

FINAL
ENVIRONMENTAL IMPACT STATEMENT
WAILUKU-ALENAIO WATERSHED
HAWAII COUNTY, HAWAII

March, 1976

Soil Conservation Service



Office Of Environmental Quality
Office Of The Governor
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WAILUKU-ALENAIO WATERSHED PROJECT
HAWAII COUNTY, HAWAII

FINAL ENVIRONMENTAL IMPACT STATEMENT

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March 1976

PREPARED BY:

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USDA ENVIRONMENTAL IMPACT STATEMENT

WAILUKU-ALENAIO WATERSHED PROJECT

Hawaii County
Hawaii

Prepared in Accordance with
Sec. 102(2) (C) of P.L. 91-190

SUMMARY

- I. Final
- II. Soil Conservation Service
- III. Administrative
- IV. Description of Project Purpose and Action:

A project for watershed protection and flood prevention in Hawaii County, Hawaii, to be implemented under authority of the Watershed Protection and Flood Prevention Act (PL-566, 83d Congress, 68 Stat. 666), as amended. Project measures consist of 2.1 miles of floodwater diversions, .66 mile of channel work, .19 mile of masonry wall, and land treatment.

At the present time, there are no diversions at the proposed sites. The diversions will be excavated in rock or earth and will include the necessary stabilization measures. Channel work along Waipahoehoe Stream, a natural ephemeral stream, will consist of removing boulders, brush, and trees near Chong's Bridge. Land treatment measures will be installed on forest, agricultural, and urban lands.

- V. Summary of Environmental Impact and Adverse Environmental Effects:
 - Reduce floodwater, sediment, and erosion damages on 970 acres by 99 percent.
 - Reduce sediment yield from the watershed by an estimated 26 percent.
 - Reduce nutrient transport to the receiving waters.
 - Protect ecosystems of natural flora and fauna.
 - Increase the economy of the flood plain.

- Provide employment opportunities.
- Eliminate agricultural and forestry production on 12.2 acres.
- Modify 3,500 feet of Waipahoehoe Stream.
- Remove trees and other vegetation at the structural sites.
- Create temporary noise, air, and water pollution.
- Temporary traffic inconvenience when replacing Chong's Bridge.

VI. List of Alternatives Considered:

Accelerated Land Treatment Only; Accelerated Land Treatment, Flood Plain Zoning, Flood Proofing, and Flood Insurance; Accelerated Land Treatment, Floodwater Diversions, and Channel Work; and No Project Alternative.

VII. Comments were received from the following departments and agencies:

Federal

- Department of the Air Force
- Department of the Army - Headquarters, U.S. Army Support
Command, Hawaii
- Corps of Engineers
- Department of Commerce
- Environmental Protection Agency
- Department of Health, Education, and Welfare
- Advisory Council on Historic Preservation
- Department of the Interior
- Department of Transportation - U.S. Coast Guard

State

- Department of Agriculture
- Office of Environmental Quality Control
- Governor's Office
- Department of Health - Director's Office
- Environmental Engineer, Hilo
- Department of Land and Natural Resources
- Department of Planning and Economic Development
- Department of Transportation
- University of Hawaii - Environmental Center

VIII. Draft statement transmitted to CEQ on February 28, 1975.

PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

USDA Soil Conservation Service
Final Environmental Impact Statement^{1/}

for

Wailuku-Alenaio Watershed, Hawaii

Installation of this project constitutes an administrative action. Federal assistance will be provided under authority of Public Law 83-566, 83d Congress, 68 Stat. 666, as amended.

SPONSORING LOCAL ORGANIZATIONS

Waiakea Soil and Water Conservation District
Mauna Kea Soil and Water Conservation District
County of Hawaii

PROJECT PURPOSES

The purposes of the project are to reduce erosion and prevent floodwater and sediment damages to agricultural and urban areas.

The sponsors' specific goals are:

1. Land treatment--Install conservation land treatment measures on 16,800 acres during the 10-year installation period.
2. Flood prevention--Provide a 100-year level of flood protection for the residential areas of Ainako, Kaumana, and Chongmanville and a minimum of a 25-year level of flood protection for the agricultural areas. The acreages presently damaged by floodwater for different flood events are as follows:

^{1/} All information and data, except as otherwise noted by reference to source, were collected during the watershed planning investigation by the Soil Conservation Service and Forest Service, U.S. Department of Agriculture.

<u>Area</u>	<u>25-year Level</u>	<u>50-year Level</u>	<u>100-year Level</u>
	-----Acres-----		
Kaumana:			
Urban	40	46	58
Pasture and Sugarcane	425	512	640
Chong's Bridge	74	88	110
Flood Plain Below Chong's Bridge	273	326	407
Kaumana Garden	12	14	18
Downtown Hilo	135	160	203
Ainako Stream:			
Urban	35	45	61
Pasture	60	80	103

3. Sediment reduction--Reduce soil loss on cropland to not more than 5 tons per acre per year.
4. Fish and wildlife--Maintain wildlife habitat.

PLANNED PROJECT

Land Treatment Measures: Conservation land treatment measures will be applied to 1,600 acres of cropland, 4,000 acres of pastureland, 1,200 acres of urban land, and 10,000 acres of forest land during the 10-year installation period. (See Land Treatment Map - Appendix D.) These conservation land treatment measures will be installed by the individual land owners and operators on a voluntary basis. Technical assistance needed to install the treatment measures will be provided by the Soil Conservation Service and the U.S. Forest Service, through the soil and water conservation districts and the State Division of Forestry, respectively.

Accelerated application and continued maintenance of the land treatment measures are necessary to insure the expected benefits from the other improvements. Therefore, in addition to presently available technical assistance, \$90,000 in federal funds will be made available under the authority of Public Law 566 to accelerate planning of these measures.

Cropland treatment measures include:

- Crop residue management - Using plant residues to protect cultivated fields during critical erosion periods (300 acres).
- Conservation cropping system - Growing crops in combination with needed cultural and management measures (1,600 acres).
- In-field diversions - Using channels to transport runoff water from areas of concentration and carry it at safe velocities to protected outlets (72,000 feet).
- Stream channel stabilization - Stabilizing the channel of a stream with structures (750 feet).
- Grade stabilization structures - Stabilizing the grade or controlling a head cut using structures in natural or artificial channels (4 each).
- Streambank protection - Stabilizing and protecting banks of existing streams against scour and erosion by vegetative or structural means (1,200 feet).
- Critical area planting - Planting vegetation such as trees, shrubs, vines, grasses, or legumes on critically eroded areas (20 acres).

Pastureland treatment measures include:

- Pasture management - Treating and proper grazing use of pastureland (4,000 acres). (Practices include fertilization and rotation grazing.)
- Pasture planting - Establishing and reestablishing long-term stands of adapted species of perennial, biennial, or reseeding forage plants (250 acres).
- Brush management - Managing and manipulating stands of brush by mechanical, chemical, or biological means (500 acres).

Urban land treatment:

Permits to clear land for urban use will require measures to minimize erosion and runoff. These measures, which may be temporary or permanent, include replanting denuded lands with proper vegetation and providing diversions, holding ponds, and similar measures to keep the soil on the land. Also, only a limited number of acres will be permitted to be disturbed at any one time. A total of 1,200 acres will be treated.

Forest land treatment measures:

Land treatment measures on forest land are designed to increase productivity for forest products, recreation, and wildlife habitat, while maintaining the present generally favorable watershed condition and protecting ecosystems of natural flora and fauna. Typical measures include:

1. Reforestation or improvement of forest cover to protect the soil, reduce runoff, and enhance timber, scenic, recreation, and wildlife resources.
2. Maintain favorable watershed conditions by:
 - a. Excluding feral animals and trespass domestic cattle from forest reserves and maintaining game animal numbers at acceptable levels.
 - b. Keeping burned acreage at acceptable level with effective fire prevention and control program.
 - c. Insect and disease control - continue to evaluate cause, effect and, if feasible, implement control for "ohia die-back" and other insect and disease infestations.

There are no critical land stabilization needs on forest land in the watershed. The current program for management of state forest land and technical assistance presently available to private forest landowners under the Cooperative Forest Management Program will be adequate during the project period. No accelerated program is anticipated under this project.

Structural Measures: The structural measures will supplement the land treatment program in reducing floodwater and sediment damages. The structural measures consist of four floodwater diversions, stream channel work in Waipahoehoe Stream, and a concrete rubble masonry wall (see Appendix B).

Structure 6 (see Figure 1A) consists of a rock and earth cut trapezoidal floodwater diversion with provisions to trap debris. The diversion to Waipahoehoe Stream will be approximately 4,020 feet long with a bottom width of 8 feet for the first 1,000 feet and 25 feet thereafter. Depth will range from 5 to 11 feet. Side slope will be 1:4 (1 horizontal to 4 vertical). The diversion will be constructed through pastureland and woodland with topsoil 10 to 12 inches deep over lava rock. Pockets and layers of soil and highly fractured rock may be encountered during excavation. Pneumatically applied mortar will be used to line these areas. The area is expected to contain lava tubes, some with flowing water. When a

tube carrying water is intercepted during construction, the water will either be bypassed or introduced into the diversion. This structure will intercept runoff from forest lands and will protect sugarcane fields and the residential areas above Kaumana. It will be designed to contain the 100-year peak flow estimated at 290 cfs for the reach up to Station 12+50 and 1,780 cfs for the remainder of the diversion.

A 13-foot-wide maintenance road will run parallel to the diversion on the downhill side. About 4.5 acres of pastureland will be required for the right-of-way and construction of the diversion. Displacement of people, businesses or farm operations is not anticipated. Soil erosion and water and air pollution will be minimal in this rocky area. No major erosion or pollution problems are expected.

Structure 5 (see Figure 1B) consists of a trapezoidal floodwater diversion channel that will divert overland flow from Kaumana Drive to Kaluiiki Branch. The diversion will be approximately 1,100 feet long, with a bottom width of 12 feet and depth of 9.4 feet. Side slopes will be 2:1.

This diversion will be excavated in soil underlain by fractured rock. The soil is highly sensitive. The strength and erosion resistance is relatively high in the undisturbed state but extremely low when disturbed. Special care will be exercised during construction, and channel banks will be shaped from the bottom to keep disturbance to a minimum. It will be constructed through sugarcane land and will be vegetated. No maintenance road will be needed since the diversion channel will be maintained from the inside.

It will intercept floodwater from the area below Structure No. 6 to protect the sugarcane fields and residential areas along Kaumana Drive. It will be designed to contain the 100-year peak flow estimated at 1,350 cfs.

A bridge crossing will be constructed on Wilder Road and a ford crossing on the field road.

About 2.0 acres of sugarcane land will be required for right-of-way and construction of the diversion. Soil erosion and noise and air pollution can be expected during the construction phase. However, vegetating the channel as construction proceeds will minimize the erosion problem.

Structure 4 (see Figure 1C) will consist of a rock-cut trapezoidal floodwater diversion channel that will divert overland runoff into Wailuku River. This diversion will be approximately 4,050 feet long with a bottom width of 10 feet and a depth of 13 feet. Side slopes will be 1:4. As in Structure 6, lava tubes may be encountered during excavation. If the tube feeding Ainako Stream is intercepted, a bypass structure will be provided to release low flows into the stream.

This diversion will be constructed on pastureland and urban-zoned land. Soils with a high level of organic material are about 10 inches deep over lava rock. Excavation through highly fractured rock is expected during

excavation. Pneumatically applied mortar will be used to line these areas. This diversion will intercept floodwater from forest and pasture lands and will protect the Ainako residential area. It will be designed to contain the 100-year flow estimated at 1,120 cfs.

For safety, a fence will be installed along the last 1,130 feet of the diversion.

A 13-foot-wide maintenance road will run parallel to the diversion on the downhill side. A water main will be relocated near Waianuenu Road, and a bridge crossing will be constructed on that road.

About 4.2 acres will be required for the construction of this diversion. As in Structure 6, construction will be in a rocky area and no pollution problems during construction are expected.

Structure 3 (see Figure 2) will consist of a floodwater diversion, a concrete rubble masonry (CRM) wall and channel work in the vicinity of Chong's Bridge.

The diversion will intercept floodwater from the woodlands and transport it to Waipahoehoe Stream. It is approximately 2,100 feet long with a bottom width of 8 feet and a depth of 6.7 feet. Side slopes will be 1:4. It will be constructed through recently cleared brushland. The soils are less than 12 inches thick over lava rock. Pneumatically applied mortar will be used where soil pockets or highly fractured rocks are encountered.

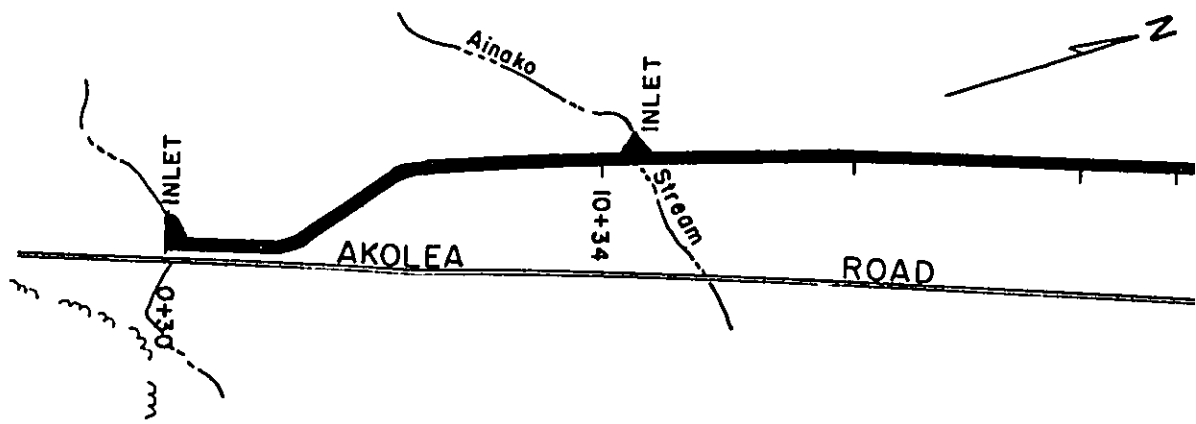
The channel work on Waipahoehoe Stream consists mainly of removing boulders and trees within the stream proper to increase stream capacity above Chong's Bridge. The 3,500 feet of channel work will remove only those boulders and trees which block or restrict the flood flows. Work will be limited to one bank where possible.

The work will increase the capacity of the stream to contain the 100-year flow except in two sections of the 3,500-foot reach. A CRM wall will be constructed along these sections. An 800-foot-long CRM wall will be constructed downstream of the diversion outlet. This trapezoidal wall will have 7 feet bottom width, 2 feet top width, and 10 feet in height. A similar CRM wall, 200 feet in length, will be constructed downstream from Chong's Bridge. Foundations for these walls will be in rock.

A 13-foot-wide maintenance road will run parallel to the diversion and CRM wall. About 1.5 acres of brushland will be cleared to construct these measures. This structure will protect the residential areas along Chong Street. It will be designed to contain the 100-year flow estimated at 440 cfs for the diversion and 4,100 to 7,080 cfs for Waipahoehoe Stream.

Chong's Bridge will be replaced and the water main relocated.

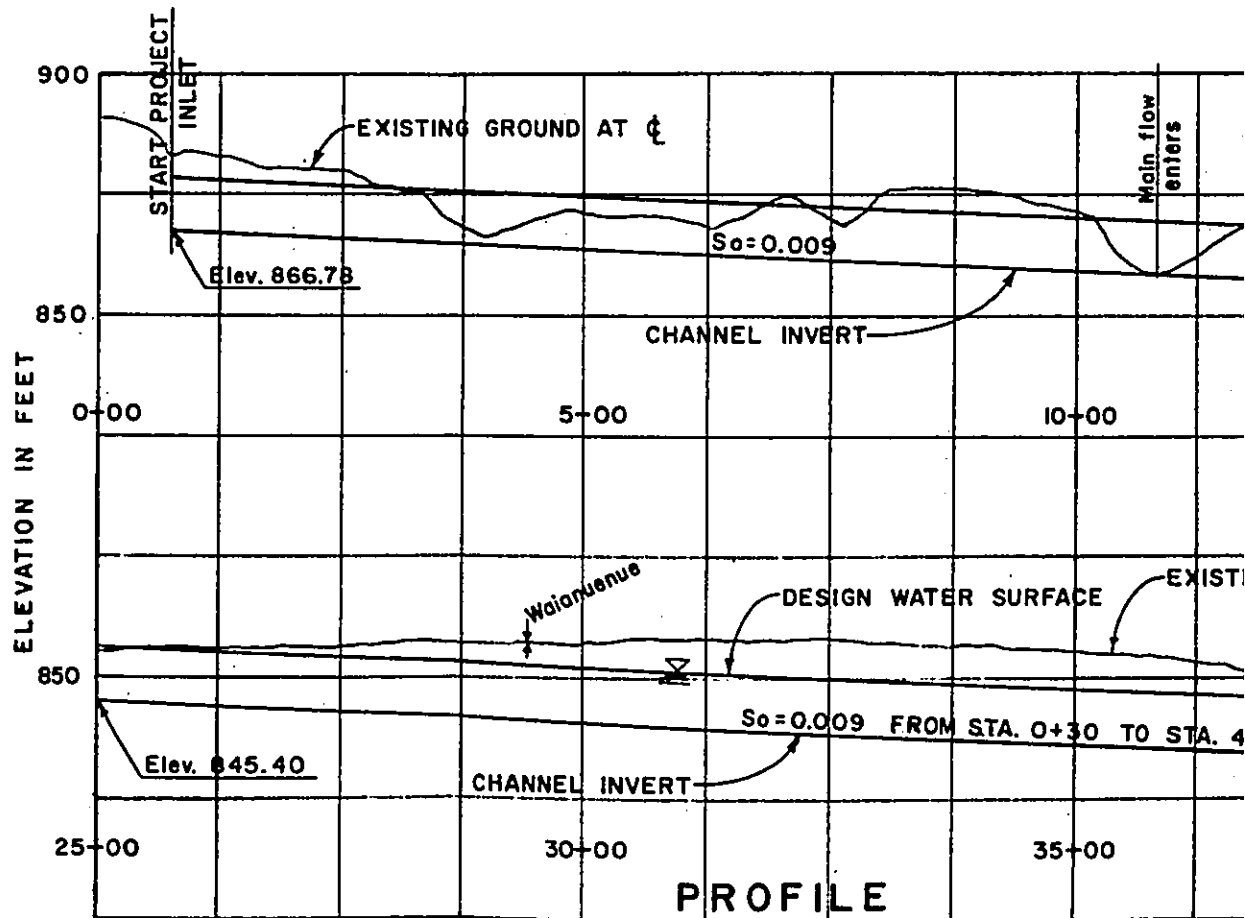
The structural data is shown in Table 1.



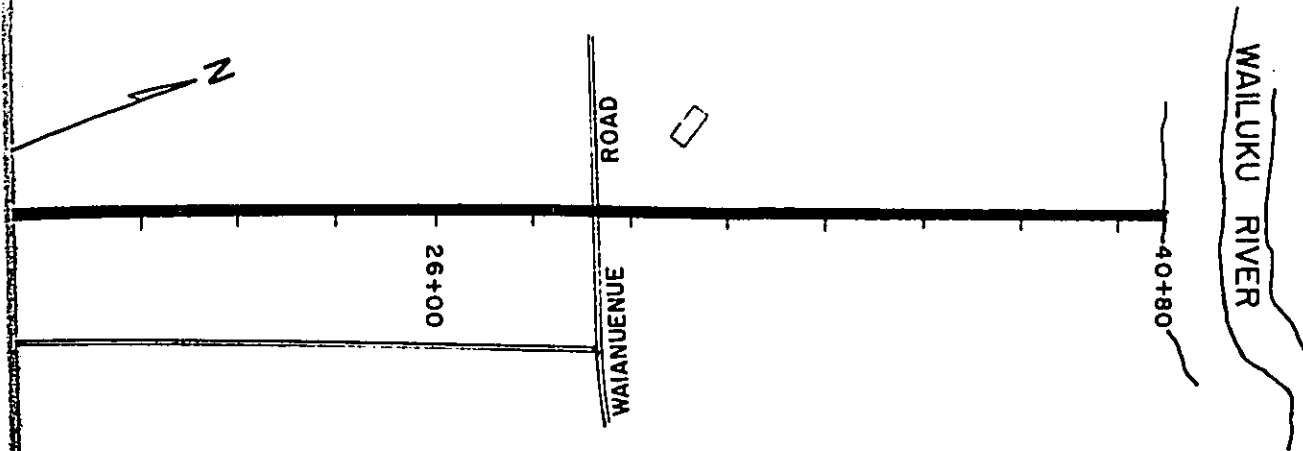
PLAN

LEGEND

- Existing Stream
- Floodwater Diversion
- == Paved Road



PROFILE



PLAN

0 200 0 400
SCALE IN FEET

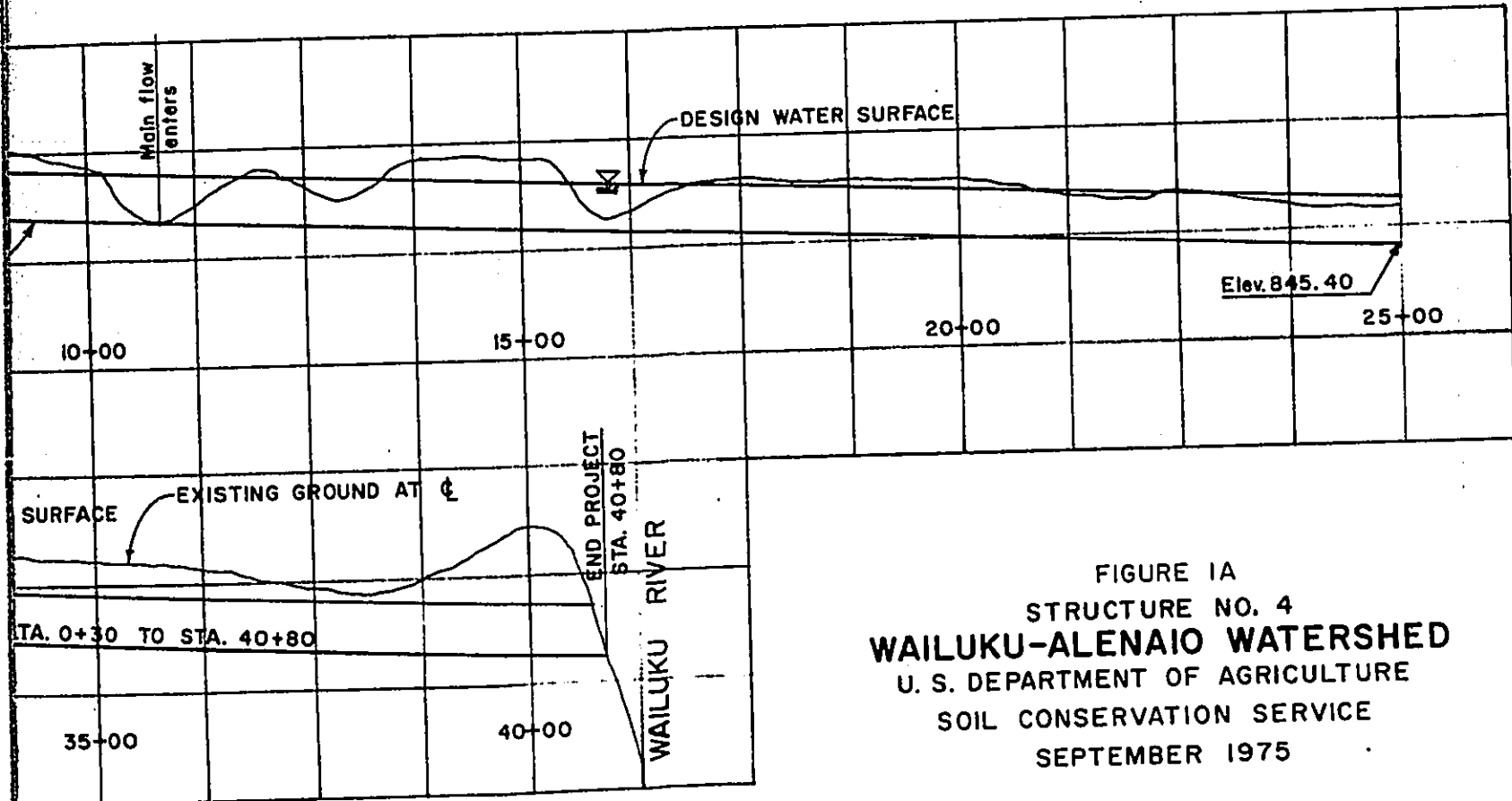
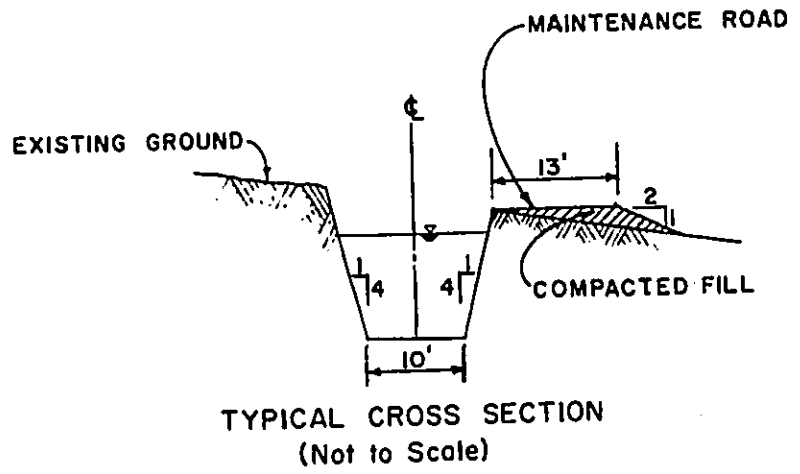
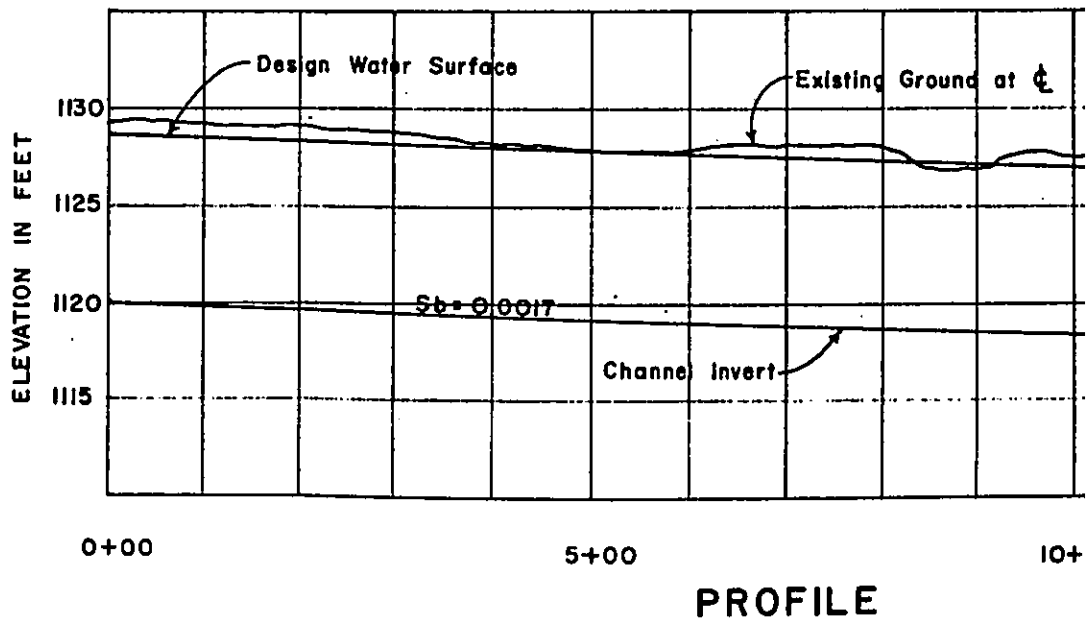
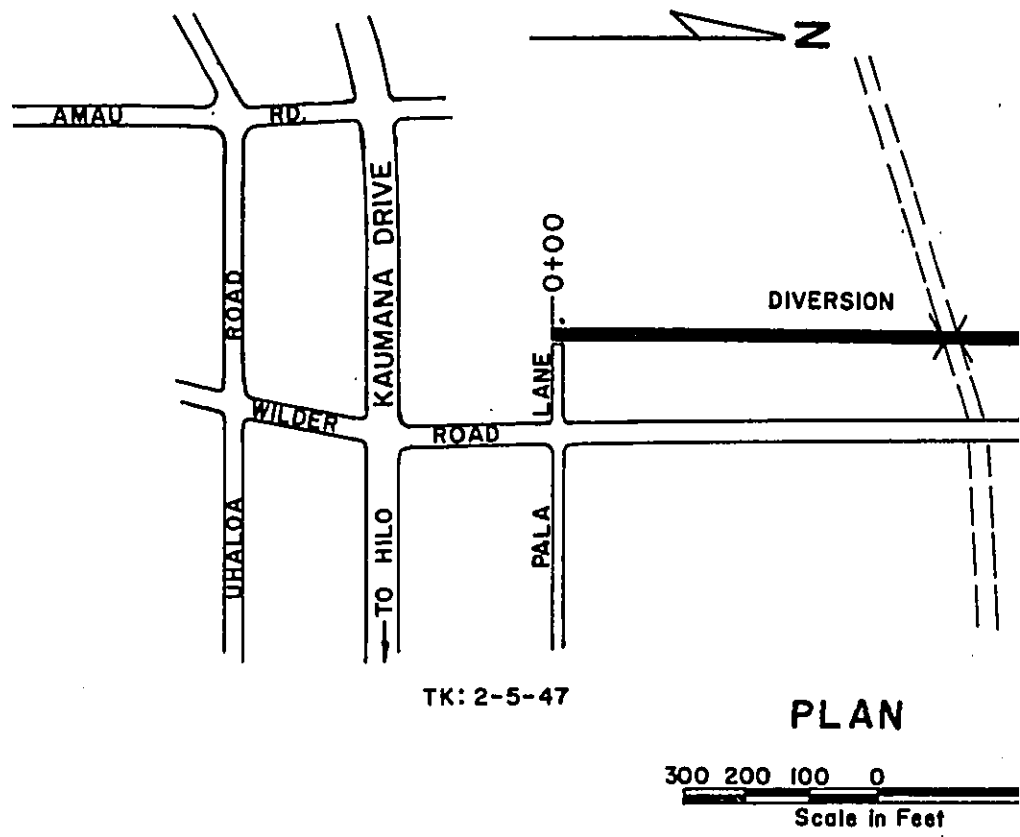
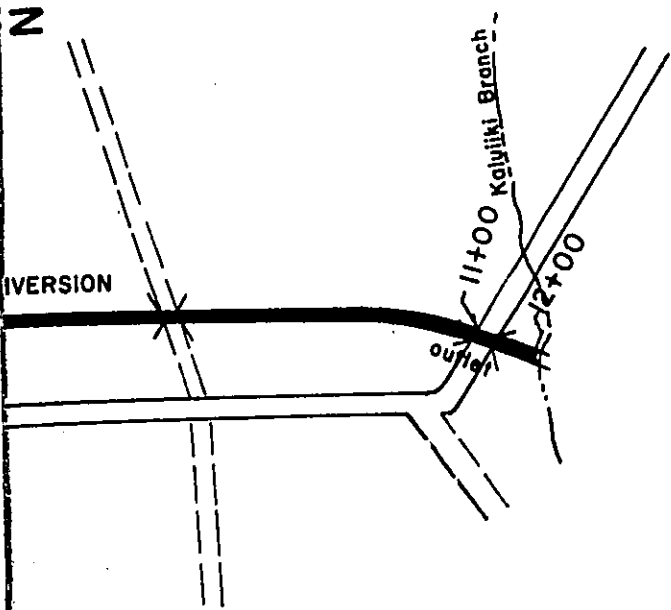


