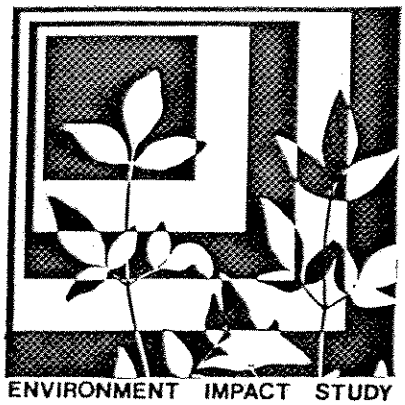

ENVIRONMENT IMPACT STUDY CORP.

KAUKONAHUA-POAMOHO STREAM IMPROVEMENTS

Revised

Environmental Impact Statement

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813 ● (808) 523-4411

FRANK F. FASI
MAYOR

TYRONE T. KUSAO
DIRECTOR

79/EC-6(SE)
LU6/80-2826

July 3, 1980

Mr. Donald Bremner, Chairman
Environmental Quality Commission
State of Hawaii
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Mr. Bremner:

Revised Environmental Impact Statement
For the Kaukonahua - Poamoho Stream Improvements
Waialua, Oahu, Hawaii

On behalf of the Mayor of the City and Councy of Honolulu, we are notifying you of our acceptance of the above as an adequate fulfillment of Chapter 343, HRS, requirements. Our Acceptance Report is attached. By copy of this letter, we are also informing the proposing agency of our decision.

Very truly yours,

TYRONE T. KUSAO
Director of Land Utilization

TTK:sl
Attach.

cc: DPW

7/25/80

DEPARTMENT OF LAND UTILIZATION July 3, 1980

ACCEPTANCE REPORT: REVISED ENVIRONMENTAL IMPACT STATEMENT FOR THE KAUKONAHUA - POAMOHO STREAM IMPROVEMENTS, WAIALUA, OAHU, HAWAII

A. Background

The Environmental Impact Statement (EIS) was filed by the Department of Public Works (DPW) of the City and County of Honolulu. It describes the anticipated environmental effects of the construction of improvements to the stream banks of the Kaukonahua and Poamoho Streams. The intent of the project is to provide improved protection against flooding for the low-lying residents of the Kiikii subdivision.

City and County funds will be used for construction of this project, so the provisions of Chapter 343, HRS, are applicable.

The project was assessed by DPW and the EIS was prepared by Environmental Impact Study Corporation. The mayor is the final "Accepting Authority" for this EIS.

B. Procedures

1. The DPW issued an EIS Preparation Notice which was published in the EQC Bulletin on June 8, 1979. Organizations and persons consulted during preparation of the EIS are listed in Exhibit A. All parties who were consulted or who requested to be consulted had 30 days to submit comments and received a written response from DPW, in accordance with Section 1:41 of the EIS Regulations.

2. The EIS was filed with the EQC, which distributed the document to the persons and organizations listed in Exhibit B. The deadline for comments was January 7, 1980, which allowed for a 30-day review period.

3. The DPW made a point-by-point response to all comments on the EIS. The Revised EIS, which included these responses, was submitted to the Department of Land Utilization for acceptance on June 24, 1980. Twenty copies were also transmitted to the EQC.

C. Content

The Revised EIS meets all the basic content and style requirements specified in Sections 1:42 and 1:43 of the EIS Regulations.

D. Response

The DPW made an adequate point-by-point response to all comments submitted during the official review period.

E. Determination

The revised EIS is determined to be acceptable under the criteria for acceptance established in Section 1:71 of the EIS Regulations.

~~APPROVED~~

TYRONE T. KUSAO
Director of Land Utilization

TTK:sl

DEPARTMENT OF PUBLIC WORKS

CITY AND COUNTY OF HONOLULU

REVISED

ENVIRONMENTAL IMPACT STATEMENT

FOR THE

KAUKONAHUA-POAMOHO STREAM

IMPROVEMENTS

WAIALUA-HALEIWA, OAHU, HAWAII

TMK 6-6-22, 24, 25, 27
6-7-06, 09

Submitted Pursuant to Chapter 343

Hawaii Revised Statutes

Proposing Agency:	Department of Public Works City & County of Honolulu 650 South King Street Honolulu, Hawaii 96813
Responsible Official:	Wallace Miyahira JUN 0 9 1980 Wallace Miyahira Date Director and Chief Engineer
Accepting Authority:	Mayor City and County of Honolulu
Prepared for:	First West Engineers, Inc.
Prepared by:	Environment Impact Study Corp.

JUNE, 1980

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SUMMARY

KAUKONAHUA-POAMOHO STREAM

(Tax Map Key: 6-6-22, 24, 25, 27
6-7-06, 09)

WAIALUA-HALEIWA, OAHU, HAWAII

PROPOSED PROJECT:	KAUKONAHUA-POAMOHO STREAM IMPROVEMENTS AT WAIALUA-HALEIWA, OAHU, HAWAII
PROPOSING AGENCY:	DEPARTMENT OF PUBLIC WORKS
ACCEPTING AUTHORITY:	MAYOR CITY AND COUNTY OF HONOLULU

The proposed action consists of public works improvements at the confluence of Kaukonahua and Poamoho Streams, which consists of a raised stream bank protection and a realignment of the stream confluence. The mouth of Poamoho Stream will be realigned to facilitate its stream discharge with Kaukonahua Stream, and a raised stream bank protection will be provided for portions of Kaukonahua Stream at its confluence with Poamoho Stream. The design of improvements has been based on the 100-year storm discharges determined by the U.S. Army Corps of Engineers.

The project area is located in Waialua-Haleiwa, Oahu. The community is primarily agriculture-oriented, with the Waialua Sugar Company being the major agricultural enterprise in the area. Most of the land is in agricultural or residential use.

The majority of structures in the Waialua-Haleiwa area are wooden buildings in very good to dilapidated condition.

The project development will generate short-term construction-related impacts affecting air quality, noise levels, erosion, water quality and traffic. These impacts will be mitigated by appropriate measures. In addition, aquatic and terrestrial wildlife and vegetation may be temporarily disturbed by construction occurring around and within the streams.

Long-term impacts resulting from the project will include increased safety for residents and property and minimized stream bed erosion. The change in the natural aesthetics of the existing stream may create a visual impact.

Most of the short-term adverse impacts that will be generated from the proposed project are associated with construction activities. Mitigative measures will be taken to minimize such impacts. Increased turbidity from construction activities within the stream will be unavoidable but temporary until construction is completed. Site clearing and grading activities along the stream banks will remove vegetation which provide habitat for wildlife. The wildlife in the project area does not include any endangered species. It is anticipated that stream fauna will return to the area upon project completion.

Alternatives considered included (1) no action, (2) floodproofing consisting of a raised stream bank, (3) full channel improvements, (4) relocation, and (5) partial channel improvements. In the no action alternative, potential property damage, injuries and loss of lives would still exist. Concrete lined slope protection was considered as an alternate bank lining for a raised stream bank but was not selected due to soft and loose subsurface soil conditions. Full channel improvements would entail higher costs and more extensive environmental impacts. Relocation of residents away from the flood hazard area would create severe social and economic impacts. Partial channel improvements would involve higher costs and additional environmental impacts.

The improvements provided will result in a reduction of flood damage and erosion. This will enhance and preserve the flood plain for future use. Economic losses caused by inundation of residential, commercial and agricultural lands will be reduced, thus enabling productivity to proceed without sudden and severe interruptions.

The construction materials, public funds, energy and labor involved in this project will be irreversibly and irretrievably committed. Land will be committed for the duration of the flood controls.

The City and County of Honolulu's General Plan designates the Waialua-Haleiwa area as residential and agricultural.

Residential zoning (R-3 to R-6) and agricultural zoning (AG) predominate, with commercial (B-2) areas located near community areas and along major thoroughfares.

Portions of Waialua-Haleiwa have been designated as flood hazard areas and the comprehensive zoning code is expected to be amended to comply with Federal requirements regarding flood plain management. New construction and future land use will be affected by the Flood Plain Management program.

The project area is classified for urban and agricultural use on State land use maps.

SECTION I

SECTION 1

DESCRIPTION OF THE PROPOSED PROJECT

I. INTRODUCTION

The Poamoho-Kaukonahua Streams confluence is located in the Waialua-Haleiwa district on the northwestern coast of Oahu, Hawaii, as shown in Figures 1-1 and 1-2. Poamoho and Kaukonahua Streams merge to form Kiikii Stream, which subsequently empties into Kaiaka Bay.

The project area is located in a semi-urban community which is economically dependent on the sugar cane industry. The area is subjected to recurring floods, which have caused much damage. Flooding is widespread along Kiikii Stream downstream of the Kaukonahua-Poamoho confluence. Most of the flooding occurs along the east bank because of the low elevation of the land in this area. Almost all of the land in this stretch is below elevation 10. Only a few homes are situated in this area, as most of the land is in agricultural use.

Flooding is also a problem along Poamoho Stream and Kaukonahua Stream. Along Poamoho Stream, most of the flooding occurs along the north bank, where much of the area is below elevation 15. Almost all of this area is presently in agricultural use. Along Kaukonahua Stream, flooding and erosion occur along the west bank. Homes located in this reach that are at or below elevation

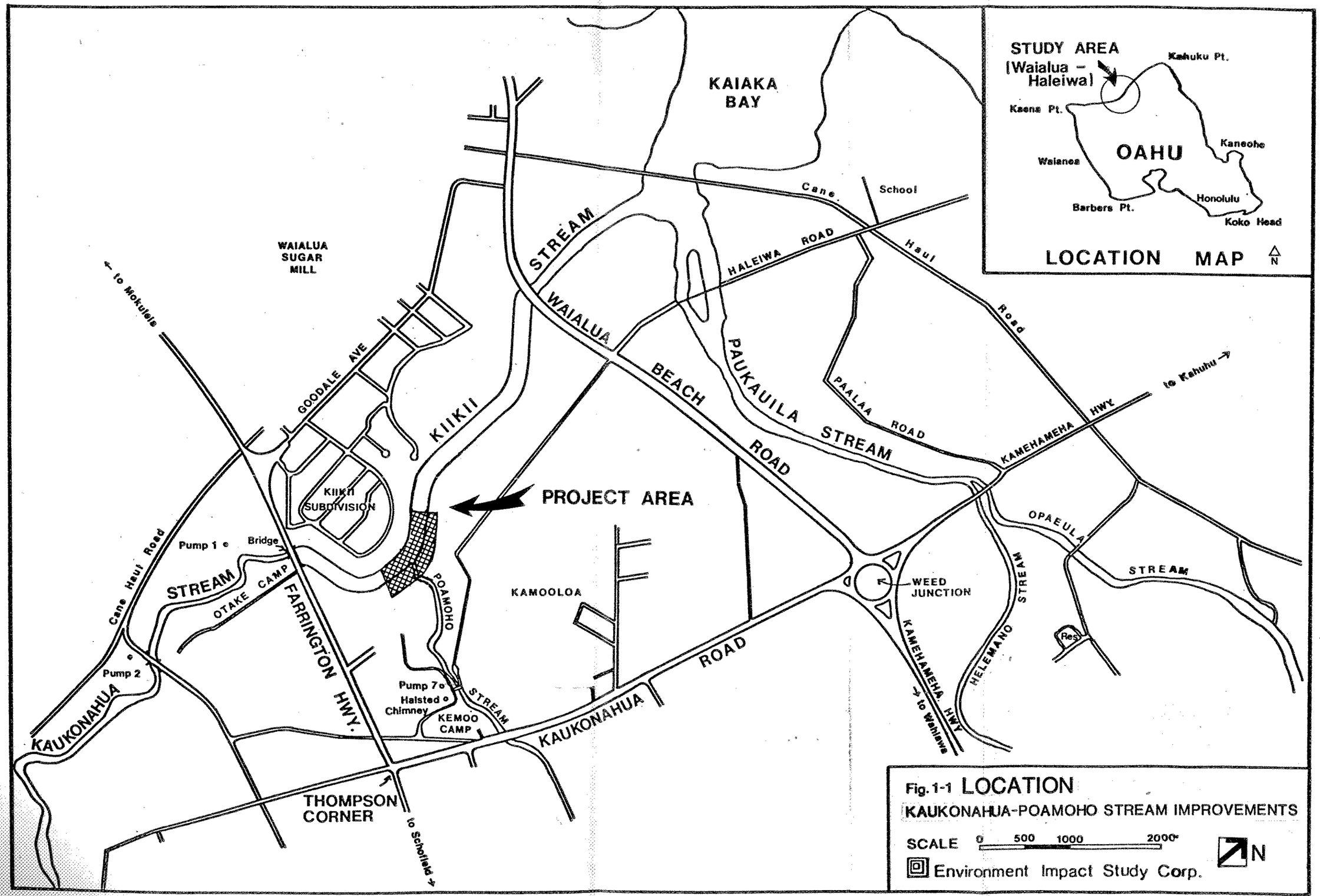

Fig. 1-1 LOCATION
KAUKONAHUA-POAMOHO STREAM IMPROVEMENTS
SCALE 0 500 1000 2000'
Environment Impact Study Corp.
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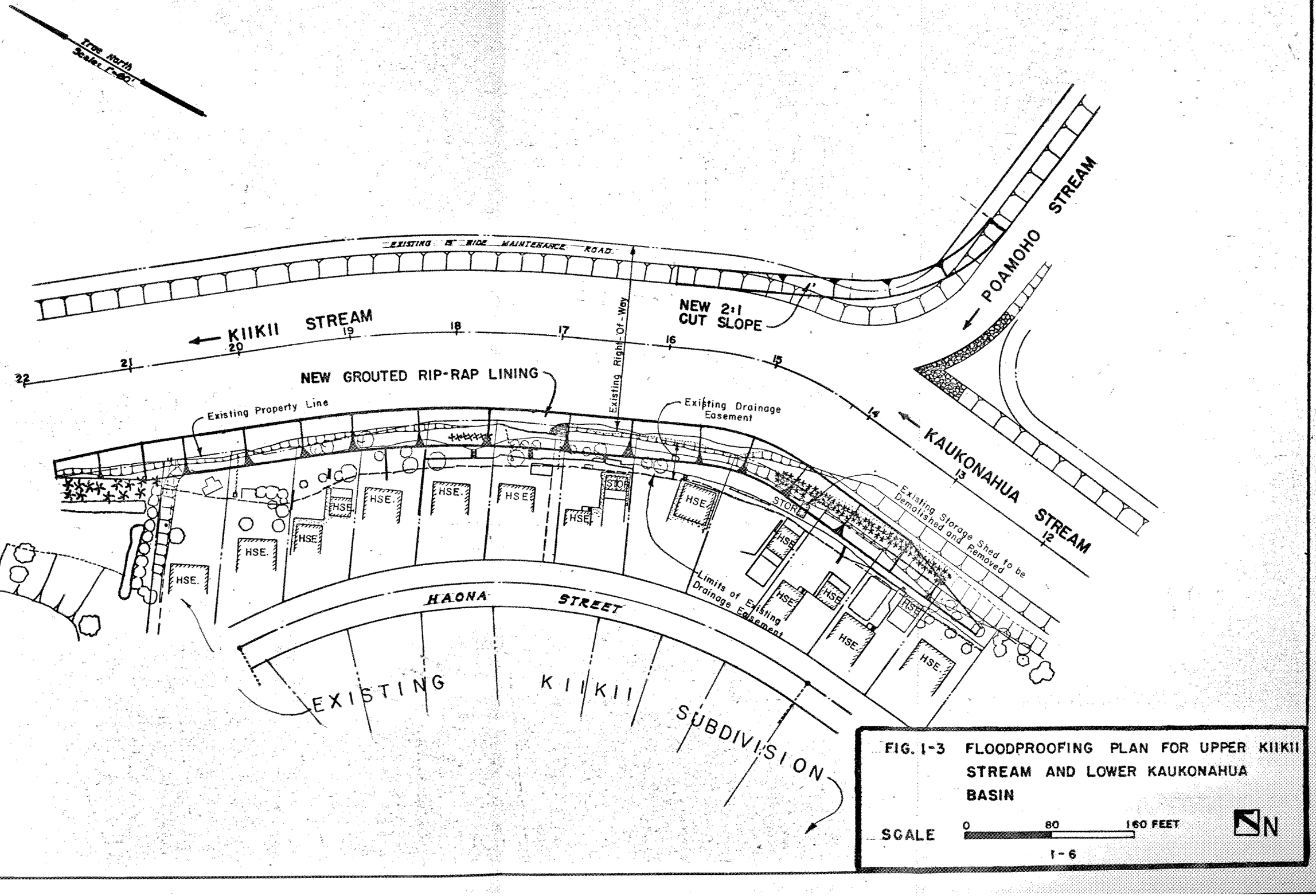

FIG. 1-3 FLOODPROOFING PLAN FOR UPPER KIIKII STREAM AND LOWER KAUKONAHUA BASIN

SCALE 0 80 160 FEET

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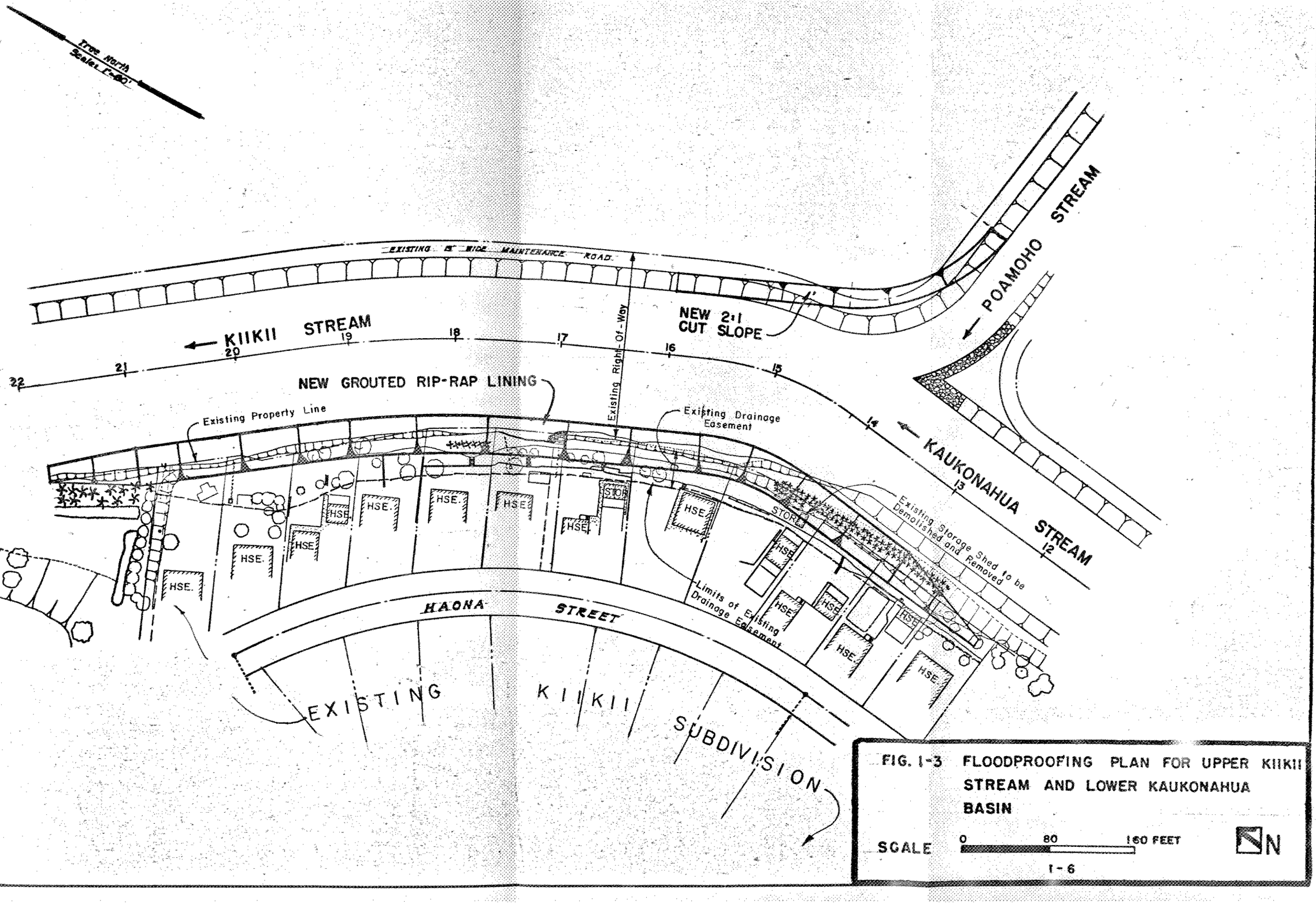

FIG. 1-3 FLOODPROOFING PLAN FOR UPPER KIIKII STREAM AND LOWER KAUKONAHUA BASIN

SCALE 0 80 160 FEET

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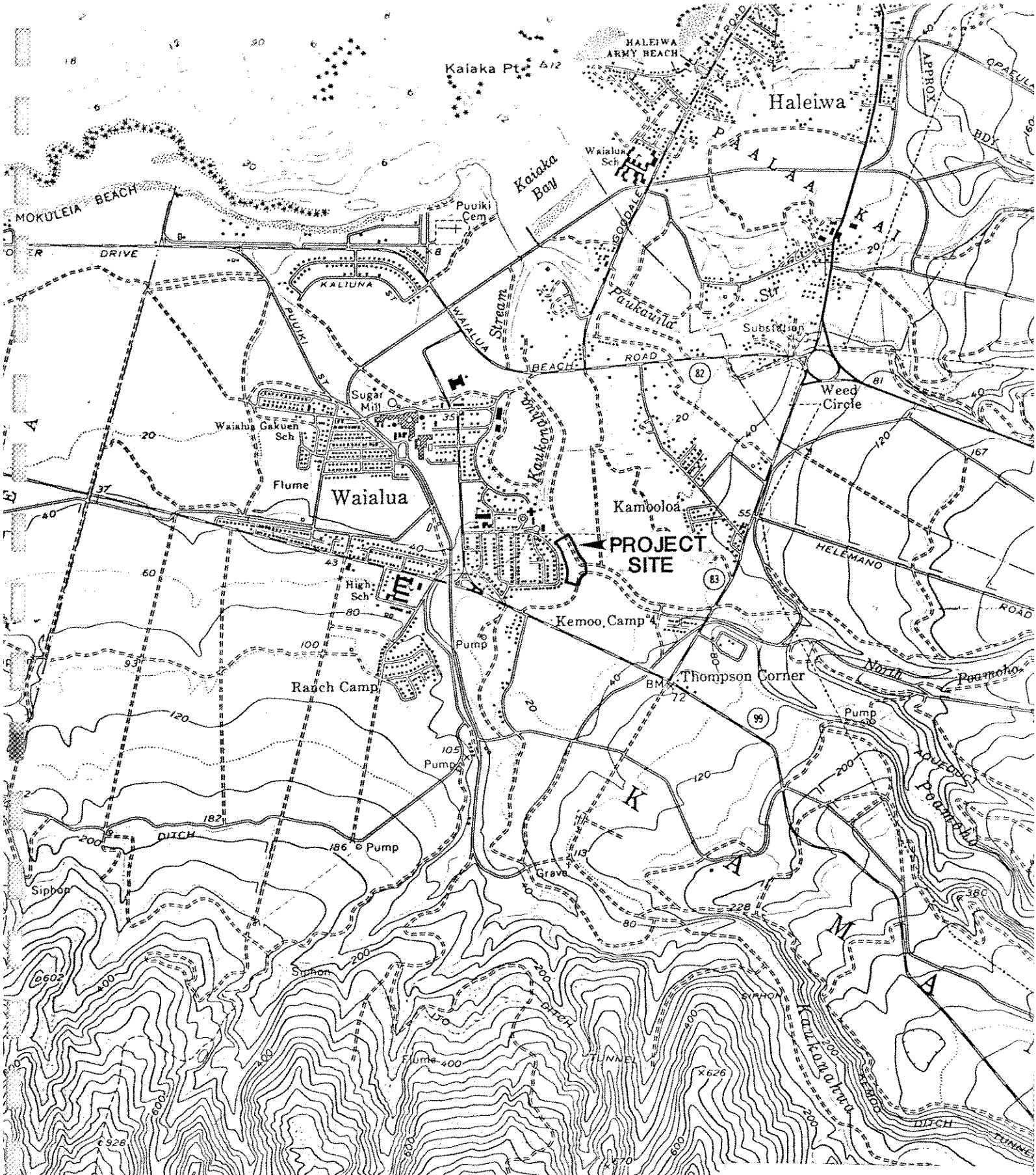


FIGURE 1-2
PROJECT VICINITY

15 are subject to flooding conditions. Approximately 25 homes within Kiikii Subdivision are located along this left bank and are subject to flooding. Twelve of the homes abut the west bank of Kaukonahua Stream, and the other 13 are across Haona Street.

The nearby Farrington Highway Bridge over Kaukonahua Stream is another problem area, according to residents. The channel constructions associated with this bridge cause erosion along the upstream and downstream banks, which subjects the homes to further damages during flood conditions.

Annual losses, based on damages possible for a 100-year flood, are estimated at $207,000 (Table 2-4). Of this, $199,000 is related to residential damage. Specific examples of the flood-related damage within the project area include the following:

1. Kaukonahua-Poamoho confluence - Five homes along west bank damaged on 4-19-74. Waialua Sugar Company losses estimated at $345.00.
2. Upper Kiikii Stream - Low-lying areas flooded on 2-01-69. Waialua Sugar Company losses estimated at $25,000.

The inundation of the project area is the result of the inadequate capacity of the existing streams to contain peak flows during heavy and sustained rainfall, and the low elevations of the surrounding areas. The problem is further

compounded by silt and debris which decreases the discharge capacities of the stream by plugging the stream outlets and filling the existing stream cross-sections.

The proposed project will primarily protect the 25 homes in the Kiikii subdivision abutting the confluence of the Poamoho and Kaukonahua Streams. Because of the natural confluence of the two streams in this area and the progressively weakening existing earthen dike, the homes abutting the west bank are susceptible to endangerment during flood conditions. The proposed project will provide a physical and visual protection against potential flood damages. The proposed project would provide an estimated reduction in flood losses of $150,000 annually, as shown in Table 2-4.

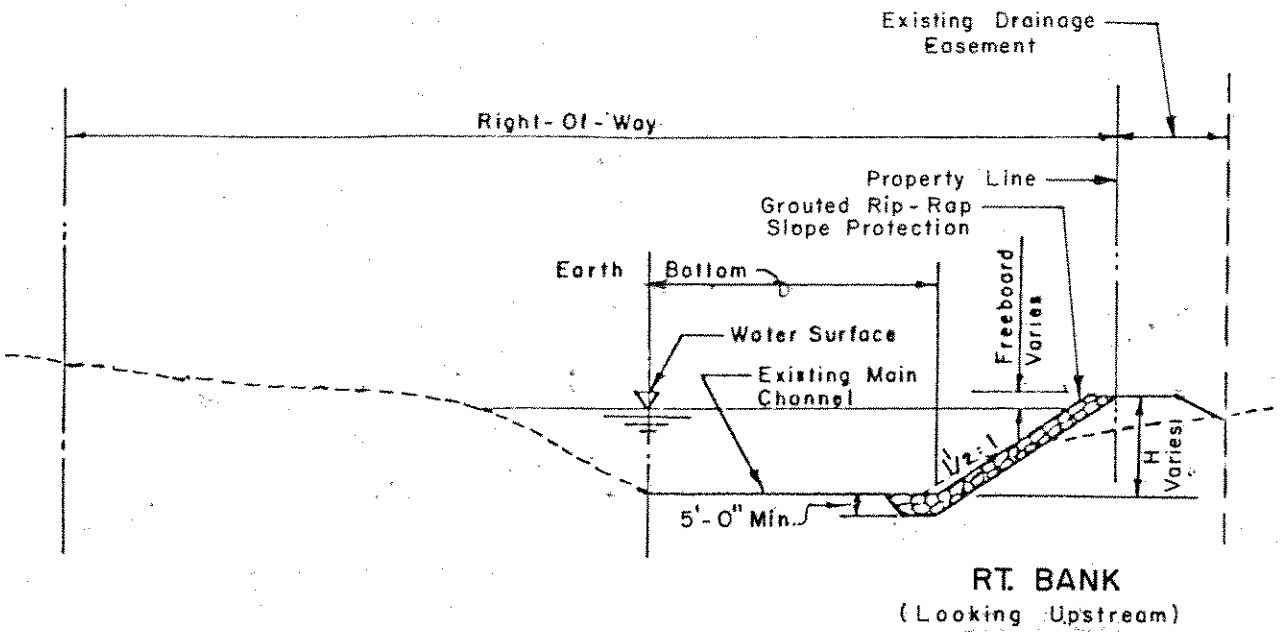
II. PROJECT OBJECTIVES

In order to minimize flood hazard along Poamoho, Kaukonahua and Kiikii Streams, the Kaukonahua-Poamoho Stream Improvements project is proposed. Its objectives include the following:

A. To minimize further economic losses due to recurring floods.

B. To protect the safety and well-being of human life.

C. To complete the proposed project with the least possible degradation of the natural and human environment.



TYPICAL SECTION

LOWER KAUKONAHUA STREAM

NO SCALE

PROPOSED SLOPE PROTECTION
KAUKONAHUA-POAMOHO STREAM IMPROVEMENTS

WAIALUA - HALEIWA, OAHU, HAWAII

FIGURE 1-4

The flood hazards associated with the Farrington Highway Bridge and the Waialua Beach Road Bridge will be considered with other Public Works projects. Such projects will be undertaken separately from the proposed project. The scope of this specific project is limited to improvements to the area of the confluence of the Kaukonahua and Poamoho Streams.

