1991-12-23-OA-FEA- Clapp Shoreline Setback Variance for seawall

FILE COPY

SHORELINE SETBACK VARIANCE
APPLICATION FOR SEAWALL PERMIT

DR. PETER R. CLAPP
44-435 KANEOHE BAY DRIVE
KANEOHE, HAWAII 96744
TAX MAP KEY NO: 4-4-06: 10 & 15

Prepared For:

City & County of Honolulu
Department of Land Utilization
650 S. King Street
Honolulu, Hawaii

Prepared By:

Sea Engineering, Inc.
Makai Research Pier
Waimanalo, Hawaii

December 1990

1. LOCATION AND INTRODUCTION

The parcel under consideration for shore protection is located on the east shoreline of Kaneohe Bay. A general location map is shown in Figure 1. The lot is one of the few between Kaneohe Yacht Club to the south and Nuupia fishpond to the north without an existing seawall. Two City and County structures could be directly impacted by further shoreline erosion. A concrete storm drain shows evidence of local erosion. The proposed seawall would tie into this structure and eliminate the erosion problem. A City and County sewer passes within feet of the shoreline. Further erosion could undermine and possibly damage the sewer. The seawall would be built in front of the sewer line and protect the sewer from undermining.

2. COASTAL SETTING

Kaneohe Bay is a reef sheltered lagoon with a total bay front exposure of 4.6 miles between Kualoa Point to the northwest and Mokapu Peninsula on the southeast. This opening is mostly reef with only two navigable channels, which limits the wave energy entering the bay. The mean tidal range between mean lower low and mean higher high water is 2.1 feet. The tidal change is the major driving force for currents in the bay.

The eastern shore of Kaneohe Bay is sheltered from wave attack from the north, east and south by Mokapu Peninsula and by the island of Oahu from waves from the west. Waves that do enter the bay are greatly reduced by the shallow coral and sand bottom.

The largest waves that could reach the site would be generated by local winds blowing across the open water of the bay. These waves would be limited in height due to the short fetch length. The Windward Oahu Hurricane Vulnerability Study prepared by Sea Engineering, Inc. (1990) for the State of Hawaii Department of Defense and the U.S. Army Corps of Engineers, Pacific Ocean Division describes the winds produced by the hypothetical worst case scenario hurricanes which could occur in Hawaii. Maximum wind speeds of 106 mph would be generated by the scenario hurricane over a 7.5 mile long fetch in an average water depth of 9 feet. This would generate an extreme worst case wave height of 4 feet.