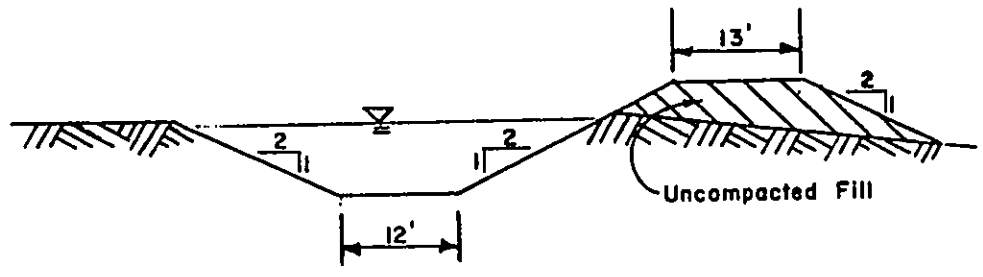
FIGURE 1A
STRUCTURE NO. 4
WAILUKU-ALENAIO WATERSHED
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SEPTEMBER 1975





PLAN

100 0 300
Scale in Feet



TYPICAL CROSS SECTION
(Not to Scale)

LEGEND

- Existing Stream
- Floodwater Diversion
- Paved Road

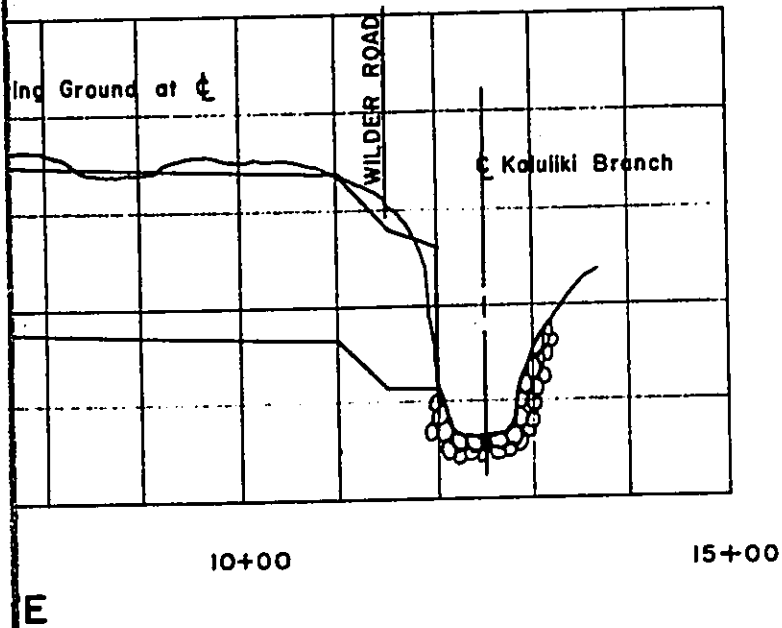
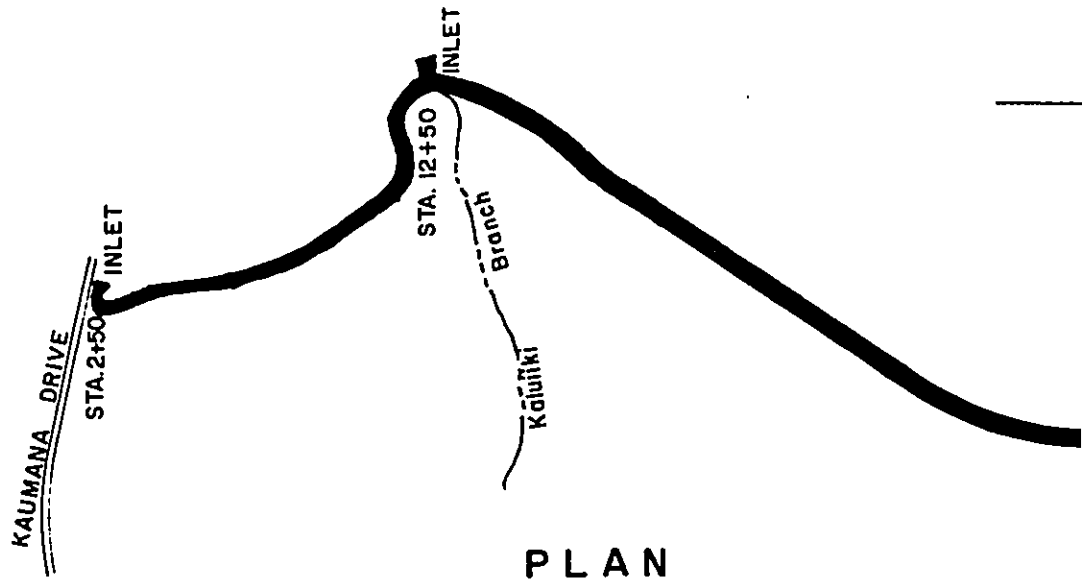
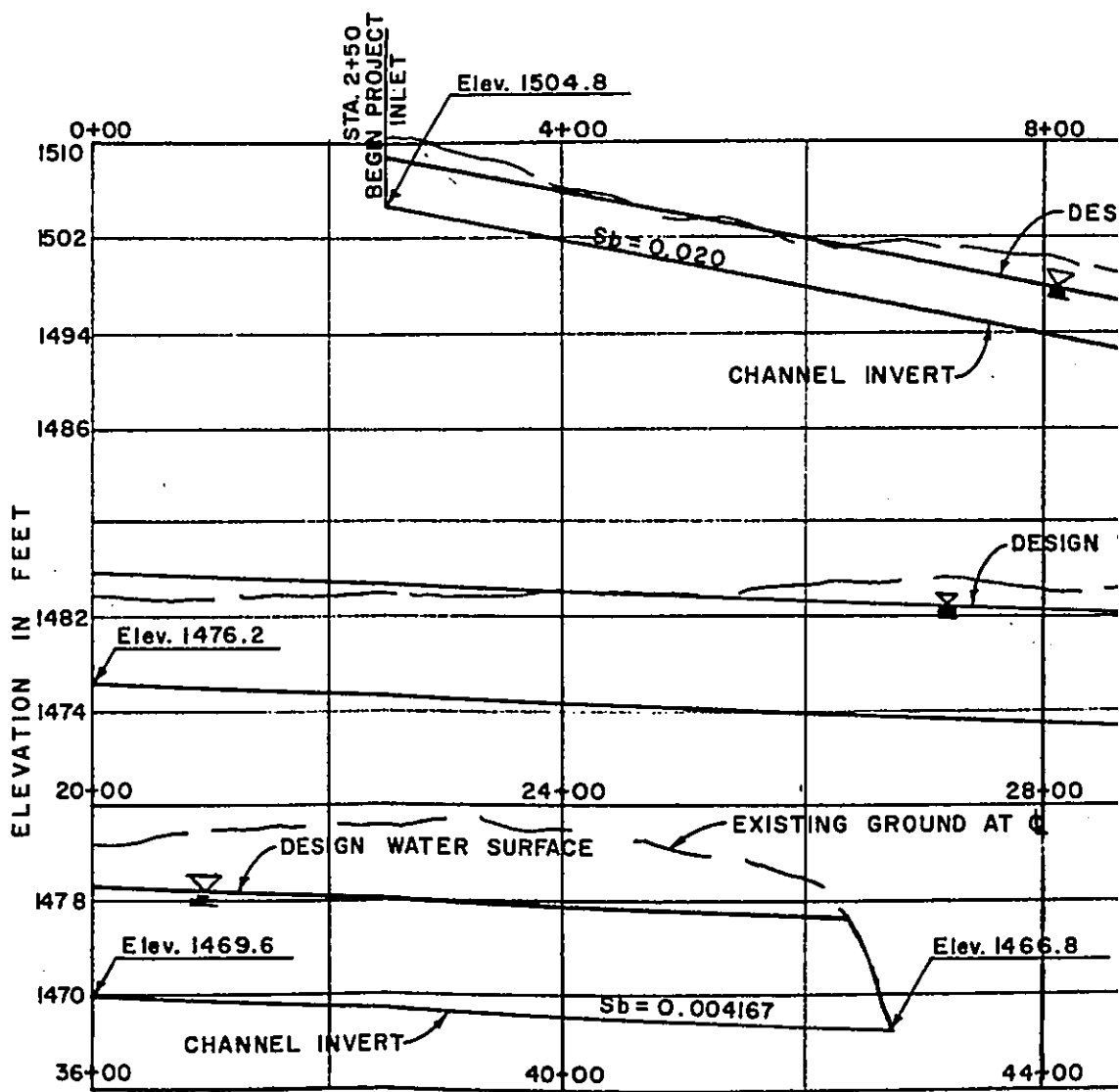
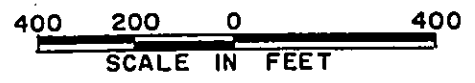
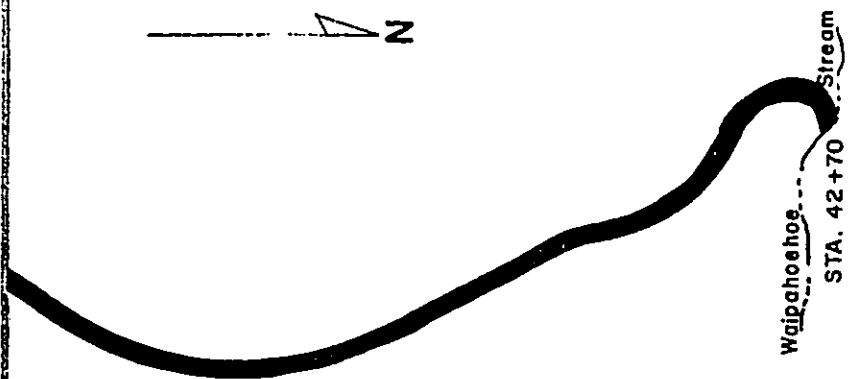
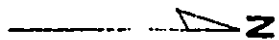


FIGURE 1B
STRUCTURE NO. 5
WAILUKU-ALENAIO WATERSHED
ISLAND OF HAWAII, HAWAII
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SEPTEMBER 1975



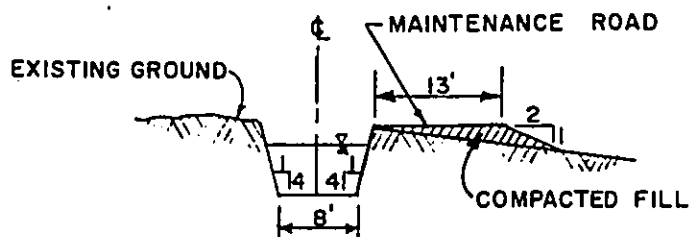
PLAN



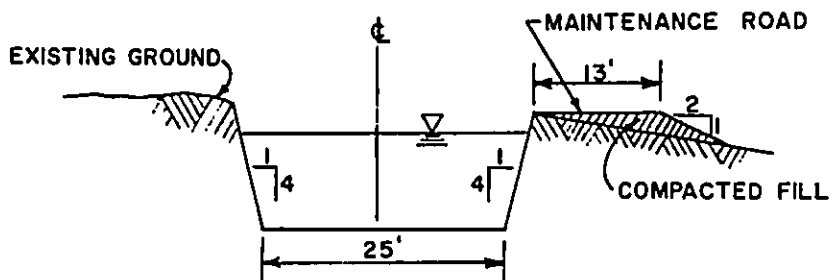


LEGEND

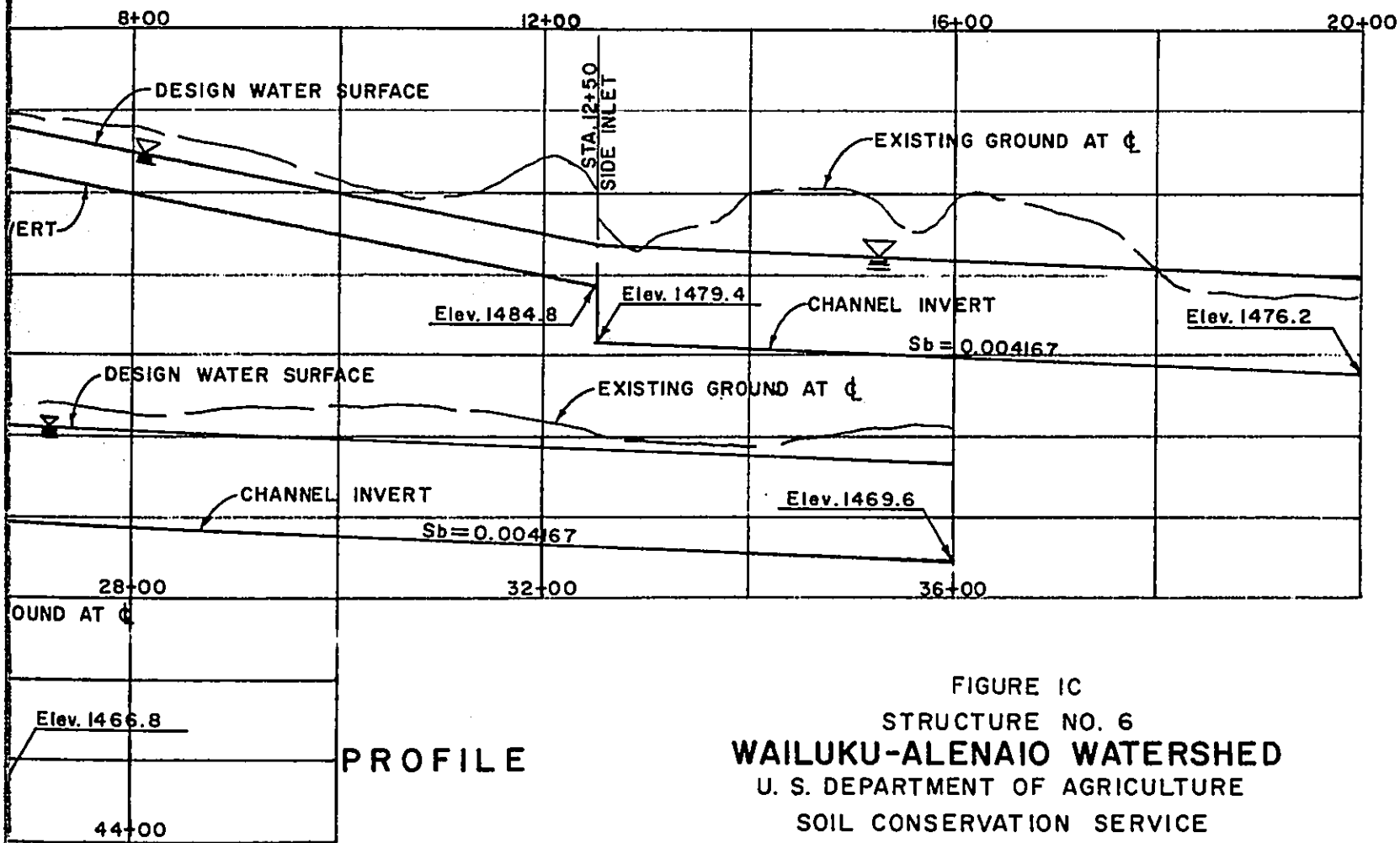
- Existing Stream
- Floodwater Diversion
- Paved Road



TYPICAL CROSS SECTION
Sta. 2+50 to Sta. 12+50
(Not to Scale)

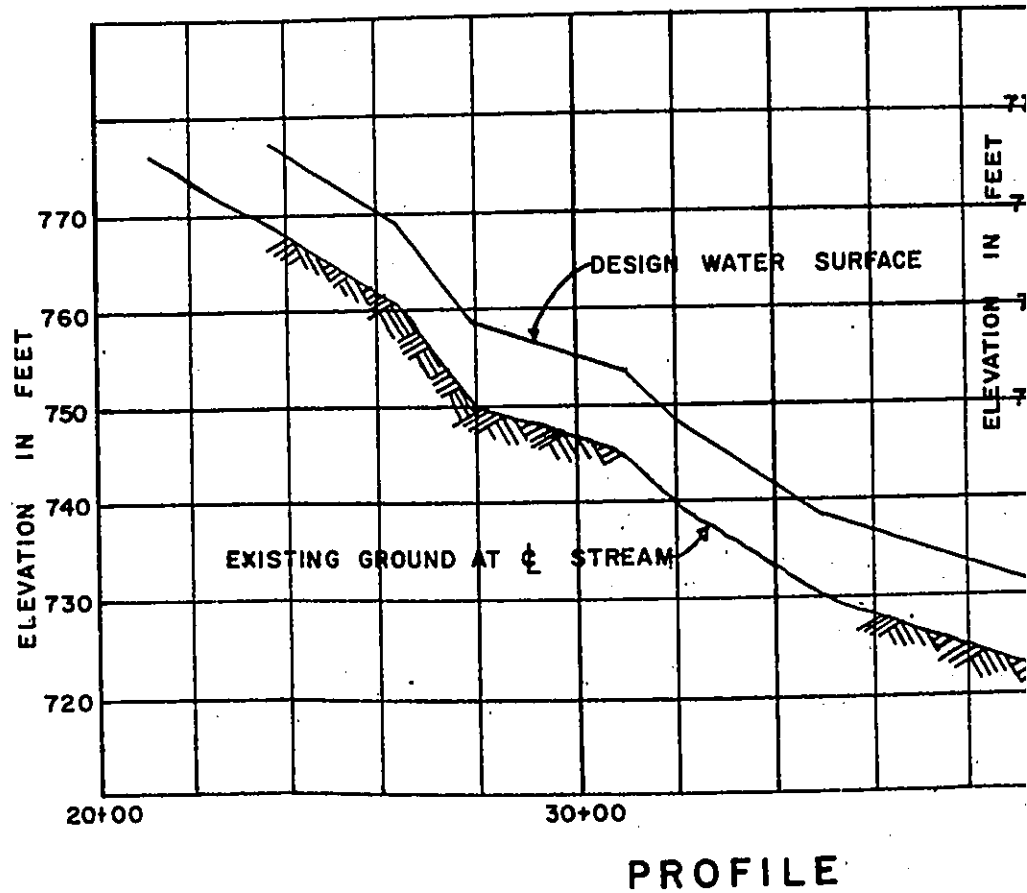
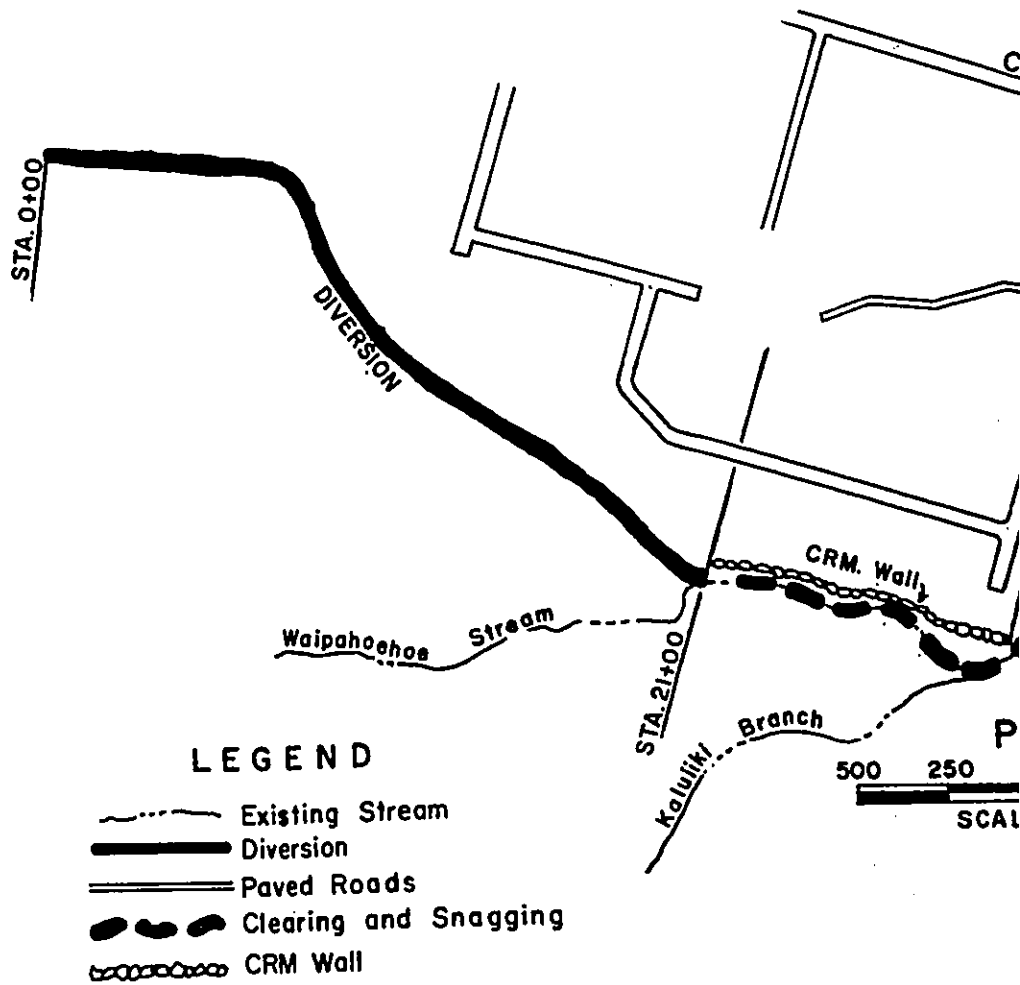


TYPICAL CROSS SECTION
Sta. 12+50 to Sta. 42+70
(Not to Scale)