III. DESCRIPTION OF THE PROJECT

The proposed project will consist of the following public works improvements (Figures 1-3 and 1-4):

1. Construction of approximately 900 feet of stream bank improvements along the west bank of lower Kaukonahua Stream and upper Kiikii Stream in the vicinity of the Poamoho-Kaukonahua confluence. The west bank will be raised above the estimated 100-year flood level and lined with grouted rip-rap protection; and the east bank will be planted to Napier grass. The grass will be fertilized according to soil tests, and precautions will be taken to insure that fertilizer does not enter the stream. As shown in Figure 1-4, the lining of the west bank will be supported by a boulder foundation to prevent undercutting. The boulders for the foundation would measure roughly two to three feet in diameter and weigh approximately one ton. The boulder foundation will extend downward approximately five feet below the mud line. The

TABLE 1-1

ESTIMATED COST OF PROJECT

ITEM NO.	DESCRIPTION	COST
1.	Unclassified Excavation	$ 797,700.00
2.	Grouted Riprap	417,500.00
3.	Access Road	5,500.00
4.	Mobilization	73,300.00
	TOTAL COST	$1,294,000.00

outlets of the existing storm drain systems will be reconstructed and provided with flap gates to prevent backflow.

2. Realignment and widening of the mouth of Poamoho Stream.

These measures are intended to protect structures and their contents from damages, and prevent loss of lives and injuries. They are not intended to eliminate all types of flood damage. The design of the floodproofing improvements has been based on the 100-year storm discharges determined by the U.S. Army Corps of Engineers.

Riprap slope protection and concrete-lined protection with pre-stressed concrete sheet piles were structural alternatives evaluated for lining the banks described in Item 1. These alternatives, and others, are discussed in Section 5.

IV. PROJECT PHASING AND FUNDING

The proposed project will be initiated after all necessary approvals have been received. Construction time for stream improvements is estimated at 12 months.

Project costs for the public works improvements, assuming riprap slope protection, are estimated at a total of $1,294,000. Table 1-1 gives a breakdown of estimated cost. The funds will come from the City and County Public Works Improvement Fund.

SECTION 2

SECTION 2

DESCRIPTION OF THE ENVIRONMENTAL SETTING

I. LOCATION

As shown in Figure 1-1, the Poamoho-Kaukonahua Streams confluence is located approximately 1,400 feet downstream of the Farrington Highway bridge that crosses Kaukonahua Stream. The project area is located in Waialua-Haleiwa, Oahu, Hawaii.

Waialua is primarily a sugar plantation town with one of the few remaining sugar mills on Oahu. The sugar plantation of the Waialua Sugar Company is the primary economic mainstay of the region. Sugar cane fields and small truck farms predominate in this area. Service and retail establishments are dispersed throughout Waialua-Haleiwa, particularly along the major highways and residential sections. Residences range from recently constructed, modern buildings to dilapidated structures requiring extensive repairs.

II. CLIMATE

The climate of the Waialua-Haleiwa district is mild and moderately dry, with rainfall occurring primarily bewtween October and April and averaging about 30 inches per year. Temperatures range from the low 60's°F to the mid 80's°F.

III. LAND USE

Most of the flood plain is designated for residential and agricultural use in the City and County of Honolulu's General Plan. The west bank area of lower Kaukonahua Stream and upper Kiikii Stream is a residential subdivision while the east bank is planted in sugar cane. All of the surrounding areas are expected to remain in agricultural and residential use.

The State Land Use designations for the project area are Urban and Agriculture. (Also refer to Section 9).

IV. POPULATION

Most of the project area is located within Census Tract 99.02, with the extreme limits of the area encroaching into Tracts 99.09 and 100. The following information reflects the community profile for the major tract 99.02.* In 1970 the population for Tract 99.02 was 4,047 persons, which represents a 50 percent increase over the 1960 population.

Waialua Town's population had a medium age of 25 years, with 10 percent under five years of age and 7 percent 65 years and over. There were 1,023 households, averaging 4 persons per household. The 1970 median family income was $9,484, with 5 percent of the families below the poverty level, 54 percent with incomes less than $10,000 and 4

*Data taken from Community Profiles for Hawaii; Department of Planning and Economic Development, 1972.

percent with incomes above $25,000. The predominant ethnic groups in the area were Filipino (43.7 percent), Japanese (25.4 percent), and Caucasian (24.5 percent).

A large percentage of the working population were employed as laborers and farm workers (20.4 percent) and as professional and technical workers (12.6 percent). The Waialua Sugar Company is the major employer in the area.*

V. FLORA

The project area is predominantly covered with sugar cane (Saccharum officinarum). Vegetation along the stream banks primarily consists of weeds and shrubs. The stream banks are lined with koa haole (Leucaena leucocephala), vines (Ipomoea spp.), California grass (Brachiaria mutica), guinea grass (Panicum maximum), spiny amaranth (Amaranthus spinosus), and castor bean (Ricinis communis). Java plum (Eugenia cuminii), bamboo (Bambusa sp.), banana (Musa sp.), and coconut (Cocos nucifera) are also found along the stream banks. Hau (Hibiscus tiliaceus) and kiawe (Prosopis pallida) flourish in the downstream areas. At the upper Kiikii and lower Kaukonahua Stream areas, residents are using the silt deposits to plant corn (Zea mays), green onion (Agapanthus fistulosum), sweet potato (Ipomoea batatas), pumpkin (Cucurbita pepo) and soybean (Glycine max).

*Haleiwa-Waialua Manpower Profile: Labor Force and Industries Office of Social Resources, City and County of Honolulu, September 29, 1972.

VI. FAUNA

Avifauna in the flood plain consists of mynah (Acridotheres tristis), cardinal (Cardinalis cardinalis), English sparrow (Passer domesticus), and barred dove (Geopelia striata). Rats (Rattus rattus, R. norvegicus and R. exulans hawaiiensis), mice (Mus musculus domesticus), and mongooses (Herpestes auropunctatus) are probably found here. The domestic dog (Canis familiaris) and cat (Felis catus) are prevalent near residential areas. Goats (Capra hircus) were recorded infrequently.

The housefinch (Carpodacus mexicanus frontalis), spotted munia, (Lonchura punctulata), Japanese white-eye (Zosterops japonica), and lace-necked dove (Streptopelia chinensis) are also common inhabitants of the project area.

Samoan crab (Scylla serrata) and blue claw crab (Thalamita crenata) were observed from the catches of the local fishermen. The shore crab (Metopograpsus messor) is prevalent along the stream banks. Tilapia (Tilapia mossambica), mullet (Mugil cephalus), o'opu (Gobiidae), prawn (Macrobrachium lar), and mosquito fish (Gambusia affinis) are found in all streams.

Additional information on the aquatic organisms from Kiikii Stream is reported in a study prepared for the

Waialua Sugar Company.*

This study was conducted in May, 1972 and corresponded to the dry season when stream flows are lowest. The results would thus represent conditions prevailing over most of the year. During the rainy months stream flows increase and the water quality and stream fauna would then be influenced by these flows.

During this study biological communities sampled included, in part, zooplankton by day and night plankton net tows, juvenile fishes by nehu nets, the larger fishes by gill nets, and crabs by netting as normally done by crab fishermen.

Sampling stations of pertinence to this project are shown in Figure D-1, in Appendix D. There were 3 stations in the vicinity of the project area and two other stations makai of Waialua Beach Road. A summary of prominent fish catches in presented in Table 2-1. A more detailed table showing distribution and abundance of these and other species of fish is presented in Appendix D. Appendix D also contains a table showing distribution and abundance of zooplankton, a figure showing numbers and distribution of crabs at each station, and a species list.

*Draft Environmental Impact Statement on The Cooling Water Discharges in Kiikii Stream prepared by Sunn, Low, Tom & Hara, Inc., August, 1972.

TABLE 2-1

SUMMARY OF PROMINENT FISH CATCHES

KIIKII STREAM, WAIALUA, HAWAII

Fish	Stations 1, 2, 3	Stations 4, 5
Aholehole	186	27
Mullet	55	1
Goby (*Oxyurichthys*)	466	5
Barracuda	7	4
Tilapia	334	0

Fishes such as the aholehole and mullet are very commonly observed in areas of decreased salinity but are also capable of surviving in normal sea water. The goby, Oxyurichthys, is an estuarine species and is found throughout its life history in waters of low salinity. Tilapia inhabit fresh waters as well as estuarine waters, but generally they do not enter normal sea water for any extended length of time. The remaining species of fishes sampled were not in concentrations equal to the fishes previously mentioned. These fishes (barracuda, awa, maki awa, nehu, etc.) may represent forms that only occasionally enter estuarine waters where feeding and/or reproductive processes are completed.

Fishing and crabbing is done in the vicinty of the project site. Mullett and aholehole are generally favored over tilapia, and Samoan crabs over other types, according to fishermen frequenting Kiikii Stream.

VII. GEOLOGY AND SOILS

The geology of the project area is associated with the Koolau Volcanic Series.* The Koolau Range is an eroded remnant of a large Pliocene shield volcano, with a maximum altitude of 3,100 feet above mean sea level.

*Water Resources of North-Central Oahu, Hawaii, J.C. Rosenau, E.R. Lubke, and R.H. Nakahara, Geological Survey Water Supply Paper, 1899-D, 1971.

Lava flows from this volcano underlie most of the project site. Coastal plain deposits that formed after cessation of the volcanic activity consist of terrestrial and marine sedimentary deposits. Successive submergences and emergences have produced the sequences of marine and terrestrial sediments which form the Coastal Plain area. Alluvial deposits extend from below sea level to an elevation of about 350 feet above sea level and form an apron around much of the island.

The U.S. Department of Agriculture's Soil Survey Report reports that the soils in the project are comprised of the Waialua, Haleiwa, Kawaihapai and Mamala series. They consist of moderate to well-drained soils on alluvial fans on the island of Oahu. These soils developed in alluvium derived from basic igneous material.

A. Haleiwa Series

In a representative profile the surface layer is a dark brown silty clay to a depth of approximately 17 inches. The subsoil and substratum, to a depth of more than five feet, are dark brown and dark yellowish brown silty clay. The soil is neutral to slightly acid. The permeability is moderate. Runoff is very slow and the erosion hazard is slight.

B. Waialua Series

The surface layer is dark reddish-brown silty clay about 12 inches thick. The subsoil, about 14

inches thick, is dark reddish-brown and reddish brown silty clay. The soil is neutral in the surface layer and slightly acid in the subsoil. Permeability is moderate and the runoff is slow. The erosion hazard is slight.

C. Kawaihapai Series

The surface layer is dark brown clay loam about 22 inches thick. The next layer is dark brown stratified sandy loam 32 inches thick. The substratum is stony and gravelly. The soil is neutral throughout the profile. Permeability is moderate, runoff is slow and the erosion hazard is slight.

D. Mamala Series

In a representative profile the surface layer is dark reddish-brown silty clay loam about eight inches thick. The subsoil of dark reddish-brown silty clay loam is about 11 inches thick. The underlying material is coral limestone and consolidated calcareous sand. The soil is neutral to mildly alkaline. Permeability is moderate, runoff is very slow to medium and the erosion hazard is slight to moderate.

VIII. DRAINAGE AND HYDROLOGY

A. Drainage Area

The Poamoho Stream and Kaukonahua Stream drainage basins are located in the Waialua-Haleiwa district

on the northwestern coast of Oahu, Hawaii. The drainage basins are part of the Paukauila and Kiikii Streams and Tributaries Drainage Basin, which is the largest drainage basin on the island. Figure 2-1 shows the extent of the drainage basins. The Poamoho drainage basin has an area of 11,584 acres and the Kaukonahua drainage basin has an area of 25,344 acres. The basins extend from the ocean eastward to the Koolau Mountain Range and southward to the Waianae Mountain Range. Poamoho and Kaukonahua Streams are tributaries of Kiikii Stream, which discharges into Kaiaka Bay. Kiikii Stream is about one mile long and about 150 feet wide. In the estuarine portion, the average low tide depth is about 5 feet.

The tributary streams are confined to narrow valleys and have relatively steep gradients until they reach the vicinity of their respective confluences. They are perennial in their upper reaches, but intermittent in the lower reaches and are affected by tidal influences near their confluences. The mid-reaches of the tributaries are tapped for irrigation and domestic purposes. The tapped stream waters are stored in more than 30 small reservoirs along the tributaries. The Wahiawa Reservoir, with a 9200

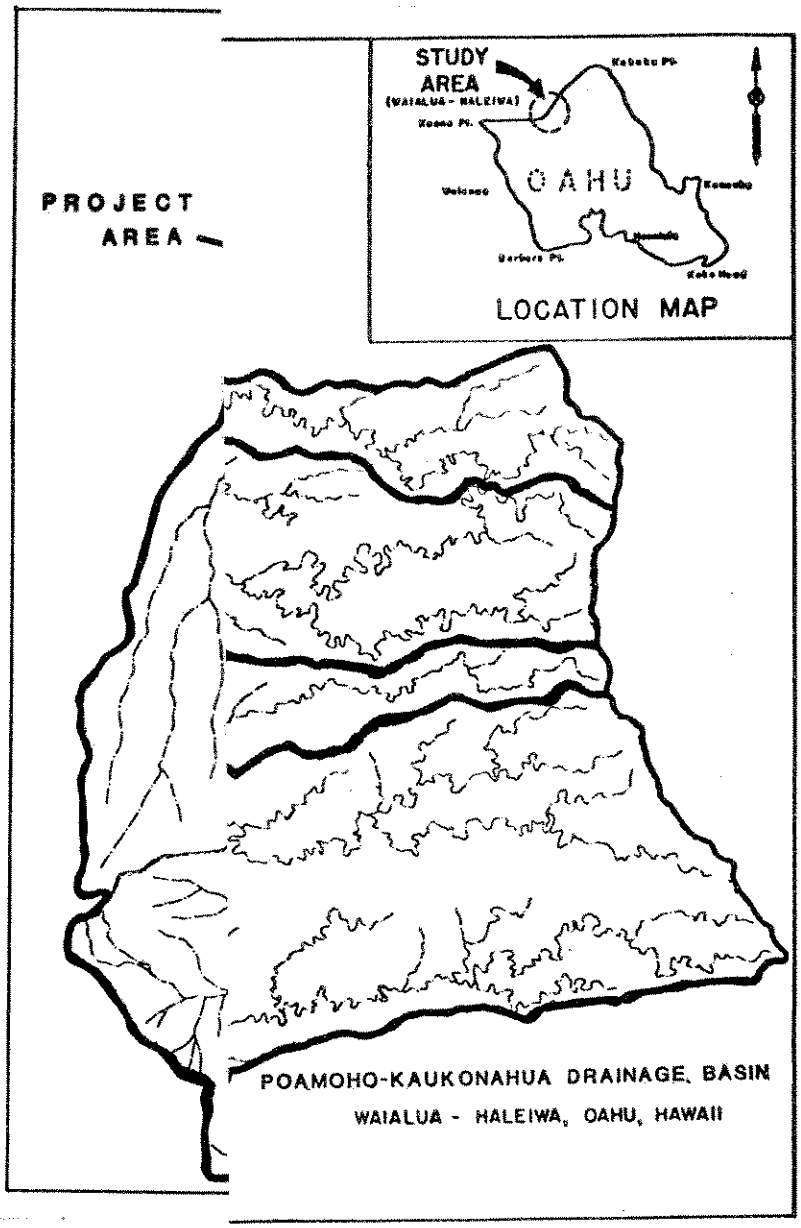

STUDY AREA
(WAIALUA - HALEIWA)
OAHU
LOCATION MAP
PROJECT AREA
POAMOHO-KAUKONAHUA DRAINAGE BASIN
WAIALUA - HALEIWA, OAHU, HAWAII

FIGURE 2-1

acre-foot capacity is located at the junction of the North and South Forks of Kaukonahua Stream. This reservoir is owned and used by the Waialua Sugar Company primarily for irrigation purposes.

The land in the upper portion of the drainage basin is a forest reserve. Approximately 13 square miles between the 700 and 1300 foot elevations is used for pineapple cultivation. Two centers of population, Wahiawa and Schofield Barracks, are located at about the 900-foot elevation along Kaukonahua Stream. About nine square miles of the watershed below the 850 foot elevation are used for sugar cane production.

B. Flooding

Flooding in Hawaii is generally caused by storms occurring predominantly between November and April; however, flooding due to intense local thunderstorms can occur at any time. In the Waialua-Haleiwa area, flooding generally occurs in the low-lying areas between elevation 30 and the Pacific Ocean because of the drainage basin topography and existing drainage-way capacities.

Flooding in this area is not related to the management of the many small irrigation reservoirs or the Wahiawa Reservoir. These waters are used solely for irrigation. The larger Wahiawa Reservoir permits recreational uses and

serves as receiving waters for secondary treated sewage effluent from the Wahiawa Sewage Treatment Plant. The management of reservoirs for flood control is a very complicated enterprise. Hydrologic forecasts of possible and probable floods must be weighed against the goal of maximizing water storage for irrigation. If the storage capacity is not available when a flood strikes, there will be little attenuation of the flood wave and the reservoirs can even be overtopped. This is compounded by the fact that flooding due to intense local thunderstorms can occur at any time, as previously mentioned. On the other hand, if the water level is lowered and the threatened flood does not materialize, valuable water supply for the next season is lost.

1. Kiikii Stream

Flooding is common along Kiikii Stream from its confluence with Poamoho Stream to Waialua Beach Road. The inadequate capacity of the existing stream cross-section and the inadequate waterway opening of the Waialua Beach Road Bridge contribute to the flooding in this area. The flood hazard posed by the bridge will be considered with a separate Public Works project. Most of the flooding occurs along the low east bank, which is below elevation 10. The majority of the land is in agricultural use but a few residences are also located here.

2. Poamoho Stream

The area from Poamoho Stream mouth extending easterly to Kaukonahua Road also suffers from the inadequacy of the existing stream cross-section to contain the flood flows. Most of the flooding occurs along the north bank, where much of the area is below elevation 15. Major portions of this area are presently in agricultural use.

3. Lower Kaukonahua Stream

Lower Kaukonahua Stream extends north from Farrington Highway. The inadequate capacity of the existing stream cross-section coupled with the natural confluence with the Poamoho Stream and the irregular stream alignment cause most of the flooding problems in this area. Homes located on the west bank situated at elevation 15 and below, are subject to flooding. Erosion along the west bank also causes further damage. Approximately 25 homes in the Kiikii Subdivision are endangered along this west bank. The area is partially protected by an earth levee. Flood damages in this area result from the weakening of the earth levee due to erosion, and the back flow of the existing storm drain system due to high stage in the stream. Back flow through the existing storm

drain system has occurred because of damages to the existing outlets of those systems. The proposed increased height of the bank protection will be beneficial in protecting against the possible over-topping potential of the existing lower earth levee. The existing damaged outlets would be reconstructed on a stable foundation provided by the proposed grouted rip-rap lining and provided with flap gates to protect against back flow from the stream. The east bank, which is mostly below elevation 15, is subject to widespread flooding. Most of the land along the east bank is in agricultural use.

C. Hydrology

1. Variability of Flow

The U.S.Geological Survey (USGS) maintains crest-stage partial-record gaging stations on Kaukonahua Stream near Highway 99 and Poamoho Stream near Kaheaka Road.

On Kaukonahua Stream the gage measures storm flow from a 38.7 square mile drainage area. The annual maximum discharge, for a given day, for the last four years is as follows:

1975	889 cubic feet per second (cfs)
1976	2,650 cfs
1977	610 cfs (estimated)
1978	1,200 cfs

On Poamoho Stream the gage measures flow from a 10.9 square mile drainage area. The annual maximum discharge, for a given day, for the last four years is as follows:

1975	1,800 cfs
1976	1,500 cfs (estimated)
1977	1,600 cfs (estimated)
1978	250 cfs (estimated)

With water going to both domestic and agricultural users, the flows are usually extremely small during the summer months. Periods of no flow occur in both streams.

2. Stream Erosion and Deposition

Stream erosion and deposition is largely determined by the velocity of the water. An increase in velocity enables a stream to transport more and larger material and to erode more rapidly, while a decrease in velocity causes a fully loaded stream to deposit some of its load. Velocity is governed largely by the steepness of the stream gradient and also by its volume. The steeper the gradient and/or the greater the flow, the greater will be the velocity.

Since both the increased volume and the increased velocity of a stream in a flood greatly increase the load it can carry, one great flood

TABLE 2-2

100 YEAR STORM DISCHARGES

STREAM AND LOCATION	DRAINAGE AREA (sq. mi.)	Ac	100 YEAR PEAK DISCHARGE 1/ (cfs)
Poamoho Stream at confluence with Kaukonahua Stream	18.1	11,584	20,500
Kaukonahua Stream at confluence with Poamoho Stream	39.6	25,344	23,000
Kiikii Stream at confluence with Paukauila Stream	58.4	37,376	33,000

1/ Source: U.S. Army Corps of Engineers. June 30, 1976. Waialua-Haleiwa Area, Island of Oahu, Hawaii - Detailed Report on Small Flood Control Project - Termination Letter.

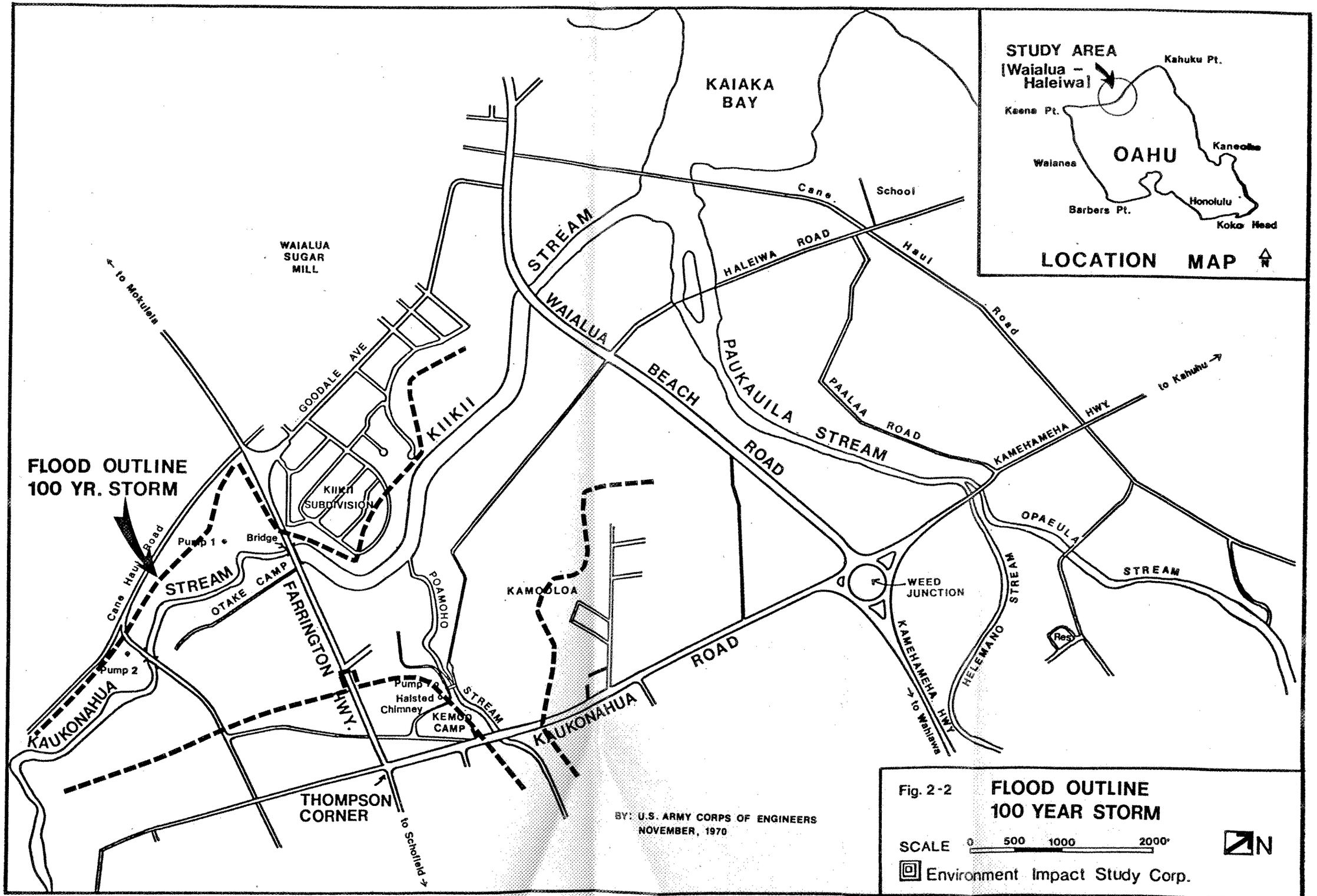

STUDY AREA
(Waialua – Haleiwa)
Kahuku Pt.
Kaena Pt.
OAHU
Kaneohe
Waianae
Barbers Pt.
Honolulu
Koko Head
LOCATION MAP
KAIAKA BAY
WAIALUA SUGAR MILL
← to Mokuleia
STREAM
WAIALUA
HALEIWA ROAD
Cane
School
Haul Road
BEACH ROAD
PAUKAUILA STREAM
PAALAA ROAD
KAMEHAMEHA HWY
to Kahuku →
GOODALE AVE
KIIKII
KIIKII SUBDIVISION
FLOOD OUTLINE
100 YR. STORM
Pump 1
Bridge
Cane Haul Road
STREAM
OTAKE CAMP
FARRINGTON HWY.
POAMOHO STREAM
KAMOOLOA
WEED JUNCTION
OPAEULA STREAM
HELEMANO STREAM
Pump 2
KAUKONAHUA ROAD
Pump 3
Halsted & Chimney
KEMOO CAMP
KAUKONAHUA
KAMEHAMEHA HWY
→ to Wahiawa
Rest
THOMPSON CORNER
to Schofield →
BY: U.S. ARMY CORPS OF ENGINEERS
NOVEMBER, 1970
Fig. 2-2
FLOOD OUTLINE
100 YEAR STORM
SCALE 0 500 1000 2000'
N
Environment Impact Study Corp.

TABLE 2-3

EXISTING STREAM CAPACITIES

LOCATION	LENGTH (feet)	DESCRIPTION	BANK CAPACITY (cfs)
Poamoho/Kaukonahua Confluence	550	Low east bank elevation of 5.0, narrow waterway and stream confluence.	3,000
Poamoho	1,900	Low north bank elevation of 8.0 and narrow waterway.	6,000
Lower Kaukonahua	1,400	Low east bank elevation of 7.5, narrow waterway and meandering alignment.	7,000

may accomplish more erosional work than a stream would accomplish over many years of normal flow.

The project area, being at the confluence of Poamoho Stream and Kaukonahua Stream is generally an area of deposition of silt and debris. The exception is during large flows, when erosion increases, particularly on the west bank. Appendix E presents data regarding depth, volume and sediment characteristics.

3. Peak Discharge and Stream Capacity

Table 2-2 shows peak discharges based on 100-year storm discharges determined by the U.S. Army Corps of Engineers. The 100-year flood is the flood level that is estimated to have a one percent chance of occurring each year in a given location. It is determined from a combination of meteorological, hydrological, and geographical conditions within the specific drainage basin. For this specific drainage basin it would also consider the effects of the reservoirs located therein. Because of the difference in the length of time that each of the streams takes to reach its peak discharges, the peak discharges for the main stream does not equal the algebraic sum of the peak discharges of the contributing branches. Figure 2-2 shows the flood outline from a 100-year storm.

TABLE 2-4

POTENTIAL FLOOD DAMAGE

LOCATION	EXISTING CAPACITY FLOW (cfs)	EXISTING CAPACITY RECURRENCE INTERVAL (yr)	100-YEAR RECURRENCE FLOW * (cfs)	ESTIMATED DAMAGE ($1,000)	ESTIMATED ANNUAL DAMAGE ($1,000)
Upper Kiikii	3,000	1	33,000	100	49 Residential
Poamoho-Kaukonahua Confluence	3,000	1	33,000	485	150 Residential
Poamoho	6,000	2	20,500	19	4 Agricultural
Lower Kaukonahua	7,000	1	23,000	12	4 Agricultural
TOTALS				616	207

*Estimated Flows provided by Corps of Engineers.

