April 7, 1978

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Based upon the recommendation of the Office of Environmental Quality Control, I am pleased to accept the environmental impact statement for the Halawa Stream Maintenance Dredging, Halawa, Oahu, as satisfactory fulfillment of the requirements of Chapter 343, Hawaii Revised Statutes, and the Executive Order of August 23, 1971. This environmental impact statement will be a useful tool in the process of deciding whether or not the action described therein should or should not be allowed to proceed. My acceptance of the statement is an affirmation of the adequacy of that statement under the applicable laws, and does not constitute an endorsement of the proposed action.

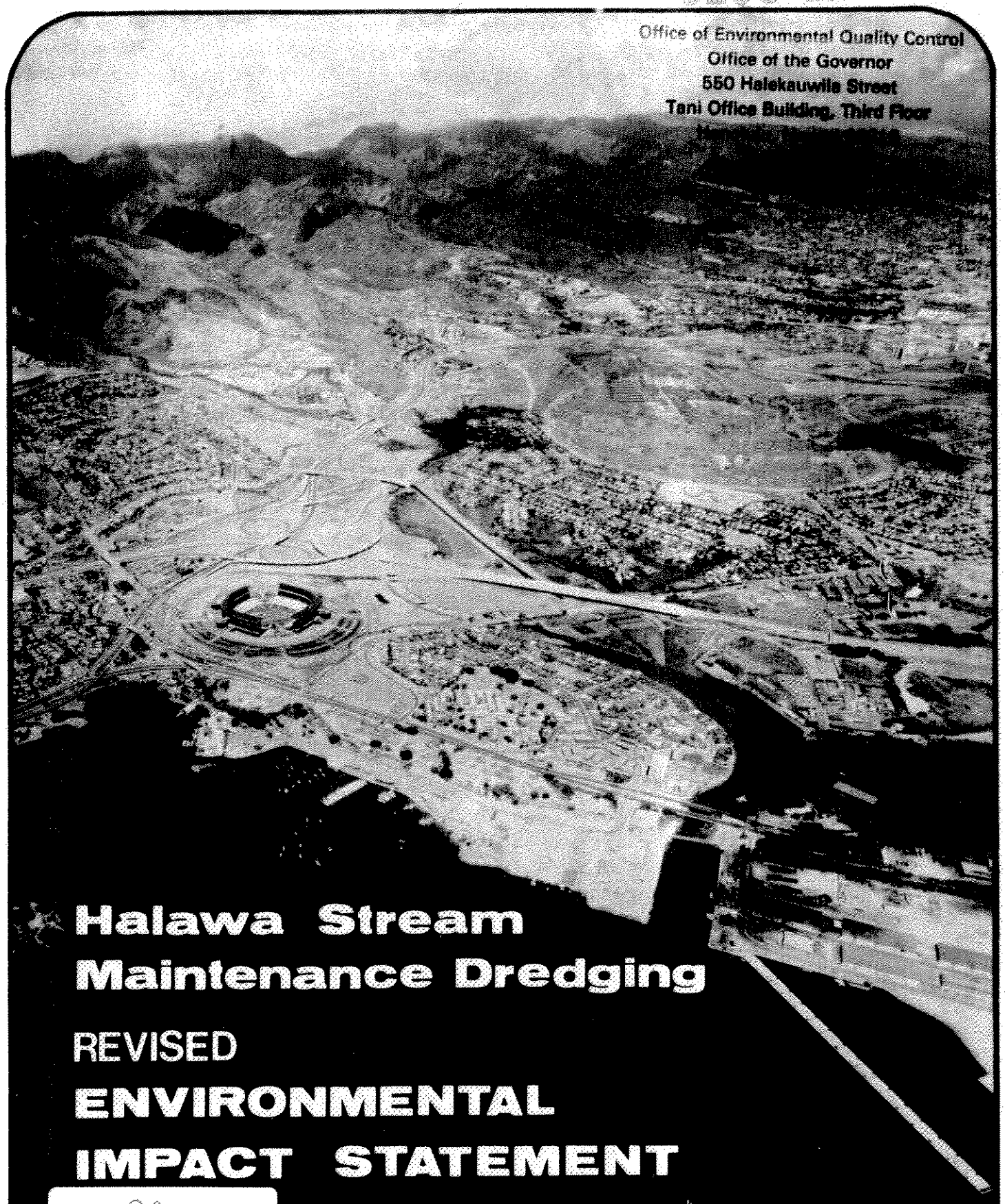
When you make your decision regarding the proposed action itself, I hope you will weigh carefully whether the societal benefits justify the environmental impacts which will likely occur. These impacts are adequately described in the statement, and, together with the comments made by reviewers, will provide you with a useful analysis of alternatives to the proposed action.

With warm personal regards, I remain,

Yours very truly,

George R. Ariyoshi

bcc: Mr. Richard L. O'Connell
Environmental Quality Commission



Halawa Stream Maintenance Dredging

REVISED ENVIRONMENTAL IMPACT STATEMENT

VTN PACIFIC

City & County of Honolulu
Dept. of Public Works

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU

REVISED

ENVIRONMENTAL IMPACT STATEMENT

FOR THE

HALAWA STREAM

MAINTENANCE DREDGING PROJECT

Halawa, Oahu, Hawaii
TMK: 9-9-02, 03

This Environmental Document is submitted
pursuant to Chapter 343, HRS

Responsible Official Wallace Miyahira Date: 2/8/78
Wallace Miyahira
Director and Chief Engineer

Prepared by
VTN Pacific
1164 Bishop St., Suite 906
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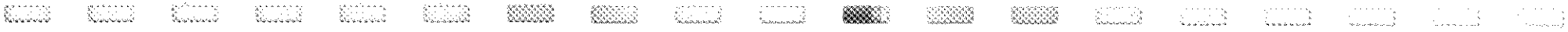

Environmental Impact Statement
for the
Halawa Stream Maintenance Dredging Project

SUMMARY

Proposing Agency

Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Accepting Authority

Governor, State of Hawaii

Description of the Proposed Project

The proposed project consists of the removal of approximately 100,000 cubic yards of sediment from the Halawa Stream channel between Salt Lake Boulevard and Kamehameha Highway. Hydraulic dredging with land disposal is recommended; however, if a dewatering site cannot be obtained, the sediment would be disposed of at the designated ocean dumping site.

Description of the Environmental Setting

The area to be dredged is approximately 3,200 feet long by 100-300 feet wide. The elevation of the channel bottom decreases toward Pearl Harbor, ranging from +4 feet msl on the vegetated gravel bars at Salt Lake Boulevard to -4 feet at the Kamehameha Highway bridge.

The project area was originally dredged in 1965. Since that time, approximately 87,630 cubic yards of sediment has settled in the channel, reducing its capacity to handle major storm runoff. It is estimated that 120 - 130 homes in the Halawa Valley Estates Subdivision, on the north bank of the stream, could be damaged by a 100-year flood.

As a whole, the accumulated sediment is approximately 9% clay, 46% silt, 34% sand and 11% gravel, although at the downstream end there

is 97% silt and clay. Various chemical and biological parameters indicate that the sediment is not especially polluted. The aquatic life found in the project area is typical of a healthy, productive estuarine environment.

Probable Impacts of the Proposed Project and Mitigating Measures

The proposed improvements will have the beneficial impacts of reducing the flood hazard and improving the sediment trapping capacity of the Halawa Stream estuary.

There will be short-term adverse impacts to aquatic life but the long-term effect of the dredging is expected to be beneficial.

Potential impacts to water quality from dredging and spoil disposal would be short-term and mitigatable through the management of the dewatering pond or by the use of silt curtains.

It appears that the use of land for a dewatering pond would generate unavoidable land use conflicts. This issue has yet to be resolved and may govern the method of spoil disposal.

Alternatives to the Proposed Project

Five categories of alternatives were evaluated; alternative project designs, alternative dewatering and disposal sites, alternatives to dredging, non-structural alternatives and no project. Considered under alternative project designs were various dredging depths, mechanical dredging and ocean disposal.

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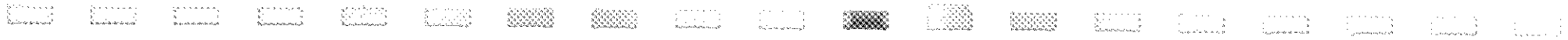


I. DESCRIPTION OF THE PROPOSED PROJECT

A. Location

Halawa Stream is located in the Pearl Habor drainage basin on the island of Oahu (Figure 1). The stream is composed of two major forks which drain a total of 6,130± acres (9.6± square miles) from the crest of Koolau Mountains (elevation 2,800 feet) to the East Loch of Pearl Habor. The proposed project involves the lower portion of the stream from Salt Lake Boulevard to Kamehameha Highway, a distance of approximately 3,370 feet (Figure 2).

B. Historic Perspective

The history of flood control improvements on Halawa Stream, relevant to the proposed project, begins in 1964 and 1965 with the initial dredging of the project area as a part of the improvements for the Halawa Valley Estates subdivision. The original right-of-way for this stretch of Halawa Stream was set at 165 feet with 15 foot maintenance access easements on both sides. The alignment was designed to closely follow the meanderings of the existing stream. Slopes of 1.5 :1 were planned to begin at the R/W line and extend down to the invert elevation throughout, producing bottom widths from approximately 142 feet at Kamehameha Highway to 102 feet at Salt Lake Boulevard. During the latter part of 1964, it was decided that a section of the original alignment of the right-of-way would be changed in such a manner to follow the north bank, which is the rear boundary line for some of the Halawa Valley Estates' lots.

However, the results of actual construction of the project varied greatly from the design. The invert was dredged, as planned, to elevation -4.50 feet (msl) at the northerly banks and this dredging was continued towards the southerly banks for some distance until they could conveniently join existing ground. The southerly side of the stream bed did not resemble the latest planned right-of-way, but does resemble the present existing banks. The stream bed extends outside of the proposed R/W on the southerly side, from about Station 4+00 to Station 19+00. An elevation of -4.50 feet was maintained towards the northerly slopes only. The invert elevation towards the southerly banks was higher than -4.50 feet to an unknown extent. The developer had stated that these variations from the design plans were initiated in order to obtain more needed fill material

for the subdivision. No fill material was placed along the stream bed.

Improvements or modifications to Halawa Stream above the project area have been extensive. Approximately 1.1 miles of stream bed has been enlarged and lined with concrete from Salt Lake Boulevard to beyond the confluence of the two forks at the Moanalua Freeway. Table 1 in Appendix A lists pertinent data on these existing improvements, which were constructed during the period 1969 - 1971.

Planning for the present project was begun in December 1976, initiated as part of the Department of Public Works maintenance program. A study titled "Design Alternatives and Hydraulic Analysis for the Halawa Stream Maintenance Dredging Project" (see Appendix A of this EIS) estimated water surface elevations for various stream discharges and recommended an optimum dredging depth of -4.50 feet msl. An EIS Preparation Notice of this project was circulated on March 23, 1977; the comments and responses to the Preparation Notice are reproduced in Appendix C of this EIS. The draft EIS was circulated on September 26, 1977 with comments and responses in Appendix D of this report.

C. Need for Improvement

The primary objective of the proposed action is to remove accumulated sediment in order to restore the storm flow capacity of Halawa Stream. Since the dredging project described above, approximately 87,630 cubic yards (142,800 tons) of stream sediment has filled the channel between Salt Lake Boulevard and Kamehameha Highway. The upstream portion just below Salt Lake Boulevard has received the majority of the sediment and several sand and gravel bars have built up to 2 - 4 feet above mean sea level (Figures 2 and 7 and Plates 1 and 2).

There is no record of property damage from flooding in the project area; however, since 1965, when the Halawa Valley Estates Subdivision was constructed, there have been no major floods in the watershed. Furthermore, until about 1971, when the sedimentation of the channel began to become apparent (see Chapter II. B. 2), there was adequate capacity for at least a 50-year storm.

The effect of the sedimentation has been to reduce the channel capacity to a maximum of approximately 8,600 cfs (see Chapter II. A. 3). With the design flow of 12,500 cfs (derived from City and County of Honolulu Storm Drain Standards for a 100-year

recurrence interval), it has been calculated that the stream would overflow the upper bank by as much as 2.5 feet. It appears that approximately 120 - 130 homes would be inundated by such a flood (Figure 6).

In addition to the need for flood protection, sediment storage capacity of the Halawa Stream estuary needs to be restored. Although some sediment is presently being trapped, backwater calculations show that the water velocities in the channel (Appendix A, Plates 15 and 16) are high enough to carry much of the finer material through the channel into Pearl Habor. With a deeper invert the velocity of flow would be reduced, thus allowing more sediment to settle out.

D. Technical Characteristics

The project will consist of dredging and disposing approximately 90,000 - 100,000 cubic yards of material from the estuarine portion of Halawa Stream. The following sections describe the preferred dredging and disposal method. Other potentially viable alternatives and methods,which were rejected in the early stages of the planning process, are described in Chapter IV. The project details hereby described are tentative, pending public review of the EIS.

1. Dredging Limits, Depths and Quantity. The project limits, shown on Figure 2, are from the Kamehameha Highway right-of-way to the concrete apron at the end of the existing lined channel downstream of Salt Lake Boulevard, a distance of about 3,370 feet along the established centerline. (Since the original alignment is being utilized on this project, the "centerline" does not follow the centroid of the stream between stations 3+50 and 15+00; the actual channel length is closer to 3,200 feet in length.) The lateral dredging limits would be the existing stream banks with slopes of 1.5 to 2 (horizontal) to 1 (vertical). A flat invert, at a depth of -4.50 feet is recommended, based on hydraulic requirements and project costs (see Chapter IV). Dredging to this configuration and depth would yield approximately 92,900 cubic yards of sediment. Since it is customary to cut slightly deeper than the specified project depth, say 0.5 foot for this project, the total volume would be closer to 100,000 cubic yards.

2. Dredging Method. Of the several methods evaluated, hydraulic (suction) dredging is preferred because it would not generate as much turbidity and would not cause problems involving access. The basic set-up, for which the cost estimate was developed, would consist of a 12-inch cutterhead dredge mounted on a shallow-draft barge. A smaller dredge would not have sufficient output to complete a project of this size in an acceptable manner and would be incapable of pumping to the majority of the potential spoil dewatering sites. Most of the larger dredging rigs require a barge with a deeper draft than the project area can provide during low tides. For these conditions, there are 12-inch dredges available that draw as little as two feet of water. The sediment to be dredged consists of material that is loose enough to negate the need for a cutterhead; however, for expediency, a cutterhead is usually employed to prevent clogging.

Mobilization operations would begin by clearing and grading a temporary road along the access easement on the south and north banks. This access would be needed to set the anchors for the lines which pull the dredge from side to side. The dredge would be transported by truck along Kamehameha Highway to Halawa Drive (the entrance to CINCPAC Headquarters).

At this location, there is a short access road to the stream. After excavating a slip for itself, the dredge would be hoisted into the water with a crane. This launching site could also serve as the project operations center and equipment storage yard (pending approval by the Navy).

The dredge would begin at the downstream end, creating floating and maneuvering room as it works upstream. The anchors would be reset ahead of the dredge about every 25 - 50 feet. The dredge would discharge a slurry with about 10 - 20% solids through a floating and/or land-based pipeline to the disposal site. For most rigs, the maximum pumping distance is approximately 4,000 feet; with a booster pump, the sediment slurry could be pumped up to 14,000 feet (2.6 miles). Prior to dredging operations, several existing small docks, trash and other obstructions should be removed from the channel.

When the project depth is achieved, the dredge would be removed at the same point where it was launched. All

access roads and other disturbed areas would be revegetated or otherwise stabilized for erosion control. It appears that one section of the south bank, near Kamehameha Highway (stations 3+00 to 6+00), would be subject to bank erosion after the small "island" and the existing shelf of oyster-covered rocks are removed. A layer of ungrouted rip-rap is recommended to protect this bank (and to replace the rocky substrate habitat).

3. Disposal Method. Land disposal of the dredged material is preferred over ocean disposal, primarily because of the high cost of barging. A disposal area has not been obtained to date, although there are a number of possible sites. Since various factors will be unique to each site, only a generalized disposal plan can be described at this time.

There are three stages in the disposal process; dewatering, drying and reclamation. Dewatering is an initial separation of the sediment from the slurry that is produced by the dredge. Slurry is pumped into one end of a pond, usually constructed of compacted earth dikes, and water is drained off at the opposite end over an adjustable sluice gate or outlet pipe. The slurry must be held in the pond long enough for the fine sediment to settle out, otherwise the discharge water would be too turbid. Turbidity in the discharge can be controlled by adjusting the rate of dredging, pond discharge rate, pond size, dike height and other variables.

The required dewatering pond capacity is roughly twice the volume of material to be dredged (general rule of thumb). For this project, approximately 124 acre-feet would be required. With the addition of 10-foot high dikes (2:1 side slopes) with 8-foot wide crests, the dewatering site would encompass at least 14 acres. This does not include access areas beyond the base of the dikes. Should the dikes be constructed to a height of 14 feet, the required area would be approximately 11 acres.

Seven potential dewatering sites (Table 1 and Figure 3) have been identified; 1, the truck farm immediately adjacent to the stream (14.5 acres), 2, the top of the bluff adjacent to Halawa Heights Road (10.7 acres), 3, the truck farm adjacent to Halawa Heights Road (8.2 acres), 4 and 5, two parcels isolated by ramps of the H-1 Freeway (5.0 acres and 8.0 acres), 6, an isolated parcel underneath the H-1

Table 1 Potential Dewatering Sites

Site No.	Designation	Size (acres)	Dist. from Project Area (ft)[a]	Elevation (ft)	Road Crossings	Ownership
1.	South Bank Farm	14.5	2,200	10	None	Queen's Hosp.
2.	Halawa Hts. Rd. Bluff	10.7	5,800	85	None[c]	Queen's Hosp.
3.	Halawa Hts. Rd. Farm	8.2	3,200	18	Salt Lake Blvd.	Queen's Hosp.
4.	Interchange	5.0	5,400	20	Freeway Ramp	Queen's Hosp.
5.	Upper Stream	8.0	7,700	60	None	State
6.	Viaduct	4.6	4,000	11	None[c]	State
7.	Makalapa Crater	15.5	3,800	60[b]	Luapele Rd.	Navy

Notes:

a. Approximate distance from Kamehameha Highway.
b. Approximate maximum pumping elevation; crater floor is 40 feet elevation.
c. Would have to cross under stadium access road.

viaduct (4.6 acres) and 7, the Makalapa Crater (15.5 acres). Only sites 1 and 7 could provide enough area for dewatering. If neither of these sites are available, several smaller sites could be used. The majority of dredge plants would require a booster pump to reach the dewatering ponds of all sites except 1 and 3. Access to sites 3, 4 and 7 would require crossing a roadway. This could possibly be accomplished without disrupting traffic by tunneling under the roadway. Considering all factors, site 1 is the best dewatering area since it is adjacent to the stream. However, the owners have indicated that it is not available. The second most preferred site would be 7, in Makalapa Crater. Use of this site is currently being studied by the Navy; if it is not available, site 2 would then be considered.

When the dredging operation is completed, excess water would be drained out of the dewatering pond, allowing the sediment to dry out. Depending on its thickness and other conditions, it could require up to several years to completely dry the spoil. However, there are ways to hasten this process, such as breaking up the surface to prevent a skin from forming, and removing the upper layer as soon as it is dry enough to be transported.

The procedures for reclaiming the spoil would depend on the final disposal site. If it can remain in the dewatering area, the sediment would be graded to an aesthetic contour and stabilized with vegetation. If the site is appropriate, landscaping and park facilities could be provided. Without special treatment, the sediment would not be suitable for foundation support. It is more likely that the dried sediment would have to be removed by trucks to another location for final reclamation. Several golf courses are being considered for this purpose, but no commitments have been made. The sediment has a very high nitrogen content and a texture that would render it suitable for landscaping, after the salt is leached out. Following removal of the sediment from the dewatering area, the site would be graded to its original contours and revegetated.

E. Costs

The following costs are based on the generalized dredging and disposal operation described above and are therefore approximations. The actual costs would depend on the contractor and any modifications he might make to the general project approach.

Mobilization, which includes clearing and grading the access easements, preparing the dewatering site, removing obstacles and launching the dredge is difficult to estimate because of the many unknowns. It is believed that this stage would cost roughly $80,000.

The cost of operating the dredge can be broken down to labor ($850 per day), equipment ($880 per day), materials ($100 per day) and miscellaneous for a total of roughly $2,300 per day. The cost per cubic yard depends on how fast the dredging can be completed. With the relatively loose silt and sand in the Halawa Stream estuary, an average production rate of 800 cubic yards per day (8 hours) could be expected. It would therefore take about 125 days to dredge 100,000 cubic yards, resulting in an operating cost of approximately $287,500 ($2.88 per cubic yard).

The demobilization, disposal and reclamation stages are also difficult to estimate. Activities include installing rip-rap, stabilizing the access and operations areas, drying and transporting the sediment to a final disposal site, and grading and revegetating the dewatering site. A rough estimate of $100,000 will be made for these operations. The total project cost, consisting of mobilization, dredging 100,000 cubic yards, demobilization, disposal and reclamation, would be roughly $467,500. As of this date, it has not been determined if the project would be funded entirely by the City and County of Honolulu, or if State assistance would be obtained.

F. Schedule

The dredging (including mobilization and demobilization) would take approximately 6 months; drying and reclamation could conceivably require up to two years. To avoid hazards of potential flooding, it would be desirable to begin dredging in the months of April or May. However, a start-date for the project cannot be predicted, due to the uncertainty of funding.

II. DESCRIPTION OF THE ENVIRONMENTAL SETTING

A. The Halawa Stream Watershed

1. Physical Characteristics. The two forks of Halawa Stream originate at the crest of the Koolau Mountains and flow through relatively narrow valleys in steep topography until their confluence near the Moanalua Freeway. From the confluence of the two forks, to the stream mouth in the East Loch of Pearl Harbor, Halawa Stream flows over the relatively level alluvial deposits of the coastal plain. Elevations at the crest of the watershed range from 2,400 to 2,800 feet. The total watershed area (at Kamehameha Highway) is approximately 6,130 acres (9.58 square miles); the north fork drains 3,000 acres (4.69 square miles), the south fork drains 2,000 acres (3.13 square miles) and the watershed below the confluence makes up the remaining 1,130 acres (1.76 square miles).

2. Vegetation and Land Use. Approximately 77% of the Halawa Stream watershed is undeveloped (Figure 4). The principal vegetation type is mixed forest, which grades into montane rain forest at the higher elevations. Forest covers approximately 56% of the upper watershed and most of the forested areas are within the Ewa Forest Reserve. The remaining undeveloped land supports koa haole and other lowland shrubs with some patches of grass on the exposed ridges. The undeveloped land outside of the Forest Reserve and outside of the several military reservations amounts to approximately 900 acres (15% of the watershed). Steep slopes and adjacent land uses make much of this land unsuitable for residential development.

Land uses in the developed portion of the watershed include single-family residences (660 acres), commercial, industrial and military activities (Aloha Stadium, Halawa Quarry, Halawa Jail, animal quarantine - 455 acres) and the large freeway interchange (205 acres). Below the project area is the Halawa Landing (USS Arizona Memorial tour) and the Naval Supply Center Fuel Pier.

Immediately adjacent to the project area, along the north (ewa) bank are the single-family residences of the Halawa Valley Estates Subdivision. These homes were constructed in 1965, concurrent with the original dredging of the Halawa Stream estuary. The land between the south bank of the stream and Salt Lake Boulevard is occupied by a small truck farm

(approximately 14 acres) and a kennel. The steep slope of Makalapa Crater forms the remainder of the south bank (Figure 2). Ownership of the stream and adjacent properties is divided between the B. P. Bishop Estate, the Queen's Hospital, the City and County of Honolulu, the State of Hawaii and the U.S. Government (Figure 5).

The land use of greatest significance with regard to the proposed maintenance dredging project is the stadium/freeway complex which covers approximately 300 acres of the lower watershed, just above the project area. The entire 300 acres were denuded when construction was begun early in 1972. Landscaping of the interchange area is only now being completed. There is evidence suggesting that much of the sediment deposited in the Halawa Stream estuary came from the stadium and freeway projects (see discussion under Chapter II. B. 2).

3. Water Resources. The annual rainfall in the Halawa Stream watershed ranges from less than 30 inches at Pearl Harbor to over 150 inches at the crest of the Koolau Mountains. The majority of this rain occurs in the winter months; very little rain falls from May to September (except for an occasional Kona storm). The lower portion of the stream is typically dry during these months. The average discharge of the two forks is approximately 11 cfs (7mgd). Since 1954, the average yearly peak flow has been 2,530 cfs; the five highest peak flows have been 6,750 cfs, 4,200 cfs, 3,710 cfs, 3,560 cfs and 3,250 cfs (Nakahara, 1974). There is also a report, originating from the Oahu Sugar Company, of floods in 1927 and 1935 which were gaged at 13,000 cfs and 12,000 cfs, respectively.

A reconnaissance report prepared by the Corps of Engineers (1976), determined that the 50-year, 100-year and "standard project" floods at Salt Lake Boulevard would be 10,500 cfs, 13,500 cfs and 20,000 cfs, respectively. The Corps of Engineers also estimated that approximately 41,000 cubic yards of sediment had accumulated between Salt Lake Boulevard and Kamehameha Highway, reducing the bankfull capacity of the channel from 13,500 cfs to 10,500 cfs. A more detailed backwater analysis was conducted for the proposed project, in order to determine the optimum dredging depth; the results of this analysis are presented in a separate report (VTN Pacific, 1977) and summarized below and in Appendix A.

The north bank of the stream, from Salt Lake Boulevard to Kamehahema Highway, has a two-step bank, with a

2 - 7 foot difference in elevation between the upper and lower banks. The homes of the Halawa Valley Estates Subdivision are at or slighly above the elevation of the upper bank. However, many of the residents along the stream have placed structures and other improvements on the bench area between the upper and lower banks. With the existing channel, filled with approximately 87,630 cubic yards of sediment, the capacity at the lower bank is estimated to be 4,600 cfs. The capacity at the upper bank is 8,600 cfs, but the storm drain system in the subdivision would back up with a flow of approximately 7,200 cfs. The capacity of the lower bank would be exceeded by a storm with a recurrence interval of approximately 8 years, while the upper bank would be over-topped by a 25-year storm (DLNR, 1970). With the design flow of 12,500 cfs (City and County of Honolulu Storm Drain Standards), it has been calculated that the stream would overflow the upper bank by as much as 2.5 feet. It appears that approximately 120 - 130 homes would be inundated by such a flood (Figure 6).

The ground water in this area is a mixture of fresh and salt water with a chloride concentration around 200 ppm or greater (Dale, 1967), and is therefore only marginally potable. The potential spoil disposal sites are located on the relatively impermeable coastal plain deposits and would not be in direct contact with the basal water system (Stearns and Vaksvik, 1935).

4. Soils. The Soil Conservation Service (Foote, et. al. 1972) has mapped ten soil series and three miscellaneous classifications in the Halawa watershed; Hanalei, Honouliuli, Helemano, Kaena, Kawaihapai, Kokokahi, Lahaina, Makalapa, Manana, Waipahu, Rock Land, Rough Mountainous Land and Mixed Fill Land. The majority of the watershed is Rough Mountainous and Rock Land. The Kaena, Kawaihapai and Hanalei soils are found in the drainage courses with the latter predominant in the project area. The freeway/stadium complex was developed primarily on Kawaihapai soils. The residential development in the watershed has been on Lahaina, Makalapa and Manana soils which have developed on the ridges and uplands.

The erosion hazard of the soils in the Halawa watershed ranges from slight to severe, depending primarily on topography. The erodability factors ("K" in the Universal

Soil Loss Equation; SCS, 1976) are in the moderate to high range (.17 - .28). As is typical for most Hawaiian watersheds, a large amount of natural soil loss occurs as mass wasting on the steep mountainous slopes, but when the lower slopes and ridges are denuded of their plant cover for agriculture or urban development, erosion can become serious.

B. The Halawa Stream Estuary

1. Physical Characteristics. The Halawa Stream channel from Salt Lake Boulevard to Kamehameha Highway is approximately 3,300 feet long and 100 to 300 feet wide. The surface area involved in the project is approximately 12.7 acres. The landform of the project area is dominated by the Makalapa Crater, which forms the south bank of the stream (Plates 1 - 3 and Figure 2). The north side of the stream is relatively low; elevations in the Halawa Valley Estates Subdivision range from 5 feet to 15 feet (msl). The earth banks of the channel rise 3 to 5 feet above the high tide line and are nearly vertical in places. Below the high tide line the channel is relatively flat. The elevation of the channel bottom decreases toward Pearl Habor, ranging from +4 feet msl on the gravel bars at Salt Lake Boulevard to -4 feet at the Kamehameha Highway bridge (Figure 7). Downstream from the bridge (out of the "project area") the bottom drops to -8 feet msl, rises slightly at the Navy bridge (Plate 4) then drops to -19 feet msl in the dredged portion of the U.S.S. Arizona Memorial landing. The entire project area is subject to the tides, which have a normal average range of approximately 2 - 2.5 feet. At high tide, only the gravel bars near Salt Lake Boulevard are exposed, and at the lowest tide approximately 8 acres of mudflat are exposed. The present bottom contours are delineated on Figure 2.

2. Sedimentation. Since the project area was originally dredged to a uniform depth of -4.5 feet msl in 1965, it is estimated that 87,630 cubic yards of sediment has accumulated in the channel between Salt Lake Boulevard and Kamehameha Highway. The thickness of sediments deposited since the original dredging ranges from approximately 8 feet at Salt Lake Boulevard to less than one foot at the downstream end (Figure 7).

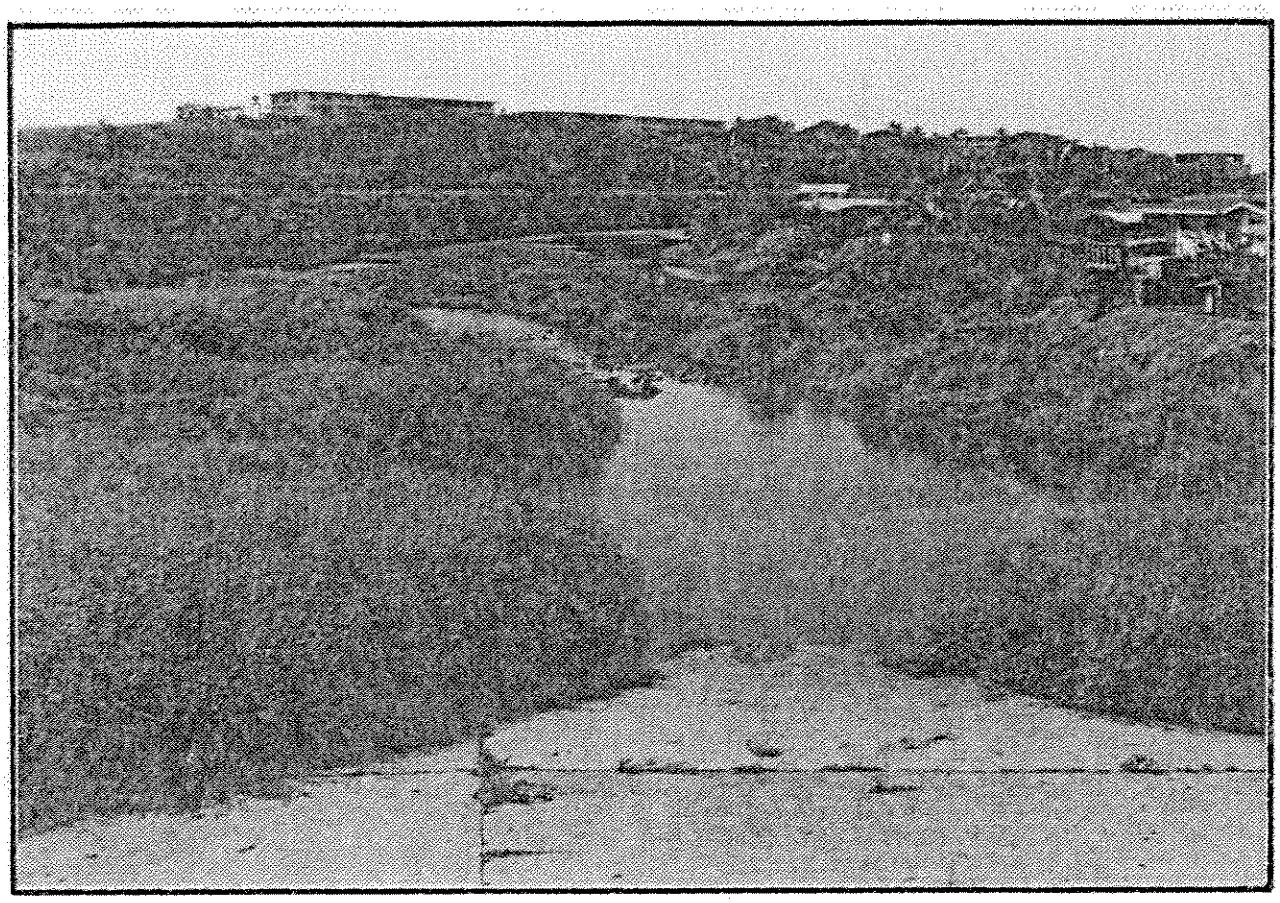


Plate 1 View downstream at Salt Lake Boulevard.

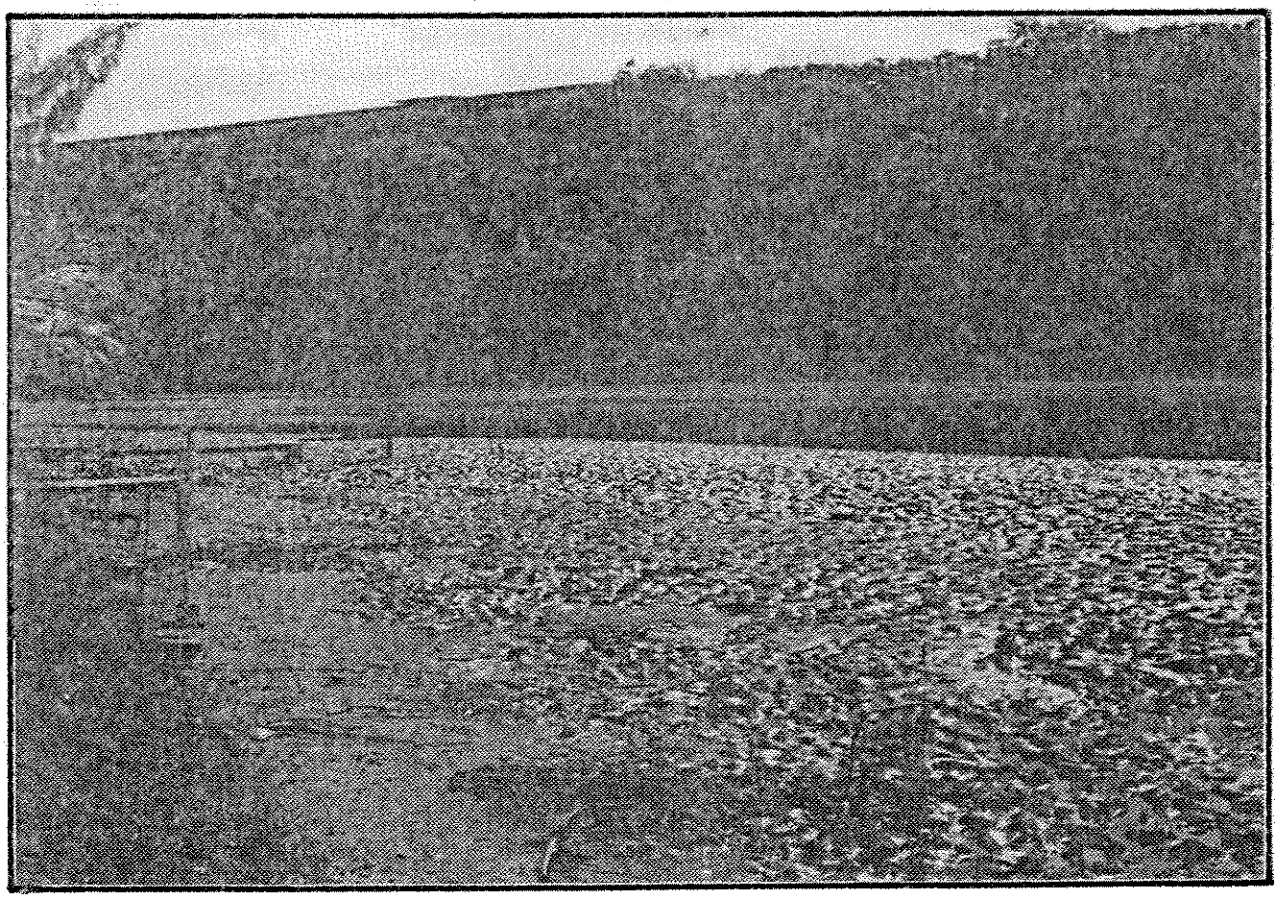


Plate 2 Large mudflat in lower section of Halawa Stream.

