after the document for Increment I was submitted to the appropriate agencies on Dec. 8, 1983 for the public review period. Items pertinent to Increment I, however, will be addressed in the final document as part of additional responses obtained from the public review period. These will include any proposed parcelization, development phasing plan and subsequent potential impacts, permit schedules, and other studies identified by the Department of Land Utilization.

In addition, your concerns on the acceptance and approval of the February 1981 generic EIS document will be resolved following the ruling by the Environmental Quality Commission, State of Hawaii. Such a decision would be documented within the final Supplemental EIS for Increment I.

Thank you again for your interest in the project. Please feel free to further comment during the public review period from December 23, 1983 - January 23, 1984.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:jw

University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

RECEIVED
DEC 12 1983
GACI, INC.

December 8, 1983

PN:0027

Mr. Gerald Takano
GACI
926 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Takano:

Preparation Notice
Supplemental Environmental Impact Statement
Ewa Marina Community Project, Increment I
Honouliuli, Ewa, Oahu

In response to your letter of October 27, 1983 regarding the Preparation Notice for a Supplemental Environmental Impact Statement pertaining to Increment I, Ewa Marina Community Project we have the following comments:

There seems to be a procedural question with regard to the preparation of a Supplemental EIS for this project. According to the cover page, the original Draft Environmental Impact Statement for the Ewa Marina Community was submitted in May 1980 "pursuant to NEPA and pursuant to Chapter 343, Hawaii Revised Statutes". Lead agencies were listed as the City and County of Honolulu, Department of Land Utilization; State of Hawaii, Governor's Office; and U.S. Army Corps of Engineers. We note per your letter (10/27/83) that, "On February 20, 1981, the Department of Land Utilization approved [accepted?] the Final Environmental Impact Statement for the Ewa Marina Community Project...." In accordance with EQC regulations Sub-Part H. Acceptance of Environmental Impact Statement. 1:72 a, for actions involving both State and County lands/or funds, the Governor shall have the final authority for EIS acceptance. Furthermore, EQC regulations (Sub-Part K. 2.10 Supplemental Statement) require the preparation of a Supplemental Statement "whenever the proposed action for which a Statement was accepted (emphasis added) has been modified to the extent that new or different environmental impacts are anticipated."

We have no record of a Final (Federal document), or Revised (State document) EIS having been accepted for this project.

We were unaware, until receipt of the Preparation Notice, that a "Final" EIS had been prepared or approved by the DLU. Subsequently, we were provided with a copy of the referenced EIS dated February 1981, however, there is no indication on the cover of this document as to its official status, i.e. "Draft," "Revised," or "Final," and no indication of "Acceptance" or "Approval." We also note that the cover sheet (pages 1-4) refers

G A C I
926 BETHEL STREET HONOLULU, HAWAII 96813 TELEPHONE (808) 533-1725

December 20, 1983 Ref: 05683

Doak C. Cox
Director
Environmental Center
University of Hawaii at Manoa
Crawford #317
2550 Campus Road
Honolulu, Hawaii 96822

Subject: Preparation Notice for Supplemental Environmental Impact Statement, Ewa Marina Community Project, Increment I, Honouliuli, Ewa, Oahu

Dear Mr. Cox:

Pursuant to your December 8, 1983 response regarding subject Supplemental EIS Preparation notice, please be apprised that your letter was received by GACI, INC. on December 12, 1983 after the document for Increment I was already submitted to the appropriate agencies for public review. Your concerns, however, will be addressed in our final document after the review period.

Your request for clarification on the acceptance and approval of the original EIS document dated February 1981 has been referred to both the Department of Land Utilization, City & County of Honolulu and the Environmental Quality Commission, State of Hawaii. We anticipate a ruling by the Environmental Quality Commission on this issue prior to submittal of the final document. As such, the results of subject ruling will be included within the Supplemental EIS, Increment I specifically to address your concerns.

Thank you very much for your interest in our project. Please feel free to further comment during the public review period, December 23, 1983 - January 23, 1984.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:jw

APPENDIX N

Public Draft Review Responses
(February 8 - March 9, 1984)

(P)1086.4

Mr. Michael McElroy
Director
Department of Land Utilization
City and County of Honolulu
650 South King Street, 7th Floor
Honolulu, Hawaii 96813

Dear Mr. McElroy:

Subject: Draft Supplemental Environmental Impact Statement, Increment I for Ewa Marina Community, Honouliuli, Ewa, Oahu, Hawaii

We have reviewed the subject environmental impact statement and have no comments to offer.

Thank you for the opportunity to review the environmental impact statement.

Very truly yours,

RIKIO NISHIOKA
State Public Works Engineer

RY:lm
cc: Mr. Walter K. Tagawa
Mr. Gerald Takano

March 12, 1984 Ref: 05684

Rikio Nishioka
State Public Works Engineer
Department of Accounting &
General Services
P.O. Box 119
Honolulu, Hawaii 96810

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project, Tax Map Key: 9-1-12, Portion of 5

Dear Mr. Nishioka:

Thank you very much for your February 14, 1984 letter on subject project.

Your interest in the Ewa Marina Community Project is most appreciated.

Yours very truly,

GACI, INC.

Gerald T. Takano

GGT:jw

State of Hawaii
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
3949 Diamond Head Road
Honolulu, Hawaii 96816

FEB 1 1983

HIENG

Mr. Michael McElroy, Director
Department of Land Utilization,
City & County of Honolulu
650 South King Street, 7th Floor
Honolulu, Hawaii 96813

Dear Mr. McElroy:

Ewa Marina Community

Thank you for providing us the opportunity to review the Draft Supplemental Environmental Impact Statement for "Increment I, Ewa Marina Community".

We have completed our review and have no comments to offer at this time.

Yours truly,

JERRY M. MATSUDA
Major, HANG
Contr & Engr Officer

cc: M.S.M. & Assoc., Inc.
GACI
OEQC w/EIS

March 12, 1984 Ref. 05784

Jerry M. Matsuda
Major, HANG
Contr. & Engr. Officer
Department of Defense
Office of the Adjutant General
3949 Diamond Head Road
Honolulu, Hawaii 96816

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project, Tax Map Key 9-1-12, Portion of 5

Dear Major Matsuda:

Thank you very much for your February 14, 1984 letter on subject project.

Your interest in the Ewa Marina Community Project is greatly appreciated.

Yours very truly,

GACI, INC.

Gerald T. Takano

GTT:jw

PB 84-121

February 16, 1984

TO: MR. MICHAEL McELROY, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: ROY H. TANJI
DIRECTOR AND BUILDING SUPERINTENDENT

SUBJECT: DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
FOR INCREMENT I, EWA MARINA COMMUNITY
HONOULIULI, EWA, OAHU

We have reviewed the Draft Supplemental Impact Statement for Increment I of the Ewa Marina Community project and have no comments.

Thank you for the opportunity to review the draft supplemental EIS.

ROY H. TANJI
Director and Building Superintendent

TH:jo
cc: M.S.M. & Associates, Inc.
GACI
J. Harada

March 12, 1984 Ref: 05684

Mr. Roy H. Tanji
Director and Building Superintendent
City & County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project, Tax Map Key: 9-1-12, Portion of 5

Dear Mr. Tanji:

Thank you very much for your February 16, 1984 letter on subject project.

Your interest in the Ewa Marina Community is greatly appreciated.

Yours very truly,

GACI, INC.

Gerald T. Takano

GTT:jw

GEORGE R. ARIYOSHI
GOVERNOR

JACK K. SUWA
CHAIRMAN, BOARD OF AGRICULTURE

SUZANNE D. PETERSON
DEPUTY TO THE CHAIRMAN

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 So. King Street
Honolulu, Hawaii 96814

Mailing Address:
P. O. Box 22159
Honolulu, Hawaii 96822

RECEIVED
FEB 22 1984
GACI, INC.

February 17, 1984

MEMORANDUM

TO: Mr. Michael M. McElroy, Director
Department of Land Utilization
City and County of Honolulu

SUBJECT: Draft Supplemental Environmental Impact Statement (EIS)
for Increment I, Ewa Marina Community Project
M.S.M. and Associates, Inc.
TMK: 9-1-12: Por. 5
Honouliuli, Ewa, Oahu
Acres: 174.491

The Department of Agriculture has reviewed the subject draft supplemental EIS and offers the following comments.

The draft EIS states that the sugarcane yield from the area within Increment I is "...considered marginal and the distance to the sugar mill result in an uneconomic operation" (EIS, page 10). As noted in our letter to Mr. Gerald Takano of GACI, dated November 30, 1983 (copy may be seen in Appendix L of the draft EIS), Oahu Sugar Company recently reviewed all of its cultivated lands to identify those to be kept or phased out of sugar production, on the basis of relative operating costs for irrigation water pumpage, yield potential, and other factors. The sugarcane fields within Increment I are among those lands to be kept.

The draft EIS should address the impacts to Oahu Sugar Company that may result from the irrevocable loss of productive agricultural land. These losses include future income from sugar revenues, employment, and alternative agricultural uses of the land.

We note that Oahu Sugar Company will be allowed to continue sugarcane cultivation within the project area until such time as the affected properties are actually needed for development (EIS, page 11). This action would mitigate the short-time loss of income that would result from the untimely loss of immature sugarcane.

We have studied the proposed "A-Modified" scheme for the dual water system (EIS, pages 104-109) and found that there is no discussion of the proposed system's impacts upon the irrigation water needs of the Oahu Sugar Company in the Ewa area. Appendix "K" indicates that approximately 13.2 million gallons per day of brackish water from several Oahu Sugar Company wells will be allocated to existing and proposed east and west Ewa developments.

Pages 34 through 39 of the draft EIS, and Appendix "C" ("Hydrologic Report, by William Hee and Associates, Inc.) propose that a golf course be situated between the Ewa Town development area and the Ewa Marina site to act as a storm flow retention basin system. This proposed golf course is outside the site of the Ewa Marina project site but is considered a neccessary part of the project. The development of the basin system will result in the termination of sugarcane cultivation in the area. The impacts associated with this additional loss of sugarcane cultivated land should be considered in the draft EIS.

Thank you for the opportunity to comment.

Jack K. Suwa

JACK K. SUWA
Chairman, Board of Agriculture

cc: MSM and Associates
✓ GACI

THE ESTATE OF JAMES CAMPBELL

March 12, 1984

RECEIVED
MAR 13 1984
GACI, INC.

Mr. Gerald T. Takano
GACI
926 Bethel Street
Honolulu, HI 96813

Dear Gerald:

Draft Supplemental
Environmental Impact Statement (EIS)
for Increment I, Ewa Marina Community Project

The following comments are in response to the concerns raised by the Department of Agriculture on sugar cane cultivation and irrigation water needs relative to the subject draft supplemental EIS.

The draft EIS states that sugar cane yield from the area within Increment I is ". . . considered marginal and the distance to the sugar mill results in an uneconomic operation" (EIS, page 10). In Oahu Sugar Company's original review of its cultivated lands, undertaken to identify which lands should be retained in sugar production, Oahu Sugar Company had indicated phasing out of sugar production for the area within Increment I. Subsequently Oahu Sugar Company decided to continue cultivation in this area until such time as the property was actually needed for development. The lease between Campbell Estate and Oahu Sugar Company provides that Campbell Estate can withdraw up to 4,000 acres classified as cane or contributory from the lease as needed for development projects. The 4,000-acre figure represents Oahu Sugar Company's determination of the total acreage which could be withdrawn from cultivation without affecting the economic viability of its operation.

In accordance with the terms of the lease between Campbell Estate and Oahu Sugar Company, Oahu Sugar Company is kept current as to areas planned for future development which will eventually necessitate withdrawal from the Oahu Sugar lease. Oahu Sugar Company's continued sugar cane cultivation within the project area until such time as the affected properties are actually needed for development should mitigate the short-term loss of income from that property. Therefore, although this land will eventually need to be withdrawn from the Oahu Sugar Company lease, it has been planned and provided for and will occur at the latest possible date.

Oahu Sugar Company has 14,000 acres under lease from Campbell Estate, of which 8,900 are presently under cultivation. Withdrawal from sugar cultivation of the 174.491 acres covered by the subject draft supplemental EIS should not have any affect on employment by Oahu Sugar Company.