TABLE 2-4(A)

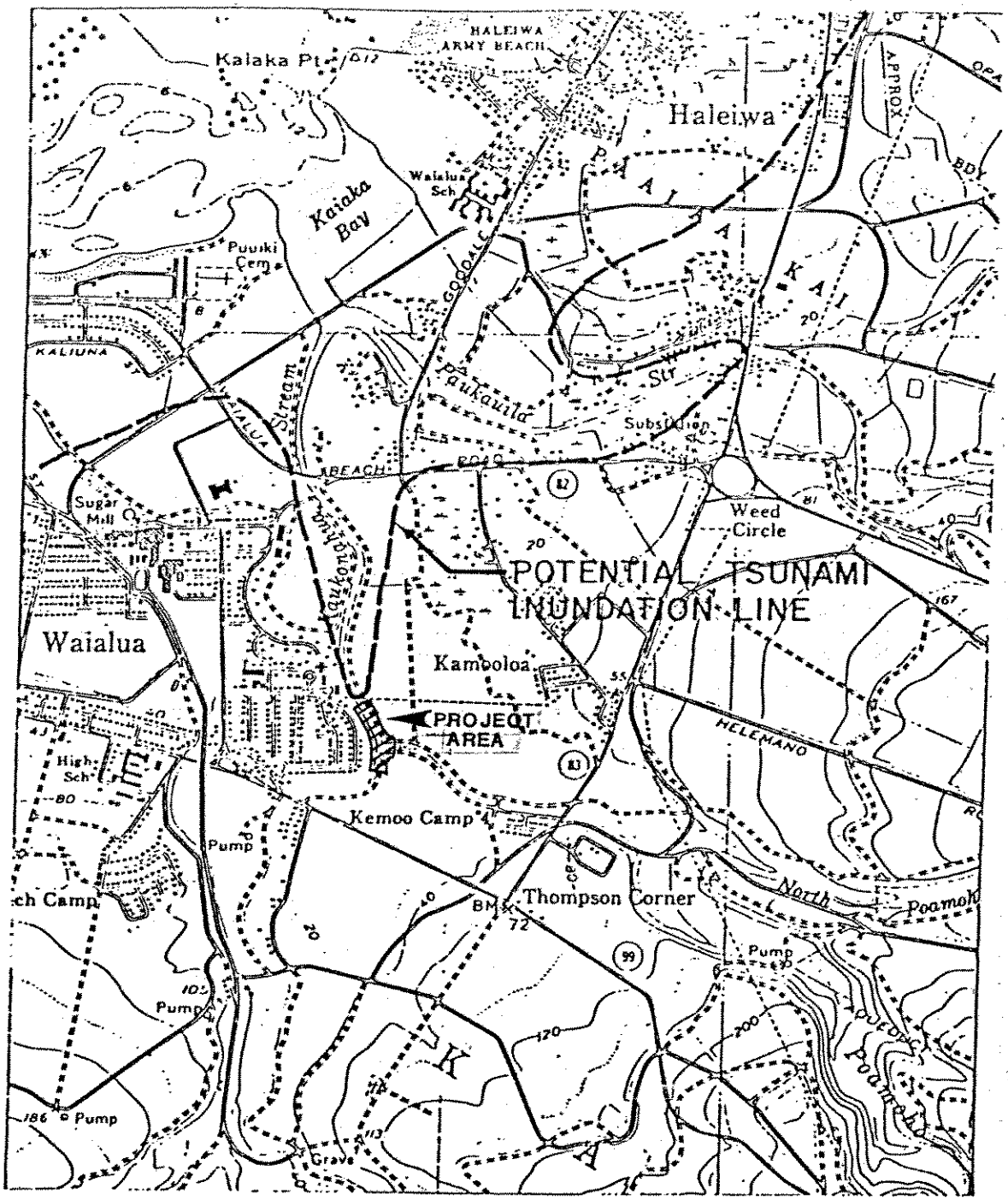
POTENTIAL FLOOD DAMAGES
WITH 100-YEAR RECURRENCE FLOOD
AT UPPER KIIKII STREAM

ORDER OF SEVERITY	RESIDENTIAL STRUCTURE & CONTENT VALUE ($)	FLOODING ABOVE FLOOR LEVEL (FT)	(%) DAMAGE	ESTIMATED DAMAGE ($)
1	1,250	4.5	87	1,084
2	1,250	3.7	70	872
3	74,778	2.8	50	37,722
4	51,815	2.8	50	26,133
5	62,073	2.7	47	29,360
6	4,803	2.6	46	2,193
7	1,250	2.0	32	398
8	4,765	1.2	15	732
9	4,273	0.8	6	270
10	17,378	0.6	0.38	66
11	54,688	0.5	0.10	53
12	54,688	0.5	0.10	53
13	44,288	0.4	0.06	27
TOTALS	377,299			98,963

TABLE 2-4(B)

POTENTIAL FLOOD DAMAGES
WITH 100-YEAR RECURRENCE FLOOD
AT POAMOHO/KAUKONAHUA CONFLUENCE

ORDER OF SEVERITY	RESIDENTIAL STRUCTURE & CONTENT VALUE ($)	FLOODING ABOVE FLOOR LEVEL (FT)	(%) DAMAGE	ESTIMATED DAMAGE ($)
1	55,090	5.4	71	38,940
2	46,570	4.7	61	28,586
3	44,623	4.7	61	27,392
4	44,415	4.7	61	27,262
5	75,105	4.6	60	44,906
6	65,718	4.0	51	33,663
7	47,250	4.0	51	24,228
8	37,095	4.0	51	19,035
9	76,320	3.9	50	38,312
10	70,558	3.9	50	35,429
11	49,580	3.9	50	24,933
12	37,628	3.9	50	18,937
13	69,808	3.8	48	33,661
14	43,505	3.5	45	19,679
15	46,688	3.4	43	20,108
16	46,953	2.8	35	16,652
17	38,850	2.5	32	12,465
18	79,245	2.1	25	20,301
19	32,893	0.6	0.28	92
20	33,408	0.5	0.25	84
21	50,985	0.4	0.22	112
22	37,628	0.4	0.19	72
23	39,910	0.3	0.17	69
24	49,495	0.3	0.15	77
25	47,320	0.3	0.15	72
TOTALS	1,266,640			485,067



KAUKONAHUA-POAMOHO
STREAM IMPROVEMENTS

WAIALUA-HALEIWA, OAHU, HAWAII

POTENTIAL TSUNAMI
INUNDATION LINE

FIGURE 2-3

Source: State of Hawaii, Civil Defense Agency

N

Existing stream capacities shown in Table 2-3 were determined from existing stream cross-sections which were assumed to be free of silt, debris, or other obstructions. The capacities were based on water surface profiles without any overflows beyond the top of the bank. A comparison of existing stream capacities with peak discharge flows show a severe inadequacy of the existing streams to contain peak flows. The addition of silt and debris compounds the inadequacy of the existing stream capacities.

Table 2-4 is a summary of potential flood damages for the Poamoho-Kaukonahua area. Potential flood damages were estimated from calculations of water levels compared to rough surveys of floor elevations for every unit in the flood plain. The U.S. Army Corps of Engineers provided baseline data regarding flooding elevations, existing floor elevations and damage estimates based on a 100-year flood recurrence interval. Estimated dollar damages were derived from current replacement costs for the degree of physical damages incurred.

Table 2-4(A) shows a breakdown of the estimated damages to the 13 homes affected in the Upper Kiikii Stream area. Table 2-4(B) shows a breakdown of the estimated damages to the 25 homes affected in the Poamoho-Kaukonahua Streams confluence area.

D. Tsunami

The project area is located adjacent to the potential tsunami inundation limit. The Tsunami Research Institute at the University of Hawaii has developed a potential tsunami inundation limit which is shown in Figure 2-3. A tsunami on March 9, 1957 affected an area from sea level to about the 13 foot elevation in the Waialua-Haleiwa area. The coastal area between Kaiaka and Waialua Bays was inundated about 3,000 feet inland.

IX. WATER QUALITY

The waters in the vicinity of the project site are classified as follows (taken from Chapter 37-A, Water Quality Standards of the State Department of Health):

Kaukonahua Stream - perennial stream, Class 2

Poamoho Stream - perennial stream, Class 2

Kiikii Stream - perennial stream and estuary, Class 2

Kaiaka Bay - embayment, Class A

Classification of the water uses of Class 2 and A waters, per Chapter 37-A, as as follows:

> "CLASS 2 - It is the objective of this class of waters that their use for recreational purposes, propagation of fish and other aquatic life and agricultural and industrial water supply be protected.
>
> The uses to be protected in this class of waters are all uses compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation in and on these waters. Such waters shall not act as receiving waters for any discharge which has not received the best degree of treatment or control compatible with the criteria established for this class. No new industrial or sewage discharges will be permitted within estuaries.
>
> CLASS A - It is the objective of this class of waters that their use for recreational purposes and aesthetic enjoyment be protected.
>
> Any other use shall be permitted as long as it is compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation in and on these waters. Such waters shall not act as receiving waters for any discharge which has not received the best degree of treatment or control compatible with the criteria established for this class. No new industrial or sewage discharges will be permitted within embayments."

Tests were conducted to determine existing water quality conditions. Sampling and field studies were made in June 1976, corresponding to the time when stream flows are lowest and construction is most likely to occur. During the dry months the flows are small and water movement in the estuarine portions of the stream is primarily dependent on tidal action.

Water quality parameters examined include temperature, salinity and conductivity, dissolved oxygen, pH, turbidity, and odor. Additional information on methods, procedures, State Water Quality Standards and collected data is presented in Appendix A.

State criteria for streams (p. A-5 to A-7) would most likely relate to Stations 1 and 2 on Figure A-1 (p. A-3), and criteria for estuaries (p. A-7 to A-8) most likely relate to Stations 3-5.

Since sampling was conducted prior to the revised standards (1979), not all of the parameters are directly comparable to State criteria (such as turbidity and dissolved oxygen). However, the following general statements can be made about Stations 1 and 2:

Temperature: Recorded temperature at Station 1 and 2 varied by up to 3°C from one another, indicating that they probably vary by more than 1°C from ambient conditions.

Conductivity: Both stations exceeded the maximum conductivity standard of 300 micromhos/centimeter, by 3 to 60 times.

pH: Recorded values for pH appear to meet the criteria for pH units.

In addition, the following general statements can be made about Stations 3, 4 and 5:

Temperature: Recorded temperaturs at Stations 3-5 did not exhibit significant variations, thus appear to be within State criteria.

Salinity: Recorded salinity at Stations 3 and 4 did not vary by more than 4%. Salinity at Station 5 varied by about 12%, as opposed to the criterion of 10%.

Existing conditions in Kiikii Stream are influenced by tidal conditions and thermal discharge from the Waialua Sugar Company Mill. Heated condenser cooling waters are discharged into Kiikii Stream at a point approximately 2,000 feet from its mouth, at a rate of 14 million gallons per day (mgd). In a report prepared for the Waialua Sugar Company, the discharge was determined to affect temperature, salinity and dissolved oxygen content.* The data collected at in 1976 at ebb tide and flood tide reflect the changes resulting from the heated discharge and tidal change. Data from 1972 is also presented in Appendix A.

X. EXISTING STREAM IMPROVEMENTS

The existing stream improvements were done in 1938 and 1974. Improvement measures included stream realign-

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*Draft Environmental Impact Statement on the Cooling Water Discharges in Kiikii Stream prepared by Sunn, Low, Tom & Hara, Inc., August, 1972.

ment and widening. The improvements consisted of:

1. Widening 4800 feet of Kiikii Stream, from Farrington Highway to Waialua Beach Road, by as much as 80 feet (1967)

2. Realigning and widening:

   a. 2400 feet of Poamoho Stream upstream of the Kiikii confluence (1938)

   b. 2200 feet of Kaukonahua Stream above Poamoho Stream confluence (1938)

3. Levees along the east bank of Kaukonahua Stream above Farrington Highway and on the west bank below the highway (1938)

The flooding which occurred even after these improvements were made strengthens the need for additional stream improvements to contain flood flows.

XI. EXISTING FACILITIES AND SERVICES

A. Access

Present access to the project area is from Farrington Highway and Kamehameha Highway. Future access will continue from these two highways with Farrington Highway being used by Mokuleia and Schofield bound traffic and Kamehameha Highway being used by Wahiawa and Kahuku bound traffic. The Department of Transportation is planning to construct an additional two-lane highway from Weed Junction to Haleiwa Beach

Road. The proposed highway will be constructed mauka (south) of the existing Kamehameha Highway and will alleviate traffic congestion in Haleiwa.

B. Water

An existing 16-inch water line parallels Kamehameha Highway with smaller 12-inch and 8-inch tie-ins servicing the outlying areas of Waialua and Haleiwa.

C. Wastewater

Cesspools and private treatment plants are used for wastewater disposal. A municipal wastewater treatment plant is proposed for this area. Planning for the Waialua wastewater treatment plant is scheduled for the 1980's. A separate sewer system will be built to serve Haleiwa.

D. Power

Power to the project area is supplied by Hawaiian Electric Company through existing overhead lines. The distribution voltage to the substations in the area is 46,000 volts, which is then reduced to 11,500 volts for general distribution.

E. Communications

Hawaiian Telephone Company provides service to the Waialua-Haleiwa area through the Waialua Central Office. The following data has been compiled for this office:
Total stations (business and residential): 4,310
Main stations (business and residential): 2,991
Total office capacity: 5,200 lines

F. Parks and Recreational Facilities

The Waialua Recreation Center is the major recreational facility in this area. Haleiwa Beach Park, Haleiwa Small Boat Harbor, and the outlying beach areas also serve the recreational needs of the community. In addition, a State park has been developed at Kaiaka Point.

The vicinity of the project site is used for fishing and crabbing by local fishermen. Boating in the stream is rare, except for crab fishing. Swimmimg is virtually non-existent. Turbidity, muddy bottom and heavy organic debris on the bottom no doubt contribute to this, as well as the accessibility of nearby swimmiming beaches.

G. Educational Facilities

Waialua High and Intermediate School is the primary educational facility in the Waialua-Haleiwa area. Feeder schools include Waialua Elementary School and Haleiwa Elementary School. Current enrollment at Waialua High and Intermediate stands at 1,072 students.

H. Police Protection

The Honolulu Police Department divides the City and County into four districts. Each district is then subdivided into individual beats. The Waialua-Haleiwa area is included in District II, encompassing

the area from Waialua to Sunset Beach. There are four beats in District II, with one beat in Waialua. Response time to the project area would vary according to the location and availability of the officer.

I. Fire Protection

The nearest fire station to the project area is located at 66-420 Haleiwa Road. There are three shifts with five men on duty per shift. The station's equipment includes a 1,250 gallon triple combination pumper and a rescue boat. An ambulance is also on duty from 7:00 a.m. to 3:00 p.m., except Mondays and Tuesdays. Approximate response time to the project site is two to three minutes, depending on traffic and weather conditions.

XII. ARCHAEOLOGICAL-HISTORICAL SIGNIFICANCE

According to information obtained through maps from the Department of Land and Natural Resources, Historic Sites Division, there are no sites of archaeological or historical significance located in the project area. If any artifacts are discovered during construction, the State Preservation Officer will be notified.

SECTION 3

SECTION 3

POTENTIAL ENVIRONMENTAL IMPACTS THAT MAY BE GENERATED BY THE PROPOSED ACTION AND MITIGATIVE MEASURES TO MINIMIZE ADVERSE IMPACTS

I. AIR QUALITY

A. Short-term Impacts

Ambient air quality may be affected by dust and emissions generated during construction, which is anticipated to last 12 months. Dust will be raised during clearing and grubbing, and trenching and back-filling activities for the duration of the construction phase of the proposed project. Emissions from internal combustion engines will also be generated.

Dust and emissions are not anticipated to cause problems. The prevailing tradewinds will disperse and dilute any emission concentrations and the contractor will be responsible for maintaining all construction equipment to minimize such emissions. Water wagons and/or temporary sprinkler systems will be used to control dust levels. Roadways near construction sites will be periodically sprinkled to control vehicular dust generation.

All construction activities will be conducted so as to minimize dust generation, and will be in compliance with the Air Pollution Control Regulations of the Department of Health. All applicable County

ordinances relating to excavation, grading and site preparation will be followed.

B. Long-term Impacts

No long-term impacts on air quality are anticipated.

II. NOISE

A. Short-term Impacts

Noise will be generated by construction vehicles and equipment. Standard construction equipment will be used and noise will generally occur in the ranges presented in Table 3-1. Noise may present a temporary nuisance to residents living near construction areas. The contractor will ensure that all equipment is operational and equipped with mufflers. Construction activities will generally be limited to the hours of 7:00 a.m. to 3:30 p.m., five days a week to mitigate construction noise. Public Health Regulations, Chapter 44-A (Vehicular Noise Control for Oahu) and Chapter 44-B (Community Noise Control for Oahu) will be observed.

B. Long-term Impacts

No long-term impacts are anticipated.

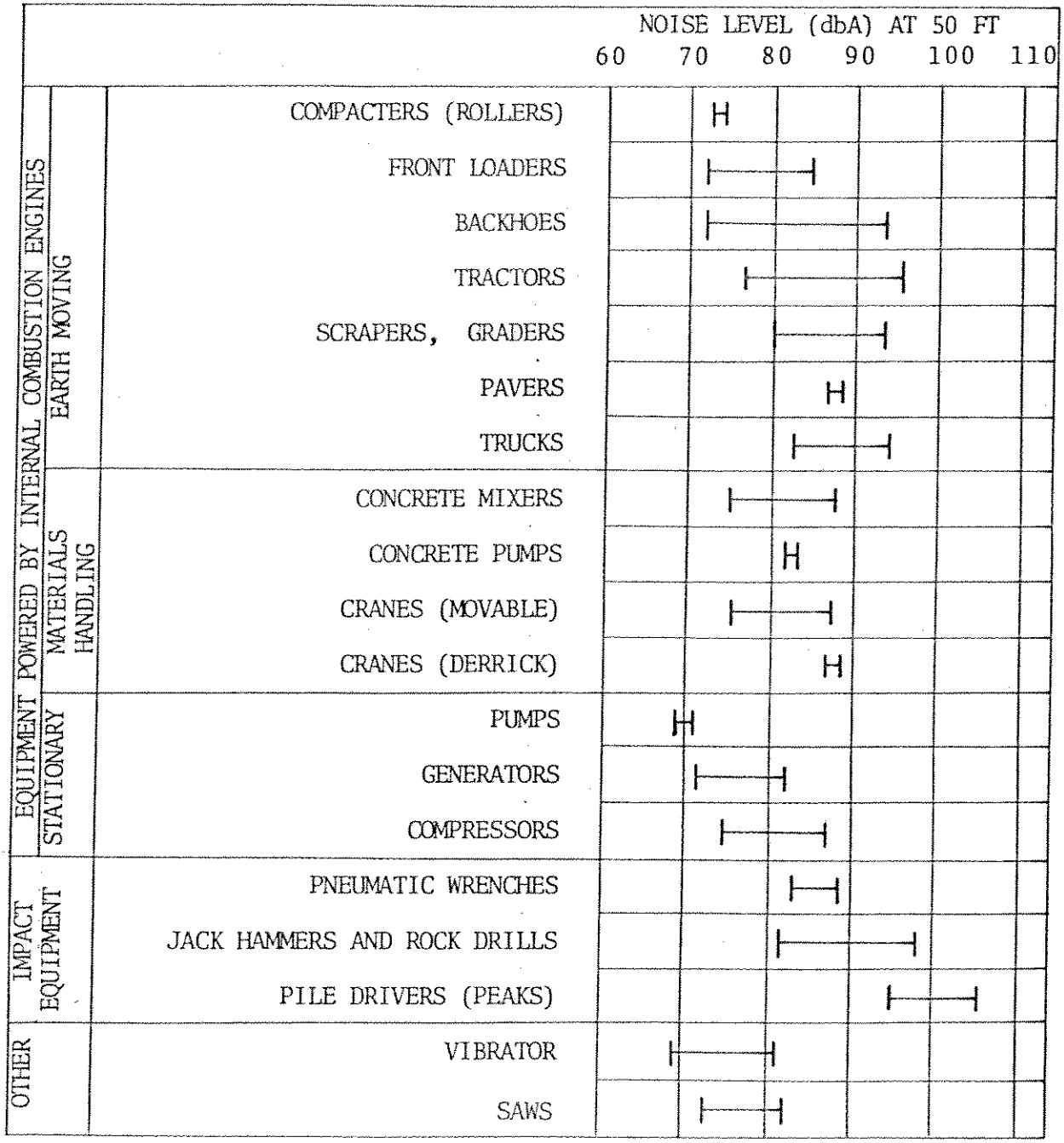
III. EROSION

A. Short-term Impacts

During construction activities, limited erosion due to clearing and grubbing may occur along the

TABLE 3-1

CONSTRUCTION EQUIPMENT NOISE RANGES



Note: Based on Limited Available Data Samples

Source: Noise From Construction Equipment and Operations Building Equipment, and Home Appliances, EPA, 1971

stream banks. However, debris from construction activities will be prevented from entering the stream and silt curtains will be used to prevent excessive spreading of highly turbid water. All cleared areas will be replanted as construction is completed.

B. Long-term Impacts

The stream bank protection from the proposed project will help to minimize erosion along the banks.

IV. WATER QUALITY

A. Short-term Impacts

Turbidity in the streams will be increased temporarily during construction activities occurring within and around the streams. The contractor will be required to provide berms and silting basins to minimize the effect of surface runoff from construction sites along the stream banks. Construction occurring within the stream will produce turbidity that will be temporary and unavoidable.

B. Long-term Impacts

The completion of the project will not reduce flood flows over cane fields and open areas. The east bank will remain at the existing elevation and continue to be inundated by the 100-year storm discharge. However, stream bank erosion will be minimized in the project area. Since the project area is located on the level area of the drainage basin, the flow

velocity will not increase significantly as a result of the proposed improvements. A natural rock slope protection and an earth bottom will be used in order to conform to the natural cross-section as much as possible. While erosion will be reduced, it is not expected to result in a significant reduction in turbidity in the downstream portion of the stream or in Kaiaka Bay. Erosion on the east bank is anticipated to remain the same.

V. TRAFFIC

A. Short-term Impacts

Heavy construction vehicles and equipment will cause temporary congestion along the major highways, and rerouting of traffic may occur where construction occurs near highways. This disruption will be reduced by the use of signal men to direct traffic flow, and traffic cones and signs to alert motorists of construction activities.

B. Long-term Impacts

No long-term impacts are anticipated.

VI. FAUNA

A. Short-term Impacts

Clearing and grading activities will remove existing vegetation which provides a habitat for mice, rats, exotic (introduced) birds and mongoose. Wildlife which will be impacted are not endangered species and are found throughout the flood plain.

Stream flow will not be cut off and debris from construction activities will be prevented from entering the stream. The increase in turbidity from construction will be temporary. Silt curtains will be used to prevent excessive spreading of highly turbid water. Since the aquatic species have survived the periodic floods and more frequent times of high rainfall, the increase in turbidity is not anticipated to be a problem. The species found here are very hardy and repopulation of the improved areas is anticipated to occur rapidly.

B. Long-term Impacts

The proposed stream improvements will minimize stream bed erosion which directly affects water quality in streams. The decrease in erosion is anticipated to have a beneficial, though minor, effect on the coastal aquatic ecosystems. A decrease in turbidity may increase light penetration which affects primary photosynthetic productivity. A decrease in sediments may also benefit the benthic habitat and reduce the smothering of sessile forms such as algae and corals.

Kiikii Stream hosts groups of endemic macrofauna that periodically migrate across the freshwater-marine interface. These diadromous organisms live and spawn in the streams but require a marine environment during their larval and post larval stages. The survival of these organisms, which include the o'opu, opae,

awa, and aholehole depend on the quality of water in stream courses and estuaries. Any decrease in turbidity from flood flows will have a positive effect on the marine and freshwater organisms in the project area.

Conversely, an increase in temperature, pH, dis solved oxygen or conductivity and a decrease in shelter will have a negative effect on the stream habitat.

Preliminary results by Timbol and Maciolel* showed that an average increase of approximately 4°C could be attributed to the warming effect of a revetment and 2°C for a cleared/realigned channel. This is due primarily to the removal of riparian (steamside) vegetation during construction of such alterations. Devegetation eliminates overhead cover and results in excessive radiant heat transfer, which leads to wider ranges in temperature (very high in the afternoons and very low in the early mornings). These fluctations, in turn, have a negative impact on fish habitat in the streams.

This should not have a significant effect upon lower Kaukonahua/Kiikii Stream, which is at least

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* Timbol, A.S. and J.A. Maciolek. 1978. Stream Channel Modification in Hawaii, Part A: Statewide Inventory of Hawaiian Streams Including Survey of Habitat Factors and Associated Biota. FWS/OBS-78/16. USFWS National Stream Alteration Team, Columbia, Missouri.

100 feet wide, because very little of the riparian vegetation presently provides much overhead cover. While Poamoho Stream is narrower and has more overhead cover, only its mouth will be realigned and a significant change in temperature is not anticipated to result from this action.

An increase in pH, dissolved oxygen and conductivity is clearly related to the presence of channelized stream sections, however, a more precise statement of the relationship is not possible at the present time.* Loss of shelter, due to the elimination of natural stream bottoms, also degrades the stream habitat, expecially for native species. However, this will not present a problem as the proposed project will be designed to retain the natural stream bottoms. In addition, grouted rip-rap will be used, with the grouting recessed. This will increase surface irregularities, which aid in the artificial substrate's ability to support benthic life.

VII. FLORA

A. Short-term Impacts

Vegetation will be removed along stream banks where construction activities occur. Vegetation

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* Hathaway, Charles B., Jr. 1978. Stream Channel Modification in Hawaii, Part C: Tolerance of Native Stream Species to Observed Levels of Environmental Variability. FWS/OBS-78/18.

around the project sites consists mainly of weeds and shrubs. Cleared areas will be grassed when construction is completed.

B. Long-term Impacts

Long-term impacts from the removal of vegetation are not anticipated. Vegetation along streams tend to reduce erosion, however, the proposed rock slopes will act as a more efficient erosion control measure.

VIII. ECONOMIC IMPACT

A. Short-term Impacts

The immediate benefit of the proposed project will be an infusion of cash and the provision of jobs to the local sector. The estimated $1,294,000 for the project may involve the purchase of some materials outside Hawaii, but it is anticipated that the major portion of the amount will be spent purchasing labor and services within the State, specifically within the City and County of Honolulu. These direct expenditures will provide direct tax revenues to the County, State and Federal governments. Wages and salaries will generate an increased demand for goods and services from construction workers and suppliers sharing in the project payments.

B. Long-term Impacts

The major economic impact of the proposed project will be to protect the property and safety of residents

currently living in the project area. In addition, the flood control program will allow additional development to occur that will be less liable to flood damage. Since the proposed project will protect an existing subdivision, the only additional development which could occur would be improvements to the existing homes. These improvements are permitted under Federal guidelines, provided they do not constitute 50% or more of the structures' current market value. The need for land acquisition is not anticipated as the existing easements are adequate for the proposed project. The determination of the level of the damages and fatalities which could occur from floods with the magnitudes exceeding the 100-year flood level and the 100-year tsunami zone is not required in maintaining consistency with the National Flood Insurance Program.

IX. AESTHETIC IMPACT

A. Short-term Impacts

Construction activities will result in the removal of vegetation and the presence of heavy construction equipment may disturb the tranquil setting of the area. These impacts to the aesthetic environment will be for the duration of the construction period. Vegetation will reclaim the cleared areas through natural introduction and grassing programs after all construction equipment has been removed.

B. Long-term Impacts

Portions of the natural, irregular cross section of the stream will be replaced by a uniform section. The change in the natural aesthetics of the existing stream may be considered undesirable from a visual standpoint but the increased protection to property and life makes this change preferable. It is anticipated that in the years to come, vines and other vegetation will reduce the man-made aspects of the improvements.

X. LAND USE

A. Short-term Impacts

No short-term land use impacts are anticipated from implementation of the proposed project.

B. Long-term Impacts

Upon completion of the project, there should not be any significant impact on land use. New construction must be in accordance with flood plain management guidelines and local building regulations. Land use will also be influenced by the new City Development Plan for the area.

SECTION 4

SECTION 4

ADVERSE IMPACTS WHICH CANNOT BE AVOIDED

I. SHORT-TERM IMPACTS

Most of the short-term, adverse impacts that may be generated by the proposed project are associated with stream improvements and construction activities. These include impacts on air quality, noise, erosion, water quality and traffic. Noise, erosion, traffic, and air quality impacts are not expected to be severe, and will be mitigated by actions discussed in Section 3. Water quality impacts from construction sites will also be mitigated, however, turbidity from construction within the streams will be unavoidable but temporary. The temporary increased turbidity is not anticipated to be a serious problem. The stream waters are normally turbid and stream inhabitants have survived periods of high turbidity during periods of high and sustained rainfall.

Vegetation will be removed during construction work and wildlife will be displaced. It is anticipated that wildlife will repopulate the area when vegetation has grown back from adjacent areas.

II. LONG-TERM IMPACTS

The primary long-term adverse impact associated with

the project will be visual. As mentioned in Section 3, the proposed improvements may be considered undesirable from an aesthetic standpoint. However, it is anticipated that vines and other vegetation will reduce the man-made aspects of the improvements to some extent.

SECTION 5

SECTION 5

ALTERNATIVES TO THE PROPOSED ACTION

I. NO ACTION

If the proposed project is not implemented, continued periodic flooding with potential property damage, injuries, and loss of life will still exist. Estimated annual damages totaling $207,000 (Table 2-3) will continue. The existing stream capacities shown in Table 2-2 will be reduced further because of additional silt and debris that will accumulate after heavy rains.

II. FLOODPROOFING ALTERNATIVE

Floodproofing measures consist of raising the existing structures above the expected flood level, sealing all flood-prone openings of the existing structures, and constructing floodwalls to keep flood flows away from flood-prone structures. At the specific location of the Kaukonahua-Poamoho Stream confluence, the existing ground conditions on the west bank are prone to continuous erosion. Therefore, the construction of a floodwall would provide a more positive means of flood protection. Such a floodwall would consist of raising the west bank of the stream at the confluence to a height above the estimated 100-year flood level. Because the bank is prone to continuous erosion, a protective lining would need to be provided.

TABLE 5-1

ECONOMIC COMPARISONS OF ALTERNATIVE ACTIONS

(Present Worth Cost in Thousand Dollars)

LOCATION	CHANNEL IMPROVEMENTS	PARTIAL IMPROVEMENTS	FLOODPROOFING IMPROVEMENTS	RELOCATION
Poamoho/ Kaukonahua Confluence	2,243	1,887	1,737	2,550

Source: Chung Dho Ahn and Associates, Inc. 1976. Engineering Report for Paukauila and Kiikii Stream and Tributaries Flood Control.