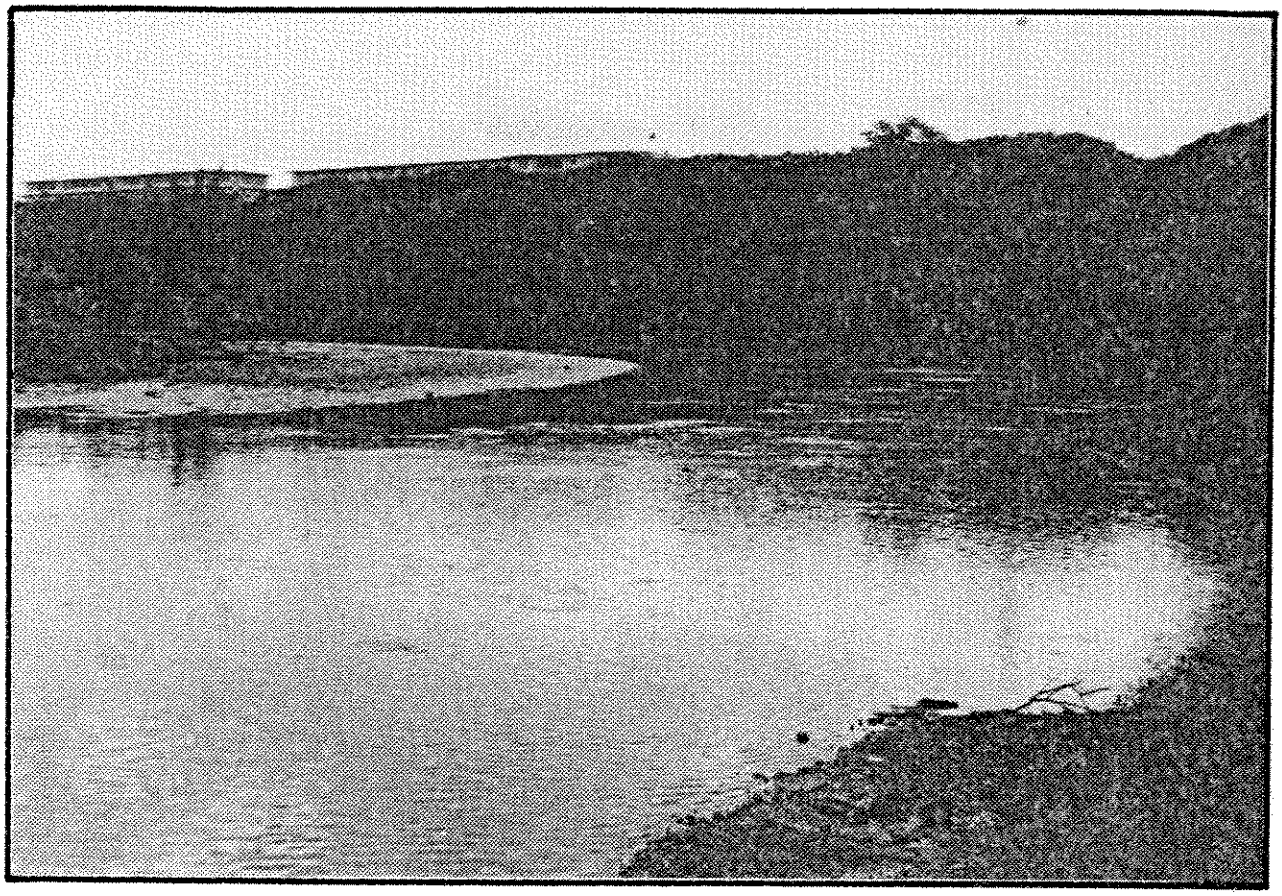


Plate 3 View upstream at Kamehameha highway.

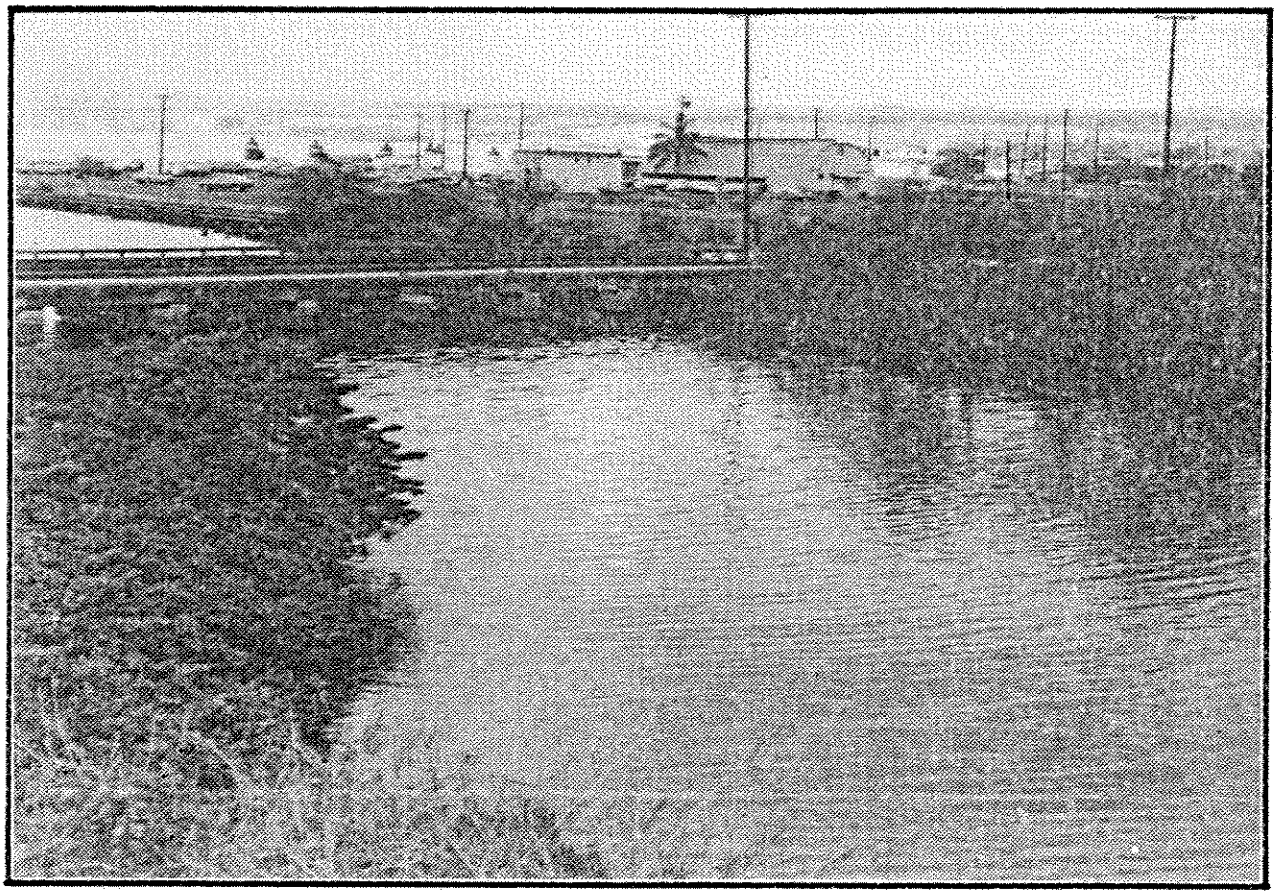


Plate 4 View downstream at Kamehameha Highway. Note constricted channel.

Important sources of sedimentation in the watershed in the last 12 years have been the construction of the Aloha Stadium, the construction of the large complex of freeway interchanges, stream channel construction, housing construction in Halawa Heights and operations at the Halawa quarry. A series of aerial photos of the project vicinity, taken from October 1969 to May 1977 show that the sand bars at the Salt Lake Boulevard end of the estuary grew concurrently with construction of the stadium and the freeway. In a photo taken in 1969, prior to any construction on the stadium or the freeway, no sand bars were evident. In August 1971, the first increment of stream channelization above Salt Lake Boulevard had been completed and construction of the Halawa Heights Road overpass was underway. At this time, small sand bars could be seen beneath the water surface on both sides of the channel downstream from the Salt Lake Boulevard bridge. A photograph taken in late April 1972 shows the entire stadium/freeway area, approximately 300 acres, completely denuded and construction of the remaining channel lining in progress; the small sand bars had grown and had emerged above the water surface. In July 1973, the stadium/freeway area was still being graded and the upper stream channel was under construction. The sand bars had grown considerably and a photo taken in December 1973 shows one bar partially vegetated. In December 1974, the majority of the construction had been completed but the ground was still exposed; both the size of the sand bars and their vegetative cover had grown. At the present time (August 1977), the landscaping on the freeway project is just being completed and it will be some time before a good ground cover is established. Even with conscientious effort at erosion control, such a large area exposed and disturbed for more than five years cannot help but produce a significant volume of sediment.

The physical characteristics of the sediment deposited in the Halawa Stream estuary has been described by seive analyses of eleven core samples (see Appendix B). This data is presented on the sediment zone map (Figure 8) and the particle size distribution table (Table 2). Each core sample was taken at least as deep as the proposed dredging depth (except Zone 1, where boulders were encountered) and was mixed prior to the seive analysis in order to give a

Table 2 Sediment Particle Size Distribution

Zone[a]	Field Description	Unified[b]	% Clay[c] <.004 mm	% Silt .004-.074	% Sand .074-4.76	% Gravel 4.76-76.2	% of Total
1	Sandy Silty Gravel	GW	0	6	30	64	12
2	Gravelly Sand	SM	8	30	45	17	11
3a	Silty Sand	SM	6	41	49	4	21
3b	Silty Sand	ML	10	47	41	2	16
4	Sandy Silt	ML	12	61	27	0	31
5	Soft Silt	ML	18	79	3	0	9
	% of Total		9	46	34	11	100

Notes

a. Refer to Sediment Zone map, Figure 8.
b. Classification according to the unified Soil Classification System: GW, well-graded coarse gravel; SM, silty sand; ML, inorganic silt with low plasticity.
c. Textural classes (in milimeters) based on the Unified Soil Classification System

representative sample of the sediment as it would be discharged by the dredge. The sediment is actually layered in places, alternating between silt and sand. These layers, from less than 6 inches to over a foot in thickness, represent variations in the sediment discharge of the stream. They were not analyzed in sufficient detail to provide a correlation with actual storm events.

As illustrated on Figure 8, the coarse sediments - gravel, cobbles and boulders - have been deposited in the first 500 feet below Salt Lake Boulevard. As the water velocity decreases, the finer particles drop out of suspension. The water reaches its lowest velocity at the wide curving section of the estuary (2.3 fps at 3,000 cfs, see Plates 15 and 16 in Appendix A) and this is where the finest sediment is deposited (Zone 5, 97% silt and clay). The channel narrows in the vicinity of the Kamehameha Highway and Navy bridges; as a result, the water velocity increases and the bottom sediments contain more sand. In fact, the bottom profile (Figure 7) indicates that the channel is probably being scoured below the Kamehameha Highway bridge. The overall particle size distribution of the deposited sediment is 9% clay, 46% silt, 34% sand, 11% gravel. (Cobbles and boulders are present in Zone 1, but could not be included in the sampling.)

The volume of sediment deposited in the estuary does not represent the total volume of material transported by the stream, since some of the finer particles stay in suspension longer and are carried into Pearl Habor. Since no long range data on sediment load has been collected for Halawa Stream, a "back door" approach (suggested by B. L. Jones of the USGS) has been used to calculate the total volume of soil transported by the stream since 1965. To determine the proportion of sediment that has passed through the estuary, the percentage of fine material typically carried in suspension by the streams in the same area (Kipapa, Waikele and Kalihi) was compared to the percentage of fine material deposited in the project area. The known volume of sediment deposited in each size category was then adjusted to match the particle size distribution of the sediment carried by the stream. The volume of sediment required to make this adjustment is the volume of sediment that has passed through the estuary. (See Appendix B for details). These calculations yielded a total transported sediment volume of 123,480 cubic yards

since 1965, of which 87,630 cubic yards or 71% has been trapped in the estuary. This 71% "trap efficiency" is an average for the 12-year period; it would have been higher immediately after the initial dredging but the efficiency would be much lower now since the estuary has been partially filled with sediment.

Based on calculations referred to above, the average sediment yield of the Halawa Stream watershed for the period 1965 - 1977 has been 16,770 tons per year (based on a specific weight of 120 pounds per cubic foot) or 1,750 tons per year per square mile. This figure is the same order of magnitude as the sediment yields calculated by the USGS for other streams in the area: Waimalu Stream, 1,100 tons per year per square mile; Waikele Stream, 1,200 $T/yr/mi^2$; and Kalihi Stream, 1,590 $T/yr/mi^2$ (Jones, et. al. 1971). Preliminary sediment data collected on Moanalua Stream by the USGS indicates an average yield (suspended sediment plus bed load)of approximately 300 $T/yr/mi^2$ for the 1972 to 1975 water years (C. J. Ewart, personal communication). The great difference in magnitude between this measured yield and the calculated yields for the other streams may be due to the fact that the discharge of Moanalua Stream was below normal during the sample period. The yields calculated by the USGS are gross averages and should be considered minimum estimates (Jones, et. al. 1971); the same is true for the Halawa Stream computations.

Since the Halawa Stream estuary was dredged in 1965, stream discharge in the area has been approximately 4% above average. (Using Moanalua Stream, with a 50-year record, as the index.) However, from 1972 to 1976, when the stadium and freeway were under construction, stream discharge was 30% below the average. In spite of below-normal runoff, several large sand bars developed in the estuary during this period, as described above.

3. Water and Sediment Quality. As part of its Environmental Protection Data Base program, the Naval Civil Engineering Laboratory has published a number of studies on Pearl Habor, including two reports on the water quality and sediments of the habor and its tributaries. Two stations in Halawa Stream were covered by these studies; one just below Salt Lake Boulevard (Station TT06) and one at the stream's entrance to Pearl Habor (Station SE01). In addition, soil samples were

analyzed at three locations in the Halawa Stream watershed (Stations GS11, 12 and 13). This data, presented in Tables 3 and 4, provides an adequate baseline for the purpose of this study.

Table 3 lists the values obtained at the Halawa Stream stations for 25 water quality parameters tested in 1972 by the Navy (Morris, et. al. 1973) and compares these with applicable State Department of Health Standards. Station SE01, which is technically in Pearl Habor, is in waters with a Class B designation, while Station TT07 is in Class 2 waters. The greatest discrepancy between the measured values and the State Standard is in total and fecal coliform bacteria at Station TT07; the mean value for fecal coliform is over 20 times higher than the Standard. This is undoubtedly a result of sewage discharges from the Halawa Jail and the animal quarantine station. The jail presently discharges up to 0.094 mgd of sewage into South Halawa Stream and the animal quarantine facility discharges up to 0.18 mgd of sewage into North Halawa Stream. Both discharges receive secondary treatment but there have been problems with the animal quarantine plant. Both treatment plants are scheduled for connection with the City and County sewer in early 1983. Other water quality parameters do not indicate any serious pollution in the Halawa Stream waters during the 1972 test period.

At the stream mouth (Station SE01), two measurements of each parameter were made, one at the surface of the water and one at the bottom. The reading representing the poorest water quality has been recorded in Table 3 but in many cases, the values did not significantly differ. Important exceptions were salinity, dissolved oxygen, total organic carbon and turbidity. The surface water is slightly less saline than the bottom water, which is a typical estuarine condition found throughout Pearl Habor. The dissolved oxygen level is an indicator of the physical, chemical and biological activities existing in the water. The amount of dissolved oxygen in the deeper waters throughout Pearl Habor and at Station SE01 is less than in the surface waters and occasionally drops below the State Standard, implying an existing or potential pollution source. The total organic carbon levels were also lower in the bottom waters by a factor of 6.

Turbidity measurements indicate that the deeper water layer is about twice as turbid as the surface layer. The State

Table 3 Halawa Stream Water Quality [a]

Parameter [b,c]	(unit)	Stream Mouth SEO1		Upper Estuary TTO7		DOH Standard [d] SEO1	TTO7
		Range	Mean	Range	Mean		
Temperature	(°C)	S 23.0-28.9	(26.2)	19.0-32.7	(25.6)	Δ1.5°	Δ 1.5°
PH		S 7.7-8.4	(8.1)	6.9-9.6	(8.1)	7.0-8.5	6.5-8.5
Turbidity	(JTU)	B 2.2-25.0	(6.7)	1.4-190.0	(27.4)	Δ20%	Δ10%
Clarity	(meters)	S 1.0-3.0	(2.0)	no data			
Salinity	(ppt)	B 33.8-36.4	(35.2)	.07-26.8	(16.1)		
Diss. Oxygen	(my/l)	B 0.9-5.0	(3.3)	3.0-18.8	(10.3)	4.5	5.0
T. Phosphorus	(ppm)	B DL-.098	(.040)	DL-.491	(.206)	.030	.20
T. Kjeldahl N	(ppm)	S DL-.083	(-)	DL-1.303	(.465)	.20	
Nitrate	(ppm)	B DL-.062	(.028)	DL-.450	(.061)		
Nitrite	(ppm)	B DL-.025	(.010)	DL-.013	(.006)		
Ammonia	(ppm)	B .005-.028	(.015)	DL-1.125	(.293)		
T. Organic C	(ppm)	S DL-17.0	(7.3)	DL-8.0	(4.4)		
Manganese	(ppm)	S DL-.20	(-)	DL-.16	(.08)		
Magnesium	(ppm)	B 1400	(-)	990	(-)		
Potassium	(ppm)	no data		210	(-)		
Zinc	(ppm)	B DL-.02	(.02)	DL-.02	(-)		
Iron	(ppm)	no data		DL-28.5	(8.48)		
T. Coliform	(MFC/100ml)	S 2-170	(-)	80-52,000	(2,650)		1,000
Fecal Colif.	(MFC/100ml)	S 2-110	(40)	140-4,400	(2,270)	400	200
Phenols	(ppb)	S DL-2.4	(-)	DL-36.2	(35.0)		
Oil & Grease	(ppm)	no data		268.2	(-)		
Chlorides	(ppm)	S 20,000	(20,000)	37-14,580	(5,221)		
Settleable Solids	(ppm)	no data		DL-200	(32)		
T. Susp. Solids	(ppm)	S 5	(-)	8-340	(68)		
T. Residue	(ppm)	no data		140-27,730	(5,260)		

Notes

a. Data from NCEL, 1973b, presented as range of values and mean value, in parentheses; a (-) notation indicates too few readings above the detection limit (see below) to compute a mean.

b. "DL" refers to a reading below the detection limit of the instrument. These limits where noted, are as follows (in ppm): Tot. P, .005; Tot. KN, .05; Nitrate, .002-.005; Nitrite, .001; Amonia, .005; TOC, .5·

Table 3

Notes ----Continued

Mn, .02-.04; An, .02; Fe, .04-.2 and phenols, .05. The following heavy metals could not be detected above their respective detection limits (in ppm): As, .02; Cu, .02-.06; Cd, .02; Cr, .1-.2; Hg, .002-.005; Ni, .04; Pb, .04-.40 and Ag, .04. "T" is an abbreviation for Total.

c. Samples were collected at the surface (S) and at the bottom (B) of the water column; only the poorest quality values are presented here. See text for discussion of parameters with significant difference between surface and bottom readings.

d. According to State Dept. of Health criteria, station SEO1 is in Class B waters and station TTO7 is in Class 2. waters. The "Δ" symbol indicates prohibition of a change in the parameter beyond the specified amount. No entry for a parameter indicates that a standard has not been established for that water class.

Standards specify that the turbidity shall not be altered from "natural conditions", more than 20% for Class B waters or more than 10% for Class 2 waters. However, the turbidity at Station SE01 varies under "natural conditions" by more than 1,000% (2.2 - 25 JTU) and turbidity at TT07 naturally varies by more than 13,000% (1.4 - 190 JTU). The sediment is easily stirred up from the bottom of the estuary on windy days so the high turbidity readings at Station TT07 are not necessarily a result of stream discharges. It is apparent that this particular standard is more applicable to coastal waters than to an estuarine environment, where sedimentation is a very "natural" process (although often accelerated by human activities).

As a result of their physical and chemical properties, bottom sediments often become a "sink" for pollutants, particularly heavy metals. The more serious heavy metals, such as copper, mercury, zinc and others, were not detected (or were barely present) in the water column at either station, but were found in the sediments, occasionally in high concentrations. Table 4 lists the results of tests for ten heavy metals conducted by the Navy at the two Halawa Stream stations and at three stations in the Halawa watershed (Youngberg, 1973). The results are compared with the range and mean values of other samples in the area. There is no clear pattern between the concentration of heavy metals at the two stations. Contrary to expectation, Station SE01, which has a greater proportion of fine particles and is seemingly more exposed to pollutant sources, has a much lower total metal concentration than does Station TT07. However, both stations were lower in total metals than the average values for other Pearl Harbor and tributary stream sediments. Compared with other stream sediments, the Halawa estuary sample had higher than average concentrations of copper, lead, manganese, nickle and zinc; the mercury level was average. Compared with the average values for the earth's crust, all of the stream sediments are high in cadmium, lead, nickle and silver. The lead is probably from vehicle exhaust, while cadmium, nickle and silver are used in many industrial activities. Zinc, which also has many industrial applications, was found concentrated in most harbor sediments, except at SE01.

Other sediment parameters tested were total Kjeldahl Nitrogen, percent volatile solids and particle size distribution.

Table 4 Quality of Halawa Sediments[a]

Parameter mg/kg dry wt (ppm)		Harbor Sediment Stream Mouth SEO1	Stream Sediment Upper Estuary TTO7	Uncultivated Soil Watershed GS 11 /12/ 13	Average in Earth's Crust
Cadmium	S[b]	2	0.20	no data	
	O	DL-11 (1.2)	DL-20 (2)	DL-0.17 (0.01)	0.15
Chromium	S	20	100	52/51/ 79	
	O	9-360 (10)	52-150 (104)	4.4-170 (66)	200
Copper	S	69	58	43/18/34	
	O	8-1,200 (157)	18-69 (47)	4.2-85 (34)	70
Iron	S	12,000	37,000	54,000/34,000/28,000	
	O	13-93K (33,651)	24K-47K(36,900)	19,000-17,000 (43,467)	
Lead	S	110	54	26/12/6.5	
	O	DL-1,700 (115)	3.5-120 (43)	DL-26 (11)	16
Manganese	S	107	2,200	1,140/340/670	
	O	DL-4,800 (575)	330-2,200 (634)	39-1140 (336)	1,000
Mercury	S	1.6	0.58	.053/.055/.077	
	O	.07-9.5 (1.1)	.21-1.4 (.58)	DL-5.1 (0.78)	.5
Nickel	S	30	120	190/59/170	
	O	4-930 (126)	59-190 (118)	7.9-190 (80)	80
Silver	S	no data	1.3	2.0/1.8/5.9	
	O	DL-21 (3.6)	DL-6.4 (1.7)	DL-8.4 (1.6)	.1
Zinc	S	39	96	72/41/59	
	O	16-1,900 (251)	42-230 (93)	9.9-72 (44)	132
Total Metals[c]	S	270	430	385/183/354	
	O	26-3,777 (747)	244-1,151 (467)	67-490 (253)	499
T. Kjeldahl Nitrogen	S	10	3,700	no data	
	O	10-4,920 (690)			

Table 4, continued

Parameter mg/kg dry wt (ppm)		Harbor Sediment Stream Mouth SEO1	Stream Sediment Upper Estuary TTO7	Uncultivated Soil Watershed GS 11, 12, 13	Average in Earth's Crust
% Volitile Solids	S	12.74	17.81	16.17/14.25/11.91	
	O	3.83-30.47 (15.2)			
% Gravel		0	3.8		
% Sand		7.5	27.6		
% Silt & Clay		92.5	68.6		

Notes

a. Data from Youngberg, 1973.

b. "S" indicates data from the subject station; "O" indicates data from other stations, given as the range of values, and the mean. "K" is an abbreviation for 1000.

c. Sum of Cadmium, Chromium , Copper, Lead, Mercury, Nickel, Silver and Zinc. Iron and Manganese are not included because of their high natural occurrence.

The nitrogen concentration in the estuary sample was incredibly high, probably as a result of the sewage discharges from the Halawa Jail and the animal quarantine station. Volatile solids were not outstanding and the grain size distributions were also typical. Throughout the field reconnaissance and core sampling program conducted for this EIS, no hydrogen sulfide odor was detected in the sediment. A very faint oily smell was detected in several samples near the Kamehameha Highway bridge and a few blobs of oil were picked up on some of the sampling equipment. However, not nearly as much oil was found as would be expected so close to the NSC Fuel Pier. The sediment contains a typical collection of urban trash scattered about, which significantly detracts from the appearance of the area, especially at low tide.

It is difficult to say precisely whether or not the sediment in the Halawa Stream estuary is "polluted", since there are no numerical criteria established for such a determination. The latest EPA Regulations and Criteria for Ocean Dumping (January 1977) base the ocean dumping permit criteria on either a toxicity threshold determined by bioassay tests with appropriate marine organisms, or by comparison of an elutriate of the dredged material (sediment/water mixture) with applicable water quality standards. Since there are no State Standards for heavy metals, the bioassay test would have to be applied to establish whether or not the Halawa Stream sediments are acceptable for ocean disposal at a location other than an EPA-designated site. This alternate disposal method is evaluated in Chapter IV; since it is not a preferred alternative, the bioassay tests have not been conducted.

3. Biological Resources. The terrestrial biota of the project area is typical of disturbed habitats throughout the coastal plain of Oahu. The south bank of the stream is heavily vegetated with koa haole and a few scattered palms and other trees. The north bank, which is dominated by the houses of the Halawa Valley Estates Subdivision, has a few large palms and ironwood trees. Terrestrial wildlife encountered in the project area included mongeese, rats, feral cats and the common species of "urban" birds. The mudflat in the wide section of the estuary (Plates 2 and 3) provides some habitat for shore birds; golden plovers and wandering tattlers (winter migrants) were sighted and tracks of the black-crowned night heron were noted. On one

occasion, a group of four Hawaiian stilts (an endangered resident) was sighted. This mudflat is only a marginal habitat for the stilts, due to its small size (1.5 acres at mllw), its proximity to the subdivision and a lack of suitable nesting sites.

The Halawa Stream estuary provides at least four distinct aquatic habitats; the water column, the submerged sediments, submerged rocks and pilings and the intertidal shoreline and mudflats. Each of these habitats are affected by chemical and physical variations caused by stream discharge and by the tides. The salinity ranges from 35 ppt (average sea water) to less than 1 ppt. The tides have a normal range of approximately 2.5 feet. In addition, the water temperature, turbidity and dissolved oxygen levels all have large ranges (see Table 3), which is to be expected in an estuary, especially a small, shallow one.

The volume of water in the estuary (above Kamehameha Highway bridge) is approximately 18 acre-feet at mean higher high water, 8 acre-feet at mean sea level and only 1 acre-foot at mean lower low water. This limits the amount of "habitat" available to the fish and results in significant warming of the shallow water at low tide.

The submerged sediments have been described above in terms of their physical and chemical characteristics. The grain size is a characteristic that is of particular importance to the organisms living on and in the sediment and species often segregate themselves by sediment texture classes. Another factor affecting benthic organisms is the heavy metal concentration. In the Navy's sampling program in Pearl Harbor, it was found that the stations with the highest level of total metals had the least benthic organisms and vice versa (Youngberg, 1973). The total metal level in the Halawa Stream sediments is in the low range compared with the stations where this correlation was noted.

The rock and piling habitat is limited in extent in the project area but is nevertheless important since it provides the only solid surface for mussels, barnacles, sponges and a host of other sessile organisms. The pilings of the Kamehameha Highway bridge and the Navy bridge are heavily encrusted with many of these species. There is is only one relatively small area with a rocky substrate in the "marine end" of the estuary, as indicated on Figure 8.

Oysters and other associated species are abundant on these rocks.

The intertidal zones in the estuary support another distinct assemblage of organisms. The mudflats are occupied by crabs and polychaete worms, while other crabs live in burrows along the shore. This habitat is also utilized for feeding by shore birds, as noted above.

The biota of the estuary was sampled and identified by the Naval Ocean Systems Center (Jeff Grovhong, Bill Cook, Dave Brock and Linda Ward) on several occasions in June and July of 1977. The methods employed were seining, plankton tow and seiving sediment samples. Table 5 lists the organisms that were collected; the specimens are housed in the NOSC collection at the Hawaii Laboratory on the Kaneohe MCAS. The unpublished results of this sampling effort are summarized below.

A total of eleven different species of fish were collected in the Halawa Stream estuary. The dominant fish appears to be the mullet, followed by tilapia and mollys. At the time of sampling (June 1, 1977), there was a school of nehu between Kamehameha Highway and the Navy bridges.

Crabs collected by seining included the red crab and swimming crab. The Kamehameha Highway bridge is a very popular crabbing spot and fishermen catch these two species as well as an occasional Samoan crab. Other frequently encountered crustaceans included opae, barnacles and several species of amphipods living in the sediments. One of the amphipod species (Neomicrodeutopus sp.) has not previously been recorded in Hawaii.

The plankton tows produced a wide variety of organisms. There were the larvae of crustaceans and polychaete worms, numerous copepods and some single-celled algae. Also present were larvae of a fresh-water insect which presumably had been washed down in the stream. In the past, eggs or larvae of native diadromous stream animals might have been encountered but channelization of the stream has destroyed their habitat (Maciolek and Timbol, unpublished).

The dominant macro-organism in the sediment at the time of sampling (June 1 and July 1, 1977) was the polychaete worm (Strebliospio sp.). This is believed to be the first record of

Table 5 Aquatic Species List

The following species of marine animals were collected in the Halawa Stream estuary in June and July, 1977 by VTN Pacific and personnel of the Naval Ocean Systems Center. Identifications were made by Jeff Grovhoug (fish), Bill Cook (crustaceans) and Linda Ward (polychaete worms) at the NOSC. This list is not intended to represent an exhaustive inventory, although it is believed that the majority of the dominant species present in the estuary at the time of sampling are included.

FISH	
Gobiidae	
Bathygobius fuscus	Goby
Oxyurichthys lonchotus	Goby
Gnatholepis anjerensis	Goby
Engraulidae	
Stolephorus purpureus	Nehu
Synodontidae	
Saurida gracilis	Lizardfish
Carangidae	
two juvenile species, unidentified	Jack, Papio
Cichlidae	
Tilapia mossambica (?)	Tilapia
Sphyraenidae	
Sphyraena barracuda	Barracuda
Mugilidae	
Mugil cephalus	Mullet
Poeciliidae	
Mollienesia latipinna	Molly
CRUSTACEANS	
Portunidae	
Thalimita crenata	Swimming crab
Podophthalamus vigil	Red crab

Table 5, Continued

Xanthidae	
Pilumnus oahuensis	Crab
several unidentified species	Crab
Grapsidae	
Melopograpsus messor	Shore crab
Palaemonidae	
Palaemon pacificus	Opae
Palaemon debilis	Opae
Aoridae	
Neomicrodeutopus sp.	Amphipod
Corophiidae	
Corophium insidiosum	Amphipod
Balanidae	
Balanus reticulatus	Barnacle
POLYCHAETE WORMS	
Capitellidae	
Capitella capitata	
Nereidae	
Nereis (Neanthes) accuminata	
Nereis (Neanthes) succinea	
Ophelidae	
Armandia brevis	
Spionidae	
Polydora websteri	
Streblospio benedicti	

of this genus in Hawaii. (The genus has one described species, S. gardneri.) Also collected was Capitella capitata, a polychaete that has been cited as an indicator of polluted sediments when it is present in very large numbers (Reish, 1958). However, very few Capitella were found in the Halawa Stream estuary. This observation suggests that the sediments are not polluted, a determination that could not be made on the basis of chemical parameters alone (see above).

None of the sampling efforts were strictly quantitative, so biomass comparisons with other estuaries cannot be made. However, it can be stated that the Halawa Stream project area supports an assemblage of organisms that is typical of a healthy estuarine environment and appears to be very productive. The finding of two species not previously reported in Hawaii does not necessarily indicate any particular uniqueness of the Halawa Stream sediments. Pearl Harbor has been the entry point for a number of new marine species and nearly all of the ships eventually call at the NSC Fuel Pier at the mouth of Halawa Stream. If the worm and amphipod are not recent introductions to Hawaii, it is likely that they have been overlooked in other stream mouth estuaries.

III. PROBABLE IMPACTS OF THE PROPOSED PROJECT AND MITIGATING MEASURES

A. Flooding

The existing channel below Salt Lake Boulevard does not have sufficient capacity for the design flow of 12,500 cfs (as calculated from City and County of Honolulu Storm Drain Standards). If such a flood should occur, roughly 120 - 130 houses could be damaged to varying degrees. With the proposed invert elevation of -4.50 feet, the damage would be reduced to a maximum of 40 homes (Figure 6). This inundation could be further reduced or eliminated by constructing a relatively low levee (or block wall) along a 1,200-foot long segment of the south bank.

These estimates of inundation are predicated upon the removal of all obstructions from the bench between the upper and lower banks of the south side of the stream. The fences, duck pens, lanais and other obstructions could cause higher water surface elevations and result in more serious flooding of the homes. The access easement should also be kept clear for maintenance purposes.

B. Erosion and Sedimentation

During the construction period of the project, the access roads and the dewatering area would be subject to erosion. However, the total disturbed area would be small. An Erosion Control Plan will be submitted with the construction plans for the project. Measures that could be employed include seeding the dewatering pond berms and providing a temporary drainage system for the access roads. The final reclamation of the dredged sediment would include erosion control if the material is not incorporated into another project.

After the dredging, the project area would function as a highly efficient sediment trap. With the recent designation of North Halawa Valley as the proposed route of TH-3, such a sediment trap is a desirable facility. Construction of TH-3 would likely accelerate the filling of the estuary but this is preferable to the sediment being deposited in Pearl Harbor.

It is not possible to estimate with any confidence the amount of time it would take for the estuary to fill again with sediment. The conditions of rainfall and land use in the watershed in the next 12 years will not be the same as during the past 12 years.

With the growing concern over erosion, it is probable that future construction projects would utilize more effective controls. However, a series of very wet years with several major storms could fill the estuary in a relatively short time.

C. Water Quality

Turbidity would occur at the dredge and at the discharge from the dewatering pond. The turbidity from the dredge would be minimal and would probably not require the use of silt curtains. Silt discharge from the dewatering pond would be influenced by the area of the pond, the rate of pumping and the particle size of the sediment being dredged. Several researchers have developed a convenient method for determining the concentration of suspended sediment in the water discharged from a dewatering pond (Krizek, et. al., 1976). To obtain an order-of-magnitude estimate, a dewatering pond with an area of 15 acres and a constant production rate of 100 cubic yards of sediment per hour can be assumed. The suspended sediment concentration of the effluent would then range from 0.5 to 45 grams/liter, depending on the sediment zone being dredged; the weighted average concentration would be approximately 17 grams/liter. However, the dredging would not be constant, since only one 8 - 10 hour shift would be used. The slurry could therefore be retained in the pond for a longer period of time then released gradually during the night. This method was employed on a dredging project in Hawaii Kai and was very successful. With proper adjustment of the dredging and discharge rates, a dewatering pond can be made to discharge clear water.

The State Public Health Regulations (Chapter 37A) specify a maximum turbidity increase of 10% for the stream and 20% for the estuary. Suspended sediment in stream runoff normally varies between 0 grams/liter and about 10 - 20 grams/liter, but the higher values occur for only a brief period during the peak of a storm (B. L. Jones, personal communication). The average discharge of Halawa Stream is 11 cfs and at this flow the suspended sediment concentration would only be about 0.04 grams/liter (by comparison with Moanalua Stream, Jones and Ewart, 1973). With a dredging production rate of 100 cubic yards of sediment per hour, the unadjusted flow of water from the dewatering pond would be roughly 0.6 cfs. Given this discharge and average stream flow conditions, the suspended sediment concentration in the pond effluent could be as high as 0.75 grams/liter and would still meet the 10% turbidity increase limit.

If the dewatering pond cannot function as efficiently as required, or if the dredge creates more turbidity than anticipated, silt curtains could be installed near the Kamehameha Highway bridge. These could contain the turbid water in the project area until completion. Two overlapping curtains have proven effective in similar circumstances (Johanson, 1976) but the specific design would be up to the contractor.

The sediment in the project area does not appear to be significantly polluted with heavy metals or other harmful substances. However, when the sediment is agitated, some of the chemical compounds that are present would be released into the water column. Each compound would react differently depending on a complex set of variables. If the Halawa Stream sediments behave in the same way as other dredged sediments, the heavy metals could be expected to go into solution for a brief time, then be readsorbed to the sediment particles as they settle out in the dewatering pond. If the chemical conditions are right, nitrogen in the sediment could be converted to a more soluble form and released in high concentrations. In one study, the quality of the effluent from the dredge spoil disposal was as good as the quality of the river water from which the sediments were taken, except for nitrogen, which increased (Krizek, et. al., 1976). An increase in the nitrogen level is a water quality impact most noticeable in its effect on plankton and will therefore be discussed in the following section. The return water would be saline and would therefore degrade the quality of the lower portion of Halawa Stream; this too is covered in the following section.