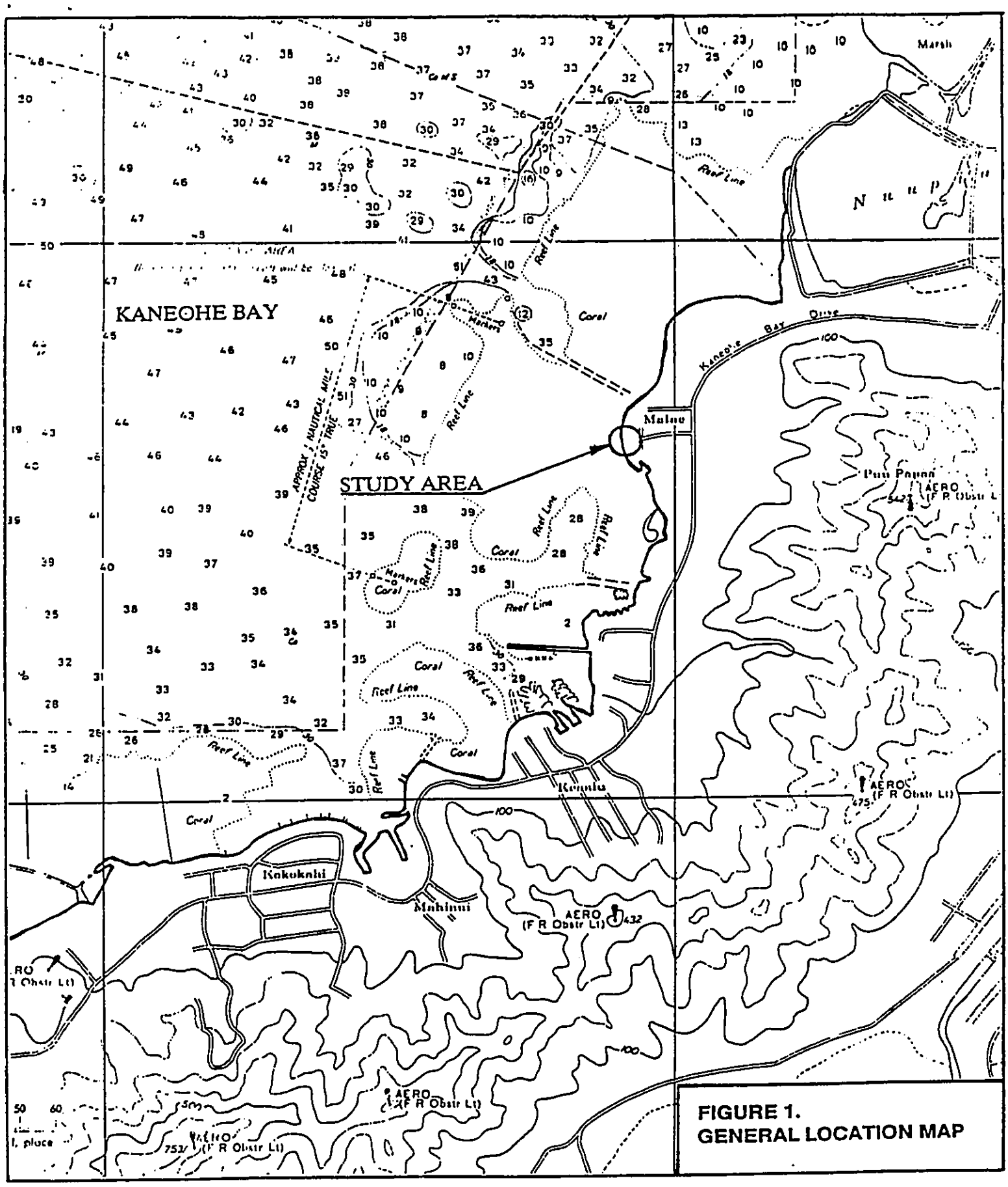


FIGURE 1.
GENERAL LOCATION MAP

This storm although unlikely, would generate considerable flooding and cause severe coastal damage.

Northerly winds would generate the largest waves at the site, since the direction of approach corresponds to the longest fetch length. According to records compiled by the U.S. Naval Weather Service, north winds with speeds exceeding 27 knots occur much less than 1 percent of the time. Assuming constant depth across the bay and sustained wind speeds (both conservative assumptions), a 27-knot north wind would generate a 2.4 foot wave along the ocean side of the reef margin. The wave height reaching the shoreline would be reduced by the shallow water and the bottom roughness. This is probably a conservative estimate of the highest annual wave height at the site.

The shoreline and offshore areas are comprised of a complex reef bottom consisting of mostly sand with widely scattered boulders details of the bay bottom are shown in the Oahu Coastal Zone Atlas (AECOS, 1981).

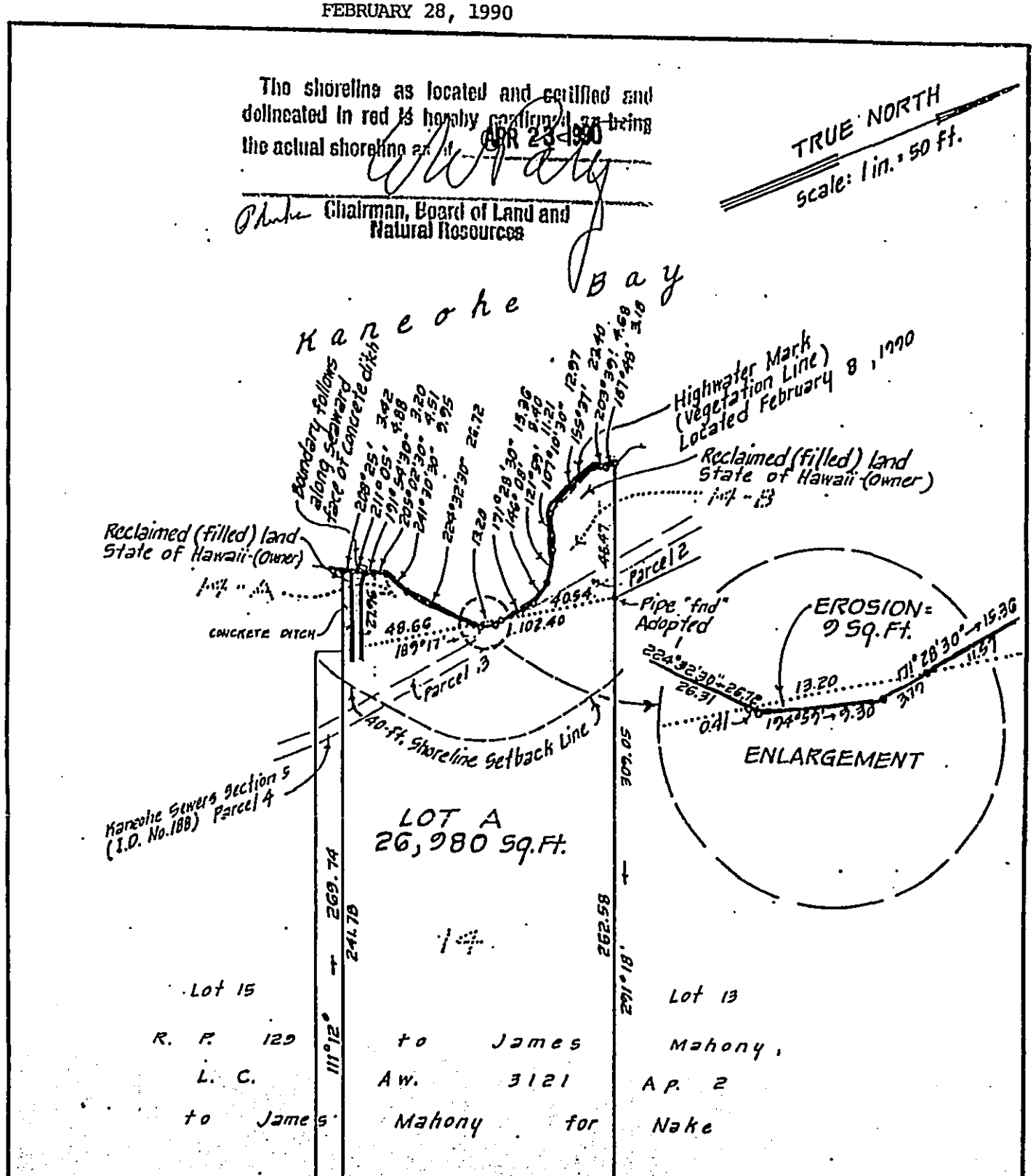
The tidal currents and prevailing low wave energy limit the littoral transport. Offshore areas adjacent to existing seawalls show no sign of toe scour or alteration in the foreshore slopes, which would be typical in areas of littoral transport.