TABLE 5-1(A)

COST ANALYSIS OF ALTERNATIVE ACTIONS
AT POAMOHO/KAUKONAHUA CONFLUENCE

(PRESENT WORTH COSTS AT 6%)

COST ELEMENTS	CHANNEL IMPROVEMENTS	PARTIAL IMPROVEMENTS	FLOODPROOFING IMPROVEMENTS	RELOCATION	NO ACTION
CONSTRUCTION					
Earthwork	1,046,500	1,046,500	1,046,500		
Grouted Riprap	753,500	450,000	450,000		
Access Road	9,000	9,000	9,000		
Fencing	11,000	5,500	5,500		
Contingencies	273,000	226,000	226,000		
Sub-Total	2,093,000	1,737,000	1,737,000		
LAND ACQUISITION					
Agricultural Property (1)	150,000	150,000		150,000	
Residential Property (25)				2,400,000	
ESTIMATED DAMAGES OVER 50-YEAR PERIOD					
Residential Property (25)					2,364,000
TOTALS	2,243,000	1,887,000	1,737,000	2,550,000	2,364,000

A. Grassed Levee

As discussed on pages 2-4 and 2-5, a levee is already present in the project area. This levee has not provided adequate flood damage protection but has actually contributed to some damages. Replacing it with another similar levee was rejected because it has not proven to be a structurally sound method in this instance.

B. Alternate Bank Lining

Rip-rap and concrete-lined slope protection were structural alternatives evaluated for lining the west banks of upper Kiikii Stream and lower Kaukonahua Stream.

The subsurface soil condition along upper Kiikii Stream and lower Kaukonahua Stream was found to be soft and loose. The soft soil strata extended down to the maximum drilled depths of 45 feet. The use of concrete lining with sheet piles was not feasible because no bearing stratum which could be used to resist lateral loads was encountered. Specific data on maximum depth of scour during flood flow are not available. However, comparison of inverts of previous improvements with the latest field surveys and depth measurements indicate that existing bottom elevations are lower by one foot in some places and higher by two to three feet in others. These comparisons and the

erosion of the west stream bank. Protection of this bank is imperative to assure reasonable protection for the homes.

Assigning a cost for this alternative would be inappropriate because the danger to the homes would continue to exist. It is not possible to estimate with any confidence the amount of time it would take for the area to fill again with sediment, as this would be influenced largely by conditions of rainfall and land use in the watershed (1).

In terms of environmental impacts, water quality would be somewhat affected. Turbidity would occur at the dredge and at the discharge from the dewatering pond. 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 (2).

Other impacts would occur on the stream and estuarine fauna in the vicinity. However, studies have indicated that bottom fauna will rapidly recolonize an area after the population has been destroyed by dredging (3).

---

(1) VTN Pacific. 1977. Environmental Impact Statement for the Halawa Stream Maintenance Dredging Project. Prepared for the Department of Public Works, City and County of Honolulu.

(2) Ibid. (1).

(3) Op. Cit. (1).

In addition, it has been observed that many crabs survive passage through the pump and discharge pipe, and fish can easily escape the dredge.* Thus, long-term impacts due to dredging need not necessarily be significant.

III. FULL CHANNEL IMPROVEMENTS ALTERNATIVE

Full channel improvements involving concrete sides and bottoms was an alternate considered to contain flood flows. This alternative would entail enlarging the existing waterways, buildup of stream bank elevations and dredging of the stream bottom. Full channel improvements would adversely affect aquatic life by extensive alterations of their natural habitat, although stream water quality would be somewhat improved. The extensive improvements were not feasible due to high costs, adverse environmental effects and poor subsurface soil conditions. Refer to Tables 5-1 and 5-2.

IV. RELOCATION ALTERNATIVE

The relocation alternative consists of the acquisition of the homes and businesses that are subject to major flooding, and the relocation of residents away from the flood hazard area. The relocation alternative would be the most positive means of avoiding dangers to human life; however, it would result in a disruption of the individual lifestyles

*VTN Pacific. 1977. Environmental Impact Statement for the Halawa Stream Maintenance Dredging Project. Prepared for the Department of Public Works, City and County of Honolulu.

of the residents, including potential adverse financial and social impacts. Costs are shown in Tables 5-1 and 5-2.

V. PARTIAL IMPROVEMENT ALTERNATIVE

The partial improvements alternative considered involved widening the mainstream and lining only the west bank in this reach. The height of the lining on the west bank would be raised above the estimated 100-year flood level. Rip-rap lining would be the proper material to provide protection against the continuous erosion.

VI. SUMMARY

The proposed project will protect west bank areas from erosion and extensive flood damages. Flooding of the east bank areas, which are in agriculture, will continue. As can be seen from Tables 5-1 and 5-2, the proposed improvements will meet the project objectives at a lesser cost than the other alternatives. Table 5-1 (A) shows a breakout of the costs for each of the actions evaluated. The levels of flood damage protection (i.e. benefits) provided by the various alternatives are related to the estimated damages to residential property of $2,364,000 over a 50-year period. The environmental impacts of the proposed improvements will also be less than with the other improvements.

While relocation would have the least physical effects on the streams, it would involve a significant disruption of the lifestyles of the residents. The subdivision is an

older one, close to schools, medical facilities and employment. The present vacancy rate for housing on Oahu is approximately 1.5% (State Data Book, 1978) and; while exhaustive studies were not made, it is doubtful that replacement housing of similar quality and cost could be found for 25 households within the Waialua-Haleiwa area. Thus, social impacts are anticipated to be significant.

Partial improvements with its component of widening the existing mainstream would impact the stream bottom more severely.

Full channel improvements with its components of widening the existing mainstream and concrete bottom slab and walls would have greater impacts on stream fauna.

Of othe other floodproofing improvement alternatives, concrete lined slope protection is not considered to be a suitable substate for demersal native stream species, besides its ineffectiveness in being adequately founded in the soft and loose subsurface soil condition. Grass lined slopes, while retaining the existing natural substrate has been ineffective in providing adequate protection against the continuous erosion.

SECTION 6

SECTION 6

THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The project area is currently being used for agricultural and residential purposes. The reduction of flood damages and erosion will enhance and preserve the flood plain for future use. Economic losses caused by inundation of residential lands will be reduced, thus enabling productivity to proceed without sudden and severe interruptions.

SECTION 7

SECTION 7

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

The construction materials, public funds, energy, and labor involved in this project will be irreversibly and irretrievably committed. Land committed to the project will be for the duration of the flood controls. Vegetation removed from the project area to construct floodproofing improvements and maintenance roads will be irretrievably committed.

SECTION 8

SECTION 8

AN INDICATION OF WHAT OTHER INTERESTS AND CONSIDERATIONS OF GOVERNMENTAL POLICIES ARE THOUGHT TO OFFSET THE ADVERSE ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

As indicated in Section 3, Anticipated Environmental Impacts and Mitigative Measures to Minimize Adverse Impacts, most of the adverse impacts are short-term and related to construction activities. All adverse impacts anticipated from implementation of the proposed actions are insignificant when compared to the benefits to be gained. The protection of the project area via the proposed improvements will be in accordance with the objectives and policies of the General Plan for the City and County of Honolulu, particularly Objective B under Public Safety, which states that it is City policy: "to protect the people of Oahu and their proterty against natural disaster, traffic and fire hazards, and unsafe conditions in buildings and public areas."

SECTION 9

SECTION 9

RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES, AND CONTROLS FOR THE AFFECTED AREA

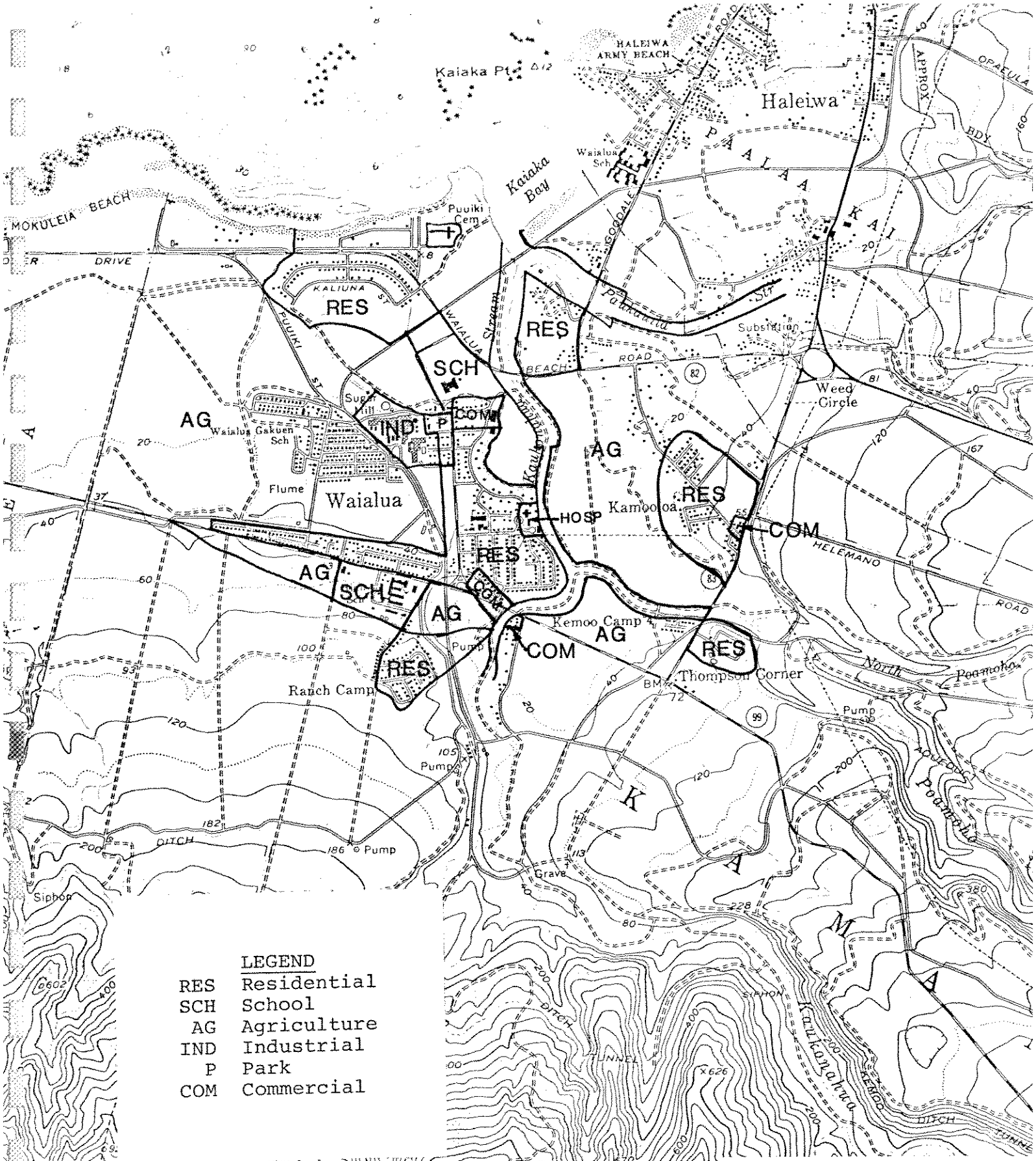
I. APPLICABLE LAND USE CONTROLS

The following land use controls apply to the Waialua-Haleiwa area as indicated below:

FEDERAL: The project area is included in specially designated flood hazard areas delineated by the U.S. Army Corps of Engineers. This flood area delineation is in conjunction with the National Flood Insurance Program administered by the Federal Insurance Administrator in the U.S. Department of Housing and Urban Development. Local government participation is required in this program. Appendix B explains the highlights of the National Flood Insurance Program.

STATE: The project area is classified in Urban and Agricultural State land use districts.

COUNTY: The 1977 City and County of Honolulu's General Plan designates the area for Residential and Agricultural use (Figure 9-1). Commercial designations are found near areas zoned for residential use. Kaiaka Point and the west bank area of Kiikii Stream above Waialua Beach Road is designated as open space. These designations may change when the new City Development Plan for the area is completed. Portions



LEGEND

RES	Residential
SCH	School
AG	Agriculture
IND	Industrial
P	Park
COM	Commercial

FIGURE 9-1
GENERAL PLAN

of the project area are zoned Residential (R-3 to R-6) with strip-zoned commercial areas (B-2) located along the main thoroughfares.

Portions of Waialua-Haleiwa have been designated as special flood hazard areas on maps prepared by the U.S. Army Corps of Engineers. These maps are presently being revised and are due for completion in February or March, 1980.

Revised flood hazard maps will be submitted with an amendment to the comprehensive zoning code to the City Council for approval. If approved, changes identical or similar to those presented in the draft amendment (Appendix C) will be instituted.

The project area is also located in the Special Management Area and a Special Management Area Permit will be required.

All new development will be subject to the following conditions:

1. It must conform to applicable zoning codes.
2. Adequate floodproofing measures must be instituted.
3. Building code regulations must be satisfied.

II. FLOOD PLAIN MANAGEMENT

The City and County of Honolulu, in conjunction with the United States Department of Housing and Urban Develop-

ment, is presently engaging in a flood plain management program resulting from the 1968 and 1973 Flood Disaster Protection Acts. As mentioned, The U.S. Army Corps of Engineers has updated special flood hazard maps delineating areas prone to inundation from flood flows. These maps outline the 100-year flood area and the 100-year tsunami zone. The County building codes are expected to be amended as a result of the 1973 Flood Disaster Protection Act. Additional information is available in Appendices B and C. The amended County building codes are expected to stipulate special anchoring of structures, special materials, and methods of construction to resist flood damage. New construction will be regulated by the new amendments. According to Federal guidelines, existing structures will be permitted to remain as long as they are not improved by 50 percent or more of the structure's current market value.

III. COASTAL ZONE MANAGEMENT

The Federal Coastal Zone Management (CZM) Act of 1972 declares that it is national policy to "preserve, protect, develop, and where possible, to restore, or enhance, the resources of the Nation's coastal zones for this and succeeding generations."

The policies of the Hawaii Coastal Zone Management Program are detailed in under "Coastal Ecosystems" (Section 205A-2(c)(4), HRS):

"(A) Improve the technical basis for natural resource management;

(B) Preserve valuable coastal ecosystems of significant biological or economic importance;

(C) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization and similar land and water uses, recognizing competing water needs; and

(D) Promote water quantity and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate State water quality standards."

The proposed project has been designed to have the least environmental impact and yet satisfy the need for floodproofing in the project area. As noted by Norton, Timbol, and Parrish*, "when administrators are faced with no alternative but to allow some form of channel alteration in a stream, an alteration leaving the stream

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* Norton, S.E., Timbol, A.S., and J.D. Parrish. 1978. Stream Channel Modification in Hawaii, Part B: Effect of Channelization on the Distribution and Abundance of Fauna in Selected Streams. FWS/OBS-78/17.

bottom in a natural state is much the best choice ecologically. " Such is the case with the proposed project.

In an effort to comply with the new State Water Quality Standards, mitigation measures will be instituted to minimize erosion and sedimentation and increase in temperature. However, as can be noted in Appendix A, some of the existing parameters of the streams do not meet the new standards.

IV. HAWAII WATER RESOURCES PLAN

The purpose of the Hawaii Water Resources Regional Study was to formulate a comprehensive plan of action to achieve the balanced conservation, development and use of Hawaii's water resources. Coordinated by the U.S. Water Resources Council, the study was conducted by an intergovernmental team representing nearly 50 agencies, with the participation of private industry and the public. The result was the "Hawaii Water Resources Plan", which was published in January, 1979.

Recommendations from the plan which are clearly pertinent to the issue at hand include the following:

"12-1 Reduce the loss of life and property damage caused by storm flooding.

Provide non-structural measures such as regulation of flood plain use, zoning, building codes, and flood insurance.

Provide structural measures such as dams, lined channels and flood proofing where non-structural measures are inadequate.

Improve flood peak records, flood mapping, and damage surveys.

24-3 Protect the beauty of waterfalls and other scenic water resources.

Preserve visual access to scenic water resources.

Acquire water rights to maintain adequate streamflow and water levels.

Prevent unsightly and damaging encroachments on scenic water areas.

Catalog pertinent on-site and off-site aesthetic values.

Develop methods for quantifying relative values."

In the plan, Waialua is listed as an area which is subject to serious storm flooding and Kakonahua and Poamoho Streams are listed as scenic water resources. According to the Plan, "water development plans must include provisions for maintaining aesthetic values of waterfalls and the scenic reaches of flowing streams."

V. FEDERAL WATER POLLUTION CONTROL ACT/CITY AND COUNTY'S "208" PLAN

The 1972 Federal Water Pollution Control Act Amendments (P.L. 92-500) set two basic goals for the nation:

1. That wherever attainable, water quality which provides for the protection and propagation of fish, shellfish and wildlife and for recreation in and on the water, must be achieved by July 1, 1983. In other words, the waters are to be "fishable and swimmable" by that time.

2. That the discharge of pollutants into the navigable water of the United States is eliminated by 1985.

The U.S. Environmental Protection Agency (EPA) administers the Act nationally and the State Department of

Health (DOH) administers it within the State of Hawaii. Section 101 (a) (5) of the Act requires that "areawide waste treatment and management planning processes be developed and implemented to assure adequate control of sources of pollutants in each State". The specific requirements for the development and contents of these plans are contained in Section 208 of the Act; hence, they are referred to as "208" plans.

The "208" plan for the City and County of Honolulu was completed by DOH and the City and County in October, 1978. Final acceptance of the plan is pending completion of the other County plans within the State.

The plan focuses on streams and coastal water quality, and suggests several "Best Management Practices" (BMP's) to reduce erosion. These are on-site pollution control measures that "allow the use of a natural resource without detriment to the envrironment or final depletion of the resource".

BMP's can be broken down into two categories: structural and nonstructural. Structural measures involve construction on or around the periphery of a land site to control sedimentation. Nonstructural measures actually slow down the erosion process and thus the amount of sediment entering a receiving water. Examples of BMP's which could be used in conjunction with floodproofing and construction are given in Appendix F.

VI. NORTH SHORE DEVELOPMENT PLAN (PRELIMINARY DRAFT)

The preliminary draft of the City and County of Honolulu's North Shore Development Plan was published in October, 1979. This is one of several Development Plans for the Island of Oahu and will undergo further revisions prior to acceptance. Policies stated in this draft ordinance include the following:

"3-02 Urban Design

1. Guidelines for Urban Design

b. Open space

3) Streams should be considered major scenic, recreational, and open space resources. They may also serve as community focal points, and be the basis for mauka-makai view corridors when viewed from roadway bridges.

A strip of land along each side of major streams should be kept free of permanent structures and landscaped so as to establish open space corridors in recognition of the scenic, recreational, and potential hazard conditions associated with streams. Major streams include, but are not limited to:

a) Opaeula, Poamoho, Helemano, Kiikii, and Anahulu Streams in Haleiwa;

b) Waimea River in Waimea;

c) Makaleha Stream in Mokuleia;

Whenever possible, public access to and along streams should be provided.

4) Existing natural stream beds should be retained and further channelization avoided whenever possible. Where channelization must occur, materials which are harmonious with the setting, such as stone, should be used.

4-03 Public Facility Systems

5. Stormwater Management System

a. The stormwater management system includes natural streams, drainage channels, drainage basins, ponds, and bridges. Natural streams and existing major channels are delineated on the Development Plan Map.

b. Drainage improvements within flood zones will emphasize natural means and retention of water with minimum reliance on structural means and rapid water transport."

SECTION 10

SECTION 10

SUMMARY OF UNRESOLVED ISSUES

As discussed in Section 9, the City and County of Honolulu is presently engaged in a flood plain management program for the Waialua-Haleiwa area. Flood hazard maps are being revised and will then be sent, with amendments to the Comprehensive Zoning Code, to the City Council for its approval. Future modifications, new construction and insurance rates will be affected by these changes. Flood control measures will probably occur after the new changes and insurance rates are in effect.

SECTION II

SECTION 11

LIST OF NECESSARY APPROVALS

1. Special Management Area Permit.
2. Hawaii CZM, Federal Consistency Certification.
3. Army Corps of Engineers Permit for Activities in Waterways (Section 404 Permit).
4. City and County grading permit.

SECTION 12

SECTION 12

ORGANIZATIONS AND INDIVIDUALS CONSULTED IN THE NOP REVIEW PROCESS

The following list includes organizations to whom the NOP was sent during the review period. Those with an asterisk are those for whom a comment and corresponding response is given on the following pages.

79 04196

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

RECEIVED
DEPT OF PUBLIC WORKS
JUN 21 2 23 PM '79
TO Engrg

PODED-PV

19 June 1979

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:

We have reviewed the Environmental Impact Statement Preparation Notice for the Kaukonahua-Poamoho Stream Improvements, Waialua-Haleiwa, Oahu, Hawaii, that was forwarded to us on 17 May 1979. A Department of the Army permit is required for the stream widening, realignment and rip-rap bank protection. We suggest that you submit your permit application for processing as soon as possible to avoid any delays in project implementation. We do not feel that proposed improvements to 1,000 feet of the stream course will significantly reduce stream bed erosion to realize any benefits in reduced water turbidity in the downstream portion of the stream or in Kaiaka Bay.

We thank you for the opportunity of participating in the review process.

Sincerely yours,

KISUK CHEUNG
Chief, Engineering Division

901-12-0418

July 30, 1979

Mr. Kisuk Cheung, Chief
Engineering Division
U.S. Army Engineer District, Honolulu
Building 230
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

Subject: Your letter PODED-PV of June 19, 1979 relating to the Kaukonahua-Poamoho Stream Improvements Environmental Impact Statement Notice of Preparation

Thank you for reviewing the Notice of Preparation. Your comments will be considered within the Environmental Impact Statement.

An application for a Department of the Army permit will be submitted at the appropriate time.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

AM/RYN:rm

cc: First West Engineers, Inc.

7904640

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
AREA OFFICE
300 ALA MOANA BLVD., RM. 3318, P.O. BOX 50007
HONOLULU, HAWAII 96850

RECEIVED
DEPT. OF PUBLIC WORKS
JUL 10 1 4- PM '79
ENVIR Engrg

REGION IX
450 Golden Gate Avenue
P.O. Box 36003
San Francisco, California 94102

July 9, 1979

TO _____ IN REPLY REFER TO:
9.1SS (Johnson/546-5554)

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

Dear Mr. Miyahara:

Subject: Kaukonahua-Poamoho Stream Improvements
Environmental Impact Statement
Notice of Preparation

The proposed action to provide improvements for the Kaukonahua, Poamoho and Kiikii Streams will minimize flooding in the Waialua-Haleiwa area.

The notice states that City & County funds will be utilized for improvements, however, should HUD CDBG funds be utilized for improvements within a designated floodplain the City and County must comply with Executive Order 11988, Floodplain Management. Compliance with the Executive Order could be easily accomplished within the framework of the EIS since it would fulfill several of the required steps.

A copy of the Water Resources Council, Floodplain Management Guideline for Implementing Executive Order is enclosed for your information.

Should you have any questions, please call Frank Johnson of our staff.

Sincerely,

Alvin K. H. Pang
Area Manager

Enclosure

901-12-0419

July 30, 1979

Mr. Alvin K. H. Pang
Area Manager
Department of Housing and Urban Development
300 Ala Moana, Room 3318
P. O. Box 50007
Honolulu, Hawaii 96850

Dear Mr. Pang:

Subject: Your letter 9.1SS (Johnson/546-5554) of July 9, 1979 relating to the Kaukonahua-Poamoho Stream Improvements Environmental Impact Statement Notice of Preparation

Thank you for reviewing the Notice of Preparation and for the copy of the Floodplain Management Guideline for Implementing Executive Order 11988.

The Environmental Impact Statement will fulfill most of the required steps of the Executive Order. Full compliance will be made should HUD CDBG funds be utilized for this project.

Very truly yours,

Wallace Miyahira
WALLACE MIYAHIRA
Director and Chief Engineer

AM/RYN:rm

cc: First West Engineers, Inc.

79 04177

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P.O. BOX 50167
HONOLULU, HAWAII 96850

IN REPLY REFER TO:

Room 6307

RECEIVED
DEPT OF PUBLIC WORKS
JUN 20 2 30 PM '79

TO Enwll
Engrg

June 18, 1979

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

Re: Environmental Impact Statement
Kaukonahua-Poamoho Stream
Improvements
Waialua-Haleiwa, Oahu, Hawaii

Dear Sir:

We have reviewed the referenced Environmental Impact Statement and it appears to adequately address the impact that the proposed project will have on fish and wildlife resources at the site, except as noted below.

Removal of shoreside vegetation and changes in the stream bank lining will result in a loss of fish and wildlife habitat. We believe that these losses may be reduced by proper construction methods and suggest the following:

1. If grouted riprap is used, the grouting should be recessed in order to increase surface irregularities. That increases the artificial substrate's ability to support benthic life.

2. Increased turbidity and siltation should be prevented by protecting exposed soils from erosion by covering them during construction and immediate reseeding after construction. If possible, silt curtains should be used to prevent excessive spreading of highly turbid water.

3. Debris from construction activities should be prevented from entering the stream.

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

Specific Comments:

Pages vi, 3-5, and 4-1. Last paragraphs. Omit or modify idea that wildlife will relocate to surrounding areas. There is nothing presented in this report to indicate that the surrounding area's carrying capacity will increase enough to absorb wildlife displaced from the project site.

We appreciate this opportunity to comment.

Sincerely yours,

Maurice H. Taylor
Field Supervisor
Division of Ecological Services

cc: HA
NMFS
HDF&G
EPA, San Francisco

901-12-0417

July 30, 1979

Mr. Maurice H. Taylor, Field Supervisor
Division of Ecological Services
U.S. Department of the Interior
Fish and Wildlife Service
P. O. Box 50167
Honolulu, Hawaii 96850

Dear Mr. Taylor:

Subject: Your letter ES of June 18, 1979
relating to the Kaukonahua-Poamoho
Stream Improvements Environmental
Impact Statement Notice of Preparation

Thank you for reviewing the Notice of Preparation. Your comments will be considered within the Environmental Impact Statement.

Grouted riprap with recessed grouting is part of the project design. Silt curtains will be considered as part of the program to control degradation of the stream waters during construction. All cleared areas will be immediately grassed as construction progresses. Careful supervision of construction operations should insure that debris is prevented from entering the stream.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

AM/RYN:rm

cc: First West Engineers, Inc.

7904043

RECEIVED
CITY & COUNTY OF HONOLULU
JUN 15 1 20 PM '79

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DEPT. OF PUBLIC WORKS
JUN 15 8 14 AM '79

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

ENV
Engrg

GEORGE A. L. YUEN
DIRECTOR OF HEALTH

VERNE C. WAITE, M.D.
DEPUTY DIRECTOR OF HEALTH

HENRY M. THOMPSON, M.A.
DEPUTY DIRECTOR OF HEALTH

JAMES S. KUMAGAI, PH.D., P.E.
DEPUTY DIRECTOR OF HEALTH

TADAO SEPPU
DEPUTY DIRECTOR OF HEALTH

June 13, 1979

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 Kaukonahua-Poamoho Stream Improvements, Waialua-Haleiwa, Oahu

Thank you for allowing us to review and comment on the subject proposed EIS. We submit the following comments for your consideration:

1. We would appreciate receiving more information on the proposed mitigation of non-point source pollution in the stream during construction. For your information, Public Health Regulations, Chapter 37-A, Water Quality Standards, and its proposed revision, does require the mitigation of non-point pollution in the stream during construction. In particular, we refer you to Section 6.A.5. of Chapter 37-A.

2. We would prefer that the following statement be amended:

   All cleared areas will be replanted as (when) construction is completed. (Top of page 3-4 of the draft EIS)

3. We recommend that measures to minimize the creation of non-point source pollution from the land to the stream, resulting in sedimentation, should be considered as an element of the project.

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,

Brian Y. I. Choy
for JAMES S. KUMAGAI, Ph.D.
Deputy Director for
Environmental Health

901-12-0416

July 30, 1979

James S. Kumagai, Ph.D.
Deputy Director for Environmental Health
Department of Health
State of Hawaii
P. O. Box 3378
Honolulu, Hawaii 96801

Dear Dr. Kumagai:

Subject: Your letter EPHS-SS of June 13, 1979 relating to the Kaukonahua-Poamoho Stream Improvements Environmental Impact Statement Notice of Preparation

Thank you for reviewing the Notice of Preparation. Your comments will be considered within the Environmental Impact Statement.

In addition to berms and silting basins, silt curtains will be considered as part of the program to mitigate pollution. All cleared areas will be immediately grassed as construction progresses. Other methods of minimizing pollution will also be discussed.

Very truly yours,

Wallace Miyahira
WALLACE MIYAHIRA
Director and Chief Engineer

AM/RYN:rm

cc: First West Engineers, Inc.

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

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

June 25, 1979

REF. NO.: APO-521
YOUR REF. NO.: 901-12-0260

Honorable Wallace Miyahira
Director and Chief Engineer
Department of Public Works
650 South King Street
Honolulu, HI 96813

Dear Sir:

Thank you for sending us a copy of the EIS preparation notice for the Kaukonahua-Poamoho Stream work.

We think an EIS is needed and that a good start has been made. We think it desirable if some idea of the relative abundance of fish in the stream is described. Also, we note that there is no indication if fishing is done at the site.

A description of fluvial dynamics and morphology would be useful as would an idea of the variability of flow.

These completed, it would then be desirable to assess the proposed improvement in terms of possible changes to fish life and characteristics of the streams.