D. Biological Resources

The organisms found in the project area are typical of a periodically-disturbed estuarine environment. This is particularly true of the worms found in the sediment; Streblospio and Capitella appear to thrive where the sediment is frequently disturbed (McCauley, et. al., 1976). These and other members of the bottom fauna will rapidly recolonize an area after the population has been destroyed by influxes of fresh water (Stone and Reisch, 1965) or after dredging (McCauley, et. al., 1976). For these reasons, it is believed that dredging would have no long-term adverse effect on the benthic infauna which constitutes one of the major elements of the estuarine food web. Other bottom-dwelling organisms, such as crabs and the rocky-substrate community near the Kamehameha Highway bridge would also be removed during dredging. On other dredging projects, it has

been observed that many crabs survive passage through the pump and discharge pipe and even follow the effluent out of the dewatering pond. Crabs that escape the dredge along with the undisturbed population downstream from the Kamehameha Highway bridge would contribute to the recolonization of the estuary after dredging is completed. Rocks on which oysters and other organisms are attached would either be removed or displaced during the dredging. This impact would be mitigated by placing rip-rap along the bank in the same area, as recommended for erosion control. Some of the original oyster-covered rocks could be replaced in order to provide a suitable settling surface for oyster larvae.

Since fish could easily escape the dredge, no direct impacts are expected. However, the discharge from any of the potential dewatering sites would be routed to Halawa Stream and it is likely that this water would be rich in nitrogen. There is therefore a possibility that an algal "bloom" could occur in the estuary. Under conditions of poor water circulation, the dissolved oxygen level of the water could be depressed, resulting in a fish-kill. At worst, this would only occur periodically during dredging. If a heavy bloom should occur, a fish-kill could be prevented by oxygenating the water. One reason for dredging to a flat invert is to provide for tidal water circulation, so that stagnation does not occur in the estuary. The stretch of Halawa Stream down which the discharge water would flow is entirely lined with concrete which does not support native stream animals (Maciolek and Timbol, unpublished). It is likely that the saline water would kill some exotic species but they would return after the discharge ceases.

The proposed action will result in adverse biological impacts which will be "short-term" compared to the beneficial impacts of the dredging. The removal of mudflats will result in a loss of shorebird habitat. However, the mudflats habitat was created by the sedimentation which occurred after the 1965 dredging and is a major reason for the proposed action. Dredging will increase the minimum water volume upstream of the Kamehameha Highway from approximately 1 acre-foot to over 50 acre-feet. With this greater volume of water, the temperature fluctuations would not be as large as at present and surface chop would not stir up the bottom sediments as easily. The dredging of the channel upstream of the Kamehameha Highway will leave a 2 foot rise in the Halawa Channel downstream of the bridge (refer to Figure 7). This may create an aneorobic sink which can limit the potential of the estuary as a habitat to benthic and pelagic animals alike. The potential for an aneorobic environment would last until stream sedimentation again fills in the depression created by the dredging upstream of the bridge. Also, confined sedimentation

would eventually recreate the mudflat habitat used by shorebirds and other existing fauna. Although this sedimentation of the channel may eventually require that future dredging again occur (thus restarting the biological "cycle" described above), the beneficial impacts of the action on the biological resources of Halawa Stream will be of longer duration than the expected short-term adverse impacts.

E. Noise and Emissions

If is probable that the 55dBA noise level proscribed by the Community Noise Control ordinance (Public Health Regulations Chapter 44B) would be exceeded by the dredge, at least when it is operating close to the homes on the north bank. For this reason, a permit from the Department of Health would be obtained and the operating hours would be limited to 7 a.m. to 6 p.m. If the dredge produced noise levels in excess of 95 dBA, the operating hours would be reduced to 9 a.m. to 5:30 p.m. Some dredge plants have a housing which significantly reduces their noise impact; this factor would be considered in the selection of the contractor. The activities of ancillary equipment, such as bulldozers and trucks, would also be included under the noise permit, following the requirements of Chapter 44A (Vehicular Noise Control).

At no time during the field surveys have malodorous sediments been encountered. The water circulation in the estuary is apparently sufficient to prevent the formation of stagnant pockets. It is therefore unlikely that noxious odors would be released during dredging. This problem is usually encountered only in sediment that is highly polluted with chemical wastes. Exhaust emissions from the equipment would be minimal and fugitive dust would be controlled as required by Chapter 43 of the Public Health Regulations.

F. Traffic Circulation

Moving the dredge would cause only minor disruption of traffic, since most 12-inch dredges are designed to allow truck transport. Launching would be accomplished off of the road. Depending on the site, the pipeline to the dewatering pond might have to cross a roadway. This could be accomplished without disturbing traffic by tunneling underneath the roadway. In the case of

Salt Lake Boulevard, care would be exercised to avoid the various underground utilities. Several of the sites could be reached by passing the pipeline underneath the Salt Lake Boulevard bridge. When the dried sediment is removed from the dewatering site, truck traffic could generate conflicts. Consideration would be given to providing traffic control measures, such a temporary signalization.

G. Safety

The project would have the beneficial effect of restoring flood capacity to the Halawa Stream channel. Approximately 120 - 130 homes potentially threatened by flooding would be protected. However, this would be achieved by increasing the channel depth to -4.50 feet and at high tide the channel would be approximately 6 feet deep. This presents a potential drowning hazard and the right-of-way should be provided with a security fence.

H. Land Use

The ownership of the area to be dredged is divided among the Queen's Hospital, B. P. Bishop Estate, City and County of Honolulu, State of Hawaii and the U. S. Navy. The project would serve the interests of all of these parties by providing flood control and an improved sedimentation basin. The only land use impact associated with the dredging would come from removing the improvements that residents have placed on the bench between the upper and lower north banks. This is a maintenance access easement and should have been kept clear for that purpose. The project could facilitate development of the truck farm on the south bank by providing flood protection. However, development plans were made prior to this project, so the dredging cannot be said to have a growth inducing impact.

Although seven "vacant" parcels have been found that could serve as dewatering sites, there is no land in the project vicinity that does not have some other interest or commitment. Disposal of the spoil would therefore generate a land use conflict regardless of the site. Sites 1 through 4 are owned by the Queen's Medical Center; sites 1 and 3 are currently being farmed and development plans for these parcels may preclude their use for spoil disposal. Sites 5 and 6 are in the freeway right-of-way and may adversely affect land settling or other

aspects of the freeway facilities. The Navy intends to develop a golf course in Makalapa Crater; use of this site may or may not be in conflict with this plan, depending on the handling of drainage in the area.

Some of these potential conflicts might be avoided by scheduling. If a final disposal area can be located, the dewatering site would only be needed until the sediment is dry enough to be loaded into trucks. If none of the sites can be used, then the spoil would have to be dumped in the ocean; if this is too expensive, the project may have to be abandoned.

I. Aesthetics

Certain elements of the project area are aesthetically displeasing; the broken docks and trash on the mudflats are prime examples (Plate 2). The proposed project would remove these items. Vegetation that has encroached onto the stream access roads would be removed but this will only be a short-term impact. The spoil disposal site would be unsightly until reclamation is completed.

J. Antiquities

No archaeological or historical resources have been identified in the project area. It is highly unlikely that dredging would have any impacts in this category but the spoil disposal site could have archaeological or historical value. This possibility is very remotive, however, since all of the sites have been disturbed by past land uses.

IV. ALTERNATIVES TO THE PROPOSED PROJECT

A. Alternative Project Designs

Given the basic project description of dredging accumulated sediments in order to restore channel capacity, there are numerous alternative approaches to the depth of dredging, the method of dredging and the method of spoil disposal. The following alternatives for each of these project elements have been researched and evaluated for the best combination.

1. Dredging Depth. The optimum dredging depth is a function of the channel capacity needed to contain the design flow of 12,500 cfs, compared against cost. To determine this depth, the water surface elevation at the design flow was calculated for three invert elevations; -2.5 feet, -4.5 feet and -8.0 feet. The volume of sediment to be removed for each alternative was also determined. The controlling elevation was found to be 10 feet msl, the elevation of the top of the north bank at Station 29+00; a water level above this could result in flood damage. With an invert elevation of -2.5 feet, the water level at Station 29+00 would exceed the top of the bank by approximately 1.3 feet; at -4.5 feet, the bank would be exceeded by approximately 0.2 feet; and at -8.0 feet, the water level would be approximately 0.8 feet below the top of the bank.

When this data is plotted against the dredging volume, it can be seen that to lower the water surface elevation at Station 29+00 from 11.3 feet to 10.2 feet (1.1 feet) requires the removal of approximately 39,000 cubic yards of sediment (difference between a -2.5 foot invert and a -4.5 foot invert), but to lower the water surface from 10.2 feet to 9.2 feet, would require the removal of an additional 65,000 cubic yards (-4.5 foot invert to a -8.0 foot invert). To dredge to -8.0 feet would cost roughly $180,000 more than it would to dredge to -4.5 feet. Constructing approximately 1,200 feet of levee or reinforced block wall along the flood threatened section of the north bank could provide the same degree of flood protection at a much lower cost.

2. Dredging Method. Dredges may be divided into two basic categories; mechanical and hydraulic. In mechanical dredging, the material is picked or scooped up and placed in a conveyance for transportation to the disposal site. In

hydraulic dredging, the material is pumped up as a slurry and transported via pipeline to the disposal site. The two types of mechanical dredging most suitable for the proposed project would appear to be dragline and clamshell, operating from the access easements on both banks of the channel. The sediment would be piled against the bank by the dragline and after enough water drains off, it would be picked up by the clamshell and loaded into trucks equipped with water-tight gates. The cost of this approach is strongly influenced by the distance to the disposal site; with a 3 mile round trip, the cost of dredging and disposing of 100,000 cubic yards of sediment would be roughly $350,000 (including mobilization, demobilization and reclamation). If the disposal site requires a 15 mile round trip, the total cost would be roughly $470,000.

Although the cost of the project could be less with mechnical dredging than with hydraulic dredging, there are four factors that make mechanical dredging undesirable in these circumstances. First, access is very limited; it is doubtful that there is enough room on the 15-foot easement for two large cranes and the trucks to maneuver. Second, it would take up to 200 days to complete the dredging by this method, as opposed to an estimated 125 days for hydraulic dredging. The equipment would literally be in the back yards of 48 residences during much of this time and the noise and disturbance would be undesirable. Third, the trucks would create traffic conflicts, requiring the use of traffic control devices. Finally, mechanical dredging would stir up much more turbidity than hydraulic dredging although this could be controlled with silt curtains.

Consideration has also been given to constructing a coffer dam at the lower end of the project area then pumping out the water and diverting the stream. Presumably, the sediment would be dry enough in a relatively short time to allow removal by equipment working in the channel. However, it is very unlikely that the sediment could ever support heavy equipment, especially in sediment Zones 4 and 5 which are very soft and deep. Handling storm flow during the operation would also present a serious problem with this method.

3. Disposal Method. There are two alternatives for disposing of the dredged sediment; ocean disposal at the EPA-designated disposal site or disposal on land at a presently undetermined site. Land disposal has been indicated as the recommended method, primarily due to

the high cost of transporting the spoil by barge. However, if a dewatering site cannot be secured, ocean disposal would have to be used. A possible procedure would be to pump the sediment to a temporary dewatering area within the channel and contain it by silt curtains or a dike. An "air ram" type pump would then be used to pump the sediment into a barge moored in the vicinity of the Halawa Landing. The air ram uses compressed air and has the significant advantage of being able to pump a slurry of 80% - 90% solids, as opposed to the 10% - 20% solids pumped by the dredge. The barge could therefore be filled without spilling any turbid water. A similar approach is being considered for the Ala Wai Canal maintenance dredging project.

There are several advantages to ocean disposal. The spoil would not need to be rehandled or reclaimed and this cost savings would partially offset the cost of barging. A dewatering site would not have to be disturbed and the attendant land use conflicts would be avoided. One disadvantage of ocean disposal is the potential impacts to the marine environment. However, the Halawa Stream sediments are not badly polluted. Furthermore, since a site has been designated for ocean disposal, it is assumed that impacts are acceptable at that location. Another disadvantage is that a barge moored at the Halawa Landing could cause conflicts with the USS Arizona Memorial tour boats.

B. Alternative Dewatering and Disposal Sites

The following parcels are being considered for use as slurry dewatering sites (refer to Chapter I. D. 3, Table 1 and Figure 3). To date, none of these sites have been made available, although discussions with the owners are proceeding.

Site 1, South Bank Farm. This site is located adjacent to the south side of the stream between Salt Lake Boulevard and Makalapa Crater (TMK 9-9-2:24). It is approximately 14.5 acres in area and has an elevation of approximately 10 feet. It is currently used to grow vegetables and a kennel is located in the corner near the Salt Lake Boulevard bridge. Two significant advantages to this site are its immediate proximity to the project area and its size. Also, the dewatering pond could be placed against Makalapa Crater, reducing the amount of dike needed. However, the owners have indicated that this parcel is not available.

Site 2, Halawa Heights Road Bluff. Site 2 is situated on the north side of Halawa Heights Road on a flat-topped bluff (TMK 9-9-2:16). The elevation of the bluff is approximately 85 feet and approximately 10.7 acres would be useable for the dewatering pond. The land was formerly cultivated in sugar cane but it has been fallow for several years and now supports a dense growth of koa haole and other weedy plants. Although this site could provide the minimum area required, the high elevation and need for dikes around the entire circumference are disadvantages. If a dike should ever fail, traffic on Halawa Heights Road or the freeway could be disrupted. The most probable route for the slurry pipeline would be up the stream channel, underneath Salt Lake Boulevard bridge, across the lower edge of the stadium parking lot, under the stadium access road and the freeway viaduct then up to the top of the bluff. The pipeline distance would be approximately 2,600 feet to 5,800 feet.

Site 3, Halawa Heights Road Farm. Site 3 is opposite site 2 and is bounded by Halawa Heights Road and Salt Lake Boulevard (TMK 9-9-2:16). The entire site is approximately 8.2 acres in area and approximately 12 - 18 feet in elevation. The upper end consists of a small water storage pond and the lower end supports a vegetable farm. There is also a barn at the lower end of the site. Site 3 does not provide sufficient area by itself and would have to be used in conjunction with another parcel, such as site 6. To reach this site, the pipeline could cross site 2 and tunnel under Salt Lake Boulevard, a distance of roughly 1,000 to 3,200 feet.

Site 4, Interchange. This site is located between the base of the site 2 bluff and the north-bound H-2/east-bound H-1 transition ramp. It is approximately 5.0 acres and at an elevation of 20 feet. Site 4 is abandoned sugar cane land and is now vegetated with grass. A pump and several structures were once located on this site but were removed when the freeway was constructed. The wells that were served by this pump have been sealed (none were located on the site). Access to site 4 could be along the stream right-of-way but the pipeline would have to cross under the freeway ramp. The distance would be 2,200 to 5,400 feet. If no other sites were available, sites 4 and 5 could be used together.

Site 5, Upper Stream. Site 5 is situated on a parcel of waste land in the freeway right-of-way between the stream and the H-2/H-1 transition ramp. The site is roughly 8.0 acres in area and at an elevation of approximately 60 feet. It is not as level as desired, so some grading and high dike construction would be required. The stream channel is not lined at this point, so flood protection would have to be taken into account. The maximum pumping distance, up the stream right-of-way, would be approximately 7,700 feet. A booster pump would be required to reach this site.

Site 6, Viaduct. This is a small parcel (4.6 acres) beneath the H-2 freeway viaduct adjacent to the stadium parking lot. Its elevation is approximately 11 feet and it would require 800 to 4,000 feet of pipeline to reach it. Use of this site is doubtful due to the difficulty of equipment manuevering among the piers supporting the freeway.

Site 7, Makalapa Crater. Makalapa Crater is second in priority as a dewatering site. It was used almost continuously from 1935 to 1946 for spoil disposal from dredging operations in Pearl Harbor and is now filled with 30 to 40 feet of sediment. There is approximately 30 acres of "waste land" on the floor of the crater, which is at an elevation of approximately 30 to 40 feet. There are two primary constraints to the use of this site; the dewatering pond cannot be placed against the freeway berms and sufficient storm runoff storage area must be provided at the outlet of the crater. Taking these constraints into account, at least 15.5 acres could be found for the dewatering pond. The pumping distance would be approximately 1,700 to 3,800 feet, with the pipeline crossing under Luapele Road near the CINCPAC Headquarters parking lot.

Final Disposal Sites. If the dewatering site cannot be used for permanent storage and reclamation of the sediment, it would have to be trucked to another location. The City and County Department of Parks and Recreation has suggested that the Ted Makalena Golf Course, the Waianae Regional Park or the Waipahu Garden Park could be considered as final spoil disposal sites. No decision has been made on this issue, pending the outcome of negotiations for a dewatering site.

C. Alternatives To Dredging

The only alternative to increasing the depth of the channel would be to increase the height of the banks. To obtain the required capacity without dredging, levees would have to be constructed to a height of approximately 7 feet along the Halawa Valley Estates Subdivision and at several points on the opposite bank. This could be less costly than dredging but would probably be strongly opposed by the affected residents. The use of levees would result in higher storm flow velocities, which would reduce the effectiveness of the estuary as a sediment trap for Pearl Harbor. In addition, the higher water elevations would cause storm drains to overflow in the residential area. The placement of small levees (2 - 3 feet high) at critical locations in conjunction with dredging the channel, is being considered.

D. Non-Structural Alternatives

Alternatives that do not involve construction in or adjacent to the stream channel would include providing flood insurance to homeowners, removing or flood-proofing threatened homes or strict application of storm runoff control measures throughout the watershed. Flood insurance would mitigate the economic impact of flood damage; removing or flood-proofing homes would eliminate the threat of flooding; and runoff control measures could reduce the degree of potential flooding. However, none of these measures would improve the action of the Halawa Stream estuary as a sediment trap for Pearl Harbor.

E. The "No-Project" Alternative

If increased storm flow capacity is not provided in the project area, the threat of flood damage to the Halawa Valley Estates Subdivision would remain. The potential short-term adverse impacts on biota and water quality would not occur, nor would the beneficial long-term impacts of improved aesthetics and biological productivity. Left as it is, the channel would accumulate some sediment but much of the sediment would pass through the project area to be deposited in Pearl Harbor.

V. UNAVOIDABLE ADVERSE IMPACTS

With the exception of presenting a hazard for drowning, there would be no long-term adverse impacts from the proposed project. Potential impacts to the water quality and biological resources of the Halawa Stream estuary would be short-term and mitigatable. The loss of property resulting from clearing the maintenance access easement on the north bank would be an unavoidable adverse impact but it can be argued that the improvements should not have been placed in the easement in the first place.

VI. THE RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

There are three basic forms of "productivity" in the project area; biological productivity, residential development and truck-farming. The proposed project would cause short-term impacts to the biota of the Halawa Stream estuary but the net long-term effect is expected to be beneficial. In the same manner, the residents adjacent to the project area would be disturbed by the noise and activity of dredging but the long-term result would be the economic and emotional security of improved flood protection. If the two sites that are currently being farmed are used for dewatering the sediment, this productivity would be interrupted. However, after the dried sediment is removed or reclaimed and the remaining saline soils leached out, the fertility of the land could be greater than before, since the sediment is high in nitrogen.

VII. Commitments of Resources

The proposed project would commit tax money, manpower and materials to the dredging of the Halawa Stream estuary. Other resources, such as groundwater or the aesthetics and aquatic life of Pearl Harbor, would not be significantly affected.

VIII. GOVERNMENTAL POLICIES OFFSETTING ADVERSE EFFECTS

The State Public Health Regulations, Chapters 37A (water pollution), 43 (fugitive dust) and 44A and 44B (noise), have already been cited (Chapter III) as providing adequate mitigation measures for the anticipated short-term impacts of the proposed dredging. Future construction activities in the watershed would be subject to erosion control standards of Chapter 37B of the Public Health Regulations, and would have to submit an Erosion Control Plan for approval by the City and County of Honolulu. These regulations could conceivably reduce the need for future maintenance dredging, all other conditions (eg. weather) being equal.

IX. RELATIONSHIP TO LAND USE POLICIES

The project has a positive relationship with the policy of the City and County of Honolulu General Plan (dated January 18, 1977), to "design surface drainage and flood control systems in a manner which will help preserve their natural setting" (policy 3. A. 5). Since the channel will not be lined, it can be recolonized by marine organisms immediately after the project is completed. The proposed project also has a positive relationship with the policy to "participate with State and Federal agencies in the funding and construction of flood control projects" (policy 7. B. 6).

X. SUMMARY OF UNRESOLVED ISSUES

A major issue that is unresolved at this time is the disposition of the sediment. The two alternatives, ocean versus land disposal, both have advantages and disadvantages, although land disposal is preferred on the basis of cost. However, if a site cannot be obtained, ocean disposal would have to be employed.

XI. NECESSARY APPROVALS

The proposed action will require a Department of the Army Permit for Activities in Waterways (Section 404 permit). The necessary forms and supplemental data will be submitted with the Revised EIS. Since the project is within the Shoreline Management Area, a permit will be required from the City Council. Also, a permit for excessive noise will be required from the Department of Health, which will be the responsibility of the contractor. Other standard approvals, such as from the Department of Transportation and the Department of Health will be obtained for the construction plans at the appropriate time. Also, coordination will be maintained with the Board of Water Supply and other utilities with regard to crossing any roadways with slurry pipeline.

References

Corps of Engineers, 1976. Halawa Stream, Oahu, Hawaii Reconnaissance Report on Small Flood Control Project. US Army Engineer Division, Pacific Ocean. 27 April, 1976.

Dale, R. H. 1967. Land Use and Its Effect on the Basal Water Supply, Pearl Harbor Area, Oahu, Hawaii, 1931-65. US Geological Survey, Hydrologic Investigations Atlas HA-267.

DLNR. 1970. Flood Frequencies for Selected Streams in Hawaii. State of Hawaii, Dept. of Land and Natural Resources, Div. of Water and Land Development, Report R36.

Foote, D. E., E. L. Hill, S. Nakamura and F. Stephens. 1972. Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii. USDA Soil Conservation Service and University of Hawaii Agricultural Experiment Station.

Johanson, E. E. 1976. Silt Curtains for Dredging Turbidity Control. In Krenkel, P. A., J. Harrison and J. C. Burdick III (eds). Dredging and Its Environmental Effects. American Society of Civil Engineers.

Jones, B. L. and C. J. Ewart. 1973. Hydrology and Sediment Transport, Moanalua Valley, Oahu, Hawaii. US Geological Survey Water Resources Division, Report No. HI-HWY-71-1-Il.

Jones, B. L., R. H. Nakahara and S. S. W. Chinn. 1971. Reconnaissance Study of Sediment Transported by Streams, Islands of Oahu. US Geological Survey, Circular C33.

Krizek, R. J., J. A. Fitzpatrick and D. K. Atmatzidis. 1976. Dredged Material Confinement Facilities as Solid-Liquid Separation Systems. In Krenkel, P. A., J. Harrison and J. C. Burdick III (eds). Dredging and Its Environmental Effects. American Society of Civil Engineers.

Krizek, R. J., B. J. Gallagher and G. M. Karadi. 1976. Water Quality Effects of a Dredging Disposal Area. American Society of Civil Engineers, Journal of Environmental Engineering Division. 102(EE2): 389-409.

Maciolek, J. A. and A. S. Timbol. Unpublished. Stream Channel Modification (Channelization) in Hawaii and its Environmental Effects on Native Fauna. Part A. Statewide Inventory of Channelization with Preliminary Survey of Environmental Factors and Associated Biota. Annual Report, August 1975 to September 1976. University of Hawaii.

Morris, D. E., S. W. Surface and J. P. Murray. 1973. Completion Report for the Pearl Harbor, Hawaii Study, Covering the Test Period Through Calendar Year 1972. Naval Civil Engineering Laboratory, MPA 6.2.1.4. (Cited by permission).

McCauley, J. E., D. R. Hancock and R. A. Parr. 1976. Maintenance Dredging and Four Polychaete Worms. In Krenkel, P. A., J. Harrison and J. C. Burdick III (eds). Dredging and Its Environmental Effects. American Society of Civil Engineers.

Nakahara, R. H. 1974. An Investigation of Floods in Hawaii Through September 30, 1973. US Geological Survey, Water Resources Division, Progress Report No. 116.

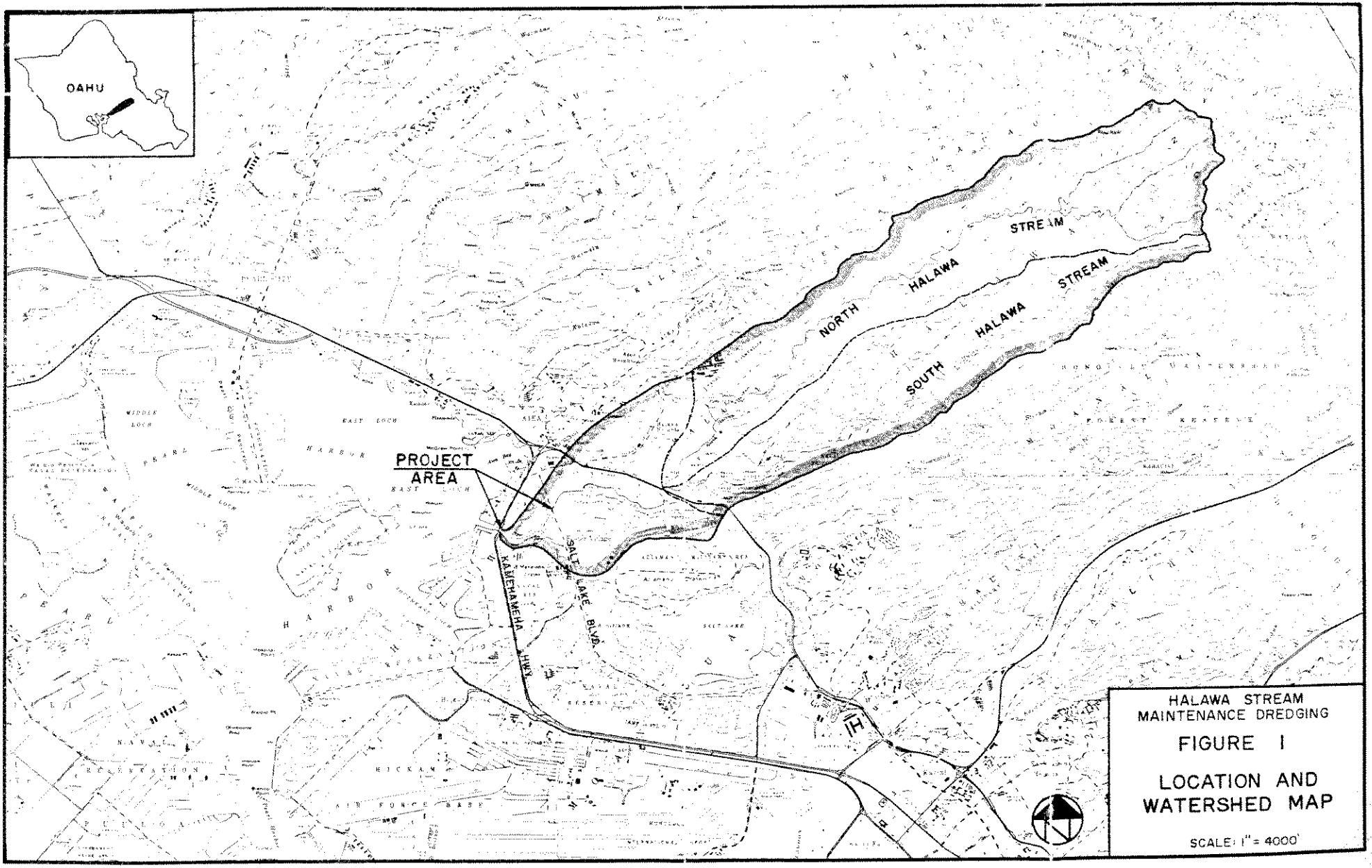
Reisch, D. J. 1958. The Relation of Polychaetous Annelids to Harbor Pollution. Public Health Reports 70 (12): 1168-1174.

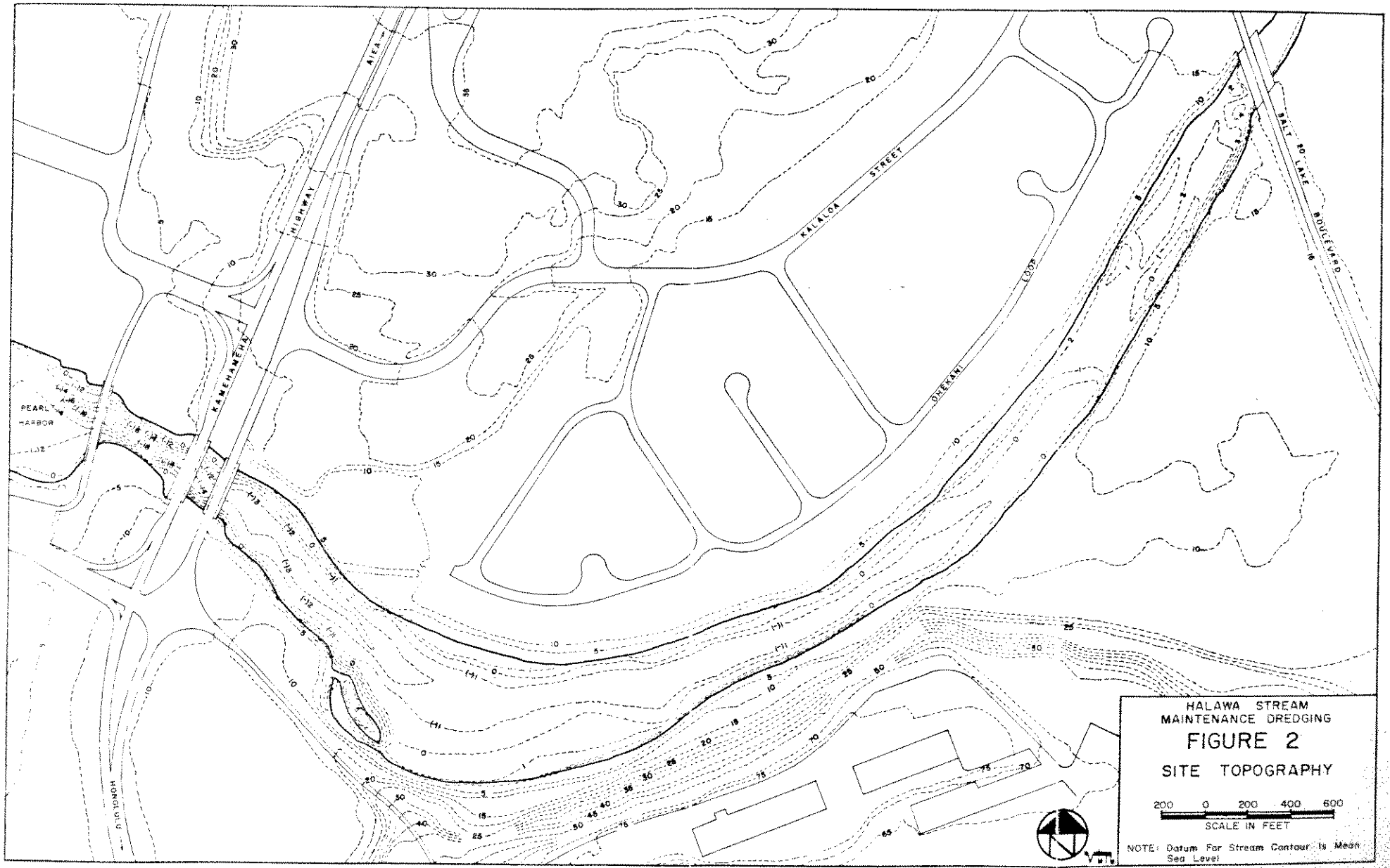
Soil Conservation Service, 1976. Erosion and Sediment Control Guide for Urbanizing Areas in Hawaii. Hawaii Assoc. of Soil and Water Conservation Districts, Soil Conservation Society of America, Hawaii Chapter.

Stearns, H. T. and K. N. Vaksvik. 1935. Geology and Ground-Water Resources of the Island of Oahu, Hawaii. Territory of Hawaii, Division of Hydrography, Bulletin 1.

Stone, A. N. and D. J. Reisch. 1965. The Effect of Freshwater Runoff on a Population of Estuarine Polychaetous Annelids. Bulletin of the Southern California Academy of Sciences. 64(3):111-119.

Youngberg, A. D. 1973. A Study of Sediment and Soil Samples From Pearl Harbor Area. Naval Civil Engineering Laboratory, MPA 6.2.1.2. (Cited by permission).