PROFILE

FIGURE 1C
STRUCTURE NO. 6
WAILUKU-ALENAIO WATERSHED
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SEPTEMBER 1975



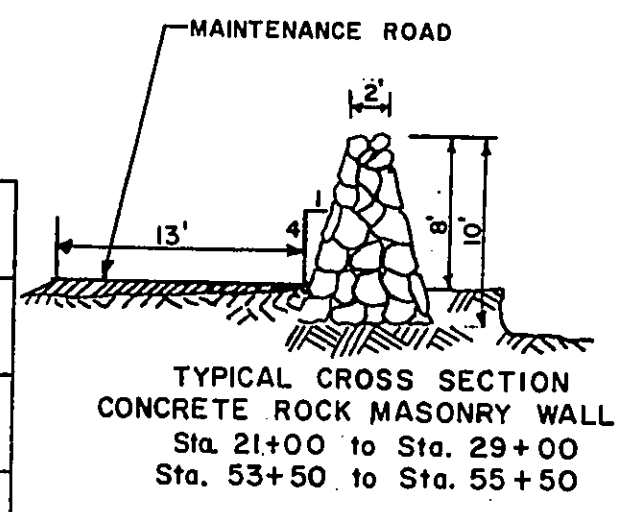
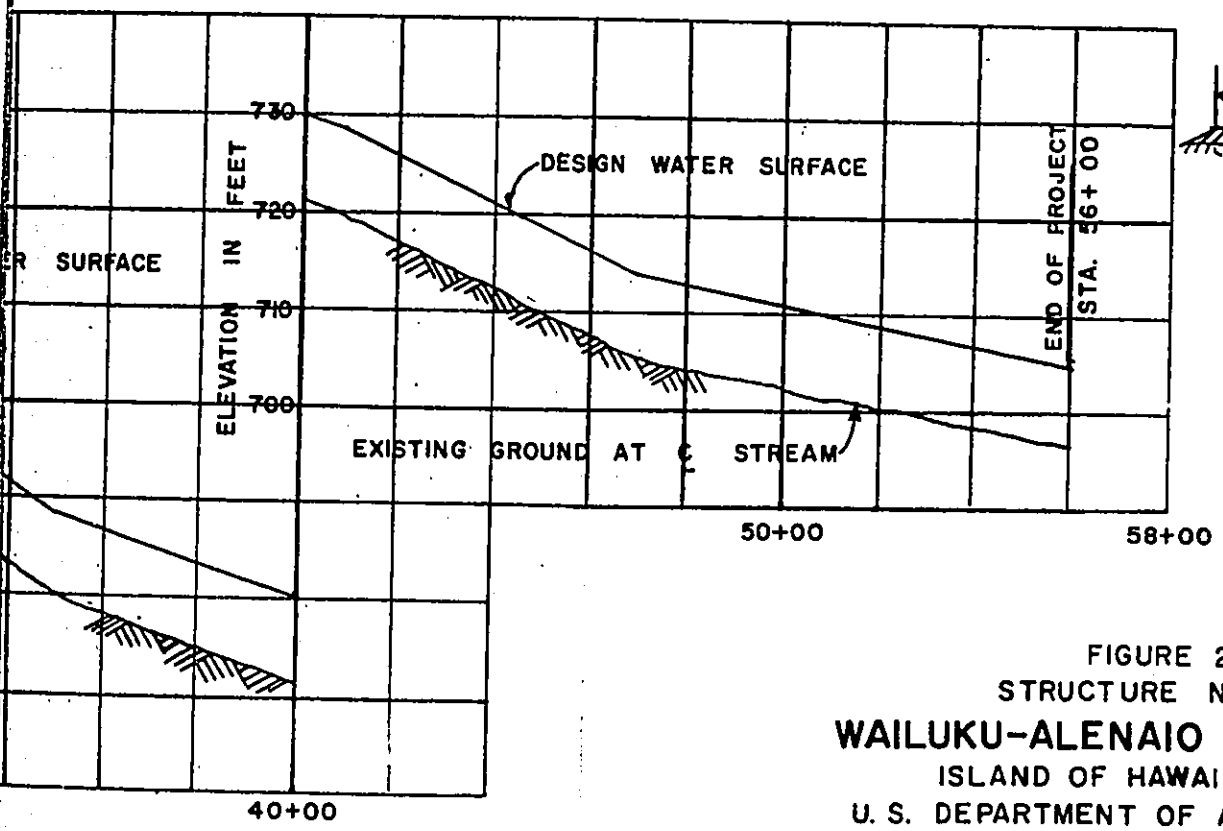
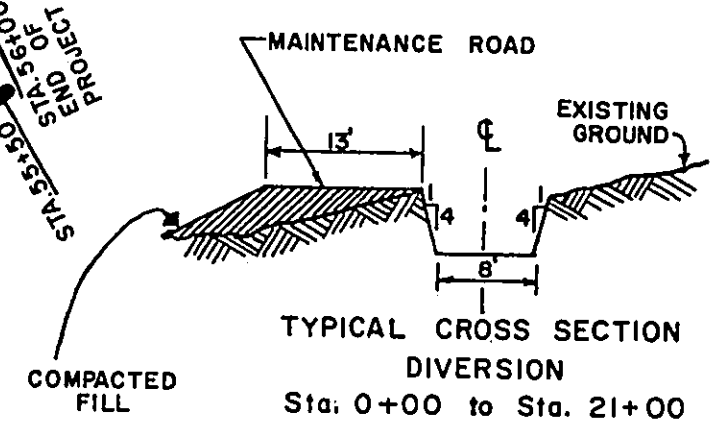
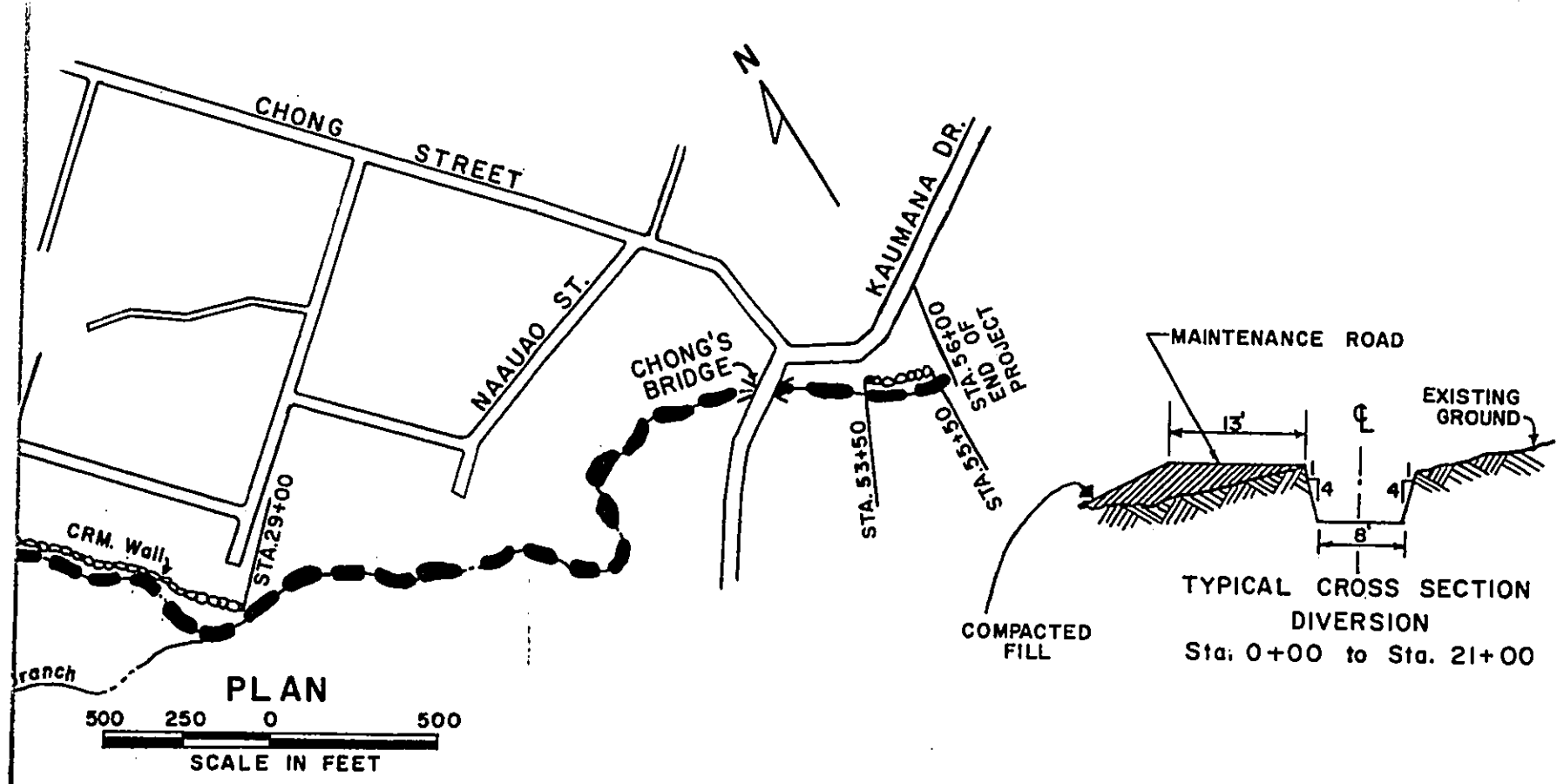


FIGURE 2
STRUCTURE NO. 3
WAILUKU-ALENAIO WATERSHED
ISLAND OF HAWAII, HAWAII
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SEPTEMBER 1975

LE

TABLE 1 - ESTIMATED PROJECT INSTALLATION COSTS

WAIJUKU-ALENAIO WATERSHED, HAWAII

Installation Cost Item	Unit	Number	Estimated Cost (Dollars) ^{1/}						Total
			P.L. 566 Funds			Other			
			Non-Fed. Land		Total	Non-Fed. Land		Total	
			SCS ^{3/}	FS ^{3/}		SCS ^{3/}	FS ^{3/}		
<u>LAND TREATMENT</u>									
Land Areas ^{2/}									
Forest Land	Ac.	10,000	--	--	--	135,000 ^{4/}	135,000	135,000	
Cropland	Ac.	1,600	--	--	--	114,000	114,000	114,000	
Pastureland	Ac.	4,000	--	--	--	130,900	130,900	130,900	
Urban	Ac.	1,200	--	--	--	610,500	610,500	610,500	
Technical Assistance			90,000	--	90,000	30,000	12,000	42,000	
TOTAL LAND TREATMENT	Ac.	16,800	90,000	--	90,000	885,400	147,000	1,032,400	
<u>STRUCTURAL MEASURES^{5/}</u>									
Construction									
Floodwater Diversions	Ft.	11,270	801,850	--	801,850	--	--	801,850	
Stream Channel Work (N) (Incl. CRM wall)	Ft.	3,500	306,650	--	306,650	--	--	306,650	
Subtotal Construction	Ft.	14,770	1,108,500	--	1,108,500	--	--	1,108,500	
Engineering Services			221,750	--	221,750	--	--	221,750	
Project Administration									
Construction Inspection			66,500	--	66,500	26,000	--	26,000	
Other			155,250	--	155,250	31,800	--	31,800	
Subtotal Administration			221,750	--	221,750	57,800	--	57,800	
Other Costs									
Land Rights			--	--	--	289,000	--	289,000	
Subtotal Other			--	--	--	289,000	--	289,000	
TOTAL STRUCTURAL MEASURES			1,552,000	--	1,552,000	346,800	--	346,800	
TOTAL PROJECT			1,642,000	--	1,642,000	1,232,200	147,000	3,021,200	

1/ Price base: 1975
 2/ Includes only areas estimated to be adequately treated during project installation period. Treatment will be accelerated throughout the watershed, and dollar amounts apply to total land area, not just to adequately treated areas.
 3/ Federal agency responsible for assisting in installation of works of improvement.
 4/ Contains \$30,000 for practices to be installed by private landowners. Remainder for practices to be installed by the State Forestry Division.
 5/ Type of channel before project: (N) - an unmodified well-defined natural channel or stream.

Design considerations and construction specifications will contain detailed requirements to minimize soil erosion and water and air pollution. These measures will be determined by evaluating the pollution hazard on a site-by-site basis. Plans and specifications will require such measures as planting temporary vegetation or mulch on exposed areas; limiting exposure of erodible soils; scheduling work for low rainfall months; building structures in segments; trapping sediment and debris in temporary debris basins; and employing measures to keep erosion under control if construction is suspended for an appreciable length of time (see Table 2).

Following construction, all denuded areas will be smoothed, fertilized, mulched, and revegetated.

Land committed to structural measures is 12.2 acres. This area presently consists of 2.0 acres of sugarcane land, 1.0 acre of proposed subdivision land, 3.1 acres of pastureland, and 6.1 acres of grazed woodland.

The state owns 2.1 acres and private owners 10.1 acres of the area to be used for structural measures. The privately owned land will be acquired in fee simple title or perpetual easement. State lands will be transferred to county ownership.

If any artifacts or other items of archaeological or historical significance are uncovered before or during construction, the Bishop Museum, National Park Service, and the Hawaii Department of Land and Natural Resources will be notified before construction continues. Since this is a federally assisted local project, there will be no change in existing responsibilities of any federal agency under Executive Order 11593 with respect to archeological and historical resources.

Operation and Maintenance: The operation and maintenance (O&M) of structural measures will be the responsibility of the County of Hawaii. An O&M Agreement between the county and SCS will be executed before project agreements are signed.

The O&M is an integral part of the proper functioning of the structural measures. It is programmed to preserve the design capacities of the diversions and channels. Special care will be exercised when maintaining Structure 5 so as not to disturb the channel banks.

The O&M for the channels and diversions will include replacement of damaged mortar and the periodic removal of debris and sediment deposited in the structures. Undesirable vegetation will be controlled by cutting or spraying with USDA-approved herbicide.

TABLE 2
 SCHEDULE FOR INSTALLATION OF STRUCTURAL MEASURES
 WAILUKU-ALENAIO WATERSHED, HAWAII

Structure		Item	Fiscal Year		
Location	Number		First	Second	Third
Above Ainako Area	4	Design Land Acquisition Construction	█	█	
Chong's Bridge Area	3	Design Land Acquisition Construction	█	█	█
Kaumana Area	5	Design Land Acquisition Construction		█	
	6			█	█

NOTE: Construction time shown includes time for advertising bids and awarding contract.

The County of Hawaii, the Mauna Kea Soil and Water Conservation District (SWCD), the Waiakea SWCD, and the SCS will jointly inspect all structures annually, and after severe storms, for a 3-year period following project installation. Thereafter, the county will inspect the structures and submit reports to the SCS on maintenance needs and scheduling of corrective measures.

The annual O&M cost is estimated at \$17,140.

Project Costs: The total project installation cost is estimated at \$3,021,200, including \$1,122,400 for land treatment measures and \$1,898,800 for structural measures.

The cost distribution to PL-566 and other funds is:

<u>Item</u>	<u>PL-566</u>	<u>Other</u>	<u>Total</u>
Construction	\$1,108,500	--	\$1,108,500
Total Project	\$1,642,000	\$1,379,200	\$3,021,200

The benefit-to-cost ratio is: 2.6:1.0.

ENVIRONMENTAL SETTING

Physical Resources: The 167,000-acre Wailuku-Alenaio Watershed is located on the island of Hawaii, which comprises Hawaii County, at approximately latitude 19°40' N. and longitude 155°20' W. Hilo, the county seat and principal business center, is located approximately 200 miles southeast of Honolulu, the state capital. The watershed is triangular in shape with Hilo, Mauna Kea, and Mauna Loa volcanoes as boundary points (see project map).

The island of Hawaii is subregion 1 of the Hawaii Water Resources Region established by the Water Resources Council to include the whole state.

The flood plain occupies an area about 6.5 miles long, from the shoreline of Hilo Bay, upstream along Waialama Canal and Alenaio-Waipahoehoe-Kaluiiki Stream complex (see Figs. 3a, 3b, 3c and 3d). A separate flood plain along Ainako Stream starts from Waiuanuenu Road to Akolea Road. The total flood plain is estimated at 1,600 acres, comprising about 450 acres urban land, 600 acres in sugarcane land, and 550 acres in pasture and forest land.

Soils in the watershed have been grouped into the following associations:^{2/}

Akaka-Honokaa-Kaiwiki: Deep, gently sloping to steep, moderately well and well-drained soils that have a moderately fine-textured subsoil; on upland.

Kekake-Keel-Kiloa: Very shallow, gently sloping to steep, well-drained organic soils over pahoehoe or fragmented aa lava; on uplands.

Hanipoe-Maile-Puu Oo: Deep, gently sloping to steep, well-drained soils that have a medium textured to moderately fine-textured subsoil; on uplands.

Lava flows: Gently sloping to steep, excessively drained, nearly level, barren lava flows and sandy and cindery soils; on uplands.

Hawaii, at the northern edge of the tropics, enjoys a subtropical climate. Hilo's mean temperature is 73.3°F., with an average minimum of 65.5°F. and an average maximum of 80.0°F. Relatively uniform temperatures and day lengths provide a 12-month growing season with only slight growth reduction from October to April.

^{2/} USDA, Soil Conservation Service, Soil Survey of Island of Hawaii, State of Hawaii, 1973.

Annual rainfall averages 140 inches at Hilo, increases to 300 inches at 3,000 feet (7 miles inland), then decreases to 50 inches at 6,500 feet and 10 inches near the top of Mauna Kea (13,796 feet).^{3/} Monthly rainfall varies from a high of 25 inches in March to a low of 12 inches in June.

Elevation in the watershed ranges from sea level at Hilo Bay to 13,796 feet (MSL) at the summit of Mauna Kea. The general slope of the land is toward the east.

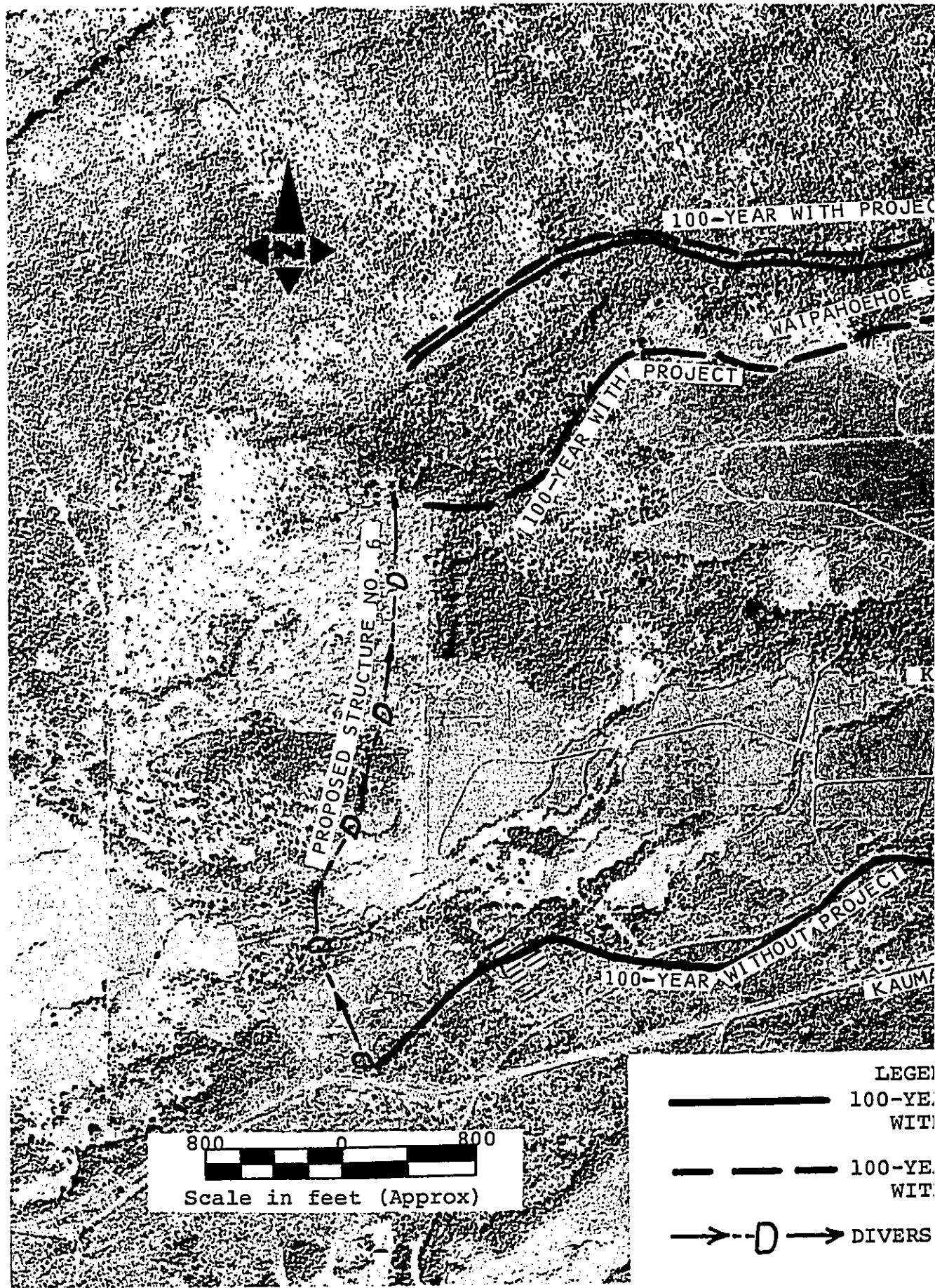
Literature on Hawaiian geology indicates no known mineral resources in the watershed.^{4/} However, lava rocks in the area are used for construction of walls, fountains, rock gardens, and decorative facings on buildings.

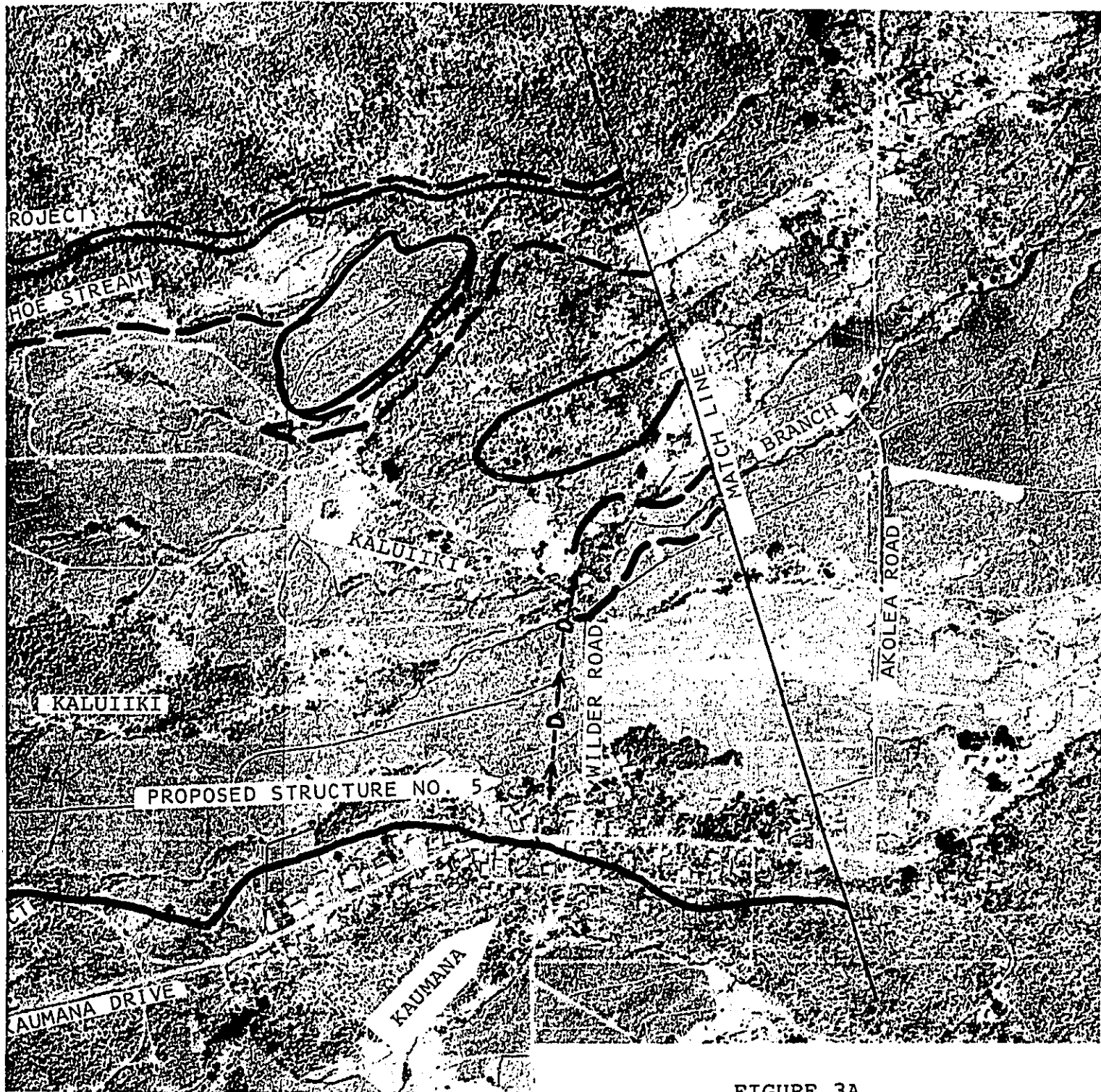
The city of Hilo is supplied with water from both surface and basal ground water sources. During heavy rains, when surface sources are subjected to discoloration problems, the system is maintained by using basal water supplies. To meet future needs, plans call for expanding both ground and surface sources.

The Hawaii Land Use Law, passed by the 1961 Legislature, gives the state power to classify and regulate land for urban, rural, agriculture, and conservation uses. Objectives include protection of prime agricultural land and advancement of orderly urban growth. Use of land classified as "conservation district," including the Hilo Forest Reserve, is regulated by the Hawaii State Department of Land and Natural Resources.

^{3/} Hawaii Water Authority, Rainfall of the Hawaiian Islands, Honolulu, Hawaii, 1959.

^{4/} Stearns, H. T., Geology of the State of Hawaii, Pacific Books, Palo Alto, Calif., 1966.