With respect to the proposed "A-Modified" scheme for the dual water system (EIS, pages 104-109), Campbell Estate is seeking approval to be co-holder with Oahu Sugar Company, sharing in the use of certain wells. As Oahu Sugar Company's requirement for water is reduced, with correspondingly reduced pumpage from those wells, Campbell Estate will use the allocation released and develop new wells to service the proposed development. There should, therefore, be no impact upon the irrigation water needs of Oahu Sugar Company because the re-allocation to the dual water system will occur as Oahu Sugar Company's requirement for water is reduced.

The proposed storm retention basin system, situated between the Ewa Town and Ewa Marina development sites, (EIS, pages 35-39 and Appendix C - "Hydrologic Report," by William Hee & Associates, Inc.) will result in the phased termination of sugar cane cultivation in the retention basin area. However, the retention basin is intended to accommodate the additional drainage resulting from development of the Ewa Town area as well as the storm waters which currently sheet-flow over the area. If this drainage were not controlled, it would probably result in greater loss in the form of damage to the cane. In addition, the intention is to construct the drainage basin in increments so as to minimize the impact on Oahu Sugar Company's operations. The development of a golf course in that drainage area is an enhancement proposed primarily to prevent that drainage area from becoming an unsightly dump site or waste area.

If you would like to discuss these comments with me, please call.

Sincerely,

Michael A. Warren
Manager, Residential
& Resort Properties

JB/vy:H203-1t

March 19, 1984 Ref: 05784

Mr. Jack K. Suwa
Chairman, Board of Agriculture
Department of Agriculture
State of Hawaii
1428 S. King Street
Honolulu, Hawaii 96814

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project, Tax Map Key: 9-1-12, Portion of 5

Dear Mr. Suwa:

Thank you very much for your February 17, 1984 letter on subject project. Please be apprised that your comments were referred directly to the Estate of James Campbell for comment.

We are transmitting herewith a copy of the Estate's March 12, 1984 letter in response to your concerns.

Thank you very much for your interest in subject project.

Yours very truly,

GACI, INC.

Gerald T. Takano

GTT:jw

Attachment

U.S. Department of Transportation
United States Coast Guard

Commander (dpl)
Fourteenth Coast Guard District

Prince Kalanianaole
Federal Building
300 Ala Moana Blvd.
Honolulu, Hawaii 96850
Phone: (808) 546-2861

RECEIVED
FEB 29 1984
GACI, INC.

11000
Serial No. 4/029
27 February 84

Mr. Michael McElroy, Director
Department of Land Utilization
City & County of Honolulu
650 South King Street, 7th Floor
Honolulu, Hawaii 96813

Dear Mr. McElroy:

The Fourteenth Coast Guard District has reviewed the Draft Supplemental Environmental Impact Statement for Increment I for the Ewa Marina Community and has no objection or constructive comments to offer at the present time.

Sincerely,

J. E. SCHWARTZ
Commander, U. S. Coast Guard
District Planning Officer
By direction of Commander,
Fourteenth Coast Guard District

Copies to: (1) M.S.M. & ASSOCIATES, INC.
(2) GACI

March 12, 1984 Ref: 05784

J. E. Swartz
Commander, U. S. Coast Guard
Fourteenth Coast Guard District
U. S. Dept. of Transportation
U. S. Coast Guard
Prince Kalanianaole Fed. Bldg.
300 Ala Moana Blvd.
Honolulu, Hawaii 96850

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project, Tax Map Key: 9-1-12, portion of 5

Dear Commander Swartz:

Thank you very much for your February 29, 1984 letter on subject project.

Your interest in the Ewa Marina Community Project is greatly appreciated.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:jw

HEADQUARTERS
NAVAL BASE PEARL HARBOR
BOX 110
PEARL HARBOR, HAWAII 96860

IN REPLY REFER TO:
002A:QLB:jam
Ser 309

27 FEB 1984

Mr. Michael McElroy, Director
Department of Land Utilization
City and County of Honolulu
650 S King Street
Honolulu, Hawaii 96813

Dear Mr. McElroy:

Draft Supplemental Environmental Impact Statement
Pertaining to Increment I, Ewa Marina Community Project

The comments and concerns of our previous correspondence relative to the effect of the marina on Nimitz Beach (See Navy's letter Ser 2387 of 22 November 1983 and U.S. Fish and Wildlife Service's letter of July 9, 1980) remain valid and need to be addressed in this re-submitted EIS. By only addressing this concern in Increment II, the true goal of the EIS which is to gain foresight into the all of the consequences of the proposed action will not be served. Although the total EIS for Increments I and II may address all of the environmental concerns when assembled, the net effect of splitting the EIS, will be to ignore spillover effects that may be present. For instance, on page 37, Section 5.1, Drainage, it is stated that the ultimate drainage plan for Increment I is dependent on the outlet Marina to be developed under Increment II of the Ewa Marina community. If there is a dependency between increments, then this EIS should address the possibility of Increment II being delayed or scrapped.

Thank you for this opportunity to again comment on this project.

Sincerely,

M. M. DALLAM
CAPTAIN, CEC, U. S. NAVY
FACILITIES ENGINEER
BY DIRECTION OF THE COMMANDER

Copy to:
Mr. Walter K. Tagawa, President
M.S.M. & Associates, Inc.
33 South King Street, Room 410
Honolulu, Hawaii 96813

Mr. Gerald Takano
GACI
926 Bethel Street
Honolulu, Hawaii 96813

March 23, 1984 Ref: 05784

M. M. Dallam
Captain, CEC U.S. Navy
Facilities Engineer
by the Direction of the Commander
Naval Base Pearl Harbor
Box 110
Pearl Harbor, HI 96860

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project, Tax Map Key: 9-1-12, Portion of 5

Dear Captain Dallam:

Thank you very much for your February 27, 1984 letter on subject project.

Pursuant to Your concerns, please be apprised of the following:

The intent of the Supplemental EIS, Increment I is to assess specific issues determined by the City and County of Honolulu's Department of Land Utilization as pertinent to the 174 acres for development, especially in consideration of rezoning and schedule. Although part of the overall Ewa Marina Community, The Supplemental EIS for Increment I assesses the project as implemented apart from the remaining portions of the total community. The design of any incremental system such as drainage, however, must consider an overall master plan of the entire community. Nevertheless, Increment I is presented as a separate entity which could function without Increment II.

Page 37, Section 5.1 on drainage will be revised to reflect the intent of the document, as specific to Increment I.

Issues pertinent to Increment II, such as those related to the entrance channel, Marina and other concerns expressed in the July 9, 1980 U.S. Fish & Wildlife Services' letter will be addressed in the Supplemental EIS for Increment II.

Yours very truly,

GACI, INC.

Gerald T. Takano

GTT:jw

MAR 1 1984

GEORGE R. ARIYOSHI
GOVERNOR

PAUL A. TOM
EXECUTIVE DIRECTOR

STATE OF HAWAII
DEPARTMENT OF SOCIAL SERVICES AND HOUSING
HAWAII HOUSING AUTHORITY
P. O. BOX 17907
HONOLULU, HAWAII 96817

IN REPLY REFER TO:

February 27, 1984

MEMORANDUM:

TO: The Honorable Franklin Y. K. Sunn, Director
Department of Social Services and Housing

FROM: Paul A. Tom, Executive Director

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project - Tax Map Key: 9-1-12, Portion of 5

On December 19, 1983, we commented on subject matter and note that this resubmitted draft supplemental EIS does not address our comments. Attached is a copy of our previous memorandum for your information.

We are returning your copy should the department decide to comment on the social services aspect of this matter.

Thank you for the opportunity to comment.

Paul A. Tom

PAUL A. TOM
Executive Director

Attachment

GEORGE R. ARIYOSHI
GOVERNOR

PAUL A. TOM
EXECUTIVE DIRECTOR

ASS'T. EXEC. DIRECTOR

STATE OF HAWAII
DEPARTMENT OF SOCIAL SERVICES AND HOUSING
HAWAII HOUSING AUTHORITY
P. O. BOX 17907
HONOLULU, HAWAII 96817

IN REPLY REFER
TO:

December 19, 1983

MEMORANDUM:

TO: The Honorable Franklin Y. K. Sunn, Director
Department of Social Services and Housing

FROM: Paul A. Tom, Executive Director

SUBJECT: Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project - Tax Map Key: 9-1-12, Portion of 5

The Authority has reviewed the subject supplemental EIS and since the developer has stated that ten percent (10%) of the total proposed housing units or 129 units will be priced at a level which is affordable to those in the low/moderate income category, we offer the following comments:

1. The definition of low/moderate income housing be defined.

2. The specific types of housing to be provided to the low/moderate income families and the proposed sales prices be included.

We are returning your copy should the department decide to comment on the social services aspect of subject matter.

Thank you for the opportunity to comment on this matter.

PAUL A. TOM, Original Signed

PAUL A. TOM
Executive Director

HIK:ck

March 12, 1984 Ref: 05784

Paul A. Tom
Executive Director
Hawaii Housing Authority
Department of Social Services
and Housing
P.O. Box 17907
Honolulu, HI 96817

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project, Tax Map Key: 9-1-12, Portion of 5

Dear Mr. Tom:

A copy of your February 27, 1984 memorandum on subject project was transmitted to us by Mr. Franklin Y. K. Sunn on February 29, 1984.

In response, please note that the developer's commitment to provide at least 10% of the units for low and moderate income families will be provided in accordance with the City & County of Honolulu's guidelines and definitions during the building permit period as defined by the Department of Housing & Community Development (DHCD). Specific types of housing and proposed sales prices for low/moderate units will also be coordinated with DHCD at the appropriate time. At present, an estimate of 80% of median range is being considered.

Verification of this matter was received by DHCD on March 2, 1984 and will be included in the Final Supplemental EIS, Increment I.

Thank you for your interest in subject project.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:jw

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

EILEEN R. ANDERSON
MAYOR

EMIKO I. KUDO
DIRECTOR

SAM L. CARL
DEPUTY DIRECTOR

OSCAR K. ASAHINA
EXECUTIVE ASSISTANT

RECEIVED
MAR 1- 1984
GACI, INC.

February 29, 1984

TO: MICHAEL M. McELROY, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: EMIKO I. KUDO

SUBJECT: DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
EWA MARINA COMMUNITY DEVELOPMENT, INCREMENT I
HONOULIULI, EWA, OAHU, HAWAII
TMK: 9-1-12: POR. 5

We have reviewed the Draft Supplemental EIS for the Ewa Marina Community Development, Increment I, and have determined the report to be generally acceptable.

Our comments to the previous Draft EIS have been acknowledged and included in Section 5.6, Recreational Resources of the Supplemental EIS as recommended.

Thank you for the opportunity to comment on the report.

(Mrs.) EMIKO I. KUDO, Director

EIK:vc

cc: Mr. Walter K. Tagawa
Mr. Gerald Takano

March 12, 1984 Ref: 05784

Emiko I. Kudo, Director
Department of Parks & Recreation
650 S. King Street
Honolulu, Hawaii 96813

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project, Tax Map Key: 9-1-12, portion of 5

Dear Mrs Kudo:

Thank you very much for your February 29, 1984 letter on subject project.

Your interest in the Ewa Marina Community Project is greatly appreciated.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:jw

EPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

MAR 5 1984

EILEEN R. ANDERSON
MAYOR

MICHAEL J. CHUN, PH.D.
DIRECTOR AND CHIEF ENGINEER

MAURICE H. KAYA
DEPUTY DIRECTOR

ENV 84-55

February 29, 1984

MEMORANDUM

TO: MR. MICHAEL M. McELROY, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: MICHAEL J. CHUN, DIRECTOR AND CHIEF ENGINEER

SUBJECT: DRAFT SUPPLEMENTAL EIS FOR INCREMENT I,
EWA MARINA COMMUNITY, HONOULIULI, EWA, HAWAII

The subject EIS was reviewed and we have the following comments.

1. Interim drainage facilities and greenbelt water collectors should be maintained by the developer in addition to the marina and sediment retention basin. In addition, the developer's proposals for handling the interim drainage flows must meet with the approval of this Department.

2. Sewage flows from Increment I can be discharged into the existing Ewa Interceptor Sewer, West Portion, as shown in Exhibit 16. Flow from Area "T" is to be connected at Point "A," while flows from Areas "A" to "I" may be connected at Point "B" of the interceptor sewer. Subdivision sewers must be designed in accordance with City Standards.