OAHU
NORTH HALAWA STREAM
SOUTH HALAWA STREAM
PROJECT AREA
KAMEHAMEHA HWY
SALT LAKE BLVD
HALAWA STREAM
MAINTENANCE DREDGING
FIGURE I
LOCATION AND
WATERSHED MAP
SCALE: 1" = 4000'


HALAWA STREAM
MAINTENANCE DREDGING
FIGURE 2
SITE TOPOGRAPHY
200 0 200 400 600
SCALE IN FEET
NOTE: Datum For Stream Contour Is Mean Sea Level
KAMEHAMEHA HIGHWAY
AIEA
KALALOA STREET
SALT LAKE BOULEVARD
OLEKAHI
PEARL HARBOR
HONOLULU

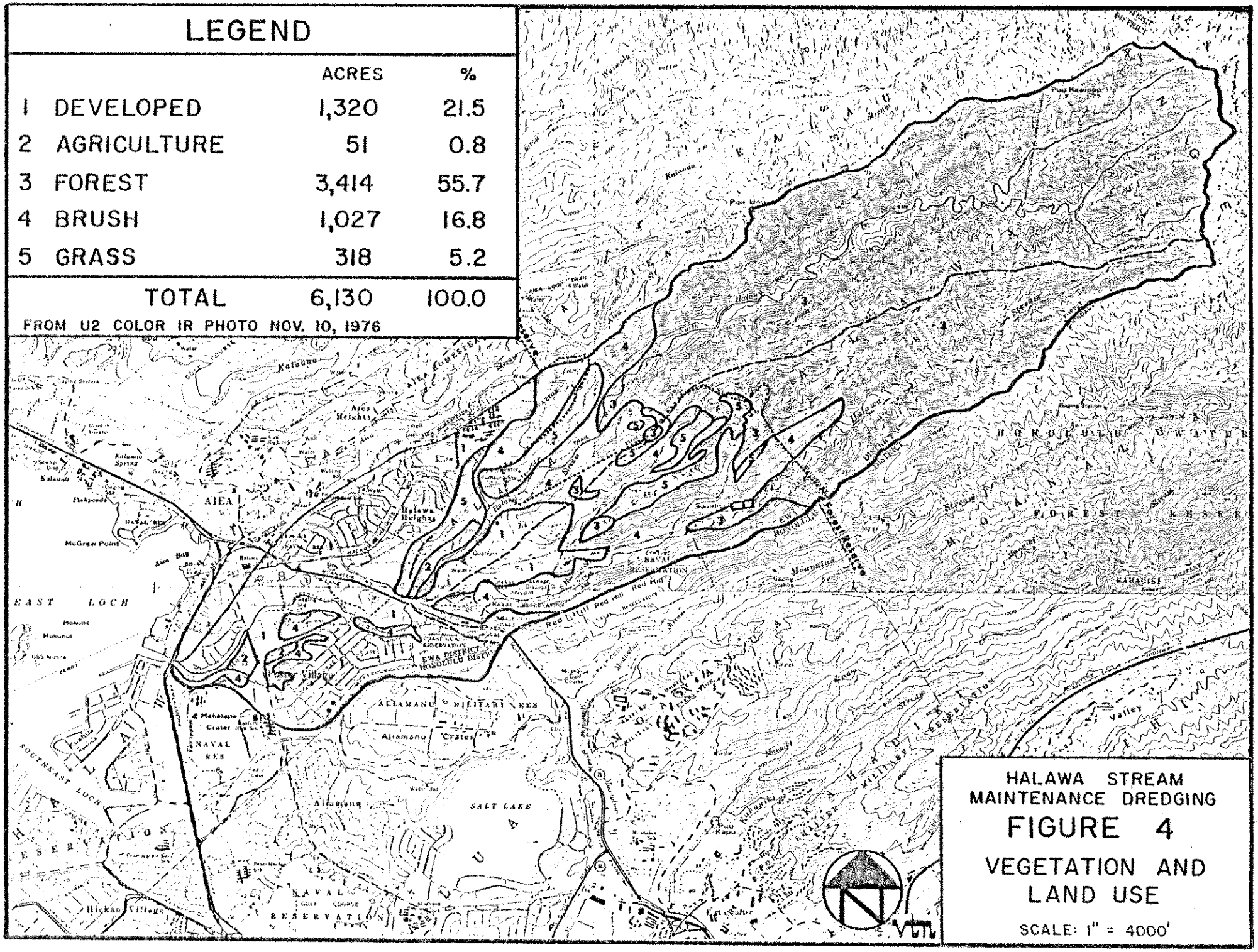
PHOTOGRAPH BY R.M. TOWILL CORP.
DECEMBER 12, 1976

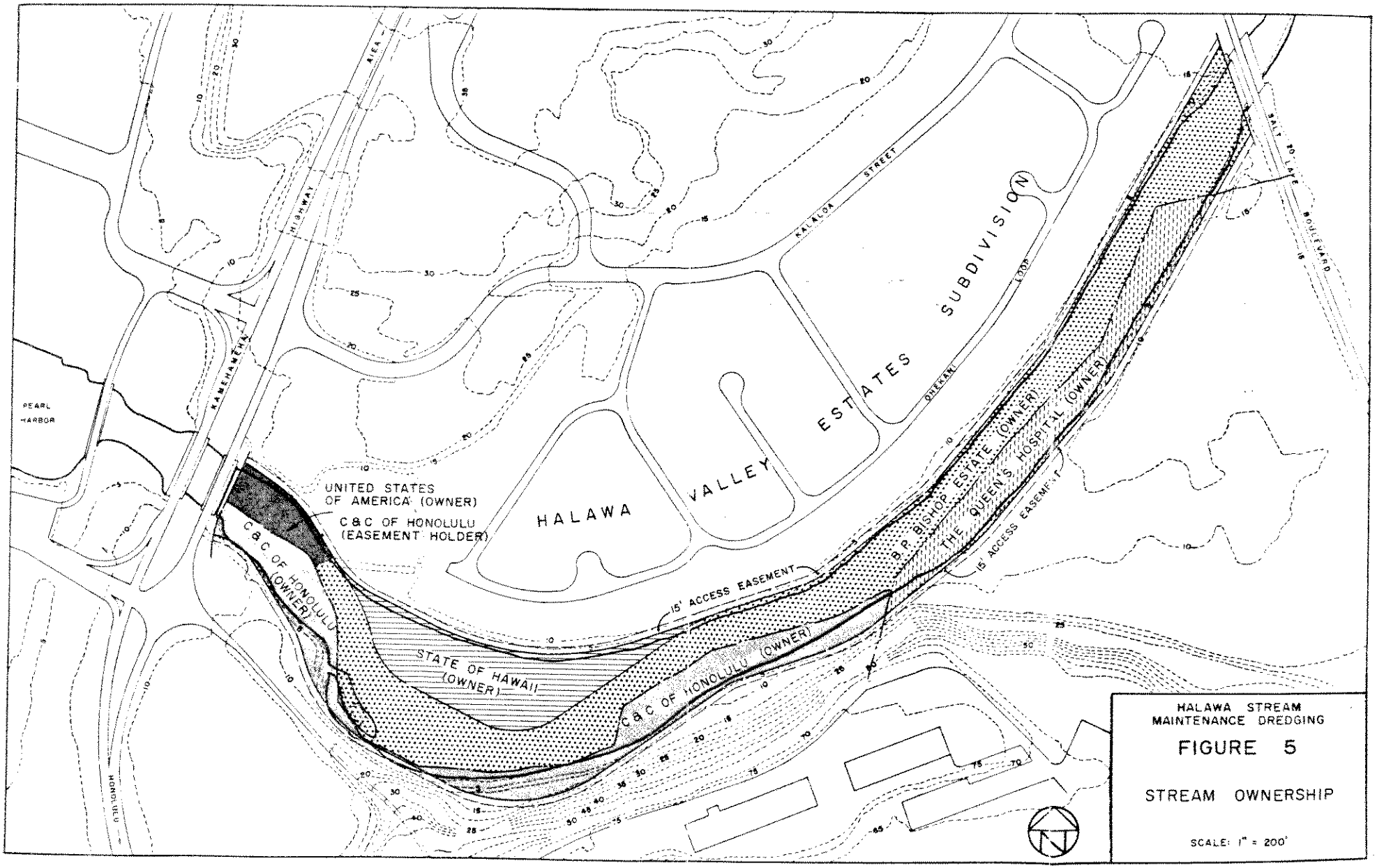
1000 500 0 1000 2000 3000
SCALE IN FEET

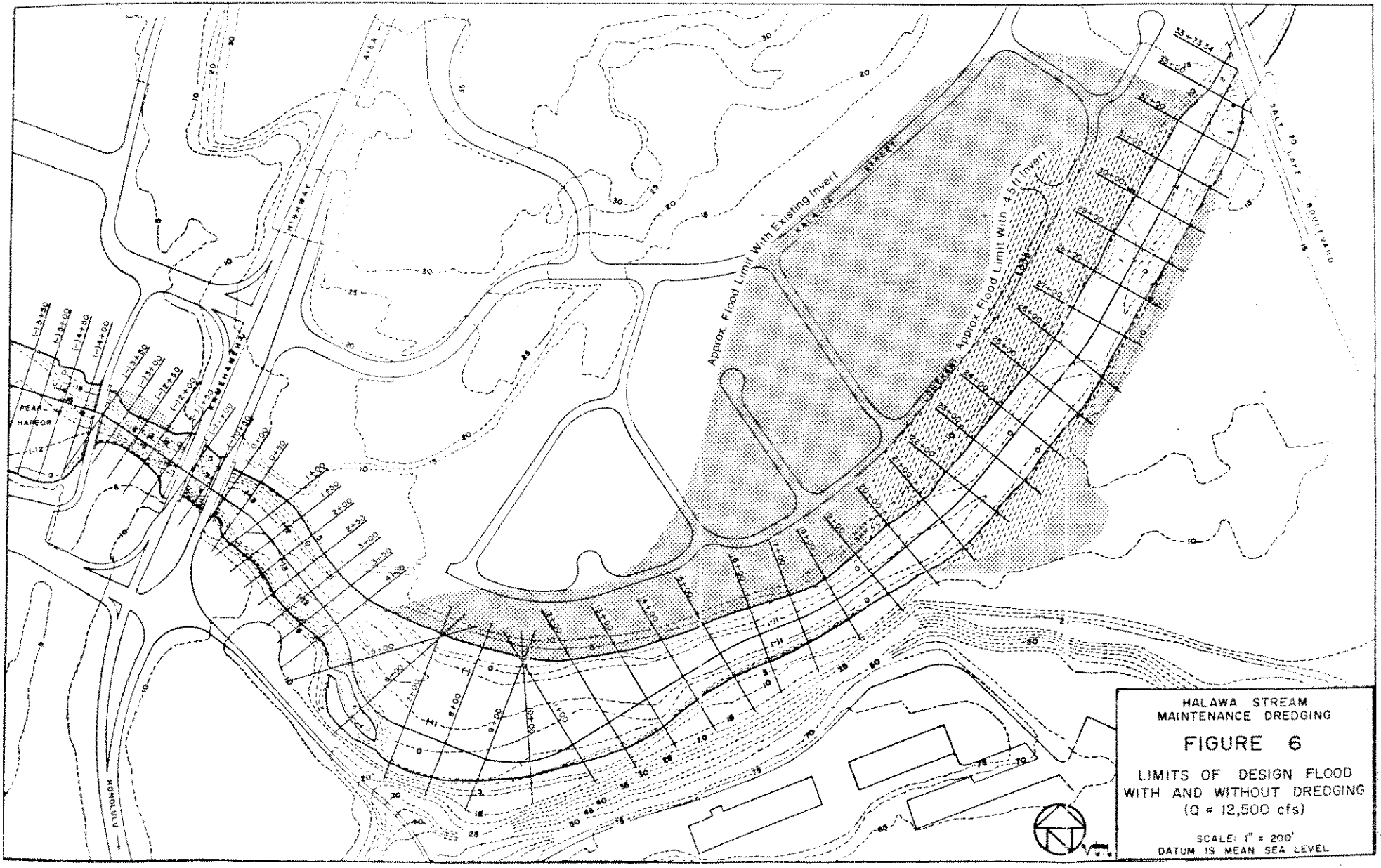
HALAWA STREAM
MAINTENANCE DREDGING

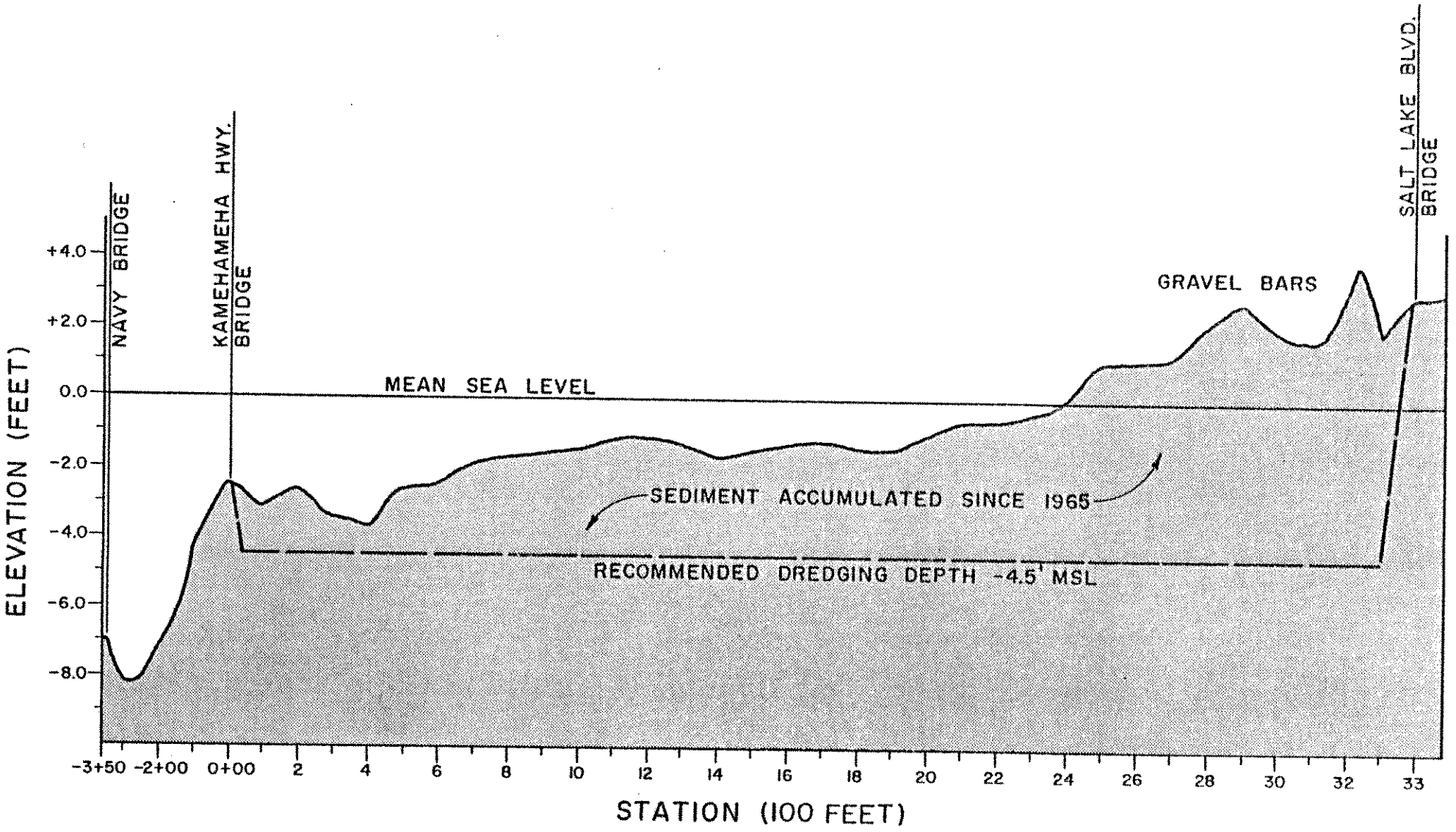
FIGURE 3

POTENTIAL
DEWATERING SITES


LEGEND
ACRES
%
1 DEVELOPED 1,320 21.5
2 AGRICULTURE 51 0.8
3 FOREST 3,414 55.7
4 BRUSH 1,027 16.8
5 GRASS 318 5.2
TOTAL 6,130 100.0
FROM U2 COLOR IR PHOTO NOV. 10, 1976
HALAWA STREAM
MAINTENANCE DREDGING
FIGURE 4
VEGETATION AND
LAND USE
SCALE: 1" = 4000'


PEARL HARBOR
KAMEHAMEHA HIGHWAY
AIEA
KALALOA STREET
HALAWA VALLEY ESTATES SUBDIVISION
OHEKANI
SALT LAKE BOULEVARD
UNITED STATES OF AMERICA (OWNER)
C&C OF HONOLULU (EASEMENT HOLDER)
C&C OF HONOLULU (OWNER)
STATE OF HAWAII (OWNER)
15' ACCESS EASEMENT
B.P. BISHOP ESTATE (OWNER)
THE QUEEN'S HOSPITAL (OWNER)
15' ACCESS EASEMENT
C&C OF HONOLULU (OWNER)
HONOLULU
HALAWA STREAM
MAINTENANCE DREDGING
FIGURE 5
STREAM OWNERSHIP
SCALE: 1" = 200'


Approx Flood Limit With Existing Invert
Approx Flood Limit With 4.5ft Invert
PEARL HARBOR
HONOLULU
SALT LAKE BOULEVARD
HALAWA STREAM
MAINTENANCE DREDGING
FIGURE 6
LIMITS OF DESIGN FLOOD
WITH AND WITHOUT DREDGING
(Q = 12,500 cfs)
SCALE: 1" = 200'
DATUM IS MEAN SEA LEVEL

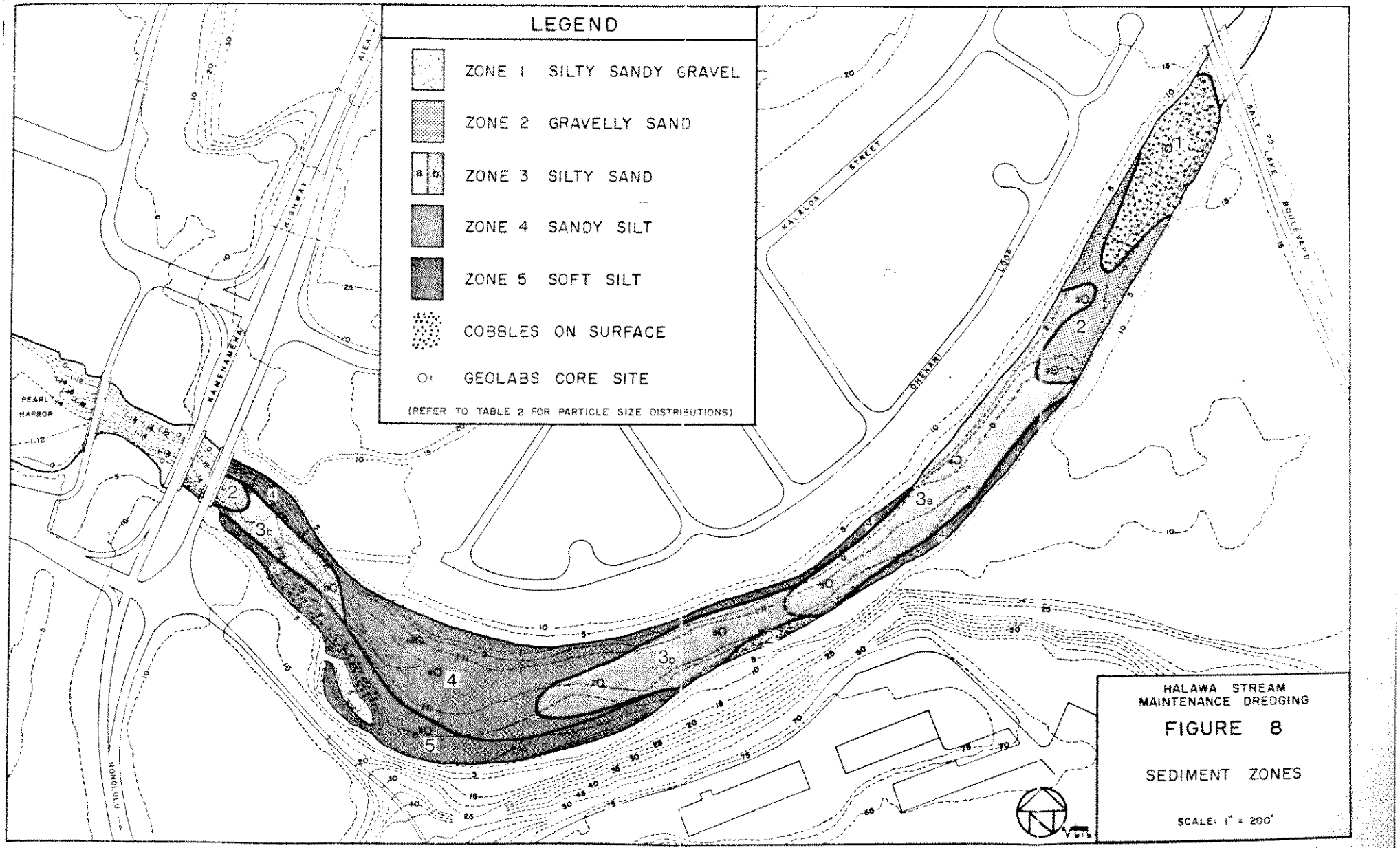


HALAWA STREAM
MAINTENANCE DREDGING

FIGURE 7

BOTTOM PROFILE ALONG CENTERLINE

SCALE: 100 HORIZ : 1 VERT


LEGEND
ZONE 1 SILTY SANDY GRAVEL
ZONE 2 GRAVELLY SAND
ZONE 3 SILTY SAND
ZONE 4 SANDY SILT
ZONE 5 SOFT SILT
COBBLES ON SURFACE
GEOLABS CORE SITE
(REFER TO TABLE 2 FOR PARTICLE SIZE DISTRIBUTIONS)
KAMEHAMEHA HIGHWAY
KALAEOA STREET
OHEKAM LOOP
SALT LAKE BOULEVARD
PEARL HARBOR
HONOLULU
HALAWA STREAM
MAINTENANCE DREDGING
FIGURE 8
SEDIMENT ZONES
SCALE: 1" = 200'

APPENDIX A HYDRAULIC DATA

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU

EXCERPTS FROM

DESIGN ALTERNATIVES AND HYDRAULIC ANALYSIS

FOR THE

HALAWA STREAM

FLOOD CONTROL PROJECT

Halawa, Oahu, Hawaii
TMK: 9-9-02, 03

April, 1977

Prepared by
VTN-Pacific
1164 Bishop Street
Suite 906
Honolulu, Hawaii 96813

For copies of the complete report, contact the Department of Public Works or VTN Pacific

TABLE OF CONTENTS

LIST OF TABLES AND PLATES

I. RECOMMENDATIONS

A. As a result of discussions within this report, it has been determined that any improvements to the stream downstream from Station 0+00 would have the effect of raising the velocity upstream and lowering the velocity downstream. Therefore, no improvements should be initiated in this downstream portion of the project since it would be conducive to introducing more siltation to the area as well as to Pearl Harbor.

B. The area from the top of slope of the upper banks on the northerly side of the stream down to the streambed should be considered as a floodway. All existing installations should be removed and no future construction should be allowed within the area. (See Sub-section I, B, 1 and Plates 2 and 4 to 12.)

C. Any proposed dredging improvements to the existing stream bed should be considered as flat inverts. This will assure sub-critical flow within the project and keep velocities and erosion to a minimum.

D. Installation of flap gates for pipe outlets at Stations 29+40 and 31+40, should be investigated. A flap gate will also be needed for Station 21+85 if the upstream is dredged higher than elevation (-)4.50 (see Table 3 and Plate 13).

E. The project limits of the Halawa Stream (Station 0+00 to Station 33+00±) should be dredged to a minimum flat invert of (-)4.50, the original invert elevation. Dredging to greater depths does not lower the hydraulic gradients or slow velocities significantly.

F. In order to provide full protection from inundation at the peak design flow of 12,500 cfs for the conditions of Backwater Curve A-3, it is recommended that the installation of levees be considered. These dikes would be required from Station 19+00 to Station 32+00 on the north side and from Stations 20+00 to 29+00 on the south side of the stream (see Plates 9, 10, 11 and 12).

II. INTRODUCTION

A. General

1. Location and Description. The Halawa Stream is located in the central to southerly portion of the island of Oahu, State of Hawaii (see Plate 1). The location of the specific project site is a stretch of stream between Salt Lake Boulevard and Kamehameha Highway, which is just prior to its entrance into Pearl Harbor (TMK 9-9-02: 24 (por.), 29, 9-9-02: 23, 24, 26 (por.), 49 (por.), 51, 66 (por.)).

   The Halawa Stream is comprised mainly of the North Fork and the South Fork, which originate at the crest of the Koolau Mountains, within the Pearl Harbor Drainage Basin, and flows through steep terrain until just prior to -- their convergence directly below the Moanalua Freeway. From this point, the stream continues along a relatively flat path for approximately 2.0 miles to its outlet in the East Loch of Pearl Harbor.

   The existing topography within the project area consists predominantly of the Makalapa Crater which is on the southerly bank of the stream. The northerly side of the stream is occupied by the Halawa Valley Estates Subdivision, where the terrain ranges from elevation 5 to 15 (Datum MSL). Other existing land use in the immediate project area consists of several apartment complexes near Kamehameha Highway. Most of the south side of Halawa Stream is U.S. Navy property. The land between the south bank of the stream and Salt Lake Boulevard is occupied by a small truck farm (approximately 18 acres) and a kennel on property owned by the B. P. Bishop Estate. The land downstream from the project area is occupied by the U.S.S. Arizona Memorial Landing, the Naval Supply Center, and the Ford Island ferry terminal (see Frontispiece).

2. Existing Conditions. Erosion and /or sedimentation has occurred in an irregular manner throughout the area and high spots and bank erosion can be identified alternately. The entire project area is subject to the tides, which have

a normal, average range of approximately 2.5 feet. At high tide, only the gravel bars near Salt Lake Boulevard and close to the southerly bank further downstream, are exposed. At the lowest tide, approximately 8 acres or 60% of the study area is exposed. The existing contour lines at the bottom of the stream are delineated on Plate 2 (datum MSL). The stream, in general, decreases in invert elevation as it approaches Pearl Harbor, ranging from +4.00 on the gravel bars at Salt Lake Boulevard, to -3.70 at the Kamehameha Highway Bridge. Downstream from this bridge, in U.S. Navy Property, the existing contour lines drop to as low as elevation -8.00 towards the middle of the stream but are quite shallow at the sides up until the existing bridge which belongs to the U.S. Navy (see Cross Sections, Plates 4 to 12). Just past this bridge, which is located approximately 350 feet downstream from Kamehameha Highway, the elevation drops to about -19.00 in the area around the U.S.S. Arizona Memorial Landings, where the channel width is approximately 300 feet.

B. Background -- Project Site Characteristics

1. North Stream Banks. On the northerly bank of the stream within the project limits, adjacent to the rear boundaries of various residences of the "Halawa Valley Estates", there are two existing slopes. The lower slope is at the stream and the top of the upper slope is approximately at lot level. Between the slopes, a flat area of varying width exists. This condition is noticeably present from about Station 0+00 to Station 16+00. Beyond Station 16+00, the upper bank is only about 2 feet high and doesn't appear to be a slope.

   The top of the lower slope varies from elevation 10.00± (MSL) to elevation 6.00±, between Stations 0+00 to 31+00. Upstream from this point to the Salt Lake Boulevard Bridge, the ground rises to as high as elevation 15.00. There are two parcels at the top of the upper bank which are at elevation 18.00 to 19.00 (MSL) near Kamehameha Highway. The ground elevations then range from

elevation 9.00± to elevation 13.00±, up to approximately Station 31+00. From this point to Salt Lake Boulevard, the terrain rises up to as high as elevation 18.00 (see Plates 2 and 4 to 12).

2. Original Improvements. The stretch of Halawa Stream between Salt Lake Boulevard and Kamehameha Highway was dredged, realigned and otherwise improved as a part of the subdivision improvements for the Halawa Valley Estates Subdivision -- Units 1-A, 1-B and 1-C, a development by the Pearl Harbor Heights Development Company. This construction work was in progress during the year 1964 and completed sometime in 1965.

The original Right-of-Way for this stretch of Halawa Stream was set at 165 feet with 15 feet maintenance access easements on both sides. The alignment was set in a manner to closely follow the meanderings of the existing stream. Slopes of $1\frac{1}{2}$ to 1 were planned to begin at the R/W line and extend down to the invert elevation throughout. The top of the slope was to follow the Water Surface elevations of a backwater curve, plus 1-foot freeboard, in order to keep the maintenance access easements free from inundation. This meant that the bottom widths must vary from approximately 142 feet at Kamehameha Highway to 102 feet at Salt Lake Boulevard.

During the latter part of 1964, it was decided that a section of the original alignment of the Right-of-Way would be changed in such a manner to follow the north bank, which is the rear boundary line for some of the Halawa Valley Estate's lots. The Right-of-Way would still maintain the same widths and easements. Also, the invert was to remain at elevation -4.50.

However, the results of actual construction of the project varied greatly from the design. The invert was dredged, as planned, to elevation -4.50 (MSL) at the northerly banks and this dredging was continued towards the southerly banks for some distance until they could conveniently join existing ground. The southerly side of the stream bed did not resemble the latest planned Right-of-Way, but does resemble the present existing banks. The stream bed extends outside of the proposed R/W on the southerly side, from about Station 4+00 to Station 19+00. An elevation of

-4.50 was maintained towards the northerly slopes only. The invert elevation towards the southerly banks were higher than -4.50 to an unknown extent. The Developer had stated that these changes from the Design Documents were initiated in order to obtain more needed fill soil.

3. Historic Design Flows. The design flow for the stream was estimated at 8,400 cfs in October, 1962 when the construction plans were first initiated. This was in accordance with studies conducted by the City and County of Honolulu. Subsequently, on January 23, 1964, Mr. Donald E. Clark, a Site Engineer for the Federal Housing Administration, wrote an Inter-Office Memorandum to Mr. Phillip R. Kelley, Chief Underwriter. Mr. Clark claimed that the engineers in the Surface Water Branch of the U.S.G.S. had informed him of the existence of unpublished data which indicated that significantly larger flows were developed in 1927 and 1935. They claimed that gage heights which were 7 and 8 feet higher than those recorded on the official Stream Gage, indicating flows of approximately 13,000 cfs and 12,000 cfs for those two years. Mr. Clark recommended that the channel should be designed for at least 25% additional capacity. In conformance to this request, the stream water surface elevations were re-calculated, using a 25% greater design flow of 10,500 cfs.

4. Improvements to Halawa Stream. Improvements or modifications to Halawa Stream have been extensive. Approximately 1.1 miles of stream bed has been enlarged and lined with concrete, upstream from Salt Lake Boulevard to the Moanalua Freeway. Table 1 indicates pertinent data on existing improvements in Halawa Stream.

The existing bridge at Salt Lake Boulevard during this period was a narrow, wooden structure which the stream would have overflowed at a design flow of 8,400 cfs. A new bridge which is more than adequate to pass expected design floods was constructed in 1968 by the City and County of Honolulu. The new span is a reinforced concrete structure and is approximately 154 feet from abutment to abutment.

TABLE 1

EXISTING IMPROVEMENTS
HALAWA STREAM *

Location	Reach Length (Ft.)	Type	Construction	Design Capacity (cfs)	Sponsoring Agency	Date Completed
Kam Highway to Salt Lake Blvd.	3,335	Trap	Earth	10,500	C&C of Honolulu	1965
Salt Lake Blvd. Station 0+00 to Station 11+32	1,132	Trap	Concrete	15,000	State of Hawaii, DAGS	1971
Station 11+32 to Station 16+80	548	Trap	Concrete	14,000	State Dept. of Trans.	1969
Station 16+80 to Station 35+00	1,820	Trap	Concrete	13,000	State Dept. of Trans.	1969
Station 35+00 to Station 39+00	400	Trap	Concrete	13,000	State Dept. of Trans.	1969
NORTH FORK HALAWA STREAM						
Existing Channel Station -9+00 to Station 14+20	2,320	Rect.	Concrete	8,200	State Dept. of Trans.	1970
SOUTH FORK HALAWA STREAM						
Existing Channel Station -9+00 to Station 36+34	4,534	Rect.	Concrete	8,200	State Dept. of Trans.	1970

* Halawa Stream, Oahu, Hawaii -- Reconnaissance Report on Small Flood Control Project. Dept. of the Army-- U.S. Army Engineer Division, Pacific Ocean

5. Sedimentation in Project Site. Several construction jobs upstream from the project area have contributed to the amount of settlement therein. With the exception of the channel improvements upstream from Salt Lake Boulevard, the most notable of these jobs was the construction of Aloha Stadium and several ramps within close proximity. Construction of the Aloha Stadium and related roadways occurred mainly in 1974 and was completed in 1975.

It has been estimated that approximately 92,000 cubic yards of sediment has accumulated in the project area as compared to the original sections. The upstream section, within the vicinity of Salt Lake Boulevard, has accumulated the majority of the sediment and several bars have built up to elevation 2.00 to 4.00 (MSL).

C. Purpose and Scope of Project

The purpose of this project is to study the hydraulic characteristics of the heavily silted Halawa Stream (Salt Lake Boulevard to Kamehameha Highway) and make recommendations on required maintenance dredging to restore stream capacity and provide flood protection.

In addition, an Engineering Report which will contain information on proposed construction methods and economic studies, an Environmental Impact Statement, Construction Plans and Specifications will be prepared.

IV. CONCLUSIONS

Table 2 is repeated here for easy reference from Section IV.

TABLE 2

BACKWATER CURVE DESIGNATIONS

Curve No.	Q (cfs)	Downstream	Upstream
A-1	12,500	No improvements	No improvements
A-2	12,500	Dredge to (-)4.50	No improvements
A-3a	12,500	No improvements	Dredge to (-)2.50
A-3	12,500	No improvements	Dredge to (-)4.50
A-4	12,500	Dredge to (-)4.50	Dredge to (-)4.50
A-5	12,500	No improvements	Dredge to (-)8.00
B-1	6,000	No improvements	No improvements
B-2	6,000	No improvements	Dredge to (-)4.50
C-1	3,000	No improvements	No improvements
C-2	3,000	No improvements	Dredge to (-)4.50

A. At Q = 12,500 cfs (Peak Flow at Tm = 100 years)

1. Hydraulic Gradients. The range of hydraulic gradient elevations attained for the various curves at "Q" = 12,500 cfs, are shown on Plate 13. All of the curves in the "A" series overflow the lower north bank. Curve Nos. A-1, A-2 and A-3a overflow the upper north bank from about Station 19+00 ahead. Curve No. A-3a is under the upper north bank from Station 23+00 ahead. These three curves also overflow the top of curbs of drainage structures in the Halawa Valley Subdivision from Station 21+85 ahead (see Table 3 and Plate 13). However, Curve Nos. A-3, A-4 and A-5 are all lower than the upper north bank. Of the latter, only Curve No. A-3 is higher than the top of the curb at the storm drainage "back-up" control point at Station 29+40 (0.6 ft.) and at Station 31+40 (0.10 ft.).

2. Velocities. The highest upstream velocities are attained by Curve No. A-2; followed by Curve Nos. A-1, A-4, A-3a, A-3 and A-5, in that order. Although the velocities for Curve Nos. A-2 and A-1 are close in numerical value, it should be noted that improvement to the downstream estuary causes velocities in Curve No. A-2 to exceed those in Curve A-1 upstream, but the velocities in the downstream section are directly opposite.

   The velocities are slowest from approximately Stations 4+00 to 12+00, where the stream bed widens to a maximum. This characteristic of the shape of the project and will be true at all flows (see Plate No. 15).

3. Miscellaneous Combinations.

   a. It is apparent that if the downstream is improved, velocities become greater upstream and lower downstream. Thus, more siltation would occur downstream and in Pearl Harbor and less would occur upstream. (See Curve Nos. A-1, A-2, A-3 and A-4 on Plate 13.)

   b. By examination of Curve Nos. A-1 and A-2, it is determined that the Water surface elevations cannot be lowered significantly unless the upstream invert is lowered.

c. Backwater Curve No. A-4 is more than a foot lower than Curve No. A-5 at Station 1+00, then becomes equal at Station 27+00, then lower, past this station. This occurrence can be attributed to the fact that Curve No. A-5 is not improved downstream and therefore, starts at a higher elevation at Station 0+00 than Curve No. A-4, which is improved downstream. Since Curve No. A-5 is dredged deeper, upstream, than Curve No. A-4, the tendency is for a lower hydraulic gradient and it is just overcoming the effects of the tailwater at Station 27+00.

d. Curve No. A-3 is only an average of about 0.6 feet higher than Curve No. A-5. Examination of Table No. 2 reveals that both curves are unimproved downstream, but Curve No. A-5 is dredged $3\frac{1}{2}$ feet deeper than Curve No. A-3, upstream. Also, Curve No. A-3a is an average of about 0.6 feet higher than Curve No. A-3. Curve No. A-3 is dredged 2 feet deeper than Curve No. A-3a. One may deduce from this observation that with the Navy estuary unimproved (downstream), lowering of the upstream below elevation (-)4.50 will not significantly lower the hydraulic gradient.

e. Many other interesting relationships among the backwater curves and velocity versus station curves may be derived from examination of Plate Nos. 13, 14, 15 and 16.

B. At Q = 6,000 cfs

1. Hydraulic Gradients (Refer to Plate No. 14). Curve Nos. B-1 and B-2 both overflow the lower banks of the north side from about Station 7+00 to Station 14+00. Starting at Station 0+00, water surface elevations for Curve No. B-1 range from about elevation 4 to elevation 9 while those for Curve No. B-2 vary from about elevation 4 to 6. Curve No. B-2 is at elevation 5.20 between Stations 7+00 to 14+00, which is about 0.2 feet over the lower north bank. Upstream, from Station 20+00 to Station 31+00, Curve No. B-1 is overflowing the lower banks on the north side by varying heights, whereas Curve No. B-2 is safely

under the lower, north bank throughout. Both curves are lower than the top of the upper, north bank throughout.

Both "B" curves are well under the top of curb overflow elevations at the various outlet structures (Table 3), within Halawa Valley Subdivision by as much as 11 feet.

Both "B" curves start at about the same elevation but separate as they progress to the upstream extremity of the project, where Curve No. B-1 is about 3 feet higher than Curve No. B-2. This can be attributed to the Curve No. B-2 overcoming the effect of the tail water towards the upstream limits of the project.

2. Velocities (Refer to Plate No. 16). The general distribution of velocities (from high to low), is similar to the "A" curves. As may be expected, Curve No. B-2 has the slower velocities, which range from about 2 fps to 10 fps. Curve No. B-1 varies from 3 fps to about 10 fps.

3. Comparisons. With the exception of the design flow, conditions for curve no. A-1 are similar to those for Curve No. B-1 and Curve A-3 similar to those for B-2. The upstream hydraulic gradient for A-1 ranges from elevation 7 to 12, while Curve B-1 varies from 3.8 to 9 for an average difference of about 2 feet. The upstream hydraulic gradient for Curve No. A-3 extends from about elevation 7.5 to 10.5 and curve no. B-2 ranges from elevation 4.5 to 6.0 for an average difference in elevation of about 3.50 feet lower than curve no. A-3.

Upstream velocities for curve no. A-1 appear to be an average of about 1 fps greater than those of curve no. B-1 as they vary within a range of 3 fps to 10 fps. Upstream velocities for curve no. A-3 are an average of about 2 fps faster than velocities for curve B-2 as it varies within a range of 2 fps to 7 fps (see Plates 15 and 16).

C. At Q = 3,000 cfs

1. Hydraulic Gradients (Refer to Plate 14). Curve Nos. C-1 and C-2 (3,000 cfs) are both considerably lower than the lower top of the bank on the north side and all of the top of curb overflow elevations within the adjacent subdivision by as much as 12 feet. As with the B series, both "C" curves start at about the same elevation but separate as they progress to the upstream extremity of the project where curve no. C-1 is over 3 feet higher than curve C-2.

2. Velocities (Refer to Plate 16). As before, the general distribution of velocities is similar to the "A" and "B" curves. Velocities for curve no. C-2 are an average of about 1 fps slower than those for curve no. C-1, which range from about 6.5 fps to 1 fps.

3. Comparisons. With the exception of the design flow, conditions for curve nos. A-1, B-1 and C-1 are similar. Curve Nos. A-3, B-2 and C-2 are also similar. The hydraulic gradient for Curve No. B-1 is an average of about 2.0 feet lower than Curve No. A-1. Curve No. C-1 varies from elevation 3 to 7, and is an average of about 2.0 feet lower than Curve No. B-1.

   The hydraulic gradient for Curve No. B-2 is an average of about 3.5 feet lower than Curve No. A-3. Curve No. C-2 ranges from elevation 2.7 to 3.6 and is an average of about 2.0 feet lower than Curve No. B-2.