Very truly yours,

Susumu Ono
SUSUMU ONO, Chairman
Board of Land and Natural Resources

LEND A HAND TO CLEAN OUR LAND · STATE OF HAWAII

901-12-0414

July 30, 1979

Mr. Susumu Ono, Chairman
Board of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

Subject: Your letter REF. NO.: APO-521 of June 25, 1979 relating to the Kaukonahua-Poamoho Stream Improvements Environmental Impact Statement Notice of Preparation

Thank you for reviewing the Notice of Preparation. Your comments will be considered within the Environmental Impact Statement. A discussion of the proposed improvements in relation to changes in fish life and stream characteristics will be included.

Very truly yours,

Wallace Miyahira
WALLACE MIYAHIRA
Director and Chief Engineer

AM/RYN:rm

cc: First West Engineers, Inc.

79 03968

DEPARTMENT OF GENERAL PLANNING

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

GEORGE S. MORIGUCHI
CHIEF PLANNING OFFICER

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TO Engrg

DGP5/79-1580(CT)

June 12, 1979

MEMORANDUM

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

FROM : GEORGE S. MORIGUCHI, CHIEF PLANNING OFFICER

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE FOR KAUKONAHUA-POAMOHO STREAM IMPROVEMENTS, MAY 1979
COMMENTS REQUESTED MAY 17, 1979

1. Reference to stream banks should be consistent. In one section, it is indicated that "flooding occurs along the right bank, looking downstream . . ." (p. 1-1). In another section, it is indicated that construction will involve "stream bank improvements along the right bank (looking downstream) . . ." (p. 1-4). Elsewhere, there is reference to land uses on the left bank and the right bank without indicating whether a viewer is looking upstream or downstream (p. 2-2). One convention should suffice if it is consistent throughout.

2. The design flood for which the improvements are proposed is not specified.

3. Project cost is estimated to be $1,294,000.00 (p. 1-8).

   But it is not clear what benefits will accrue beyond general statements that the project will minimize stream bank erosion (p. 3-4) and "protect the property and safety of residents currently living in the area" (p. 3-8).

   The EIS preparation notice cites two examples of flood-related damage (p. 1-3). There are estimates of Waialua Sugar Company losses, but nothing on property damage to flooded homes. It is indicated that "Estimated annual damages totaling $207,000 will continue" (p. 5-1) with the "no action" alternative, but how much of this is estimated plantation losses and how much is residential property damage is not indicated.

   The EIS should provide details on expected benefits from this proposed project and provide benefit/cost ratios for the various alternatives considered.

4. Section 10 (p. 10-1) discusses flood hazard maps and indicates that "It is unresolved as to how many residents will appeal their classification to the proper authorities for a reclassification to lower flood proofing standards and insurance rates."

   Since the appeal period ended in July 1978, it should be possible to obtain a list of those who submitted appeals from the Oahu Civil Defense Agency. Indications are that there were few appeals in the project area.

Thank you for affording us the opportunity of reviewing the preparation notice.

George S. Moriguchi (signature)
GEORGE S. MORIGUCHI
Chief Planning Officer

GSM:fmt

901-12-0411

July 30, 1979

TO : MR. GEORGE MORIGUCHI, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

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

SUBJECT: YOUR LETTER DGP5/79-1580(CT) OF JUNE 12, 1979
RELATING TO THE KAUKONAHUA-POAMOHO STREAM IMPROVEMENTS
ENVIRONMENTAL IMPACT STATEMENT
NOTICE OF PREPARATION

Thank you for reviewing the Notice of Preparation. Your comments will be considered within the Environmental Impact Statement

The terminology with reference to the stream banks will be clarified. The design of floodproofing improvements utilized 100-year storm discharges as determined by the U.S. Army Corps of Engineers.

Of the $207,000 estimated annual damage, $199,000 is residential property damage and $8,000 is damage to agricultural lands. The EIS will also provide benefit/cost ratios for the various alternatives considered.

Wallace Miyahira
WALLACE MIYAHIRA
Director and Chief Engineer

AM/RYN:rm

cc: First West Engineers, Inc.

DEPARTMENT OF LAND UTILIZATION

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813 • (808) 523-4432

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TO Env Ctl
Engg

FRANK F. FASI
MAYOR

TYRONE T. KUSAO
DIRECTOR

79/EC-6(SE)
LUS/79-1951

June 8, 1979

MEMORANDUM

TO : WALLACE S. MIYAHIRA, DIRECTOR & CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

FROM : TYRONE T. KUSAO, DIRECTOR

SUBJECT : EIS PREPARATION NOTICE FOR THE PROPOSED KAUKONAHUA-POAMOHO STREAM IMPROVEMENTS, WAIALUA-HALEIWA, OAHU, HAWAII

We have reviewed the above document and feel that you have identified the major impacts associated with the project. We are particularly pleased that you are attempting to solve a flooding problem without resorting to a channelized solution.

We would like to point out, however, that references to the "left" and "right" sides of streams throughout the Preparation Notice is confusing. You should replace these references with compass equivalents.

If you have any questions on the above matter, please contact Mr. Scott Ezer of our staff at 523-4077.

Tyrone T. Kusao

TYRONE T. KUSAO
Director of Land Utilization

TTK:sl

901-12-0412

July 30, 1979

TO : MR. TYRONE T. KUSAO, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

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

SUBJECT: YOUR MEMORANDUM 79/EC-6(SE), LUS/79-1951 OF JUNE 8, 1979 RELATING TO THE KAUKONAHUA-POAMOHO STREAM IMPROVEMENTS ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION

Thank you for reviewing the Notice of Preparation. We appreciate your comments regarding the terminology and will make the suggested changes within the Environmental Impact Statement.

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

AM/RYN:rm

cc: First West Engineers, Inc.

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GREENPEACE

913 Halekauwila St.
Hon., Hi. 96814
June 12, 1979

Richard Y. Nishizawa
Dept. of Public Works
City and County of Honolulu
650 South King St.
Hon., Hi. 96813

Dear Mr. Nishizawa,

We would like to be consulted in the preparation of the Kaukonahua-Poamoho Stream Improvements, Waialua-Haleiwa, Oahu, Environmental Impact Statement.

Sincerely,

Kelley Dobbs

GREENPEACE FOUNDATION HONOLULU, HAWAII
A NON-PROFIT ORGANIZATION • (808) 537-9505

901-12-0325

June 15, 1979

Ms. Kelley Dobbs
Greenpeace
913 Halekauwila Street
Honolulu, Hawaii 96814

Dear Ms. Dobbs:

SUBJECT: YOUR LETTER OF JUNE 12, 1979 RELATING TO THE KAUKONAHUA - POAMOHO STREAM IMPROVEMENTS PROJECT

Thank you for your letter notifying us that you wish to be consulted in the preparation of the Environmental Impact Statement for this project.

We are transmitting a copy of the Notice of Preparation for your review and comments.

Very truly yours,

E. WALLACE MIYAHIRA
Director and Chief Engineer

RYN:is
Attach.
cc: First West Engineer

LIFE OF THE LAND
A GROUP FOR ENVIRONMENTAL RESEARCH AND ACTION

June 15, 1979

Mr. Richard Y. Nishizawa
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Sir:

Life of the Land would like to be a consulted party on the EIS being prepared for the Kaukonahua-Poamoho Stream Improvements.

Please send us a copy of the EIS Preparation Notice.

When it becomes available, please send us a copy of the draft EIS.

We would appreciate the draft EIS discussing at length how the proposed stream improvements will comply with Section 205A-2(c)(4), Hawaii Revised Statutes. Generally, we are skeptical of the need for structural flood control improvements in areas of Oahu where population growth would not be in accord with either the State CZM Law or the Oahu General Plan.

Sincerely,

Doug Meller

Douglas Meller
Staff Supervisor

404 PIIKOI STREET HONOLULU HAWAII 96814 TELEPHONE 521 1300

901-12-0332

June 19, 1979

Mr. Douglas Meller
Life of the Land
404 Piikoi Street
Honolulu, Hawaii 96814

Dear Mr. Meller:

SUBJECT: YOUR LETTER OF JUNE 15, 1979 RELATING TO THE KAUKONAHUA-POAMOHO STREAM IMPROVEMENTS PROJECT

Thank you for your letter notifying us that you wish to be consulted in the preparation of the Environmental Impact Statement for this project.

We are transmitting a copy of the Notice of Preparation for your review and comments.

Very truly yours,

H E Spence

FOR WALLACE MIYAHIRA
Director and Chief Engineer

RYN:ls

Attach.

cc: First West Engineers

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LIFE OF THE LAND
A GROUP FOR ENVIRONMENTAL RESEARCH AND ACTION

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July 6, 1979

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:

Re: EIS Preparation Notice for Proposed Kaukonahua-Poamoho Stream Improvements

Despite past alterations, the streams and stream beds which would be affected by the proposed flood control measures have tremendous scenic and recreational value. It would be a great shame to degrade such natural resources in order to provide flood protection to a handful of existing houses.

We would appreciate it if the draft EIS for proposed "stream improvements" indicated the full range of non-structural alternatives available in place of construction of revetments.

We also would appreciate a serious cost-benefit analysis of all feasible non-structural alternatives to construction of revetments. If the cost-benefit ratio of buying out the front yard of existing homes for a new levee, or the cost-benefit ratio of completely buying out existing homes, or the cost-benefit ratio of doing nothing is better than the cost-benefit ratio of revetments, then this should be prominently presented and not sloughed over.

Grassed levees, unlike revetments, are visually attractive and have almost as much recreational value as natural stream beds to people who want to go fishing and crabbing.

Finally, as we indicated in our letter of June 15, 1979, the draft EIS should address project compliance with Section 205A-2(c)(4), Hawaii Revised Statutes. Failure to comply with the requirements of this section of State law may precipitate a lawsuit pursuant to Section 205A-6.

Sincerely,

Dee Dee Letts
Administrator

404 PIIKOI STREET HONOLULU HAWAII 96814 TELEPHONE 521 1300

901-12-0415

July 30, 1979

Ms. Dee Dee Letts
Administrator
Life of the Land
404 Piikoi Street
Honolulu, Hawaii 96814

Dear Ms. Letts:

Subject: Your letter of July 6, 1979 relating to the Kaukonahua-Poamoho Stream Improvements Environmental Impact Statement Notice of Preparation

Thank you for reviewing the Notice of Preparation. Your comments will be considered within the Envoronmental Impact Statement.

The EIS will discuss non-structural and structural alternatives to the proposed improvements and will provide benefit/cost ratios for the various alternatives considered. The EIS will also address project compliance with Section 205A-2(c)(4), Hawaii Revised Statutes.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

AM/RYN:rm

cc: First West Engineers, Inc.

Waialua Sugar Company, Inc.
P. O. Box 665
Waialua, Hawaii 96791

790 4071

June 14, 1979

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:

Subject: Kaukonahua-Poamoho Stream Improvements
EIS Notice of Preparation

We have reviewed the subject document and concur in its intent and the proposed action.

We believe it appropriate to mention at this time that since the stream capacity is discussed and flood plain areas outlined in the document, consideration should be given to clearing the stream bed under the Farrington Highway bridge to provide maximum carrying capacity for the stream through this structure. We believe that a very serious limitation occurs because of a buildup of the bottom, and the stream bank under the bridge on the Otake Camp side.

Although it was indicated that the flow characteristics of the stream with the bank improvements on the west side will provide little increased velocity, we wish to point out that the east bank of the stream which is to be grassed may be subject to more scouring with any increased velocity and this should be reviewed very carefully. Another point we believe is pertinent to mention is that the stream bank improvements on the west side should be provided a footing and bottom structure sufficiently wide to prevent undercutting of the wall as occurred on the first phase of the stream bank improvements near the Farrington Highway bridge.

We appreciate receiving a copy of the Notice of Preparation and look forward to the work and would be pleased to be advised on the nature of the stream bank improvement. In the event this is to be done with CRM, we may be in a position to provide some of the rock from our field stone piles at no cost at their present site. We would also be pleased to know of the planned starting date of this project.

Sincerely,

WAIALUA SUGAR COMPANY, INC.

F. C. Gross, Director
Civil Engineering and
Environmental Standards

901-12-0413

July 30, 1979

Mr. F.C. Gross, Director
Civil Engineering and
Environmental Standards
Waialua Sugar Company, Inc.
P. O. Box 665
Waialua, Hawaii 96791

Dear Mr. Gross:

Subject: Your letter of June 14, 1979 relating to the Kaukonahua-Poamoho Stream Improvements Environmental Impact Statement Notice of Preparation

Thank you for reviewing the Notice of Preparation. Your comments will be considered within the Environmental Impact Statement.

Clearing the stream bed under the Farrington Highway Bridge would be a part of the overall maintenance for the stream area. However, it will not be a part of this stream improvement project. A footing and bottom structure for the west bank improvements, as suggested, will be included in the project design.

The Environmental Impact Statement will be sent to you during the review process for your comments. The planned starting date of this project is not known at the present time.

Very truly yours,

Wallace Miyahira
WALLACE MIYAHIRA
Director and Chief Engineer

AM/RYN:rm

cc: First West Engineers, Inc.

REFERENCES

Atlas of Hawaii, Department of Geography, University of Hawaii, 1973.

Community Profiles for Hawaii, Department of Planning and Economic Development, State of Hawaii, 1972.

Draft Environmental Impact Statement on the Cooling Water Discharges In Kiikii Stream, Sunn, Low, Tom and Hara, Inc., August, 1972.

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Hawaii Water Resources Plan, Hawaii Water Resources Regional Study, Honolulu, Hawaii, January, 1979.

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1973 Flood Disaster Protection Act, Oahu Development Conference Report, November, 1975.

Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, Lanai, State of Hawaii, U. S. Department of Agriculture, Soil Conservation Service, August, 1972.

References, cont'd.

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Stream Channel Modification in Hawaii, Part B: Affect of Channelization on the Distribution and Abundance of Fauna in Selected Streams, S.E. Norton, A.S. Timbol, and J.D. Parrish, FWS/OBS-78/17, U.S.F.W.S. Stream Alteration Team, May, 1978.

Stream Channel Modification in Hawaii, Part C: Tolerance of Native Stream Species to Observed Levels of Environmental Variability, Charles B.Hathaway, Jr., FW/OBS-78/18, U.S.F.W.S. Stream Alteration Team, October, 1978.

Water Quality Management Plan for the City and County of Honolulu, Volume 1. State Dept. of Health and City and County of Honolulu, Honolulu, Hawaii, 1978.

Water Resources of North-Central Oahu, Hawaii. J.C. Rosenau, E.R. Lubke, and R.H. Nakahara, U.S. Geological Survey Water Supply Paper 1889-D, 1971.

APPENDIX A

APPENDIX A

WATER QUALITY SURVEYS AND STANDARDS

I. METHODS AND PROCEDURES

Sampling and field observations were conducted during the period of June 11 through June 24, 1976. Physical and chemical characteristics were measured under various tidal conditions. Results are given in Table A-1. The sampling stations are indicated in Figure A-1. Samples were also taken at Paukauila Stream for comparative purposes.

Temperature

The temperature of the various stations were measured with a YSI Model 33 S-C-T Meter with a -2 to +50°C temperature range. Temperature readings were taken to the nearest 0.5°C.

Salinity/Conductivity

Field measurement of salinity and conductivity were made using a YSI Model 33 S-C-T Meter with a 0-40 parts per thousand salinity range over a -2 to +45°C temperature range and a 0-500, 0-5,000 and 0-50,000 micro-ohm/centimeter range.

Dissolved Oxygen

A dissolved oxygen probe from a YSI Model 57 Dissolved Oxygen Meter was used to obtain dissolved oxygen readings. The equipment measures a range of 0-2.5, 0-5 and 0-10 parts per million.

PAUKAUILA AND KIIKII STREAMS AND TRIBUTARIES
WATER QUALITY DATA

June 11, 1976, Ebb Tide
Time: 7:00 a.m. - 10:00 a.m.
Partly cloudy with sunny periods

Station	Temp. °C	Salinity Parts Per Thousand	Conductivity mhos/cm	Dissolved O2 Parts Per Million	pH	Turbidity Secchi Disk Meters	Odor
1	23°	3.0	8,000	5.0	7.1	0.5/turbid	None
2	22°	0.5	1,000	5.3	7.0	Bottom visible	None
3	27°	26.0	42,000	5.5	7.6	0.6/turbid	None
4	26°	30.0	47,000	6.4	7.6	Bottom visible	None
5	27°	24.5	40,000	6.2	7.7	0.6/turbid	None

June 19, 1976, Flood Tide
Time: 10:30 a.m. - 1:00 p.m.
High overcast

1	26°	9.0	18,000	8.5	7.2	0.7/turbid	None
2	25°	1.0	1,200	8.3	7.0	Bottom visible	None
3	27°	26.0	42,000	6.8	7.6	0.7/turbid	None
4	27'	29.0	46,000	6.2	7.5	Bottom visible	None
5	27°	25.0	38,000	4.2	7.6	0.5/turbid	Objectionabl

June 24, 1976, Ebb Tide
Time: 7:00 a.m. - 10:00 a.m.
Cloudy with light intermittent rain

1	25°	7.0	12,000	4.5	7.2	0.4/turbid	None
2	23°	0.5	1,100	5.4	7.0	Bottom visible	None
3	27°	26.0	42,000	5.3	7.5	0.5/turbid	None
4	27°	29.0	46,000	6.3	7.5	Bottom visible	None
5	26°	22.0	35,000	5.7	7.6	0.5/turbid	None

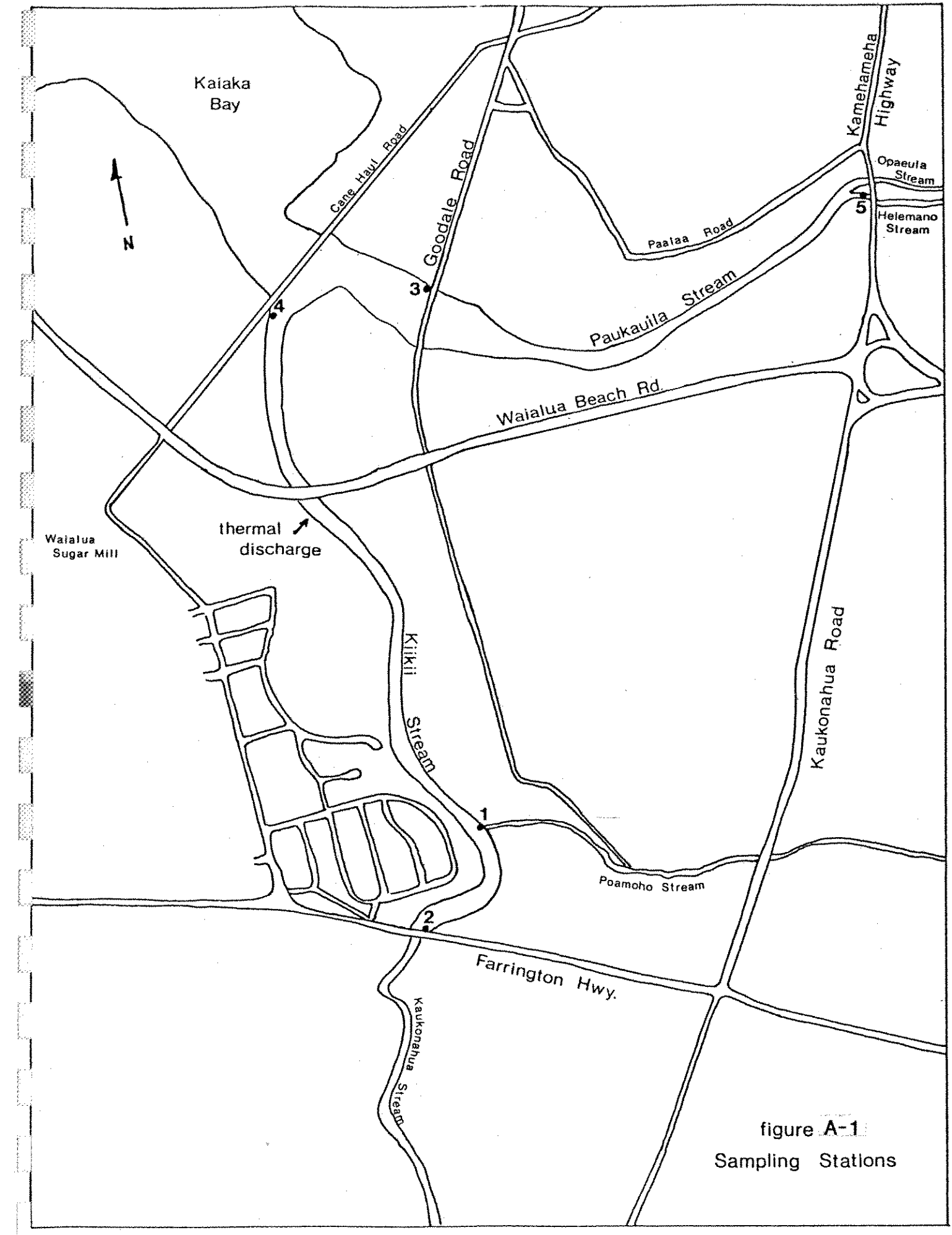


figure A-1
Sampling Stations

pH

Field measurements of pH were measured with a Corning Model 3 pH Meter with a 2-12 pH range.

Turbidity

Secchi disk visibility measurements were used to determine turbidity. The 20 centimeter disk was lowered with a nylon line calibrated in meters.

II. WATER QUALITY STANDARDS*

"4. Basic Water Quality Criteria Applicable to All Waters

All waters shall be free of substances attributable to domestic, industrial, or other controllable sources of pollutants and subject to verification by monitoring as may be prescribed by the Director of Health, as follows:

(A) Materials that will settle to form objectionable sludge or bottom deposits.

(B) Floating debris, oil, grease, scum, or other floating materials.

(C) Substances in amounts sufficient to produce taste or odor in the water or detectable off flavor in the flesh of fish, or in amounts sufficient to produce objectionable color, turbidity, or other conditions in the receiving waters.

(D) High temperatures; biocides; pathogenic organisms; toxic, radioactive, corrosive, or other deleterious substances at levels or in combinations sufficient to be toxic

*Public Health Regulations 37-A, Department of Health, State of Hawaii. These are the new water quality standards which will go into effect on December 7, 1979.

or harmful to human, animal, plant, or aquatic life, or in amounts sufficient to interfere with any beneficial use of the water. To identify the actual or potential effects of a discharge, as a minimum, a phytoplankton bioassay test or a 96-hour bioassay or both shall be required. The methods and test parameters shall be specified by the Director according to established procedures in Section 9 of this Chapter, provided that modifications may be prescribed to meet conditions specific to the disposal situation. Survival of test organisms shall not be less that that in controls which utilize appropriate experimental water. Field monitoring may be further required to insure conformance with this standard as long as a discharge or a suspected discharge is occurring.

(E) Substances or conditions or combinations thereof in concentrations which produce undesirable aquatic life.

(F) Soil particles resulting from erosion on land involved in earthwork, such as the construction of public works; highways; subdivisions; recreational, commercial, or industrial developments; or the cultivation and management of agricultural lands. This standard shall be deemed met upon a showing that the land on which the erosion occurred or is occurring is being managed in accordance with soil and water conservation district and the Director of Health, and that a comprehensive conservation program is being actively pursued, or that the discharge has received the best degree of treatment or control, and that the severity of impact of the resudual soil reaching the receiving body of water is deemed to be acceptable."

"5.3 Criteria

(B) Streams

(1) Water Column Criteria for Streams

Parameter	Geometric mean not to exceed the given value	Not to exceed the given value more than 10% of the time	Not to exceed the given value
Total Kjedahl Nitrogen (ug N/l)	250.0* 180.0**	520.0* 380.0**	800.0* 600.0**
Nitrate + Nitrate Nitrogen (ug (NO_3 + NO_2-N/l)	70.0* 30.0**	180.0* 90.0**	300.0* 170.0**
Total Phosphorus (ug P/l)	50.0* 30.0**	100.0* 60.0**	150.0* 80.0**
Total Non-filterable Residue (ug/l)	20,000.0* 10,000.0**	50,000.0* 30,000.0**	80,000.0* 55,000.0**
Turbidity (Nephelometric Turbidity Units)	5.0* 2.0**	15.0* 5.5**	25.0* 10.0**

* Wet Season - November 1 through April 30.

** Dry Season - May 1 through October 31.

pH Units shall not deviate more than 0.5 units from ambient conditions and shall not be lower than 5.5 nor higher than 8.0.

Dissolved Oxygen - Not less than 80% saturation.

Temperature - Shall not vary more than 1°C from ambient conditions.

Specific Conductance - Not more than 300 micromhos/cm.

(2) Bottom Criteria For Streams

(a) Episodic deposits of flood-borne soil sediment shall not occur in quantities exceeding an equivalent thickness of 5 mm. (0.20 inch) over hard bottoms 24 hours after a heavy rainstorm.

(b) Episodic deposits of flood-borne soil sediment shall not occur

in quantities exceeding an equivalent thickness of 10 mm. (0.40 inch) over soft bottoms 24 hours after a heavy rainstorm.

(c) In soft bottom material in pool sections of streams, oxidation-reduction potential (E_H) in the top 10 cm (4 inches) shall not be less than +100 mv.

(d) In soft bottom material in pool sections of streams, no more than 50% of the grain size distribution of sediment shall be smaller than 0.125 mm (0.005 inch) in diameter.

(e) The Director of Health shall prescribe the appropriate parameters, measures and criteria for monitoring stream bottom biological communities including their habitat, which may be affected by proposed actions. Permanent benchmark stations may be required where necessary for monitoring purposes. The water quality criteria for this subsection shall be deemed to be met if time series surveys of benchmark stations indicate no relative changes in the relevant biological communities, as noted by biological community indicators or by indicator organisms which may be applicable to the specific site."

"(D) Specific Critera for Estuaries

(1) Applicable to all Estuaries Except Pearl Harbor

Parameter	Geometric mean not to exceed the given value	Not to exceed the given value more than 10% of the time	Not to exceed the given value
Total Kjedahl Nitrogen (ug N/l)	200.0	350.0	500.0

Parameter	Geometric mean not to exceed the given value	Not to exceed the given value more than 10% of the time	Not to exceed the given value
Ammonia Nitrogen (ug NH_4 - N/l)	6.00	10.00	20.00
Nitrate + Nitrate Nitrogen (ug (NO_3 + NO_2)-N/l)	8.00	25.00	35.00
Orthophosphate Phosphorus (ug PO_4-P/l)	10.00	30.00	40.00
Total Phosphorus (ug P/l)	25.00	50.00	75.00
Light Extinction Coefficient (k units)	0.40	0.80	1.00
Chlorophyll a (ug/l)	2.00	5.00	10.00
Turbidity (Nephelometric Turbidity Units)	1.50	3.00	5.00
Non-Filterable Residue (ug/l)	35,000.00	45,000.00	50,000.00

pH Units shall not deviate more than 0.5 units from ambient conditions and shall not be lower than 7.0 nor higher than 8.6.

Dissolved Oxygen - Not less 75% saturation.

Temperature - Shall not vary more than 1°C from ambient conditions.

Salinity (ppm) - Shall not vary more than 10% from ambient conditions.

Oxidation - reduction potention (E_H) in the uppermost 10 cm. (4 inches) of sediment shall not be less than -100 mv."

"6.1 Embayments

C. Specific Criteria for Embayments

(Note that criteria for embayments differ based on fresh water inflow.)

Parameter	Geometric mean not to exceed the given value	Not to exceed the given value more than 10% of the time	Not to exceed the given value
Total Kjedahl Nitrogen (ug N/l)	200.00* 150.00**	350.00* 250.00**	500.00* 350.00**
Ammonia Nitrogen (ug NH_4-N/l)	6.00* 3.50**	13.00* 8.50**	20.00* 15.00**
Nitrate & Nitrate Nitrogen (ug (NO_3 +NO_2)-N/l)	8.00* 5.00**	20.00* 14.00**	35.00* 25.00**
Orthophosphate Phosphorus (ug PO_4-P/l)	10.00* 7.00**	25.00* 12.00**	40.00* 17.00**
Total Phosphorus (ug P/l)	25.00* 20.00**	50.00* 40.00**	75.00* 60.00**
Light Extinction Coefficient (k units)	0.40* 0.15**	0.80* 0.35**	1.20* 0.60**
Chlorophyll a (ug/l)	1.50* 0.50**	4.50* 1.50**	8.50* 3.0**
Turbidity (Nephelometric Turbidity Units)	1.50*	3.0*	5.0*
Non-Filterable Residue (ug/l)	25,000.00* 15,000.00**	40,000.00* 25,000.00**	50,000.00* 35,000.00**

* "Wet" criteria apply when the average fresh water inflow from the land equals or exceeds 1% of the embayment volume per day.

* "Dry criteria apply when the average fresh water inflow from the land is less than 1% of the embayment volume per day.

Applicable to both "wet" and "dry" conditions:

pH Units shall not deviate more than 0.5 units from a value of 8.1.

Dissolved Oxygen - Not less than 75% saturation.

Temperature - Shall not vary more than 1°C from ambient conditions.

Salinity (ppm) - Shall not vary more than 10% from natural or seasonal changes considering hydrologic input and oceanographic factors."

III. PREVIOUS WATER QUALITY SAMPLING

Water quality sampling was conducted in conjunction with an EIS prepared for the Waialua Sugar Co. in May, 1972. Salinity data for surface and bottom samples indicated that a lower salinity zone persisted on the surface and higher salinity on the bottom. This is common for estuaries with poor vertical mixing.