MICHAEL J. CHUN
Director and Chief Engineer

cc: M.S.M. & Associates, Inc.
GACI
Div. of Engineering
Div. of Wastewater Management

March 19, 1984 Ref: 05684

Michael J. Chun
Director and Chief Engineer
Department of Public Works
City & County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project, Tax Map Key: 9-1-12, Portion of 5

Dear Mr. Chun:

Thank you very much for your February 29, 1984 letter on subject project.

Please be apprised that interim drainage facilities for the Marina and interim sedimentation basin and greenbelt water collectors will be maintained by the developer. Proposals for handling the interim drainage flows will also meet with DPW approval at the appropriate time.

In addition, your verification that Increment I sewage flows can be discharged into the existing Ewa Interceptor Sewer, West Portion is appreciated. (Exhibit 16). Subdivision sewers will also be designed in accordance with City & County Standards.

Thank you for your interest in subject project.

Yours very truly,

GACI, INC.

Gerald T. Takano

GTT:jw

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813
PHONE 523-4161

EILEEN R. ANDERSON
MAYOR

JOSEPH K. CONANT
DIRECTOR

CHARLES K. TORIGOE
DEPUTY DIRECTOR

RECEIVED
MAR 1 1984
GACI, INC.

March 2, 1984

MEMORANDUM

TO: Michael M. McElroy, Director
Department of Land Utilization

FROM: Joseph K. Conant

SUBJECT: Draft Supplemental Environmental Impact Statement
Ewa Marina Community, Increment 1
Honouliuli, Ewa, Oahu

Thank you for the opportunity to review and comment on the subject document.

We are pleased to note the developer's commitment to provide at least 10% of units for low-and moderate-income families in accordance with City and County of Honolulu guidelines and definitions. Please have the developer contact Mr. James Miyagi of this Department at 523-4264 when information on the type and location of units becomes available.

We will retain this document for our files.

JOSEPH K. CONANT

cc: Mr. Walter K. Tagawa, President
M.S.M. and Associates, Inc.
33 South King Street, Room 410
Honolulu, Hawaii 96813

Mr. Gerald Takano
GACI
926 Bethel Street
Honolulu, Hawaii 96813

March 12, 1984 Ref: 05684

Mr. Joseph K. Conant
Department of Housing &
Community Development
650 S. King Street
Honolulu, HI 96813

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project, Tax Map Key 1-12-9, portion of 5

Dear Mr. Conant:

Thank you very much for your March 2, 1984 letter on subject project. Mr. James Miyagi of your office will be contacted as information on the type and location of units is available.

Your interest in the Ewa Marina Community is greatly appreciated.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:jw

Mr. Francis Hatanaka
Acting Superintenden
DR DOUGLAS H THOMPSON
XXX SUPERINTENDENT XXX

STATE OF HAWAII
DEPARTMENT OF EDUCATION
P. O. BOX 2360
HONOLULU, HAWAII 96804

OFFICE OF THE SUPERINTENDENT

March 3, 1984

Mr. Michael M. McElroy, Director
Department of Land Utilization
City & County of Honolulu
650 S. King Street
Honolulu, HI 96813

Dear Mr. McElroy:

SUBJECT: Draft Supplemental EIS
Increment I, Ewa Marine Community

The Department of Education does not have any further comments to add to the subject document.

Thank you for the opportunity to review the document.

Sincerely,

Francis M. Hatanaka
Acting Superintendent

FMH:HL:jl

cc: Mr. Vernon Honda
Leeward District
✓Mr. Walter K. Tagawa
Mr. Gerald Takano

March 12, 1984 Ref: 05684

Francis M. Hatanaka
Aciting Superintendent
Department of Education
State of Hawaii
P.O. Box 2360
Honolulu, HI 96804

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project, TAx Map Key: 9-1-12, portion of 5

Dear Mr. Hatanaka:

Thank you very much for your letter dated March 3, 1984 on subject review.

Your interest and concern in our project is greatly appreciated.

Yours very truly,

GACI, INC.

Gerald T. Takano

GTT:jw

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 15TH AIR BASE WING (PACAF)
HICKAM AIR FORCE BASE, HAWAII 96853

RECEIVED
MAR 1984
GACI, INC.
5 MAR 1984

REPLY TO ATTN OF: DEEV (Mr Yamada, 449-1831)

SUBJECT: Draft Supplemental Environmental Impact Statement for the Increment 1, Ewa Marina Community

TO: Ms Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, HI 96813

1. This office has reviewed subject EIS and has no comment relative to the proposed project.

2. We greatly appreciate your cooperative efforts in keeping the Air Force apprised of your project and thank you for the opportunity to review the document. The EIS is returned for your file.

ROBERT M. OKAZAKI
Chief, Engrg & Envmtl Plng Div
Directorate of Civil Engineering

1 Atch
EIS

cc: Mr Michael McElroy, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street, 7th Floor
Honolulu, HI 96813

Mr Walter K. Tagawa, President
M.S.M. & Associates, Inc.
33 South King Street, Room 410
Honolulu, HI 96813

Mr Gerald Takano
GACI
926 Bethel Street
Honolulu, HI 96813

March 12, 1984 Ref: 05684

Robert M. Okazaki
Chief, Engrg. & Envmtl Planning Div.
Directorate of Civil Engineering
Department of the Air Force
Headquarters 15th Air Base Wing (PACAF)
Hickam Air Force Base, Hawaii 96853

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project, Tax Map Key: 9-1-12, portion of 5

Dear Mr. Okazaki:

Thank you very much for your March 5, 1984 letter on subject project.

Your interest in the Ewa Marina Community is greatly appreciated.

Yours very truly,

GACI, INC.

Gerald T. Takano

GTT:jw

WAIIAN ELECTRIC COMPANY, INC.
Box 2750 / Honolulu, Hawaii / 96840

March 5, 1984

ENV 2-1
NV/G

O'CONNELL, P.E.
MANAGER, ENVIRONMENTAL DEPARTMENT
(808) 548-6980

RECEIVED
MAR 7 1984
GACI, INC.

Mr. Michael McElroy, Director
Department of Land Utilization
City & County of Honolulu
650 South King Street, 7th Floor
Honolulu, Hawaii 96813

Dear Mr. McElroy:

Subject: Draft Supplemental Environmental Impact Statement for Increment 1, Ewa Marina Community

We have reviewed the above Draft Supplemental Environmental Impact Statement and offer the following comments:

1. Exhibit 25 - The legend should be corrected to show the solid black line is a 44 kv not 12 kv line.

2. Exhibit 25 - The legend and map should be corrected as we have indicated to show the actual routes of the Ewa Beach 1 - Ewa Beach 112 kv and Ewa Beach 1 - Ewa Beach 212 kv lines.

Thank you for the opportunity to comment on the Draft Supplemental Impact Statement.

Sincerely,

Richard L. O'Connell
Manager, Environmental Department

JMP,Jr.:cal

cc: M.S.M. & Associates
Mr. Walter K. Tagawa

GACI
Mr. Gerald Takano

March 12, 1984 Ref: 05684

Richard L. O'Connell
Manager, Environmental Department
Hawaiian Electric Company, Inc.
Box 2750
Honolulu, HI 96840

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project, Tax Map Key: 9-1-12, portion of 5

Dear Mr. O'Connell:

Thank you very much for your March 5, 1984 letter on subject project. Exhibit 25 will be revised as per your comments.

Your interest in the Ewa Marina Community is greatly appreciated.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:jw

FIRE DEPARTMENT
CITY AND COUNTY OF HONOLULU
1455 S. BERETANIA STREET, ROOM 305
HONOLULU, HAWAII 96814

EILEEN R. ANDERSON
MAYOR

MELVIN M. NONAKA
FIRE CHIEF

THOMAS C. BLONDIN
FIRE DEPUTY CHIEF

March 6, 1984

TO: MICHAEL McELROY, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: MELVIN M. NONAKA, FIRE CHIEF

SUBJECT: SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT PERTAINING TO INCREMENT I, EWA MARINA COMMUNITY PROJECT, TAX MAP KEY: 9-1-12, PORTION OF 5

We have reviewed your Environmental Impact Statement (EIS) for the subject project and have determined that fire protection services are adequate. Also, we would like to furnish you with additional comments regarding fire protection services for the Ewa Community.

As stated in your report on page 116, fire protective services for the Ewa Community is primarily provided by the Ewa Beach Fire Station; however, due to the rapid growth of the Ewa Community, we have included in our CIP Program a new fire facility in the Campbell Industrial Park and the Ewa Tenney Village area, and the relocation of the existing Ewa Beach Fire Station within the general vicinity of the Campbell High School and the Ewa Shopping Center Complex. Land acquisition for these facilities are necessary and need to be acquired within the next few years. These projects have been deferred beyond Fiscal Year 1986 but are now being reconsidered to a higher priority.

MELVIN M. NONAKA,
Fire Chief

MMN:ct/NSKW

ccs: Mr. Walter K. Tagawa, President
M.S.M. & Associates, Inc.
and
Mr. Gerald Takano
GACI

March 12, 1984 Ref: 05684

Melvin M. Nonaka
Fire Chief
Fire Department
City and County of Honolulu
1455 S. Beretania St. Rm 305
Honolulu, Hawaii 96814

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project. Tax Map Key: 9-1-12, Portion of 5

Dear Chief Nonaka:

Thank you very much for your March 6, 1984 letter in response to subject project. Your assessment that fire protection services are adequate is greatly appreciated. In addition, information concerning a new fire facility in the Campbell Industrial Park and the Ewa Tenney Village area will be considered for inclusion in the final Supplemental EIS, Increment I.

Yours very truly,

GACI, INC.

Gerald T. Takano

GTT:jw

POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU
1455 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96814 - AREA CODE (808) 943-3111

EILEEN R. ANDERSON
MAYOR

DOUGLAS G. GIBB
CHIEF

WARREN FERREIRA
DEPUTY CHIEF

RECEIVED
MAR 12 1984
GACI, INC.

OUR REFERENCE EC-JS

March 7, 1984

Mr. Michael McElroy, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street, 7th Floor
Honolulu, Hawaii 96813

Dear Mr. McElroy:

Re: Draft Supplemental Environmental Impact Statement for Increment I, Ewa Marina Community

In responding to an Environmental Impact Statement (E.I.S.), our comments are usually limited to the necessity for incorporating crime prevention features into the physical layout of the development, the expected impact on, and necessity to increase or redistribute police resources and, most importantly, our concerns about traffic flow and traffic safety.

We generally expect developers to recognize the need for crime prevention features and we can generally absorb the increase of service calls resulting from increased population by reallocating police resources or, in some cases, requesting additional personnel.

But, in the case of the Ewa Marina Community project, we are greatly concerned about the impact of a significant increase of traffic and its impact on traffic safety.

We have been noting with increasing concern, the extensive development in the Ewa and Central Oahu areas and the large number of proposed developments that are in various stages of development. We are concerned about the traffic that will be generated by the sum of these proposed developments, not only on the surrounding roads (as the impact of Ewa Marina on Fort Weaver Road) but, of more concern, the impact on the H-1, Honolulu bound.

Douglas G. Gibb

DOUGLAS G. GIBB
Chief of Police

cc: M.S.M. & Associates, Inc.
GACI

March 12, 1984 Ref: 05784

Douglas G. Gibb
Chief of Police
Police Department
City & County of Honolulu
1455 S. Beretania Street
Honolulu, Hawaii 96814

SUBJECT: Draft Supplemental Environmental Impact Statement, Increment I, Ewa Marina Community Project, Tax Map Key: 9-1-12, Portion of 5

Dear Chief Gibb:

Thank you very much for your March 7, 1984 letter on subject project.

Your concern about crime prevention and traffic generated by proposed developments such as Ewa Marina is recognized. Mitigation measures to minimize adverse traffic impacts from the subject project are presented on pages 86-90.

As stated in the Report, traffic from Ewa without the subject project will increase approximately 20% by 1990. With the inclusion of Ewa Marina, an additional 15% increase is anticipated. In consideration of these increases, planned State and County improvements to Fort Weaver Road outside of Ewa Marina would help reduce negative traffic impacts from the overall area.

Thank you for your interest in the subject project.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:jw

OAHU SUGAR COMPANY, LIMITED

AN Amfac COMPANY

P. O. BOX "O"
WAIPAHU, HAWAII 96797
TELEPHONE 677-3577

March 8, 1984

RECEIVED
MAR 12 1984
GACI, INC.