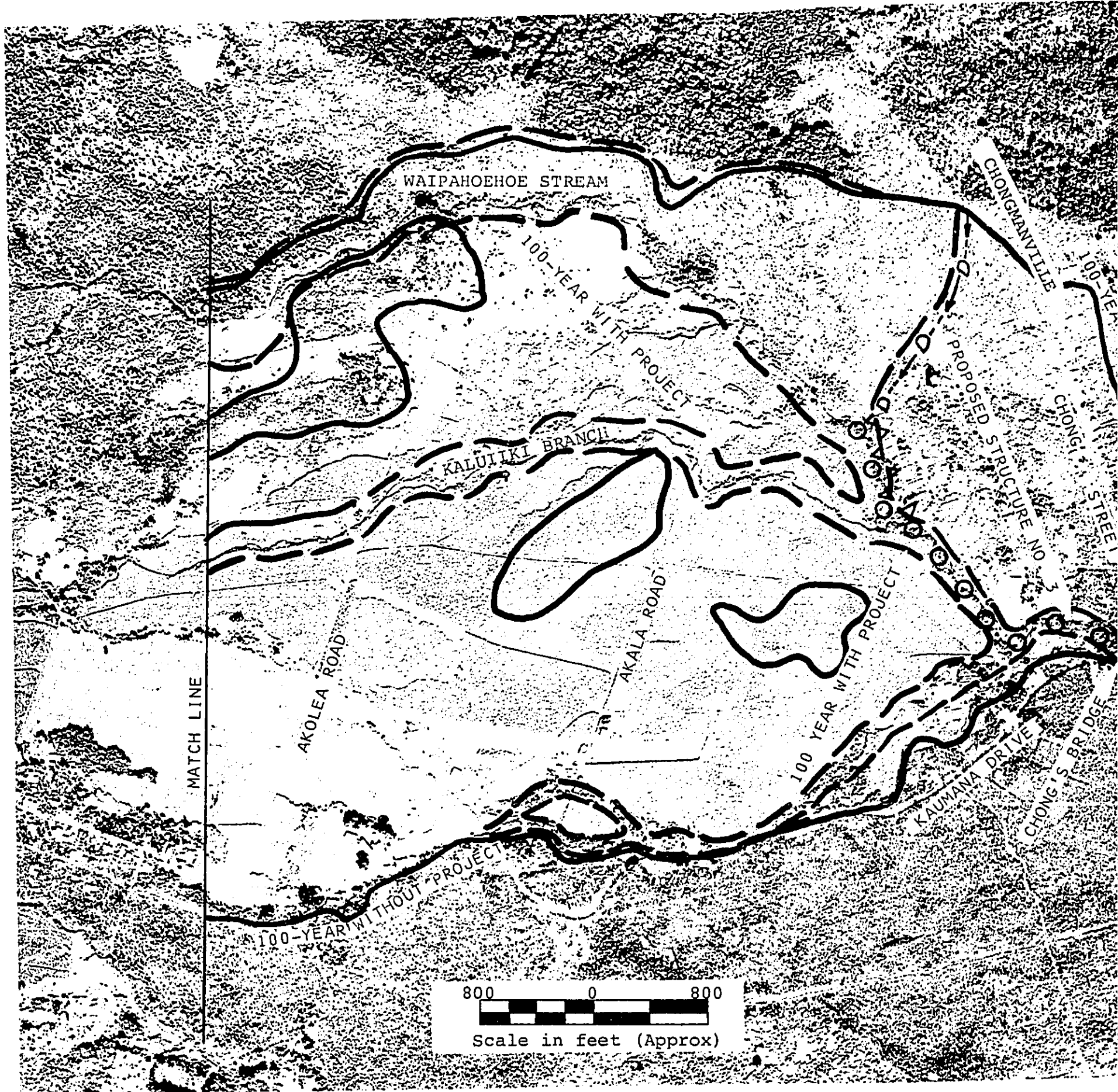




LEGEND
 0-YEAR FLOOD LIMIT
 WITHOUT PROJECT
 0-YEAR FLOOD LIMIT
 WITH PROJECT
 VERSION

FIGURE 3A
 100-YEAR STORM FLOOD PLAIN
 WAILUKU-ALENAIO WATERSHED
 ISLAND OF HAWAII, HAWAII

U. S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE
 SEPTEMBER 1975



LEGEND

- 100-YEAR FLOOD LIMIT WITHOUT PROJECT
- - - - 100-YEAR FLOOD LIMIT WITH PROJECT
- ○ ○ CHANNEL WORK
- △ △ △ △ △ RUBBLE MASONRY WALL
- ...D → DIVERSION

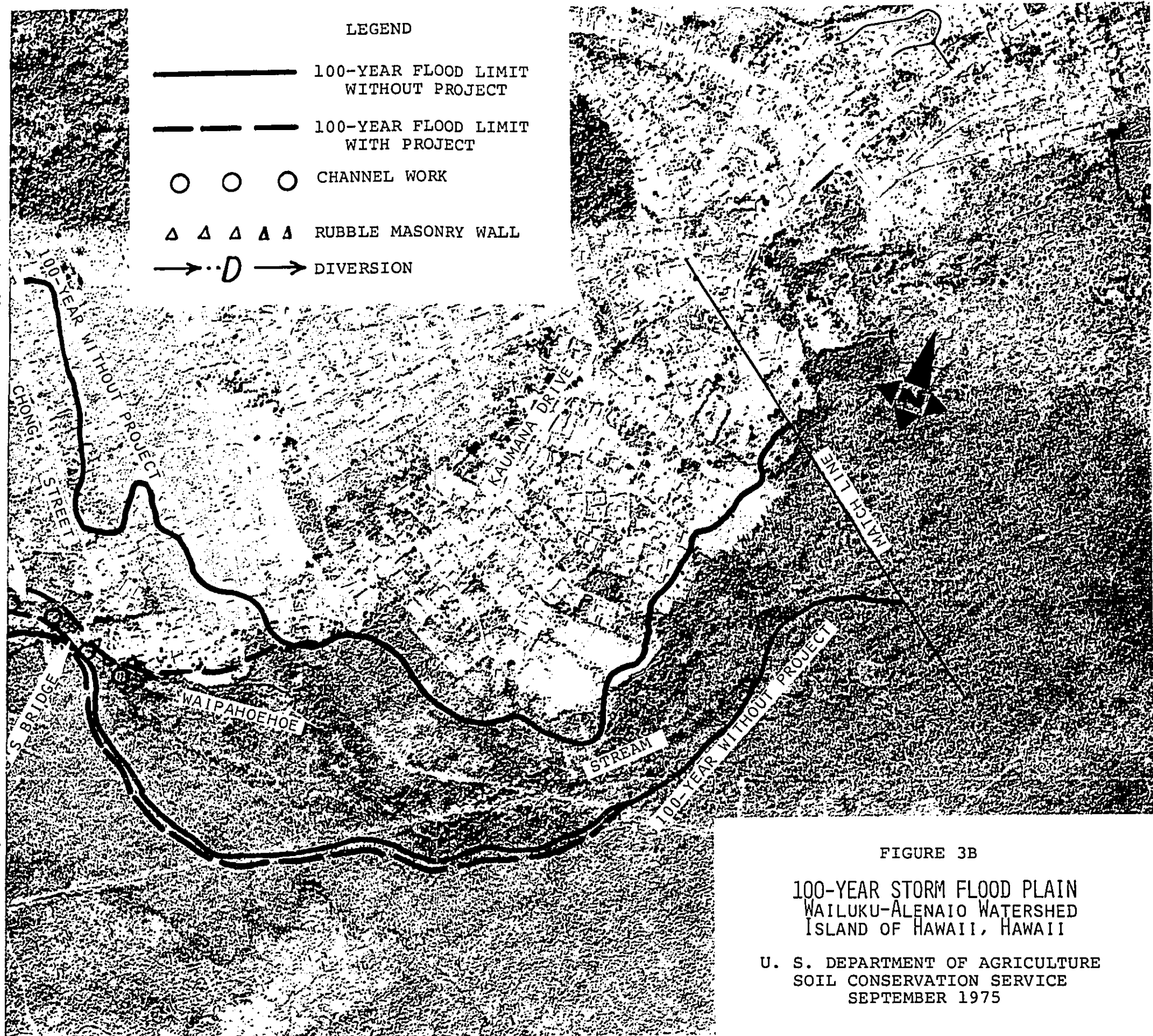
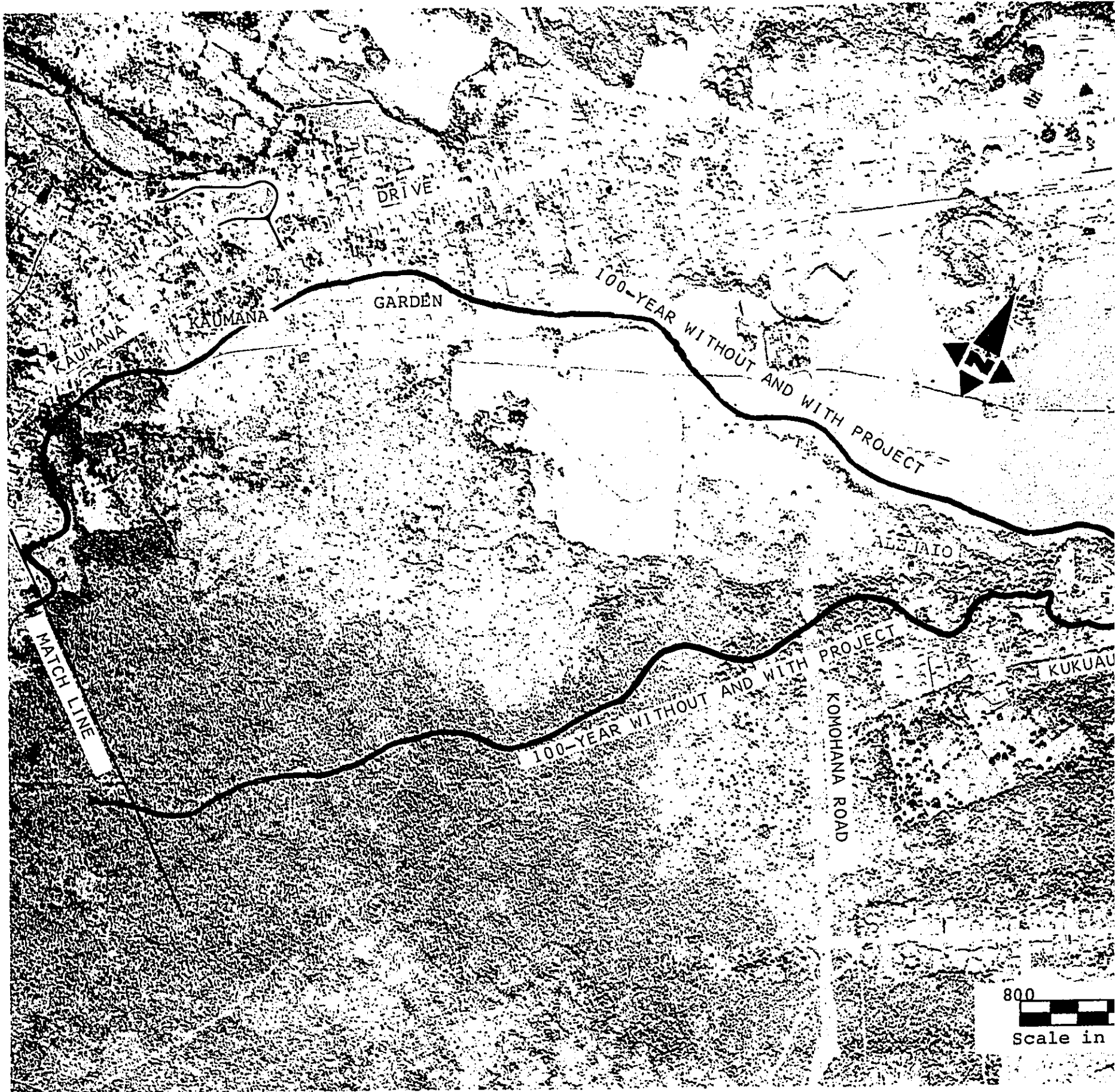


FIGURE 3B

100-YEAR STORM FLOOD PLAIN
WAILUKU-ALEMAIO WATERSHED
ISLAND OF HAWAII, HAWAII

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SEPTEMBER 1975



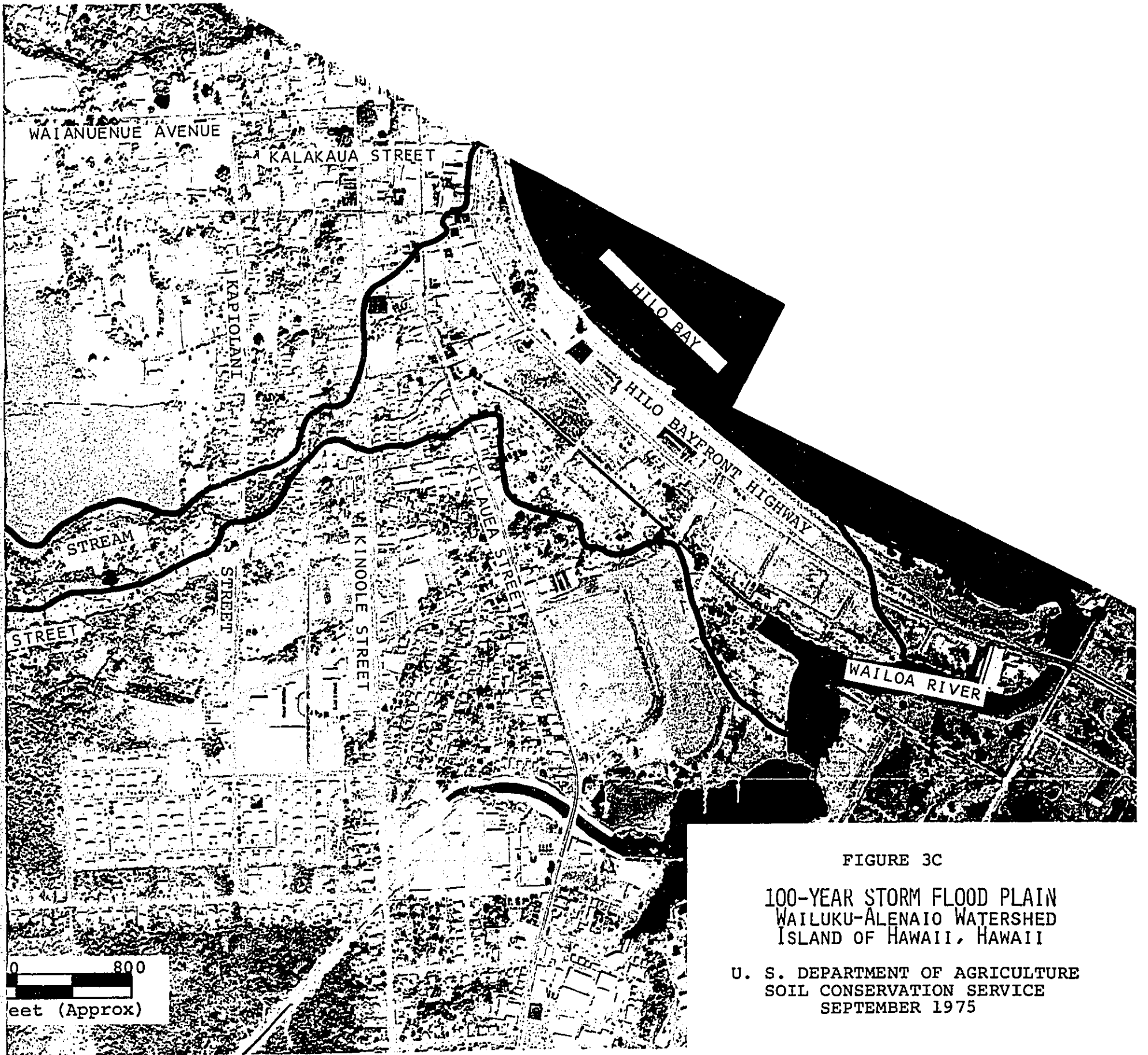
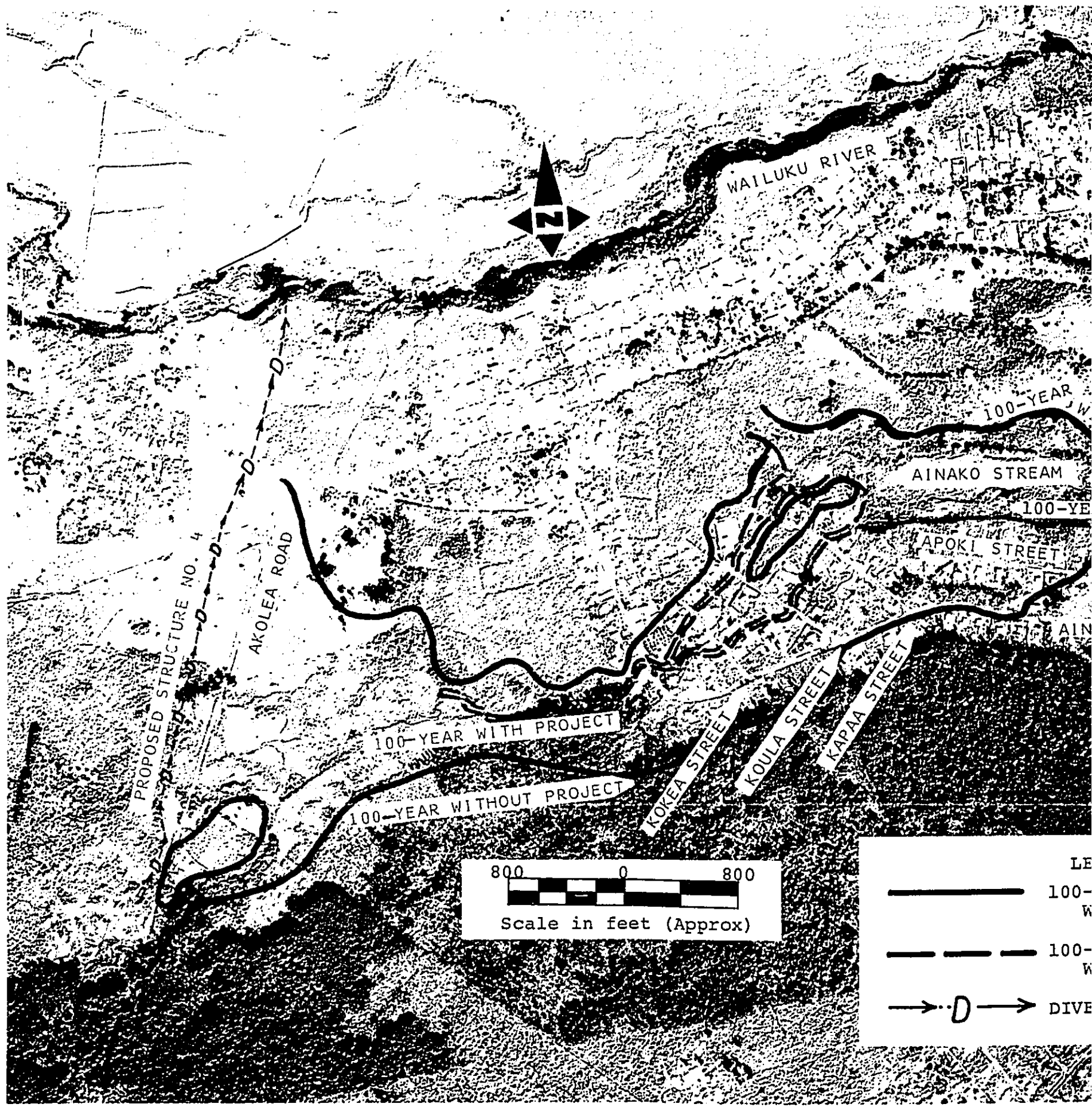


FIGURE 3C

100-YEAR STORM FLOOD PLAIN
 WAILUKU-ALENAIO WATERSHED
 ISLAND OF HAWAII, HAWAII

U. S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE
 SEPTEMBER 1975



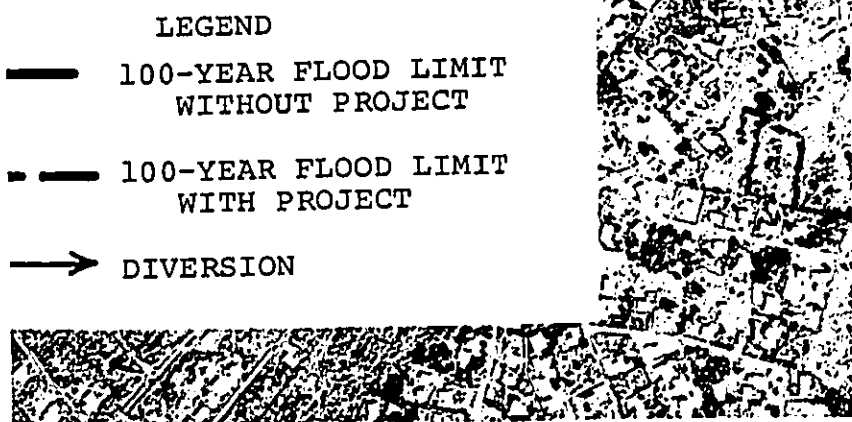
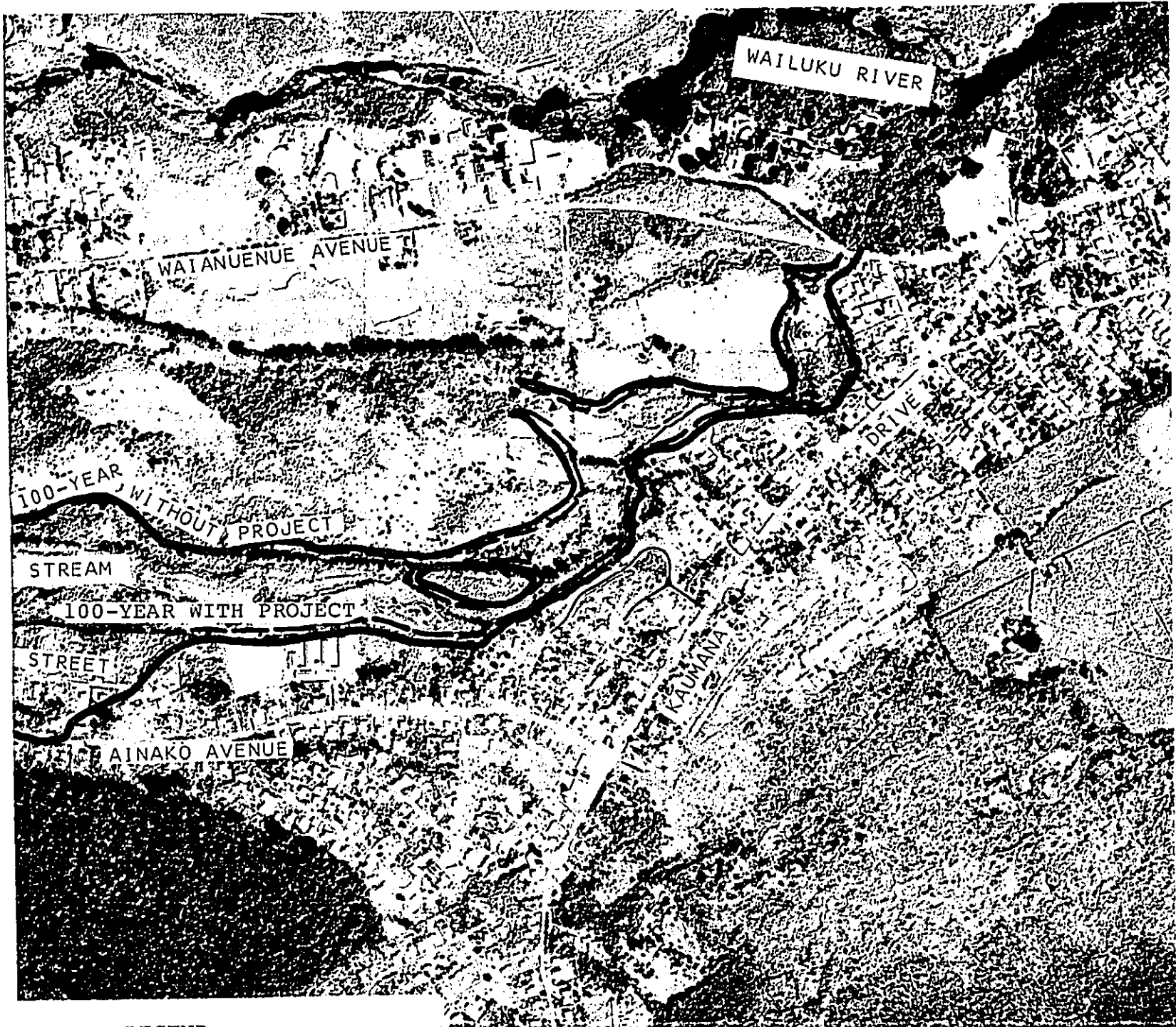


FIGURE 3D

100-YEAR STORM FLOOD PLAIN
 WAILUKU-ALENAIO WATERSHED
 ISLAND OF HAWAII, HAWAII

U. S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE
 SEPTEMBER 1975

The present land use distribution in the watershed is as follows (see Fig. 4):

<u>Land Use</u>	<u>Acreage</u>	<u>Percent of Total</u>
Cultivated Crops	3,880	2.5
Pasture		
Improved pasture	3,740	2.2
Grassland	30,110	18.0
Woodland		
Forest Reserve (general use)	10,500	6.2
" " (closed watershed)	45,500	27.8
" " (game reserve)	6,500	3.8
" " (public hunting - game mgmt. area)	5,500	3.2
Outside Reserve - not grazed	4,500	2.6
- grazed	5,000	2.9
Barren Lava and Cinderland	50,000	29.8
Urban and Industrial	<u>1,770</u>	<u>1.0</u>
	167,000	100.0

The Wailuku River and the Alenaio Stream are the two major drainageways for the watershed.

The Wailuku River, which outlets into Hilo Bay, bisects and drains about 96 percent of the watershed (see project map). It has a well-defined channel with some sections 80 feet deep and others 250 feet wide and includes plunge pools and waterfalls carved out of hard lava rock. The stream system is made up of many small tributaries with similar characteristics. Perennial tributaries, about 80 miles in length, begin at the 5,000- to 6,000-foot elevation. Maximum peak discharge recorded at the Piihonua gauge is 63,400 cubic feet per second (cfs); minimum recorded is 0.25 cfs. The mean annual discharge at the outlet is 540 cfs.^{5/} No overbank flow has been recorded.

The streams (about 10 miles long) that make up the Alenaio Stream drainage are Kaluiiki Branch, Waipahoehoe Stream, and Alenaio Stream. Kaluiiki Branch and Waipahoehoe Stream originate below the road to Lyman Springs (see project map).

^{5/} U.S. Geological Survey, Water Resources Data for Hawaii and other Pacific Areas.

Kaluiiki Branch joins Waipahoehoe Stream above Chong's Bridge south of the Wailuku River. The stream then becomes undefined in the wide flood plain below Chong's Bridge, where much of the flow percolates into the ground. It again becomes defined above Komohana Road where it forms Alenaio Stream. The three streams are ephemeral and flow for several days after heavy rains. Alenaio Stream becomes Waialama Canal which enters the Wailoa River and discharges into Hilo Bay.

Streams in the watershed are Class 2 waters under the State Water Quality Standards, except Wailuku River tributaries which provide Hilo's water supply and are Class 1.^{6/} Hilo Bay and adjacent coastal waters are Class A, except a limited area next to the boat docking facilities in the harbor which is Class B.

Coastal and fresh water is classified in accordance with the uses to be protected in each class. The definitions for Classes A, B, 1, and 2 waters are as follows:

Class A Waters

The uses to be protected in this class of water are recreational, including fishing, swimming, bathing, and other water-contact sports and aesthetic enjoyment.

It is the objective for this class of water that its use for recreational purposes and aesthetic enjoyment not be limited in any way. Such water shall be kept clean of any trash, solid materials, or oils and shall not act as receiving waters for any effluent which has not received the best practicable treatment or control compatible with the standards established for this class.

Class B Waters

The uses to be protected in this class of water are small boat harbors, commercial, shipping and industrial, bait fishing and aesthetic enjoyment.

It is the objective for this class of water that discharges of any pollutant be controlled to the maximum degree possible and that sewage and industrial effluents receive the best practicable treatment or control compatible for the standards established for this class.

The Class B designation shall apply only to a limited area next to boat docking facilities in bays and harbors. The rest of the water area in such bay or harbor shall be Class A unless given some other specific designation in Section 5.

^{6/}Department of Health, State of Hawaii, Chapter 37-A, Water Quality Standards, Public Health Regulations, January 1968.

MAUNA
KEA

N

FR

G

WG

P

Wailuku River

G

G

FR-W

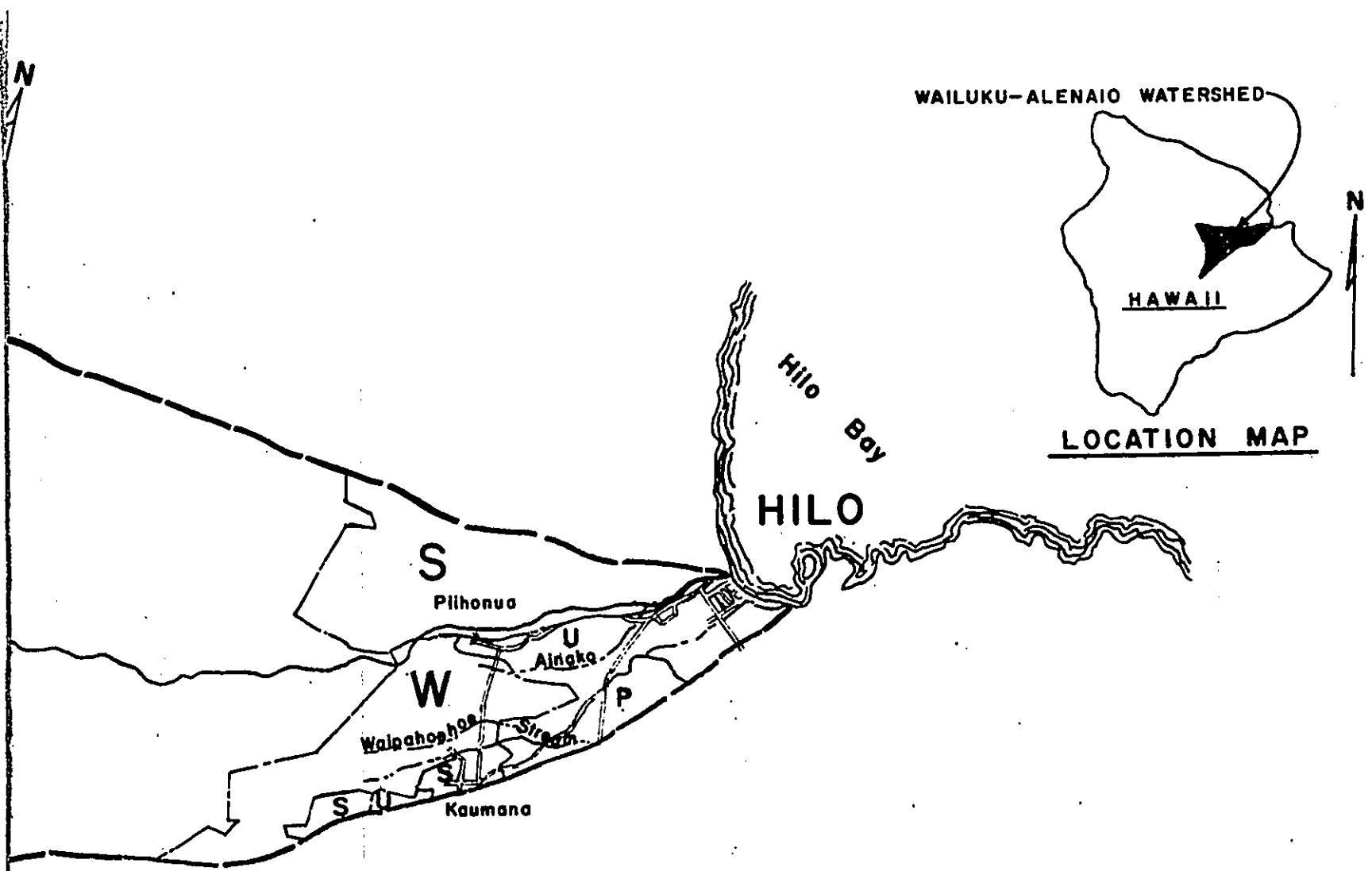
2 0 2
SCALE IN MILES

FR

LEGEND

- S Sugar Cane
- P Improved Pasture
- G Grassland
- FR-W Forest Reserve (Closed Watershed)
- FR Forest Reserve (General Use or Game Mgt. Area)
- W Outside Reserve (Not Grazed)
- WG Outside Reserve (Grazed)
- U Urban

MAUNA LOA



(gt. Area)

FIGURE 4
 EXISTING LAND USE
WAILUKU-ALENAIO WATERSHED
 U. S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE
 SEPTEMBER 1975

Class 1 Waters

The uses to be protected in this class of water are drinking water supply and food processing.