3. EXISTING SHORELINE

The existing shoreline is shown on Figure 2, which is a shoreline survey dated February 28, 1990. Both the concrete drainage ditch and the underground sewer line are shown on the survey. Figure 3 shows a cross-section profile measured on November 16, 1990. The elevations and distances are approximate, and were measured to determine the general offshore conditions.

The shoreline and nearshore area, in front of the Clapp property and the surrounding properties, has been extensively modified by past dredging and filling. At present, there is a small dredged channel paralleling the shoreline. The channel is less than four feet deep and provides navigation for small boats only. Seaward of the channel is the reef flat, which extends for several hundred feet at depths of 1 to 2 feet before dropping off into the deeper bay waters.

FIGURE 2. SHORELINE SURVEY
FEBRUARY 28, 1990



Kaneohe (I.D. No. 188)

LOT A
26,980 Sq. Ft.

269.74
241.78
111°12'

262.58
291°18'

14

Lot 15
R. P. 129
L. C.
to James

to James
Mahony
Aw. 3121

Lot 13
Mahony,
Ap. 2
for Nake

Lot B-2

21°00' ± 99.73

KANEOHE BAY DRIVE

HARRY K. MATSUO
REGISTERED PROFESSIONAL LAND SURVEYOR
No. 2717-S
HAWAII, U.S.A.

CONSOLIDATION OF
LOT 14 OF OPAAPAA SUBDIVISION LESS EROSION
AND LOT 14-A AND 14-B RECLAIMED (FILLED) LAND
OF KANEOHE BAY
INTO LOT A

AT OPAAPAA, KANEOHE, KOOLAUPOKO, OAHU, HAWAII

OWNERS: State of Hawaii
Peter R. Clapp

SCALE: 1 in. = 60 ft.

February 28, 1990

This work was prepared by me
or under my direct supervision.

Harry K. Matsuo
Registered Professional Surveyor
Certificate Number 2717

COMMUNITY PLANNING, INC.
SUITE 400, 745 FORT STREET MALL
HONOLULU, OAHU, HAWAII

8½" x 13" - 1.0 Sq. Ft.

PHOTO 1. Unprotected shoreline looking south.

PHOTO 2. Unprotected shoreline and seawall fronting lot to the south.