The bottom zone salinities in Kiikii Stream ranged from about 35 ppt at the mouth to about 15 ppt 4,000 feet upstream. The surface salinities ranged from 34 ppt to 9 ppt. Other water qaulity parameters (nitrogen, phosphorus and turbidity) were measured and results are presented in Table A-2.

Stream temperatures in the vicinity, because of low flow conditions, are influenced by meterological factors; most significantly by solar radiation. This, plus the thermal discharge, result in an increase in stream temperatures by about 10° F above what would be considered normal.

TABLE A-2

TOTAL KJEDAHL NITROGEN, TOTAL PHOSPHORUS AND TURBIDITY VALUES FOR KIIKII STREAM

	Mean	Range
TKN (mg/l N)	.38	.25 - .54
Total Phosphorus (mg/l P)	.074	.045 - .138
Turbidity (JTU)	41	22 - 76

APPENDIX B

APPENDIX B

NATIONAL FLOOD INSURANCE PROGRAM*

The National Flood Insurance Program was established in 1968 to provide under Federal auspices specified amounts of flood insurance, previously unavailable from private insurers. In return for this subsidized insurance, the National Flood Insurance Act of 1968 requires that local governments adopt and enforce land use control measures to guide land development in flood-prone areas in order to avoid or reduce future flood damage. The program is administered by the Federal Insurance Administrator in the U.S. Department of Housing and Urban Development (HUD).

The Flood Disaster Protection Act of 1973, Public Law 93-234, expands the program started in 1968. Under this Act, flood hazard maps outlining special flood areas have been updated by the Corps of Engineers. The Federal Insurance Administration has adopted the 100-year flood as the base flood elevation for the adoption of land use controls. The 100-year flood standard represents the flood level that on the average, will have a one percent chance of being equalled or exceeded in any given year. After the flood hazard areas have been identified,

*National Flood Insurance Program. U.S. Department of Housing and Urban Development, January, 1974.

the local governments will have six months to adopt positive flood plain management measures, such as building code amendments to control construction in the flood area. The 1973 Act will apply to all flood danger areas in the community and not only to those property owners interested in subscribing to the Federal insurance program.

Under the 1973 Act, new construction in the special flood zones will be floodproofed, or elevated to a level which places it above the anticipated high water level. All new construction will be affected by the new requirements, even to those properties not applying for Federal insurance. Existing structures in flood hazard areas will be permitted to remain in their existing condition as long as substantial improvements are not made. Substantial is interpreted as 50 percent or more of the structure's current market value.

Subsidized insurance coverage will be available until the Flood Hazard Boundary Maps are updated and accepted by HUD. All new construction after this date will be eligible for flood insurance at actuarial rates. The underlying concept of the 1968 and 1973 Acts is that if construction is properly floodproofed, then actuarial premium rates should not substantially exceed subsidized rates.

Requirement to Purchase Flood Insurance

Section 102(a) of the bill requires the purchase of flood insurance in communities where such insurance is available, in connection with receiving any form of Federal "financial assistance for acquisition or construction purposes."

Section 102(b) directs each "Federal instrumentality responsible for the supervision, approval, regulation, or insuring of banks, savings and loan associations, or similar institutions" to issue regulations requiring that persons receiving mortgage loans must also purchase Federal flood insurance if the property securing the loan is located within an identified special flood hazard area of a community where flood insurance is available.

Effect of Nonparticipation in Flood Insurance Program

Section 202(a). No Federal officer or agency shall approve any financial assistance for acquisition or construction purposes on and after July 1, 1975, for use in any area having special flood hazard unless the community is participating in the National Flood Insurance Program.

Section 202(b). Each Federal instrumentality responsible for the supervision, approval, regulation, or insuring of banks, savings and loan associations, or similar institutions shall by regulation prohibit such institutions on and after July 1, 1975, from making, increasing,

extending, or renewing any loan secured by improved real estate or a mobile home located or to be located in an area having special flood hazards, unless the community in which such area is situated is then participating in the national flood insurance program.

APPENDIX C

APPENDIX C

DRAFT BILL TO AMEND ARTICLE II OF THE COMPREHENSIVE ZONING CODE.

ORDINANCE NO. _____ BILL NO. _____ (1977)
(DRAFT NO. 2) (REVISED)

A BILL FOR AN ORDINANCE TO AMEND ARTICLE 11 OF THE COMPREHENSIVE ZONING CODE RELATING TO FLOOD HAZARD DISTRICTS AND AMENDING SECTION 21-110 BY DELETING DEFINITION OF DESIGN FLOOD, FLOODWAY AND FLOOD PLAIN.

BE IT ORDAINED by the People of the City and County of Honolulu:

SECTION I. Section 21-110. Definition is hereby amended by deleting the definition of Design Flood, Floodway and Flood Plain.

SECTION II. Article 11 of the Comprehensive Zoning Code is hereby amended in its entirety to read as follows:

Article 11, Flood Hazard Districts

Section 21-1101. Legislative Intent.

Within the City and County of Honolulu, certain areas are subject to recurrent inundation by flooding and/or tsunami resulting in loss of life and property, creation of health and safety hazards, disruption of commerce and governmental services as well as extraordinary public expenditures for flood and tsunami protection and relief.

The purpose of establishing the Flood Hazard District is to protect life and property and reduce public costs for flood control, rescue and relief efforts thereby promoting the safety, health, convenience and general welfare of the community.

Section 21-1102. Statutory Authority.

This article is enacted pursuant to the U.S. National Flood Insurance Act of 1968 (Public Laws 90-448 and 91-152), as amended, and the U.S. Flood Disaster Protection Act of 1973 (Public Law 93-234), as amended.

Section 21-1103. Establishment of Flood Hazard District.

(a) Flood Hazard District Boundary Maps and Flood Insurance Study.

This article shall apply to all lands within the Flood Hazard District as established on the Flood Boundary and Floodway Maps, and Flood Insurance Rate Map with the appurtenant flood study and related flood data as contained in the Flood Insurance Study and declared a part of this article and marked as exhibits as follows:

(1) Exhibit "A" - Flood Boundary and Floodway Maps, and Flood Insurance Rate Maps.

(2) Exhibit "B" - Flood Insurance Study, City and County of Honolulu, U.S. Department of Housing and Urban Development, Federal Insurance Administration.

(b) Interpretation of Flood Boundary and Flood Data.

(1) Flood Boundary in Flood Hazard District and Regulatory Flood Elevation in Floodway, Flood Fringe and Coastal High Hazard Districts.

The Flood Boundary and Regulatory Flood Elevations shall be determined by the ordinance exhibits. Where interpretation is needed as to whether or not a project lies within a certain Flood District, or interpretation is needed on the regulatory flood elevation in the Floodway, Flood Fringe or Coastal High Hazard Districts, a request for interpretation shall be submitted to the Director for determination. The request shall include the project site and location

plan, property lines and dimensions and tax map key.

(2) Other Interpretation.

Where interpretation on flood elevation, velocity, or other data is needed, other than as stated in subsection (b)(1) above, the Director with the recommendation of the Chief Engineer shall make the determination.

The request for interpretation under this section, shall be submitted to the Director, and include three sets of documents, stamped and signed by a registered professional engineer, containing adequate information and substantiating data consistent with this article, such as flood study, flood data, project site and location plan, property lines and dimension, tax map key, and topographic data, contours or spot elevations based on mean sea level. Upon review by the Director, other related information may be required to evaluate the request.

Section 21-1104. Definition.

Unless plainly evident from the context that a different meaning is intended, the words and terms used herein are defined as follows:

Chief Engineer. Chief Engineer shall mean the Director and Chief Engineer, Department of Public Works, City and County of Honolulu.

Coastal High Hazard District. Coastal High Hazard District means

the district consisting of the area subject to high velocity waters including but not limited to tsunamis. The district is designated on the Flood Boundary and Floodway Maps and/or Flood Insurance Rate Maps as Zone V1-30.

Development. Development means any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operation.

Director. Director means the Director of Land Utilization, Department of Land Utilization, City and County of Honolulu.

Flood or Flooding. Flood or flooding means a general and temporary condition of partial or complete inundation of normally dry land areas from the overflow of inland or tidal water resulting from any source, such as storms, hurricanes or tsunamis, or the unusual and rapid accumulation or runoff of surface waters from any source.

Flood Elevation. Flood elevation means the water surface elevation of a flood in relation to the mean sea level.

Flood Fringe. Flood fringe means the portion of the flood plain outside of the floodway.

Flood Fringe District. Flood Fringe District means the district consisting of the area of the flood fringe as established on the Flood Boundary and Floodway Maps.

Flood Hazard District. Flood Hazard District means the district consisting of the General Flood Plain District, the Floodway District, the Flood Fringe District and the Coastal High Hazard District as established on the Flood Boundary and Floodway Maps.

Flood Plain. Flood plain means the watercourse and adjoining normally dry land area that is likely to being inundated by the regulatory flood.

Flood Proof. Flood proof means any combination of structural and/or nonstructural additions, changes or adjustments to structures and/or properties which reduce or eliminate flood damage.

Floodway. Floodway means the watercourse and portions of the flood plain which are reasonably required in order to carry or discharge the regulatory flood without increasing the flood elevation of the flood plain more than one foot at any point.

Floodway District. Floodway District means the district consisting of the area of the floodway as established on the Flood Boundary and Floodway Maps.

General Flood Plain District. General Flood Plain District means the district consisting of the approximate flood plain area as established on the Flood Boundary and Floodway Maps, where detailed engineering studies have not been conducted to designate the flood fringe and floodway areas.

Habitable Floor. Habitable floor means any floor usable for living purposes, which includes working, sleeping, eating, cooking or recreation or a combination thereof. A floor used only for storage purposes is not a habitable floor.

Regulatory Flood. Regulatory Flood means the base flood having a one percent chance of occurrence in any given year as determined from an analysis of the available hydrologic data by the U.S. Army Corps of Engineers.

Section 21-1105. Warning and Disclaimer of Liability.
The degree of flood and tsunami protection required by this article is considered reasonable for regulatory purposes and is based on standard engineering methods of study. Larger floods or tsunamis than the regulatory flood as stated in this article may occur on occasions, or flood or tsunami heights may be increased by man-made or natural causes. This article does not imply that areas outside the flood hazard area will be free from flooding or damage.

This article shall not create liability on the part of the City and County of Honolulu or any officer, official or employee for any flood or tsunami damages that result from reliance on this article or any administrative decision lawfully made thereunder.

Section 21-1106. Standards for Development.
All buildings, subdivisions and developments within the Flood Hazard District shall:

(a) Be designed and structures adequately anchored to prevent flotation, collapse or lateral movement due to the forces caused by the regulatory flood;

(b) Use construction materials and equipment that are resistent to flood damage for portions below the regulatory flood elevation;

(c) Use construction methods and practices that will minimize against damage by the regulatory flood;

(d) Be consistent with the need to minimize damage by the regulatory flood to the best technological and practical design and construction;

(e) Provide utilities and facilities including but not limited to sewers, water, electric, telephone and gas to be designed, located, and constructed to minimize impairment to service against damage by the regulatory flood;

(f) Provide drainage to minimize damage by the regulatory flood and in accordance with the Storm Drainage Standards of the Chief Engineer;

(g) Provide new or replacement potable water system and facilities to be designed to minimize or eliminate infiltration of flood waters into the systems;

(h) Provide new or replacement sanitary sewer system and waste disposal system to be designed, located, and constructed so as to minimize impairment of them or contamination from them during and subsequent to flooding by the regulatory flood.

Section 21-1107. Floodway District.

(a) Use Regulation.

Within the Floodway District, the following uses having a low flood damage potential and not obstructing flood flows, shall be permitted to the extent that they are permitted under the underlying zoning district and are not prohibited by any other laws or ordinances; and provided they do not require structures, fill or storage of materials or equipment, which adversely affect the capacity of the floodway

or any tributary or any other drainage facility or system:

(1) Public and private outdoor recreational facilities, lawn, gardens and play areas.

(2) Agricultural uses including farming, grazing, pasture, and outdoor plant nursery.

(3) Open uses, such as off-street parking or loading and unloading areas.

(4) Drainage improvements, such as dams, levees, channels and bridges.

(5) Other uses and structures as may be permitted by the Director which meets the purpose and intent of this article pursuant to Section 21-1113.

(b) Standards.

Temporary or permanent structures, deposits, fill, storage of material or equipment or other improvements which adversely affects the capacity of the floodway or increases flood levels shall not be allowed.

Structures, grading and improvements in the Floodway District shall be subject to the approval of the Director pursuant to Section 21-1113.

Section 21-1108. Flood Fringe District.

(a) Use Regulation.

Within the Flood Fringe District, the uses permitted in the underlying zoning districts shall be permitted provided such uses, improvements, structures and utilities are in compliance with the provisions of this article.

(b) Standards.

In addition to Section 21-1106, the following standards shall be applicable in the Flood Fringe District:

(1) All construction and improvements of residential structures, including but not limited to dwelling and lodging units, shall have the lowest habitable floor including basements and all structural floor members, but not including floors used for storage purposes, carports and lanais, elevated to or above the regulatory flood elevation.

(2) All construction and improvements of non-residential structures shall have the lowest floor elevated to or above the regulatory flood elevation; or together with attendant utility and sanitary facilities, be designed and constructed so that below the regulatory flood elevation, the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy.

(3) All portions of structures above the regulatory flood elevation shall be securely anchored to the foundation to resist movement and flotation due to the regulatory flood.

(4) All portions of construction, improvements and foundations, below the regulatory flood elevation other than permitted under subsection (1) above, shall be designed to be flood-proofed, anchored to resist movement and

flotation and be able to withstand the impact and calculated forces of the regulatory flood.

(5) In areas of shallow flooding, as designated on the Flood Boundary and Floodway Maps and/or Flood Insurance Rate Maps as AO zone with flood depths from one to three feet, all construction and improvements of residential structure, including but not limited to dwelling or lodging units, shall have the lowest habitable floor including basements elevated above the crown of the nearest street to or above the depth number specified on the map exhibits. All new construction and improvements of non-residential structures within the AO zone shall have the lowest floor elevated above the crown of the nearest street to, or above the depth number specified on the map exhibits; or together with attendant utility and sanitary facilities be completely flood-proofed to or above that level so that any space below that level is watertight with walls substantially impermeable to the passage of water and with structural components having the capacity of resisting hydrostatic and hydrodynamic loads and effects of buoyancy.

Section 21-1109. Coastal High Hazard District.

(a) Use Regulation.

Within the Coastal High Hazard District, the uses permitted in the underlying zoning district shall be permitted provided such uses, improvements, structures and utilities

are in compliance with the provisions of this article and provided that where another flood district covers this area, the more restrictive provisions and standards shall govern.

(b) Standards.

In addition to Section 21-1106, the following standards shall be applicable in the Coastal High Hazard District.

(1) All construction and improvements shall have the lowest habitable floor including basement and all structural floor members elevated to or above the regulatory flood elevation and securely anchored to piles or columns to prevent movement and flotation and such foundation are able to withstand the impact and calculated forces of the regulatory flood.

(2) All construction and improvements shall have the space below the regulatory flood elevation reasonably free of obstruction or constructed with "break-away walls" intended to collapse under stress without jeopardizing the structural support of the structure so that the impact on the structure by tsunami is minimized. Such enclosed space shall not be used for human habitation.

(3) The use of fill for structural support of buildings shall be prohibited.

(4) Man-made alteration of sand dunes and mangrove stands which would increase potential flood damage shall be prohibited. Mangrove stands are an assemblage of mangrove trees which are mostly low trees noted for a copious development of interlacing adventitous roots

above the ground and which contain one or more of the following species: Black mangrove (Avicennia Nitida); red mangrove (Rhizophora Mangle); white mangrove (Languncularia Racemosa); and buttonwood (Conocarpus Erecta).

Section 21-1110. General Flood Plain District.

All proposed developments within the General Flood Plain District, shall be subject to review and approval of the Director. The application, signed and stamped by a registered professional engineer, shall include the following information to evaluate the flooding and the related flood data of the site of the proposed project and to determine whether it is located in a floodway or flood fringe area:

(a) Project location and site plan showing dimensions, topographic data, contours or spot elevation based on mean sea level, relationship of project of floodway and flood fringe area and existing and proposed flood control measures and requirements.

(b) Flood study and drainage report including cross section and profile of the area and the regulatory flood elevation and velocities at the project.

Upon review by the Director, other information may be required to evaluate the flooding of the site.

The Director, with the recommendation of the Chief Engineer, shall evaluate and determine whether the proposed project is located within a floodway or flood fringe area, and review the

related flood data such as flood elevation, velocities, boundaries, etc.

If it is determined that the proposed project is within a floodway area, the project shall comply with the provisions and standards of the Floodway District. If it is determined that the proposed project is within a flood fringe area, the project shall comply with the provisions and standards of the Flood Fringe District.

For developments in areas where the flood study and report have been previously reviewed and accepted by the City, the flood study and drainage report information may be waived by the Director.

Section 21-1111. Developments Adjacent to Drainage Facility Outside the Flood Hazard District.

Applications for building permits or development projects located on property encompassing or adjacent to a property with any stream, river or drainage facility shall be subject to review and approval of the Chief Engineer. Upon request by the Chief Engineer, the application shall include information signed and stamped by a registered professional engineer in accordance with Section 21-1110, to evaluate the potential flooding of the area.

If it is determined that the proposed project is within a floodway area, the project shall comply with the provisions and standards of the Floodway District. If it is determined that

the proposed project is within a flood fringe area, the project shall comply with the provisions and standards of the Flood Fringe District.

No drainage facility, river or stream shall be modified, constructed, lined or altered in any way unless approved by the Chief Engineer.

Section 21-1112. Development Applications.

Development applications including but not limited to Planned Development; Cluster Development; Special Design District; Historic, Cultural and Scenic Districts; Subdivision; Conditional Use Permit; Special Permit; change in zoning; and other projects, within the Flood Hazard District, shall include a stamp and signature of a registered professional engineer and/or architect that the flood measures are consistent with this article; that the flood-proofing measures are consistent with the regulatory flood elevation and adequate to withstand the flood depths, pressures, velocities, impact and uplift forces and other factors associated with the regulatory flood; and that structures in the Coastal High Hazard District are securely anchored to adequately anchored pilings or columns in order to withstand the impact and forces of the regulatory flood. Information shall include the location of the flood hazard boundaries; location, dimensions, and elevations of the property; regulatory flood elevations, velocity and data; location and elevations of existing and proposed structures, utilities, streets and improvements; and the existing and proposed flood-proofing measures and improvements.

Information relating to the regulatory flood shall include the source of the flood data such as the Flood Insurance Study, Exhibit "B." Applications within the General Flood Plain District shall include the flood data which were reviewed and accepted by the Director.

Whenever applicable, the flood data requirements of a development project shall be determined prior to processing for other approvals mandated by other laws and regulations.

Section 21-1113. Modification.

(a) The following, as permited by other ordinances and regulations, unless otherwise stated, may be permitted as modification from this article subject to review and approval of the Director:

(1) New structures which are to be erected on a lot of one-half acre or less in area, contiguous to and surrounded by lots with existing structures constructed below the regulatory flood elevation.

(2) Uses in the Floodway District and standards of this article.

(3) Height and yard spacing regulations under the Comprehensive Zoning Code where such regulations are affected by this article and provided the modification that may be granted to the height regulation shall not exceed an amount equal to the difference between the regulatory flood elevation and ground elevation of the property.

(b) Application.

The application shall be submitted to the Director and signed and stamped by a registered professional engineer, and shall include three sets of documents with the following information:

(1) Plans and specifications showing the site and location; dimensions of all property lines and topographic elevation of the lot; existing and proposed structures and improvements, fill, storage of materials; location and elevations of existing and proposed streets and utilities; flood-proofing measures, relationship of the above to the location of the flood boundary, the regulatory flood elevation and data; and the existing and proposed flood control measures and improvements.

(2) Cross-sections and profile of the area and the regulatory flood level.

(3) Flood study and drainage report in areas where study and report have not been reviewed and accepted by the City.

(4) Description of surrounding properties and existing structures and uses.

(5) Justification and reasons for the modification with consideration of the intent and provisions of this article and information as may be applicable on the following:

(i) The danger to life and property due to increased flood heights or velocities caused by the modification.

(ii) The danger that materials may be swept on to other lands or downstream to the injury of others.

(iii) The proposed water supply and sanitation systems and the ability of these systems to prevent disease, contamination, and unsanitary conditions.

(iv) The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owners.

(v) The importance of the services provided by the proposed facility to the community.

(vi) The availability of alternative locations not subject to flooding for the proposed use.

(vii) The compatibility of the proposed use with existing development and development anticipated in the foreseeable future.

(viii) The relationship of the proposed use to the flood plain management program for the area.

(ix) The safety of access to the property in times of flood of ordinary and emergency vehicles.

(x) The expected heights, velocity, duration and rate of rise of the flood waters expected at the site.

(xi) That failure to grant the modification would result in exceptional hardship to the applicant.

(xii) That the modification will not result in adverse increase to flood heights, additional threat to public safety, extraordinary public expense or conflict with other laws or regulations.

(6) An agreement whereby a notice will be inserted in the deeds and other conveyance documents of the property and filed with the Bureau of Conveyances of the State of Hawaii that the property is located in a flood hazard area. The notice shall also contain a statement that modification to construct a structure below the regulatory flood level will result in increased premium rates for flood insurance and such construction below the regulatory flood level increases risks to life and property.

(7) Such other factors which are relevant to the purposes of this article.

(c) Action.

The Director shall refer the request to the Chief Engineer and Building Superintendent for their comments and recommendations. Modification may be granted upon showing of good and sufficient cause and determination that (1) failure to grant the modification would result in exceptional hardship to the applicant; (2) that the modification will not result in adverse increase to flood heights, additional threat to public safety, extraordinary public expense or conflict with other laws or regulations except as otherwise stated; and (3) modification granted

within a floodway area would not result in increase of the regulatory flood level.

The Director may approve, approve with conditions or deny the application. Such conditions may include:

(1) Modification of the project including the sewer and water-supply facilities.

(2) Limitations on periods of use and operation.

(3) Imposition of operational controls, sureties and deed restrictions.

(4) Requirements for construction of channels, dikes, levees and other flood-protective measures.

(5) Flood-proofing measures designed consistent with the regulatory flood elevation, flood velocities, hydrostatic and hydrodynamic forces and other factors associated with the regulatory flood.

(6) Other conditions as may be required by the Director.

Section 21-1114. Non-conforming Uses and Structures Within the Flood Hazard District.

Any non-conforming uses or structures which are uses or structures which were previously lawful prior to the effective date of this article but which are not in conformity with this article, may be continued subject to the following conditions:

(a) Repairs and Maintenance.

Work may be done on any non-conforming structure in any period of 12 consecutive months on repairs and maintenance to an extent not exceeding 50 percent of the market value

of the structure before the work is started.

(b) Damage, Destruction or Demolition.

If any non-conforming structure is damaged, destroyed or demolished by any means, including flood or tsunami, to an extent of 50 percent or more of the market value of the structure prior to the time of damage or destruction, it shall not be reconstructed except in conformity with the provisions of this article.

(c) Exterior Improvements to an Existing Structure.

Work may be done on any alteration, addition or remodeling to any non-conforming structure provided work is done in a period of 12 consecutive months to an extent not exceeding 50 percent of the market value of the structure before the work is started.

(d) Relocation.

If a structure is moved for any reason for any distance whatever, it shall thereafter conform to this article.

Section 21-1115. Exemption.

The following structures shall be exempt from the provisions of this article except those constructed or conducted in the Floodway District:

(a) Structures listed on the National Register of Historic Places or State Inventory of Historic Places for reconstruction, rehabilitation or restoration.

(b) Fences and retaining walls.

(c) Interior renovations and improvements.

(d) Repair and maintenance to strengthen or restore any building or structure to a safe condition, as declared to be unsafe by an official charged with protecting the public safety.

(e) Demolition.

(f) Outdoor swimming pools.

(g) Signs.

(h) Temporary structures and uses incidental to building construction or land development.

(i) Carnivals, circuses, luaus and fairs of a temporary nature.

(j) Storage sheds for agricultural, lawn equipment and other similar storage sheds.

(k) Streets and roadways including private driveways, bridges and walkways.

(l) Bathhouses, comfort stations, open park pavilions, boat houses, picnic tables and benches, playground equipment, recreational open play courts, and recreational outdoor lighting and landscaping.

(m) Seawalls, bulkheads, wharves, piers and docks.

(n) Other structures similar to those as stated above which meet the intent and purpose of this article as determined to be exempt by the Director.

Section 21-1116. Other Laws and Regulations.

All construction and improvements subject to this article shall comply with other applicable laws and regulations including but not limited to the Building, Housing, Plumbing and Electrical Codes, and Grading Ordinances. This article, designed to reduce

flood losses, shall take precedence over any less restrictive, conflicting laws, ordinances or regulations.

Section 21-1117. Validity.

The invalidity of any word, section, clause, paragraph, sentence, part or provision of this article shall not affect the validity of any other part of this article which can be given effect without such invalid part or parts.

Section 21-1118. Violation and Penalties.

Any person, firm, entity or corporation who shall grade, construct, erect, enlarge or structurally alter any building or structure or property, in violation of the provisions of this article, shall be subject to the penalties and enforcement procedures set forth in Chapter 21, Article 1, Section 21-106 of the Revised Ordinance of Honolulu, 1969.

SECTION III. Effective Date.

This ordinance shall take effect upon its approval except or otherwise herein stated as follows:

(a) Planned Development projects approved by ordinance prior to the effective date of this ordinance;

(b) Cluster Developments, Conditional Use or Special Permits and Zoning Variances pursuant to Section 6-1009 of the Revised City Charter, approved prior to the effective date of this ordinance;

(c) Improvements required for subdivision approval where tentative approval has been granted to the preliminary map under the Subdivision Rules and Regulations and

construction plans have been approved by all appropriate governmental agencies prior to the effective date of this ordinance and is subsequently granted final approval;

(d) Any building permit which has been lawfully issued and in effect on the effective date of this ordinance and building permit applications which have been properly filed with the Building Department prior to the effective date of this ordinance provided the permit is obtained within six months after the effective date of this ordinance and provided no change in the plans and specifications are made after the effective date of this ordinance, which will increase the height or floor area of a building or the lot coverage.

INTRODUCED BY:

_____

_____

_____

_____

_____

_____

_____

_____

_____

Councilmen

DATE OF INTRODUCTION:

_____

Honolulu, Hawaii

APPROVED AS TO FORM AND LEGALITY:

_____

Deputy Corporation Counsel

Approved this _____ day of _____, 197

_____

FRANK F. FASI, Mayor
City and County of Honolulu

APPENDIX D

APPENDIX D

FAUNA SAMPLING DATA[1]

FAUNA SPECIES LIST
KIIKII STREAM

FISHES	STATUS[2]
Tilapia mossambica (Tilipia)	X
Kuhlia sandvicensis (Aholehole)	E
Mugil cephalus (Mullet)	I
Oxyurichthys lonchotus (Goby)	I
Sphyraena barrcuda (Barrcuda)	I
Chanos chanos (Milkfish) (Awa)	I
Gnatholepis anjerensis (Goby)	I
Strongylura gigantea (Needlefish)	I
Scomberoides sancti-petri (Lae)	I
Eleotris sandwicensis (O'opu okuke)	E
Saurida gracilis (Lizard Fish)	I
Etrumeus micropus (Maki Awa)	I
Stolephorus purpureus (Nehu)	I
Ctenogobius tongarevae (Goby)	I
Gnathanodon speciosus (Yellow Ulua)	I

SHRIMPS

Leander debilis (Opae)

Leander pacificus (Opae)

Palaemonella tenuipes (Opae)

Penaeus marginatus (Opae lolo)

CRABS

Thalamita crenata (Blue Claw)

Metopograpsus messor (Shore Crab)

Scylla serrata (Samoan crab)

ZOOPLANKTON (Common names)

Copepods (Crustaceans)

Fish larvae

Mysids (Shrimp larvae)

Amphipods (Crustaceans)

Zoea (Crab larvae)

Polychaete worm larvae

Brachipods (Crustaceans)

Nematods (Round worms)

---

(1) Sunn, Low, Tom and Hara, Inc. 1972. Draft Environmental Impact Statement on the Cooling Water Dishcarges in Kiikii Stream. Prepared for the Waialua Sugar Co, Inc., Waialua, Oahu, Hawaii.