Mr. Michael McElroy, Director
Department of Land Utilization
City & County of Honolulu
650 South King Street, 7th Floor
Honolulu, HI 96813

Re: EWA MARINA DEVELOPMENT

Dear Mr. McElroy:

Oahu Sugar Company, Limited has been invited to review and comment on the Environmental Impact Statement for Increment I, Ewa Marina Community. First, we wish to state that Oahu Sugar Company fully supports the subject development. Second, we believe the following comments are pertinent:

1. On page 10, the draft states that "[P]resently, much of Increment I is under sugarcane cultivation, but the soils are such that the yield is considered marginal and distance to the sugar mill result in an uneconomic operation." This statement is not entirely accurate.

While the soils are not the best and the distance to the factory is considerable by comparison, the overall cultivation costs of this area are such that these are among our most economical fields to cultivate. These fields have the lowest cost for pumping of irrigation water, the largest single variable in our operations.

2. On page 15, the draft states that "[T]here has been and continues to be strong community support for this project. The Ewa Beach Community Association, Ewa Beach Advisory Committee, Ewa Neighborhood Board No. 23, Pearl City Neighborhood Board No. 21, and Oahu Sugar Company have officially endorsed this project."

With respect to endorsement of the Ewa Marina project, Oahu Sugar Company's position is that the withdrawal of the cultivated acres would not adversely affect our viability.

3. On page 34 of the draft, a ten-acre sediment basin is described and Appendix C shows a 125-acre retention basin. Exhibits P and Q show alternate locations. The timetable is somewhat unclear but nonetheless it appears to include area proposed for the Ewa Marina project. If in fact it is to be part of the overall project, then it should be so included since from Oahu Sugar Company's standpoint, a silting or retention basin is not compatible with sugarcane culture.

March 21, 1984 Ref: 05784

W. D. Balfour, Jr.
President and Manager
Oahu Sugar Company, Ltd.
P.O. Box "O"
Waipahu, Hawaii 96797

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project, Tax Map Key: 9-1-12, Portion of 5

Dear Mr. Balfour:

Thank you very much for your March 8, 1984 letter on subject project. We found your comments constructive and will include them in our final document as appropriate. In response to your concerns, please be apprised of the following:

Item 2, Page 15

Your position on the withdrawal of cultivated acres not adversely affecting (Oahu Sugar Company's) viability will be inserted into the text.

Item 3, Page 34

As referenced from the March 12, 1984 letter from the Estate of James Campbell, "this retention basin is intended to a accommodate the additional drainage resulting from development of the Ewa Town area as well as the storm waters which currently sheet-flow overtthe area. If this drainage were not controlled, it would probably result in greater loss in the form of damage to the cane. In addition, the intention is to construct the drainage basin in increments so as to minimize the impact on Oahu Sugar Company's operations. The development of a golf course in that drainage area is an enhancement proposed primarily to prevent that drainage area from becoming an unsightly dump site or waste area."

THE ESTATE OF JAMES CAMPBELL

March 12, 1984

RECEIVED
MAR 13 1984
GACI, INC.

Mr. Gerald T. Takano
GACI
926 Bethel Street
Honolulu, HI 96813

Dear Gerald:

Draft Supplemental
Environmental Impact Statement (EIS)
for Increment I, Ewa Marina Community Project

The following comments are in response to the concerns raised by the Department of Agriculture on sugar cane cultivation and irrigation water needs relative to the subject draft supplemental EIS.

The draft EIS states that sugar cane yield from the area within Increment I is ". . . considered marginal and the distance to the sugar mill results in an uneconomic operation" (EIS, page 10). In Oahu Sugar Company's original review of its cultivated lands, undertaken to identify which lands should be retained in sugar production, Oahu Sugar Company had indicated phasing out of sugar production for the area within Increment I. Subsequently Oahu Sugar Company decided to continue cultivation in this area until such time as the property was actually needed for development. The lease between Campbell Estate and Oahu Sugar Company provides that Campbell Estate can withdraw up to 4,000 acres classified as cane or contributory from the lease as needed for development projects. The 4,000-acre figure represents Oahu Sugar Company's determination of the total acreage which could be withdrawn from cultivation without affecting the economic viability of its operation.

In accordance with the terms of the lease between Campbell Estate and Oahu Sugar Company, Oahu Sugar Company is kept current as to areas planned for future development which will eventually necessitate withdrawal from the Oahu Sugar lease. Oahu Sugar Company's continued sugar cane cultivation within the project area until such time as the affected properties are actually needed for development should mitigate the short-term loss of income from that property. Therefore, although this land will eventually need to be withdrawn from the Oahu Sugar Company lease, it has been planned and provided for and will occur at the latest possible date.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

RECEIVED
MAR 12 1984
GACI, INC.

March 8, 1984

TO: MICHAEL M. McELROY, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT FOR EWA MARINA COMMUNITY, INCREMENT I

We have the following comments on the draft environmental document:

1. Page 106: The Board has not entirely eliminated the potential use of reclaimed wastewater and groundwater from the limestone caprock for domestic purposes. Further treatment of wastewater, like the living filter concept proposed by the Water Resources Research Center, University of Hawaii, along with additional treatment could be explored in the future. Meanwhile, to avoid the expense at this time of treating brackish water to drinking water quality, we have approved the concept of a dual water system where brackish water can be used for non-potable uses such as landscape and highway irrigation.

   The last sentence should be expanded to indicate the off-site improvements for Makakilo have already been installed. Any new source in a designated ground water control area for the expansion of Makakilo will require the approval of the State Department of Land and Natural Resources and the concurrence of the Board of Water Supply.

2. Page 107: The second sentence relating to the 0.39 mgd should be explained.

3. Page 108: We have no objections to the proposal regarding development of new potable and brackish water sources in the area with the transfer of certified uses, approved by the State Department of Land and Natural Resources.

March 23, 1984

Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
City & County of Honolulu
630 South Beretania
Honolulu, Hawaii 96813

Subject: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project, Tax Map Key: 9-1-12, Portion of 5

Dear Mr. Hayashida:

Thank you very much for your March 8, 1984 letter on subject project.

Pursuant to your comments, please be apprised of the following:

Item 1, Page 6

The clarification of the approval of the dual water system concept is appreciated. The last sentence on subject will be adjusted.

Item 2, Page 107

The second sentence relating to the 0139 mgd will be expanded to include a discussion on the joint committee established by the Board of Water Supply (BWS) and subsequent allowance to provide potable water for detached single family housing units within the Ewa Marina Community.

Item 3, Page 108

Your clarification is appreciated. Location of well sites above the H-1 Freeway will be referenced to the draft Ewa Water Master Plan 1985-2000, Campbell Estate, March 1984 shown in the Appendix section.

DEPARTMENT OF GENERAL PLANNING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

RECEIVED
MAR 14 1984
GACI, INC.

EUGENE R. ANDERSON
MAYOR

WILLARD T. CHOW
CHIEF PLANNING OFFICER

RALPH PORTMORE
DEPUTY CHIEF PLANNING OFFICER

March 8, 1984

DGP2/84-542

MEMORANDUM

TO: Mr. Michael M. McElroy, Director
Department of Land Utilization

VIA: Mr. Andrew I. T. Chang, Managing Director

SUBJECT: Ewa Marina Community, Increment I
Draft Supplemental Environmental Impact Statement

Our comments are as follows:

1. The report commits properties which are located outside the defined Ewa Marina subject area. Since these offsite properties are intended for eventual dedication to the City, information should be provided on such items as their present owners, development rights agreed upon, if any, or other owner/developer assurances which would indicate that the properties will be made available when needed.

   The affected offsite properties in question include (1) portions of the proposed 60-foot wide east-west access road connection to Fort Weaver Road crossing the north-northeast corner of the subject area (exhibit 7), and (2) the 2.8-acre proposed park identified as P-3 (exhibit 8).

2. Upon completion of the proposed project, the report suggests having in place street improvements at key locations on Fort Weaver Road. Funding for these improvements, however, is uncertain. Because the report states that both the State and the City find cost sharing as unacceptable or unattractive, other funding methods must be found. The EIS mentions organizing a third party mechanism which could become

March 23, 1984 Ref: 05784

Mr. Ralph Kawamoto
Planner
Department of General Planning
City & County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project, Tax Map Key: 9-1-12, Portion of 5

Dear Mr. Kawamoto:

Thank you very much for your March 8, 1984 letter on subject project.

Pursuant to your comments, please be apprised of the following:

Item 1:

Information on affected off-site properties will be included in the final document, as appropriate.

Item 2:

As stated, the funding for street improvements on Fort Weaver Road is an unresolved issue and will be stated as such in the final document

Thank you for your interest in subject project.

Yours very truly,

GACI, INC.

Gerald T. Takano

GTT:jw

AMERICAN LUNG ASSOCIATION OF HAWAII

ENVIRONMENTAL IMPACT STATEMENT REVIEW

. . . an air quality assurance program

RECEIVED
MAR 12 1984
GACI, INC.

Project: Increment 1, Ewa Marina Community

Date: 3/9/84

To: Mr. Michael McElroy
Director
Department of Land Utilization
City & County of Honolulu

We have reviewed the EIS for the subject project with particular attention to those sections pertaining to air quality. Our detailed comments follow.

1. Page 100, Air Quality

   a. The first sentence states:

   "The analysis revealed that the State of Hawaii Emission Standards are not expected to be exceeded as a result of Increment I..."

   The standards referred to are not "emission" standards, but rather "ambient air quality" standards specified in Chapter 59, Title 11, Administrative Rules of the Department of Health.

   b. The last sentence of the second paragraph states:

   "Thus, the construction and occupancy of Increment I of the Ewa Marina Community appears to result in no long term adverse air quality impacts."

   While this may be true in the sense that ambient air quality standards appear to be met, it is also true that the project does contribute to degradation of air quality which could be considered an adverse effect.

2. Appendix J, M&E Pacific Report on Air Quality

   a. Fourth page of report, second paragraph, CONCLUSION
   Comments are the same as in paragraphs 1.a. and 1.b. above.

   b. Fifth page of report, TABLE 2
   The table is incorrectly titled "ESTIMATED CO EMISSIONS." The data presented are 1-hour and 8-hour ambient concentrations estimates.

James W. Morrow
Director
Environmental Health

JWM:ma
C5/T8405

STATE OFFICE
245 N. King St.
Honolulu, HI 96817
Telephone [illegible]

HAWAII COUNTY
Post Office Box 925
Hilo, Hawaii 96720
Telephone 935-1206

KAUAI COUNTY
Post Office Box 891
Lihue, Hawaii 96766
Telephone 245-4142

MAUI COUNTY
Cameron Center
Wailuku, Hawaii 96793
Telephone 244-5130

March 23, 1984 Ref: 05784

Mr. James W. Morrow
Director, Environmental Health
American Lung Association of Hawaii
245 N. Kukui Street
Honolulu, Hawaii 96817

Subject: Draft Supplemental Environmental Impact Statement for Increment I, Ewa Marina Community Project
Tax Map Key: 9-1-12, Portion of 5

Dear Mr. Morrow:

Thank you for your letter dated March 9, 1984 regarding the impact of Increment I on the air quality of the Ewa Marina Community Project.

We found your comments constructive and have revised the text to incorporate your concerns. A copy of the revised December 1983 draft by M & E Pacific is enclosed herewith for your information.

Yours very truly,

Gerald T. Takano

Gerald T. Takano

GTT:jw

Enclosure

JAN 1 9

M&E Pacific, Inc.

Engineers & Architects

Suite 500, Pauahi Tower
1001 Bishop Street
Honolulu, Hawaii 96813
(808) 521-3051 Telex 7430065

RECEIVED
MAR 1 9 1984
GACI, INC.

March 19, 1984

Mr. Gerald T. Takano
GACI, Inc.
926 Bethel Street
Honolulu, Hawaii 96813

SUBJECT: Draft Supplemental Environmental Impact Statement for Increment I, Ewa Marina Community Project
TMK: 9-1-12, portion of 5

Transmitted herewith is a draft of our suggested response to the comments made by the American Lung Association of Hawaii, dated March 9, 1984, on our air quality report for the subject project.

The original air quality study, dated December 1983, has been revised to incorporate the American Lung Association of Hawaii's comments and are also transmitted for your use.

Please call us if you have any questions.

Ken Ishyk

for JAMES S. KUMAGAI, Ph.D.
Vice President

RM/bs

Encl.