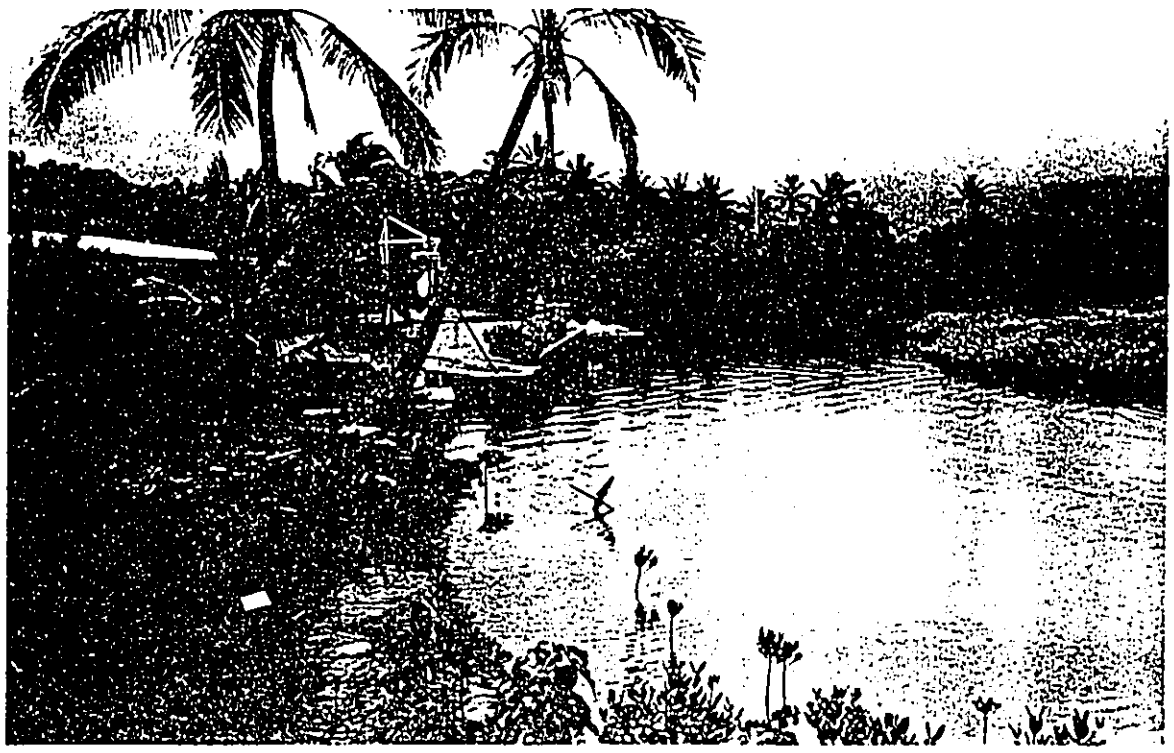


PHOTO 2. Flank erosion on north side of concrete ditch.

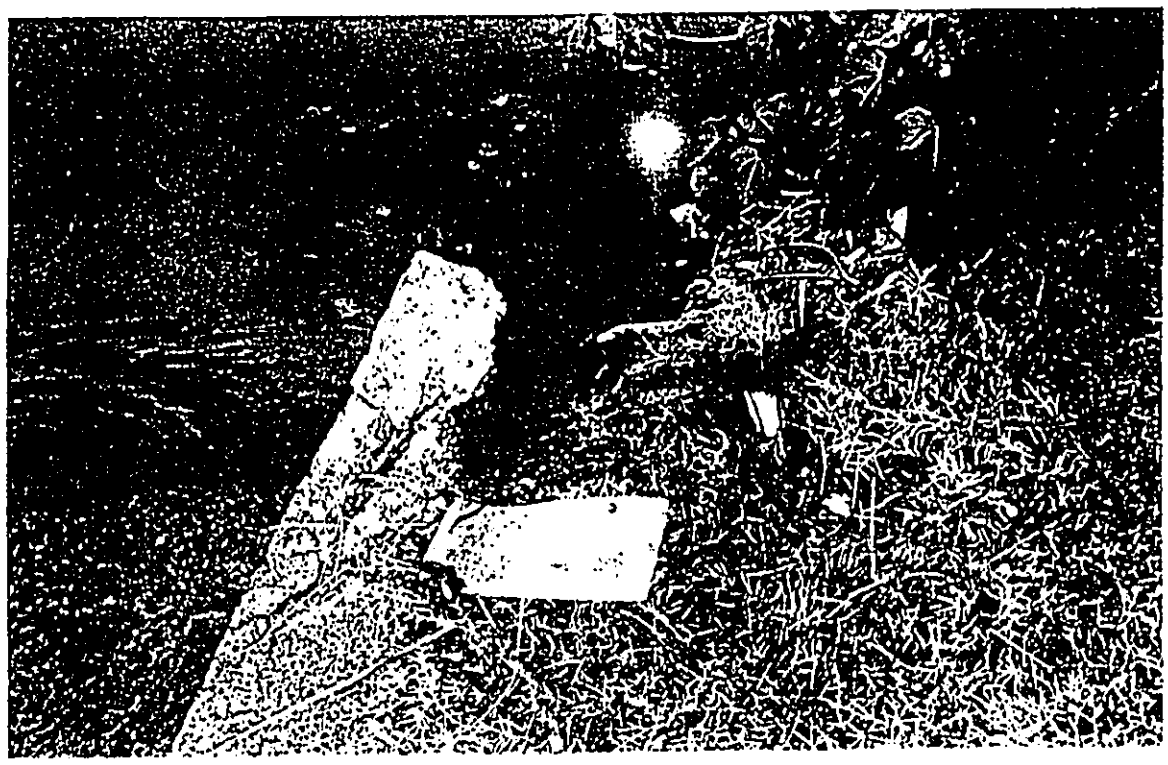


PHOTO 3. The lot and top of seawall to the north.