(2) I-indigenous; E-endemic; X-exotic (introduced)

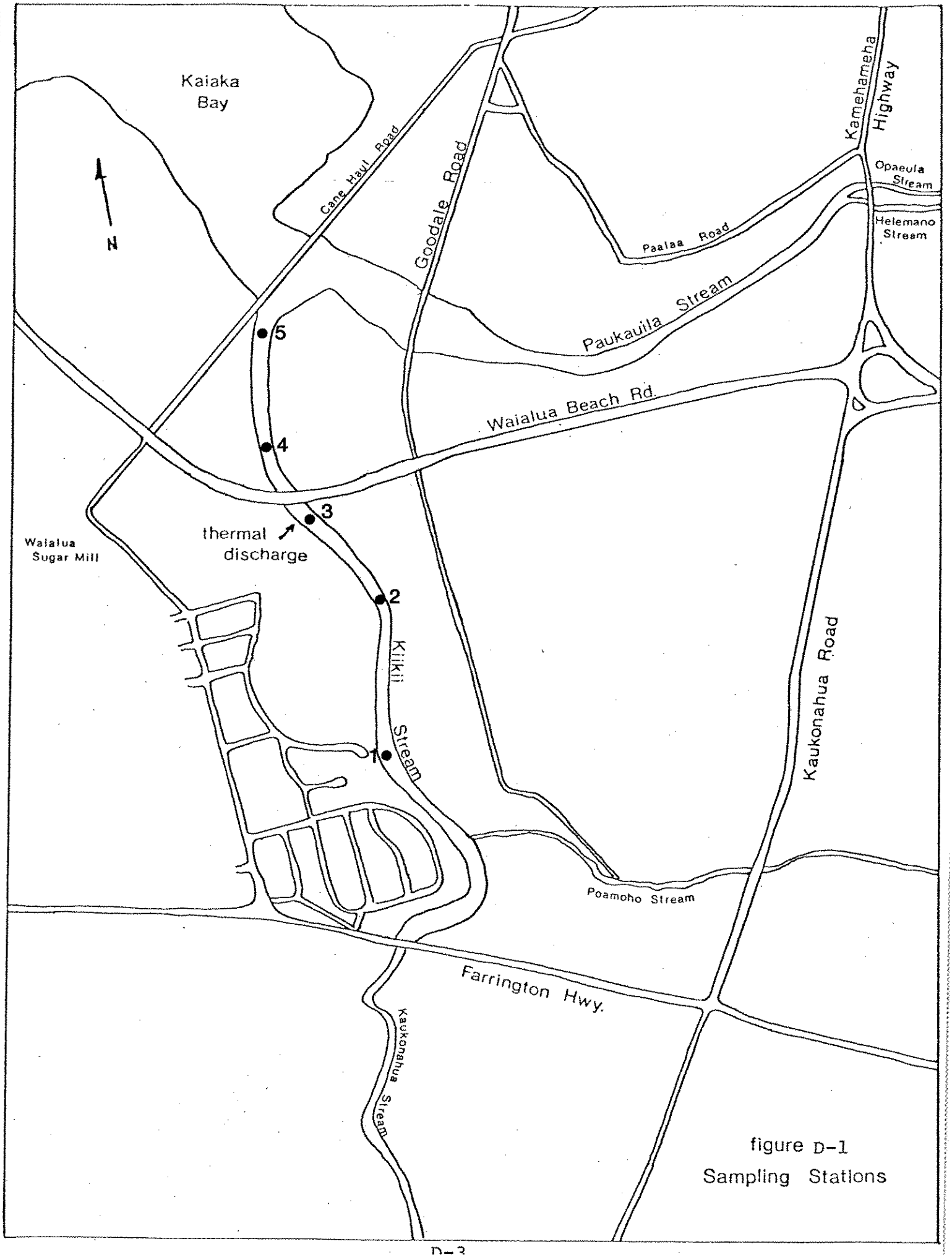


figure D-1
Sampling Stations

TABLE D-1

KIIKII STREAM
DISTRIBUTION AND ABUNDANCE OF FISH

Types	Station Number and Abundance 1	2	3	4	5
Kuhlia	183	3	ND	4	23
Mugil	50	4	1	ND	1
Oxyurichthys	240	101	125	4	1
Sphyraena	1	4	2	4	ND
Chanos	1	ND	3	ND	1
Gnatholepis	6	1	ND	ND	ND
Tilipia	27	306	1	ND	ND
Strongylura	ND	ND	ND	ND	1
Eleotris	ND	ND	ND	1	ND
Saurida	ND	ND	ND	ND	1
Etrumeus	ND	ND	4	ND	3
Stolephorus	ND	ND	ND	ND	ND
Ctenogobius	1	ND	1	ND	ND
Scomberoides	ND	ND	ND	ND	2
Ginathandon	ND	ND	ND	ND	ND

ND = None Detected

TABLE D-2

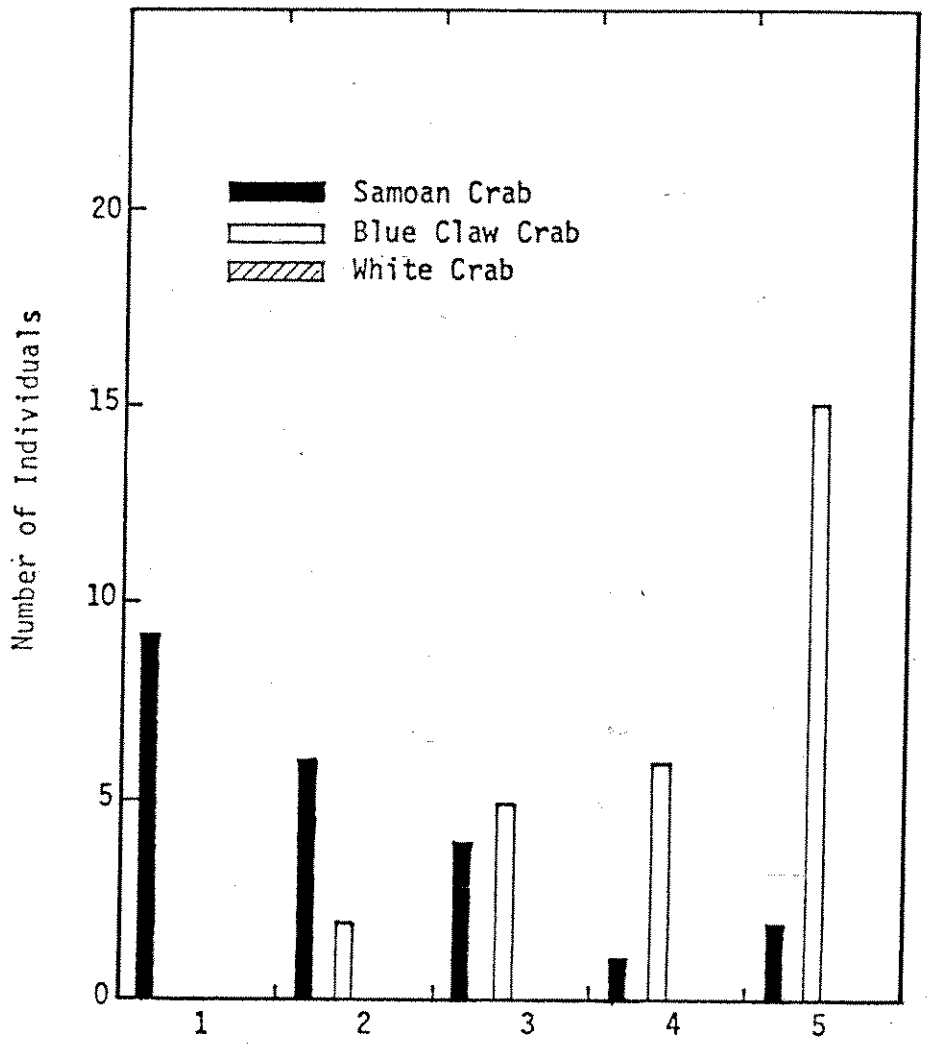
KIIKII STREAM
DISTRIBUTION AND ABUNDANCE OF ZOOPLANKTON (NIGHT SAMPLES)

Types	Station Number and Abundance 1	2	3	4	5
Copepods	283,000	137,000	49,100	6,167	57,500
Fish	50	75	750	100	25
Crabs	170	170	25	25	ND
Shrimps	275	166	250	83	100
Amphipods	166	666	250	583	2,333
Polychaetes	ND	ND	25	ND	ND
Nematodes	ND	25	ND	42	75
Brachipods	ND	ND	ND	ND	ND

ND = None Detected

FIGURE D-2

TOTAL NUMBERS AND DISTRIBUTION OF CRABS AT EACH STATION



APPENDIX E

APPENDIX E

STREAM CHARACTERISTICS
KIIKII STREAM

I. SEDIMENT CHARACTERISTICS

Eckman dredge samples were taken at each sampling station in the middle and near one edge of the stream. Samples taken near the edge were given an "A" designation after the station number. Refer to Figure D-1 in Appendix D for a map showing the location of the sampling stations.

The detritus was separated from each sample and then the sample was separated into three size categories corresponding to clay, silt and sand. Significant amounts of deritus was found at stations 2A, 3, 4A, 5 and 5A. The detritus consisted of leaves, pieces of wood, berries and kukui nut shells all in various stages of decay. The characterization of the dredge samples without detritus is shown in Table E-1.

II. DEPTH AND VOLUME CHARACTERISTICS

The depth and volume characteristics of the estuarine portions of Kiikii Stream at low tide is shown in Table E-2. Using volume data, salinity measurements, the thermal discharge inflow rate (4 mgd condenser cooling water) and the concept of mass balance, it is possilbe to estimate the average theoretical hydraulic residence time in the stream. The estimated average value for Kiikii Stream is less than one day.

Source: Sunn, Low, Tom and Hara, Inc. 1972. Draft Environmental Impact Statement on the Cooling Water Discharges in Kiikii Stream.

TABLE E-1

KIIKII STREAM DREDGE SAMPLES
CHARACTERIZATION WITH DETRITUS REMOVED

Station(1)	Clay %(2)	Silt %(3)	Sand %(4)
1	48	40	12
1A	40	41	19
2	34	47	19
2A	40	60	0
3	35	42	23
3A	25	46	29
4	48	51	1
4A	43	46	11
5	32	54	14
5A	56	42	2

(1) "A" Designation indicates sample taken near edge of stream.

(2) $\leq$ 2 u

(3) 2 u < d $\leq$ 50 u

(4) > 50 u

TABLE E-2

DEPTH AND VOLUME CHARACTERISTICS OF KIIKII STREAM

Station	Ave. Depth (feet)	Ave. Length of Reach (feet)	Ave. Width of Reach (feet)	Volume $X10^3(feet)^3$	
5	4.0				
		1000	125	656	
4	6.5				
		650	100	358	
3	4.5				
		1000	90	450	
2	5.5				
		1000	100	475	Total Volume:
1	4.0				
		1300	100	455	
End	3.0				2,394 X $10^3(ft)^3$ or 17.9 MG

APPENDIX F

APPENDIX F

BEST MANAGEMENT PRACTICES*

CRITICAL AREA PLANTING

Definition

Planting vegetation such as trees, shrubs, vines, grasses or legumes on critical areas. (Does not include tree planting mainly for wood products.)

Purpose

To stabilize the soil; reduce damage from sediment and runoff to downstream areas; improve wildlife habitat; and enhance natural beauty.

Where Applicable

On sediment-producing, highly erodible or severely eroded areas, such as dams, dike, mine spoil, levees, cuts, fills, surface mined areas, and denuded or gullied areas where vegetation is difficult to establish with usual seeding or planting methods.

Cost

$175-$600 per acre

DEBRIS BASIN

Definition

A barrier or dam constructed across a waterway or at other suitable locations to form a silt or sediment basin.

Purpose

To preserve the capacity of reservoirs, ditches, canals, diversions, waterways, and streams; to prevent undesirable deposition on bottom lands and developed areas; to trap

* Source: State of Hawaii, Department of Health. 1978. Non-point Source Pollution in Hawaii: Assessments and Recommendations. Report of the Technical Committee on Nonpoint Soure Pollution Control, "208" Areawide Waste Treatment Management Plan.

sediment originating from construction sites; and to reduce or abate pollution by providing basins for deposition and storage of silt, sand, gravel, stone, agricultural wastes, and other detritus.

Where Applicable

This practice applies where physical conditions or land-ownership preclude the treatment of the sediment source by the installation of erosion control measures to keep soil and other material in place, or a debris basin offers the most practical solution to the problem.

Cost

$500-$1500 each

DIKE

Definition

An embankment constructed of earth or other suitable materials to protect land against overflow from streams, lakes and tidal influences; flat land areas from diffused surface water; and to provide or improve wetland habitat for wildlife.

Scope

This standard covers quality requirements for planning, designing, and constructing dikes to provide protection for land and property and includes dikes for floodways and wildlife improvement.

Dikes are divided into the following three classes:

Class I dikes are used to protect improved lands where inundation, erosion and scour, or sediment and debris may cause high property damage or loss of life.

Class II dikes include embankments built to protect agricultural lands of medium to high capability with improvements generally limited to farmsteads and allied farm facilities.

Class III dikes are embankments which protect agricultural lands of relatively low capability or improvements of low values. These dikes are limited to low heads of water.

Purpose

The purposes of dikes are to permit the improvement of land for agricultural production by preventing overflow and better utilizing drainage facilities, to prevent damage to land and property, and to facilitate water storage and control in connection with wildlife and other developments. Dikes can also be used to protect natural areas, scenic features, and archaeological sites from damage.

Where Applicable

The land to be protected must be suitable for the intended use. Locations shall be such that practical and economical construction, accessibility and maintenance can be obtained. Property lines, soils, open water, watershed characteristics, runoff, and adequate outlets for either gravity or pump drainage must be favorable.

Cost

$5-$50 per foot

LINED WATERWAY OR OUTLET

Definition

A waterway or outlet with an erosion resistant lining of concrete, stone, or other permanent material. The lined section extends up the side slopes to designed depth. The earth above the permanent lining may be vegetated or otherwise protected.

Scope

This standard applies to waterways or outlets with lining of non-reinforced, cast-in-place concrete; flagstone mortared in place; rock riprap or similar permanent linings.

Purpose

Waterways or outlets are lined to provide for safe disposal of runoff from other conservation structures or from natural concentrations of flow, without damage by erosion or flooding, in situations where unlined or grassed waterways would be inadequate. Properly designed linings may also control seepage, piping, and sloughing or slides.

Cost

$10 per foot

STREAMBANK PROTECTION

Definition

Stabilizing and protecting banks of streams, lakes, estuaries or excavated channels against scour and erosion by vegetative or structural means.

Scope

This standard covers the measures used to stabilize and protect the banks of streams, lakes, estuaries, and excavated channels. It is not applicable to erosion problems on main ocean fronts and similar areas of complexity not normally within the scope of SCS authority or expertise.

Purpose

Streambank protection is established to stabilize or protect for one or more of the following purposes: (1) to prevent erosion, loss of land, or damage to utilities, roads, buildings, or other facilities adjacent to the eroding area; (2) to maintain the capacity of a channel; (3) to control channel meander which would adversely affect downstream facilities; (4) to reduce sediment loads causing damage and pollution or to improve areas for recreational use or as a habitat for fish and wildlife.

Cost

$1-$3 per foot

APPENDIX G

APPENDIX G

The following list includes organizations by whom the Environmental Impact Statement was reviewed. Those with an asterisk are those for whom a comment and corresponding response is given on the following pages.

Federal Government

U.S. Army Engineer District, Honolulu, Engineering Division
*U.S. Soil Conservation Service
U.S. Air Force
Fish and Wildlife Service
Department of the Army

State Government

*Department of Land and Natural Resources
*Department of Planning and Economic Development
Historic Preservation Office
Department of Transportation
Department of Social Services and Housing
Department of Health
Department of Accounting and General Services
Hawaii Army National Guard
Department of Agriculture

University of Hawaii

*Environmental Center
*Water Resources Research Center

City and County of Honolulu

*Department of General Planning
Department of Transportation Services
Board of Water Supply
Department of Land Utilization
Building Department
Department of Parks and Recreation
Department of Housing and Community Development

Others

*Life of the Land

RECEIVED
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DEC 13 3 20 PM '79
TO ENVIR

7908098

P.O. Box 50006 Honolulu, Hawaii 96850

December 12, 1979

Department of Land Utilization (for Mayor)
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Gentlemen:

Subject: EIS Kaukonahua-Poamoho Stream Improvements
Waialua-Haleiwa, Oahu

We have reviewed the Environmental Impact Statement (EIS) and offer the following comments.

The land surrounding the proposed project is prime agricultural land. This project will not affect this materially however.

In section III - 1. on pages 1-5 we would suggest that where it states "the east bank will be grassed," that this be changed to the east bank will be planted to Napier grass". It should be planted on about 12" to 18" spacing and fertilized according to soil test.

Thank you for the opportunity to review and comment on this document.

Sincerely,

Otis M. Gryde

Otis M. Gryde
District Conservationist

cc: Department of Public Works
City and County of Honolulu
650 South King Street
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

001-12-0291

May 23, 1980

Mr. Otis M. Gryde
District Conservationist
Soil Conservation Service
U. S. Department of Agriculture
P. O. Box 50006
Honolulu, Hawaii 96850

Dear Mr. Gryde:

Subject: Your Letter of December 12, 1979 Relating to the Kaukonahua-Poamoho Stream Improvements Environmental Impact Statement

Thank you for reviewing the Environmental Impact Statement. We note that while the proposed project is in an area designated as prime agricultural land, the project will not materially affect this land.

On page 1-5, section III, #1., lines 5-6, the following revision will be made: "The west bank will be built up and lined and the east bank will be planted to Napier grass. The grass will be fertilized according to soil tests, and precautions will be taken to insure that fertilizer does not enter the stream."

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

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

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

TO ENV
Engrg

January 14, 1980

REF. NO.: APO-1198

Environmental Quality Commission
550 Halekauwila Street
Honolulu, HI 96813

Gentlemen:

We have reviewed the EIS for the Kaukonahua-Poamoho Stream improvements.

A relatively small area is involved. No significant, permanent disruptions to stream life or associated recreation will occur. A temporary problem with turbidity can be expected, but it will be alleviated through the use of turbidity screens.

It appears that the project will afford some flood protection to properties along Haona Street in the Kiikii subdivision.

The drawing of a typical section is not to scale; therefore, we have no idea how seriously the rip-rap wall will impact on the homes on Haona Street.

The EIS still does not provide a good overview of the juncture of the existing Poamoho and Kaukonahua drainageways.

If we may be of any further service, please feel free to contact Mr. Gordon Soh of our Planning Office at 548-6461.

Very truly yours,

SUSUMU ONO, Chairman
Board of Land and Natural Resources

"I LENDA 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

001-12-0284

May 22, 1980

Mr. Susumu Ono, Chairman
Board of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

Subject: Your Letter REF. NO.: APO-1198 of January 14, 1980 Relating to the Kaukonahua-Poamoho Stream Improvements Environmental Impact Statement

Thank you for reviewing the Environmental Impact Statement.

The rip-rap wall will not impact the homes on Haona Street, since it will be located within the existing drainage easement area behind the homes.

The plan view of the floodproofing improvements (Figure 1-3) shows the limits of the backyards of the existing residential properties that will be affected. A small toolshed-storage hut on one property adjacent to Station 14+00 will be removed. Both figures will be clarified to show these conditions.

Peak discharges during a 100-year flood are 20,500 cfs for Poamoho Stream at the confluence with Kaukonahua Stream, 23,000 cfs for Kaukonahua Stream at the confluence with Poamoho Stream, and 33,000 cfs for Kiikii Stream at the confluence with Paukauila Stream. The time it takes for a longer stream to reach peak flow is longer than for a shorter stream, thus peak flows will occur at different times in different streams during the same storm. For this reason, the maximum discharge at Kiikii Stream is less than the sum of the maximum discharge of its two main tributaries.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

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STATE OF HAWAII
DEPARTMENT OF PLANNING AND
ECONOMIC DEVELOPMENT
P. O. Box 2359
Honolulu, Hawaii 96804

December 26, 1979

RECEIV
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JAN 3 8 06
TO C&C (E)

Ref. No. 0449

Mr. Tyrone Kusao
Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Kusao:

Subject: Kaukonahua-Poamoho Stream Improvements, Waialua, Haleiwa, Oahu - Environmental Impact Statement

In general, we have no overall objections to the subject project insofar as it will minimize the loss of life and property resulting from flooding. However, we do have the following comments for your consideration:

1. On page 3-7, the EIS states that the removal of streamside vegetation will negatively impact the fish habitat. Techniques designed to encourage the re-growth of overhead streamside vegetation appear to be necessary to mitigate the adverse impact on the aquatic species.

2. On page 9-4, the EIS states that the policies of the Hawaii CZM Program are detailed under "coastal systems." This should be corrected to read "coastal ecosystems."

3. On page 11-1, the list of necessary approvals should be revised to include the Hawaii CZM Program's federal consistency certification for the Army Corps of Engineers' Permit for Activities in Waterways (Section 404) for this project.

Thank you for transmitting this document to us for our review and comment.

Sincerely,

Hideto Kono

cc: ✓Department of Public Works
City and County of Honolulu

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

FRANK F. FASI
MAYOR

WALLACE MIYAMURA
DIRECTOR AND CHIEF ENGINEER

001-12-0285

May 22, 1980

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

Dear Mr. Kono:

Subject: Your letter Ref. No. 0449 of December 26, 1979 Relating to the Kaukonahua-Poamoho Stream Improvements Environmental Impact Statement

Thank you for reviewing the Environmental Impact Statement. We will respond to your comments in the order presented:

1. "On page 3-7, the EIS states that the removal of streamside vegetation will negatively impact the fish habitat. Techniques designed to encourage the regrowth of overhead streamside vegetation appear to be necessary to mitigate the adverse impact on the aquatic species."

   On page 3-7, paragraph 3, the EIS notes that removal of riparian vegetation can result in impacts on stream temperature which can have an impact on fish habitat. This is a general discussion of possible impacts. However, on page 3-7, paragraph 4, and page 3-8, paragraph 1, the EIS states that "this (pheonomenon) should not have a significant (emphasis added) effect upon lower Kaukonahua/Kiikii Stream, which is at least 100 feet wide, because very little of the riparian vegetation presently provides much overhead cover. While Poamoho Stream is narrower and has more overhead cover, only its mouth will be realigned and a significant change in temperature is not anticipated to result from this action."

2. "On page 9-4, the EIS states that the policies of the Hawaii CZM Program are detailed under 'coastal systems.' This should be corrected to read 'coastal ecosystems.'"

   On page 9-4, paragraph 3 will be revised to read "The policies of the Hawaii Coastal Zone Management Program are detailed under 'Coastal Ecosystems'....."

3. "On page 11-1, the list of necessary approvals should be revised to include the Hawaii CZM Program's federal consistency certification for the Army Corps of Engineers' Permit for Activities in Waterways (Section 404) for this project."

   The list of necessary approvals will be expanded to include this permit.

Very truly yours,

for WALLACE MIYAHIRA
Director and Chief Engineer

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JAN 10 12 51 PM '80

University of Hawaii at Manoa

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

Office of the Director

January 7, 1979

RE:0295

Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Sir:

Draft Environmental Impact Statement
Kaukonahua - Poamoho Stream Improvements
Waialua-Haleiwa, Oahu

The Environmental Center has reviewed the above cited DEIS with the assistance of Paul Ekern, WRRC; John Sorensen, Geography; Doak Cox, Barbara Vogt, Elizabeth Cunningham, and Vincent Shigekuni, Environmental Center. Paul Ekern is submitting his own comments for the WRRC as well.

The EIS adequately discusses most of the probable environmental impacts that could result from the project. Several questions, however, require further clarification or attention. These relate to the description of the project, the environmental setting, the impacts on drainage and hydrology, future land use, and the consideration of alternatives.

1. Description of the Proposed Project

A more detailed description of the toe wall mentioned on page 1-5, specifically with respect to its relationship to the maximum scouring during a flood, would be helpful.

2. Description of the Environmental Setting

On page 2-10 the EIS states that "stream waters are stored in more than 30 small reservoirs along the tributaries." Will a discussion of the effects of the reservoirs on flood levels be included in the EIS?

3. Impacts on Drainage and Hydrology

On page 2-14 the EIS states that flood damages in the lower Kaukonahua Stream area are partly a result of back flow of the existing storm drain system due to high stage in the stream. Since the effect of the storm drainage backup will be magnified by the increased height of the dike, should not this impact be mentioned in the EIS?

4. Impacts on Land use

On page 3-10 the EIS states that the proposed project "will allow additional development to occur that will be less liable to flooding." This "long-term economic impact" requires additional comment. How much development could take place and what level of damages and fatalities could occur from floods with magnitudes exceeding the .01 design-level?

5. Alternatives

a. Table 5-2, on page 5-3, presents the benefit/cost ratios for the alternative actions that were appraised. Despite the fact that flood-proofing has the most favorable ratio, it was not discussed. Why was this alternative neglected in section 5?

b. On page 1-4 the EIS state the "the channel constructions associated with this bridge (Farrington Highway Bridge over Kaukonahua Stream) cause erosion along the upstream and downstream banks, which subjects the homes to further damages during flood conditions." On page 2-12 the EIS states "the inadequate capacity of the existing stream cross-section and the inadequate waterway opening of the Waialua Beach Road Bridge contribute to flooding in this area." Why isn't the action of alleviating the effects of the two bridges discussed as an alternative; or as an action that could be taken in conjunction with another alternative?

c. On page 1-8 the EIS states that riprap slope protection will be used in the project. What is the expected life of grouted riprap? Was the use of gabions considered as an alternative to grouted riprap as a viable method for stream bank protection?

d. Finally, the last sentence on page 5-5 states "The environmental impacts of proposed improvements will be less than with the the other improvements." No support or documentation is provided to substantiate this statement. It would be useful to provide a description of the technical work utilized in arriving at this conclusion.

We appreciate the opportunity to review this document, and hope that our comments will be useful in the preparation of the final EIS.

Sincerely,

Doak C. Cox
Director

DCC/dh

cc: Department of Public Works, C&C of Honolulu
Office of Environmental Quality Control
Paul Ekern
John Sorensen
Barbara Vogt
Vincent Shigekuni
Elizabeth Cunningham

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

001-12-0286

May 22, 1980

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

Dear Dr. Cox:

Subject: Your Letter RE:0295 of January 7, 1980
Relating to the Kaukonahua-Poamoho
Stream Improvements Environmental Impact
Statement

Thank you for reviewing the Environmental Impact Statement. We will respond to your comments in the order of presentation.

1. Description of the Proposed Project

"A more detailed description of the toe wall mentioned on page 1-5, specifically with respect to its relationship to the maximum scouring during a flood, would be helpful."

The toe wall serves as a foundation for the grouted rip-rap slope protection. It will consist of large boulders weighing approximately one ton and measuring roughly two to three feet in diameter.

Specific data on maximum depth of scour during flood flow are not available. In the absence of such data, the design practice is to place the bottom of the toe wall approximately five feet below the mud line.

2. Description of the Environmental Setting

"On page 2-10 the EIS states that 'stream waters are stored in more than 30 small reservoirs along the tributaries.' Will a discussion of the effects of the reservoirs on flood levels be included in the EIS?"

The 100-year flood levels were determined by the U.S. Army Corps of Engineers from meterological, hydrological and geographical conditions within the drainage basins tributary to the project area (Figure 2-1, page 2-11 of the EIS). This would include the effects of the reservoirs located within the tributary drainage area.

3. Impacts on Drainage and Hydrology

"On page 2-14 the EIS states that flood damages in the lower Kaukonahua Stream area are partly a result of back flow of the existing storm drain system due to high stage in the stream. Since the effect of the storm drainage backup will be magnified by the increased height of the dike, should not this impact be mentioned in the EIS?"

Backflow through the existing storm drain system during high stage in the stream has occurred because of damages to the existing outlets of the systems. The increased height of the dike will be beneficial in protecting against possible overtopping of the existing lower dike. The outlets will be reconstructed on a stable foundation provided by the proposed grouted rip-rap lining and provided with flap gates to prevent backflow from the stream.

4. Impacts on Land Use

"On page 3-10 the EIS states that the proposed project 'will allow additional development to occur that will be less liable to flooding.' This 'long-term economic impact' requires additional comment. How much development could take place and what level of damages and fatalities could occur from floods with magnitudes exceeding the .01 design-level?"

Since the proposed project will protect an existing subdivision, the only additional development which could occur would be improvements to the existing homes. This is permitted under Federal guidelines as long as the improvements do not constitute 50% or more of the structures' current market value. As described on page 9-3 and 9-4 of the EIS, any new construction must have adequate floodproofing measures and will be regulated by new amendments to the Building Code and Comprehensive Zoning Code (CZC).

The level of damages and fatalities which could occur from floods with magnitudes exceeding the .01 design-level was not calculated for the project because the City and County Building Code and CZC regulations are or will be based on the 100-year flood level and 100-year tsunami zone. This practice was adopted to maintain consistency with the National Flood Insurance Program.

5. Alternatives

"a. Table 5-2, on page 5-3, presents the benefit/cost ratios for the alternative actions that were appraised. Despite the fact that flood-proofing has the most favorable ratio, it was not discussed. Why was this alternative neglected in section 5?"

The proposed project is a type of floodproofing improvement. Table 5-1 and 5-2 will be revised to indicate that floodproofing improvements are the proposed alternative.

Other means of floodproofing, such as raising the existing structures above the expected flood level or sealing all flood-prone openings of the existing structures, would not be effective in this area. The existing ground conditions on the west bank are prone to continuous erosion. Therefore, the other means of floodproofing would still subject the existing structures to flood damages.

"b. On page 1-4 the EIS states that 'the channel constrictions associated with this bridge (Farrington Highway Bridge over Kaukonahua Stream) cause erosion along the upstream and downstream banks, which subjects the homes to further damages during flood conditions.' On page 2-12 the EIS states 'the inadequate capacity of the existing stream cross-section and the inadequate waterway opening of the Waialua Beach Road Bridge contribute to flooding in this area.' Why isn't the action of alleviating the effects of the two bridges discussed as an alternative; or as an action that could be taken in conjunction with another alternative?"

The alleviation of the effects of these two bridges will be considered with other Public Works projects. Such projects will be undertaken in addition to the proposed project, not as alternatives to it. The scope of this specific project is limited to the area at the confluence of the Kaukonahua and Poamoho Streams.

"c. On page 1-8 the EIS states that riprap slope protection will be used in the project. What is the expected life of grouted riprap? Was the use of gabions considered as an alternative to grouted riprap as a viable method of stream bank protection?"

The expected life of the grouted rip-rap has been evaluated for a 50-year life. The use of gabions was initially considered as an alternative to the grouted rip-rap, but was not deemed viable because of the salt water environment. Debris can nick the PVC coating of gabions and leave the wire unprotected and exposed to the brackish or salt water.