D. Estimated Flow Capacities. Backwater curves for the two conditions wherein (1) downstream and upstream remain unimproved and (2) downstream remains unimproved but upstream is dredged to elevation (-)4.50, have been calculated for design flows (Q) of 12,500 cfs, 6,000 cfs and 3,000 cfs. This will allow us to roughly estimate the capacity of the stream under their various conditions by the method of straight line interpolation at a selected critical station. The

controlling factors for which flow capacities have been estimated are the lower and upper banks on the north side of the stream and the Storm Drainage backflow to the control point at Station 29+40. These factors, a selected critical station and interpolated capacities are shown in Table 5:

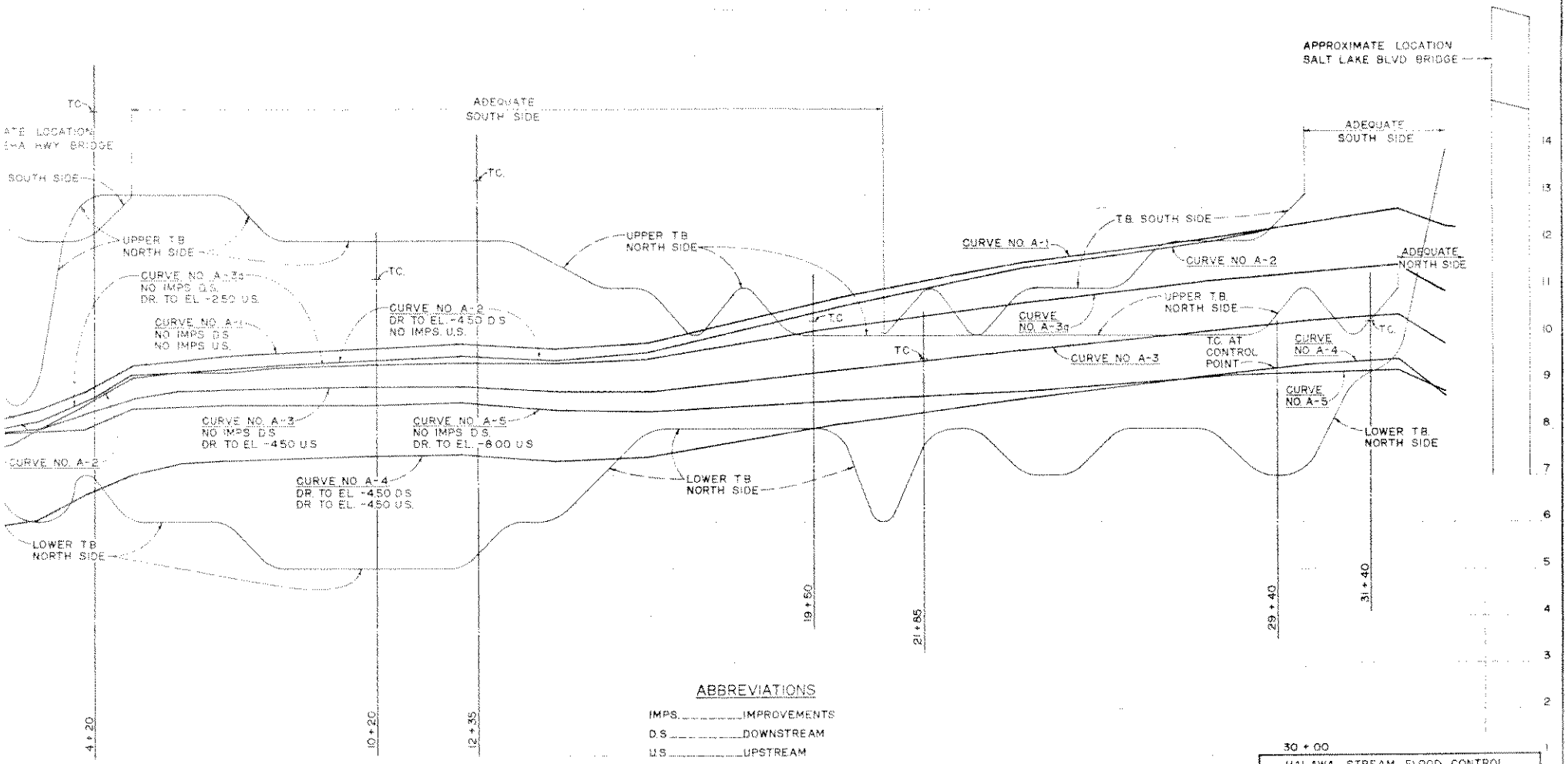
TABLE 5

ESTIMATED FLOW CAPACITIES

	Condition	Controlling Factor	Critical Station	Controlling Elevation	Capacity (cfs)
1.	No improvements D. S. & U. S.	Lower North Bank	12+00	5.0	4,600
2.	No improvements D. S. & U. S.	Upper North Bank	29+00	10.0	8,600
3.	No improvements D. S. & U. S.	T. C. @ Drain Structure	29+40	9.3	7,200
4.	No improvements D. S. Dr. to (-)4.50 U. S.	Lower North Bank	12+00	5.0	5,600
5.	No improvements D. S. Dr. to (-)4.50 U. S.	Upper North Bank	29+00	10.0	12,200
6.	No improvements D. S. Dr. to (-)4.50 U. S.	T. C. @ Drain Structure	29+40	9.3	11,000

Abbreviations:

D. S. = Downstream of Kam Highway Bridge
U. S. = Upstream
T. C. = Top of Curb



REAM

ABBREVIATIONS

IMPS.	IMPROVEMENTS
D.S	DOWNSTREAM
U.S	UPSTREAM
DR TO	DREDGED TO
C.F.S	CUBIC FEET PER SECOND
Q	DESIGN FLOW
M.S.L.	MEAN SEA LEVEL
EL.	ELEVATION
T.B.	TOP OF BANK
T.C.	TOP OF CURB ELEVATION AT LAST DRAINAGE STRUCTURE BEFORE OUTLET PIPE

HORIZ 100 50 0 100 200
VERT. 1 5 0 1 2
SCALE IN FEET

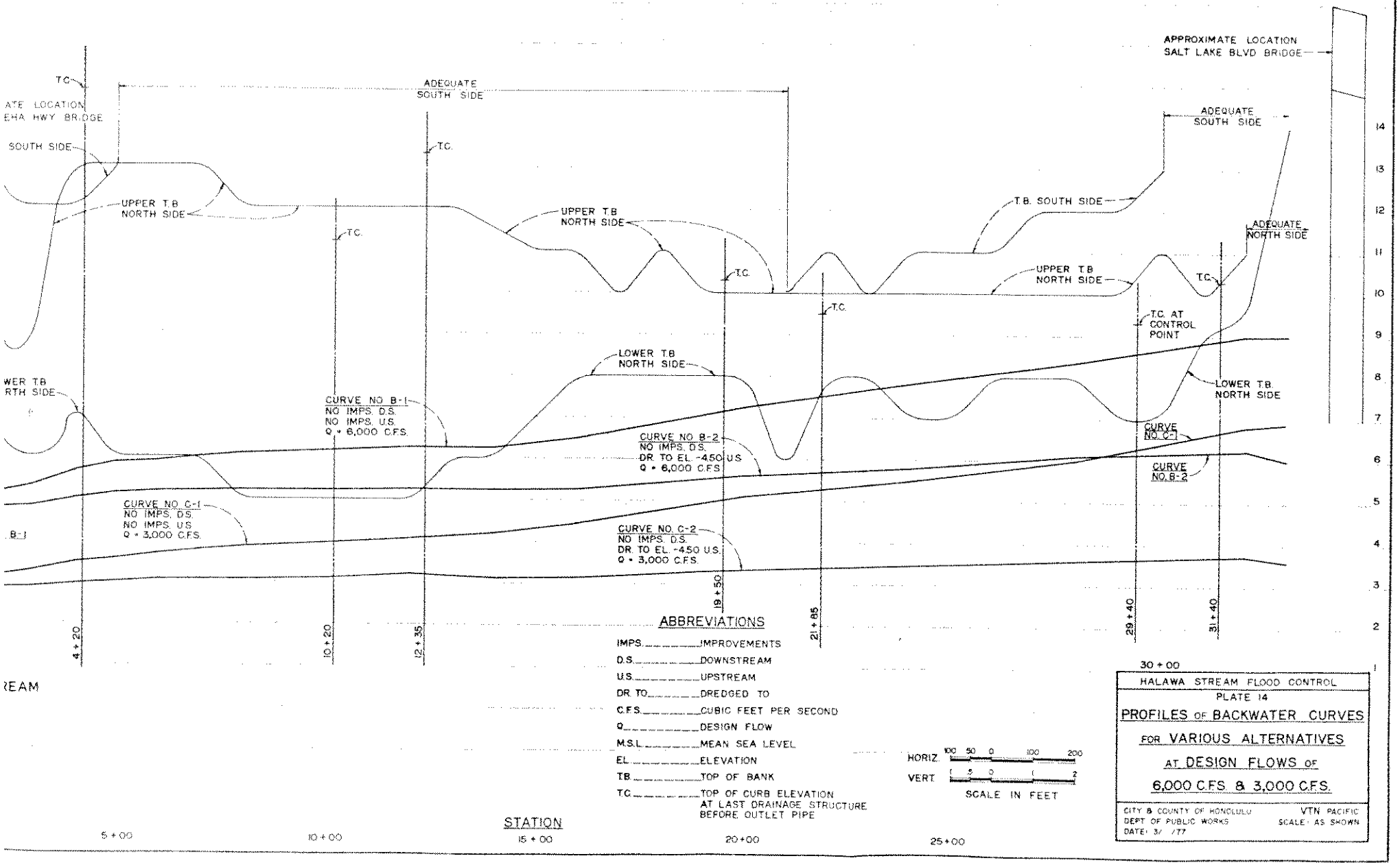
HALAWA STREAM FLOOD CONTROL

PLATE 13

PROFILES OF BACKWATER CURVES FOR VARIOUS ALTERNATIVES AT A DESIGN FLOW OF 12,500 C.F.S.

CITY & COUNTY OF HONOLULU
DEPT OF PUBLIC WORKS
DATE: 3/ /77

VTN PACIFIC
SCALE: AS SHOWN



ABBREVIATIONS

IMPS.	IMPROVEMENTS
D.S.	DOWNSTREAM
U.S.	UPSTREAM
DR. TO	DREDGED TO
C.F.S.	CUBIC FEET PER SECOND
Q	DESIGN FLOW
M.S.L.	MEAN SEA LEVEL
EL.	ELEVATION
T.B.	TOP OF BANK
T.C.	TOP OF CURB ELEVATION AT LAST DRAINAGE STRUCTURE BEFORE OUTLET PIPE

HORIZ. 100 50 0 100 200
VERT. 5 0 2
SCALE IN FEET

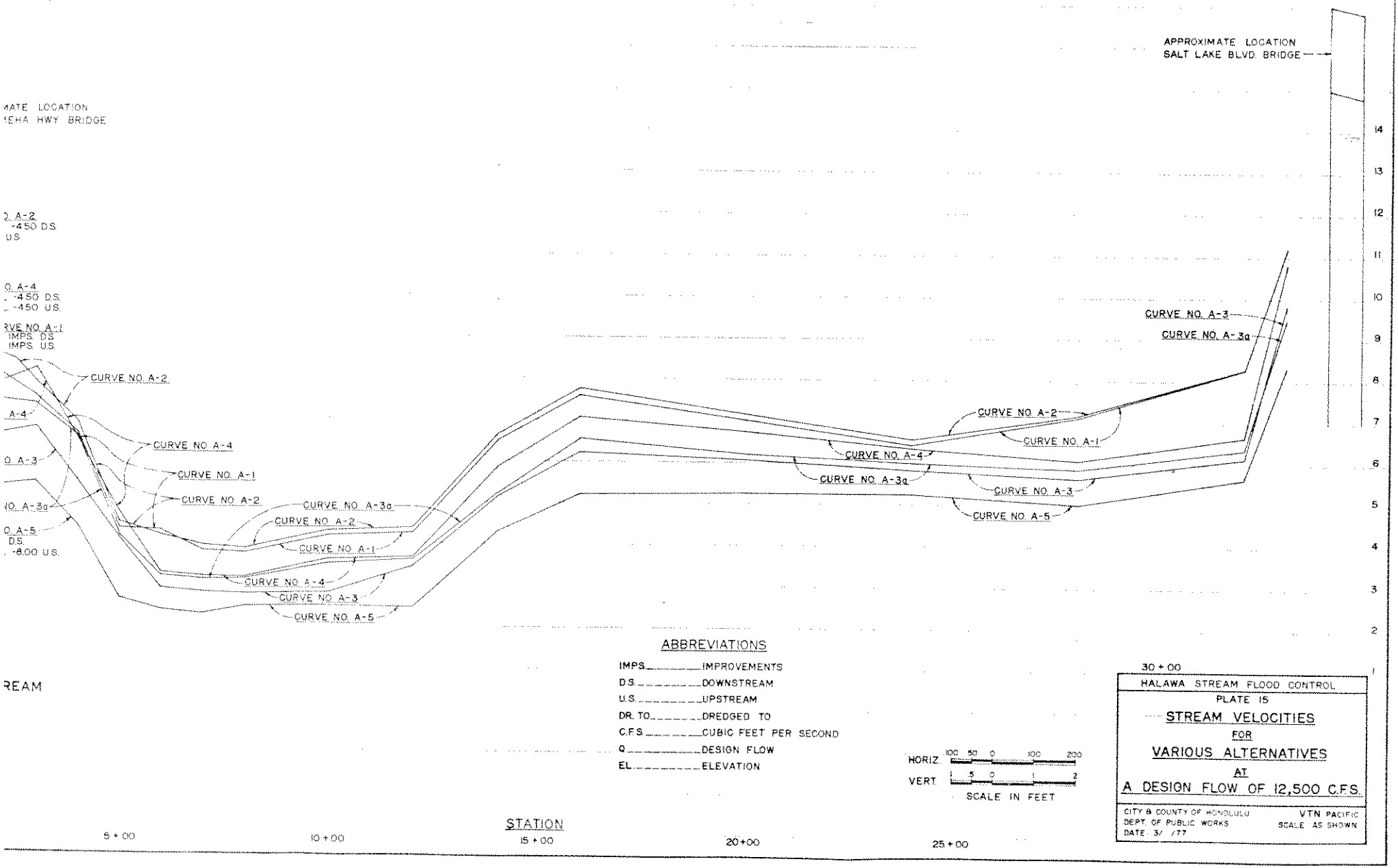
HALAWA STREAM FLOOD CONTROL

PLATE 14

PROFILES OF BACKWATER CURVES FOR VARIOUS ALTERNATIVES AT DESIGN FLOWS OF 6,000 C.F.S. & 3,000 C.F.S.

CITY & COUNTY OF HONOLULU
DEPT OF PUBLIC WORKS
DATE: 3/ /77

VTN PACIFIC
SCALE: AS SHOWN



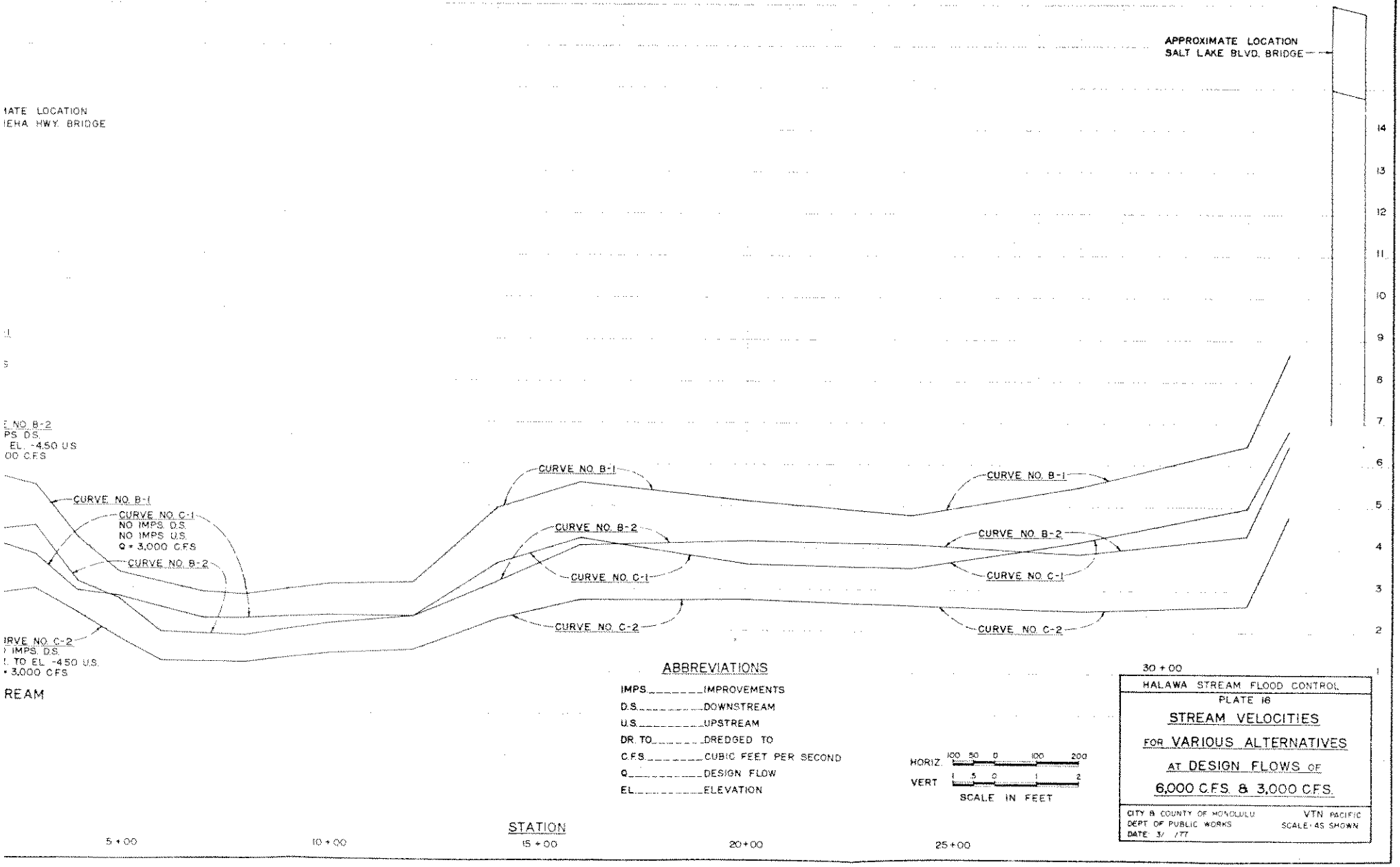
HALAWA STREAM FLOOD CONTROL

PLATE 15

STREAM VELOCITIES FOR VARIOUS ALTERNATIVES AT A DESIGN FLOW OF 12,500 C.F.S.

CITY & COUNTY OF HONOLULU
DEPT. OF PUBLIC WORKS
DATE: 3/ /77

VTN PACIFIC
SCALE AS SHOWN



ABBREVIATIONS

IMPS.	IMPROVEMENTS
D.S.	DOWNSTREAM
U.S.	UPSTREAM
DR. TO	DREDGED TO
C.F.S.	CUBIC FEET PER SECOND
Q	DESIGN FLOW
EL.	ELEVATION

HORIZ. 100 50 0 100 200
VERT 1 .5 0 1 2
SCALE IN FEET

HALAWA STREAM FLOOD CONTROL

PLATE 16

STREAM VELOCITIES FOR VARIOUS ALTERNATIVES AT DESIGN FLOWS OF 6,000 C.F.S. & 3,000 C.F.S.

CITY & COUNTY OF HONOLULU
DEPT OF PUBLIC WORKS
DATE 3/ /77

VTN PACIFIC
SCALE: AS SHOWN

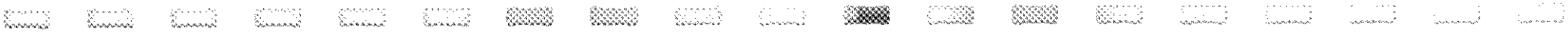
APPENDIX B SEDIMENT DATA

This Appendix sets forth the basic data and calculations supporting the information presented in this EIS regarding the sediment of the Halawa Stream estuary. Described herein are the sediment sampling and testing program, the procedure used to classify the sediment and the calculations used to derive the trap efficiency of the estuary.

I. Sediment Sampling and Testing Program

The sampling program in the Halawa Stream estuary was initiated by a field reconnaissaince by VTN personnel and Mr. Brian Ching of Geolabs-Hawaii. The entire project area was walked at low tide and numerous hand samples were taken. The samples were identified on the spot as sandy silt, gravelly sand, etc. In this manner the sediment was classified into five zones and mapped. With a few exceptions, the sediment in the project area shows a fairly gradual gradation from coarse to fine as one moves downstream from Salt Lake Boulevard bridge. For this reason, the boundaries shown on the sediment zone map (Figure 8 in this EIS) are somewhat arbitrary. However, there is a marked distinction between Zones 1 and 2 and Zones 4 and 5. Zone 2 can be distinguished from Zone 1 by the absence of cobbles. Zones 1, 2 and 3 can be easily walked on and Zone 4 is slightly more difficult; but Zone 5 is impossible to traverse (for an adult of average weight). The boundary between Zones 4 and 5 can, therefore, be easily detected on foot.

The preliminary sediment zone map was then used to select the coring sites. Eleven cores were taken by Geolabs-Hawaii, producing representative samples from each zone. Each sample was broken down by particle sizes with graduated seives and several of the samples were analysed further by the hydrmoeter method. The boring logs and results of these tests are presented in a report by Geolabs-Hawaii, which is reproduced here in full.

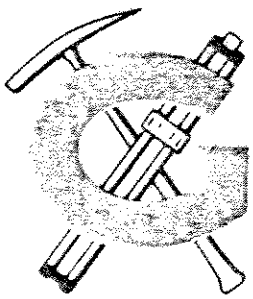


SEDIMENT SAMPLING AND TESTING
HALAWA STREAM
HALAWA, OAHU, HAWAII

W.O. 681-00 MARCH 18, 1977

FOR

VTN PACIFIC



GEOLABS-HAWAII

Foundation and Soil Engineering • Geology

GEOLABS-HAWAII
Geology, Soils and Foundation Engineering
1553 Colburn Street, Suite 202 • Honolulu, Hawaii 96817 • (808) 841-5064

March 18, 1977
W.O. 681-00

VTN Pacific
1164 Bishop Street, Suite 906
Honolulu, Hawaii 96813

Attention: Mr. Fred Proby

Subject: Sediment Sampling and Testing
Halawa Stream
Halawa, Oahu, Hawaii

Gentlemen:

Enclosed are the logs of stream sediment sampling of our subsurface soil exploration at the subject site, a description of our sampling procedures and a summary of the test results.

The project area is located in Halawa Stream from the Salt Lake Boulevard Bridge to the Kamehameha Highway Bridge near the mouth of the stream entering Pearl Harbor. Our project considerations involved sampling and testing of existing stream bed sediment and a generalized geologic evaluation of the stream area for dredging purposes.

SAMPLING

On January 12, 1977, our engineer along with Mr. Fred Proby of your firm conducted a preliminary site geologic reconnaissance. Based on visual observation, zones of various stream bed sedimentation were established. Using the data obtained from this site reconnaissance, you had developed the sampling requirements for us. These included the general locations and the depths of samples to be obtained during the later sampling phase of our work.

On our sampling expedition, eleven samples of the existing stream sediment were obtained from eleven boring locations. Locations of the samples had been relayed to your company.

The enclosed boring logs present a more detailed soil descriptions of the encountered sediment layers below the bottom of the stream.

Samples were obtained, whenever possible, either by pushing a thin-wall continuous sampler into the bottom of the stream, or bulk sampling by hand shovel in the more boulderly areas to depths of 2.0 to 8.3 feet below the stream bed surface.

LABORATORY TESTING

The mixed samples were taken back to our laboratory for sieve analysis and hydrometer testings. The results of the testings represent the particle sizes of the conglomerated soils caused by the dredging operations at each sample location.

Standard sieve analyses were performed on all eleven samples to evaluate the grain size of the on-site soil mixtures. The Unified Soil Classification System was used to classify the coarse-grained material. The ASTM Classification System was used to classify the soils with a greater percentage of fine grained material passing a #200 size sieve. A sieve size of 200 means there are 200 mesh openings per inch (0.074 millimeters).

Eight hydrometer tests were performed on selected samples (Nos.3, 5 and 7 thru 11) to evaluate the finer (-200 sieve size) portion of the recovered sediment material. For the hydrometer testing, 50 grams of dry -200 size fines were used. Calgon solution was used to soak and to disperse the clay and the silt portion of the sediment recovered.

Copies of the laboratory work sheets are enclosed. The results of the gradation tests are presented graphically on the Grain Size Analysis sheet, Plates B-1 through B-4.

If there are any questions concerning our findings or test results, please feel free to contact us.

Respectfully submitted,
C.W. ASSOCIATES, INC. dba
GEOLABS-HAWAII

By Bob Y.K. Wong
Bob Y.K. Wong, P.E.

BYKW:BC:cw

Enclosure: Boring Logs- Plates A-1 thru A-11
Summary of Laboratory Test Results (Table 1 thru 1B)
Gradation Test Results - Plates B-1 thru B-4
Laboratory Work Sheets (8)

BORING 1

Sample
Dry density (pcf)
Blows per foot
50 40 30 20 10 0

Depth (feet)
Graph

Surface elevation +0.5'± (MSL)*

SOIL DESCRIPTION | USC

BROWN SANDY SILTY GRAVEL (BOULDER TO 1' IN DIAMETER)

BORING TERMINATED AT 2.0 FEET ON 2-15-77

W.O. 681-00

LEGEND

- Moisture content
- I 2.0" O.D. split-spoon sample
- II Undisturbed ring sample
- III Disturbed ring sample
- IV Core sample
- P Sampler pushed

Plastic limit
Liquid limit
Natural water content
*Mean Sea Level
Driving energy 140 lb. wt., 30" drop

HALAWA STREAM

LOG OF BORING
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W.O. 681-00 MARCH 1977

PLATE A-1

BORING 2

Sample — Depth (feet)
Dry density (pcf) — Graph
Surface elevation +0.9'± (MSL)*

Blows per foot
50 40 30 20 10 0

SOIL DESCRIPTION — USC

BROWN SILTY SAND

DARK GRAY TO BLACK SANDY SILT WITH ORGANIC MATTER AND PEBBLES

2.5

BROWN SILTY SAND

5.0

BORING TERMINATED AT 6.0 FEET ON 2-15-77

LEGEND

- Moisture content
- I 2.0" O.D. split-spoon sample
- II Undisturbed ring sample
- III Disturbed ring sample
- IV Core sample
- P Sampler pushed

Plastic limit
Liquid limit
Natural water content

*Mean Sea Level

Driving energy 140 lb. wt., 30" drop

HALAWA STREAM

LOG OF BORING

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BORING 3

Sample — Dry density (pcf) — Depth (feet) — Graph — Surface elevation +1.5'± (MSL)*

Blows per foot: 50 40 30 20 10 0

Depth (feet)	SOIL DESCRIPTION	USC
	BROWN GRAVELLY SAND	
	DARK GRAY TO BLACK SILT WITH ORGANIC MATTER	
2.5	BROWN SAND	
5.0	BLACK SAND	
7.5	BROWN SILT, SOFT	
	BORING TERMINATED AT 8.0 FEET ON 2-15-77	

LEGEND

- Moisture content
- I 2.0" O.D. split-spoon sample
- II Undisturbed ring sample
- III Disturbed ring sample
- IV Core sample
- P Sampler pushed

Plastic limit — Liquid limit — Natural water content

*Mean Sea Level

Driving energy: 140 lb. wt., 30" drop

HALAWA STREAM

LOG OF BORING

VTN PACIFIC

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PLATE A-3

W.O. Geol-CO B-2 0.Y

BORING 4

Sample — Dry density (pcf) — Blows per foot (50 40 30 20 10 0) — Depth (feet) — Graph

Surface elevation +0.9'± (MSL)*

SOIL DESCRIPTION	USC
BROWN-REDDISH BROWN SAND	
BROWN TO DARK GRAY SANDY SILT, SOFT	
DARK GRAY TO BLACK SAND, MEDIUM DENSE	
BORING TERMINATED AT 8.3 FEET ON 2-17-77	

2.5

5.0

7.5

LEGEND

- Moisture content
- I 2.0" O.D. split-spoon sample
- II Undisturbed ring sample
- III Disturbed ring sample
- IV Core sample
- P Sampler pushed

Plastic limit — Liquid limit — Natural water content

*Mean Sea Level

Driving energy 140 lb. wt., 30" drop

HALAWA STREAM

LOG OF BORING

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BORING 5

Sample — Dry density (pcf) — Depth (feet) — Graph

Surface elevation -1.4'± (MSL)*

Blows per foot: 50 40 30 20 10 0

SOIL DESCRIPTION	USC
BROWN SAND, MEDIUM DENSE	
GRAY SANDY SILT WITH PEBBLES, SOFT	
2.5	
DARK GRAY SILTY SAND WITH SHELLS AND WOOD (¼ INCH SHELL SIZE)	
BORING TERMINATED AT 4.3 FEET ON 2-17-77	

LEGEND

- Moisture content
- I 2.0" O.D. split-spoon sample
- II Undisturbed ring sample
- III Disturbed ring sample
- IV Core sample
- P Sampler pushed

Plastic limit — Liquid limit — Natural water content

*Mean Sea Level

Driving energy 140 lb. wt., 30" drop

HALAWA STREAM

LOG OF BORING

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PLATE A-5

W.O. 681-00 B-5 2.4'

BORING 6

Sample — Dry density (pcf) — Depth (feet) — Graph

Surface elevation -1.2'± (MSL)*

Blows per foot: 50 40 30 20 10 0

SOIL DESCRIPTION	USC
BROWN SAND, MEDIUM DENSE	
2.5	
DARK GRAY SILT, LOOSE	
5.0	
BORING TERMINATED AT 6.3 FEET ON 2-17-77	

LEGEND

- Moisture content
- I 2.0" O.D. split-spoon sample
- II Undisturbed ring sample
- III Disturbed ring sample
- IV Core sample
- P Sampler pushed

Plastic limit — Liquid limit — Natural water content

*Mean Sea Level

Driving energy 140 lb. wt., 30" drop

HALAWA STREAM

LOG OF BORING

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PLATE A-6

BORING 7

Sample — Depth (feet) — Surface elevation -1.4'± (MSL)*

Dry density (pcf) — Graph

Blows per foot

50 40 30 20 10 0

SOIL DESCRIPTION — U S C

BROWN SAND, MEDIUM DENSE

2.5

DARK GRAY SAND

DARK GRAY SILT WITH SOME SAND

5.0

BORING TERMINATED AT
7.0 FEET ON 2-17-77

LEGEND

- Moisture content
- I 2.0" O.D. split-spoon sample
- II Undisturbed ring sample
- III Disturbed ring sample
- IV Core sample
- P Sampler pushed

Plastic limit
Liquid limit
Natural water content

*Mean Sea Level

Driving energy 140 lb. wt., 30" drop

HALAWA STREAM

LOG OF BORING

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PLATE A-7

BORING 8

Sample — Depth (feet)
Dry density (pcf) — Graph
Surface elevation -0.5'± (MSL)*

Blows per foot
50 40 30 20 10 0

SOIL DESCRIPTION — USC

2.5
5.0
7.5

BROWN TO GRAY SILT,
VERY SOFT TO SOFT

BORING TERMINATED AT
8.0 FEET ON 2-17-77

LEGEND

- Moisture content
- I 2.0" O.D. split-spoon sample
- II Undisturbed ring sample
- III Disturbed ring sample
- IV Core sample
- P Sampler pushed

Plastic limit
Liquid limit
Natural water content
*Mean Sea Level
Driving energy 140 lb. wt., 30" drop

HALAWA STREAM

LOG OF BORING

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PLATE A-8

BORING 9

Sample — Dry density (pcf) — Depth (feet) — Graph

Surface elevation -0.6'± (MSL)*

Blows per foot: 50 40 30 20 10 0

SOIL DESCRIPTION	USC
BROWN SAND, MEDIUM DENSE	
2.5 DARK GRAY TO BLACK SANDY SILT	
5.0 DARK GRAY TO BLACK SILT, SOFT	
BORING TERMINATED AT 7.25 FEET ON 2-17-77	

LEGEND

- Moisture content
- I 2.0" O.D. split-spoon sample
- II Undisturbed ring sample
- III Disturbed ring sample
- IV Core sample
- P Sampler pushed

Plastic limit — Liquid limit — Natural water content

*Mean Sea Level

Driving energy: 140 lb. wt., 30" drop

HALAWA STREAM

LOG OF BORING

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PLATE A-9

W.O. 681-00 B-4

BORING 10

Sample — Depth (feet)
Dry density (pcf) — Graph
Surface elevation +0.2'± (MSL)*

Blows per foot
50 40 30 20 10 0

Depth (feet)	SOIL DESCRIPTION	USC
	BROWNISH GRAY SILT	
	DARK BROWN SAND, MEDIUM DENSE	
2.5	DARK GRAY SILT WITH ORGANIC MATTER	
	DARK GRAY SILT WITH SOME SAND	
5.0	BLACK SANDY SILT, SOFT	
	BORING TERMINATED AT 7.0 FEET ON 2-17-77	

LEGEND

- Moisture content
- I 2.0" O.D. split-spoon sample
- II Undisturbed ring sample
- III Disturbed ring sample
- IV Core sample
- P Sampler pushed

Plastic limit
Liquid limit
Natural water content

*Mean Sea Level

Driving energy 140 lb. wt., 30" drop

HALAWA STREAM

LOG OF BORING

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PLATE A-10

BORING 11

Sample — Depth (feet)
Dry density (pcf) — Graph
Blows per foot
50 40 30 20 10 0

Surface elevation -3.2'± (MSL)*

SOIL DESCRIPTION	USC
DARK GRAY SANDY SILT, LOOSE	
DARK GRAY SILTY SAND WITH SHELL FRAGMENTS, MEDIUM DENSE	
2.5	
DARK BROWN TO DARK GRAY SAND, MEDIUM DENSE	
BORING TERMINATED AT 3.9 FEET ON 2-17-77	

LEGEND

- Moisture content
- I 2.0" O.D. split-spoon sample
- II Undisturbed ring sample
- III Disturbed ring sample
- IV Core sample
- P Sampler pushed

Plastic limit
Liquid limit
Natural water content

*Mean Sea Level

Driving energy 140 lb. wt., 30" drop

HALAWA STREAM

LOG OF BORING
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W.O. 681-00 MARCH 1977

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TABLE 1 - SUMMARY OF LABORATORY TEST RESULTS
HALAWA STREAM

LOCATION	B-1	B-2	B-3	B-4	B-5
SAMPLE NO.					
DEPTH BELOW SURFACE	0'-2'	0'-6'	0'-8'	0'-8.3'	0'-4.3'
DESCRIPTION	Brown Sandy Gravel	Grayish Brown Silty Sand	Brownish Gray Silty Sand	Brown Silty Sand	Dark Gray Silty Sand
GRADING ANALYSIS (% Passing)					
Sieve					
2"	85.2	100	100		
1"	62.7	98.9	97.2		100
½"	51.5	97.5	90.6	100	94.7
#4	36.3	96.0	83.5	99.2	92.0
#10	26.4	93.8	77.5	96.3	88.6
#20	17.3	89.7	72.2	88.4	80.6
#40	11.0	79.4	66.7	77.1	66.1
#100	6.7	60.0	47.3	57.7	48.3
#200	5.5	50.1	37.9	50.8	40.2
ATTERBERG LIMITS					
Air Dried Or Natural					
Liquid Limit					
Plastic Limit					
Plasticity Index					
Dilatancy					
Toughness					
Dry Strength					
UNIFIED SOIL CLASSIFICATION	GW	SM	SM	SM	SM
SPECIFIC GRAVITY					
EXPANSION AND CBR TESTS					
(Surcharge - 51 P.S.F.)					
Molding Moisture Content %					
Molding Dry Density, P.C.F.					
Swell upon saturation, %					
CBR at 0.1" Penetration					
COMPACTION TEST					
(Test Designation)					
Dry to Wet or Wet to Dry					
Max. Dry Density (P.C.F.)					
Optimum Moisture (%)					

REMARKS:

W.O.681-00 MARCH 1977

GEOLABS-HAWAII

TABLE 1A - SUMMARY OF LABORATORY TEST RESULTS (cont'd)
HALAWA STREAM

LOCATION	B-6	B-7	B-8	B-9	B-10
SAMPLE NO.					
DEPTH BELOW SURFACE	0'-6.3'	0'-7'	0'-8'	0'-7.25'	0'-7'
DESCRIPTION	Brown Sandy Silt	Dark Gray Sandy Silt	Gray Silt	Gray Sandy Silt	Brown Sandy Silt
GRADING ANALYSIS (% Passing)					
Sieve					
1"					
½"	100				
#4	98.9	100		100	100
#10	98.0	99.6	100	99.9	99.9
#20	94.9	97.6	99.9	99.6	99.1
#40	86.5	86.3	99.9	97.8	95.5
#100	69.8	57.9	99.3	82.6	80.3
#200	58.5	52.7	97.5	75.7	69.3
ATTERBERG LIMITS					
Air Dried Or Natural					
Liquid Limit					
Plastic Limit					
Plasticity Index					
Dilatancy					
Toughness					
Dry Strength					
ASTM SOIL CLASSIFICATION	ML	ML	ML	ML	ML
SPECIFIC GRAVITY					
EXPANSION AND CBR TESTS (Surcharge - 51 P.S.F.)					
Molding Moisture Content %					
Molding Dry Density, P.C.F.					
Swell upon saturation, %					
CBR at 0.1" Penetration					
COMPACTION TEST (Test Designation)					
Dry to Wet or Wet to Dry					
Max. Dry Density (P.C.F.)					
Optimum Moisture (%)					

REMARKS:

W.O. 681-00 MARCH 1977

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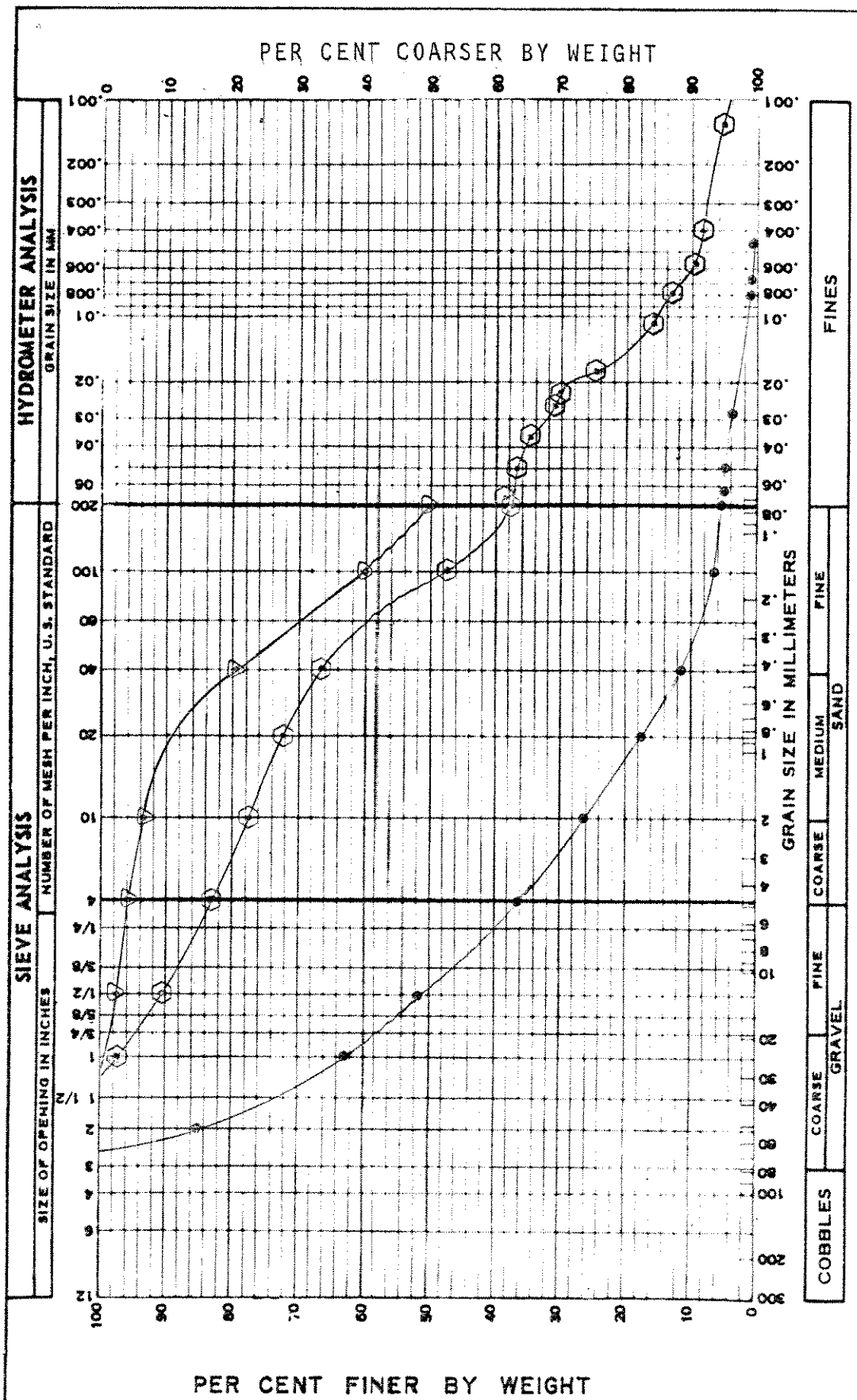
TABLE 1B - SUMMARY OF LABORATORY TEST RESULTS (cont'd)
HALAWA STREAM

LOCATION	B-11				
SAMPLE NO.					
DEPTH BELOW SURFACE	0'-3.9'				
DESCRIPTION	Dark Gray Sandy Silt				
GRADING ANALYSIS (% Passing) Sieve					
1"	100				
½"	98.2				
#4	93.8				
#10	91.0				
#20	86.7				
#40	81.2				
#100	67.6				
#200	61.1				
ATTERBERG LIMITS Air Dried Or Natural					
Liquid Limit					
Plastic Limit					
Plasticity Index					
Dilatancy					
Toughness					
Dry Strength					
ASTM SOIL CLASSIFICATION	ML				
SPECIFIC GRAVITY					
EXPANSION AND CBR TESTS (Surcharge - 51 P.S.F.)					
Molding Moisture Content %					
Molding Dry Density, P.C.F.					
Swell upon saturation, %					
CBR at 0.1" Penetration					
COMPACTION TEST (Test Designation)					
Dry to Wet or Wet to Dry					
Max. Dry Density (P.C.F.)					
Optimum Moisture (%)					

REMARKS:

W.O. 681-00 MARCH 1977



BORING NO.	DEPTH -FT.	U.S.C.	DESCRIPTION	NAT. W.C. %	L L	P L	P I
B-1		GW	● BROWN SANDY GRAVEL				
B-2		SM	▽ GRAYISH BROWN SILTY SAND				
B-3		SM	◇ BROWNISH GRAY SILTY SAND				

GRAIN SIZE ANALYSIS

HALAWA STREAM

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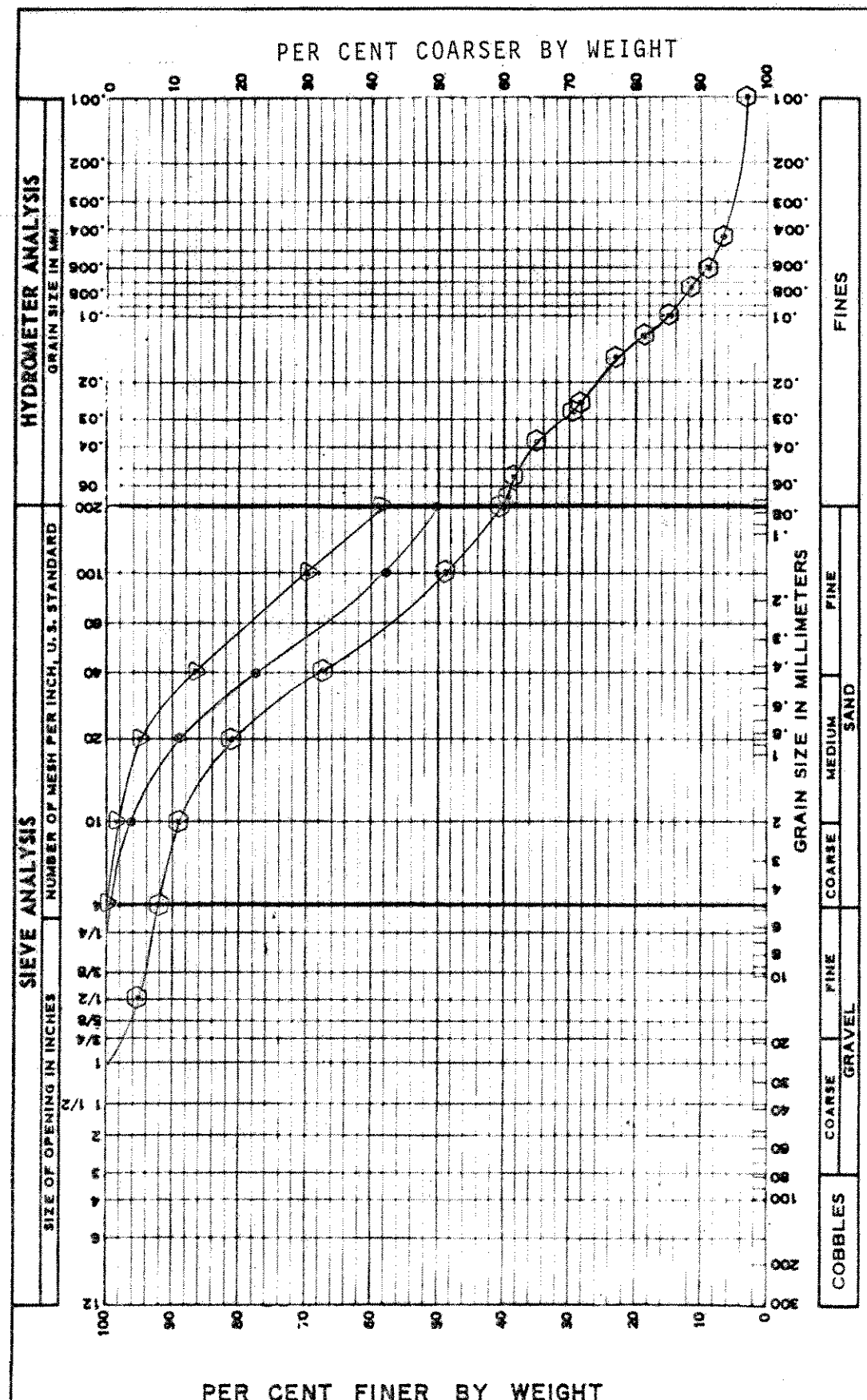

BORING NO.	DEPTH -FT.	U.S.C.	DESCRIPTION	NAT. W.C. %	L L	P L	P I
B-4		SM	• BROWN SILTY SAND				
B-5		SM	⊙ DARK GRAY SILTY SAND				
B-6		ML	▽ BROWN SANDY SILT				

GRAIN SIZE ANALYSIS

HALAWA STREAM

GEOLABS-HAWAII
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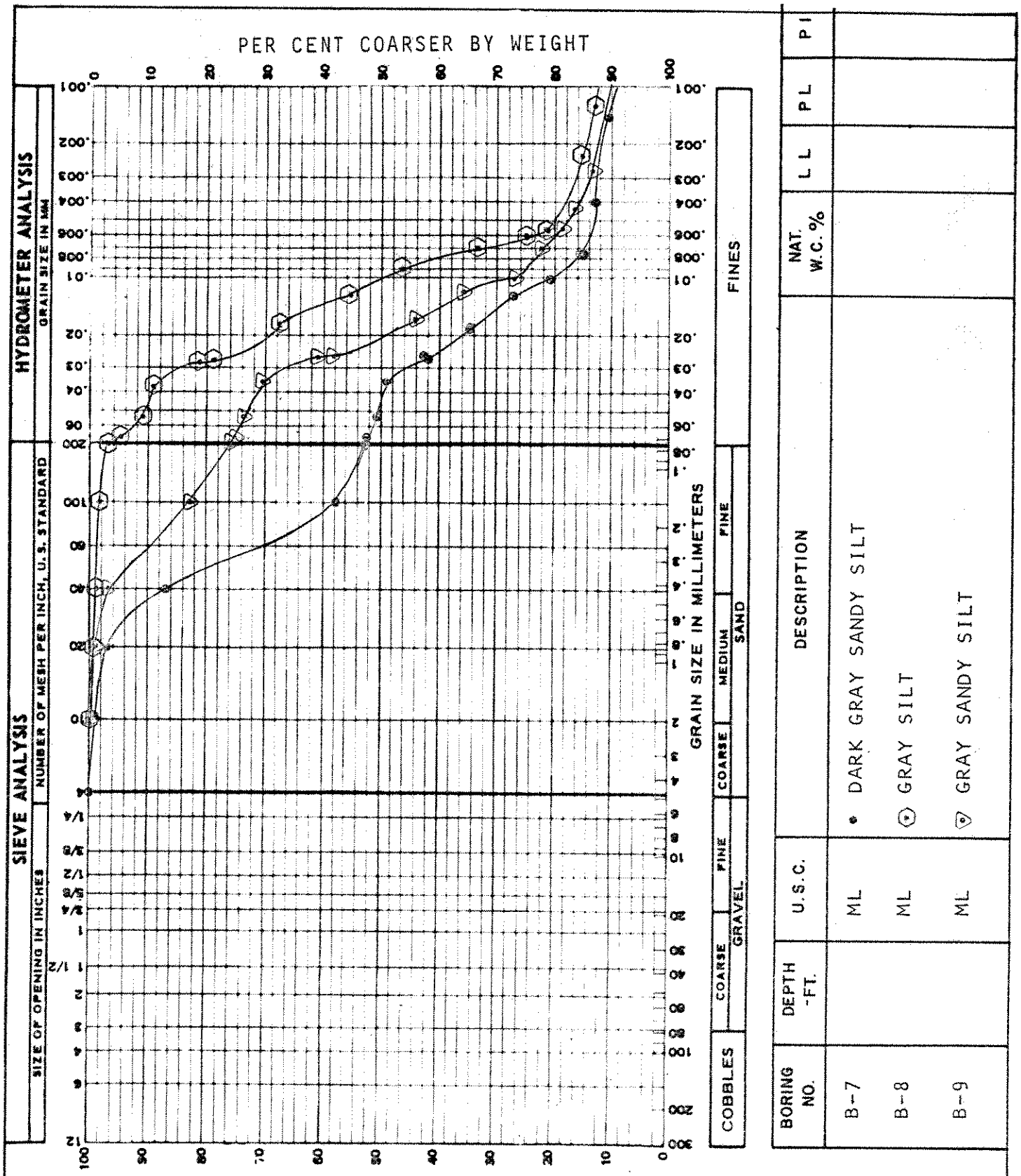

BORING NO.	DEPTH -FT.	U.S.C.	DESCRIPTION	NAT. W.C.%	L L	P L	P I
B-7		ML	• DARK GRAY SANDY SILT				
B-8		ML	⊙ GRAY SILT				
B-9		ML	▽ GRAY SANDY SILT				

GRAIN SIZE ANALYSIS

HALAWA STREAM

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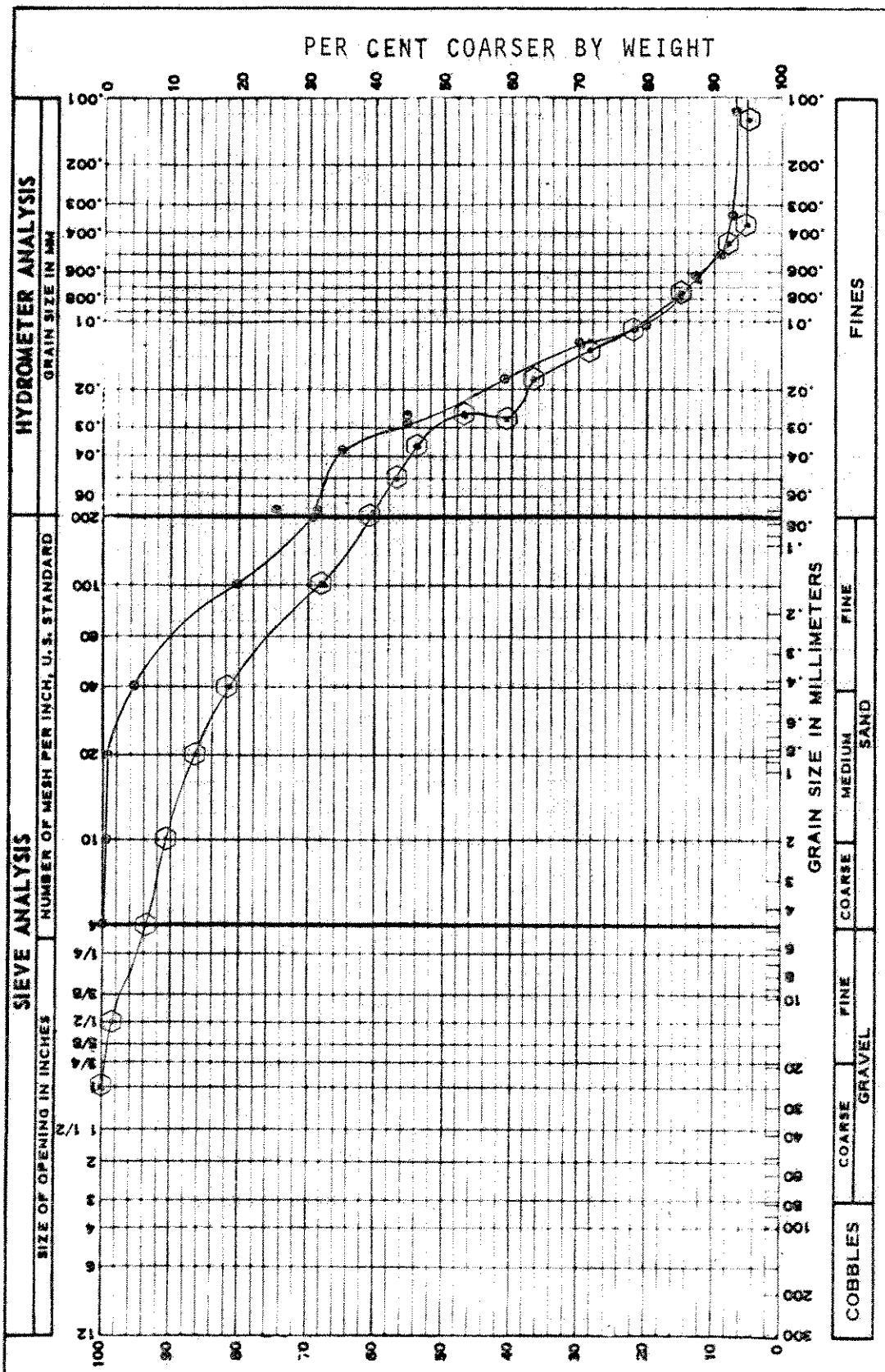

BORING NO.	DEPTH -FT.	U.S.C.	DESCRIPTION	NAT. W.C.%	L L	P L	P I
B-10		ML	● BROWN SANDY SILT				
B-11		ML	⊙ DARK GRAY SANDY SILT				

GRAIN SIZE ANALYSIS

HALAWA STREAM

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PLATE B-4

HYDROMETER ANALYSIS

Project 621-00 Halawa Stream Date 3-7-77

Boring No. B-1

Sample or Specimen No.	Classification	
Dish No.	Graduate No.	Hydrometer No.

Dispersing agent used ; Quantity

Dispersing agent correction, C_d = -.5 ; Meniscus correction, C_m = -1.5

Time	Elapsed Time min	Temp °C	Hydro. Reading (R')	Corrected Reading (R)	Particle Diameter (D), mm	Temp Correction (m)	$R - C_d + m$	Percent Finer	
								Partial	Total
		25°C							
	1/4		27	28.5	.065	+1.0	30.0	95.29	5.2
	1/2		26	27.5	.05	"	29.0	92.11	5.1
	1		23½	25.0	.036	"	26.5	84.15	4.6
	2		20	21.5	.028	"	23.0	73.06	4.0
3/4 9:05	0		—						
9:07	2		19½	21.0	.0285	"	22.5	71.47	3.9
9:10	5		14½	16.0	.02	"	17.5	55.59	3.1
9:15	10		11	12.5	.0147	"	14.0	44.47	2.4
9:25	20		7	8.5	.011	"	10.0	31.77	1.7
9:45	40		3½	5.0	.008	"	6.5	20.65	1.1
10:06½	61½		2½	4.0	.0065	"	5.5	17.47	1.0
11:05	120		1	2.5	.0046	"	4.0	12.71	0.7

Weight in grams

Dish plus dry soil		
Dish		
Dry soil	W_o	50 gm

Specific gravity of solids, G_s = 2.7 (assumed)

Corrected hydrometer reading (R) = hydrometer reading (R') + C_m

The particle diameter (D) is calculated from Stoke's equation using corrected hydrometer reading. Use nomographic chart for solution of Stoke's equation.

Hydrometer graduated in specific gravity

$$\text{Partial percent finer} = \frac{G_s}{G_s - 1} \times \frac{100}{W_o} (R - C_d + m)$$

Hydrometer graduated in grams per liter

$$\text{Partial percent finer} = \frac{100}{W_o} (R - C_d + m)$$

$$\text{Total percent finer} = \text{partial percent finer} \times \frac{W_s - W_1}{W_s}$$

W_s = total oven-dry wt of sample used for combined analysis

W_o = oven-dry wt in grams of soil used for hydrometer analysis

W_1 = oven-dry wt of sample retained on No. 200 sieve

Remarks Hydrometer graduates in specific gravity

Technician R.S. Computed by BAC Checked by

HYDROMETER ANALYSIS

Project 681-00 Halawa Stream Date 3-3-77

Boring No. B-3

Sample or Specimen No.	Classification	
Dish No.	Graduate No.	Hydrometer No.

Dispersing agent used ; Quantity

Dispersing agent correction, C_d = −. ; Meniscus correction, C_m = +1.5

Time	Elapsed Time min	Temp °C	Hydro. Reading (R')	Corrected Reading (R)	Particle Diameter (D), mm	Temp Correction (m)	R − C_d + m	Percent Finer	
								Partial	Total
		23°				1.8			
	¼		25	27.5	0.0069		31.8	101.0	38.3
	½		24	26.5	0.05		30.8	97.8	37.1
	1		23	25.5	0.036		29.8	91.5	34.7
	2		22	24.5	0.027		28.8	82.0	31.1
2:07	2		21½	24.0	0.025		28.3	80.4	30.5
2:12	5		16½	19	0.019		23.3	64.5	24.4
2:17	10		12½	14	0.014		18.3	51.8	19.6
2:27	20		9½	11	0.0104		15.3	42.2	15.0
2:47	40		7	8.5	0.0075		12.8	34.3	13.0
3:07	60		5	6.5	0.0059		10.8	29.8	9.4
4:07	120		3½	5	0.0043	↓	9.3	25.2	9.5
8:25	1112	25°	1½	3	0.0014	1.0	4.5	14.3	5.4

Weight in grams		
Dish plus dry soil		
Dish		
Dry soil	W_o	50 gm

Specific gravity of solids, G_s = 2.7 (assumed)

Corrected hydrometer reading (R) = hydrometer reading (R') + C_m

The particle diameter (D) is calculated from Stoke's equation using corrected hydrometer reading. Use nomographic chart for solution of Stoke's equation.

Hydrometer graduated in specific gravity

Partial percent finer = $\frac{G_s}{G_s - 1} \times \frac{100}{W_o} (R - C_d + m)$

Hydrometer graduated in grams per liter

Partial percent finer = $\frac{100}{W_o} (R - C_d + m)$

Total percent finer = partial percent finer × $\frac{W_s - W_1}{W_s}$

W_s = total oven-dry wt of sample used for combined analysis

W_o = oven-dry wt in grams of soil used for hydrometer analysis

W_1 = oven-dry wt of sample retained on No. 200 sieve

Remarks Hydrometer graduated in Specific gravity

Technician _____ Computed by _____ Checked by _____

HYDROMETER ANALYSIS

Project 681-00 HOLAWA STREAM Date

Boring No. B-5

Sample or Specimen No.	Classification	
Dish No.	Graduate No.	Hydrometer No.

Dispersing agent used ; Quantity

Dispersing agent correction, C_d = −0.5 ; Meniscus correction, C_m = +1.5

Time	Elapsed Time min	Temp °C	Hydro. Reading (R')	Corrected Reading (R)	Particle Diameter (D), mm	Temp Correction (m)	R − C_d + m	Percent Finer	
								Partial	Total
		28°				+1.5			40.2
	¼		27½	26.5	.072		30.3	97.8	39.3
	½		26	27.5	.054		29.8	94.7	38.1
	1		23½	25	.038		27.3	86.7	34.9
	2		19½	21	.028		23.3	74.0	29.7
2:25	2		19	20	.026		22.3	70.8	28.5
2:28	5		14½	16	.017		18.3	58.1	23.4
2:33	10		10½	12	.014		14.3	45.4	18.3
2:43	20		7½	9	.010		11.3	35.9	14.4
2:53	40		5½	7	.0072		9.3	29.5	11.8
3:13	60		3½	5	.0060		7.3	23.2	9.3
4:13	120		2	3.5	.0042		5.8	18.4	7.4
8:13		25°	0½	2	.0010	+1.0	2.5	7.9	3.2

3/3

3/3

Weight in grams		
	Dish plus dry soil	
	Dish	
	Dry soil	W_o = 50gm

Specific gravity of solids, G_s = 2.7 (assumed)

Corrected hydrometer reading (R) = hydrometer reading (R') + C_m

The particle diameter (D) is calculated from Stoke's equation using corrected hydrometer reading. Use nomographic chart for solution of Stoke's equation.

Hydrometer graduated in specific gravity

$$\text{Partial percent finer} = \frac{G_s}{G_s - 1} \times \frac{100}{W_o}(R - C_d + m)$$

Hydrometer graduated in grams per liter

$$\text{Partial percent finer} = \frac{100}{W_o}(R - C_d + m)$$

W_s = total oven-dry wt of sample used for combined analysis

W_o = oven-dry wt in grams of soil used for hydrometer analysis

W_1 = oven-dry wt of sample retained on No. 200 sieve

$$\text{Total percent finer} = \text{partial percent finer} \times \frac{W_s - W_1}{W_s}$$

Remarks Correction for 20 with 15 ml Calgon Deflocculating Agent - Hydrometer graduated for Sp.G.

Technician Computed by Checked by

HYDROMETER ANALYSIS

Project 681.00. Halawa Stream Date 3/4

Boring No. B-7

Sample or Specimen No.	Classification	
Dish No.	Graduate No.	Hydrometer No.

Dispersing agent used ; Quantity

Dispersing agent correction, C_d = -0.5 ; Meniscus correction, C_m = 1.5

Time	Elapsed Time min	Temp °C	Hydro. Reading (R')	Corrected Reading (R)	Particle Diameter (D), mm	Temp Correction (m)	R - C_d + m	Percent Finer	
								Partial	Total
~~9:13~~		25°C				+1.0			52.7
	1/4		28½	30.0	0.073		31.5	100.0	52.7
	½		27½	29.0	0.053		30.5	96.9	51.1
	1		26	27.5	.038		29.0	92.1	48.5
	2		22½	24.0	0.027		25.5	81.0	42.7
9:38	0		—	—			—		
40	2		22	23.5	0.029		25.0	79.4	41.8
9:43	5		17½	19.0	0.019		20.5	65.1	34.3
9:48	10		13	14.5	0.014		16.0	50.8	26.8
9:58	20		9	10.5	0.0108		12.0	38.1	20.1
10:18	40		6	7.5	0.0077		9.0	28.6	15.1
10:38	60		4½	6.0	0.0054		7.5	23.8	12.5
11:38	120		3	4.5	0.0035		6.0	19.1	10.1

Weight in grams

Dish plus dry soil		
Dish		
Dry soil	W_o	50 gm

Specific gravity of solids, G_s =

Corrected hydrometer reading (R) = hydrometer reading (R') + C_m

The particle diameter (D) is calculated from Stoke's equation using corrected hydrometer reading. Use nomographic chart for solution of Stoke's equation.

Hydrometer graduated in specific gravity

Partial percent finer = $\frac{G_s}{G_s - 1} \times \frac{100}{W_o} (R - C_d + m)$

Hydrometer graduated in grams per liter

Partial percent finer = $\frac{100}{W_o} (R - C_d + m)$

W_s = total oven-dry wt of sample used for combined analysis

W_o = oven-dry wt in grams of soil used for hydrometer analysis

W_1 = oven-dry wt of sample retained on No. 200 sieve

Total percent finer = partial percent finer $\times \frac{W_s - W_1}{W_s}$

Remarks Hydrometer graduated for specific gravity.

Technician Computed by Checked by

HYDROMETER ANALYSIS

W.O. 681-00 Date 3/4/77

Project HALAWA STREAM SEDIMENT SAMPLING & TESTING

Boring No. B-8

Sample or Specimen No.	Classification	
Dish No.	Graduate No.	Hydrometer No.

Dispersing agent used ; Quantity

Dispersing agent correction, C_d = −0.5 ; Meniscus correction, C_m = +1.5

Date	Time	Elapsed Time min	Temp °C	Hydro. Reading (R')	Corrected Reading (R)	Particle Diameter (D), mm	Temp Correction (m)	R − C_d + m	Percent Finer Partial	Percent Finer Total
			25°C				+1.0			
		1/4	"	27½	29.0	.075		30.5	96.9	94.2
		½	"	26½	28.0	.054		29.5	93.7	91.07
		1	"	26	27.5	.039		29.0	92.1	89.5
		2	"	23½	25.0	.028		26.5	84.2	81.8
3/4	9:16	0	"		—	—		—		
	9:18	2	"	23	24.5	.028		25.5	81.0	78.7
	9:21	5	"	19	20.5	.018		22.0	69.9	67.9
	9:26	10	"	15	16.5	.013		18.0	57.2	55.6
	9:36	20	"	11	13.5	.009		15.0	47.7	46.4
	9:56	40	"	8	9.5	.0073		11.0	34.9	33.9
	10:16	60	"	6	7.5	.006		8.0	25.4	24.7
	11:16	120	"	4	5.5	.0058		7.0	22.2	21.6
3/5	16:26	4320	"	2	3.5	.0024		5.0	15.9	15.5
	11:01	1545	"	1¾	2.75	.00135		4.25	13.5	13.2

Weight in grams		
Dish plus dry soil		
Dish		
Dry soil	W_o	50 gm

Specific gravity of solids, G_s = 2.7 (assumed)

Corrected hydrometer reading (R) = hydrometer reading (R') + C_m

The particle diameter (D) is calculated from Stoke's equation using corrected hydrometer reading. Use nomographic chart for solution of Stoke's equation.

Hydrometer graduated in specific gravity

Partial percent finer = $\frac{G_s}{G_s - 1} \times \frac{100}{W_o} (R - C_d + m)$

Hydrometer graduated in grams per liter

Partial percent finer = $\frac{100}{W_o} (R - C_d + m)$

W_s = total oven-dry wt of sample used for combined analysis

W_o = oven-dry wt in grams of soil used for hydrometer analysis

W_1 = oven-dry wt of sample retained on No. 200 sieve

Total percent finer = partial percent finer × $\frac{W_s - W_1}{W_s}$

Remarks Hydrometer graduated in specific gravity

Technician Computed by Checked by

(CONTINUED)

3/5	13:46		25°	½	2.0	0.0013	+1.0	3.5	11.1	10.8
3/7	8:30		24°	½	2.0	0.00076	+0.8	3.3	10.5	10.2

HYDROMETER ANALYSIS

Project 681-00 : Halawa Stream Sediment Sampling Date 3-3-77

Boring No. B-9

Sample or Specimen No.	Classification	
Dish No.	Graduate No.	Hydrometer No.

Dispersing agent used ; Quantity

Dispersing agent correction, C_d = −0.5 ; Meniscus correction, C_m = +1.5

Time	Elapsed Time min	Temp °C	Hydro. Reading (R')	Corrected Reading (R)	Particle Diameter (D), mm	Temp Correction (m)	R − C_d + m	Percent Finer Partial	Percent Finer Total
~~8:45~~		25°				+1.8			
	¼		27½	29.0	.073		31.3	99.4	75.2
	½		27	28.5	.052		30.8	97.8	74.0
	1		25½	27.0	.036		29.3	93.1	70.5
	2		22	23.5	.027		25.3	80.4	60.9
3/3 1:52	2		20½	22.0	.027		24.3	77.2	58.4
1:55	5		14½	16.0	.015		18.3	58.1	44.0
2:00	10		11	12.5	.013		14.8	47.0	35.6
2:10	20		7½	9.0	.010		11.3	35.9	27.2
2:30	40		4½	6.0	.0075		8.3	29.4	22.3
2:58	68		4	5.5	.0055		7.8	24.8	18.8
3:50	120		3	4.5	.0042		6.8	21.6	16.4
3/4 8:25	0995	25°	1½	3.0	.0028	+1.0	5.3	16.8	12.7

Weight in grams		
	Dish plus dry soil	
	Dish	
	Dry soil	W_o = 50 gm

Specific gravity of solids, G_s =

Corrected hydrometer reading (R) = hydrometer reading (R') + C_m

The particle diameter (D) is calculated from Stoke's equation using corrected hydrometer reading. Use nomographic chart for solution of Stoke's equation.

Hydrometer graduated in specific gravity

Partial percent finer = $\frac{G_s}{G_s - 1} \times \frac{100}{W_o} (R - C_d + m)$

Hydrometer graduated in grams per liter

Partial percent finer = $\frac{100}{W_o} (R - C_d + m)$

W_s = total oven-dry wt of sample used for combined analysis

W_o = oven-dry wt in grams of soil used for hydrometer analysis

W_1 = oven-dry wt of sample retained on No. 200 sieve

Total percent finer = partial percent finer × $\frac{W_s - W_1}{W_s}$

Remarks Hydrometer graduated in specific gravity

Technician Computed by Checked by

HYDROMETER ANALYSIS

W.O. 6681-00 Date 3-4-77

Project HALAWA STREAM SEDIMENT SAMPLING & TESTING

Boring No. B-10

Sample or Specimen No.		Classification	
Dish No.	Graduate No.		Hydrometer No.

Dispersing agent used ; Quantity

Dispersing agent correction, C_d = −0.5 ; Meniscus correction, C_m = +1.5

Time	Elapsed Time min	Temp. °C	Hydro. Reading (R')	Corrected Reading (R)	Particle Diameter (D), mm	Temp Correction (m)	R − C_d + m	Percent Finer	
								Partial	Total
		25°C				+1.0			
	¼		30½	32.0	.074		33.5	106.4	74.3
	½		28	29.5	.053		31.0	98.5	68.8
	1		26½	28.0	.039		29.0	92.1	64.3
	2		22	23.5	.029		25.0	79.4	55.4
3/3 12:00	0		—	—	—		—		
12:02	2		22	23.5	.027		25.0	79.4	55.4
12:05	5		15½	17.0	.019		18.5	58.8	41.0
12:10	10		10½	13.0	.014		13.5	42.9	29.9
12:20	20		7	7.5	.012		9.0	28.6	20.0
12:40	40		4	5.5	.0085		7.0	22.2	15.5
13:00	60		2½	4.0	.0062		5.5	17.5	12.2
14:00	120		1	2.5	.0050		4.0	12.7	8.9
3/5 16:25	265		½	2.0	.0031		2.5	11.1	7.8
11:05	1385		¼	1.5	.00135		3.5	9.2	7.2

Weight in grams		
	Dish plus dry soil	
	Dish	
	Dry soil	W_o = 50 gm

Specific gravity of solids, G_s = 2.7 (assumed)

Corrected hydrometer reading (R) = hydrometer reading (R') + C_m

The particle diameter (D) is calculated from Stoke's equation using corrected hydrometer reading. Use nomographic chart for solution of Stoke's equation.

Hydrometer graduated in specific gravity

$$\text{Partial percent finer} = \frac{G_s}{G_s - 1} \times \frac{100}{W_o} (R - C_d + m)$$

Hydrometer graduated in grams per liter

$$\text{Partial percent finer} = \frac{100}{W_o} (R - C_d + m)$$

$$\text{Total percent finer} = \text{partial percent finer} \times \frac{W_s - W_1}{W_s}$$

W_s = total oven-dry wt of sample used for combined analysis

W_o = oven-dry wt in grams of soil used for hydrometer analysis

W_1 = oven-dry wt of sample retained on No. 200 sieve

Remarks HYDROMETER GRADUATED IN SPECIFIC GRAVITY.

Technician Computed by Checked by

CONTINUED

3/5	13:45	1645	25°	0.0	1.5	.0012	+1.0	3.0	9.5	6.6
3/7	8:30	4110	24°	0.0	1.5	.00076	+0.8	2.8	8.9	6.2

HYDROMETER ANALYSIS

Date 3/4/77

Project 681-00 Holzwa Stream

Boring No. #11

Sample or Specimen No.	Classification	
Dish No.	Graduate No.	Hydrometer No.

Dispersing agent used ; Quantity

Dispersing agent correction, C_d = −0.5 ; Meniscus correction, C_m = +1.5

	Time	Elapsed Time min	Temp °C	Hydro. Reading (R')	Corrected Reading (R)	Particle Diameter (D), mm	Temp Correction (m)	R − C_d + m	Percent Finer Partial	Percent Finer Total
			24°				+0.8			61.1
		¼		27	28.5	0.07		29.8	94.7	57.9
		½		26½	28.0	0.05		29.3	93.1	56.9
		1		25	26.5	0.037		27.8	88.3	54.0
		2		21½	23.0	0.027		24.3	77.2	47.2
3/4	11:38	0		—	—			—		
	11:40	2		22	23.5	.029		24.8	78.8	48.1
	11:43	5		16	17.5	.019		18.8	59.7	36.5
	11:48	10		12	13.5	0.014		14.6	47.0	28.7
	11:58	20		8½	10.0	0.011		11.3	35.9	21.9
	12:18	40		5	6.5	0.0078		7.8	24.8	15.2
	12:38	60		4	5.5	0.0064		6.8	21.6	13.2
	13:38	120		1½	3.0	0.0045		4.3	13.7	8.4
3/5 →	16:23	285		0	1.5	0.0037		2.8	8.9	5.4
	11:23	1405		0	1.5	0.0013		2.8	8.9	5.4

Weight in grams		
Dish plus dry soil		
Dish		
Dry soil	W_o	50 gm

Specific gravity of solids, G_s =

Corrected hydrometer reading (R) = hydrometer reading (R') + C_m

The particle diameter (D) is calculated from Stoke's equation using corrected hydrometer reading. Use nomographic chart for solution of Stoke's equation.

Hydrometer graduated in specific gravity

Partial percent finer = $\frac{G_s}{G_s - 1} \times \frac{100}{W_o} (R - C_d + m)$

Hydrometer graduated in grams per liter

Partial percent finer = $\frac{100}{W_o} (R - C_d + m)$

W_s = total oven-dry wt of sample used for combined analysis

W_o = oven-dry wt in grams of soil used for hydrometer analysis

W_1 = oven-dry wt of sample retained on No. 200 sieve

Total percent finer = partial percent finer × $\frac{W_s - W_1}{W_s}$

Remarks Hydrometer graduated in specific gravity.