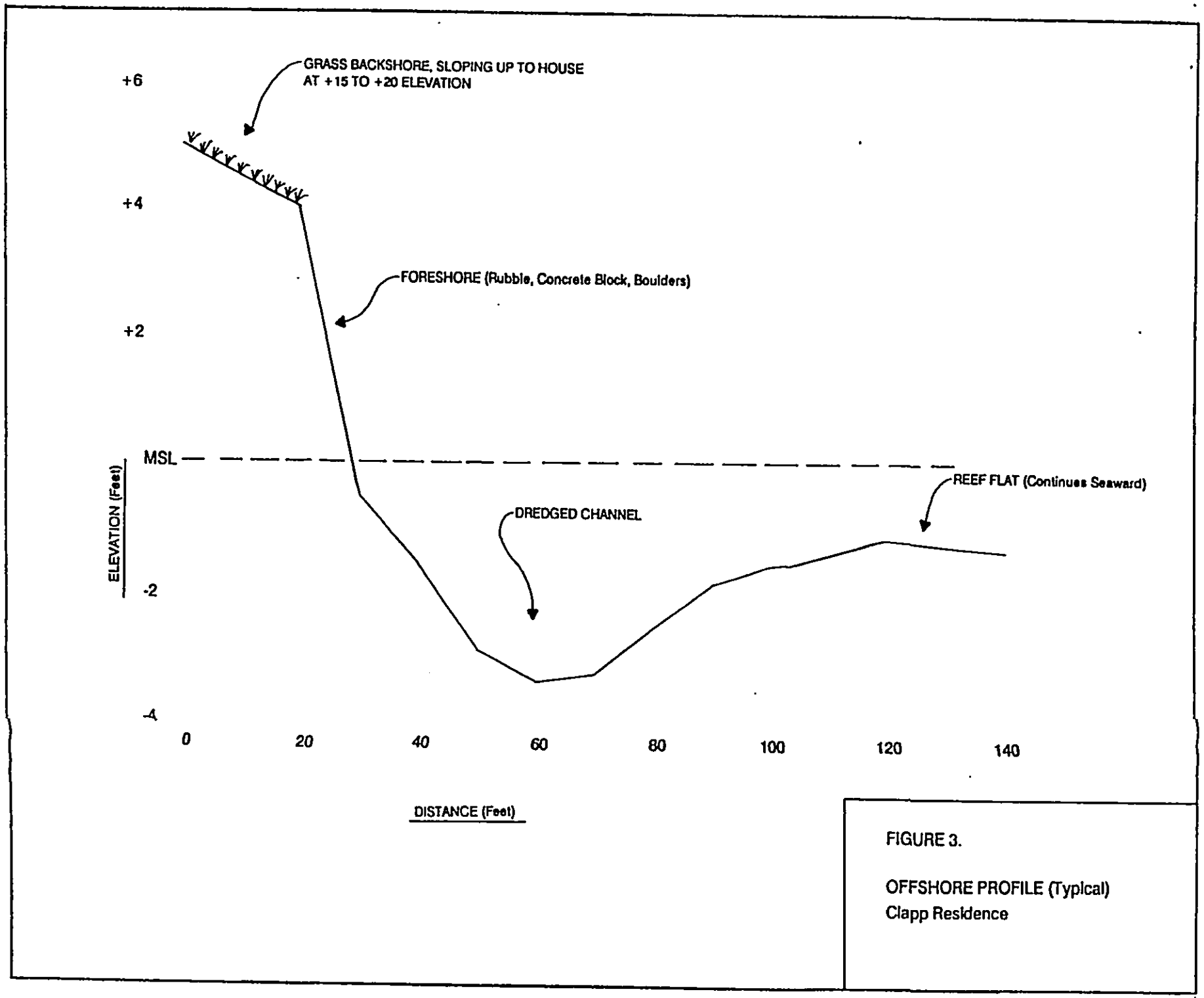


FIGURE 3.

OFFSHORE PROFILE (Typical)
Clapp Residence

The foreshore is composed of mud, rubble and vegetation. There was no sand apparent in the general area. The February survey (Figure 2) shows a crescent-shaped shoreline, apparently formed in response to past erosion. In the center of the lot, the erosion extends to the edge of the sewer easement. Rocks and cinder blocks have been placed to protect the sewer pipe from undercutting.

Photo 1, taken from the north end of the property looking to the south, shows the general condition of the shoreline. Photo 2 was taken from the center of the property and shows the neighboring properties to the south. The small navigation channel mentioned above swings to the right around the island on the right of Photo 2 and extends to the deeper water of the bay. Photo 3 shows the localized erosion occurring at the seaward end of the storm drain. The end of the structure has been patched once and is again in need of repair.

Both adjacent properties are protected by vertical seawalls. Photo 4 shows the shoreline of the lot to the north.

4. JUSTIFICATION FOR SHORE PROTECTION

Shore protection is needed to prevent the continued loss of valuable waterfront land. In addition, continued erosion will result in further damage to the concrete ditch and probable undermining and damage of the Kaneohe sewer.

5. CONSIDERATION OF ALTERNATIVES

Three possibilities exist for the parcel in question:

A) No Action

This alternative would result in continued erosion. Both the Kaneohe sewer line and the concrete ditch could be adversely impacted.

B) Revetment

This alternative could be constructed along the shoreline to eliminate further erosion. A revetment is a sloping structure with an outer facing of erosion resistant material.

Revetments are most commonly constructed of armor stones, sized to resist the design waves, over underlayers of smaller stones and bedding material. Advantages of properly designed revetments are durability, flexibility during settlement, resistance to wave damage, and reduced wave reflection. This last factor is very important when sandy beaches are located seaward of the structure.

The major disadvantage of a revetment is the extent of land used by the structure. For example, for a revetment with a total height of 5 feet and a sloping face of 1 on 3, the total structure width would be at least 15 to 18 feet.