EWA MARINA COMMUNITY AIR QUALITY ANALYSIS

SUPPLEMENT FOR INCREMENT I DEVELOPMENT

DRAFT SUBMITTAL

Prepared for:

GACI, Inc.
Honolulu, Hawaii

Prepared by:

M&E Pacific, Inc.
Engineers & Architects
1001 Bishop Street
Honolulu, Hawaii 96813

December 1983

EWA MARINA COMMUNITY AIR QUALITY ANALYSIS-

SUPPLEMENT FOR INCREMENT I DEVELOPMENT

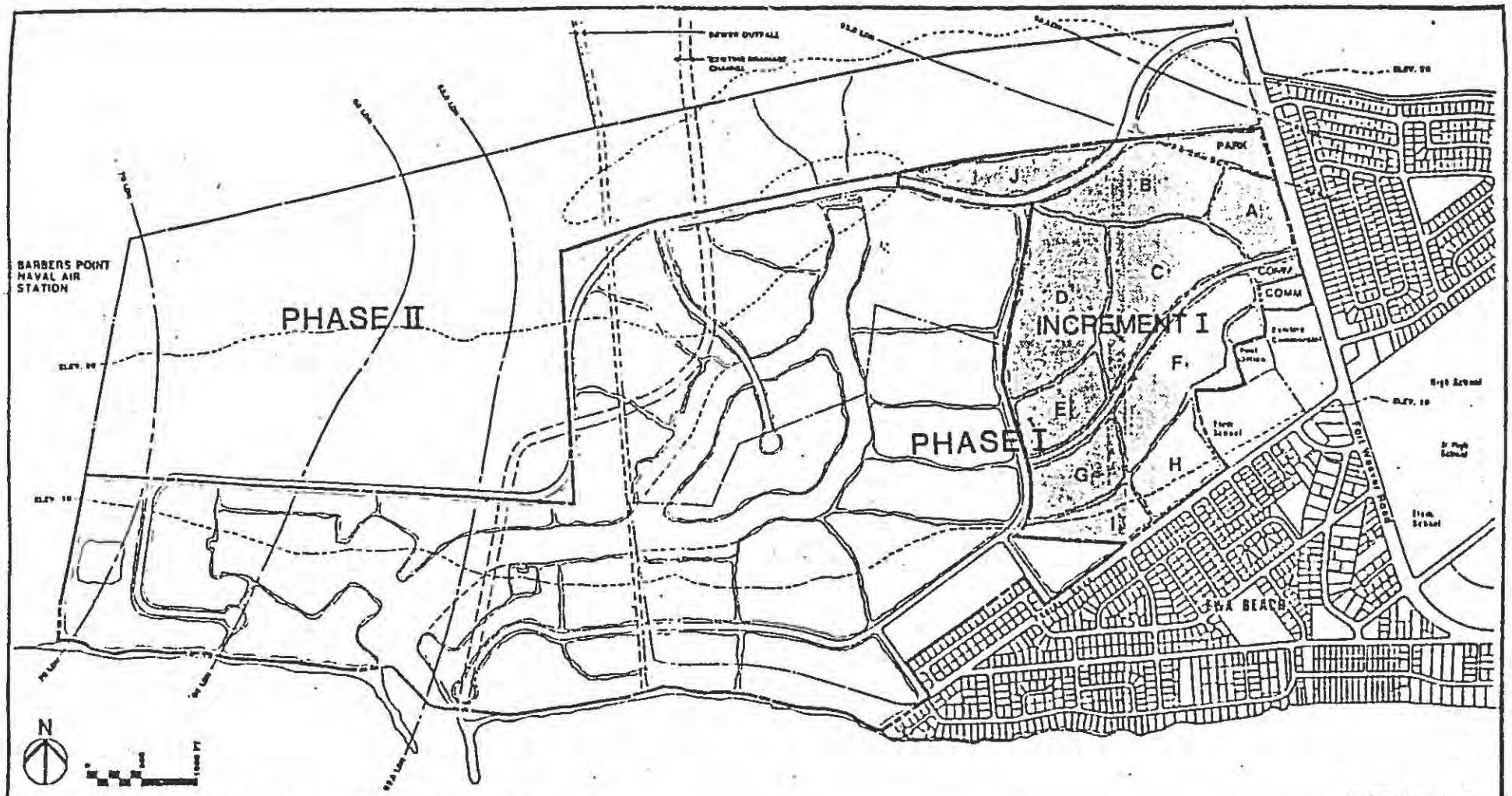
PURPOSE

Two previous air quality impact analyses for the proposed Ewa Marina community (Morrow, 1979; and Root, 1979) have been predicted on the assumption that the project was to proceed in two major construction phases. Phases I, originally slated for completion in 1992, was to encompass 700 acres and called for the construction of 5,300 family units. Phase II, slated for completion in 1996, was to cover 300 acres and called for 2,300 additional family units. The studies cited above have both identified motor vehicles of the development residents as the major source of air pollutants from the residential project. Their conclusions were based on studies of traffic flow, meteorological conditions, anticipated air pollution emission rates from five major sources, field studies and numerical models.

The present study is limited to construction of Increment I of Phase I. Increment I is comprised of 1,290 family units on 175 acres compared with the 5,300 units on 700 acres for Phase I. The significant reductions in scope and resulting population are anticipated to have a linear impact in the reduction of air pollutants. This report identifies and quantifies this reduction in emissions and projects the air quality impacts of Increment I at its completion in 1990-91. Increment I is shown in relation to Phase I and Phase II in Figure 1.

PROPOSED DEVELOPMENT

Increment I is proposed for the northeast corner of the original Phase I Development. Construction is estimated to take 5 years beginning in 1985. It is assumed, for this supplementary report, that the reduction in family units from those projected for Phase I to those of Increment I will result in a linear reduction of motor vehicles and their emissions. Thus, a reduction factor of 1,290 Family Units/5,300 Family Units = 0.243 is proposed as the modifier for Phase I traffic flows and projected emissions to project air quality impacts for Increment I.



LAND USE SUMMARY - SUBJECT AREA

FIGURE 1

AREA SUMMARY

RESIDENTIAL		: 154.2 ac
R-6	143.0 ac	
A-1	11.2 ac	
COMMERCIAL		: 6.0 ac
PARK		: 5.7 ac
ROADS		: 8.8 ac

TOTAL (SUBJECT AREA) 174.7 ac

LAND USE SUMMARY

PARCEL A	10.0 ac : 10 u/ac	:100 units	PARCEL F	24.5 ac : 5 u/ac	:122 "
B	18.4 ac : 10 u/ac	:184 "	G	10.9 ac : 5 u/ac	: 54 "
C	23.6 ac : 5 u/ac	:118 "	H	11.2 ac : 11.6 u/ac	:130 "
D	25.9 ac : 5 u/ac	:129 "	I	8.3 ac : 8 u/ac	: 66 "
E	10.2 ac : 6 u/ac	: 61 "	J	11.2 ac : 30 u/ac	:336 "

TOTAL (SUBJECT AREA) 154.2 R-ACRES, 1290 R-UNITS

EWA MARINA COMMUNITY
OAHU HAWAII

MSM & ASSOCIATES INC
MASTER DEVELOPERS

PEARSON & WUESTHOFF AIA AICP
ARCHITECTS PLANNERS

PLATE NUMBER
LU-1

TRAFFIC ANALYSIS

An earlier traffic study (Voorhees, 1979) has projected that by 1995 the originally proposed Phase I development would generate 41,000 daily vehicle trips, with 2,500 vehicle trips during the morning peak hour and 3,800 vehicles trips during the evening peak hour. Four intersections at the project site were identified as "critical" in that study; i.e., the traffic volume to roadway capacity ratio (vehicle capacity ratio) was greater than 0.95, resulting in a high probability of queuing. A conservative extrapolation of the vehicle capacity ratio from Phase I in 1995 to Increment I in 1991 indicates that "critical" conditions are not expected to occur, as shown in Table 1. This extrapolation is generated by multiplying the increment change of vehicles capacity ratios in 1995 (with and without Phase I) by the previously mentioned reduction factor to approximate conditions resulting from Increment I.

AIR QUALITY ANALYSIS

Previous air quality studies (Root, 1979 and Morrow, 1979) have identified five categories of potential air pollution sources associated with the Ewa Marina Community: (1) short term fugitive dust emissions from construction activities, (2) electric power generation, (3) solid waste incineration, (4) power boats, and (5) motor vehicles. Both studies have shown that sources 1 through 4 are either of negligible impact or can be mitigated by typical control techniques. Motor vehicle emissions, however, were identified as the principle source of air pollutants. These pollutants include: Carbon Monoxide (CO), Nitrogen Oxides (NO_x), Hydrocarbons (HC), Sulfur Oxides (SO_x), Lead (Pb), and Particulate Matter (PM). CO is a relatively inert combustion product and comprises the largest fraction of motor vehicle emissions; therefore, it is generally selected as the input parameter of choice in atmospheric pollutant dispersion model studies.

Both the Root(1979) and Morrow (1979) studies utilize CO as the selected input parameter. Specifics of their computer models and associated assumptions are discussed in detail in these reports. For this supplemental analysis a correction factor is used to modify the pollutant emissions projected for Phase I in 1992, in order to estimate the pollutant emissions

TABLE 1

VOLUME CAPACITY RATIOS (VCR)

Site	Time of Traffic Peak	1979 VCR	1995 VCR Without Development	1995 VCR Phase I	1991 VCR Increment I
Kunia Interchange On-Ramp to H-1 East	Morning	0.42	0.94	1.00*	0.95
Kunia Interchange Off-Ramp from H-1 East	Evening	0.39	0.47	1.00	0.60
Ramp from Northbound Ft. Weaver Rd. to East Bound Farrington Highway	Morning	**	0.35	0.97*	0.50
Northern Most Ewa Marina Community Access Road to Ft. Weaver Road	Morning	**	**	0.98	0.24

* = Excess traffic diverted to Farrington Highway during queuing events.

** = Roadway does not currently exist or will not exist.

Source: Alan M. Voorhees & Associates, Inc. January 1979.

associated with Increment I in 1991. The correction factor is based on the same assumption used in the traffic volume reduction described previously; namely, a linear decrease in relation to the number of residential units in Increment I. Revised CO emissions at two potentially "critical" sites (noted in the traffic analysis) are presented in Table 2. The values are developed by multiplying the incremental change in CO emissions at the sites (with and without Phase I) by the correction factor and adding this amount to anticipated background emissions without the development.

CONCLUSION

Tables 1 and 2 indicate reductions in both total motor vehicles and their emissions by the replacement of Phase I construction with Increment I. Vehicle capacity ratios associated with Phase I suggested that queuing may occur at the freeway on/off ramps during peak traffic hours. The vehicle capacity ratios associated with Increment I, however, suggest that no queuing will occur. Similarly, although CO emissions during "worst case" meteorological conditions from Phase I indicate that the Department of Health's ambient air quality standards (Chapter 59 of Title 11, Administrative Rules) may occasionally be exceeded, emission standards are not expected to be exceeded as a result of Increment I development. Air quality monitoring during and following Increment I construction may be initiated to verify these projections.

The linear reduction approximations applied here are considered conservative for they do not reflect increased use of mass transportation services and development of the Barber's Point Deep Draft Harbor with a resulting decrease in eastbound traffic. Additionally, "worst case" meteorological conditions are expected to occur less than 10% of the time and will coincide with peak traffic (when maximum emissions are generated) only a small fraction of this percentage.

Although any degree of development and population would inevitably result in some abridgement of air quality, impacts from the construction and occupancy of Increment I of the Ewa Marina Community should be relatively minor. Short term impacts are primarily limited to fugitive dust emissions (as discussed in the previously cited reports). These impacts are expected to be mitigated by site specific control measures.

TABLE 2

AMBIENT CO CONCENTRATION ESTIMATES*

Site	1992 Without Development	1992 With Phase I	1991 With Increment I
Kunia Interchange	1-Hour = 3.3+	3.6	3.4
Northern Most	1-Hour = 2.2	15.1	5.3
Ewa Marina Access Road to Ft. Weaver Road	8-Hour = 0.9	5.8	2.1

* CO concentrations at each site are the highest projected for "worst case" meteorological conditons.

\+ Emissions reported as mg/m^3

Source: J.M. Morrow, Air Quality Impact Analysis for Ewa Marina Community, 1979.

LITERATURE CITED

Morrow, J.W., Air Quality Impact Analysis-Ewa Marina Community, 1979.