It is the objective of this class of water that they remain in as nearly the natural state as possible with an absolute minimum of pollution from any source.

Class 2 Waters

The uses to be protected in this class of water are bathing, swimming, recreation, growth, and propagation of fish and other aquatic life and agricultural and industrial water supply.

It is the object for this class of water that its use for recreational purposes, propagation of fish, and other aquatic life and agricultural and industrial water supply not be limited in any way. Such water shall be kept clean of trash, solid materials, or oils and shall not act as receiving water for any effluent which has not received the best practicable treatment compatible with the standards established for this class.

Tables 3 and 4 show water quality analyses for the Alenaio Stream and Wailuku River.

Present and Projected Population: The watershed is located in the South Hilo District of Hawaii County. The population of this district increased by 7.5 percent between 1960 and 1970.^{7/} The present population of the watershed is estimated at 10,450 people. The watershed population should reach 14,000 people by 1990.^{8/}

Economic Resources: About 155,000 acres (93 percent) of the watershed are owned by the state of Hawaii, including 35,000 acres controlled by the Hawaiian Homes Commission--most of it within the Hilo Forest Reserve. The Hawaiian Homes land is leased for pasture and cropland. Almost half of the watershed cropland is leased to the Mauna Kea Sugar Company.

^{7/}Department of Planning and Economic Development, The State of Hawaii Data Book, 1972.

^{8/}U.S. Water Resources Council, OBERS Projections, Washington, D.C.

Table 3. SUMMARY OF WATER QUALITY ANALYSES - ALENAIO STREAM
February-March, 1973

Date of Sampling	Station	Nitrogen (ppm)	Phosphorous (ppm)	Potassium (ppm)	Calcium (ppm)	Magnesium (ppm)	Total Solids (percent)	Conditions
2/12/73	1	2.00	0.07	1.50	3.2	1.56	0.0092	Stream bed pool with no-flow
	2	1.20	0.04	1.95	4.4	2.19	0.0088	Stream bed pool with no-flow
	3	0.70	0.01	2.23	7.0	1.92	0.0106	Stream bed pool with no-flow
	4	2.00	0.10	2.25	8.4	1.94	0.0108	Stream bed pool with no-flow
	5	0.33	ND*	0.75	3.3	1.27	0.0056	Stream bed sub-jected to low-flow
2/26/73	1	0.30	0.02	2.75	2.3	1.12	0.0086	Stream bed pool with low-flow
	2	0.20	0.02	2.70	2.23	1.18	0.0098	Stream bed pool with low-flow
	3	0.45	0.50	1.20	3.6	0.62	0.0076	Stream bed pool with low-flow
	4	0.15	0.16	0.50	2.0	0.42	0.0062	Stream bed pool with low-flow
	5	0.15	0.02	0.50	2.6	0.59	0.0068	Stream bed sub-jected to low-flow
3/5/73	1	0.82	ND*	0.95	2.4	1.29	0.0068	Stream bed pool with no-flow
	2	0.48	0.05	1.05	2.7	1.50	0.0070	Stream bed pool with no-flow
	3	0.36	ND*	1.05	4.3	0.88	0.0056	Stream bed pool with no-flow
	4	0.42	0.12	0.55	1.8	0.56	0.0048	Stream bed pool with no-flow
	5	0.12	ND*	0.55	3.2	1.03	0.0033	Stream bed sub-jected to low flow

* ND - No detection

Source: Neighbor Island Consultants

Table 4. Selected Water Quality Data - Wailuku River
At the Piihonua Gage

Date	Instantaneous Discharge (CFS)	Temp (Deg. C)	Dissolved Silica (SiO ₂) (Mg/L)	Dissolved Solids (Sum of Constituents) (Mg/L)	pH	Turbidity (JTU)
Oct 26 '71	36	20.0	13	32	6.7	1
Apr 10 '72	4100	19.0	3.7	17	6.4	3
Nov 21 '72	390	-	12	27	6.7	1
Jun 12 '73	35	-	13	40	7.5	0

Source: U.S. Geological Survey.

About 12,000 acres (7 percent) of the watershed is in private ownership of which about 4,000 acres is forest reserve. The reserve is zoned as "closed watershed" to provide domestic water for Hilo. The remaining 8,000 acres of private land is located near Hilo. Nine landowners hold parcels ranging from 100 to 2,600 acres. The remainder consists of small ownerships and leases. There are 336 independent sugarcane operators, 52 livestock operators, and 10 truck crop and flower growers.

Most of the cane in the watershed is grown north of Wailuku River, where about 3 percent of the state's raw sugar is produced. About 730 acres of the sugarcane land are in private, small ownerships, 1,887 acres owned by Mauna Kea Sugar Company, and 1,173 acres owned by the state. The state-owned sugarcane lands are leased by Mauna Kea Sugar Company who, in turn, subleases these lands to independent growers in small increments of 10 to 15 acres. The present lease and sublease agreements are effective to 1991, after which another agreement will be negotiated.

The growers plant and care for the cane until it is ready for harvest. The sugar company harvests and hauls the cane to the mill for processing, charging growers for the services. Sugar yields range from 6 to 10 tons an acre depending on severity of drought, flood, cloud cover, or erosion during the 2-year maturity period. The small acreages and leasing arrangements limit the profit potential available to small farmers. Uncertain conditions and low economic returns have forced many to seek additional employment in agricultural, construction, and tourist industries. Therefore, the job of maintaining small farms usually falls to family members after work or school.

Timber production is not a major enterprise although about 10,000 acres within the watershed are well suited to managed timber crops. Yields of merchantable timber from unmanaged native forests are low and have offered little incentive for harvest on a commercial basis. However, the limited resource sustains a small sawmilling industry in Hilo.

Approximately 97 percent of the state's lumber is imported, although the timber crop potential in the state far exceeds the volume now imported. Efforts to develop the potential include a tree planting program. In addition, exotic species that have been planted for erosion control are showing high growth rates. Native koa may be highly productive under management.

Other locally important agricultural industries include flowers and ornamental plants, mostly for export; and tree-fern, used for planter poles, fern fiber, and related products for growers.

Agricultural land is valued about \$.30/sq. ft. in cropland, pasture, and wooded areas. Residential areas are valued at \$1.50/sq. ft. Significant reductions in value (above 30 percent) occur in severe water problem areas.

The visitor industry has emerged as a major economic force during the past decade. The number of visitors to the island rose from 75,300 in 1962 to 742,800 in 1974. The island of Hawaii hotel inventory for the same period grew from 690 to 5,400 rooms, while the room count in Hilo increased from 318 to 1,800.^{9/} Employment in hotel service and trade increased correspondingly.

Hawaii County became eligible in 1966 to receive assistance under Title 5 of the Public Works and Economic Development Act of 1965. Eligibility resulted from a decline in agricultural employment and an inadequate increase in other jobs forcing median family income below the national average. The unemployment rate is 7.7 percent. Sponsors have investigated rural economic development opportunities and have applied for a Resource Conservation and Development (RC&D) Project.

Hilo serves as the primary business and transportation center for the island. General Lyman Field, the state-operated airport located near the coast just south of the watershed, can accommodate modern commercial jet aircraft. In 1967, the airport became a major gateway (second only to Honolulu) to the state. Two major inter-island airlines provide frequent daily flights for passengers as well as agricultural products and other cargo. Hilo Harbor provides inter-island barge and container service for sugar, cattle, agricultural exports, and capital and consumer goods imports.

The area is served by a network of state and county roads that provide good access to the watershed.

Plant Resources: The predominant native tree species in the watershed are ohia (Metrosideros collina) and koa (Acacia koa). Understory trees and shrubs include tree fern (Cibotium spp.), guava (Psidium guajava), melastoma (Melastoma malabathricum), kolea (Myrsine spp.), kopiko (Straussia spp.), manono (Gouldia spp.), and false staghorn fern (Dicranopteris linearis). The higher elevation tree and shrub types include mamani (Sophora chrysophylla), naio (Myoporum sandwicense), and pukeawe (Styphelia tameiameia). About 200 acres of planted eucalyptus (Eucalyptus robusta) forests are located along the lower boundary of the Hilo Forest Reserve and in isolated stands outside the reserve.

^{9/}Department of Planning and Economic Development, The State of Hawaii Data Book, 1974.

Department of Research and Development, County of Hawaii Data Book, 1975, Hilo, Hawaii, July 1975.

Grasses and herbs in pasture and wildlife lands between 5,000 and 8,000 feet elevation include sweet vernal grass (Anthoxanthum odoratum), yorkshire fog (Holcus lanatus), kikuyugrass (Pennisetum clandestinum), white clover (Trifolium repens), and several species of bromegrass (Bromus spp.). Grasses in lower elevations around the Hilo residential areas include carpetgrass (Axonopus affinis), hilo-grass (Paspalum conjugatum), wainakugrass (Panicum repens), and foxtail (Setaria spp.).

Animal Resources: Mullet (Mugil cephalus), awa (Chanos chanos) and aholehole (Kuhlia sandvicensis) are plentiful in the Wailoa River and Waiakea Pond, a 26-acre brackish water pond located at sea level. The Waialama Canal, which outlets into Waiakea Pond, also supports similar but fewer of these fish resources.

The Wailuku River and its tributaries which drain most of the watershed, support several animal resources. According to a survey made in 1966 and 1967 by the State Division of Fish and Game, the following resources were found: atyid shrimp (Atya bisulcata), river shrimp (Macrobrachium grandimanus), crayfish (Procambarus clarkii), guppy (Lebistes reticulatus) and goby (Siujdium stimpsoni). These resources were described as fair to abundant at elevation 1,480 feet except goby which was described as few. None of these resources were found at elevation 3,360 feet.

Hilo Bay supports a variety of fish species. In a survey^{10/} made by Neighbor Island Consultants in 1972, they identified 72 species of fish found in the Bay. According to their report, some of the abundant species are: manini (Acanthurus sandvicensis), palani (Acanthurus dussumieri), nehu (Stolephorus purpureus), weke (Mulloidichthy samoensis), butterfly fishes (Chaetodon sp.), 'o'io (Albula vulpes), mullet (Mugil cephalus), kupipi (Abudefduf sordidus), papio (Caranx ignobilis) and aholehole (Kuhlia sandvicensis). Portunid crab (Portunus sanguinolentus) and red crab (Podopthalmus vigil) are also abundant.

Feral pigs, sheep, and goats are found in the watershed. Pigs occupy primarily the rain forests and the higher elevation forests at timberline. Sheep and goats occupy the more isolated habitats, open and scrub forests on the higher mountain slopes.

Several species of game birds have been successfully introduced into the watershed. These include the ring-necked pheasant, chukar partridge, lace-necked dove, barred dove, grey francolin and California quail. Most of these are found in the grasslands and the drier open forests above 5,000 feet.

^{10/}Neighbor Island Consultants, Baseline Environmental Investigation of Hilo Harbor, March 1973.

Some of the representative species of the birds present in the watershed include the Pueo (Asio flammeus sandwichensis), Hawaii Amakihi (Loxops virens virens), the Apapane (Himatione sanguinea sanguinea) and Hawaiian Hawk (Buteo solitarius).

The following wildlife species, which are present in the watershed, are listed in "Threatened Wildlife of the United States," 1973 Edition and revisions, published by the U.S. Bureau of Sport Fisheries and Wildlife:

Hawaii nukupuu	<u>Hemignathus wilsoni</u>
Hawaii akepa	<u>Loxops coccinea coccinea</u> (Gmelin)
Ou	<u>Psittirostra psittacea</u>
Hawaiian goose	<u>Branta sandvicensis</u>
Hawaiian hawk	<u>Buteo solitarius</u>
Hawaiian bat	<u>Lasiurus cinereus semotus</u>
Hawaii creeper	<u>Loxops maculata mana</u>

None of the above listed species, except the Hawaiian Hawk, are known to be in the area where structural improvements are planned.

Recreational Resources: Twenty-three parks, including five in the watershed, are within 15 minutes of Hilo. These include 18 inland parks, one resort hotel park with boat launch, and four beach parks, according to the State Comprehensive Outdoor Recreation Plan (SCORP). No potential parks or recreational areas in the watershed are included in SCORP. However, the county plans to develop a lagoon and recreational park in a 50-acre area along Waialama Canal. The state is developing a park along the Wailuku River between Boiling Pots and Peepee Falls (see project map).

The Wailoa and Wailuku Rivers, Waiakea Pond, Waialama Canal, and Hilo Bay are used for recreational fishing.

Wailuku River, carved into lava, has many scenic attractions such as Rainbow Falls, Boiling Pots, and spectacular river crossings.

Other scenic attractions include numerous lava fields in the upper watershed and Kaumana Cave, a large lava tube along Kaumana Drive. Forest lands also offer a variety of recreational opportunities--hiking, hunting, bird watching and picnicking.

Archaeological, Historical, and Unique Scenic Resources: The "National Register of Historic Places" lists no archeologically or historically important sites in the watershed. The Division of State Parks reports no sites of archeological significance in the project construction areas.

An archeological walk-through survey of selected areas in the watershed was made on June 19, 1975, by Aki Sinoto and Neal Oshima (Bernice P. Bishop Museum), and Owen Narikawa (a volunteer). The survey included the strip of land along Structures 3, 4 and 6 and the outlet of Structure 5. Two sites were located, all in the area of Structure 4. The surveyors determined these sites to have only marginal significance. Their recommendations include recording the site in more detail if they will be affected during construction and construction activity leading to their disturbance or destruction should be monitored by an archeologist.

If these sites are affected by construction activity, an archeologist will be called upon to record the sites in more detail. Also, if any more sites are discovered during design or construction periods, the sponsors will notify the Bishop Museum, National Park Service, and the Hawaii Department of Land and Natural Resources (Historic Preservation Officer) and project designs will be changed or the remains removed.

Soil, Water, and Plant Management Status: Brushlands and woodlands in the watershed are being subdivided into 1-acre agricultural areas with most of this activity taking place below Akolea Road (see project map). Urbanization has not affected sugarcane land because the area is zoned agriculture under the State Land Use Law and because the industry has committed itself to keeping 95 percent of its land in cane as a condition for securing financing for improvements in the processing mill.

SCS, through the two soil and water conservation districts, assists land owners and operators with conservation treatment on the land. There are 76 SWCD cooperators who control 95 percent of the watershed area; 14 have conservation plans covering 33,120 acres. About 10 percent of the planned land treatment measures are presently applied. There are 390 acres of cropland, 20,000 acres of pastureland, and 570 acres of urban land considered adequately treated or protected.

The forested lands in the watershed are generally in good hydrologic condition. There are no critical land stabilization needs on forest land and about 67,500 acres are considered adequately treated or protected.

Projects of Other Agencies: The County of Hawaii, as a part of its local drainage improvement program, has plans to construct a small diversion above the Ainako area to intercept water originating from the lands below Akolea Road. The county's plan is compatible and enhanced by measures in this plan.

Other county projects within the watershed area which are planned or completed are:

- Planned:
- (1) A project to reduce flooding in the Kaumana Garden subdivision.
 - (2) Channel work on Alenaio Stream between Komohana Road and Kapiolani Street, designated as Reach 2 on project map and a diversion at Komohana Road, also shown on the project map.
- Completed:
- (1) Manulele diversion in the Ainako area.
 - (2) A storm drain from Naauao Street to Waipahoehoe Stream.

WATER AND RELATED LAND RESOURCE PROBLEMS

The major water and related land resource problems in the watershed are erosion, sediment, and floodwater damage to agricultural, residential, and commercial property; and sediment pollution to Wailuku River, Alenaio Stream, and Hilo Bay.

Land and Water Management: When sugarcane harvesting was done by hand, crop residue left on the ground provided protection against soil loss. With the introduction of mechanized harvesting, much of this residue was eliminated, leaving the fields unprotected for up to 6 months before new cane provided significant cover. Soil compaction by machinery during harvesting and other operations reduces infiltration and percolation which intensifies runoff and erosion. During each major storm, soil is lost from the cultivated fields, requiring repairs to field roads and reestablishment of sugarcane.

Protection of watershed values has been the major objective of forest land management. Forest reserve lands, except the upper mountain slopes grazed by wild sheep, generally are undisturbed and in good hydrologic condition.

More than half of the land outside the forest reserve is used primarily for livestock grazing. The infiltration and water-holding capacity of the soil could be improved by managing grazing.

Land owners and operators are financially able, with the help of federal cost-sharing programs, to apply needed conservation measures. Allocation of funds for conservation practices, as well as technical assistance, will determine the rate they will be planned and applied.

Floodwater Damage: The principal floodwater problems consist of damage to agricultural lands and residential and commercial developments. Flooding in the community of Kaumana results from overland flows from the cultivated sugarcane fields and Kaluiki Branch. Below the Kaumana area, damage occurs in the vicinity of Chong's Bridge at Kaumana Drive and along Chong Street. This damage is caused by overbank flows from Waipahoehoe Stream in combination with overland flows from the nearby forested lands. Floodwaters damage homes, isolate families, and endanger lives in these residential areas.

Below Chong's Bridge in the nearly flat area where Waipahoehoe Stream becomes Alenaio Stream, floodwaters inundate a large area, including a portion of Kaumana Garden subdivision. Inadequate stream and bridge capacities and the meandering of Alenaio Stream cause flooding in the residential and commercial areas of downtown Hilo. Floodwater then flows into the Waialama Canal which has a very low capacity. Floodwater inundates the area along the canal to and including the Hilo Bayfront Highway.

Another problem is the inadequate capacity of Ainako Stream. Floodwaters damage pastureland, homes, streets, and other improvements, and endanger lives.

Thirty-three damaging floods have occurred in the past 92 years. Records list the storm of July 1966 as the most damaging, although long-time residents recall other floods of greater magnitude.

The 1966 flood (a 10-year frequency) caused an estimated \$356,600 damage, distributed as follows: agricultural \$28,500, residential \$91,200, commercial \$210,000, and public property \$26,900. Three houses and their contents were completely destroyed; two others were moved from their foundations and seriously damaged, and water ranging from

1 inch to 2.5 feet in depth entered 140 other houses. Thirty people were evacuated by rescue personnel. A policeman narrowly escaped death when he plunged into the water to escape a falling house and was swept through an 80-foot culvert and a block down the channel before being rescued. Sixty-eight commercial establishments were heavily damaged by as much as 2 feet of water. Business was suspended by most of these firms while awaiting repairs, new merchandise, and supplies.

The flood of January 1969 (a 2-year frequency) caused \$18,500 damage, as follows: agricultural \$7,000, residential \$10,500, and commercial \$1,000.

Under present conditions, a 100-year frequency storm is expected to cause serious damage in the flood plain encompassing the area to Hilo Bay. These damages are expected to be distributed as follows: agricultural \$150,000, residential \$910,000, commercial \$1,623,000, and public property \$62,000. There are 185 homes, 160 commercial firms, 10 diversified agricultural operations, and 120 other land-owners in the 100-year flood plain.

Average annual damage in the project area above Chong's Bridge is estimated at \$6,100 for agricultural crop and pasture, \$160,200 for the residential area, and \$5,100 for public property damage. (See Economic Evaluation, Appendix E.) Flooding does not restrict land use in canefield and pasture areas but does decrease economic returns and prevent adequate management of these areas.

Because of the drainage patterns, the flood plain was divided into two evaluation units. Unit 1 includes the Kaumana and Chongmanville area; Unit 2 contains the Ainako area.

The present value of developments in the flood plain to Komohana Road is about \$5 million.

Erosion Damage: The estimated annual erosion rates per acre are:

Cropland	7 - 11 tons
Pastureland	2 - 3 tons
Forest land	0.2 tons
Urban and Industrial	4 tons

Most soil loss is from sheet and rill erosion. Roadbank erosion is not a significant problem in the watershed but unsurfaced roads in cultivated fields tend to concentrate runoff and induce sheet and gully erosion. Streambank erosion is not a serious problem because most streams are contained in bedrock gorges or in well-vegetated streambanks.

Overland flows cause average annual erosion damage of \$58,100. The flow may not follow the same pattern with each flood; however, most cultivated cropland is consistently damaged. Repairing rill and gully erosion damage and replanting fields decrease crop production, resulting in lower profits.

In the residential areas, erosion damages gardens and undermines driveways and house foundations.

Sediment Damage: Approximately 160 acres in residential and agricultural areas are damaged by sediment annually and the cost is estimated to be \$7,000 for crop and pastureland, \$11,000 for residential land, and \$3,200 for public property. The estimated average annual sediment yield from the 117,000-acre contributing area is 43 acre feet (0.23 ac. ft. per sq. mi.).

Sediment discolors Wailuku River and Hilo Bay. In 1966, the U.S. Army Corps of Engineers removed 20 feet of sediment to repair a section of the breakwater for Hilo Bay.

Recreational Problems: The 23 parks within 15 minutes of Hilo are all open to the general public. Eighteen of these are inland parks. In the State Comprehensive Outdoor Recreation Plan (SCORP) it states, "Immediate priority should be placed on improving and expanding existing shoreline parks." No potential parks or recreational areas in the watershed are included in SCORP.

The present population of Hilo and vicinity is approximately 42,000. By 1990, the population of this area is projected to increase to 57,000.^{11/}

Plant and Animal Problems: Historically, clearing of native vegetation for cultivation, pasture, and urbanization resulted in loss of habitat for native birds. While protection of forest reserve tracts within the watershed since the early 1900's has prevented further habitat loss, it has not prevented damage to many native forest ecosystems by the spread of aggressive exotic vegetation, insect pests, and forest diseases.

Large population of sheep and goats occupying the isolated mountain habitats have had a detrimental impact on soils and endemic flora and fauna.

There is no known critical native land bird habitat in the areas subject to flooding, sediment deposition, erosion, or poor water quality. However, Alenaio Stream and Wailuku River become very turbid during periods of intense rainfall. The water, turned red by sediment, discharges into Hilo Bay and lowers its quality. This adversely affects waterfowl, fish and other aquatic life in the canals, estuarine ponds and coastal areas. When runoff ceases, the water again becomes clear.

^{11/} Department of Research and Development, County of Hawaii Data Book, 1975, Hilo, Hawaii, July 1975.

Economic & Social Problems: The double leasing arrangements (state lands are leased to Mauna Kea Sugar Company which in turn leases a portion of the land to independent growers), high costs of harvesting and processing, and the uncertainty of a profitable yield during the 2-year growing period make the independent growers marginal operators. These conditions have made installation of conservation measures difficult and have required many growers to seek outside employment. As expenses for the independent growers rise and their return decreases, additional employment opportunities will be needed to maintain a sufficient standard of living. The family farms, maintained after work and on weekends, use little or no hired labor. Approximately 0.1 percent of the benefited area is devoted to farmers using more than 1.5 man-years of hired labor.

RELATIONSHIP TO LAND USE PLANS, POLICIES, AND CONTROL

The planned project is compatible with the general plan for the Hilo area,^{12/} which includes the Wailuku-Alenaio watershed, and with the Federal Water Pollution Act Amendments of 1972.

ENVIRONMENTAL IMPACT

The major impacts of the project will be a 99 percent floodwater damage reduction to 970 acres; and sediment pollution reduction to the Wailuku River, Alenaio Stream, and Hilo Bay. Included in the 970 acres are 560 residents, 136 homes, and 10 diversified agricultural operations. Other impacts will be the effects on the quality of the land-related resources and the social and economic well-being of the people in the project area. The irrevocable commitment of small parcels of land for the structural measures will affect the future-use options for these parcels.

Conservation Land Treatment: Conservation land treatment practices will be applied to crop, pasture, urban, and forest lands. These practices will help the operators obtain optimum land use and production efficiency.

Cropland conservation treatments will increase water penetration, stimulate plant growth, and minimize soil erosion. Application of good pasture management practices will likewise promote more and better forage while providing soil protection.

Forest land treatment measures are designed to increase productivity for forest products, recreation, and wildlife habitat while maintaining the present generally favorable watershed condition and protecting ecosystems of natural flora and fauna.

Urban land treatment measures are designed to control runoff and to keep the soil on the land.

^{12/}County of Hawaii, General Plan, January 1971.

Impacts of the various land treatment measures:

- Crop residue management protects cultivated fields during critical erosion periods and increases water penetration (300 acres).
- Conservation cropping system will maintain organic matter in the soil, increase water penetration, and control erosion (1,600 acres).
- In-field diversions will divert water to areas where it can be disposed of safely (72,000 feet).
- Stream channel stabilization will prevent channel erosion (750 feet).
- Grade stabilization structures will control head cutting in natural or artificial channels (4 each).
- Streambank protection will protect streambanks from scour and erosion (1,200 feet).
- Critical area planting will protect critical sediment source areas from erosion (20 acres).
- Pasture management will maintain cover and reduce runoff (4,000 acres).
- Pasture planting will establish and reestablish long-term stands of adapted forage species, increasing cover protection and water penetration (250 acres).
- Brush management will increase cover and reduce runoff (500 acres).
- Forest management will maintain favorable watershed conditions (10,000 acres).
- Urban land treatment will provide measures to minimize erosion and runoff from urban development sites (1,200 acres).

During the 10-year project installation period, 82 percent of the needed land treatment on crop, pasture, and urban lands will be installed. These land treatment measures will reduce the sediment yield from the watershed by an estimated 26 percent (9,500 tons). The estimated average annual erosion rates per acre after the land treatment measures are applied are:

Cropland	3 - 5 tons
Pastureland	1.5 - 2 tons
Forest Land	0.2 tons
Urban & Industrial	3 tons

The reduction in sediment yield will affect the quality of the runoff water. The reduction of sediment in the runoff will result in the reduction of nutrients being transported to the receiving waters. Less pollution to Hilo Bay from sediment and nutrients will result in cleaner waters. Cleaner waters will benefit the benthic biota, particularly the coral reefs of the Bay and adjacent coastal waters. A study by EPA^{13/} of the effect of sediment along the Hamakua Coast has indicated that sedimentation has resulted in a reduced coral population density. However, the number of coral species did not seem to be affected. Because of reduced coral growth and other benthic life which are directly dependent on coral, sources of food and shelter for fish are adversely affected. Turbidity of the Bay water also inhibit the ability of fish to locate food since most local species are clean-water specimens which visually locate their food.