C) Seawalls

Seawalls are vertical concrete or grouted masonry walls used to protect the land from wave damage, with use as a retaining wall a secondary consideration. Seawalls are proven, long lasting, relatively low maintenance shore protection structures. They require limited horizontal space along the shoreline, and stairs may be provided for access to the water. Masonry gravity walls are commonly used for shore protection in Hawaii. This type of wall may be constructed of cast-in-place reinforced concrete or of individual rocks grouted in place. A gravity wall is stabilized by its own weight. Weep holes are provided at regular intervals for drainage. The near vertical seaward faces of seawalls cause wave energy to be deflected both upward and downward; the downward component can cause severe scour at the base of the wall, particularly in shallow waters and, thus, adequate toe protection is required. Ideally the wall should be constructed on solid, non-erodable substrata. Undermining of the toe is one of the most common causes of seawall failure. Seawalls are inflexible structure and failure of one section can often initiate failure of the entire wall. Because they dissipate little wave energy, smooth, vertical seawalls are also more easily overtopped by waves and spray than sloping irregular walls.

6. PROPOSED ALTERNATIVE

Since there are no beaches in the immediate area and wave reflection is not a concern, a seawall is the preferred alternative. The homeowner proposes to use a CRM wall, with a cross section as shown in Figure 4. The wall will follow the existing shoreline.

The wall was not designed by Sea Engineering, Inc. and this report only addresses the justification for, and the coastal impacts of, the wall, and should not be considered a verification of the structural design. However, the wall does appear to meet the general guidelines for seawalls described above.

7. POTENTIAL IMPACTS

Given the existing conditions, with seawalls already protecting the neighboring properties, and the nearshore dredged channel, the proposed wall should have no adverse impacts. Positive impacts will include the following:

A) protection of the sewer line paralleling the shoreline;

B) stabilization of the seaward end of the drainage channel;

C) protection of valuable waterfront land, and;

D) an improvement in the general aesthetics of the area, by substitution of a seawall for a foreshore consisting of rubble and weeds.

Submitted by:

Robert Y. Rocheleau

Robert Y. Rocheleau
Registered Professional Engineer
Civil Branch, License Number 4792