Technician B.K.C/R.S. Computed by B.K.C, A.L. Checked by

(CONTINUED)

3/5	13:47	1569	25°	-½	1.0	0.00125	0.8	2.3,		
3/8	8:30	4132	24°	0	1.5	0.00022	0.8	4.3	13.7	8.4

(end of Geolabs report)

II. Sediment Classification

To be more useful for describing the sediment of the project area, the particle size distribution data developed by Geolabs-Hawaii was averaged for each zone. The results of this procedure are shown on Table B-1. Although there is a degree of variation between the samples in each zone and some overlap between zones, the average values for each zone are distinct. This is brought out when the size classes are grouped as clay, silt, sand and gravel (Table B-2). As a result of this averaging and the USCS classification of the samples, Zone 3 was divided into two sub-zones.

The volume of sediment that has accumulated in the channel was obtained by comparing the as-dredged channel topography with the existing channel topography. The latter was obtained by VTN's survey crew and plotted as a contour map from which cross-sections were taken at 100-foot intervals (50-foot intervals near Kamehameha Highway bridge). The volume of sediment accumulated since the previous dredging was thereby determined to be approximately 87,630 cubic yards. The volume of sediment in each zone was then calculated by assuming a vertical projection of the sediment zone boundaries. The results were: Zone 1, 10,520 cubic yards; Zone 2, 9,640 cubic yards; Zone 3a, 18,400 cubic yards; Zone 3b, 14,020 cubic yards; Zone 4, 27,160 cubic yards; and Zone 5, 7,890 cubic yards. These figures were then converted into percentages (Table B-1, third column from the right) and multiplied by the average size class percentages for each zone (Table B-1, "Weighted Ave."). By thus "weighting" the average particle size distribution for each zone, the average particle size distribution for the total volume of accumulated sediment was obtained (Table B-1, bottom row and Table B-2). Of course, using only eleven samples to describe 87,630 cubic yards of sediment limits the accuracy of these results, but it is judged to be adequate for the purposes of this project.

Table B-1 Averaging and Weighting of Sediment Samples

Sample	Zone	% of Total	% in Size Class (diameter in milimeters)															
			.002	.004	.008	.016	.031	.062	.125	.250	.50	1.0	2.0	4.0	8.0	16.0	32.0	64.0
1	1		0	0	1	1	2	1	1	3	4	6	7	8	10	10	15	31
Weighted Ave		12%	0	0	.12	.12	.24	.12	.12	.36	.48	.72	.84	.96	1.20	1.20	1.80	3.72
3	2		7	2	5	5	13	5	4	19	9	5	4	4	5	5	8	0
Weighted Ave		11%	.77	.22	.55	.55	1.43	.55	.44	2.09	.99	.55	.44	.44	.55	.55	.88	0
2	3a		10	4	7	6	11	10	6	16	13	7	4	2	1	1	2	0
4	3a		9	6	7	8	10	8	8	11	14	10	5	3	1	0	0	0
5	3a		3	3	6	10	9	8	7	11	15	11	6	3	2	2	4	0
Ave	3a		7	4	7	8	10	9	7	13	14	9	5	3	1	1	2	0
Weighted Ave		21%	1.47	.84	1.47	1.68	2.1	1.89	1.47	2.73	2.94	1.89	1.05	.63	.21	.21	.42	0
6	3b		14	7	8	7	9	10	12	11	12	6	2	2	0	0	0	0
7	3b		12	1	3	14	16	5	5	14	21	7	1	1	0	0	0	0
11	3b		5	1	10	14	22	7	7	10	7	5	3	2	3	1	0	0
Ave	3b		10	3	7	12	16	7	8	12	13	6	2	2	1	0	0	0
Weighted Ave		16%	1.60	.48	1.12	1.92	2.56	1.12	1.28	1.92	2.08	.96	.32	.32	.16	.16	0	0
9	4		12	4	8	17	26	7	7	9	8	1	1	0	0	0	0	0
10	4		7	1	8	18	22	12	9	13	7	2	1	0	0	0	0	0
Ave	4		10	2	8	17	24	9	8	11	8	2	1	0	0	0	0	0
Weighted Ave		31%	3.10	.62	2.48	5.27	7.44	2.79	2.48	3.41	2.48	.62	.31	0	0	0	0	0
8	5		15	3	22	23	21	9	5	1	1	0	0	0	0	0	0	0
Weighted Ave		9%	1.35	.27	1.98	2.07	1.89	.81	.45	.09	.09	0	0	0	0	0	0	0
Weighted Total			8.29	2.43	7.72	11.61	15.66	7.28	6.24	10.60	9.06	4.74	2.96	2.35	2.12	2.12	3.10	3.72
Tot Volume (yd^3)			7264	2129	6765	10,174	13,723	6379	5468	9289	7939	4154	2594	2059	1858	1858	2717	3260

Table B-2 Sediment Particle Size Distribution

Zone[a]	Field Description	Unified[b]	% Clay[c] <.004 mm	% Silt .004-.074	% Sand .074-4.76	% Gravel 4.76-76.2	% of Total
1	Sandy Silty Gravel	GW	0	6	30	64	12
2	Gravelly Sand	SM	8	30	45	17	11
3a	Silty Sand	SM	6	41	49	4	21
3b	Silty Sand	ML	10	47	41	.2	16
4	Sandy Silt	ML	12	61	27	0	31
5	Soft Silt	ML	18	79	3	0	9
	% of Total		9	46	34	11	100

Notes

a. Refer to Sediment Zone map, Figure 8.
b. Classification according to the unified Soil Classification System: GW, well-graded coarse gravel; SM, silty sand; ML, inorganic silt with low plasticity.
c. Textural classes (in milimeters) based on the Unified Soil Classif-cation System

III. TRAP EFFICIENCY

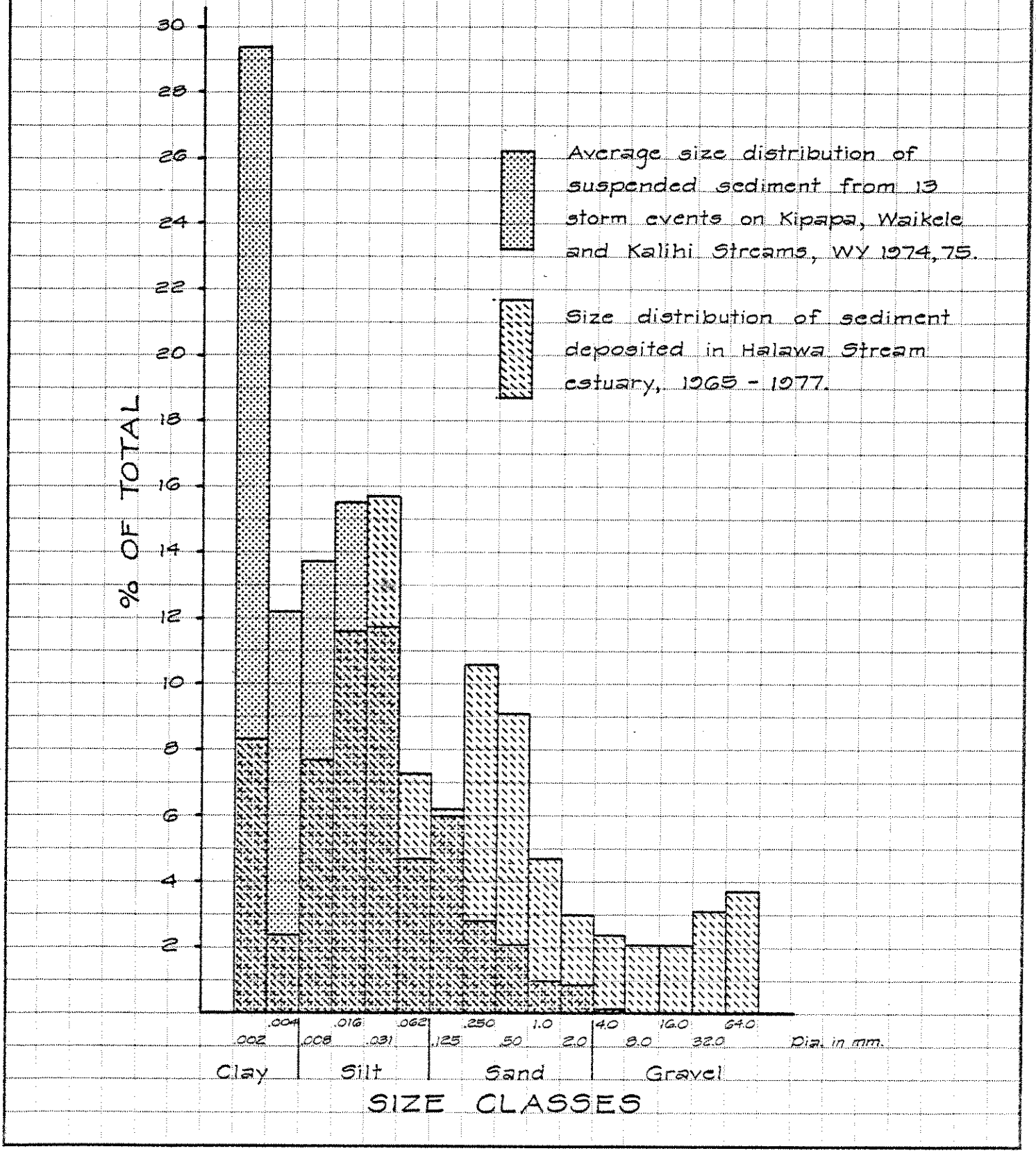
The trap efficiency of a sedimentation basin is a measure of its ability to accumulate sediment. It is expressed as the amount of sediment carried by the stream, divided by the amount that stays in the basin. The sediment load of a stream consists of a suspended portion and a bed load portion, which are made up of finer particles and larger particles, respectively. The interaction between the water and these two stream sediment components is a dynamic system that is affected by many complex variables and is poorly understood. It is therefore impossible to determine trap efficiency by predicting the behavior of the suspended and bed load sediments when the stream enters a sedimentation basin. It is obvious that most of the bed load and some of the suspended sediment will settle out and that some of the finer particles will remain in suspension and pass through the basin. However, until a model is developed that relates stream velocity to turbidity and the fall velocity of the sediment, either direct measurement or some other method must be used to obtain trap efficiency.

Direct measurements of sediment inflow or outflow have not been made in the Halawa Stream estuary. However, the volume of sediment accumulated since 1965 and its particle size distribution are known. Using this data, plus suspended sediment data from other streams, a rather simple method was developed to estimate the total volume of sediment transported by the stream. The basic logic behind this method, suggested by Ben Jones of the USGS, is that since a proportion of the fine material is passing through the estuary, the particle size distribution of the accumulated sediment should be poor in those size ranges. This does turn out to be the case, as illustrated on Figure B-1. The dotted pattern represents the average suspended sediment percentage in each size class for 13 storms on Kipapa, Waikele and Kalihi Streams in 1974 and 1975 (USGS, "Water Resources Data for Hawaii and Other Pacific Areas"). These streams were selected becuase they are located on either side of Halawa Stream, so the data should be representative of a typical suspended sediment load in Halawa Stream. The dashed line pattern on Figure B-1 represents the particle size distribution of the sediment in the Halawa Stream estuary.

Figure B-1 shows, as expected, that there is much more fine material in the suspended portion of the stream's sediment load than has been deposited in the estuary. But this is only true for particles smaller than 0.016 mm; for the larger sizes, the percentage accumulated in the stream is greater than the percentage passing through. To put it

FIGURE B-1 HALAWA STREAM SEDIMENT

Particle Size Distribution



another way, 100% of the suspended particles, in size classes 4.0 mm to 0.031 mm, are deposited in the estuary. Furthermore, 100% of the bed load is deposited in the estuary. This is demonstrated on Table B-1, which shows that Zones 4 and 5 do not have any particles greater than 2 mm in diameter and in Zone 3a only 7% of the particles are greater than 2 mm in diameter.

Since the volume of sediment deposited in each size class is known (Table B-1, bottom row), the total volume transported by the stream can be calculated by the formula,

$$X = V \div \frac{pV}{pX} \quad ;$$

where X = volume of suspended sediment transported by the stream,
V = volume of suspended and bed load sediment deposited in the estuary (87,630 cubic yards),
pV = percent total volume deposited (for each size class) and
pX = percent total volume transported in suspension (for each size class).

Once the volume of each size class that is transported is known, the volume passing through (Y) is simply obtained by subtracting V from X. The steps and results of these calculations are shown on Table B-3. The total transported sediment volume comes out to 123,481 cubic yards; of this, 35,851 cubic yards have passed beyond the Kamehameha Highway bridge for an overall trap efficiency of 71%. Since the trap efficiency will change as the hydraulic characteristics of the channel change, 71% is only an average for the 12 years since the channel was last dredged; right after dredging, it would have been greater than 71% but now that the channel is partially filled, the efficiency would be much less. (It should be understood that, although these volumes are expressed to the nearest cubic yard, they are not that accurate. The series of averages and assumptions that have been used limits the accuracy of all of these calculations to slightly better than order-of-magnitude.)

An interesting aspect of the calculations shown on Table B-3 is the breakdown between the bed load portion (B) and the "suspended" portion (S) of the deposited sediment (V = S+B). Particles as small as 0.031 mm appear to have been transported as bed load. This fine sediment could have been part of the bed load under low-flow conditions. Or, this anomalous result might indicate that the suspended load of one stream cannot be applied to another stream as a simple average. These limitations should be evaluated before attempting to apply this methodology to another sedimentation basin.

Table B-3 Sediment Volume Adjustment

Size in mm	pX	pV	V	$\frac{pV}{pX}$	X	Y	B	S
.002	.294	.083	7,264	.282	25,730	18,466	0	7,264
.004	.122	.024	2,129	.197	10,822	8,693	0	2,129
.008	.137	.077	6,765	.562	12,036	5,271	0	6,765
.016	.155	.116	10,174	.748	13,595	3,421	0	10,174
.031	.117	.157	13,723	1.342	10,227	0	3,496	10,227
.062	.047	.073	6,379	1,553	4,107	0	2,272	4,107
.125	.060	.062	5,468	1.033	5,292	0	176	5,292
.250	.028	.106	9,289	3.786	2,545	0	6,835	2,454
.50	.021	.091	7,939	4.333	1,832	0	6,107	1,832
1.0	.010	.047	4,154	4.700	884	0	3,270	884
2.0	.008	.030	2,594	3.750	692	0	1,902	692
4.0	.001	.024	2,059	24.000	86	0	1,973	86
8.0	0	.021	1,858		0	0	1,858	0
16.0	0	.021	1,858		0	0	1,858	0
32.0	0	.031	2,717		0	0	2,717	0
64.0	0	.037	3,260		0	0	3,260	0
Totals	1.000	1.000	87,630		87,757	35,851	35,724	51,906

Definition of Terms:

pX = percent of total volume suspended sediment transported by stream,
pV = percent of total volume suspended and bed load deposited in estuary,
V = volume of suspended and bedload deposited (cubic yards),
X = Volume transported in suspension (cubic yards) = V ÷ pV/pX,
Y = Volume lost to Pearl Harbor (cubic yards) = X - V,
B = Bed load deposited in estuary (cubic yards) = V - X,
S = Suspended sediment deposited in estuary (cubic yards) = X - Y.

Summary

B + S = 87,630 cubic yards
Y + B + S = 123,481 cubic yards
(B + S) ÷ (Y + B + S)100 = 71%

APPENDIX C Agencies and Organizations Consulted for the EIS

Federal Government	Response to Preparation Notice
Honolulu District Corps of Engineers	3/25/77
USDI Fish and Wildlife Service	none
USDA Soil Conservation Service	4/11/77
Headquarters Fourteenth Naval District	3/24/77
Naval Ocean Systems Center	3/30/77
14th Coast Guard District	3/29/77
U.S. Army Support Command, Hawaii	3/18/77
U.S.G.S., Water Resources Division	3/29/77
State of Hawaii	
Dept. of Accounting and General Services	3/21/77
Dept. of Education	none
Dept. of Health	3/24/77
Dept. of Land and Natural Resources	4/5/77
Dept. of Planning and Economic Dvelopment	3/22/77
Dept. of Transportation	4/7/77
Office of Environmental Quality Control	4/6/77
City and County of Honolulu	
Board of Water Supply	3/22/77
Dept. of General Planning	none
Dept. of Land Utilization	3/23/77
Dept. of Transportation Services	4/1/77
Others	
Aiea District Council	none
B. P. Bishop Estate	none
Halawa Valley Community Association	none
Life of the Land	none
The Queen's Hospital	none

77 01935

DEPARTMENT OF THE ARMY
HONOLULU DISTRICT, CORPS OF ENGINEERS
BLDG. 230, FT. SHAFTER
APO SAN FRANCISCO 96558

RECEIVED MAR 28 1 43 PM '77

RECEIVED MAR 28 9 32 AM '77 DEPT OF PUBLIC WORKS

PODED-PV

25 ~~March 1977~~ Engrg

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

We have reviewed the Environmental Impact Statement Preparation Notice for the proposed Halawa Stream Flood Control project per your request of 9 March 1977. We offer the following comments for your consideration:

a. As the proposed project involves work in navigable waters, a Department of the Army permit under Section 10 of the River and Harbor Act of 1899 will be required.

b. A second DA permit may be needed, depending upon the location of the final disposal site selected.

Thank you for the opportunity to review this document.

Sincerely yours,

KISUK CHEUNG
Chief, Engineering Division

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

701-12-0256

June 8, 1977

Mr. Kisuk Cheung
Chief, Engineering Division
Honolulu District
U.S. Army Corps of Engineers
Bldg. 230, Fort Shafter
APO San Francisco 96558

Dear Mr. Cheung:

SUBJECT: YOUR LETTER OF MARCH 25, 1977, RELATING TO THE EIS PREPARATION NOTICE FOR THE HALAWA STREAM MAINTENANCE DREDGING PROJECT

Thank you for your comments on the subject EIS Preparation Notice. We are aware that a Department of the Army permit will be required for the dredging operations, and perhaps for spoil disposal, depending on the alternative selected. The permit application will be submitted when the construction schedule and funding are firmly established.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

PC/RYN:ss

7702297

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
440 Alexander Young Building, Honolulu, HI 96813

RECEIVED DIV OF ENGINEERING APR 12 3 42 PM '77
RECEIVED DEPT OF PUBLIC WORKS APR 12 11 50 AM '77

April 11, 1977

TO ENV & Engrg

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City & County of Honolulu
650 South King Street
Honolulu, HI 96813

Dear Mr. Miyahira:

Subject: Halawa Stream Flood Control Project, Halawa, Oahu

We have reviewed the above preparation notice and have no comments to offer.

Thank you for the opportunity to review this notice.

Sincerely,

Donald Argyros, Acting

Jack P. Kanalz
State Conservationist

7701947

HEADQUARTERS
FOURTEENTH NAVAL DISTRICT
BOX 110
FPO SAN FRANCISCO 96610

RECEIVED
DIV. OF ENGINEERING
MAR 28 3 35 PM '77

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MAR 28 9 31 AM '77

IN REPLY REFER TO:
8:09F:SH:sh
Ser 575

TO ENVIR
Engrg

26 MAR 1977

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, HI 96813

Dear Mr. Miyahira:

Environmental Impact Statement
Preparation Notice for the Halawa Stream
Flood Control Project

The subject Preparation Notice, which was forwarded with your transmittal of 9 March 1977, has been reviewed, and the following comments are submitted:

a. The U.S. Navy is in full support of the project for improving the capacity of Halawa Stream to cope with flood waters. The results of this project will improve the existing situation.

b. The U.S. Navy is concerned, however, with any projects that may contribute to soil erosion and siltation of tributary streams, with consequent sedimentation of Pearl Harbor. Therefore, the Environmental Impact Statement (EIS) should address the following range of problems:

(1) Scheduling of the project and its duration

(2) Measures taken to reduce sedimentation flow

(3) Intensity, duration and proposed hours for noise

(4) Discussion of disposal methods and route for slurry

(5) Accessibility of workmen to project site

(6) Problems of barge at USS ARIZONA tour landing

48:09F:SH:sh
Ser 575

c. Consideration should be given to providing a silt storage basin in-stream at a location and of a design that would allow easy access and removal of accumulated silt. In this manner, if annual or more frequent maintenance is done of the silt storage basin, silt will be confined to a limited and designated area. This would reduce costs to the City and Navy on dredging costs of the stream and harbor.

Thank you for the opportunity for advance comment, and review will be made of the EIS proper upon receipt.

Sincerely,

R. P. NYSTEDT
CAPTAIN, CEC, USN
DISTRICT CIVIL ENGINEER
BY DIRECTION OF THE COMMANDANT

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

701-12-0257

June 8, 1977

Captain R. P. Nystedt
District Civil Engineer
Headquarters, Fourteenth Naval
District
Box 110
FPO San Francisco 96610

Dear Captain Nystedt:

SUBJECT: YOUR LETTER OF MARCH 24, 1977, RELATING TO THE EIS PREPARATION NOTICE FOR THE HALAWA STREAM MAINTENANCE DREDGING PROJECT

Thank you for your comments on the subject EIS Preparation Notice, and your expression of support for the project.

We recognize the importance of erosion and siltation, and will thoroughly evaluate these subjects in the EIS. We do not yet have specific details on the alternative dredging methods, so we are not able to answer your concerns at this time. Please be assured that the EIS will deal with the issues that you have raised.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

PC/RYN:ss

770 2083

DEPARTMENT OF THE NAVY
NAVAL OCEAN SYSTEMS CENTER
Hawaii Laboratory
P. O. Box 997
Kailua, Hawaii 96813

92/BI:smb
Ser NOSC 92-11
30 March 1977

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Reference is made to your letter of 9 March 1977 regarding the Environmental Impact Statement (EIS) Preparation Notice for the Halawa Stream Flood Control Project TMK: 9-9-02 and 03.

Enclosed is a copy of the review by Dr. Evan C. Evans III of the Hawaii Laboratory.

Sincerely yours,

J. B. BURKS
Director

Enclosure

3/25/77 92 B

NAVAL OCEAN SYSTEMS CENTER, HAWAII LAB
P. O. Box 997, Kailua, HI 96734

Memorandum

EIC-1283
24 III 1977

From: Dr. Evan C. Evans III, code 846
To: CAPT J. B. Burks, code 92

Subj: EIS Preparation Notice, Halawa Stream Flood Control Project

1. I have reviewed the Environmental Impact Statement (EIS) Preparation Notice for the Halawa Stream Flood Control Project, received 21 March. The document has been carefully prepared & states the purposes of the proposed project clearly.

2. From the document, it is evident that the section of Halawa Stream between Salt Lake Boulevard & Kamehameha Highway has been acting as a sediment trap for many decades. As such, it protects upper East Loch of Pearl Harbor. To be effective as a sediment trap, it must be & has been dredged. Last dredging occurred in 1965. The area may thus be classified as intermittantly disturbed.

3. Because of this classification, I see no need for extensive expenditures in EIS preparation. Sufficient sediment & water quality measurements have already been made by the Naval Civil Engineering Laboratory. Biological survey effort should be minimal & should be oriented toward demonstrating the probable increased productivity of the area resulting from the proposed dredging.

4. Disposal of the dredge material should be on land if possible. If a suitable land disposal site is found, the EIS should give special attention to criteria used in site selection & to the projected impact of spoil deposition. The Dredge Materials Research Project (DMRP) of the Corps of Engineers has published much information on disposition of spoil, including efficient methods for establishing vegetation to minimize aesthetic losses.

5. In my opinion, the project should proceed as proposed. The alternatives to dredging are clearly inferior. Since all lochs of Pearl Harbor are intermittently exposed to large amounts of suspended silt due to natural runoff, I see no requirement for the added expense of silt containment devices during dredging.

Evan C. Evans III

Enclosure

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

701-12-0258

June 8, 1977

Mr. J. B. Burks, Director
Naval Ocean Systems Center
Hawaii Laboratory
P. O. Box 997
Kailua, HI 96734

Dear Mr. Burks:

SUBJECT: YOUR LETTER OF MARCH 30, 1977, RELATING TO THE EIS PREPARATION NOTICE FOR THE HALAWA STREAM MAINTENANCE DREDGING PROJECT

Thank you for transmitting a copy of the comments from Dr. Evan C. Evans III on the subject EIS Preparation Notice.

The EIS will discuss the biological impacts of dredging and spoiling. We anticipate that productivity will be increased from the release of nutrients, an increase in the volume of the estuary and the removal of polluted sediments. The alternatives for spoil disposal are currently being investigated. Should land disposal be selected, reclamation of the disposal site will be a part of the operation.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

PC/RYN:ss

7702051

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

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DIV OF ENVIR CONTROL
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DEPT OF PUBLIC WORKS
APR 1 1 32 PM '77
TO Envir Engrg

Address reply to:
COMMANDER (mep)
Fourteenth Coast Guard District
677 Ala Moana
Honolulu, Hawaii 96813

16452
29 MAR 1977

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Staff review of your "EIS Preparation Notice for the Halawa Stream Flood Control Project" has been completed, and the Coast Guard has no comments to offer at this time. However, because ocean dumping is one alternative being considered for disposal of the dredged material, a copy of the DEIS is requested when it becomes available. The Coast Guard is responsible for surveillance of ocean dumping activities under the Marine Protection Research and Sanctuaries Act.

The opportunity to review and comment on the EIS preparation notice is appreciated.

Sincerely,

J. V. CAFFREY
Captain, U. S. Coast Guard
Chief of Staff
Fourteenth Coast Guard District

Copy to:
COMDT(G-WEP/7)
OEQC Hawaii

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

701-12-025

June 8, 1977

Captain J. V. Caffrey
Chief of Staff
Fourteenth Coast Guard District
677 Ala Moana Boulevard
Honolulu, HI 96813

Dear Captain Caffrey:

SUBJECT: YOUR LETTER OF MARCH 29, 1977, RELATING TO THE EIS PREPARATION NOTICE FOR THE HALAWA STREAM MAINTENANCE DREDGING PROJECT

Thank you for your comments on the subject EIS Preparation Notice.

We will coordinate with you if ocean dumping is recommended for disposal of the spoil.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

PC/RYN:ss

7701795

DEPARTMENT OF THE ARMY
HEADQUARTERS UNITED STATES ARMY SUPPORT COMMAND, HAWAII
SAN FRANCISCO 96558

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TO ENV 11 18 MAR 1977
Engg

Dept of Public Works
City and County of Honolulu
ATTN: Wallace Miyahira, Director and Chief Engineer
650 South King Street
Honolulu, Hawaii 96813

Gentlemen:

Reference is made to Environmental Impact Statement (EIS) Preparation Notice for Halawa Stream Flood Control Project forwarded for our review and comment on 9 March 1977.

The document has been reviewed and we have no comments to offer. There are no Army installations in the immediate vicinity of the proposed project.

Thank you for the opportunity to review the environmental aspects of the project at this early stage of development.

Sincerely yours,

Carl P. Rodolph

CARL P. RODOLPH
Colonel, CE
Director of Facilities Engineering

770 2082

United States Department of the Interior
GEOLOGICAL SURVEY
Water Resources Division
5th Floor, 1833 Kalakaua Ave.
Honolulu, Hawaii 96815

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To Envlly
Engrg

March 29, 1977

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Sir:

Your environmental impact statement preparation notice for the Halawa Stream Flood Control Project has been reviewed by this office and our comments follow:

1. We believe that a detailed survey of the accumulated sediment would yield significant sediment discharge data. The conditions resulting from the dredging done in 1965 seem to be fairly well documented so determining the amount of sediment removed and the amount remaining would indicate the (minimum) amount of sediment deposited since 1965. The collection and analyses of core samples of the deposition taken at enough points distributed both in the lateral and longitudinal direction could be of value in tying in the accumulation to storm events in the past.

2. Records of the floods in 1927 and 1935 mentioned on page 2 of the notice are not from the U. S. Geological Survey, which did not have a gage operating at the site during these particular years. We have made no estimates of discharge for these floods.

3. While no details are given, it would seem that the bridge downstream of Kamehameha Highway (Plate 4) may cause some backwater during periods of high discharge.

The foregoing is provided informally for technical assistance and is not intended to represent the position of the Department of the Interior.

Sincerely,

F. T. Hidaka

F. T. Hidaka
District Chief

cc: Regional Hydrologist, WRD, WR

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

701-12-026C

June 8, 1977

Mr. F. T. Hidaka
United States Department
of the Interior
Water Resources Division
300 Ala Moana Blvd., Room 6110
P. O. Box 50166
Honolulu, HI 96850

Dear Mr. Hidaka:

SUBJECT: YOUR LETTER OF MARCH 29, 1977, RELATING TO THE EIS PREPARATION NOTICE FOR THE HALAWA STREAM MAINTENANCE DREDGING PROJECT

Thank you for your comments on the subject EIS Preparation Notice.

Our reference to the USGS for the 1927 and 1935 floods was incorrect; we have since determined that the flood height was gaged by the Oahu Sugar Co. We have conducted backwater analyses for the project area, and have determined that the major controlling conditions are the deep water below the Navy bridge and the constriction in the channel between the Navy bridge and the Kamehameha Highway bridge. The effect of the Navy bridge is relatively negligible.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

PC/RYN:ss

77 01868

GEORGE R. ARIYOSHI
GOVERNOR

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DEPT. OF PUBLIC WORKS
MAR 23 9 11 AM '77

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

TO ENVIR
Engg

LETTER NO. (P)1295.7

MAR 21 1977

Mr. Wallace Miyahira
Director & Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Subject: Halawa Stream Flood Control Project
Environmental Impact Statement
Preparation Notice

Thank you for the opportunity to review and comment on the subject notice.

Our review shows that the subject project will not have any adverse environmental effects on any existing or planned facilities serviced by our department.

Very truly yours,

RIKIO NISHIOKA
State Public Works Engineer

LT:jnt

770 2495

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

TO ENV
Engrg

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. Box 3378
HONOLULU, HAWAII 96801

GEORGE A. L. YUEN
DIRECTOR OF HEALTH

Audrey W. Mertz, M.D., M.P.H.
Deputy Director of Health

Henry N. Thompson, M.A.
Deputy Director of Health

James S. Kumagai, Ph.D., P.E.
Deputy Director of Health

March 24, 1977

In reply, please refer to:
File: EPHS - SS

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City & County of Honolulu
650 S. King St.
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Subject: Request for Comments on Proposed Environmental Impact Statement (EIS) for Halawa Stream Flood Control Project, Halawa, Oahu, TMK: 9-9-02 and 03

Thank you for allowing us to review and comment on the subject proposed EIS. Please be informed that we have no comments or objections to this project 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,

JAMES S. KUMAGAI, Ph.D.
Deputy Director for
Environmental Health

7702206

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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TO ENVIR Engrg

CHRISTOPHER COBB, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

April 5, 1977

Honorable Wallace Miyahira
Dept. of Public Works
650 So. King St.
Honolulu, HI 96813

Dear Sir:

We have reviewed the EIS preparation notice for the Halawa Stream project.

The forthcoming EIS should detail the specific method of dredging to be utilized for the proposed project, including a thorough discussion on dredging methods having the least adverse impact on the environment. For example, suction dredging is known to create less turbid conditions at the intake end than the use of dragline or clamshell techniques. Further, the EIS should include a discussion on the possible employment of such devices as silt screens for the purpose of minimizing down-stream flow of excessive sediments stemming from the proposed dredging activities. All dredging operations should be conducted during periods of low rainfall.

Additionally, measures to alleviate the possible impact that the proposed project may have on the populations of nehu, papio, crabs and other forms of marine life utilized by the commercial and/or recreational fishery should be discussed.

Very truly yours,

GORDON SOH
Program Planning Coordinator

cc: Fish & Game
DOWALD
Historic Sites

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER
701-12-0261

June 8, 1977

Mr. Gordon Soh
Program Planning Coordinator
Department of Land and Natural
Resources
State of Hawaii
P. O. Box 621
Honolulu, HI 96809

Dear Mr. Soh:

SUBJECT: YOUR LETTER OF APRIL 5, 1977, RELATING TO THE EIS PREPARATION NOTICE FOR THE HALAWA STREAM MAINTENANCE DREDGING PROJECT

Thank you for your comments on the subject EIS Preparation Notice.

The EIS will evaluate several alternative dredging methods on the basis of cost and environmental impacts. Water quality impacts resulting from the dredging and spoiling will be closely evaluated. We agree that it would be advantageous for many reasons to schedule the dredging during the dryer months, although this may be difficult to accomplish. We will discuss in detail the potential impacts to the aquatic life of the Halawa Stream estuary, since the area is such a popular fishing and crabbing spot.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

PC/RYN:ss

77 01940

GEORGE R. ARIYOSHI
Governor

HIDETO KONO
Director

FRANK SKRIVANEK
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

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March 22, 1977

TO ENVIR
Engrg

Ref. No. 3197

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Subject: Environmental Impact Statement Preparation Notice for Halawa Stream Control Project, Halawa, Oahu, TMK: 9-9-02 and 3

We have reviewed the subject EIS Preparation Notice and wish to suggest that the project be closely coordinated with the Department of Land Utilization, City and County of Honolulu, for compliance with Act 176, SLH 1975, Relating to Environmental Shoreline Protection.

We have no further comments to offer at this time but appreciate this opportunity to review the EIS Preparation Notice.

Sincerely,

HIDETO KONO

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

701-12-0262

June 9, 1977

Mr. Hideto Kono, Director
Department of Planning and
Economic Development
State of Hawaii
P. O. Box 2359
Honolulu, HI 96804

Dear Mr. Kono:

SUBJECT: YOUR LETTER OF MARCH 22, 1977, RELATING TO THE EIS PREPARATION NOTICE FOR THE HALAWA STREAM MAINTENANCE DREDGING PROJECT

Thank you for your comments on the subject EIS Preparation Notice.

We are aware that a Shoreline Management Permit will be required for the proposed project. The permit application will be submitted to the City Department of Land Utilization when the construction schedule and funding are firmly established.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

PC/RYN:ss

770229

GEORGE R. ARIYOSHI
GOVERNOR

E. ALVEY WRIGHT
DIRECTOR

DEPUTY DIRECTORS
WALLACE AOKI
RYOKICHI HIGASHIONNA
DOUGLAS S. SAKAMOTO
CHARLES O. SWANSON

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DIV OF ENGINEERING
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DEPT OF PUBLIC WORKS
APR 7 8 30 AM '77

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

TO Env 1d
Engrg

IN REPLY REFER TO:

April 7, 1977

STP 8.4181

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
650 S. King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Subject: Halawa Stream Flood Control Project

Thank you very much for giving us the opportunity to review the above-captioned document. We have no comments to offer which could improve the notice.

Sincerely,

E. Alvey Wright

E. ALVEY WRIGHT
Director

GEORGE R. ARIYOSHI
GOVERNOR

RICHARD E. MARLAND, PH.D.
DIRECTOR

TELEPHONE NO.
548-6915

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
OFFICE OF THE GOVERNOR
550 HALEKAUWILA ST.
ROOM 301
HONOLULU, HAWAII 96813

April 6, 1977

Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu

Dear Mr. Miyahira,

SUBJECT: Environmental Impact Statement Preparation Notice for the Halawa Stream Flood Control Project

We have reviewed the subject EIS Preparation Notice and are in agreement with the statement that, "...with the large number of available alternatives, the public forum provided by the environmental review process will be constructive in arriving at the best course of action." We offer the following comments for your consideration.

Potential changes in land use upstream of the project site should receive consideration as to how they might affect the storm runoff volumes.

The goal of enhancing Pearl Harbor's water quality would appear as important as the flood control aspect of the project, although this is not reflected in the project title.

If a spoil disposal site is utilized near the project site (stated as being within one mile) then the impacts of releasing the water with a potentially high salinity content should be evaluated. This might include the effects on stream fauna and flora if stream disposal is utilized.

If the dredged spoil is mechanically removed then the potential heavy truck traffic and their access route to and from the project site should be evaluated. This would include noise and dust generation.

The location of the Halawa Valley Estates sub-division should be shown on the map.

A brief discussion should be provided on how the adopted grading ordinance would relate to reducing the need of projects of this type in the future.

Thank you for allowing us to comment on this EIS Preparation Notice.

Sincerely,

for Richard E. Marland
Director

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER
731-12-0404

August 17, 1977

Dr. Richard E. Marland
Director
Office of Environmental Quality Control
State of Hawaii
550 Halekauwila Street
Room 301
Honolulu, HI 96813

Dear Dr. Marland:

SUBJECT: YOUR LETTER OF APRIL 6, 1977, RELATING TO THE EIS PREPARATION NOTICE FOR THE HALAWA STREAM MAINTENANCE DREDGING PROJECT

Thank you for your review of the subject EIS Preparation Notice.

Since we received your response on August 12, 1977, we will consider the points you have raised in the EIS. The project title indicated on the Preparation Notice has been changed to the more descriptive, "Halawa Stream Maintenance Dredging".

Very truly yours,

For WALLACE MIYAHIRA
Director and Chief Engineer

RYN:ss

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BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA
HONOLULU, HAWAII 96843

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TO ENVIR
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March 22, 1977

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

SUBJECT: Environmental Impact Statement Preparation Notice for the Halawa Stream Flood Control Project

We have no objections to the proposed project.

However, we request that the construction plans be coordinated with us to insure the protection of our water mains along Salt Lake Boulevard.

Please call Mr. Lawrence Whang at 548-5221 if further information is required.