After the installation period, 1,990 acres of cropland, 24,000 acres of pastureland, 77,500 acres of woodland, and 1,770 acres of urban land will be considered adequately treated and protected.

Structural Measures: The installation of the structural measures will result in the loss of 12.2 acres of land for agricultural production. Channel works along 3,500 feet of Waipahoehoe Stream, in the vicinity of Chong's Bridge, will result in removal of shrub-type woody vegetation consisting primarily of guava, Java plum, and Christmas berry.

A detour road may be needed when replacing Chong's Bridge.

The Ainako diversion will add a peak flow of 1,120 cfs to the Wailuku River above the point where it normally enters, but this will have no significant effect on the comparatively large flow (estimated at 62,000 cfs for 100-year peak flow at Piihonua gauge) of the Wailuku River.

About 9.2 acres of grazed woodland and pasture that have limited wildlife value will be lost to the structural measures. This acreage is only one hundredth of one percent of the total woodland. Moreover, most of the game birds in the watershed are found in the grasslands and drier open forests above 5,000-foot elevation. The back slopes of the maintenance road and fill areas will have grass and shrub plantings with wildlife value to replace some of the lost habitat.

The project measures will not have any measurable effect on flood-water damage in the existing flood prone area downstream of Chong's Bridge. This area includes the broad wooded flood plain of Waipahoehoe and Alenaio Streams and downtown Hilo along Alenaio Stream and Waialama Canal.

In downtown Hilo, the County of Hawaii has plans for flood control measures. When these flood control measures are installed, the flood damage from a 100-year storm will be greatly reduced.

^{13/} Environmental Protection Agency, The Hawaii Sugar Industry Waste Study, June 1971.

Under its authority of approving subdivision plans, the county requires flood control measures before any developers are allowed to build in undeveloped flood plains.

The construction activities will create some temporary noise, air, and water pollution.

Economic and Social: An immediate benefit resulting from the project installation will be employment of watershed residents who will be hired to construct, operate, and maintain the project measures. Damages caused by storm runoff will be reduced; the economic base will be stabilized; and family farm enterprises will have a higher net return.

The value of lost production from the 2.0 acres of sugarcane land, 6.1 acres of grazed woodland, and 3.1 acres of pastureland needed for the structural measures is approximately \$8,000 per crop for sugarcane land and \$100 per year for pastureland and grazed woodland.

The installation of the project will provide security and peace of mind for the residents and agricultural operators in the 970-acre flood-prone area. These factors will contribute to an increase in property values to these 970 acres.

Distribution of the rural population in the watershed will remain relatively constant. There are about 560 people living in the benefited area. No land use changes are expected and no one will be displaced by the project.

Favorable Environmental Effects

- A. Reduce floodwater, sediment, and erosion damages on 970 acres by 99 percent.
- B. Reduce sediment yield from the watershed by an estimated 26 percent (9,500 tons). This sediment reduction will result in reduction of nutrients being transported to the receiving waters.
- C. Protect ecosystems of natural flora and fauna and maintain the present generally favorable watershed condition in the forest.
- D. Increase the economy of the flood plain through reduction of flood losses and improved security against loss of life.
- E. Provide employment opportunities during the installation and operation and maintenance of the project.

Adverse Environmental Effects

- A. Eliminate agricultural and forestry production on 12.2 acres which will be occupied by structural measures.

- B. Approximately 3,500 feet of natural stream channel in the Chong's Bridge area will be modified. This will result in the removal of shrub-type woody vegetation consisting primarily of guava, Java plum and Christmas berry.
- C. Create temporary noise, air, and water pollution during construction.
- D. About 9.2 acres of woodland and pasture will be lost to the structural measures.
- E. Temporary traffic inconvenience when replacing Chong's Bridge.

ALTERNATIVES

The following alternatives, some of which could be carried out under the authority of PL-566, were considered as solutions to the problems identified at the onset of planning:

1. Accelerated Land Treatment Only:

Accelerated conservation land treatment measures would be applied to cropland, pastureland, urban land, and forest land. Typical land treatment measures that would be applied to the various land uses are:

Cropland: Crop residue management, conservation cropping system, in-field diversions, stream channel stabilization, streambank protection, critical area planting, grade stabilization structures.

Pastureland: Pasture management, brush management, pasture planting.

Urban land: Replanting denuded areas, diversions, holding ponds.

Forest land: Reforestation, insect and disease control, fire control and prevention program.

The conservation land treatment measures would protect the agricultural land from the 25-year storm and would reduce the average annual flood damages by about 5 percent. The sediment yield by land use would be reduced as follows: 66 percent cropland, 28 percent pasture, and 55 percent urban land. Storm runoff would not be reduced significantly, and flooding would continue. The cost of this alternative is estimated at \$1,885,000.

2. Accelerated Land Treatment, Flood Plain Zoning, Flood Proofing, and Flood Insurance:

The land treatment measures would be installed, and their impact and effect would be the same as the "Accelerated Land Treatment Only" alternative.

Flood plain zoning which regulates residential construction would hold future damages to a minimum. Regulations would require flood control structures or flood proofing measures in new residential constructions as a prerequisite to issuance of building permits. In some areas where the flood hazard is great, the county would buy these properties for open space use, depending on the community needs. These areas could also be rezoned for pasture, orchard, and similar uses where flooding would cause minor amounts of damage.

Flood proofing of existing buildings would be of the permanent type because of the inability of forecasting the occurrence of damaging floods in time to install contingent flood proofing structures. Examples of permanent type installations would include solid wall and earth dikes upstream of individual houses. Such installations would effectively divert floodwater from the protected property.

This method of flood proofing would be possible only to some houses because of their orientation with direction of flood flows. Also, these flood proofing walls would divert water into neighboring properties and streets. Damages to unprotected areas would increase. Streets would be impassable during flooding and floodwater would continue to be a threat to life and property.

Flood proofing in future construction would require building floors above flood levels.

Flood insurance, presently available for those who can afford to buy it, would offset monetary losses to property owners. Insurance would not relieve the distress and anxiety of those caught in the flood nor can it fully compensate for loss of life or property.

The cost of this alternative is estimated at \$5.3 million.

3. Accelerated Land Treatment, Floodwater Diversions, and Channel Work:

This alternative includes the land treatment measures described in the "Accelerated Land Treatment Only" alternative.

The structural measures consist of:

- a. A floodwater diversion at Akolea Road, extending from Waipahoehoe Stream to the Wailuku River.
- b. A floodwater diversion about 1,600 feet downstream from the road to Lyman Springs. This diversion will extend from Kaumana Drive to Waipahoehoe Stream.
- c. A floodwater diversion upstream from Wilder Road. This diversion will extend from the housing area to Kaluiiki Branch.
- d. A floodwater diversion upstream from Chongmanville and channel work in the vicinity of Chong's Bridge.

This alternative would protect all the agricultural land below the structures and would provide a 100-year level of protection to the urban areas of Kaumana, Ainako, and Chongmanville.

The estimated cost of this alternative is \$5.1 million.

4. No Project Alternative:

This alternative would leave the agricultural areas and residential areas of Chongmanville, Kaumana, and Ainako vulnerable to floodwater, sediment, and erosion damages. Flood plain residents can purchase federally subsidized flood insurance for existing development through the Federal Insurance Administration. Flood insurance does not provide flood protection but rather is a means of recovering a portion of a flood loss. Flood insurance would cost each residence approximately \$115 per year.

The on-going land treatment program will continue at its present level of installation.

The net average annual benefits forgone by not implementing the project would be about \$208,450.

SHORT-TERM VS. LONG-TERM USE OF RESOURCES

The short-term uses will be affected to the extent that land will be taken out of production by the structural measures. Long-term effects will be the preservation of the land resource in the watershed.

The reduction of flooding and erosion resulting from installation of structural measures will enhance and preserve the flood plain for future uses. The agricultural land, presently zoned for agricultural uses, is compatible with the state goal to keep and use all remaining agricultural lands for crop production. These uses are compatible with the projected long-term uses for the area. Annual and recurrent land treatment measures will be effective in conserving land and water resources after the designed life of the project. Replacement of some of the structural measures may be necessary at that time.

Other projects in the water resources subregion as designated by the Water Resources Council are as follows:

1. PL-566 Puukapu - completed.
2. PL-566 Kona - completed.
3. PL-566 Naalehu - completed.
4. Corps of Engineers - Wailoa River - completed.

These projects, with the exception of the Wailoa River project, have no relationship to the Wailuku-Alenaio Watershed or to each other. They are not part of one common river basin. They are independent streams draining to the ocean. As a result, no cumulative effects are anticipated from the proposed project.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The area needed for construction of structural measures included in this plan will be committed to these uses for at least the life of the project (100 years). The area consists of 2.0 acres of sugarcane, 3.1 acres of pasture, 1.0 acre of subdivision land, and 6.1 acres of grazed woodland, for a total of 12.2 acres.

CONSULTATION WITH APPROPRIATE FEDERAL AGENCIES AND REVIEW BY STATE AND LOCAL AGENCIES DEVELOPING AND ENFORCING ENVIRONMENTAL STANDARDS

The Kaumana-Piihonua Flood Control Committee gathered data, held meetings, and, with the Waiakea and Mauna Kea Soil and Water Conservation Districts, prepared an application for assistance under PL-566.

After the application was submitted to the Secretary of Agriculture, a preliminary investigation was conducted by SCS. The investigation report was presented to the sponsors and to the local people at a public meeting. A favorable response was received. Authorization for planning was then requested by SCS. More than 10 meetings with the sponsors and federal, state, and county agencies were held to coordinate planning with their activities. The coordination was made with such agencies as State Parks and Recreation, County Planning, County Public Works, Corps of Engineers, and Forest Service. About midway in the planning process, another public meeting was held to inform residents of progress in planning and to present the alternatives studied. The response was favorable.

After the planning was completed, a tentative work plan was sent to the federal, state, and county agencies directly involved with the watershed. Another public meeting was held to get final approval from the sponsors, inform the residents and concerned people, and obtain their approval. The response to the meeting was favorable and no adverse comments have been received.

The National Register of Historic Places has been reviewed, and no sites of historic and archeological significance are listed in the Wailuku-Alenaio Watershed where works of improvement are planned. The State Historic Preservation Officer was consulted and an agreement was reached.

The Division of State Parks reports no sites of archeological significance in the project construction areas.

Procedures set forth in Section 106 of PL-87-665 have been followed and SCS has complied with Executive Order 11593.

DISCUSSION AND DISPOSITION OF EACH PROBLEM, OBJECTION, AND ISSUE

Comments were requested from the following agencies:

- Department of the Army
- Department of Commerce
- Department of Health, Education, and Welfare
- Department of the Interior
- Department of Transportation
- Environmental Protection Agency
- Office of Equal Opportunity, USDA
- Advisory Council on Historic Preservation
- Federal Power Commission
- Department of Land and Natural Resources
- Hawaii State Clearinghouse
- Governor's Office, State of Hawaii
- Office of Environmental Quality Control

Information copies were sent to the following groups or individuals:

Natural Resources Defense Council
Friends of the Earth ,
Environmental Defense Fund
National Wildlife Federation
National Audubon Society
Environmental Impact Assessment Project

Comments were received from the following departments and agencies:

Federal

Department of the Air Force
Department of the Army - Headquarters, United States Army
Support Command, Hawaii
- Corps of Engineers
Department of Commerce
Environmental Protection Agency
Department of Health, Education, and Welfare
Advisory Council on Historic Preservation
Department of the Interior
Department of Transportation - U.S. Coast Guard

State

Department of Agriculture
Office of Environmental Quality Control
Governor's Office, State of Hawaii
Department of Health - Director's Office
- Environmental Engineer, Hilo
Department of Land and Natural Resources
Department of Planning and Economic Development
Department of Transportation
University of Hawaii - Environmental Center

Comments made during the formal interagency review of the draft environmental impact statement and their disposition are summarized as follows:

FEDERAL AGENCIESDepartment of the Air Force

1. Comment: "We have no comments to render relative to the draft environmental impact statement for the following project: Wailuku-Alenaio Watershed Project, Hilo."

Response: Noted.

Department of the Army, Headquarters, United States Army Support Command, Hawaii

1. Comment: "The following Draft Environmental Impact Statement was reviewed by our office: Wailuku-Alenaio Watershed Project, Hawaii County, Hawaii and we have no comments to offer at this time."

Response: Noted.

Department of the Army, Corps of Engineers

1. Comment: "a. Both the draft work plan (pages 18 and 22) and the environmental impact statement (EIS, page 18) refer to County and/or Corps of Engineers studies of Alenaio Stream flood problems. The Corps of Engineers completed a reconnaissance study on the Alenaio Stream flood problem in March 1973. The report concluded that a diversion channel located near Komohana Street, diverting high flows from Alenaio Stream into Wailuku River, appears to be a feasible solution. A further conclusion found that Federal participation is possible, but since local funds are not available, no further work is in progress."

Response: Noted - appropriate corrections have been made.

2. Comment: "b. The work plan's usage and interpretation of the 'Flood Plain Information Study' is correct as presented on page 52. However, the reference to the Flood Plain Information Study of Kaumana-Punahoa on page 51 should be qualified by stating that the study covers a separate, adjacent watershed area."

Response: The Corps' report "Flood Plain Information Study" covers Kaumana-Punahoa, the same area where the structural measures are located. The watershed, however, includes areas not covered in the Corps' study. These areas include those forest and sugarcane lands north of Wailuku River.

3. Comment: "c. Although the work plan and EIS present a systematic coverage of the environmental setting of the total watershed, more specific details of the physical, plant, and wildlife resources in the vicinity of the structural improvements should be included to better describe the impacts of the proposed actions."

Response: The Structural Measures section of the EIS has been revised to include more detail on structural features, vegetation, soil type, and geology along the alignment of the structures.

4. Comment: "d. The project description states that three diversion will be excavated in earth and rock. The susceptibility of the excavations to erosion, particularly when cut in earth, and the measures to be incorporated for stabilization should also be described."

Response: The revised Structural Measures section includes measures such as pneumatically applied concrete and rubble masonry walls to stabilize weak areas expected to be found in diversions excavated in rocks. The diversion excavated in earth will be vegetated as stated in the revised Structural Measures section.

5. Comment: "e. Additional information on the National Flood Insurance Program is offered for consideration in the discussion of alternatives (page 19 of the work plan and page 25, EIS). For continued eligibility, the program requires that the County (1) zone special flood hazard areas as outlined by the U.S. Department of Housing and Urban Development, (2) recognize flood hazards in subdivision regulations, and (3) include provisions in building codes for flood proofing. It should be noted that in flood plain regulations it is not necessary for the County to purchase flood plain lands. Permitted uses may be stated in zoning codes. Finally, with reference to the availability of flood insurance, the intent of government subsidization of flood insurance is to enable every homeowner to afford it."

Response: The requirements, as stated, for continued eligibility under the National Flood Insurance Program were recognized; thus, the need to combine flood plain zoning, flood proofing, and flood insurance with accelerated land treatment in Alternative 2.

We agree that buying the land is not necessary to regulate flood plain lands. However, since there may be a need for additional open space, one of the actions considered in Alternative 2 was for the county to buy portions of the flood plain where the hazard is great. For other portions flood proofed houses would still be allowed. Still, other portions would be down-zoned for agricultural use as the need requires. These uses were assumed for cost estimating purposes.

We agree that flood insurance is subsidized to enable homeowners to buy it; but, the fact remains that not all homeowners can afford it.

Department of Commerce

1. Comment: "The draft environmental impact statement specifies that conservation land treatment measures will be applied to 1,600 acres of crop land, 4,000 acres of pasture land, 1,200 acres of urban land, and 10,000 acres of forest land during the 10-year installation period. However, it then states that these conservation land treatment measures will be installed by the individual land owners and operators on a voluntary basis. We feel that the conservation land treatment measures are the most vital part of this watershed project as far as curtailment of erosion is concerned. It is the runoff from denuded land, particularly cropland, which generates the majority of the sediment load in the streams of the watershed. The sediment-laden water then discharges into Hilo Bay where it has an adverse effect on the water quality and the estuarine and marine biota of the bay and adjacent coastal waters. Because implementation of these critical measures is voluntary, with consequent uncertain results, we suggest that this problem be addressed in much greater detail in the final environmental impact statement. At a minimum, the degree of previous voluntary implementation of conservation land treatment measures achieved in authorized, operating SCS Small Watershed Projects in Hawaii should be discussed and tabulated, by category."

Response: The land treatment measures under the Planned Project section of the EIS are part of the project and will be applied voluntarily by the landowners. The willingness and ability of landowners to install the needed land treatment measures are important criteria under PL 83-566.

Implementation of the land treatment measures will be enhanced by the proposed County grading ordinance. The ordinance will require operators of agricultural lands to actively implement a conservation plan approved by the respective soil and water conservation district.

As an indication of success in implementing land treatment measures, the following tabulation shows planned and applied measures in the Naalehu Watershed, which occurs on the same water resources subregion. As in the Wailuku-Alenaio Watershed, most of the measures are needed in sugarcane lands:

Land Treatment Measures	Unit	Planned 1963	Installed 1965
Contour Farming	acre	1,500	1,500
Conservation Cropping System	acre	1,800	1,800
Crop Residue Use	acre	1,800	1,000
Diversions	feet	29,000	34,700
Diversion Outlet	feet	3,000	2,700

2. Comment: "We question the need for stream bank protection and stream channel stabilization, especially with the use of structural measures. A statement is made in the draft environmental impact statement that 'stream bank erosion is not a serious problem because most streams are contained in bedrock gorges or in well-vegetated stream banks.' In light of the above statement the need for removal of vegetation (channel work) and the construction of a concrete rubble masonry wall along Waipahoehoe Stream should be clarified."

Response: The stream bank protection and stream channel stabilization are land treatment practices that will be installed in the sugarcane area north of the Wailuku River. The channel work proposed for a portion of Waipahoehoe Stream consists of removing vegetation that has grown within the stream channel. Accumulated rocks and debris within the stream will also be removed.

The channel work will increase the capacity of the stream; however, some segments will still not contain the estimated 100-year peak flow. In these segments, a concrete rock masonry (CRM) wall is proposed to prevent floodwater from flowing into the residences of the Chongmanville area.

The Planned Project section describing the stream work has been revised to state the need for CRM wall.

3. Comment: "The description of aquatic life in the streams, estuary, and coastal waters of the watershed (page 16) is incomplete. A complete species inventory including habitat description is given for terrestrial plants and animals, both native and introduced, in the watershed. For aquatic life, however, a three sentence paragraph is utilized to describe the entire fresh water, estuarine, and marine complex (see Specific Comments below).

Species inventories are particularly important for the fresh water and estuarine biota. Fresh water fish species include more than 'guppies and swordtails,' as stated. Lists of species found in the Wailuku River, Waialama Canal, and Alenaio-Waipahoehoe-Kaluiiki Stream complex should include the endemic diadromous fauna, such as the various species of gobies (oopu), prawns (opae), and limpets (hiwai), many of which are rapidly becoming endangered. The upstream limit of estuarine species should be determined for the Wailoa and Wailuku Rivers and Waialama Canal. Of particular importance are valuable commercial species such as the mullet (Mugil cephalus), awa (Chanos chanos), aholehole (Kuhlia sandvicensis), and nehu (Stolephorus purpureus). Nehu is the primary bait fish species utilized by the Hawaiian skipjack tuna fishery, and Hilo Bay is the major nehu baiting area on the Island of Hawaii.

It is quite probable that aquatic resources will benefit by the proposed watershed project. Nonetheless, these resources should be delineated in order to adequately assess the environmental impact of the proposed action."

Response: The Animal Resources section has been revised to include the resources found in the Wailuku River, Wailoa River, Waiakea Pond, Waialama Canal and in Hilo Bay. The following paragraphs have been added:

Mullet (Mugil cephalus), awa (Chanos chanos) and aholehole (Kuhlia sandvicensis) are plentiful in the Wailoa River and Waiakea Pond, a 26-acre brackish water body located at sea level. The Waialama Canal, which outlets into Waiakea Pond, also supports similar but fewer of these fish resources.

The Wailuku River and its tributaries which drain most of the watershed, support several animal resources. According to a survey made in 1966 and 1967 by the State Division of Fish and Game, the following were found: atyid shrimp (Atya bisulcata), river shrimp (Macrobrachium grandimanus), crayfish (Procambarus clarkii), guppy (Lebistes reticulatus), and goby (Siujdium stimpsoni). These species were described as fair to abundant at elevation 1,480 feet except goby which was described as few. None of these species were found at elevation 3,360 feet.

Hilo Bay supports a variety of fish species. In a survey made by Neighbor Island Consultants^{10/} in 1972, they identified 72 species being found in the Bay. According to their report, some of the abundant species are: manini (Acanthurus sandvicensis), palani (Acanthurus dussumieri), nehu (Stolephorus purpureus), weke (Mulloidichthys samoensis), butterfly fishes (Chaetodon sp.); 'o'io (Albula vulpes), mullet (Mugil cephalus), kupipi (Abudefduf sordidus), papio (Caranx ignobilis), and aholehole (Kuhlia sandvicensis). Portunid crab (Portunus sanguinolentus) and red crab (Podophthalmus vigil) are also abundant.

4. Comment: "Page 5, paragraph 6. Under critical area planting, in addition to eroded areas, vegetation should be planted around crop land (sugar cane fields) and bordering unpaved cane-haul roads to further prevent sheet and gully erosion."

Response: The critically eroded areas are bare areas located within cropland and forest land.

Most of the unpaved cane-haul roads are just wide enough to accommodate farm vehicles and there are no borders to plant grass. In roads where there are borders, grass planted in these borders would require extensive management to prevent grass from encroaching into the sugarcane.

^{10/}Neighbor Island Consultants, Baseline Environmental Investigation of Hilo Harbor, March 1973.

5. Comment: "Page 7, paragraph 5. This paragraph, outlining design considerations and construction specifications which will minimize soil erosion and water and air pollution is of vital importance and should be emphasized with an appropriately underlined heading in the environmental impact statement."

Response: The content and format of the EIS are according to the SCS guidelines for preparing environmental impact statements published in the Federal Register, Vol. 39, No. 107-Monday, June 3, 1974. We believe the importance of minimizing soil, water and air pollution is well emphasized in the EIS.

6. Comment: "Page 16, paragraph 2. As mentioned under General Comments above, this paragraph on aquatic animals is incomplete. In addition to the requested data on fresh water and estuarine species outlined under General Comments, the marine resources of Hilo Bay which will be affected by the proposed project should be assessed. The last sentence in this paragraph stating 'Hilo Bay contains almost all known species of fish in the islands' is erroneous. Many pelagic, deep-water demersal, and reef fish requiring clear non-polluted water are not found in the bay, particularly as residents. The environmental impact statement should describe the major fisheries resources of the bay and adjacent waters, and should include invertebrate resources (crustaceans, mollusks) as well as fish."

Response: The Animal Resources section has been revised. (See response to comment 3.)

7. Comment: "Page 17, paragraph 1. A brief description of recreational fishing in Wailoa and Wailuku River, Waiakea Pond, Waialama Canal, and Hilo Bay is needed in this section. Recreational and commercial fishing are hard to differentiate in Hawaii since many recreational fisherman often sell part or all of their catch. Therefore, the majority of species listed under fisheries resources would also fall under recreational resources."

Response: The Recreational Resources section of the EIS has been revised to include the following sentence: "Recreational fishing is presently done in the Wailoa River, Waiakea Pond, Waialama Canal, Wailuku River and Hilo Bay." (The species of fish caught in these waters are described in the Animal Resources section of the EIS.)

8. Comment: "Page 24, paragraph 1. The statement is made that 'Less pollution to Hilo Bay from sediment and nutrients will result in cleaner waters, enhancing the esthetic and fishery resources of the shoreline.' This statement should be substantiated. A discussion of the obvious benefits of the reduction of sediment and nutrients to the benthic biota, particularly the coral reefs of the bay and adjacent coastal waters, would enhance the final environmental impact statement."

Response: This paragraph has been revised to read:

The reduction in sediment yield will affect the quality of the runoff water. The reduction of sediment in the runoff will result in the reduction of nutrients being transported to the receiving waters. Less pollution to Hilo Bay from sediment and nutrients will result in cleaner waters. Cleaner waters will benefit the benthic biota, particularly the coral reefs of the Bay and adjacent coastal waters. A study by EPA^{13/} of the effect of sediment along the Hamakua coast has indicated that sedimentation has resulted in a reduced coral population density. However, the number of coral species did not seem to be affected. Because of reduced coral growth and other benthic life which are directly dependent on coral, sources of food and shelter for fish are adversely affected. Turbidity of the Bay water would also inhibit the ability of fish to locate food since most local species are clean water specimens which visually locate their food.

Environmental Protection Agency

1. Comment: "On pages 23 and 26 of the Draft EIS, there is a discussion of reduction in sediment yield of 26% (9,500 tons) resulting from the land treatment measures. EPA commends the SCS for the land treatment efforts to reduce sediment yield. However, the erosion rates per acre presented on page 23 (i.e. 1.5-5.0 tons per year post land treatment) indicate a significant remaining sediment yield. EPA is interested in the affects of channelization of the flood flows and whether this channelization will exacerbate the sedimentation rate downstream. One method of assessing this aspect of channelization would be to compare the downstream sedimentation resulting from land treatment measures alone to downstream sedimentation with channelization."

Response: The 1.5-5.0 tons-per-acre-year erosion rate is within the erosion rate tolerance for agricultural land. The national standard for maximum erosion on agricultural land is 5.0 tons per acre per year.

Diversion of the flood flows will increase the delivery ratio of erosion vs. sediment yield. The land treatment measures to be installed during project installation will reduce erosion, thereby reducing the amount of sediment available for transport. The diversion channels are designed to flow at non-erosive velocities. Taking all these factors into consideration, the sedimentation rate downstream will be reduced.

^{13/} Environmental Protection Agency, The Hawaii Sugar Industry Waste Study, June 1971.

In actuality, the word "channelization" is a misnomer in that diversion channels (diversions) are to be installed. Channelization, per se, will not be a part of this project.

2. Comment: "On page 14 of the Watershed Workplan it is stated, 'Within 5 to 10 years, residential development is planned for the wooded area between Chongs Bridge and Komohana Road. The Alenaio Stream flood plain goes through the center of this area, and damageable values could increase as a result of development.' Since this area is being afforded no protection by the project, to what degree might the channelization and diversion of sheet flows into the channels deliver an even greater quantity of water to this area than under present conditions? EPA is interested in how much additional flood water will be reaching this area and what may be the concomitant effects."

Response: A recent decision was made by the County of Hawaii to have the area between Chong's Bridge and Komohana Road remain in its present use; no residential development is now planned for the future.

Our evaluation on the effect of the proposed project on flood flow indicates an increase in flood peak of about 0.6 percent going into the area between Chong's Bridge and Komohana Road. The volume of flood flow, however, is not changed because there is no additional watershed area brought in by the structures. In the downtown area, the peak flow is estimated to increase by 1 percent for the 100-year flow. There is no measurable increase in damage due to this change in peak flow.

3. Comment: "On page 15 of the Watershed Workplan it is stated that, 'Alenaio Stream and Wailuku River become very turbid during periods of intense rainfall.' EPA is interested in the quantification of the turbidity. Is information available on the ranges of turbidity? In the review of the EIS and workplan there appears to be a dearth of information on existing water quality. EPA suggests that specific water quality data be included so that base level (pre-project) water quality conditions can be established. This might include such parameters as temperature ranges; maximum, minimum, and mean flows; turbidity; sediment loads; nutrients; and coliforms. In addition, is information available on the expected water quality which would discharge into the various streams and Wailuku River?"

Response: Water quality data, including turbidity for the Alenaio Stream and the Wailuku River, is very limited.