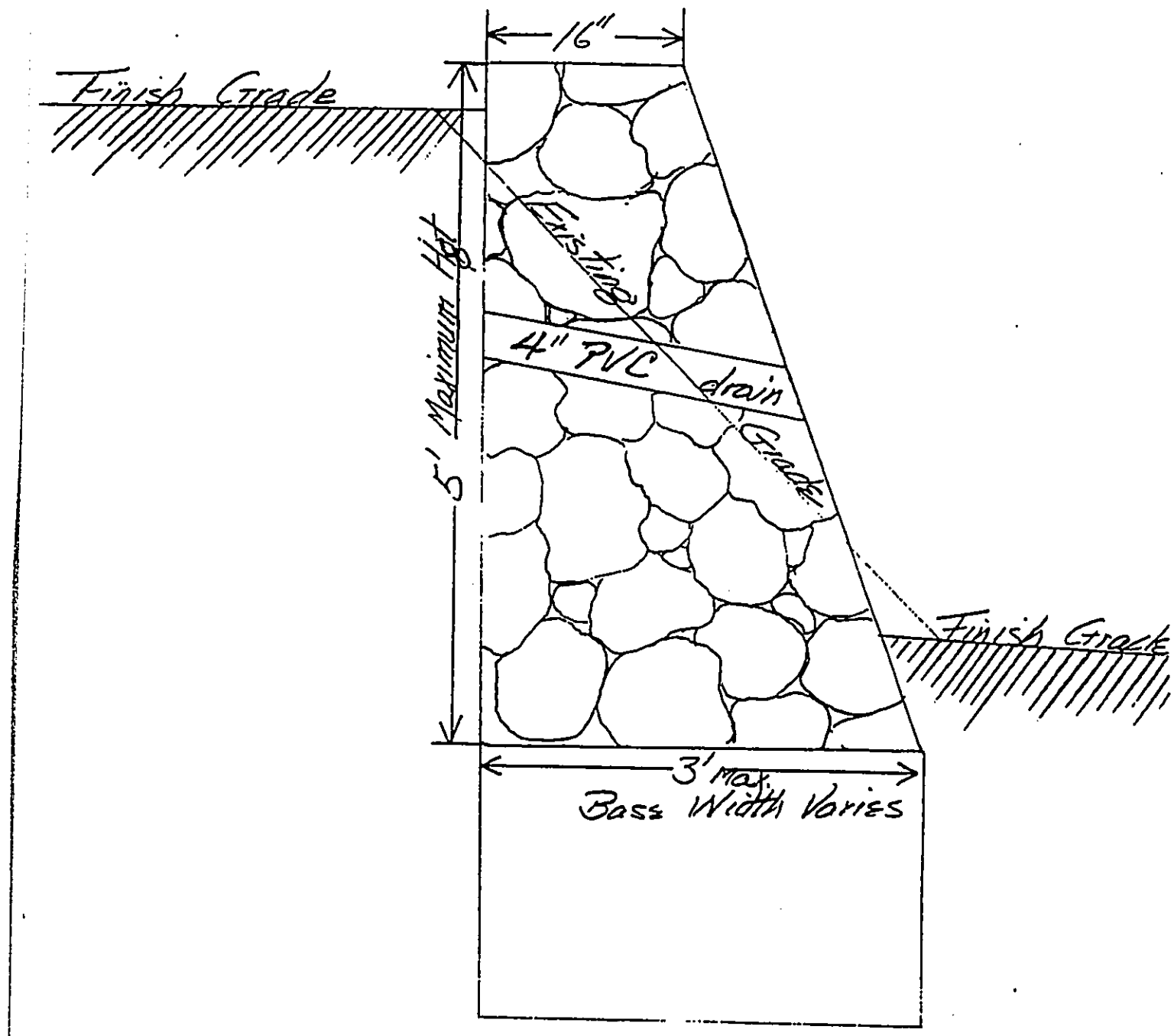


FIGURE 4.
TYPICAL CROSS SECTION
CRM RETAINING WALL

7. REFERENCES

AECOS, Inc. 1981. "Oahu Coastal Zone Atlas". Prepared for the State of Hawaii, Department of Transportation, Harbors Division.

Sea Engineering, Inc. 1990. "Windward Oahu Hurricane Vulnerability Study, Determination of Coastal Inundation Limits." Prepared for the State of Hawaii, Department of Defense and the U.S. Army Corps of Engineers, Pacific Ocean Division.

Sea Engineering, Inc.
Makai Research Pier, Waimanalo, Hawaii 96795 (808)259-7966 FAX(808)259-8143

August 30, 1991

Mr. Michael Street, Deputy Director
Department of Public Works
City and County of Honolulu
650 South King Street
Eleventh Floor
Honolulu, Hawaii 96813

Dear Mr. Street:

Subject: Shoreline Setback Variance for Construction of Shore Protection at 44-435 Kaneohe Bay Drive, Oahu (TMK 4-4-06: 10 & 15)

This is to follow up my recent telephone conversation with you regarding the proposed construction of a seawall on the subject property (residence of Dr. and Mrs. Peter Clapp). Sea Engineering, Inc., on behalf of Dr. Clapp, has submitted a Shoreline Setback Variance Application (SSVA) to the Department of Land Utilization (DLU) for this project. We are presently working with the DLU to resolve the placement and design of the seawall. The proposed seawall would be constructed landward of the certified shoreline for the property, a portion of which is in close proximity to a City and County sewer line easement. The certified shoreline and sewer easement are shown on the enclosed copy of the shoreline survey map (enclosure 1).

Dr. Clapp's property is located on the east shoreline of Kaneohe Bay, and is one of the few lots between Kaneohe Yacht Club to the south and Nuupia fishpond to the north without an existing seawall. Continued erosion of the shoreline could impact the stability of the sewer line.

Construction of a seawall would stabilize the shoreline and would be beneficial to both the homeowner and the City and County of Honolulu. The proposed seawall designed by Mr. David Wong is shown in the enclosed figure (enclosure 2). This typical section will be used for the majority of the shoreline, with the possible exception of the shoreline adjacent to the sewer line.

The design of the portion of the seawall adjacent to the sewer line would be completed during construction, after excavation for the seawall footing has been done. The required elevation of the seawall footing in the vicinity of the sewer line, necessary to eliminate any bearing or pressure being exerted on the line, cannot be completely determined until the soil characteristics in the vicinity of the proposed wall can be analyzed. This can most easily be accomplished when construction equipment is in place and the excavation is being done, and would be less costly then having soil borings taken before construction begins. If deemed necessary, approval of the final seawall design by the Department of Public Works (DPW) or the DLU could be a pre-requisite for construction of the center portion of the seawall adjacent to the sewer line.

Concurrence from the DPW for this project is necessary for approval of the Shoreline Setback Variance, and the purpose of this letter is to obtain DPW approval of the proposed seawall design and construction plan.

Should you have any questions or need additional information please call me at 259-7966. Thank-you for your timely consideration of this matter.

Sincerely

Gordon S. Harkins
Project Engineer

Enclosures

cc: Mr. John Morihara, DLU
Mr. David Wong
Dr. Peter Clapp

LU 10/91 - 8109

DEPARTMENT OF PUBLIC WORKS

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

'91 OCT 3 PM 1 45

DEPT OF LAND UTILIZATION
CITY & COUNTY OF HONOLULU

FRANK F. FASI
MAYOR

SAM CALLEJO
DIRECTOR AND CHIEF ENGINEER

C. MICHAEL STREET
DEPUTY DIRECTOR

In reply refer to:
WPC 91-142

October 2, 1991

MEMORANDUM

TO: MR. DONALD A. CLEGG, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: SAM CALLEJO, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

SUBJECT: SHORELINE SETBACK VARIANCE FOR CONSTRUCTION OF SHORE PROTECTION AT 44-435 KANEOHE BAY DRIVE, KANEOHE, OAHU, HAWAII
TAX MAP KEY: 4-4-6:10 & 15

We have no objection to the proposed variance since the new seawall will be constructed outside of our existing sewer easement. Due to the steps proposed by the project engineer, the seawall should aid in protecting our sewer from ocean erosion.