Very truly yours,

Edward Y. Hirata
Manager and Chief Engineer

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

701-12-0264

June 9, 1977

TO : MR. EDWARD Y. HIRATA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

FROM : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

SUBJECT : YOUR LETTER OF MARCH 22, 1977, RELATING TO THE EIS PREPARATION NOTICE FOR THE HALAWA STREAM MAINTENANCE DREDGING PROJECT

Thank you for your review of the subject EIS Preparation Notice.

We will continue to keep you informed of our plans as they develop.

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

/ PC/RYN:ss

7701877

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

GEORGE S. MORIGUCHI
DIRECTOR

LU3/77-1005(CS)

March 23, 1977

MEMORANDUM

TO : MR. WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

FROM : WILLIAM E. WANKET, ACTING DIRECTOR

SUBJECT: HALAWA STREAM FLOOD CONTROL PROJECT
TAX MAP KEY: 9-9-02 and 03
ENVIRONMENTAL IMPACT STATEMENT
PREPARATION NOTICE

We have reviewed your Environmental Impact Statement Preparation Notice for the subject project and have no substantive comments to make at this time. We note that the project area lies within the Shoreline Management Area created by Ordinance 4529 (Interim Shoreline Protection Ordinance) and the project will require a Shoreline Management Permit from the City Council. Such a permit may be applied for upon acceptance of the Environmental Impact Statement. We appreciate the opportunity to review the preparation notice and look forward to receiving the document prior to the formal response phase.

Should you have any questions, please contact Mr. Carl Smith of our staff at 523-4077.

WILLIAM E. WANKET
Acting Director

WEW:gc

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

701-12-0263

June 9, 1977

TO : MR. GEORGE S. MORIGUCHI, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

SUBJECT : YOUR LETTER OF MARCH 23, 1977, RELATING TO THE EIS PREPARATION NOTICE FOR THE HALAWA STREAM MAINTENANCE DREDGING PROJECT

Thank you for your review of the subject EIS Preparation Notice.

We are aware that a Shoreline Management Permit will be required; the permit application will be submitted when the construction schedule and funding are firmly established.

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

PC/RYN:ss

77 02136

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

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DEPT OF PUBLIC WORKS
APR 5 7 55 AM '77

TO ENV'G
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FRANK F. FASI
MAYOR

Kazu Hayashida
DIRECTOR

TE3/77-709

April 1, 1977

MEMORANDUM

TO : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

FROM : AKIRA FUJITA, ACTING DIRECTOR

SUBJECT: EIS Preparation for Halawa Stream Flood Control Project (Ref: 701-12-0104)

The use of traffic controls to minimize the impact of the use of heavy construction equipment should be addressed in the Summary of Impacts and Mitigation Measures Section.

Akira Fujita

AKIRA FUJITA
Acting Director

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

701-12-0265

June 9, 1977

TO : MR. KAZU HAYASHIDA, DIRECTOR
DEPARTMENT OF TRANSPORTATION SERVICES

FROM : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

SUBJECT : YOUR MEMORANDUM OF APRIL 1, 1977, RELATING TO THE EIS PREPARATION NOTICE FOR THE HALAWA STREAM MAINTENANCE DREDGING PROJECT

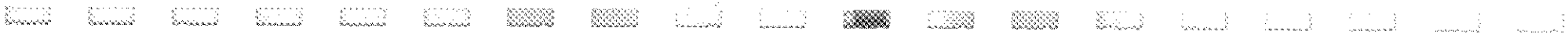
Thank you for your review of the subject EIS Preparation Notice.

The EIS will discuss the impacts to traffic circulation from the proposed project, and the installation of traffic controls will be considered as a mitigation measure.

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

PC/RYN:ss



APPENDIX D. Comments and Responces to EIS

	Comment Date
Federal Government	
Fourteenth Naval District	9/26/77
US Department of Agriculture	11/7/77
US Department of the Air Force	11/17/77*
US Department of the Army, Honolulu Eng. Dist.	11/28/77
US Department of the Army, Army Support Comm.	10/18/77*
US Department of the Interior, Fish & Wildlife	11/23/77
State of Hawaii Agencies	
Department of Agriculture	10/17/77*
Department of Defense	10/14/77*
Department of Health	10/31/77
Department of Land and Natural Resources	11/3/77*
Department of Planning and Economic Development	11/14/77*
Department of Social Services and Housing	10/18/77*
Office of Environmental Quality Control	11/7/77*
State Comptroller 10/18/77	
University of Hawaii	
Environmental Center	11/2/77
Water Resources Research Center	11/23/77
City and County of Honolulu	
Department of Housing and Community Development	10/24/77*
Department of Land Utilization	11/10/77
Department of Transportation Services	11/7/77*

* Indicates no response necessary.

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HEADQUARTERS
FOURTEENTH NAVAL DISTRICT
BOX 110
Pearl Harbor, Hawaii 96860

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TO ENVIQ Engg

4 NOV 1977

Dr. Richard E. Marland, Director
Office of Environmental Quality Control
State of Hawaii
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Dr. Marland:

Environmental Impact Statement (EIS)
Halawa Stream Maintenance Dredging (26 Sep 77)

The subject EIS, which was forwarded with your transmittal (undated) received on 18 October 1977, has been reviewed, and the following comments are submitted:

a. The six problem areas provided in the U.S. Navy response of 24 March 1977 to the EIS Preparation Notice have all been addressed in the current EIS study.

b. The subject project is expected to have no significant effect on the U.S.S. Arizona Memorial operations or plans unless alternate disposal of dredged material is necessary, requiring a barge in Halawa Stream on the Makai side of Kamehameha Highway.

c. The U.S. Navy is in full support of the project for improving the capacity of Halawa Stream to cope with flood waters. The results of this project will improve the existing situation.

Thank you for the opportunity to review this EIS and make appropriate comments.

Sincerely,

R. P. MYSTEDT
[illegible], CEC, USN
DISTRICT CIVIL ENGINEER
BY DIRECTION OF THE COMMANDANT

Copy to:
Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
Honolulu Municipal Building
Honolulu, Hawaii 96813

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

801-12-0037

January 26, 1978

Captain R. P. Nystedt
District Civil Engineer
Headquarters, Fourteenth Naval District
Box 110
Pearl Harbor, Hawaii 96860

Dear Captain Nystedt:

SUBJECT: YOUR LETTER OF SEPTEMBER 26, 1977 TO STATE EQC, RELATING TO THE HALAWA STREAM MAINTENANCE DREDGING PROJECT EIS

Thank you for your comments on the subject EIS. The following response is submitted.

Offshore disposal of the dredged material has been given the lowest priority of the alternative disposal methods discussed in the text. However, should offshore disposal become necessary, we will coordinate barge operations with your headquarters to insure that interference with the USS Arizona Memorial operations is avoided.

Very truly yours,

FOR WALLACE MIYAHIRA
Director and Chief Engineer

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
P. O. Box 50004, Honolulu, HI 96850

November 7, 1977

Environmental Quality Commission
Office of the Governor
State of Hawaii
550 Halekauwila St., Rm. 301
Honolulu, HI 96813

Gentlemen:

Subject: Environmental Impact Statement for the Halawa Stream Flood Control Project, Halawa, Oahu

We have reviewed the environmental impact statement on the Halawa Stream Maintenance Dredging and would like to express our concerns that Site 1, South Bank Farm, not be selected as the dewatering site. Our concerns are based on the fact that this area is presently used for agricultural production. Therefore, we would recommend that another site be selected for dewatering purposes.

Thank you for the opportunity to review this document.

Sincerely,

Jack P. Kanalz
State Conservationist

cc:
Department of Public Works, City & County of Honolulu
Office of Environmental Quality Control

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

801-12-0035

January 26, 1978

Mr. Jack P. Kanalz
State Conservationalist
United States Department of Agriculture
Soil Conservation Service
P. O. Box 50004
Honolulu, Hawaii 96850

Dear Mr. Kanalz:

SUBJECT: YOUR LETTER OF NOVEMBER 7, 1977 TO THE STATE EQC, RELATING TO THE HALAWA STREAM MAINTENANCE DREDGING PROJECT EIS

Thank you for your comments regarding the subject EIS. The following response is submitted.

We cannot say with certainty that Site 1 will not be selected for a dewatering site. However, your concerns for nondisruption of agricultural operations will be considered in the final determination.

Very truly yours,

for WALLACE MIYAHIRA
Director and Chief Engineer

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 15TH AIR BASE WING (PACAF)
HICKAM AIR FORCE BASE, HAWAII 96853

DIV/ENGINEERING RECEIVED NOV 21 10 44 AM '77

17 NOV 1977

REPLY TO ATTN OF: DEEV (Mr. Nakashima, 4491831)

SUBJECT: Environmental Impact Statement (EIS) for the Halawa Stream Maintenance Dredging Project, Halawa, Oahu, Hawaii

ENV 4 Engrg

TO: Governor, State of Hawaii
Office of Environmental Quality Control
550 Halekauwila Street
Room 301
Honolulu, Hawaii 96813

1. This headquarters has reviewed the subject EIS and has no comment to render 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 EIS.

ROBERT Q. K. CHING
Chief, Engineering, Construction
and Environmental Planning Div
Directorate of Civil Engineering

1 Atch
Environmental Impact Statement

Cy to: Dept of Public Works wo/atch
City and County of Honolulu
Honolulu Municipal Building
Honolulu, Hawaii 96813

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
BUILDING 230
FT. SHAFTER, HAWAII 96858

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OFFICE OF THE MAYOR
Nov 30 4 28 PM '77

TO ENVIR Engrg

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28 November 1977

Mr. Wallace Miyahira, Director
Department of Public Works
City and County of Honolulu
Honolulu Municipal Building
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

We find the Environmental Impact Statement for the Halawa Stream Maintenance Dredging Project to be very informative and commend the efforts to avoid ocean disposal of the dredged material.

On pages 4 and 5 of the statement, we suggest that use of booster pumps be considered in attempting to move dredged spoil over long distances. Aside from enlarging the size of the settling basin, other measures can be considered to increase water retention time and the degree of settling by fine sediments such as dividing the basin into several compartments or other modifications to prolong the distance and time of water flow.

As noted on page 46, a Department of the Army permit is required prior to performing the work; however, the authority for the permit is not Section 404. We suggest that the reference to Section 404 be deleted. More importantly, action should be initiated to apply for a Section 10 permit to avoid unnecessary project delays. We hope that the dewatering and upland disposal site selection would be completed prior to applying for the permit.

We thank you for the opportunity to review the environmental statement.

Sincerely yours,

F. M. PENDER
Colonel, Corps of Engineers
District Engineer

Copy Furnished:
Office of Environmental Quality Control
State of Hawaii
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

801-12-0036

February 1, 1978

Colonel F. M. Pender
District Engineer
Honolulu District
U. S. Army Corps of Engineers
Building 230
Fort Shafter, Hawaii 96858

Dear Colonel Pender:

SUBJECT: YOUR LETTER OF NOVEMBER 28, 1977, RELATING TO THE HALAWA STREAM MAINTENANCE DREDGING PROJECT EIS

Thank you for your comments on the subject EIS. The following responses are submitted.

1. We concur with your suggestion for using booster pumps for moving dredged spoil over long distances. As stated on page 7, paragraph 1, all potential spoil deposit sites except 1 and 3 would require booster pumps.

2. The additional design concepts for the settling pond which you suggested will be considered. We expect that final approval of the basin design will include evaluations of the feasibility of this and other alternatives based on the characteristics of the basin site and dredging operations.

3. The reference to Section 404 has been deleted.

Very truly yours,

FOR WALLACE MIYAHIRA
Director and Chief Engineer

7708483

DEPARTMENT OF THE ARMY
HEADQUARTERS UNITED STATES ARMY SUPPORT COMMAND, HAWAII
FORT SHAFTER, HAWAII 96858

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DEPT OF PUBLIC WORKS
Oct 20 2 37 PM '77

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TO ENV
Engrg OCT 18 1977

Office of the Governor
State of Hawaii
Environmental Quality Commission
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Gentlemen:

Thank you for the opportunity to review the inclosed Environmental Impact Statement for Halawa Stream Maintenance Dredging, Halawa, Oahu, Hawaii. A review has been conducted and there are no comments. The document is returned as requested.

Sincerely,

1 Incl
As stated

CARL P. RODOLPH
Colonel, CE
Director of Facilities Engineering

Copy furnished:
Department of Public Works
City & County of Honolulu
Honolulu Municipal Building
650 S. King Street
Honolulu, Hawaii 96813

770933

RECEIVED
DIV. OF ENGINEERING
NOV 28 11 46 AM '77

Envlt
Engrg

Division of Ecological Services
3000 Ala Moana Blvd., Rm. 7322
P. O. Box 50167
Honolulu, Hawaii 96850

Reference: ES

November 23, 1977

Environmental Quality Commission
State of Hawaii
550 Halekauwila Street, Rm. 301
Honolulu, Hawaii 96813

Re: EIS for Palawa
Stream Maintenance
Dredging, Palawa
Stream, Oahu - Dept.
of Public Works

Dear Sir:

We have reviewed the referenced Environmental Impact Statement, dated 23 September 1977, concerning the proposed maintenance dredging of Palawa Stream to increase both its flood and sediment storage capacity.

In general the statement adequately describes the fish and wildlife resources affected by and the impacts resulting from construction of the proposed project. Our comments are directed to (1) an apparent misinterpretation of the long-term effects of the proposed project on the biological productivity of the Palawa Stream estuary; and (2) recommendations to mitigate habitat disruption during project construction.

On page 37, construction of the proposed project was described as providing long term benefits to the biological productivity of the estuary. Removal of the spoil has been given dual benefits, i.e. not only would the project area have a greater flood carrying capacity, its effectiveness as a sediment trap for upstream runoff would also be increased. While this latter use is valuable as a back-up measure after on-site erosion control measures have been taken, it unfortunately could serve as an excuse for not instituting

these precautions, thus promoting continued upstream habitat degradation. The addition of sediment to the estuary maintenance dredge area also would result in a decrease of its habitat value.

While the area upstream from Farapagoha Bridge is shallow, increasing its depth may not be as beneficial as currently estimated. By doing so, shorebird habitat would be eliminated, thereby reducing present habitat utilization by at least one parameter. It appears that an approximately 2 foot sill will be left in the downstream portion. An anaerobic sink may form thereby reducing the value of the estuary to benthic and pelagic animals alike. (See figure 7, bottom profile along centerline). Based on these impacts and the need for future maintenance dredging and habitat disruption inherent in projects of this type, the conclusion that this project may have long-term positive impacts on estuarine biota is unfounded.

With regard to mitigative measures, all efforts should be made to prevent increased turbidity resulting from project construction. This is especially critical since construction in other areas around Fast Loch contribute to occasional high turbidity levels. Therefore, we will recommend the following conditions be made a part of appropriate State and Federal permits required for this project.

1. The dredging of Malaya Stream be done during periods of seasonally low stream flow, i.e. from mid-April thru mid-October.

2. Silt control devices, such as silt screens, be used to control turbidity.

3. Prior to revegetation of areas cleared for project construction, erosion control measures be instituted to control sedimentation.

Although potential spoil disposal sites have been identified and evaluated in this document, final selection has not been made. Upland disposal would potentially produce the least severe impacts providing precautions are taken to minimize turbidity in spoil effluent discharge. This method of disposal would also permit a beneficial use of the spoil. Should upland disposal be selected, this Service will recommend the following:

1. Extreme care be taken to insure that no debris, petroleum products, or other deleterious materials be allowed to fall, flow, leach, or otherwise enter the water.

2. Water quality standards will be maintained in accordance with Federal and State water quality regulations.

3. All construction activities within and adjacent to the water be conducted so as to minimize turbidity and control erosion.

4. If a bucket dredge is used, there shall be no stockpiling of materials in the water to obtain full buckets.

5. On land, spoil disposal be conducted behind maintained berms above the influence of the tide. Only clear runoff water from the spoil disposal area be allowed to reenter the waterway.

Should ocean disposal be utilized, efforts should be made to prevent incidental spillage of the slurry as it is transported to the barge and to the disposal site. A temporary land disposal site surrounded with impermeable berms would be preferable to stockpiling the material in the stream. Should stockpiling in the stream be unavoidable, and we will recommend against it, construction of a flood-proofed impermeable dike would be required to reduce the chances of having a significant amount of spoil wash downstream if flooding occurs.

Please notify us when a disposal site has been selected. Should additional measures for adverse impact reduction be applicable, we will recommend them at that time.

Thank you for the opportunity to comment on this project.

Sincerely yours,

Marine R. Taylor
Field Supervisor

cc: EPA
HDF&G
Dept. of Public Works, C&C of Honolulu

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

801-12-0029

February 2, 1978

Mr. Maurice H. Taylor, Field Supervisor
Division of Ecological Services
U.S.D.I. Fish and Wildlife
300 Ala Moana Boulevard
Room 5392
Honolulu, Hawaii 96850

Dear Mr. Taylor:

SUBJECT: YOUR LETTER OF NOVEMBER 23, 1977 TO THE STATE EQC, REGARDING THE HALAWA STREAM MAINTENANCE DREDGING PROJECT EIS

Thank you for your comments on the subject EIS. The following responses are submitted.

1. We have incorporated your comments and concerns relating to the long-term beneficial impacts of the proposed project into the text of the EIS on page 34. The phrase "long-term" is used in the report to indicate that the beneficial impacts of the project on the stream's biotic environment will occur over a longer period of time than the initial adverse biological impacts of dredging the channel.

2. As stated on page 8 of the EIS, it is preferable that the 6-month dredging period begin during the months of April or May when the low-flow period of the stream is starting. Construction can be scheduled within the fiscal year when funds become available except for EDA funds.

3. Although silt screens are not expected to be needed during the construction period (page 32), final determination will be made after review of the contractor's dredging plans.

4. As stated in Chapter III, Section B, an Erosion Control Plan will be submitted with the construction plans outlining the measures to be employed in controlling erosion in disturbed areas.

5. The matter of the disposal of the dredged material will be resolved prior to construction of the project. The plans will be reviewed to insure minimization of potential pollution and erosion. If applicable or necessary, your recommendations may be incorporated into any disposal plans submitted by the contractor. However, at this time we do not foresee any use of bucket dredging methods or stockpiling material in the stream.

Very truly yours,

WALLACE M. YAHIRA
Director and Chief Engineer

GEORGE R. ARIYOSHI
GOVERNOR

JOHN FARIAS, JR.
CHAIRMAN, BOARD OF AGRICULTURE

YUKIO KITAGAWA
DEPUTY TO THE CHAIRMAN

Env Ctl
Engrg.

STATE OF HAWAII
DEPARTMENT OF AGRICULTURE
1428 SO. KING STREET
HONOLULU, HAWAII 96814

October 17, 1977

MEMORANDUM

To: Governor, State of Hawaii
(Office of Environmental Quality Control)

Subject: EIS for Halawa Stream Maintenance Dredging

The Department of Agriculture has no comments on this project. We appreciate the opportunity to review the EIS.

John Farias, Jr.
Chairman, Board of Agriculture

cc: Department of Public Works, City & County of Honolulu

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GEORGE R. ARIYOSHI
GOVERNOR

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VALENTINE A. SIEFERMANN
MAJOR GENERAL
ADJUTANT GENERAL

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
FORT RUGER, HONOLULU, HAWAII 96816

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Department of Public Works
City and County of Honolulu
Honolulu Municipal Bldg.
Honolulu, Hawaii 96813

Gentlemen:

Halawa Stream Maintenance Dredging

Thank you for sending us a copy of the "Halawa Stream Maintenance Dredging" Environmental Impact Statement. We have received the publication and have no comments to offer.

Yours truly,

WAYNE R. TOMOYASU
Captain, CE, HARNG
Contr & Engr Officer

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. Box 3378
HONOLULU, HAWAII 96801

GEORGE A. L. YUEN
DIRECTOR OF HEALTH
Aubrey W. Mertz, M.D., M.P.H.
Deputy Director of Health
Henry N. Thompson, M.A.
Deputy Director of Health
James S. Kumagai, Ph.D., P.E.
Deputy Director of Health

October 31, 1977

In reply, please refer to:
File: EPHS – SS

MEMORANDUM

To: Mr. Wallace Miyahira, Director and Chief Engineer
Department of Public Works, City & County of Honolulu

From: Deputy Director for Environmental Health

Subject: Environmental Impact Statement (EIS) for Halawa Stream Maintenance Dredging, Halawa, Oahu, Hawaii

Thank you for allowing us to review and comment on the subject EIS.

We question whether the dewatering operation will be able to meet the maximum turbidity increase of 10 percent standard. If the 10 percent standard should be exceeded, operations should cease or be modified to meet the standard. We recommend the following control measures:

1. The use of silt curtains be required in the plan specifications.

2. Grassing or matting of the pond berms also be required in the plan specifications.

3. The discharge area should be sampled to assure compliance with the 10 percent standard.

Please be informed that Pearl Harbor is one of our most sensitive water bodies.

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.

JAMES S. KUMAGAI, Ph.D.

cc: Environmental Quality Commission
Office of Environmental Quality Control

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

801-12-0034

January 26, 1978

Dr. James S. Kumagai
Deputy Director of Health
Department of Health
State of Hawaii
P. O. Box 3378
Honolulu, Hawaii 96801

Dear Dr. Kumagai:

SUBJECT: YOUR MEMORANDUM OF OCTOBER 31, 1977, RELATING TO THE HALAWA STREAM MAINTENANCE DREDGING PROJECT EIS

Thank you for your comments on the subject EIS. The following response is submitted.

As stated on page 31 of the EIS, an Erosion Control Plan will be submitted with the dredging plan specifications and spoil disposal site plans for your review. The necessary erosion control measures will be determined as soon as specific dredging and disposal plans are made. These plans may incorporate the recommendations outlined in your letter.

Very truly yours,

FOR WALLACE MIYAHIRA
Director and Chief Engineer

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

W. Y. THOMPSON, Chairman
BOARD OF LAND & NATURAL RESOURCES
EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

November 3, 1977

Governor, State of Hawaii
Office of Environmental
Quality Control
550 Halekauwila St.
Honolulu, HI 96813

Dear Sir:

We have reviewed the EIS for dredging Halawa Stream. Our comments do not include the spoil disposal phase of the project since a disposal site has not been selected.

The project otherwise appears desirable not only for removing a flood hazard but also for restoring sediment trapping qualities of the channel, thereby preventing siltation of Pearl Harbor.

Very truly yours,

W. Y. THOMPSON
Chairman of the Board

cc: Dept. of Public Works
C & C of Honolulu
Division of Fish and Game

LEND A HAND TO CLEAN OUR LAND · STATE OF HAWAII

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

801-12-0030

January 26, 1978

Mr. William Y. Thompson, Chairman
Board of Land and Natural Resources
State of Hawaii
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Thompson:

SUBJECT: YOUR LETTER OF NOVEMBER 3, 1977 TO THE EQC, RELATING TO THE HALAWA STREAM MAINTENANCE DREDGING PROJECT EIS

Thank you for your comments on the subject EIS. The matter of the disposal of the dredged material will be resolved prior to construction of the project. All necessary permits will be secured and all requirements will be met.

Very truly yours,

FOR WALLACE MIYAHIRA
Director and Chief Engineer

GEORGE R. ARIYOSHI
Governor

HIDETO KONO
Director

FRANK SKRIVANEK
Deputy Director

RECEIVED
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DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT

Kamamalu Building, 250 South King St., Honolulu, Hawaii • Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Nov 17 10 31 AM '77

TO Envir
Engrg

November 14, 1977

Ref. No. 4957

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Subject: Environmental Impact Statement for Halawa Stream Maintenance Dredging

We have reviewed the subject EIS and find that it has adequately identified the major environmental impacts which can be anticipated resulting from the proposed action.

We have no further comments to offer at this time but appreciate the opportunity to review and comment on this matter.

Sincerely,

HIDETO KONO

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P. O. Box 339
Honolulu, Hawaii 96809

October 18, 1977

MEMORANDUM

TO: Environmental Quality Commission
550 Halekauwila St., Room 301
Honolulu, Hawaii 96813

FROM: Andrew I. T. Chang, Director
Department of Social Services and Housing

SUBJECT: Environmental Impact Statement - Halawa Stream Maintenance Dredging

Subject EIS has been reviewed for its impact on departmental programs.

We have no comment to make and we are returning the EIS for your usage.

Thank you for the opportunity to review and comment.

Andrew I. T. Chang
DIRECTOR

Attachment
cc: Governor (Office of EQC)
Deprt. of Public Works, C&C of Honolulu

GEORGE R. ARIYOSHI
GOVERNOR

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RICHARD E. MARLAND, PH.D
DIRECTOR

TELEPHONE NO
548-6915

ENV 40
TO Engrg

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
OFFICE OF THE GOVERNOR
550 HALEKAUWILA ST
ROOM 301
HONOLULU, HAWAII 96813

November 7, 1977

Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu

SUBJECT: Environmental Impact Statement for Halawa Stream Maintenance Dredging

Dear Mr. Miyahira:

We have reviewed the subject environmental impact statement and find it quite satisfactory in describing potential environmental impacts of the proposed project. We offer the following comments for your consideration:

1. What kind of improvements have been placed on the bench between the upper and lower north banks? Would the removal of these improvements create an economic impact to the residents who have put in such improvements? What might these costs be?

2. We are encouraged to see that the project is not going to channelize additional stream habitat.

3. We hope that the adopted grading ordinance would reduce the need of projects such as this in the future.

As of this date we have received a total of eight (8) comments as indicated on the attached list. We will forward any additional comments received after the endoof the review period.

We have not attempted to summarize the comments of other reviewers. Instead, we recommend that each comment be given careful consideration by yourself.

We trust that our comments will be helpful to you in the preparation of the revised statement. Thank you for the opportunity to review this EIS.

Sincerely,

Richard E. Marland
Director

attachment

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

801-12-0033

January 26, 1978

Mr. Richard L. O'Connell, Director
Office of Environmental Quality Control
Office of the Governor
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Mr. O'Connell:

SUBJECT: YOUR LETTER OF NOVEMBER 7, 1977, RELATING TO THE HALAWA STREAM MAINTENANCE DREDGING PROJECT EIS

Thank you for your comments on the subject EIS. Our corresponding responses follow:

1. The improvements that have been placed along the north bank of the Halawa Stream by the local residents are mainly small docks. Although the costs associated with removal of these facilities are unknown, any adverse impacts can, in part, be mitigated by giving residents the option to remove and salvage these improvements prior to beginning dredging operations.

2. No response is necessary.

3. As stated within the report, erosion and siltation associated with the construction of the freeway and stadium were major factors in the rapid increase of sediment in Halawa Stream. Increased regulation and control over construction related erosion resulting from the grading ordinance should reduce the frequency for future dredging in the Halawa Stream.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

OCT 18 1977

(P)2091.7

Dr. Richard Marland
Director
Office of Environmental
Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Dr. Marland:

Subject: EIS for the Halawa Stream
Maintenance Dredging Project

Our review of the subject statement shows that the project will not have adverse environmental impact upon any existing or planned facilities serviced by our department.

However, we suggest that Chapter IIIF, Traffic Circulation, be expanded to assure that any heavy traffic drawn by the Aloha Stadium will not be disrupted. By disruption, we mean closing of lanes, operation of temporary signalization, mud-caked roadways, etc.

Thank you for this opportunity to comment.

Very truly yours,

HIDEO MURAKAMI
State Comptroller

LT:jnt
cc: Mr. W. Miyahira

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

801-12-0032

January 26, 1978

Mr. Hideo Murakami
State Comptroller
Department of Accounting and
General Services
State of Hawaii
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Murakami:

SUBJECT: YOUR LETTER OF OCTOBER 18, 1977 TO THE STATE EQC, RELATING TO THE HALAWA STREAM MAINTENANCE DREDGING PROJECT EIS

Thank you for your comments on the subject EIS. The following response is submitted.

Movement of dredging equipment will be scheduled so as to avoid any conflict with traffic drawn by the Aloha Stadium. Also, if transport of the dried sediment to a final disposal site is necessary, confining trucking activities between morning and afternoon peak traffic hours will reduce the potential for disruption of Aloha Stadium-bound traffic. The potential for traffic disruption occurring as a result of mud-caked roads can be reduced by implementing a dust control program such as covering truck beds when hauling spoil to prevent the spreading of dirt.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

801-12-0031

January 26, 1978

Dr. Doak C. Cox, Director
Environmental Center
University of Hawaii at Manoa
2550 Campus Road, Crawford 317
Honolulu, Hawaii 96822

Dear Dr. Cox:

SUBJECT: YOUR LETTER OF NOVEMBER 2, 1977 TO THE STATE EQC, RELATING TO THE HALAWA STREAM MAINTENANCE DREDGING PROJECT EIS

Thank you for your comments on the subject EIS. The following response is submitted.

Depending on the magnitude of chlorides, the use of golf courses as a final site for disposal of dredged material is one alternative that can be considered. We will keep your suggestion of the Hawaii Kai site in mind for full evaluation after a dewatering site and process have been determined.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

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TO ENVIR Engrg

University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

Office of the Director

November 2, 1977

State of Hawaii
Environmental Quality Commission
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Sir:

Halawa Stream Flood Control Project
Halawa, Oahu

We have received the above EIS and will not take part in a formal review. However, we have noted in Section X (page 45) the yet unresolved issue of the disposition of the sediment. In connection with other reviews and studies coordinated by the Environmental Center related to dredge spoil disposal, we have had discussions with Mr. Charles Coupe' of Kaiser Aetna regarding possible disposal sites in the Queens Beach area of Hawaii Kai. Depending on the nature of the material and its de-watering characteristics it may be suitable for golf course fill and could be purchased by Kaiser Aetna.

We appreciate the opportunity to comment on this EIS.

Yours very truly,

Doak C. Cox
Director

DCC/ln

cc: Office of Environmental Quality Control
Department of Public Works, City and County of Honolulu
Jacquelin N. Miller
Darro Thuet

UNIVERSITY OF HAWAII

Water Resources Research Center

November 23, 1977 TO Engrg

Office of the Director

Mr. Wallace Miyahira
Dept. of Public Works
C & C of Honolulu
Honolulu Municipal Building
Honolulu, Hawaii 96813

Dear Mr. Miyahira

The following review comments are submitted for the Halawa Stream Maintenance Dredging EIS:

1. This project would commit $500,000 (±) for dredging the lower Halawa Stream (for every 10-15 years) to prevent the 100-year flood for about 130 homes. A benefit-cost analysis of other alternatives, especially the non-structural alternatives, would be useful to arrive at a better decision. EIS failed to present such analyses and to show the grounds for their rejection. Genuine effort should be made in examining non-structural alternatives, especially from an economic standpoint. In addition, a combination of non-structural alternatives and non-dredging alternatives might be examined. For example, what effect would flood-proofing, run-off control measures, and flood-insurance have on the requirements for a 7-foot level? What about a combination of flood-proofing and channel maintenance other than dredging, such as removal of obstructions?

2. According to Figure 7, the bottom profile of the Lower Halawa Stream has only 900 ft. (from station 24+00 to 33+00) with maximum of 4 feet above mean-sea-level i.e. dredging of the stream bottom has no significant impact on the 100-year flood profile. On the otherhand, according to plate 13, the profiles of the backwater curves showed that the Kamehameha Highway Bridge restricts the passage of flood water to Pearl Harbor. In other words, finding ways to let the flood water pass under the Kamehameha Highway Bridge should be the key to the flooding problem. This has not been identified or elaborated in the EIS.

3. We are not convinced that the dredged and dewatered material will be suitable for agricultural use, or for growing other vegetation. What about leaching of heavy metals, nitrogen, etc.?

4. In 10-15 years, the same site disposal problem will probably exist, this should be elaborated on, as well as the need for future channel maintenance.

Sincerely,

Reginald H. F. Young

Reginald H. F. Young
Asst. Director, WRRC

RHFY:jm

cc: OEQC
Env. Center
Y. Fok
M. J. Chun
H. Gee

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

801-12-0038

January 26, 1978

Dr. Reginald H. F. Young
Assistant Director
Water Resources Research Center
2540 Dole Street
Honolulu, Hawaii 96822

Dear Dr. Young:

SUBJECT: YOUR LETTER OF NOVEMBER 23, 1977, RELATING TO THE HALAWA STREAM MAINTENANCE DREDGING PROJECT EIS

Thank you for your comments on the subject EIS. The following responses are submitted.

1. We concur that alternative measures to dredging as a flood control practice may be feasible. However, flood control is only one of the reasons for which the proposed maintenance project is being undertaken. Reducing the potential for siltation of Pearl Harbor is another major purpose of the project. As stated in Chapter IV, Section D, page 43, these other flood control alternatives were rejected as inadequate for controlling siltation in the harbor. The dredging program was selected as the most feasible means, economically and environmentally, for satisfying both objectives.

2. Modifications of the Kamehameha Highway Bridge as a flood control measure, also fails to fulfill the dual purpose of this project. Removing the obstructions caused by the Kamehameha Highway Bridge would accelerate stream discharge into Pearl Harbor. However, this would not increase the estuary's ability to trap sediment before it reaches Pearl Harbor. In fact, removal of bridge obstructions would increase siltation of Pearl Harbor. Therefore, the proposed dredging project is a more feasible alternative for accomplishing both flood control and sediment trap objectives.

3. We concur with your statement that the dredged and dewatered spoil material may not be suitable for agricultural purposes. Agricultural use of dredged material was not proposed in the report. However, depending on the magnitude of chlorides and cost of treatment, the material may be used at recreational areas such as parks or golf courses as described in the EIS.

4. We agree that future dredging and spoil disposal may be needed some time in the future as sedimentation within the estuary increases. Acting as a sediment trap to prevent siltation of Pearl Harbor is part of the purpose of the project. However, the period of time before dredging again becomes necessary may be longer than 10 to 15 years. As indicated in Chapter II, Section B, the heavy construction period of the early 1970's (Aloha Stadium, H-1 Freeway, stream channelization and housing construction) which occurred within the Halawa Stream drainage area was the major factor in the rapid sedimentation that took place since the stream's dredging in 1965. Since much of this area is presently built up, and with stricter regulations for grading and erosion control, future sedimentation would probably occur at a much slower rate. Also, if a permanent spoil disposal site is used presently, it may also be available when dredging again becomes necessary.

Very truly yours,

for WALLACE MIYAHIRA
Director and Chief Engineer

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Department of Housing and Community Development
City & County of Honolulu

October 24, 1977

Environmental Quality Commission
550 Halekauwila Street, Rm. 301
Honolulu, Hawaii 96813

Gentlemen:

Subject: Halawa Stream Maintenance Dredging
Environmental Impact Statement

Thank you for the opportunity of reviewing the subject environmental impact statement.

We have no objections to the project.

Per your request we are returning the copy of the EIS forwarded to us.

Sincerely,

TYRONE T. KUSAO

TYRONE T. KUSAO
Director

cc: Office of Environmental Quality Control
Department of Public Works, ✓
City and County of Honolulu

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU HAWAII 96813

FRANK F. FASI
MAYOR

GEORGE S. MORIGUCHI
DIRECTOR

TO Env'l Engg

77/EC-9 (JW)

November 10, 1977

MEMORANDUM

TO : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

FROM : GEORGE S. MORIGUCHI, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT
HALAWA STREAM MAINTENANCE DREDGING

We suggest that the disposal site for the dredged material be determined prior to application for a Shoreline Management Permit for the above. If the site is located within the Shoreline Management Area (SMA), the permit request should include details on the method of disposal. Site #1 is the only dewatering location mentioned in the EIS which is in the SMA. However, all three of the potential final land disposal sites (i.e. Ted Makalena Golf Course, Waianae Regional Park and Waipahu Garden Park) are in the SMA. The ocean disposal site, of course, would not be in the SMA.

As disclosed on Page 38 of the EIS, the decision not to dredge deeper than the -4.5 foot level will mean that either some surrounding residences will have to be flood-proofed or a 1,200 foot levee or reinforced block wall will be constructed along the flood-threatened section of the north bank. If the latter alternative is selected, the project will require a Shoreline Management Permit. Since the dredging, spoil disposal and subsequent flood-prevention measures would all be part of a single action, we feel it advisable to apply for a single permit covering all these aspects.

GEORGE S. MORIGUCHI
Director of Land Utilization

GSM:mh

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

801-12-0028

January 26, 1978

TO : MR. GEORGE S. MORIGUCHI, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

SUBJECT: YOUR MEMORANDUM OF NOVEMBER 10, 1977, RELATING TO THE HALAWA STREAM MAINTENANCE DREDGING PROJECT EIS

Thank you for your comments of the subject EIS. The following response is submitted.

A disposal site for the dredged material will be selected prior to the application for a Shoreline Management Area permit for this project. If the disposal site is located in the SMA, and should a levee or block wall construction for floodproofing be included with this project, a single permit will be requested for all the work.

for WALLACE MIYAHIRA
Director and Chief Engineer

CITY AND COUNTY OF HONOLULU

770823

FRANK F. FASI
MAYOR

HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

KAZU HAYASHIDA
DIRECTOR

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CITY ENGINEER'S OFFICE
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Environmental Quality Commission
550 Halekauwila St., Room 301
Honolulu, Hawaii 96813

Gentlemen:

Environmental Impact Statement for the Halawa Stream Maintenance Dredging

We have reviewed the Environmental Impact Statement for the above subject and are satisfied with its discussion on traffic impact.

Very truly yours,

(for) KAZU HAYASHIDA
Director

cc: Gov. Ariyoshi
DPW