Water quality analysis for the Alenaio Stream was made by Neighbor Island Consultants for their report, "An Assessment of Environmental Impact Resulting From Proposed Flood Control Development." The results are shown in Table 3.

The conclusion made on the water quality aspect of the report is, "Since Alenaio Stream has not been sampled for these chemical properties prior to the three samplings made for the present study, it is impossible to speculate on the degree to which the preceding values represent normal or seasonal trends of the Stream's water quality."

The limited data on water quality in Wailuku River were taken at Piihonua gage. Unfortunately, the drainage area above this gage is primarily forest land. The data, therefore, do not show runoff quality from sugarcane lands. The following sentence has been added in the Physical Resources section: "Tables 3 and 4 show water quality analyses for Alenaio Stream and Wailuku River." (See Tables 3 and 4 in the final EIS.)

Department of Health, Education, and Welfare

1. Comment: "The material provided appears to describe adequately the impacts of the proposed action as well as the alternatives that were presented. The major concerns of this department are related to possible impacts upon the health of the population, services to that population and changes in the characteristics of the population which would require a different level or extent of services. Our review does not identify problems related to these specific concerns."

Response: Noted.

Advisory Council on Historic Preservation

1. Comment: "This is in response to your request of February 28, 1975 for comments on the draft environmental statement (DES) and watershed work plan (WWP) for the Wailuku-Alenaio Watershed Project, Hawaii County, Hawaii. Pursuant to its responsibilities under Section 102 (2) (C) of the National Environmental Policy Act of 1969, the Advisory Council has determined that the DES and WWP appear adequate concerning compliance with Section 106 of the National Historic Preservation Act of 1966 and the provisions of Executive Order 11593 'Protection and Enhancement of the Cultural Environment' of May 13, 1971.

However, the Council notes in its review that should previously unidentified cultural remains be discovered during the construction phases of the project, arrangements will be made to avoid or salvage them. The Soil Conservation Service is reminded that if such remains are encountered, prior to initiating any action which would result in the destruction or substantial alteration of the property, it should seek a determination from the Secretary of the Interior respecting the property's eligibility for inclusion in the National Register of Historic Places. Further, should the Secretary of the Interior determine such properties are eligible for inclusion in the National Register,

it is required to afford the Council an opportunity to comment in accordance with 'Procedures for the Protection of Historic and Cultural Properties' (36 C.F.R. Part 800) which sets forth the steps for compliance with Section 106 and the Executive Order 11953."

Response: The Archeological, Historical, and Unique Resources section has been revised to read:

The "National Register of Historic Places" lists no archeologically important sites in the watershed. The Division of State Parks reports no sites of archeological significance in the project construction areas.

An archeological walk-through survey of selected areas in the watershed was made on June 19, 1975, by Aki Sinoto and Neal Oshima (Bernice P. Bishop Museum), and Owen Narikawa (a volunteer). The survey included the strip of land along Structures 3, 4, and 6 and the outlet of Structure 5. Two sites were located, all in the area of Structure 4. The surveyors determined these sites to have only marginal significance. Their recommendations include recording the sites in more detail if they will be affected during construction, and construction activity leading to their disturbance or destruction should be monitored by an archeologist.

If these sites are affected by construction activity, an archeologist will be called upon to record the sites in more detail. Also, if any more sites are discovered during design or construction periods, the sponsors will notify the Bishop Museum, National Park Service, and the Hawaii Department of Land and Natural Resources (Historic Preservation Officer) and project designs will be changed or the remains removed.

Department of the Interior

1. Comment: "We have completed our review of the work plan and draft statement. Both the work plan and draft statement do not contain an adequate discussion of the existing aquatic resources in the study area or provide a valid analysis of the project's impact on these resources. We also believe these two documents could be improved by providing an adequate discussion on what specific mitigation measures will be employed to reduce or eliminate the project's adverse effects on the wildlife resources of the study area."

Response: The Animal Resources section in the EIS has been revised to include aquatic resources in the watershed (see response to U.S. Department of Commerce, comment 3).

To mitigate any effect that the project may have on wildlife habitat, natural vegetation will be allowed on back slopes of maintenance roads along diversions 3, 4, and 6. These back slopes protected with rocks excavated from the diversions will blend with the surroundings when natural revegetation occurs.

It should also be noted that the project will include land treatment of critically eroding areas (20 acres) and eroding stream banks (1,200 feet). The value of these areas to wildlife will make up for the loss of 12.2 acres taken out for the project.

The reduction of sediment yield due to land treatment of sugarcane fields and pasturelands will also have beneficial effects on wildlife.

2. Comment: "We also believe the work plan and draft statement are deficient in the coverage of the cultural resource base of the study area. We believe that a survey of the project area is necessary to determine the presence or absence of historic or archeological values and to carry out a meaningful evaluation as to the importance of this value. Such knowledge is essential to determine how this project should be modified to avoid unnecessary damage to the resources detected and what, if any, salvage may be required. Sound planning would require that this information be developed before final plans for the project are established and an impact statement written prior to the availability of this information on cultural resources can never fully develop the project's impact on these resources."

Response: An archeological survey was made on June 19, 1975 (see comment 6 for additional response).

3. Comment: "The work plan, page 10, and the impact statement, page 16, mention that numerous waterfalls in the Wailuku River limit fish populations to smaller species such as guppies and swordtails. This statement, while partially true, does not accurately describe the fresh water species present and their importance to this river system. We recommend that the statement be changed to reflect the facts that, although the Wailuku River is physically and biologically comparable to other rivers in Hawaii in that such physical barriers as waterfalls restrict the movement of some fish species, the stream supports approximately seven major species of aquatic forms including two fresh water shrimps, two mollusks and at least three gobies. Six of these species are diadromous, thus requiring salt water during part of their life cycle. The major period of their lives is spent in the upper fresh water reaches of the stream after migrating up the river, including ascending the falls. Hence, waterfalls are really not an effective barrier to these aquatic life forms."

Response: The Animal Resources section has been revised to include more data on the fish resources of Wailuku River (see response to comment 3 by U.S. Department of Commerce).

4. Comment: "On page 11 of the work plan and page 16 of the impact statement, some common and some scientific names are incorrect and we suggest further review and correction of this information."

Response: The following names have been corrected: Maui Amakihi (Loxops virens wilsoni), to Hawaii Amakihi (Loxops virens virens); Maui Creeper (Loxops maculata newtoni), to Hawaii Creeper (Loxops maculata mana).

5. Comment: "Cultural Resources - The statement should include a more detailed appraisal of the possible adverse environmental impacts of the project. A description of the esthetic qualities of the area and the impact on these qualities resulting from the project should be mentioned. Flood control projects in the past have been delayed and aborted due to public protest over adverse changes in such qualities. The description of the natural riparian vegetation as 'weedy brush' is inadequate and this description should be either changed or qualified."

Response: An archeological survey within the proposed location of the structures has been made as stated in the Archeological, Historical and Unique Scenic Resources section of the EIS. Recommendation contained in the archeological survey report will be considered. Other cultural resources are identified in the Recreational Resources section. This section and other sections under the Environmental Setting are believed adequate in describing the aesthetic qualities of the area.

The description of the vegetation affected by channel work in Waipahoehoe Stream has been revised to read: "Channel works along 3,500 feet of Waipahoehoe Stream, in the vicinity of Chong's Bridge, will result in removal of shrub-type woody vegetation consisting primarily of guava, Java plum and Christmas berry."

6. Comment: "The draft statement lists a number of land treatment and structural measures, which could produce adverse effects upon archeological resources. The following measures outlined on pages 5-7 of the draft statement involve surface modification, which could be potentially hazardous to archeological resources, if any exist in the area: in-field diversions, stream channel stabilization, grade stabilization structures, streambank protection, four floodwater diversions, stream channel work in Waipahoehoe Stream, and a concrete rubble masonry wall. Those areas within the watershed where these or any other earth-moving activities are planned should be surveyed by a professional archeologist. If significant archeological resources are identified, they should be described and evaluated for their National Register of Historic Places and compliance with Title 36, CFR 800.4 should be documented. The survey and evaluation of all identified sites for their National Register potential should be

made early enough in the planning stages of the project so that the results of the evaluation can be incorporated into the decision-making process for selecting the best alternative and in developing final designs for the project."

Response: An archeological survey of the watershed area was made on June 19, 1975 by Aki Sinoto and Neal Oshima (Bernice P. Bishop Museum) and Owen Narikawa, (a volunteer). The survey area included the strip of land along Structures 3, 4, and 6 and the outlet of Structure 5. Two sites were located, all in the area of Structure 4. The surveyors determined these sites to have only marginal significance. Their recommendations include recording the site in more detail if they will be affected during construction, and construction activity leading to their disturbance or destruction should be monitored by an archeologist. Their findings and recommendations have been included in the EIS.

The areas where land treatment measures will be applied and the strip of land for Structure 5 were not included in the survey area. These are in cultivated areas; therefore, any resource that may have been present has long ago been destroyed.

7. Comment: "A copy of the archeologist's report should be made available to the Arizona Archeological Center, National Park Service, P.O. Box 49008, Tucson, Arizona 85717, in accordance with Section 3 (a) of Public Law 93-291. The survey report should detail the intensity and methodology of the survey and the precise location of areas examined. Only with this information will we be able to adequately assess the impact of the project upon archeological resources."

Response: A copy of the archeological survey report has been sent to the Arizona Archeological Center, National Park Service, Tucson, Arizona.

8. Comment: "Geologic and Mineral Resources - Potential adverse environmental impacts related to geologic conditions have been given adequate consideration in the draft environmental statement and Watershed Work Plan. Further, mineral development should not be adversely affected by the project."

Response: Noted.

9. Comment: "Both the draft watershed work plan and the draft environmental impact statement discuss potential recreation areas that will lie within the watershed area. The EIS should make note of any

possible impacts of the project on these potential recreation resources. In addition, the EIS does not address mitigation for any impacts, recreation or otherwise. We trust the final statement will address this issue."

Response: The proposed structural measures are not expected to affect existing and identified potential recreation areas. Structure 4 (see Appendix B) outlets into Wailuku River in the vicinity of Boiling Pots but will be hidden from the proposed park by a ridge and existing shrubs and trees.

Department of Transportation - U. S. Coast Guard

1. Comment: "The Department of Transportation has reviewed the material submitted. We have no comments to offer nor do we have any objection to this project."

Response: Noted.

STATE AGENCIESDepartment of Agriculture

1. Comment: "The Department of Agriculture has reviewed this statement. The proposed project incorporates best available and feasible practices to achieve the desired goal. No additions or changes are recommended."

Response: Noted.

Office of Environmental Quality Control

1. Comment: "On page 6, the dEIS states, 'The channel work on Waipahoehoe Stream consists mainly of deepening and removing boulders and trees to increase stream capacity above Chong's Bridge.' However, throughout the rest of the EIS there is no mention of the deepening of the channel. Thus, this Office recommends a discussion as to how much deepening is involved and what happens to the fill from the deepening operation. Also, clarification is necessary since the dEIS seems to imply inundation of Waipahoehoe Stream is caused by debris blocking the water passage rather than the inadequate capacity of the stream itself."

Response: The description of the channel work under the Structural Measures section has been revised to read: "The channel work on Waipahoehoe Stream consists mainly of removing boulders and trees within the stream proper to increase stream capacity above Chong's Bridge." The work mainly will be to establish a larger flow area at existing depths. In shallow reaches of the stream where the 100-year flow cannot be contained and the stream overflows into Chongmanville area, a concrete rubble masonry wall will be built. These clarifications have been included in the previously mentioned section.

The materials removed during the channel work will be disposed of according to a plan that will be developed as part of the construction contract and specifications.

2. Comment: "Although reference is made to Waipahoehoe Stream being a tributary of Alenaio Stream on page 13 of the dEIS, the project map does not show any connection between the streams."

Response: Waipahoehoe Stream becomes undefined about one-half mile downstream of Chong's Bridge as described in the Physical Resources section. Floodwater inundates a wide area in the flat-and-brush-covered flood plain. Therefore, to put a stream on the map of that area would be misleading.

3. Comment: "The discussion of the fish and wildlife population affected by the proposed project is inadequate. The effect of temperature changes in the stream, water quality, and erosion should be discussed in the final EIS as to their relationship to the fish and wildlife."

Response: There are no fish resources in Alenaio Stream because it does not flow constantly but flows only for a few days after an intense and sustained rainstorm. The Wailoa River, Waiakea Pond, Waialama Canal, Wailuku River, and Hilo Bay support a variety of fish resources. The Animal Resources section has been expanded to describe these resources in detail.

The effect of the project on wildlife will be beneficial due to reduced sediment by land treatment measures. These effects are described in the expanded Environmental Impact section.

4. Comment: "Although Wailuku River is mentioned as part of the title for the EIS, will any more work be done on the river itself besides the diversion? The project map seems to indicate some type of small channelization work or are the marks along the river something else that has not been identified."

Response: No work will be done in Wailuku River. The marks along the river indicate pools and wider sections of the river.

5. Comment: "Page 19 of the dEIS indicates that, 'Below Chong's Bridge in the nearly flat area where Waipahoehoe Stream becomes Alenaio Stream, floodwaters inundate a large area, including a portion of Kaumana Terrace Subdivision.' Since the flat area is a factor in the change of water velocity (i.e. a decrease in water velocity), we question whether the concrete channelization above the bridge will be adequate to control or alleviate the flooding in the area below the bridge. To further complicate matters, the 'Inadequate stream and bridge capacities and the meandering of Alenaio Stream cause flooding in the residential and commercial areas of downtown Hilo.' Thus, is channelization an effective mitigation measure for the area below Chong's Bridge? A discussion is strongly recommended."

Response: The stream work upstream of Chong's Bridge is not "concrete channelization." It will consist mainly of removing boulders and trees within the stream proper to increase stream capacity. The description of the stream work has been expanded to read:

The channel work on Waipahoehoe Stream consists mainly of removing boulders and trees within the stream proper to increase stream capacity above Chong's Bridge (see Figure 2). The 3,500 feet of channel work will remove only those boulders and trees which block or restrict the flood flows. Work will be limited to one bank where possible.

The work will increase the capacity of the stream to contain the 100-year flow except in two sections of the 3,500-foot reach. A concrete rubble masonry wall (CRM) will be constructed along these sections. An 800-foot-long CRM wall will be constructed downstream of the diversion outlet. This trapezoidal wall will have 7 feet bottom width, 2 feet top width, and 10 feet in height. A similar CRM wall, 200 feet in length, will be constructed downstream from Chong's Bridge. Foundation for these walls will be in rock.

A 13-foot-wide maintenance road will run parallel to the diversion and CRM wall. About 1.5 acres of brushland will be cleared to construct these measures. This structure will protect the residential areas along Chong Street. It will be designed to contain the 100-year flow estimated at 440 cfs for the diversion and 4,100 cfs for Waipahoehoe Stream.

The following paragraphs describing the effect of the project on flooding downstream of the bridge have been included in the Environmental Impact section:

The project measures will not have any measurable effect on floodwater damage in the existing flood-prone area downstream of Chong's Bridge. This area includes the broad, wooded flood plain of Waipahoehoe and Alenaio Streams and downtown Hilo along Alenaio Stream and Waialama Canal.

In downtown Hilo, the County of Hawaii has plans for flood control measures. When these flood control measures are installed, the flood damage from a 100-year storm will be greatly reduced.

Under its authority of approving subdivision plans, the county requires flood control measures before any developers are allowed to build in undeveloped flood plains.

6. Comment: "If only a diversion leading to Wailuku River is needed in the upper region about a mile before the beginning of Ainako Stream, what is the justification for the phrase on page 19, 'inadequate capacity of Ainako Stream'? Since no improvements for the length of Ainako Stream are proposed, will the area throughout the stream be benefited? Or is the project designed for protection of the upper regions?"

Response: The diversion along Akolea Road outletting into the Wailuku River is designed to prevent floodwater damage in the Ainako residential area and the pasture upstream of that area. The writeup on page 19 describes the present flooding problem. After the project is installed, the existing stream is estimated to contain the 100-year flow from the pasturelands upstream of Ainako Avenue.

7. Comment: "The discussion of short-term vs. long-term use of resources should be expanded to include quantified estimates of potential increase for urbanization as a result of this project."

Response: There is no expected change in land use zoning as a result of the project. The Short-Term Vs. Long-Term Use of Resources section is considered adequate.

8. Comment: "Will safety features such as fences in the residential areas be provided when the project is implemented?"

Response: A fence for safety will be installed along the last 1,130 feet of Structure No. 4.

9. Comment: "Although SCS has followed NEPA guidelines, there seems to be conflict with Act 246, SLH 1974. The statute states, 'Whenever an agency proposes to implement an action proposing the use of state or county lands or the use of state or county funds, ... that agency shall assess such action at the earliest practicable time to determine whether an environmental impact statement shall be required.' Under the definition of 'agency' in Act 246, SCS is not the 'agency' that determines whether an EIS is necessary. Thus, why is SCS making the determination for an EIS instead of the appropriate agency established by statute? Who is the appropriate proposing agency in this case? What other agencies are involved with this project? What is SCS's role in this project? Are any state/county lands or state/county funds involved? We strongly recommend a discussion of the relationship of this action to Chapter 343, H.R.S."

Response: The applicability of Chapter 343, Hawaii Revised Statutes, to this federally and locally funded project is covered under the newly adopted Environmental Impact Statement Regulations of the Environmental Quality Commission, State of Hawaii. In Sub-part J - NEPA Actions, it states: "NEPA requires that draft statements be prepared by the responsible Federal official. When the responsibility of preparing an EIS is delegated to a State or County agency, the requirements of these Regulations shall apply in addition to Federal requirements under NEPA."

SCS, in this case, is the responsible federal agency and, since the preparation of the EIS was not delegated, NEPA guidelines were followed.

Other agencies involved in this project are: County of Hawaii, Mauna Kea Soil and Water Conservation District, and Waiakea Soil and Water Conservation District.

This is a PL-566 project. The Secretary of Agriculture has the authority under this Act to assist local organizations in planning and carrying out a program for the development, use, and conservation of the nation's soil and water resources. The Act provides for technical, financial, and credit assistance by the department to local organizations representing the people living in small watersheds.

State/county funds will be used for land rights costs and a portion of the project administration cost.

Governor's Office

1. Comment: "I appreciate the copies of the Draft Environmental Impact Statement and the Draft Plan for the Wailuku-Alenaio Watershed. I have referred this matter to the Office of Environmental Quality Control. That office will review and coordinate comments on the documents before the April 30, 1975, deadline."

Response: Noted.

Department of Health, Deputy Director for Environmental Health

1. Comment: "Please be informed that we have no objections to this 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."

Response: Noted.

Department of Health, Environmental Engineer

1. Comment: "Not enough alternatives were considered. We would recommend to investigate also the following alternatives:
- a) Hydroelectric energy generation potential
 - b) Recreation potential by creating lakes
 - c) Water resource potential by dammed up reservoirs
 - d) Aqua cultures, fishponds, etc.
 - e) Tourist potential in creating exotic, tropical gardens, etc.

"Investigate availability of federal and other funds for these more imaginative alternatives. Investigate opposite actions. Instead of spending money for fast removal of excess water, what would be the cost benefit ratio of using this mass of water."

Response: Any proposed project undertaken under the authority of PL 83-566, as amended, is evaluated for flood prevention and for multipurpose objectives, including storage for municipal and industrial use, supplemental irrigation, fish and wildlife, recreation, water quality management, livestock water, and other purposes. In the Wailuku-Alenaio Watershed project, however, the flooding problem occurs in sloping flood plains where any storage would be created by excavation and embankment fill. Experience has shown that this type of undertaking would be very expensive. Area for the reservoir would also take large acres of forest, pasture, and possibly sugarcane.

A detention dam was investigated for flood prevention for downtown Hilo. This would be located in the brush-covered flood plain downstream of Chong's Bridge. The embankment would be U-shaped where capacity would be created by a combination of fill and excavation.

This structure would cost about \$8.1 million. The cost includes storage for flood prevention only. Cost for

additional storage needed for other purposes would include lining to make the reservoir impervious. Lining for 2,000 acre-feet of water would cost about \$15 million.

Ephemeral streams do not lend themselves to the production of hydroelectric energy generation. HELCO has a small hydroelectric plant on the Wailuku River and they have no plans to expand this plant. Instead, their plans call for a new oil burning electric generation plant.

The cost for creating exotic, tropical gardens would be a non-federal cost. All costs will have to be incurred by the sponsors.

2. Comment: "What would be the penalty of not using these potentials now. How the recommended action will negate future projects like those (a, b, c, d, e) recommended in 1."

Response: Not applicable in light of infeasibility of suggested measures.

3. Comment: "Meteorological and climatic effects of fast removal of pondings. How it influences draft conditions, natural ecological balance (more contained water versus less, evaporation, precipitation, etc.) How the insect population will be affected and as a results of that, how the bird and wildlife will be changed, if less fresh water will be available for them for shorter periods."

Response: There is no information available on this comment. However, it should be remembered that these are ephemeral, not perennial, streams and carry water only during rains - small ponds remaining only a few days until seeped or evaporated after cessation of rainfall. It is felt that the project will have little, if any, effect on the conditions mentioned in this comment.

4. Comment: "Geological, seismic and lava flow effects might be investigated in connection with the structural measures. Is there any seismic danger during its useful life."

Response: The possibility of damage from seismic effect will exist for the proposed structures. Since these structures are diversions, the damage due to failure will be minimal. If the structures were dams that retain water, failure would be of a greater concern. Inundation of the structures by lava is a possibility.

5. Comment: "Is this project in conformity with future water resource needs which 'call for expanding both ground and surface sources'. How does this planned measure correlate to the ongoing water resources study? Is there any coordination considered between the two?"

Response: It is felt that this project will have little, if any, effect on future water resource needs in the area as it deals with ephemeral streams. This plan is included in the Hawaii Water Resources Regional Study.

6. Comment: "Conclusion: In these times of the energy getting scarcer and scarcer it is unwise to spend money to waste quickly such precious resource of huge amounts of fresh water which this watershed area occasionally can provide.

"Would it be rather more in tune with our timely needs to use all these resources in a more profitable way, such as a hydroelectric plant and a series of water reservoirs retained by suitable dams.

"Therefore, instead of making this piecemeal solution of the problem now with limited imagination, it would be more appropriate to go slow now or do as little as possible and to use all our imagination and possible financial resources to develop a far reaching, far-sighted general plan of hydroelectric power generation, water preservation, recreation, wildlife promotion, tropical gardens, parks, bird sanctuaries, etc. or at least investigate these possibilities in depth, before the final commitment to this project."

Response: We are not dealing with "huge amounts of fresh water." We are dealing with floodwaters in ephemeral streams.

Ephemeral streams do not lend themselves to production of hydroelectric energy.

Due to the shallowness of the soil and the porosity of the underlying rock, reservoirs are not feasible in this area.

Finally, the purpose of this project is to alleviate flood danger to agricultural lands and homes in the watershed area. We do not feel this project is a piecemeal solution to the problem.

Department of Land and Natural Resources

1. Comment: "'Black francolin and Gambel's Quail' are not found in the watershed."

Response: The species Black francolin and Gambel's Quail will be eliminated from this paragraph.

2. Comment: "'California Quail' and 'Valley Quail' are synonomous, and thus listing both is redundant."

Response: The word "Valley Quail" will be eliminated from this area of EIS.

3. Comment: "The 'Maui Amakihi' and 'Maui Creeper' are found on Maui, not Hawaii. Correct listing should be 'Hawaii Amakihi (Loxops virens)'; 'Hawaii Creeper (Loxops parva)'."

Response: "Hawaii Amakihi (Loxops virens virens)" will be substituted for "Maui Amakihi;" "Hawaii Creeper (Loxops maculata mana)" will be substituted for "Maui Creeper."

4. Comment: "The Hawaiian Hawk has been seen at Kaumana in Hilo, thus it is erroneous to say that it is not found in area where structural improvements are planned."

Response: "Hawaiian hawk" will be added to the list of birds found in the area where structural improvements are planned.

Department of Planning and Economic Development

1. Comment: "Upon examination of both reports, which we have found to be comprehensive and well prepared, we would like to indicate our concurrence with its assessment and proposed work plan.

"In addition, we would like to add that the program from which funds are being requested, Watershed Protection and Flood Prevention - Catalog No. 10.904, is required by the Office of Management and Budget to be reviewed through the A-95 Project Notification and Review System. According to PNRS procedures, a Notification of Intent to Apply for Federal Assistance for the subject development is required to be filed with the State Clearinghouse prior to submission of the formal application to the Federal funding agency."

Response: We are aware of the requirements of Office of Management and Budget Circular A-95.

Department of Transportation

1. Comment: "On page 24, 2nd paragraph, the words 'coastal highway' should read 'Hilo Bayfront Highway.'"

Response: In the Floodwater Damage section, "coastal highway" will be changed to read "Hilo Bayfront Highway."

2. Comment: "The Statement should discuss the potential floodwater diversions at Komohana Road and from Waialama Canal across Kamehameha Avenue and Hilo Bayfront Highway, and the possible detours when replacing Chong Bridge."

Response: The proposed project will reduce damage in areas upstream of downtown Hilo, while the potential floodwater diversions at Komohana Road and from Waialama Canal across Kamehameha Avenue and Hilo Bayfront Highway would be some alternatives of reducing floodwater damage in downtown Hilo. These alternatives were investigated by the Corps of Engineers for the County of Hawaii. The diversion at Komohana Road appeared feasible; however, no county funds are yet available for implementation.

A detour road that may be needed to reroute traffic when replacing Chong's Bridge is not considered a major portion of the project, thus, will not have any major impact.

University of Hawaii - Environmental Center

1. Comment: "The flood hazard in Hilo is admittedly severe, and the commercial importance of that city to the island and the State is significant. Therefore, we seriously question the wisdom of incremental planning and installation of flood control channels above Hilo, before a general protection plan is provided specifically for Hilo. Since the general purpose of channelization and diversion is to reduce storage of flood water on the land, won't this project aggravate downstream flooding? Was the entire drainage basin, including Hilo, considered in evaluating the hydraulic and hydrologic impact of the project plan? The 'Potential Floodwater Diversion' shown in Appendix B on the Project Map would seem to indicate that the problem was recognized. Were possible increased damages downstream subtracted from the damage reduction benefits claimed, especially for Evaluation Unit 1?"

Response: The flooding problem in downtown Hilo was recognized and evaluated in addition to those problems in the areas above Hilo. Possible solutions to those problems were also investigated. Because of the high costs for structural measures to prevent damage in this urban area of Hilo, the project was

formulated to include flood prevention measures only for the upper areas where beneficiaries were mostly agricultural, rural, and suburban areas. For downtown Hilo, the County of Hawaii has asked the Corps of Engineers to investigate possible flood prevention measures. The diversion at Komohana Road appeared feasible and may be implemented when local funds become available.

The effect of the project on the flooding problem in downtown Hilo was investigated. Flood peak flow was estimated to increase by about 1 percent but with no measurable increase in flood damage.

2. Comment: "Under the urban land treatment, 1200 acres will be treated (DEIS, p. 5). Would this acreage need the treatment if the flood control measures were not installed? What is the location of the 1200 acres? Why is this treatment necessary if no land use changes are expected (DEIS, p. 24)? A map showing the general location of the land treatment measures would be helpful in assessing the impacts of the treatments."

Response: A map (Appendix D) showing areas needing land treatment has been included. The areas needing treatment are already in urban use designation but still not developed. When these areas are developed for residential use, the developer will be required to install erosion control measures under the proposed county grading ordinance whether or not the flood control measures are installed.

3. Comment: "What recourse does SCS have if the land treatment measures and O & M agreements are not kept once the flood control structures are complete? What would be the impact of the structures if the agreements were not carried out over the project life?"