C. Michael Street
for SAM CALLEJO
Director and Chief Engineer

OVERSIZED DRAWING/MAP

PLEASE SEE 35MM ROLL

0088

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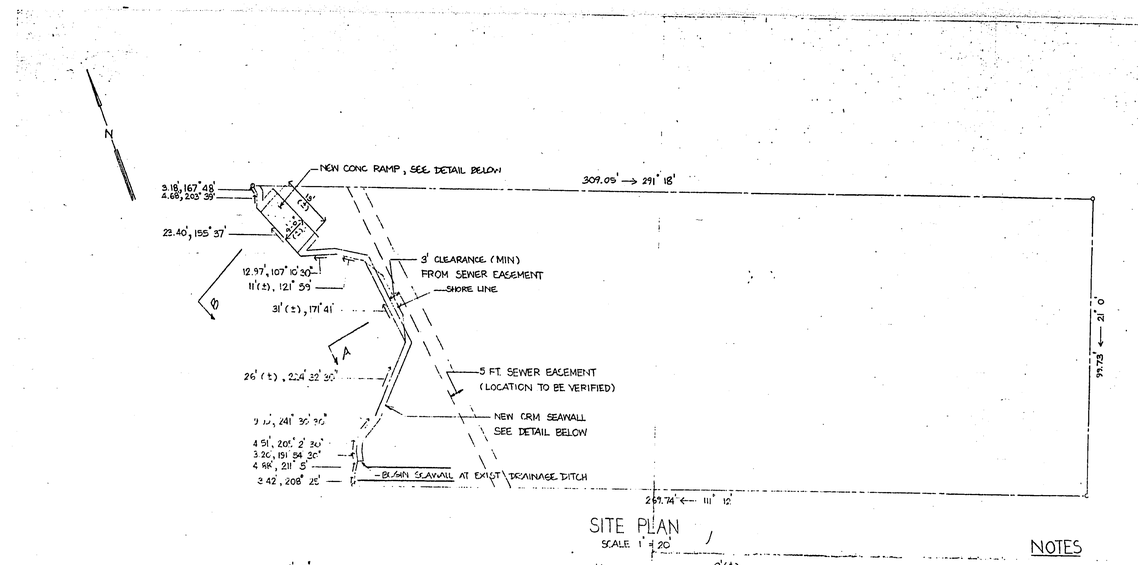
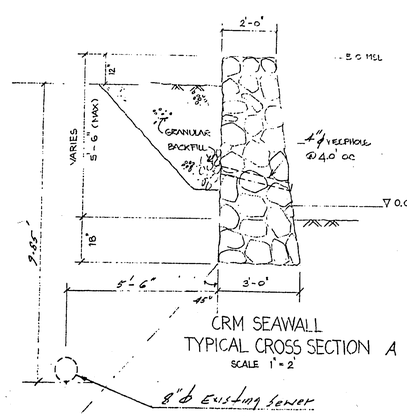
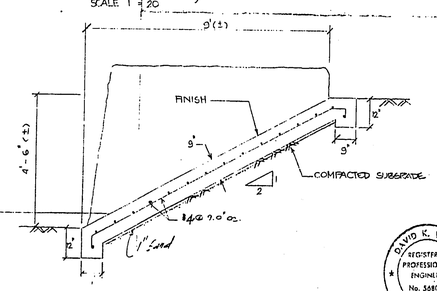


SITE PLAN
SCALE 1" = 20'



CRM SEAWALL
TYPICAL CROSS SECTION A
SCALE 1" = 2'



CONCRETE RAMP
CROSS SECTION B
SCALE 1" = 2'

DAVID K. WONG
REGISTERED PROFESSIONAL ENGINEER
No. 3680-S
HAWAII, U.S.A.

NOTES

- PLAN SHOWN IS BASED ON TOPOGRAPHIC MAP PREPARED BY HARRY K. MATSUO FEB, 1990.
- THE CRM SEAWALL SHOWN WAS DESIGNED ACCORDING TO THE PREVIOUS STUDY 'SHORELINE SETBACK VARIANCE APPLICATION FOR SEAWALL PERMIT' PREPARED BY SEA ENGINEERING, INC. DEC, 1990
- LOCATIONS AND ELEVATIONS OF UTILITIES SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED PRIOR TO THE CONSTRUCTION.
- WORKS SHALL BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS, DEPT. OF PUBLIC WORK, CITY COUNTY OF HONOLULU LATEST EDITION UNLESS OTHERWISE SPECIFIED.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION. CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY SUPERVISION, AS DEFINED BY CHAPTER 16, SECTION 1-2 (m) OF THE REVISED LAWS OF HAWAII 1955.

Signature

CRM SEAWALL PLAN AND DETAILS

FOR: DR. PETER R. CLAPP
44-438 KANEOHE BAY DRIVE
KANEOHE, HAWAII 96744
TMK: 4-4-06: 10 & 15

BY: DR. DAVID WONG PE. STRUCTURAL ENGINEER

DATE: MAY 20, 1991

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