Root, B.D., Ewa Marina Community Air Quality Analysis, 1979.

Voorhees and Associates, A Traffic Study for the Ewa Marina Community, 1979.

Soil
Conservation
Service

P.O. Box 50004
Honolulu, Hawaii
96850

March 9, 1984

RECEIVED
MAR 12 1984
GACI, INC.

Mr. Michael McElroy, Director
Department of Land Utilization
City and County of HOnolulu
650 South King St., 7th Floor
Honolulu, HI 96813

Dear Mr. McElroy:

Re: Draft Supplemental EIS for Increment I, Ewa Marina Community
Honouliuli, Ewa, Oahu

The above mentioned document has been reviewed as requested.

We previously expressed our concerns about the loss of several hundred acres of agricultural land that will result from this increment and the rest of the development that is proposed.

We also note that our previous comments are not included in Appendix L, Preparation Notice Responses, EIS.

Sincerely,

Francis C.H. Lum

FRANCIS C.H. LUM
State Conservationist

cc:
Mr. Walter K. Tagawa, President
M.S.M. & Associates, Inc.
33 South King Street, Room 410
Honolulu, Hawaii 96813

Mr. Gerald Takano
GACI
926 Bethel Street
Honolulu, Hawaii 96813

March 27, 1984

Mr. Francis C.H. Lum
State Conservationist
Soil Conservation Service
U.S. Department of Agriculture
P.O. Box 50004
Honolulu, HI 96850

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project, Tax Map Key: 9-1-12, Portion of 5

Dear Mr. Lum:

Thank yourvery much for your March 9, 1984 letter on subject project.

Pursuant to your conderns, please be apprised that according to the Estate of James Campbell, Oahu Sugar Company has reviewed its cultivated lands and indicated phasing out of sugar production for the area within Increment I. Subsequently, Oahu Sugar Company decided to continue cultivation in this area until such time as the property was actually needed for development. The lease between Campbell Estate and Oahu Sugar Company provides that Campbell Estate can withdraw up to 4,000 acres classified as cane or contributory from the lease as needed for development projects. The 4,000 acre figure represents Oahu Sugar Company's determination of the total acreage which could be withdrawn from cultivation without affecting the economic viability of its operation. The cultivation of sugar cane will continue until such time as the affected properties are actually needed for development.

In response to the inclusion of your comments, dated January 13, 1984, in the revised draft Supplemental EIS, Increment I, please be apprised that the first draft was withdrawn and subsequently the revised review period was superseded to February 9 - March 9, 1984. Although your January 13, 1984

comments are not officially required in the revised draft, your March 9, 1984 comments and applicant response will be included in the final documents.

Thank you for your interest in subject project.

Yours very truly,

GACI, INC.

Gerald T. Takano

GTT:jw

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813 • (808) 523-4432

EILEEN R. ANDERSON
MAYOR

MICHAEL M. McELROY
DIRECTOR

ROBERT B. JONES
DEPUTY DIRECTOR

March 9, 1984

79/SMA-139(SM)

RECEIVED
MAR 12 1984
GACI, INC.

Mr. Gerald Takano
GACI
926 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Takano:

Supplemental Environmental Impact Statement (EIS)
Increment I - Ewa Marina Community Project
Ewa, Oahu, Hawaii; Tax Map Key 9-1-12: Portion 5

We have reviewed the resubmittal for the above and offer the following comments:

1. Reference: Pages 33 - 40.

   Comment: The discussion of the drainage plan is too general. Specifically, the plan should detail:

   a. Dimensions and elevations of the proposed off-site sedimentation basin and the interim on-site sedimentation basin.

   b. Any interim grading required for these basins, including quantities and locations.

   c. The approximate sizes and alignments of on-site drainage lines, and outlet structures if they are required.

   d. A maintenance plan for the sedimentation basins, including location of area where excess silt is to be taken, if necessary.

   e. Schedule for the implementation of the off-site sedimentation basin. Will it coincide with the development of Increment I.

   f. Willingness of the landowner to allow construction of the off-site sedimentation basin.

2. Reference: Page 48.

   Comment: The grading plan should provide an estimate of the quantities of excavation and embankment required for Increment I, and the approximate locations of this grading activity.

3. Reference: Exhibit 15.

   Comment: This exhibit does not clearly depict what happens after sewage generated by Increment I arrives at Points A and B. Will both of these connections be required for the implementation of Increment I?

4. Reference: Pages 85 - 90.

   Comment: What improvements to Fort Weaver Road or Papipi Road will be required for the implementation of Increment I? This would include any acceleration/deceleration lanes, road widening, or signalization requirements along those corridors.

5. Reference: Pages 104 - 109.

   Comment: A summary of the water sources, i.e., potable or non-potable, for the 700,000 gallons per day required for this project should be presented. References to Exhibits 17 - 19 in the "Water Commitment" section appear to be mislabelled. The information to be conveyed by Exhibit 23 is unclear, and should be clarified.

6. General Comment: Our Comment No. 14. from December 21, 1983 is still applicable, i. e., (1) There is no discussion of alternatives of development or scope of project; (2) other necessary agency permit approvals for Increment I should be clearly presented; and (3) unresolved issues should be listed and discussed.

Should it become necessary, the applicant may request, in writing, for an extension of time in order that an adequate Final EIS document can be prepared.

If there are any questions, please contact Sampson Mar of our staff at 527-5038.

Very truly yours,

MICHAEL M. McELROY
Director of Land Utilization

MMM:sl

cc: Walter Tagawa

March 23, 1984 Ref: 05784

Michael M. McElroy
Director
Department of Land Utilization
650 S. King Street
Honolulu, Hawaii 96813

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project, Tax Map Key: 9-1-12, Portion of 5

Dear Mr. McElroy:

Thank you very much for your March 9, 1984 letter on subject project.

Your comments are constructive and where appropriate, we have revised the document's text accordingly. Please be apprised of the following responses to your comments:

Item 1.a: On April,1981, the Hydrologic Reports for Kaloi Stream Improvement, by William Hee & Associates, Inc, March 1981, was approved by the Department of Public Works. Dimensions and elevations of the proposed off-site sedimentation are referenced to Addendum No. 1 of the report, and included in the Supplemental EIS, Increment I document.

The on-site Increment I sedimentation basin will be approximately 300 feet wide by 1,500 feet long with a maximum depth of about seven feet. Final engineering details are currently being developed.

Item 1.b: The location of the interim on-site sedimentation basin will be shown on Exhibit 10B. Although specific quantities are unknown at this time, some grading within the limits of the proposed marina (Increment II) will be involved.

Item 1.c: Exhibits 10 and 10A will illustrate the approximate sites and alignments of on-site drainage lines and criteria for outlet structures as required.

Item 1.d: As stated in the revised text, drainage channels and sedimentation basin for Increment I will be maintained by the developer. As required, excess silt will be disposed of within the project, if the material is suitable, or will otherwise be hauled to an approved solid waste disposal.

Item 1.e: The development of Increment I will precede the construction of the marina which will be included in Increment III, and may possibly precede the implementation of the 125 acre retention basin above the Ewa Marina Project boundary by others. Consequently, the temporary drainage facilities will be constructed to accommodate this interim condition.

Item 1.f: The Estate of James Campbell has master planned the off-site sedimentation basin for implementation.

Item 2: Detailed grading plans are unavailable at this time and will be developed.

Item 3: As confirmed by the Department of Public Works, City and Count of Honolulu on February 29, 1984, area sewage flows from Increment I will be connected to Point B. on Exhibit 16. This item will be clarified in the text.

Item 4: As identified in the Department of Transportation, State of Hawaii's March 20, 1984 letter to DLU, prior to the widening of Fort Weaver Road, the cost of improvements at the intersection of the access road and Fort Weaver Road for the safe and efficient movemnt of traffic will be borne by the developer. These requirements will be coordinated with all appropriate agencies.

Item 5: The section on Water Commitment has been revised. In addition, a copy of the draft Ewa Water Master Plan 1985-2000, Campbell Estate, March 1984 is included in the Appendix Section.

Item 6: The text has been revised to include a section on alternatives, permit approvals for Increment I and unresolved issues.

Thank you for your interest on subject project.

Yours very truly,

GACI, INC.

Gerald T. Takano

GTT:jw

GEORGE R. ARIYOSHI
GOVERNOR
KENT M. KEITH
DIRECTOR
JOHN R. PINGREE
DEPUTY DIRECTOR
MURRAY E. TOWILL
DEPUTY DIRECTOR

DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT

KAMAMALU BUILDING, 250 SOUTH KING ST., HONOLULU, HAWAII
MAILING ADDRESS: P.O. BOX 2359, HONOLULU, HAWAII 96804

Ref. No. 8998

O
P
Y

March 9, 1984

Mr. Michael McElroy
Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. McElroy:

Subject: Draft Supplemental Environmental Impact Statement for Increment No. 1, Ewa Marina Community, Ewa, Honolulu, February 1984

We have completed our review of the subject document and find that many of the concerns expressed in our letters of December 7, 1983, and January 23, 1984, remain applicable. The following comments raise these concerns, as appropriate, as well as address additional concerns identified as a result of our review.

The supplemental EIS should clearly indicate the timing and impact of proposed actions in the context of the entire Ewa Marina community. For example, the widening of Fort Weaver Road makai of Renton Road and the proposed North-South access road are essential elements of the plan as well as water supply and sewer treatment and transmission facilities. In particular, the availability of water must be discussed in light of the restrictions imposed on the Pearl Harbor Groundwater Control Area. MSM and Associates should provide all assurances to prevent cross-connections and contamination in their proposed dual water system. The dredging of the marina and entrance channel will also impact the entire development in terms of access, drainage, etc.

Other substantive concerns relate to noise, recreation, public access, scenic and open space, and coastal issues.

1. Due to the possibility of noise impacts from both Barbers Point Naval Air Station and Honolulu International Airport, a noise covenant as shown in Appendix I, or a similar covenant that is satisfactory to the State Department of Transportation should be placed in each residential deed for the entire Ewa Marina community (not only Increment No. 1).

2. With respect to the relevant objectives and policies of the Hawaii Coastal Zone Management Program, we offer the following comments.

The subject document as resubmitted responds in part to our previously expressed concern that impacts on coastal resources of the total project be addressed rather than select increments. However, there remains a significant resource area in which the discussion of potential impacts of the project are not adequately addressed.

Recreation

Provide coastal recreational opportunities accessible to the public. (Section 205A-2(b)(1)(A), HRS)

Encourage reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the Land Use Commission, Board of Land and Natural Resources, County Planning Commissions and crediting such dedication against the requirements of Section 46-6. (Section 205A-2(c)(1)(B)(viii), HRS)

Scenic and Open Space

Protect, preserve, and where desirable, restore or improve the quality of coastal scenic and open space resources. (Section 205A-2(b)(3)(A), HRS)

The project proposes to encompass the existing Ewa Beach Park with commercial and residential development and to develop the remaining shoreline extending from the Park to the Ewa Beach Community. It is important to preserve these shoreline parcels for future recreational use. Two recreational planning documents support this contention:

In 1980, the City and County of Honolulu prepared a "Draft Long Range Plan for Beach Parks and Beach Right-of-Ways. This document recommended that the existing Ewa Beach Park be expanded along the shoreline to the East and West to include open beach parcels and their immediately adjacent parcels.

The Technical Document which supports the most recent State Recreation Plan also recommends that this shoreline area be set aside for acquisition to meet future regional public recreation needs.

hael McElroy

, 1984

In summary, the subject document does not respond to the overall project's impacts in the referenced resource areas, nor does it consider the importance of these resources in light of future demand as referenced in the documents cited above.

Thank you for the opportunity to comment on the proposed project.

Very truly yours,

Kent M. Keith

cc: Mr. Walter K. Tagawa,
MSH and Associates, Inc.
Mr. Gerald Takano, GACI
Office of Environmental Quality Control

March 23, 1984 Ref: 05784

Mr. Kent M. Keith
Director
Department of Planning &
Economic Development
250 S. King Street
Honolulu, Hawaii 96804

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community Project, Tax Map Key: 9-1-22, Portion of 5

Dear Mr. Keith:

Thank you very much for your March 9, 1984 letter on subject project.