"d. Finally, the last sentence on page 5-5 states 'The environmental impacts of proposed improvements will be less than with the other improvements.' No support or documentation is provided to substantiate this statement. It would be useful to provide a description of the technical work utilized in arriving at this conclusion."

Of the alternatives discussed in Section 5 of the EIS, those which will satisfy the need for floodproofing in the project area, including stabilization of the west bank, consist of rip-rap slope protection, concrete-lined slope protection, full channel improvements, and relocation. While relocation would have the least physical effects on the streams, it would involve a significant disruption of the lifestyles of the residents. The subdivision is an older one, close to schools, medical facilities and employment.

The present vacancy rate on Oahu is approximately 1.5% (State Data Book, 1978) and; while exhaustive studies were not made, it is doubtful that replacement housing of similar quality and cost could be found for 25 households within the Waialua-Haleiwa area. Thus, social impacts could be anticipated to be significant.

Of the remaining alternatives, concrete lined slope protection, while protecting the bank from erosion, would have greater impacts on stream fauna than rip-rap protection. This is primarily due to the fact that the smooth concrete surface is not considered to be a suitable substrate for demersal native stream species, all of which orient to the natural substrate. Rip-rap protection provides a surface more like the natural substrate.

Full-channel improvements would compound the impacts of concrete-lined slope protection, since the stream bottom would also be impacted.

We appreciate your thorough review of the EIS.

Very truly yours,

for WALLACE MIYAHIRA
Director and Chief Engineer

8E Ea 134

UNIVERSITY OF HAWAII
Water Resources Research Center

TO Earl
Engr

31 December 1979

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

Dear Sir:

Subject: Kaukonahua-Poamoho Stream EIS

Among points which I feel are not adequately addressed:

1. Statement and accommodation must be made for reservoir effects on the probable flood levels. Specifically the management of the multiple reservoirs and the large Wahiawa reservoir to reduce flood peaks as well as the possibility of increased flood peaks if the awards made from the April 1974 storm were valid.

2. Action should be taken to assess and reduce the probable contribution of the two bridges to the flood hazard.

3. The stated effect of strom drainage backup to the flood potential must be corrected since this effect will be magnified by the increased height of the dike.

4. The use of gabions as an alternative to the grouted rip rap may well be a viable method for stream bank protection.

Other thoughts as I study the proposal are:

Does the accepted 100-year flood include the effects and the purported reservoir enhancement of the April 19, 1974 flood?

Is the Wahiawa reservoir inflated crest still used to alter high level storage capacity? Probably should amplify the remarks on the 30 odd reservoirs, p. 2-10.

1-1 and other places such as 2-13, why the interchange of the terms elevation 10 and the 10' elevation? 1-4 and 2-12, I find no further reference to the alleviation of the bridge effects. 2-14, I find no further action on the storm drains as major factors in flooding. 1-5, Can any inference be drawn from the current levee about the maximum depth of scour during flood flow so that more specific terms can be used to define the required toe wall for the levee?

2540 Dole Street · Honolulu, Hawaii 96822

Can any statement be made on the expected life of the grouted rip rap? Was an consideration given to the use of gabions such as is outlined in the recent article of Burroughts, 1979 ASCE Civil Engineering 49:58-61? 2-8, though technically perhaps correct, the statement on alluvial deposits to 600' can be misleading, since many subaerial fans do occur. References on the geomorphic origins of the Ewa-Waipahu plain and the Waimanalo plain might help clarify the point. The role of the 90' sea stand cliff along the north shore might well receive more emphasis in the discussion, see Ruhe et al, 1965, Soil Sci. Soc. Amer. Proc. 29:282-287 and Lum & Stearns, 1970, Geol. Soc. Amer. Bull. 81:1-16, Figure 2, particularly.

Sincerely,

Paul C. Ekern
WRRC EIS Coordinator

PCE:jmn

Enclosure

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

FRANK F. FASI
MAYOR

WALLACE MIYAMURA
DIRECTOR AND CHIEF ENGINEER

001-12-0290

May 23, 1980

Dr. Paul C. Ekern
WRRC EIS Director
Water Resources Research Center
University of Hawaii
2540 Dole Street
Honolulu, Hawaii 96822

Dear Mr. Ekern:

Subject: Your Letter of December 31, 1979 Relating to the Kaukonahua-Poamoho Stream Improvements Environmental Impact Statement

Thank you for reviewing the Environmental Impact Statement. We will respond to your comments in the order presented.

1. "Statement and accommodation must be made for reservoir effects on the probable flood levels. Specifically the management of the multiple reservoirs and the large Wahiawa reservoir to reduce flood peaks as well as the possibility of increased flood peaks if the awards made from the April 1974 storm were valid."

   The 100-year flood levels were determined by the U.S. Army Corps of Engineers from meteorological, hydrological and geographical conditions within the drainage basins tributary to the project area (Figure 2-1, page 2-11 of the EIS). This would include the effects of the reservoirs located within the tributary drainage area.

   The several small reservoirs in the upper drainage basin are used by private landowners solely for irrigation of crops. The larger Wahiawa Reservoir is owned by Waialua Sugar Company, Inc. The water is used solely for irrigation. Recreational use within the reservoir is regulated by the State. Theoretically, such reservoirs can also be used for flood detention, but in practice none of them are.

   The management of reservoirs for flood control is a very complicated enterprise. Hydrologic forecasts of possible and probable floods must be weighed against the goal of maximizing water storage for irrigation. If the storage capacity is not available when a flood strikes, there will be little attenuation of the flood wave and the reservoirs can even be overtopped. This is compounded by the fact that flooding due to intense local thunderstorms can occur at any time (page 2-12 of the EIS). On the other hand, if the water level is lowered and the threatened flood does not materialize, valuable water supply for the next season is lost.

2. "Action should be taken to assess and reduce the probable contribution of the two bridges to the flood hazard."

   Action regarding the probable contribution of the Farrington Highway Bridge and the Waialua Beach Road Bridge to the flood hazard will be considered with other Public Works projects. Such projects will be undertaken in addition to the proposed project, not as alternatives to it. The scope of this specific project is limited to the area at the confluence of the Kaukonahua and Poamoho Streams.

3. "The stated effect of storm drainage backup to the flood potential must be corrected since this effect will be magnified by the increased height of the dike."

   Outlets of the existing storm drainage system will be reconstructed on a stable foundation to be provided by the proposed grouted rip-rap lining and will be provided with flap gates to prevent backflow from the stream.

4. "The use of gabions as an alternative to the grouted rip rap may well be a viable method for stream bank protection."

   Gabions (which are defined in the article you provided) were initially considered as an alternative to the grouted rip-rap lining, but were not deemed viable because of the salt water environment. As noted in the article you provided, debris can nick the PVC coating of gabions and leave the wire unprotected and exposed to the brackish or salt water.

Other Concerns:

"Does the accepted 100-year flood include the effects and the purported reservoir enhancement of the April 19, 1974 flood?"

   As discussed above, determination of the 100-year flood levels included effects of the reservoirs located within the tributary drainage areas.

APPENDIX G

The following list includes organizations by whom the Environmental Impact Statement was reviewed. Those with an asterisk are those for whom a comment and corresponding response is given on the following pages.

Federal Government

U.S. Army Engineer District, Honolulu, Engineering Division
*U.S. Soil Conservation Service
U.S. Air Force
Fish and Wildlife Service
Department of the Army

State Government

*Department of Land and Natural Resources
*Department of Planning and Economic Development
Historic Preservation Office
Department of Transportation
Department of Social Services and Housing
Department of Health
Department of Accounting and General Services
Hawaii Army National Guard
Department of Agriculture

University of Hawaii

*Environmental Center
*Water Resources Research Center

City and County of Honolulu

*Department of General Planning
Department of Transportation Services
Board of Water Supply
Department of Land Utilization
Building Department
Department of Parks and Recreation
Department of Housing and Community Development

Others

*Life of the Land

RECEIVED
DEPT OF ENGINEERING

DEPT OF PUBLIC WORKS
DEC 13 3 20 PM '79
TO ENVIR

7908098

P.O. Box 50006 Honolulu, Hawaii 96850

December 12, 1979

Department of Land Utilization (for Mayor)
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Gentlemen:

Subject: EIS Kaukonahua-Poamoho Stream Improvements
Waialua-Haleiwa, Oahu

We have reviewed the Environmental Impact Statement (EIS) and offer the following comments.

The land surrounding the proposed project is prime agricultural land. This project will not affect this materially however.

In section III - 1. on pages 1-5 we would suggest that where it states "the east bank will be grassed," that this be changed to the east bank will be planted to Napier grass". It should be planted on about 12" to 18" spacing and fertilized according to soil test.

Thank you for the opportunity to review and comment on this document.

Sincerely,

Otis M. Gryde

Otis M. Gryde
District Conservationist

cc: Department of Public Works
City and County of Honolulu
650 South King Street
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

001-12-0291

May 23, 1980

Mr. Otis M. Gryde
District Conservationist
Soil Conservation Service
U. S. Department of Agriculture
P. O. Box 50006
Honolulu, Hawaii 96850

Dear Mr. Gryde:

Subject: Your Letter of December 12, 1979 Relating to the Kaukonahua-Poamoho Stream Improvements Environmental Impact Statement

Thank you for reviewing the Environmental Impact Statement. We note that while the proposed project is in an area designated as prime agricultural land, the project will not materially affect this land.

On page 1-5, section III, #1., lines 5-6, the following revision will be made: "The west bank will be built up and lined and the east bank will be planted to Napier grass. The grass will be fertilized according to soil tests, and precautions will be taken to insure that fertilizer does not enter the stream."

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

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

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

TO ENV
Engrg

January 14, 1980

REF. NO.: APO-1198

Environmental Quality Commission
550 Halekauwila Street
Honolulu, HI 96813

Gentlemen:

We have reviewed the EIS for the Kaukonahua-Poamoho Stream improvements.

A relatively small area is involved. No significant, permanent disruptions to stream life or associated recreation will occur. A temporary problem with turbidity can be expected, but it will be alleviated through the use of turbidity screens.

It appears that the project will afford some flood protection to properties along Haona Street in the Kiikii subdivision.

The drawing of a typical section is not to scale; therefore, we have no idea how seriously the rip-rap wall will impact on the homes on Haona Street.

The EIS still does not provide a good overview of the juncture of the existing Poamoho and Kaukonahua drainageways.

If we may be of any further service, please feel free to contact Mr. Gordon Soh of our Planning Office at 548-6461.

Very truly yours,

SUSUMU ONO, Chairman
Board of Land and Natural Resources

"I LENDA 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

001-12-0284

May 22, 1980

Mr. Susumu Ono, Chairman
Board of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

Subject: Your Letter REF. NO.: APO-1198 of January 14, 1980 Relating to the Kaukonahua-Poamoho Stream Improvements Environmental Impact Statement

Thank you for reviewing the Environmental Impact Statement.

The rip-rap wall will not impact the homes on Haona Street, since it will be located within the existing drainage easement area behind the homes.

The plan view of the floodproofing improvements (Figure 1-3) shows the limits of the backyards of the existing residential properties that will be affected. A small toolshed-storage hut on one property adjacent to Station 14+00 will be removed. Both figures will be clarified to show these conditions.

Peak discharges during a 100-year flood are 20,500 cfs for Poamoho Stream at the confluence with Kaukonahua Stream, 23,000 cfs for Kaukonahua Stream at the confluence with Poamoho Stream, and 33,000 cfs for Kiikii Stream at the confluence with Paukauila Stream. The time it takes for a longer stream to reach peak flow is longer than for a shorter stream, thus peak flows will occur at different times in different streams during the same storm. For this reason, the maximum discharge at Kiikii Stream is less than the sum of the maximum discharge of its two main tributaries.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

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STATE OF HAWAII
DEPARTMENT OF PLANNING AND
ECONOMIC DEVELOPMENT
P. O. Box 2359
Honolulu, Hawaii 96804

December 26, 1979

RECEIV
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JAN 3 8 06
TO C&C (E)

Ref. No. 0449

Mr. Tyrone Kusao
Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Kusao:

Subject: Kaukonahua-Poamoho Stream Improvements, Waialua, Haleiwa, Oahu - Environmental Impact Statement

In general, we have no overall objections to the subject project insofar as it will minimize the loss of life and property resulting from flooding. However, we do have the following comments for your consideration:

1. On page 3-7, the EIS states that the removal of streamside vegetation will negatively impact the fish habitat. Techniques designed to encourage the re-growth of overhead streamside vegetation appear to be necessary to mitigate the adverse impact on the aquatic species.

2. On page 9-4, the EIS states that the policies of the Hawaii CZM Program are detailed under "coastal systems." This should be corrected to read "coastal ecosystems."

3. On page 11-1, the list of necessary approvals should be revised to include the Hawaii CZM Program's federal consistency certification for the Army Corps of Engineers' Permit for Activities in Waterways (Section 404) for this project.

Thank you for transmitting this document to us for our review and comment.

Sincerely,

Hideto Kono

cc: ✓Department of Public Works
City and County of Honolulu

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

FRANK F. FASI
MAYOR

WALLACE MIYAMURA
DIRECTOR AND CHIEF ENGINEER

001-12-0285

May 22, 1980

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

Dear Mr. Kono:

Subject: Your letter Ref. No. 0449 of December 26, 1979 Relating to the Kaukonahua-Poamoho Stream Improvements Environmental Impact Statement

Thank you for reviewing the Environmental Impact Statement. We will respond to your comments in the order presented:

1. "On page 3-7, the EIS states that the removal of streamside vegetation will negatively impact the fish habitat. Techniques designed to encourage the regrowth of overhead streamside vegetation appear to be necessary to mitigate the adverse impact on the aquatic species."

   On page 3-7, paragraph 3, the EIS notes that removal of riparian vegetation can result in impacts on stream temperature which can have an impact on fish habitat. This is a general discussion of possible impacts. However, on page 3-7, paragraph 4, and page 3-8, paragraph 1, the EIS states that "this (pheonomenon) should not have a significant (emphasis added) effect upon lower Kaukonahua/Kiikii Stream, which is at least 100 feet wide, because very little of the riparian vegetation presently provides much overhead cover. While Poamoho Stream is narrower and has more overhead cover, only its mouth will be realigned and a significant change in temperature is not anticipated to result from this action."

2. "On page 9-4, the EIS states that the policies of the Hawaii CZM Program are detailed under 'coastal systems.' This should be corrected to read 'coastal ecosystems.'"

   On page 9-4, paragraph 3 will be revised to read "The policies of the Hawaii Coastal Zone Management Program are detailed under 'Coastal Ecosystems'....."

3. "On page 11-1, the list of necessary approvals should be revised to include the Hawaii CZM Program's federal consistency certification for the Army Corps of Engineers' Permit for Activities in Waterways (Section 404) for this project."

   The list of necessary approvals will be expanded to include this permit.

Very truly yours,

for WALLACE MIYAHIRA
Director and Chief Engineer

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University of Hawaii at Manoa

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

Office of the Director

ENV Engrg

January 7, 1979

RE:0295

Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Sir:

Draft Environmental Impact Statement
Kaukonahua - Poamoho Stream Improvements
Waialua-Haleiwa, Oahu

The Environmental Center has reviewed the above cited DEIS with the assistance of Paul Ekern, WRRC; John Sorensen, Geography; Doak Cox, Barbara Vogt, Elizabeth Cunningham, and Vincent Shigekuni, Environmental Center. Paul Ekern is submitting his own comments for the WRRC as well.

The EIS adequately discusses most of the probable environmental impacts that could result from the project. Several questions, however, require further clarification or attention. These relate to the description of the project, the environmental setting, the impacts on drainage and hydrology, future land use, and the consideration of alternatives.

1. Description of the Proposed Project

A more detailed description of the toe wall mentioned on page 1-5, specifically with respect to its relationship to the maximum scouring during a flood, would be helpful.

2. Description of the Environmental Setting

On page 2-10 the EIS states that "stream waters are stored in more than 30 small reservoirs along the tributaries." Will a discussion of the effects of the reservoirs on flood levels be included in the EIS?

3. Impacts on Drainage and Hydrology

On page 2-14 the EIS states that flood damages in the lower Kaukonahua Stream area are partly a result of back flow of the existing storm drain system due to high stage in the stream. Since the effect of the storm drainage backup will be magnified by the increased height of the dike, should not this impact be mentioned in the EIS?

4. Impacts on Land use

On page 3-10 the EIS states that the proposed project "will allow additional development to occur that will be less liable to flooding." This "long-term economic impact" requires additional comment. How much development could take place and what level of damages and fatalities could occur from floods with magnitudes exceeding the .01 design-level?

5. Alternatives

a. Table 5-2, on page 5-3, presents the benefit/cost ratios for the alternative actions that were appraised. Despite the fact that flood-proofing has the most favorable ratio, it was not discussed. Why was this alternative neglected in section 5?

b. On page 1-4 the EIS state the "the channel constructions associated with this bridge (Farrington Highway Bridge over Kaukonahua Stream) cause erosion along the upstream and downstream banks, which subjects the homes to further damages during flood conditions." On page 2-12 the EIS states "the inadequate capacity of the existing stream cross-section and the inadequate waterway opening of the Waialua Beach Road Bridge contribute to flooding in this area." Why isn't the action of alleviating the effects of the two bridges discussed as an alternative; or as an action that could be taken in conjunction with another alternative?

c. On page 1-8 the EIS states that riprap slope protection will be used in the project. What is the expected life of grouted riprap? Was the use of gabions considered as an alternative to grouted riprap as a viable method for stream bank protection?

d. Finally, the last sentence on page 5-5 states "The environmental impacts of proposed improvements will be less than with the the other improvements." No support or documentation is provided to substantiate this statement. It would be useful to provide a description of the technical work utilized in arriving at this conclusion.

We appreciate the opportunity to review this document, and hope that our comments will be useful in the preparation of the final EIS.

Sincerely,

Doak C. Cox
Director

DCC/dh

cc: Department of Public Works, C&C of Honolulu
Office of Environmental Quality Control
Paul Ekern
John Sorensen
Barbara Vogt
Vincent Shigekuni
Elizabeth Cunningham

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

001-12-0286

May 22, 1980

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

Dear Dr. Cox:

Subject: Your Letter RE:0295 of January 7, 1980
Relating to the Kaukonahua-Poamoho
Stream Improvements Environmental Impact
Statement

Thank you for reviewing the Environmental Impact Statement. We will respond to your comments in the order of presentation.

1. Description of the Proposed Project

"A more detailed description of the toe wall mentioned on page 1-5, specifically with respect to its relationship to the maximum scouring during a flood, would be helpful."

The toe wall serves as a foundation for the grouted rip-rap slope protection. It will consist of large boulders weighing approximately one ton and measuring roughly two to three feet in diameter.

Specific data on maximum depth of scour during flood flow are not available. In the absence of such data, the design practice is to place the bottom of the toe wall approximately five feet below the mud line.

2. Description of the Environmental Setting

"On page 2-10 the EIS states that 'stream waters are stored in more than 30 small reservoirs along the tributaries.' Will a discussion of the effects of the reservoirs on flood levels be included in the EIS?"

The 100-year flood levels were determined by the U.S. Army Corps of Engineers from meterological, hydrological and geographical conditions within the drainage basins tributary to the project area (Figure 2-1, page 2-11 of the EIS). This would include the effects of the reservoirs located within the tributary drainage area.

3. Impacts on Drainage and Hydrology

"On page 2-14 the EIS states that flood damages in the lower Kaukonahua Stream area are partly a result of back flow of the existing storm drain system due to high stage in the stream. Since the effect of the storm drainage backup will be magnified by the increased height of the dike, should not this impact be mentioned in the EIS?"

Backflow through the existing storm drain system during high stage in the stream has occurred because of damages to the existing outlets of the systems. The increased height of the dike will be beneficial in protecting against possible overtopping of the existing lower dike. The outlets will be reconstructed on a stable foundation provided by the proposed grouted rip-rap lining and provided with flap gates to prevent backflow from the stream.

4. Impacts on Land Use

"On page 3-10 the EIS states that the proposed project 'will allow additional development to occur that will be less liable to flooding.' This 'long-term economic impact' requires additional comment. How much development could take place and what level of damages and fatalities could occur from floods with magnitudes exceeding the .01 design-level?"

Since the proposed project will protect an existing subdivision, the only additional development which could occur would be improvements to the existing homes. This is permitted under Federal guidelines as long as the improvements do not constitute 50% or more of the structures' current market value. As described on page 9-3 and 9-4 of the EIS, any new construction must have adequate floodproofing measures and will be regulated by new amendments to the Building Code and Comprehensive Zoning Code (CZC).

The level of damages and fatalities which could occur from floods with magnitudes exceeding the .01 design-level was not calculated for the project because the City and County Building Code and CZC regulations are or will be based on the 100-year flood level and 100-year tsunami zone. This practice was adopted to maintain consistency with the National Flood Insurance Program.

5. Alternatives

"a. Table 5-2, on page 5-3, presents the benefit/cost ratios for the alternative actions that were appraised. Despite the fact that flood-proofing has the most favorable ratio, it was not discussed. Why was this alternative neglected in section 5?"

The proposed project is a type of floodproofing improvement. Table 5-1 and 5-2 will be revised to indicate that floodproofing improvements are the proposed alternative.

Other means of floodproofing, such as raising the existing structures above the expected flood level or sealing all flood-prone openings of the existing structures, would not be effective in this area. The existing ground conditions on the west bank are prone to continuous erosion. Therefore, the other means of floodproofing would still subject the existing structures to flood damages.

"b. On page 1-4 the EIS states that 'the channel constrictions associated with this bridge (Farrington Highway Bridge over Kaukonahua Stream) cause erosion along the upstream and downstream banks, which subjects the homes to further damages during flood conditions.' On page 2-12 the EIS states 'the inadequate capacity of the existing stream cross-section and the inadequate waterway opening of the Waialua Beach Road Bridge contribute to flooding in this area.' Why isn't the action of alleviating the effects of the two bridges discussed as an alternative; or as an action that could be taken in conjunction with another alternative?"

The alleviation of the effects of these two bridges will be considered with other Public Works projects. Such projects will be undertaken in addition to the proposed project, not as alternatives to it. The scope of this specific project is limited to the area at the confluence of the Kaukonahua and Poamoho Streams.

"c. On page 1-8 the EIS states that riprap slope protection will be used in the project. What is the expected life of grouted riprap? Was the use of gabions considered as an alternative to grouted riprap as a viable method of stream bank protection?"

The expected life of the grouted rip-rap has been evaluated for a 50-year life. The use of gabions was initially considered as an alternative to the grouted rip-rap, but was not deemed viable because of the salt water environment. Debris can nick the PVC coating of gabions and leave the wire unprotected and exposed to the brackish or salt water.

"d. Finally, the last sentence on page 5-5 states 'The environmental impacts of proposed improvements will be less than with the other improvements.' No support or documentation is provided to substantiate this statement. It would be useful to provide a description of the technical work utilized in arriving at this conclusion."

Of the alternatives discussed in Section 5 of the EIS, those which will satisfy the need for floodproofing in the project area, including stabilization of the west bank, consist of rip-rap slope protection, concrete-lined slope protection, full channel improvements, and relocation. While relocation would have the least physical effects on the streams, it would involve a significant disruption of the lifestyles of the residents. The subdivision is an older one, close to schools, medical facilities and employment.

The present vacancy rate on Oahu is approximately 1.5% (State Data Book, 1978) and; while exhaustive studies were not made, it is doubtful that replacement housing of similar quality and cost could be found for 25 households within the Waialua-Haleiwa area. Thus, social impacts could be anticipated to be significant.

Of the remaining alternatives, concrete lined slope protection, while protecting the bank from erosion, would have greater impacts on stream fauna than rip-rap protection. This is primarily due to the fact that the smooth concrete surface is not considered to be a suitable substrate for demersal native stream species, all of which orient to the natural substrate. Rip-rap protection provides a surface more like the natural substrate.

Full-channel improvements would compound the impacts of concrete-lined slope protection, since the stream bottom would also be impacted.

We appreciate your thorough review of the EIS.

Very truly yours,

for WALLACE MIYAHIRA
Director and Chief Engineer

8E Ea 134

UNIVERSITY OF HAWAII
Water Resources Research Center

TO Earl
Engr

31 December 1979

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

Dear Sir:

Subject: Kaukonahua-Poamoho Stream EIS

Among points which I feel are not adequately addressed:

1. Statement and accommodation must be made for reservoir effects on the probable flood levels. Specifically the management of the multiple reservoirs and the large Wahiawa reservoir to reduce flood peaks as well as the possibility of increased flood peaks if the awards made from the April 1974 storm were valid.

2. Action should be taken to assess and reduce the probable contribution of the two bridges to the flood hazard.

3. The stated effect of strom drainage backup to the flood potential must be corrected since this effect will be magnified by the increased height of the dike.

4. The use of gabions as an alternative to the grouted rip rap may well be a viable method for stream bank protection.

Other thoughts as I study the proposal are:

Does the accepted 100-year flood include the effects and the purported reservoir enhancement of the April 19, 1974 flood?

Is the Wahiawa reservoir inflated crest still used to alter high level storage capacity? Probably should amplify the remarks on the 30 odd reservoirs, p. 2-10.

1-1 and other places such as 2-13, why the interchange of the terms elevation 10 and the 10' elevation? 1-4 and 2-12, I find no further reference to the alleviation of the bridge effects. 2-14, I find no further action on the storm drains as major factors in flooding. 1-5, Can any inference be drawn from the current levee about the maximum depth of scour during flood flow so that more specific terms can be used to define the required toe wall for the levee?

2540 Dole Street · Honolulu, Hawaii 96822

Can any statement be made on the expected life of the grouted rip rap? Was an consideration given to the use of gabions such as is outlined in the recent article of Burroughts, 1979 ASCE Civil Engineering 49:58-61? 2-8, though technically perhaps correct, the statement on alluvial deposits to 600' can be misleading, since many subaerial fans do occur. References on the geomorphic origins of the Ewa-Waipahu plain and the Waimanalo plain might help clarify the point. The role of the 90' sea stand cliff along the north shore might well receive more emphasis in the discussion, see Ruhe et al, 1965, Soil Sci. Soc. Amer. Proc. 29:282-287 and Lum & Stearns, 1970, Geol. Soc. Amer. Bull. 81:1-16, Figure 2, particularly.

Sincerely,

Paul C. Ekern
WRRC EIS Coordinator

PCE:jmn

Enclosure

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

FRANK F. FASI
MAYOR

WALLACE MIYAMURA
DIRECTOR AND CHIEF ENGINEER

001-12-0290

May 23, 1980

Dr. Paul C. Ekern
WRRC EIS Director
Water Resources Research Center
University of Hawaii
2540 Dole Street
Honolulu, Hawaii 96822

Dear Mr. Ekern:

Subject: Your Letter of December 31, 1979 Relating to the Kaukonahua-Poamoho Stream Improvements Environmental Impact Statement

Thank you for reviewing the Environmental Impact Statement. We will respond to your comments in the order presented.

1. "Statement and accommodation must be made for reservoir effects on the probable flood levels. Specifically the management of the multiple reservoirs and the large Wahiawa reservoir to reduce flood peaks as well as the possibility of increased flood peaks if the awards made from the April 1974 storm were valid."

   The 100-year flood levels were determined by the U.S. Army Corps of Engineers from meteorological, hydrological and geographical conditions within the drainage basins tributary to the project area (Figure 2-1, page 2-11 of the EIS). This would include the effects of the reservoirs located within the tributary drainage area.

   The several small reservoirs in the upper drainage basin are used by private landowners solely for irrigation of crops. The larger Wahiawa Reservoir is owned by Waialua Sugar Company, Inc. The water is used solely for irrigation. Recreational use within the reservoir is regulated by the State. Theoretically, such reservoirs can also be used for flood detention, but in practice none of them are.

   The management of reservoirs for flood control is a very complicated enterprise. Hydrologic forecasts of possible and probable floods must be weighed against the goal of maximizing water storage for irrigation. If the storage capacity is not available when a flood strikes, there will be little attenuation of the flood wave and the reservoirs can even be overtopped. This is compounded by the fact that flooding due to intense local thunderstorms can occur at any time (page 2-12 of the EIS). On the other hand, if the water level is lowered and the threatened flood does not materialize, valuable water supply for the next season is lost.

2. "Action should be taken to assess and reduce the probable contribution of the two bridges to the flood hazard."

   Action regarding the probable contribution of the Farrington Highway Bridge and the Waialua Beach Road Bridge to the flood hazard will be considered with other Public Works projects. Such projects will be undertaken in addition to the proposed project, not as alternatives to it. The scope of this specific project is limited to the area at the confluence of the Kaukonahua and Poamoho Streams.

3. "The stated effect of storm drainage backup to the flood potential must be corrected since this effect will be magnified by the increased height of the dike."

   Outlets of the existing storm drainage system will be reconstructed on a stable foundation to be provided by the proposed grouted rip-rap lining and will be provided with flap gates to prevent backflow from the stream.

4. "The use of gabions as an alternative to the grouted rip rap may well be a viable method for stream bank protection."

   Gabions (which are defined in the article you provided) were initially considered as an alternative to the grouted rip-rap lining, but were not deemed viable because of the salt water environment. As noted in the article you provided, debris can nick the PVC coating of gabions and leave the wire unprotected and exposed to the brackish or salt water.

Other Concerns:

"Does the accepted 100-year flood include the effects and the purported reservoir enhancement of the April 19, 1974 flood?"

   As discussed above, determination of the 100-year flood levels included effects of the reservoirs located within the tributary drainage areas.