The intent of the Supplemental EIS, Inc. I is to assess specific issues determined by the City & County of Honolulu's Department of Land Utilization as pertinent to the 174 acres for development, especially in consideration of rezoning and schedule. Although part of the overall Ewa Marina Community, the Supplemental EIS for Increment I assesses the project apart from the remaining portions of the total community as a separate functional entity. As recommended in your letter, however, Increment I issues which are appropriate to the context of the entire community (Increment I & II) will be discussed in the text, including master plans for the infrastructure system.

Pursuant to other specific concerns, please be apprised of the following: Public funding will be sought fof the widening of

* Public funding will be sought for the widening of Fort Weaver Road. However should the development of Ewa Marina C Community precede the availability of public funds, the developer will provide the necessary funds.
* The North-South access road will be discussed under Increment II.
* Water supply (including the Pearl Harbor Groundwater Control Area), sewer treatment transmission facilities are further elaborated in the text, as pertinent to Increment I.

* The dual water system will be installed in accordance with Board of Health standards to preclude cross-connection and contamination.

* Issues pertinent to Increment II, including the dredging of the Marina and entrance channel, noise covenant for Increment II, impacts on coastal resources and scenic and open space resources, are issues to be further elaborated on in the Supplemental EIS for Increment II.

Thank you very much for your interest in subject project.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:jw

cc: 19
Country

University of Hawaii at Manoa

Water Resources Research Center
Holmes Hall 283 • 2540 Dole Street
Honolulu, Hawaii 96822

RECEIVED
MAR 15 1984
GACI, INC.

9 March 1984

Mr. Michael McElroy, Director
Department of Land Utilization
650 South King Street, 7th Floor
Honolulu, Hawaii 96813

Dear Mr. McElroy:

SUBJECT: Draft Supplemental Environmental Impact Statement for Increment I, Ewa Marina Community, Honouliuli, Ewa, Oahu February 1984

We have reviewed the subject DSEIS and have no comment to offer. Thank you for the opportunity to comment. This material was reviewed by WRRC personnel.

Sincerely,

Edwin T. Murabayashi/jm

Edwin T. Murabayashi
EIS Coordinator, WRRC

ETM:jm

cc: Walter Tagawa
Gerald Takano

March 23, 1984

Mr. Edwin T. Murabayashi
EIS Coordinator
Water Resources Research Center
University of Hawaii at Manoa
Holmes Hall 283
2540 Dole Street
Honolulu, Hawaii 96822

Dear Mr. Murabayashi:

Subject: Draft Supplemental Environmental Impact Statement for Increment I, Ewa MarinaCommunity, Honouliuli,Ewa, Oahu-February 1984

Thank you very much for your letter dated March 9, 1984 on the review of subject project. We appreciate your interest in the project.

Yours very truly,,

GACI, INC.

Gerald T. Takano

GTT:jg

GEORGE R. ARIYOSHI
GOVERNOR

Letitia N. Uyehara
Interim Director

TELEPHONE NO.
548-6915

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
550 HALEKAUWILA STREET
ROOM 301
HONOLULU, HAWAII 96813

RECEIVED
MAR 13 1984
GACI, INC.

March 9, 1984

Mr. Gerald Takano
GACI
926 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Takano:

We have reviewed your EIS and offer the following comments:

1. Traffic: The Ewa Marina Community Development, due to its large size, will have a tremendous impact on Fort Weaver Road traffic. Although the volume on Fort Weaver Road will not exceed its capacity except at the intersection of Hanakahi Street, the volume will increase sufficiently to significantly reduce the level of service that Fort Weaver supplies. The fact that Fort Weaver Road is the only entrance and exit for the Ewa Beach area only intensifies this impact.

   The EIS acknowledges that the widening of the road will substantially facilitate traffic flow at all intersections and suggests that the City or State could share in the cost of the Fort Weaver Road widening. However, to the best of our knowledge neither the City nor the State has made this commitment. Unless a commitment to widen Fort Weaver Road is made the proposed widening cannot be considered a mitigation measure.

   We wish to point out that neither the County nor the State is obligated to make improvements to facilitate this development, but rather is it the responsibility of the developer to obtain commitments to mitigate serious impacts so that his project will receive approval.

2. Water: The project is within the Pearl Harbor Groundwater Control Area, where potable water is becoming increasingly scarce. Because other developments will be competing for this resource, we strongly suggest that a water commitment be obtained from the Board of Water Supply.

We hope that these comments will be helpful in preparing a complete informational document.

Sincerely,

Letitia N. Uyehara

Letitia N. Uyehara
Interim Director

cc: Mr. Michael McElroy
Department of Land Utilization

Mr. Walter Tagawa
M.S.M. & Associates, Inc.

March 23, 1984 Ref: 05784

Ms. Letitia N. Uyehara
Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

SUBJECT: Draft Supplementa Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community, Ewa, Oahu, Hawaii.

Dear Ms. Uyehara:

Thank you very much for your letter dated March 9, 1984. Your comments are constructive and we offer the following responses.

Item 1: It is acknowledged that the issue of Fort Weaver Road's widening is at present unresolved. To mitigate any impacts in lieu of this situation, we concur with the Department of Transportation's March 20, 1984 comments of subject document that the developer will be responsible for safe and efficient movement of traffic at the intersection of the access road prior to the highway widening. The access requirements will be coordinated with the Highways Division and other appropriate agencies.

Item 2: A copy of the Board of Water Supply's March 6, 1984 letter regarding the availability of Water for Ewa Marina is attached for your information.

Your interest in the subject project is appreciated.

Yours very truly,

GACI, INC.

Gerald T. Takano

GTT:jw

University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

March 9, 1984

(RE:0309)

Mr. Gerald Takano
GACI
926 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Takano:

Draft Supplemental Environmental Impact Statement
Ewa Marina Community Project, Increment I
Honouliuli, Ewa, Oahu

In a letter dated January 23, 1984 we submitted comments on the original DSEIS for Ewa Marina Community Project, Increment I. Because many of those comments have not been responded to in the present DSEIS and are still pertinent, we again wish to call them to your attention via the attached copy of our January 23, 1984 letter.

Some additional comments on the latest DSEIS have been prepared by the Environmental Center with the assistance of Bion Griffin, Anthropoloy; Paul Ekern, Agronomy and Soils; Frank Peterson, Geology and Geophysics; George Curtis, Joint Institute for Marine and Atmospheric Research; John Burgess, Mechanical Engineering; Jacquelin Miller and Antonio De Oteyza, Environmental Center.

The major inadequacies identified by our reviewers focus on the impacts of the project related to runoff, noise, and on the appropriateness of presenting the DSEIS for Increment I without addressing the impact of the total Ewa Marina community project.

Runoff

As stated in the DSEIS the overall project area, including Increment I, is located within the Kaloi Gulch flood plain. Hence runoff and silt transport to the area becomes a significant issue. Clarification of the statement (pg. 35), "the need to accommodate the expected storm water runoff and to convey it to the sea is continually being resolved" should be provided in the revised SEIS. How is the need "continually being resolved"?

The estimates of runoff from sugar cane fields presented in Exhibit B-2 Table 9.5 were based on the furrow system of irrigation. Because irrigation techniques have now been modified to the drip-irrigation method, the validity of such estimates is questionable. We would suggest that the differences in runoff between the two types of irrigation systems be estimated and that the projections provided in Table 9.5 be modified to apply to lands under drip irrigation.

On page 10 of the document, the marginal profits of sugar cultivation in the area are cited and it is implicit in these comments that the nearby sugar cultivation will be reduced or discontinued in the near future. Assuming that this is the situation then estimates of runoff from possible alternative vegetation covers should be included in the report.

The use of retention basins and grassed recreation areas for holding water flows and sediments is mentioned (pgs. 34, 36). The capacity and dimensions of these structures and maps of their locations should be indicated in the revised SEIS.

Noise

The report mentions (pg. 97) that some areas of Increment I (5.5 acres) will be exposed to noise levels from Ldn 62.5 to Ldn 64 and that noise levels of 65 (Ldn) or below do not represent a "conflict for residential areas." As previously pointed out, 62.5 Ldn implies a precision not possible even in the best performed analysis of this type. Thus, it must be assumed that the levels are 60 to 65 Ldn. It has been shown (in surveys) that the intrusive nature of aircraft noise makes it even more annoying than that from vehicular traffic of the same Ldn. The EPA "levels document" sets 55 Ldn as the desired level for residential areas in temperate climates but with the type of construction used in Hawaii's climate a lower level seems appropriate. The issue of aircraft noise should be more carefully and adequately addressed in the revised SEIS.

Impact of the total Ewa Marina Community Project

In our letter of January 23, 1984, we mentioned our concern with the appropriateness of reviewing the impacts of Increment I out of the overall project context. In that same letter we mentioned that an adequate EIS on the project could not be prepared without an estimate of the potable water demand of the project and its availability. In the resubmitted DSEIS estimates of Water Demand for various development areas are provided (Appendix K) but no actual commitment by the Board of Water Supply to this project is included. Instead reference is made to the master water plan of Campbell Estate. It would be helpful to include the referenced (pg. 109) Campbell Estate's master water plan or a summary of the pertinent sections.

The eventual shift in agricultural use of the surrounding land combined with changes in irrigation practices and reduction of infiltration due to developments will likely alter, to a significant extent, the drainage requirements of this development. If the ultimate drainage plan for Increment I is dependent on Increment II of the Ewa Marina Community as indicated in the DSEIS (pg. 37), it would seem essential that the impacts of this marina development be addressed prior to the construction of structures whose flood protection is now indicated to ultimately depend on the marina.

Minor comments

There are a number of typographical and grammatical errors in the text. For example, on page 6 the project is incorrectly referred to as being in the northwest corner of the development. Exhibit 2 shows the location as the northeast corner. Information referred to on page 106 is not given in Exhibit 17 as mentioned. Exhibits 17, 18, and 19 are all misnumbered (labelled 22, 23, 24 in the DSEIS).

We appreciate your consideration of the concerns we have expressed and look forward to your response.

Yours truly,

Doak C. Cox
for JM

Doak C. Cox
Director

Enclosure

cc: OEQC
Bion Griffin
Paul Ekern
Frank Peterson
George Curtis
John Burgess
Jacquelin Miller
Antonio De Oteyza
Mark Ingoglia

G A C I
926 BETHEL STREET HONOLULU, HAWAII 96813 TELEPHONE (808) 533-1725

March 23, 1984

Mr. Doak C. Cox
Director
Environmental Center
Crawford 317
2550 Campus Road
Honolulu, Hawaii 96822

Dear Mr. Cox:

Subject: Draft Supplemental Environmental Impact Statement, Ewa Marina Community Project, Increment I
TMK: 9-1-12, Portion of 5

Thank you very much for your letter dated March 9, 1984. Your concerns are constructive and we offer the following responses:

Drainage and Runoffs

1. The section on drainage, including Exhibits, has been revised. The drainage system addresses Increment I as a stand alone project. The SEIS to follow for Increment II will address the total system, including the marina. The revised text, however, includes a discussion of present conditions, on-site and off-site drainage, improvements, and storm runoff.

The development of Increment I will precede the construction of the marina which will be in Increment II, and may possibly precede the implementation of the 125-acre retention basin above the Ewa Marina project boundary by others. Consequently, temporary drainage facilities will be constructed to accommodate this interim condition. Exhibit 10A will show the Increment I Drainage Master Plan which consists of permanent drainage facilities within Increment I and temporary diversion channels and sedimentation basin to collect and covey storm runoff to the existing Kaloi Gulch drainage channel.

A major portion of the storm water is presently absorbed by the permeable soil in the area, due to extensive agriucltural use. The entire tributary above the overall project site (which takes up more than two-thirds of the total tributary area) will remain agricultural and/or conservation for many

years before ultimate urbanization of those areas occur. The majority of the storm water will continue to percolate into the substratum due to the nature of the soil and its land use. Therefore, during the development of Increment I, prior to the construction of the Marina in Increment II, the same storm conditions that exist today are anticipated mauka of the project site.

Four alternative drainage system discharge/disposal schemes were considered for Increment I.

1. Discharge the storm water into the existing City storm drain system located in Papipi Road. This alternative was not considered viable because the existing drain system cannot accommodate the total storm runoff from Increment I. Expanding the existing system by replacing lines or installing parallel lines would be too costly and disruptive to the existing Ewa Beach community.

2. Discharge the storm water into the sea by constructing a new outlet on the sea coast just west of the existing Ewa Beach community. This alternative was not selected because the new outlet would create a change that could be expected to have an adverse impact on the marine environment near the outlet, and because this scheme would not be consistent with the ultimate drainage system for this project.

3. Discharge the storm water into the adjacent agricultural fields just west of Increment I. This alternative assumes that the storm runoff would be absorbed by the existing permeable ground. However, while this may be true for most rainfall, it is doubtful that the ground could absorb the runoff from severe storms. Since damages to existing property would result if the storm runoff is not absorbed by the ground, this alternative was not chosen.

4. Convey the storm water to the existing Kaloi Gulch drainage channel. This alternative was selected because it posed the least negative impacts to the marine environment and surrounding community. A sedimentation basin will be provided to minimize sediment discharge into the ocean.

As shown on the revised Increment I Drainage Master Plan, an unlined diversion channel will be constructed along the mauka boundary of the project to intercept and direct storm runoff to the existing Kaloi Gulch drainage channel. This channel will be designed to accommodate the peak storm with low flow velocities and will be maintained with vegetation to minimize erosion.

Within Increment I, the permanent drainage system will be installed to collect the storm runoff water and discharge it into temporary unlined channels outside Increment I leading to a sedimentation basin. Overflow from this basin will then discharge into the existing Kaloi Gulch drainage channel and ultimately out to the sea. The sedimentation basin will be approximately 300 feet wide by 1,500 feet long with a maximum depth of about seven feet. Portions of the drainage channels and the sedimentation basin will be constructed within the limits of the proposed marina to minimize the disruption and impact of future development beyond Increment I. The drainage channels and sedimentation basin will be maintained by the developer. As required, excess silt will be disposed of within the project if the material is suitable, or will otherwise be hauled to approved solid waste disposal sites.

In addition, the drainage system will be designed in accordance with City and County standards.

2. Your comments on runoff from sugar cane fields and irrigation systems are referenced from the Hydrologic Report for Kaloi Stream Improvement by W. Hee & Associates, March 1981. This document was approved by the Department of Public Works on April 1, 1981.

3. Section on sugar cultivation has been revised. Oahu Sugar Company's sugar cane cultivation within the project area will continue until such time as the affected properties (Increment I) are actually needed for development.

4. The capacity and dimensions for the on-site sedimentation basin are shown on the revised Drainage Master Plan Exhibit for Increment I. Off-site retention basin dimensions are shown in the Addendum to the previously mentioned Hydrologic Report for Kaloi Stream Improvement.

Noise

1. As indicated in the text, 62.5 Ldn was used as the upper limit for residential development based on the Navy's noise criteria for compatible development next to Barbers Point.

Impact of the Total Ewa Marina Community Project

1. Both the Campbell Estate master water plan and a March 6, 1984 letter from the Board of Water Supply verifying the availability of water will be included in the revised text.

2. Although Increment I is part of the overall Ewa Marina Community project including the marina, the drainage requirements in the subject document preclude the construction of the marina (Increment II) and may possibly precede the previously mentioned off-site retention basin. Increment I facilities will be built to accommodate this interim situation and issues pertinent to Increment I are thereby present.

Minor Comments

1. References to inconsistencies and typographical errors have been addressed.

Your interest in the subject project is appreciated.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:it

APPENDIX O

Letter received after March 9, 1984

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HAWAII 96801

CHARLES G. CLARK
DIRECTOR OF HEALTH

RECEIVED
MAR 20 1984
GACI, INC.

In reply, please refer to:
EPHSD-SS

March 16, 1984

MEMORANDUM

To: Mr. Michael McElroy, Director, Department of Land Utilization
City & County of Honolulu

From: Deputy Director for Environmental Health

Subject: Draft Supplemental Environmental Impact Statement (EIS) for Increment I, Ewa Marina Community, Honouliuli, Ewa, Oahu

Thank you for allowing us to review and comment on the subject EIS. Our staff wishes to make the following comments:

Drinking Water

The Drinking Water Program would like to reiterate our January 3, 1984 comments on the proposal to use a dual water system to serve the Ewa area.

While the conceptual idea of utilizing a dual water system has merit, we believe that practical application will determine that the proposal is unfeasible at this time. The existence of two systems so closely intermingled increases the potential for cross-connection of the two systems and increases the danger of contamination of the potable water.

On page 106 of this document, the following statement is made: "Sources of the non-potable system will be of sufficient quality so that accidental ingestion would not be harmful." The standards for potable water are based on known health effects. How can a water supply not meet the potable water requirements and yet be unharmful to human health? On what criteria will the nonpotable system be evaluated prior to use? Who will be responsible for this determination? How often and by whom and for what parameters will the dual system be monitored?

Recent concerns over the quality of groundwater would suggest that any nonmonitored or nonregulated water would be unsuitable for routine human exposure. The Drinking Water Program finds the use of a dual water system completely unacceptable and suggest that such a proposal be abandoned at this time.

If a dual system is developed, it is imperative that conditions be stipulated that the owner and/or supplier of water ensure that all potential for human exposure to the nonpotable water will be eliminated and be held liable for any cross-connections between the potable and nonpotable systems and any human exposure.

Please be advised that if the project intends to develop any new sources of potable water, this source must be approved by the Director of Health prior to its use as a potable water system. The new source must comply with all the applicable terms and conditions of Chapter 20, Title 11, Administrative Rules.

Noise & Radiation

The applicant has not addressed any mitigative measures toward previous concerns of the proposed development. Reference is made to comments on submittal of Environmental Assessment/Determination, March 27, 1980.

1. Reservations toward the proposed community development were stressed in our previous comments due to the mixture of land uses within the project location. Noise associated with commercial, recreational and marine activities may have adverse impacts if situated adjacent to residential areas.

2. We concur with the applicant's comment that noise from aircraft activities from Barbers Point Naval Air Station and Honolulu International Airport will impact the proposed community. This concern was addressed in previous comments to Zone Change Request and District Boundary Amendment (November 29, 1983 and January 18, 1984).

3. The EIS continues to address Public Health Regulations. Since these regulations were repealed, reference should be directed toward Title 11, Administrative Rules.

Wastewater Management

1. There is a possibility that the marina dredgeline may conflict with the Honouliuli Outfall line. Precautions should be taken to locate the outfall prior to dredging.

2. Dual System - No dual system using recycled wastewater should be allowed in residential areas.

3. Since the disposal of the Ewa Marina wastewater will be into the City & County's Honouliuli Treatment Facility, the development will not be required to obtain NPDES or Zone of Mixing permits. However, stand-by power should be maintained at the sewage pump stations to prevent by-passes into the marina.

Geology

1. KARST Topography - The area is underlain by coral/algal limestone. While there is no evidence of large sinkholes being encountered in the area, this does not preclude the existence of large (greater than 1 meter) solution or growth cavities. The collapse of such a cavity could have catastrophic effects.

ter Quality -

a. ·avation dewatering during construction could lower water levels enough to cause salt water intrusion in the caprock aquifer.

b. The open marina channel will cause significant degradation of the caprock aquifer.

Sanitation

We do not foresee any public health problems if all the plumbing outlets are connected to the public sewerage system for Phase I.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

MELVIN K. KOIZUMI

cc: Mr. Walter Tagawa
Mr. Gerald Takano
OEQC

March 23, 1984

Mr. Melvin K. Koizumi
Department of Health
State of Hawaii
P.O. Box 3378
Honolulu, Hawaii 96801

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community, Tax Map Key: 9-1-12, Portion of 5

Dear Mr. Koizumi:

Thank you very much for your comments of March 16, 1984. Although your comments were received after the official public review period deadline of March 9, 1984, your concerns are constructive and will be addressed in the text as appropriate.

Drinking Water:
The text has been revised to clarify the dual water system. It is also understood that new sources of potable water will require the approval of the Department of Health and compliance with Chapter 20, Title 11, Adminstrative Rules.

Noise and Radiation:
As noted on the text Exhibits, commercial uses will adjoin existing commercial areas outside the project. The corridor roadway will further act as a buffer between commercial and residential areas. Although impacts from the Marina are referenced in the separate EIS for Increment II, the control of motor boats and other noise generating Marina uses is presently undercoonsideration.

Aircraft activities from Barbers Point will not impact Increment I, but will be assessed under the separate EIS for Increment II. Mitigation measures for noise impacts from the Honolulu International Airport are presented in the text.

Reference to Title 11, Administrative Rules has been addressed in the text.

Wastewater Management:
Items 1 and 2 will be addressed in the separate EIS for Increment II. At present, recycled wastewater is not under consideration for residential areas.

Geology and Groundwater Quality:
Both items are relevant to the separate EIS for Increment II.

As stated above, items, pertinent to Increment I are in the subject document. Your comments pertaining to Increment I will be addressed at a later time.

Your interest is the subject project is appreciated.

Yours very truly,

GACI, INC.

Gerald T. Takano

GTT.jw

6286

STP 8.9785

March 20, 1984

RECEIVED
MAR 23 1984
GACI, INC.

Mr. Michael McElroy, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. McElroy:

Draft Supplemental Environmental
Impact Statement
Ewa Marina Community, Increment I
TMK: 9-1-12, Por. 5

Comments on the first draft supplemental environmental impact statement were provided on two occasions (Airports Division letter dated 1/3/84 and DOT letter dated 1/20/84).

Our review of the subject document indicates that:

1. The comments from the Airports Division have been satisfactorily incorporated.

2. Earlier comments and concerns about the water quality of the marina have been addressed.

3. We do not agree with the discussion of the traffic impacts upon the existing Fort Weaver Road. Until Fort Weaver Road is improved beyond Renton Road, Level of Service "E" or "F" operating conditions can be expected under its present two-lane configuratio

4. The access requirements at Fort Weaver Road should be further coordinated with the Highways Division.

5. Prior to the highway widening, the cost of improvements at the intersection of the access road and Fort Weaver Road for the safe and efficient movement of traffic should be borne by the developer.

6. Section 5.8 Traffic-Highway Funding is speculative and should be deleted in its entirety.

Thank you for allowing us to review this document.

Very truly yours,

Wayne K. Yamasaki
Director of Transportation

KYA:ko

cc: Walter Tagawa, MSM & Associates
Gerald Takano, GACI
HWY-PA
HAR-EP
AIR-EP
STP(KYA)

March 23, 1984 Ref: 05784

Mr. Wayne Yamasaki
Director
Department of Transportation
869 Punchbowl
Honolulu, Hawaii 96813

SUBJECT: Draft Supplemental Environmental Impact Statement Pertaining to Increment I, Ewa Marina Community, Tax Map Key: 9-1-12, Portion of 5

Dear Mr. Yamasaki:

Thank you very much for your comments in your letter of March 20, 1984. Although your comments were received after the official public review period deadline of March 9, 1984, your concerns are constructive and will be addressed in the text as appropriate.

Item 5 will be discussed at a later time with appropriate agencies.

Your interest in the subject project is appreciated.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:jw

GEORGE R. ARIYOSHI
GOVERNOR

WAYNE J. YAMASAKI
DIRECTOR

DEPUTY DIRECTORS
JONATHAN K. SHIMADA, Ph.D.
WALTER T.M. HO
CHERYL D. SOON
ADAM D. VINCENT

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

IN REPLY REFER TO

STP 8.9789

March 27, 1984

RECEIVED
MAR 29 1984
GACI, INC.

Mr. Michael McElroy, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street, 7th Floor
Honolulu, Hawaii 96813

Dear Mr. McElroy:

Draft Supplemental Environmental Impact Statement, Ewa Marina Community, Increment I, TMK: 9-1-12, por. 5

This is to advise you that Item 2 of our March 20, 1984 comments to you should read:

"2. Earlier comments and concerns about the water quality of the marina have <u>not</u> been addressed."

Please advise the applicant of this matter.

Very truly yours,

Wayne J. Yamasaki
Director of Transportation

cc: Gerald Takano, GACI

G A C I
926 BETHEL STREET HONOLULU, HAWAII 96813 TELEPHONE (808) 533-1725

March 30, 1984

Wayne Yamasaki
Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813

SUBJECT: Draft Supplemental Environmental Impact Statement, Ewa Marina Community, Increment I, TMK: 9-1-12, Portion of 5

Dear Mr. Yamasaki:

Thank you very much for your letter of March 27, 1984 clarifying your comments in your letter of March 20, 1984.

Your revision has been acknowledged.

Yours very truly,

GACI, INC.

Gerald T. Takano

Gerald T. Takano

GTT:jw