Response: Land treatment measures are strictly voluntary but are required by PL 83-566, as amended. When the project is approved for operations, technical assistance for accelerated land treatment measures will be available to landowners. In addition, the proposed county grading ordinance will mandate erosion control practices on any land-disturbing activities.

An Operation and Maintenance (O&M) Agreement between the county and SCS will be executed before any construction begins. O&M is necessary to keep the structures functional. Performance by the county in O&M in similar PL 83-566 projects has been excellent. If the O&M agreements were not carried out, the structures will not function properly and may not contain the 100-year storm runoff.

4. Comment: "Are the 430 acres of urban land in the floodplain actually developed or are some of the lands only zoned urban at this time? (DEIS, p. 11)."

Response: After reevaluation, this section has been corrected to read: "The total flood plain is estimated at 1,600 acres comprising about 450 acres urban land, 600 acres in sugarcane land, and 550 acres in pasture and forest land." Of the 450 acres of urban land in the flood plain, about 200 acres are not yet developed.

5. Comment: "What are the ownership patterns in the areas benefitted?"

Response: The benefitted areas in residential, pasture and sugarcane are primarily in small ownership. The 740 acres in sugarcane and pasture are owned and operated by 10 operators.

6. Comment: "Is development expected in the bushlands and woodlands in the benefitted area below Akolea Road?"

Response: The forest land in the benefitted area below Akolea Road is now zoned A-1a (Agriculture, 1 acre). This land use designation A-1a is expected to remain.

7. Comment: "How was the \$160,200 average annual damage figure derived for the residential area? The entire amount is claimed as a damage reduction benefit (Workplan, p. 46). What average annual damages will still exist after the project provides protection up to the 100-year flood threshold?"

Response: The procedure for estimating benefits are described in the Economics section of the Investigations and Analysis portion of the Watershed Work Plan. This has been included as Appendix E.

It is estimated that no damage will occur to the residential area from storms up to the 100-year flood event after the structures are installed.

8. Comment: "We note in figures 1A, 1B, and 1C as well as in the text, that 'spoil will be placed on the downhill side' of each of the flood water diversion channels. Will this fill result in a levee effect and thus increase damage if overtopping occurs? What is the expected frequency of overtopping? On Figure 3A a significant portion of agricultural and open space land appears to be protected by Structure 6. What share of the project benefits result from Structure 6?"

Response: The floodwater diversions are designed to contain the design flows within undisturbed ground whenever possible. In the few segments where the downstream bank will be built up, these will be lined with concrete rubble masonry (CRM). Any overtopping of the banks is not expected to cause the structure to fail. Including flow within the freeboard, the structures can contain the 200-year storm-runoff.

Only about 20 percent of the excavated material will be used for embankment. The statement on spoil has been revised.

The benefit from Structure 6 will accrue primarily to pasture and sugarcane lands. Structure 5 will complement this structure to protect other agricultural lands. Benefits from these two structures were not separated from benefits due to Structure 3.

9. Comment: "What kind of protection will be provided for the planned residential development between Chong's Bridge and Komohana Road (DEIS, p. 20)? What would the combined effect of the SCS proposal and the protection for the proposed development be on the Hilo flood hazard downstream?"

Response: Plans for developing the area between Chong's Bridge and Komohana Road have been changed by the County Planning Department. The plan is to not have residential development but to leave it as is. The final EIS has been changed to reflect this revision.

10. Comment: "The benefit cost ratio for the structural measures is cited in Appendix A of the DEIS as 2.4:1.0. Such a ratio is surprisingly high for an area benefitted which is mostly agricultural. What specific percent of the total damage reduction was used to estimate damage reduction for land treatment measures? Why were Evaluation Units 1 and 2 combined for the benefit/cost ratio, but analyzed separately otherwise?"

Response: Structural measures 3, 5 and 6 which will protect mostly agricultural lands have benefit-to-cost ratio of 2.0 to 1.0.

The flood damage reduction attributed to land treatment measures was estimated at 2.9 percent of total damage reduction.

The project was divided into two evaluation units because the structures for each unit will prevent damage in two separate and distinct areas. The combined benefit-to-cost ratio represents the feasibility for the whole project.

11. Comment: "Under Alternative 2, flood plain zoning, floodproofing and flood insurance are all lumped together and \$5.3 million is the estimated cost (DEIS, pp. 26-27). What are the details of this alternative? Would flood insurance be cost effective in any part of the project area? Which residents could afford to buy it? Are any residents currently purchasing flood insurance? If not, why not, considering the hazard? What areas are considered by SCS to be candidates for the zoning alternatives? What would the downstream effects of this alternative be?"

Response: Alternative 2 is composed of the following:

- a. Flood insurance for most of the homes costing about \$240,000.
- b. Flood proofing for existing 40 homes for approximately \$360,000.
- c. Flood plain zoning consisting of three items:
 - (1) Flood proofing of new construction (350 homes) for about \$700,000.
 - (2) Twenty acres in high hazard areas that would be purchased for \$1,600,000.
 - (3) Twenty-five acres that would be down-zoned to agricultural use costing about \$1,300,000.

Together with land treatment measures costing about \$1,100,000, this alternative would have a total cost of \$5.3 million.

Flood insurance would not be cost effective in any part of the watershed.

Flood insurance is available for those who can afford to buy it. It is not known how many of the existing homes in the watershed are covered by flood insurance. Most new residences are protected with flood insurance.

The areas that may be candidates for zoning are portions of the Ainako and Kaumana residential areas.

There will be no significant effect on the downstream area as a result of the implementation of this alternative. Damages would not change from the situation that exists today.

12. Comment: "What percent of the net average annual 'benefits foregone' in Alternative 4 result from protecting only Ainako (DEIS, p. 28)?"

Response: If the project protects only the Ainako area, the annual benefits foregone in the other evaluation unit of the watershed would be \$73,190 about 35 percent of the total annual benefits foregone by not implementing this other portion of the project.

13. Comment: "What wetland areas exist in the project area and how will they be modified by the project? How will the modification affect wildlife? To what extent do the six wildlife species listed in 'Threatened Wildlife of the United States' (p. 16) depend on flood-plain habitats? The single sentence devoted to the project's possible impact on these species is inadequate. Was a survey of the area done by professional biologists?"

Response: There are no identified wetland areas in the project area as defined in "Wetlands of the United States," Circular 39, U.S. Fish and Wildlife Service. The wildlife species listed in "Threatened Wildlife of the United States," 1973 Edition, U.S. Bureau of Sport Fisheries and Wildlife, generally inhabit the middle and upper portions of the watershed. However, the Hawaiian hawk has been seen in Kaumana. The sentence on threatened wildlife has been revised to read: "None of the above listed species except the Hawaiian hawk are known to be in the area where improvements are planned." These above determinations were made by our professional biologist.

14. Comment: "It seems reasonable to conclude that with reduction in sheet flow and general decrease in flooding in the area indicated on Appendix B, project maps, that a significant and possibly severe negative impact will be felt on the predominantly forest, grassland and pasture areas. Marked ecological changes would be expected in this area both in plant life and the accompanying animal populations. The potential affect of this decrease in water should be more fully assessed in the final EIS."

Response: Because of the type of sheet flow that the project is planned to control, we believe the project will increase rather than decrease water penetration into the ground. The area is relatively steep and floodwater flows at eroding velocities. During the 1966 storm, floodwater eroded sugarcane as well as pasture and forest lands. Removal of vegetation by erosion reduces water penetration. The project is designed to reduce these erosion damages. The project will therefore maintain favorable soil-cover conditions for increased water penetration.

15. Comment: "A final comment must be appended to our overall review of this DEIS and the accompanying Draft Watershed Work Plan. It is particularly annoying to encounter and review repetitious documentation such as is presented in the bulk of the Watershed Work Plan. The first 35 pages of text of the Watershed Work Plan are covered, for the most part, verbatim, in the DEIS. Figures 2, 3A, 3B, 3C, 3D, 4, 5, 6, 7 and the Project Maps are identical, yet carry different figure numbers to those included in the DEIS. Since the basic organization of the two documents is not the same, and since sentence and paragraph structure has been slightly altered, one can not simply ignore the first 35 pages and the maps but must sift through the

pages of repetitious material in search of possible interjected meaningful sentences. The difference between the two reports in 75-80% of the text is confined to the grammatical construction of the sentences:

"DEIS, pg. 20 - Under present conditions, a 100-year frequency storm is expected to cause serious damage

"Watershed Work Plan, pg. 14 - A 100-year storm under present conditions would be expected to cause

"We would strongly urge that hereafter supporting documents to a DEIS be carefully compiled to eliminate unnecessary and wasteful duplication which result in inefficiency in the review process."

Response: We concur that much of the contents of the Work Plan and Environmental Impact Statement (EIS) are similar. However, each document serves a different purpose. The format and content of the Work Plan was formulated long before an EIS was required. The Work Plan was needed to carry out the intent of PL 83-566, as amended, while the EIS was required to satisfy the requirements of the Natural Environmental Policy Act of 1969 (PL 91-190).

SCS has now formulated a guideline whereby a combined Work Plan and EIS can satisfy both laws and will be utilized in future planning activities under PL-566. This will eliminate the duplication you mentioned.

LIST OF APPENDIXES

Appendix A - Comparison of Benefits and Costs for Structural Measures - From the Work Plan

Appendix B - Project Map

Appendix C - Letters of Comments Received on the Draft Environmental Impact Statement

Appendix D - Land Treatment Map

Appendix E - Economic Evaluation

Approved by *Francis C. H. Lum* Date 12/29/75
Francis C. H. Lum
State Conservationist

Approved by *Herbert T. Matayoshi* Date 1/27/76
Herbert T. Matayoshi
Mayor, County of Hawaii

Approved by *George R. Ariyoshi* Date FEB 4 1976
George R. Ariyoshi
Governor, State of Hawaii

APPENDIX A
COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

WAILUKU-ALENAIO WATERSHED, HAWAII

(Dollars)

Evaluation Unit	Average Annual Benefits ^{1/}			Total	Average ^{2/} Annual Cost	Benefit Cost Ratio
	Damage Reduction	Secondary	Redevelopment			
1 ^{3/}	138,300	15,000	13,300	166,600	81,390	2.0:1.0
2 ^{4/}	154,200	15,900	5,500	175,600	35,190	5.0:1.0
Project Administration	--	--	--	--	17,170	--
GRAND TOTAL	292,500 ^{5/}	30,900	18,800	342,200	133,750	2.6:1.0

1/ Price base: ~~1975~~

2/ From Table 4, Wailuku-Alenaio Watershed Work Plan.

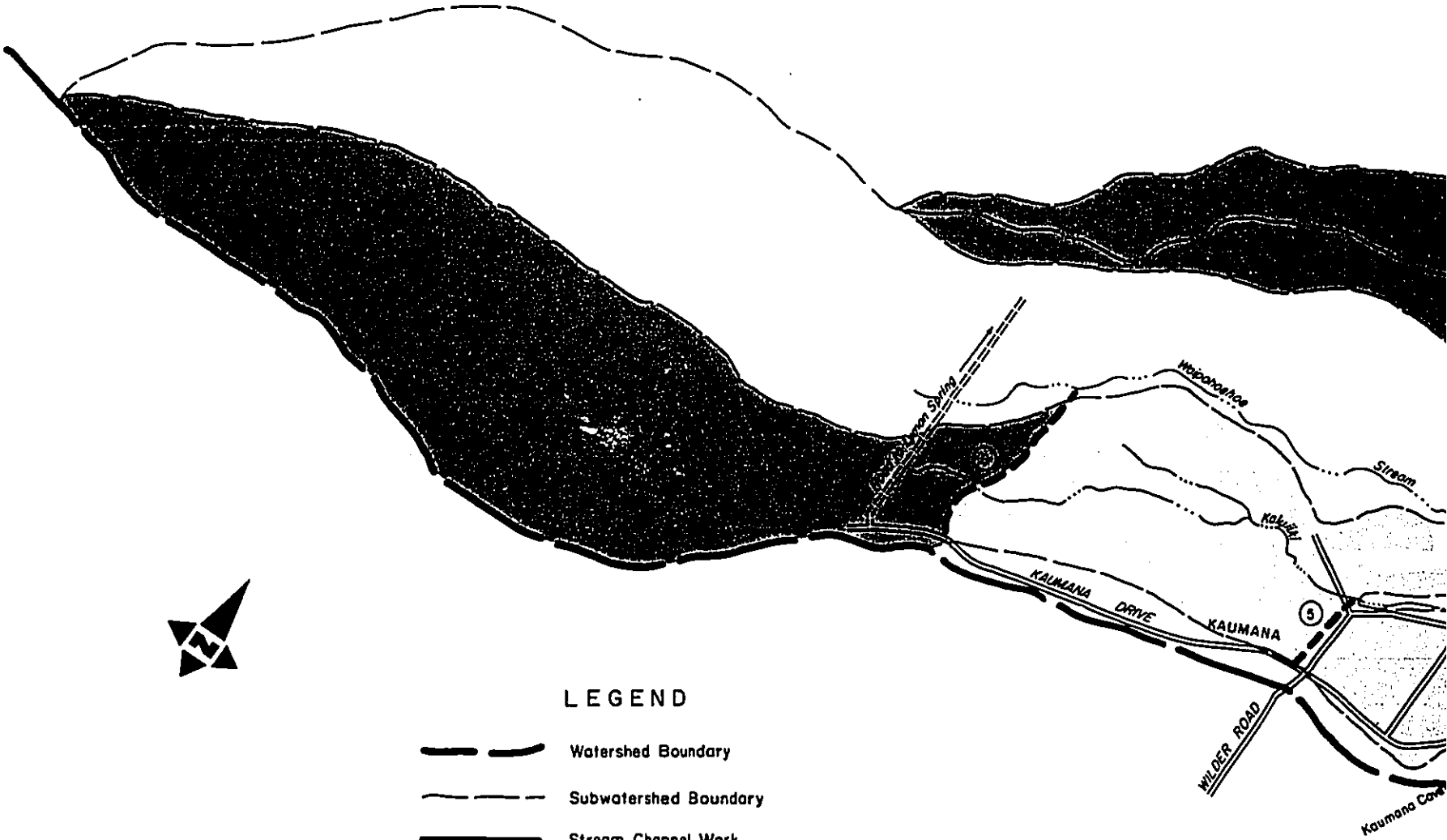
3/ Includes structural measures 3, 5, and 6 in the Kaumana and Chongmanville areas.

4/ Structural measure 4 in the Ainako area.


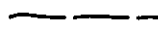





5/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of \$8,700 annually.

March 1976

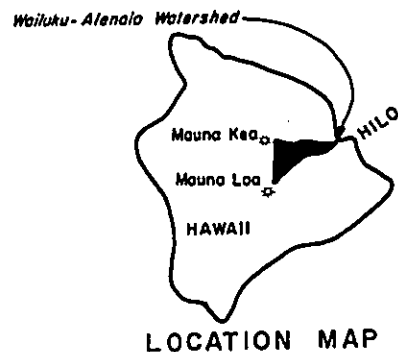
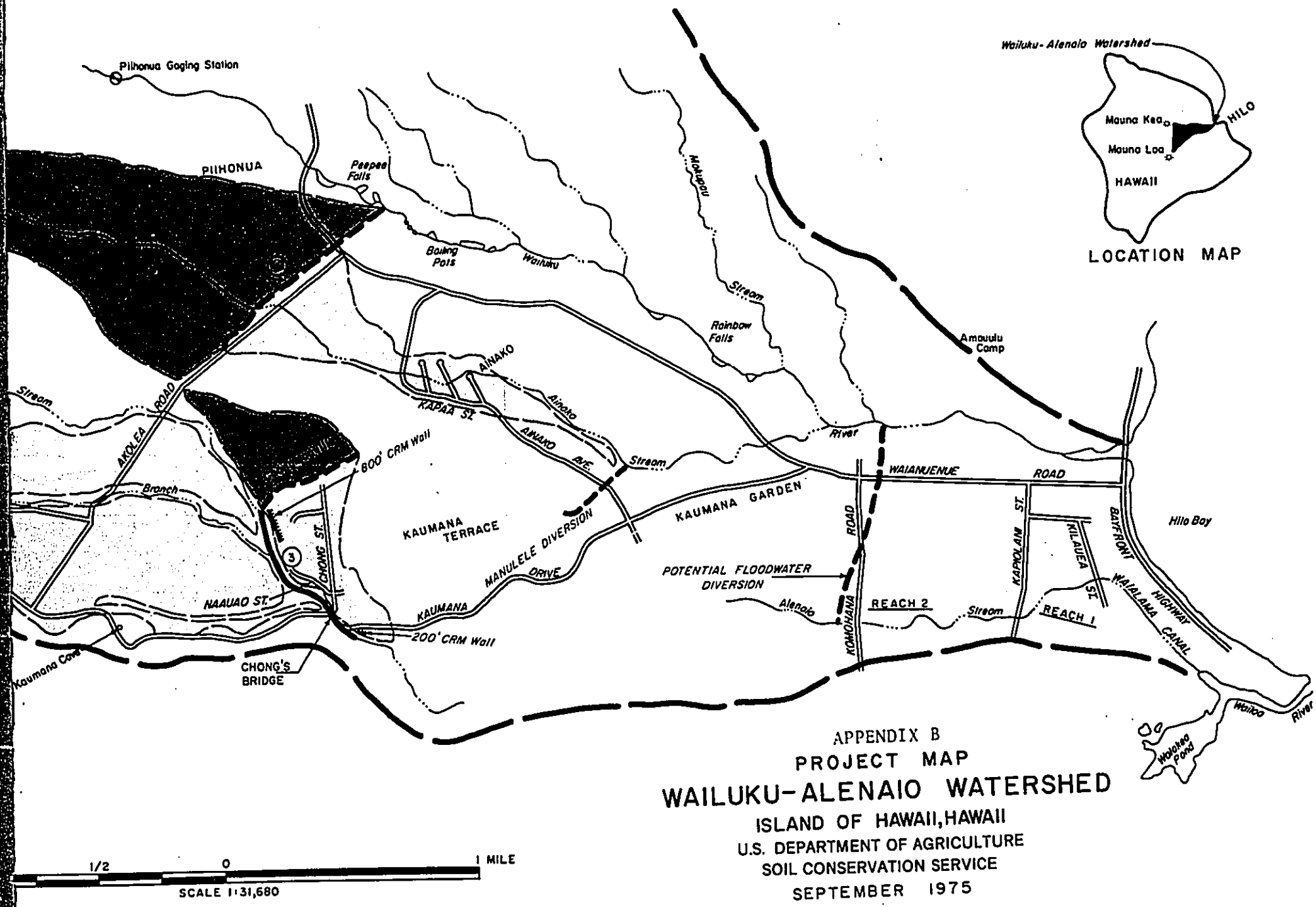
RECEIVED AS FOLLOWS



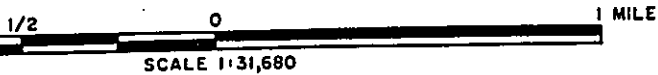
LEGEND

-  Watershed Boundary
-  Subwatershed Boundary
-  Stream Channel Work
-  Floodwater Diversion
-  Structure Number
-  Drainage Area Controlled by Channel Work and Floodwater Diversion
-  Areas Benefited by Project

RECEIVED AS FOLLOWS



APPENDIX B
PROJECT MAP
WAILUKU-ALENAIO WATERSHED
ISLAND OF HAWAII, HAWAII
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SEPTEMBER 1975



APPENDIX C

LETTERS OF COMMENTS RECEIVED

ON THE

DRAFT ENVIRONMENTAL IMPACT STATEMENT

FEDERAL

C-1-1

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 15th AIR BASE WING (PACAF)
APO SAN FRANCISCO 96353



REPLY TO
ATTN OF: DEEE (Mr Kimura, 4492158)


10 APR 1975

SUBJECT: Draft Environmental Impact Statement

TO: Office of Environmental Quality Control
Office of the Governor
550 Halekauwila Street
Tani Office Building, Third Floor
Honolulu, Hawaii 96813

We have no comments to render relative to the draft environmental impact statements for the following projects:

1. Panaewa Zoological Garden, Hilo.
- ✓ 2. Wailuku-Alenaio Watershed Project, Hilo.
3. Ewa Beach Sewer System.
4. Excavation & Quarry Operation, Honokahau 2nd.
5. Construction and Operations, Mauna Kea Science Reserve.
6. Waimanalo Stream Improvement.
7. Palehua PD-H (Projects 2 through 5).


ALLAN M. YAMADA
Asst Dep Comdr for Civil Engineering

C-2-1



AFZV-SG-EC

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

22 APR 1975

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

Dear Dr. Marland:

The following Draft Environmental Impact Statements were reviewed by our office:

- ✓ 1. Wailuku-Alenajo Watershed Project, Hawaii County, Hawaii.
2. Ewa Beach Sewer System.
3. Existing Operation of the UH Observatory and the Construction and Operation of the New IRTF and Ukirt Observatories, Mauna Kea Science Reserve, County of Hawaii, Hawaii.
4. Panaewa Zoological Garden, Panaewa, South Hilo, Hawaii.
5. Lilipuna Road-Ka-Hanahou Circle Relief Drain.

We have no comments to offer at this time.

We thank you for the opportunity to review these statements.

Sincerely,

A handwritten signature in cursive script, appearing to read "Lee C. Herwig, Jr.", is written over the typed name.

LEE C. HERWIG, JR.
Colonel, MSC
Environmental Consultant to Commander,
U.S. Army Support Command, Hawaii

C-3-1



PODED-P

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
BLDG. 230, FT. SHAFTER
APO SAN FRANCISCO 96558

18 April 1975

Mr. Francis C. H. Lum
State Conservationist
U.S. Department of Agriculture
Soil Conservation Service
440 Alexander Young Building
Honolulu, Hawaii 96813

Dear Mr. Lum;

We have reviewed the draft watershed work plan and draft environmental impact statement for Wailuku-Alenaio Watershed Project, Hawaii County, and have the following comments.

a. Both the draft work plan (pages 18 and 22) and the environmental impact statement (EIS, page 18) refer to County and/or Corps of Engineers studies of Alenaio Stream flood problems. The Corps of Engineers completed a reconnaissance study on the Alenaio Stream flood problem in March 1973. The report concluded that a diversion channel located near Komohana Street, diverting high flows from Alenaio Stream into Wailuku River, appears to be a feasible solution. A further conclusion found that Federal participation is possible, but since local funds are not available, no further work is in progress.

b. The work plan's usage and interpretation of the "Flood Plain Information Study" is correct as presented on page 52. However, the reference to the Flood Plain Information Study of Kaumana-Punahoa on page 51 should be qualified by stating that the study covers a separate, adjacent watershed area.

c. Although the work plan and EIS present a systematic coverage of the environmental setting of the total watershed, more specific details of the physical, plant, and wildlife resources in the vicinity of the structural improvements should be included to better describe the impacts of the proposed actions.

d. The project description states that three diversions will be excavated in earth and rock. The susceptibility of the excavations to erosion,



PODED-P

18 April 1975


Mr. Francis C. H. Lum

particularly when cut in earth, and the measures to be incorporated for stabilization should also be described.

e. Additional information on the National Flood Insurance Program is offered for consideration in the discussion of alternatives (page 19 of the work plan and page 25, EIS). For continued eligibility, the program requires that the County (1) zone special flood hazard areas as outlined by the U.S. Department of Housing and Urban Development, (2) recognize flood hazards in subdivision regulations, and (3) include provisions in building codes for flood proofing. It should be noted that in flood plain regulations, it is not necessary for the County to purchase flood plain lands. Permitted uses may be stated in zoning codes. Finally, with reference to the availability of flood insurance, the intent of government subsidization of flood insurance is to enable every home owner to afford it.

Thank you for the opportunity to review both the work plan and EIS. We would appreciate copies of the final documents when they are available.

Sincerely yours,


KISUK CHEUNG
for Chief, Engineering Division



C-4-1
UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D.C. 20230

April 30, 1975

Mr. Francis C. H. Lum
State Conservationist
United States Department of
Agriculture
Soil Conservation Service
440 Alexander Young Building
Honolulu, Hawaii 96813

Dear Mr. Lum:

The draft environmental impact statement for the "Wailuku-Alenaio Watershed Project, Hawaii County, Hawaii," which accompanied your letter of February 28, 1975, has been received by the Department of Commerce for review and comment.

The statement has been reviewed and the following comments are offered for your consideration.

General Comments

The draft environmental impact statement specifies that conservation land treatment measures will be applied to 1,600 acres of crop land, 4,000 acres of pasture land, 1,200 acres of urban land, and 10,000 acres of forest land during the 10-year installation period. However, it then states that these conservation land treatment measures will be installed by the individual land owners and operators on a voluntary basis. We feel that the conservation land treatment measures are the most vital part of this watershed project as far as curtailment of erosion is concerned. It is the runoff from denuded land, particularly cropland, which generates the majority of the sediment load in the streams of the watershed. The sediment-laden water then discharges into Hilo Bay where it has an adverse effect on the water quality and the estuarine and marine biota of the bay and adjacent coastal waters. Because implementation of these critical measures is voluntary, with consequent uncertain results, we suggest that this problem be addressed in much greater detail in the final environmental impact statement. At a minimum, the degree of previous



voluntary implementation of conservation land treatment measures achieved in authorized, operating SCS Small Watershed Projects in Hawaii should be discussed and tabulated, by category.

We question the need for stream bank protection and stream channel stabilization, especially with the use of structural measures. A statement is made in the draft environmental impact statement that "stream bank erosion is not a serious problem because most streams are contained in bedrock gorges or in well-vegetated stream banks." In light of the above statement the need for removal of vegetation (channel work) and the construction of a concrete rubble masonry well along Waipahoehoe Stream should be clarified.

The description of aquatic life in the streams, estuary, and coastal waters of the watershed (page 16) is incomplete. A complete species inventory including habitat description is given for terrestrial plants and animals, both native and introduced, in the watershed. For aquatic life, however, a three sentence paragraph is utilized to describe the entire fresh water, estuarine, and marine complex (see Specific Comments below).

Species inventories are particularly important for the fresh water and estuarine biota. Fresh water fish species include more than "guppies and swordtails," as stated. Lists of species found in the Wailuku River, Waialama Canal, and Alenaio-Waipahoehoe-Kaluiiki Stream complex should include the endemic diadromous fauna, such as the various species of gobies (oopu), prawns (opae), and limpets (hiwai), many of which are rapidly becoming endangered. The upstream limit of estuarine species should be determined for the Wailoa and Wailuku Rivers and Waialama Canal. Of particular importance are valuable commercial species such as the mullet (Mugil cephalus), awa (Chanos chanos), aholehole (Kuhlia sandvicensis), and nehu (Stolephorus purpureus). Nehu is the primary bait fish species utilized by the Hawaiian skip-jack tuna fishery, and Hilo Bay is the major nehu baiting area on the Island of Hawaii.

It is quite probable that aquatic resources will benefit by the proposed watershed project. Nonetheless, these resources should be delineated in order to adequately assess the environmental impact of the proposed action.

Specific Comments

Page 5, paragraph 6. Under critical area planting, in addition to eroded areas, vegetation should be planted around crop land (sugar cane fields) and bordering unpaved cane-haul roads to further prevent sheet and gully erosion.

Page 7, paragraph 5. This paragraph, outlining design considerations and construction specifications which will minimize soil erosion and water and air pollution is of vital importance and should be emphasized with an appropriately underlined heading in the environmental impact statement.

Page 16, paragraph 2. As mentioned under General Comments above, this paragraph on aquatic animals is incomplete. In addition to the requested data on fresh water and estuarine species outlined under General Comments, the marine resources of Hilo Bay which will be affected by the proposed project should be assessed. The last sentence in this paragraph stating "Hilo Bay contains almost all known species of fish in the islands" is erroneous. Many pelagic, deep-water demersal, and reef fish requiring clear non-polluted water are not found in the bay, particularly as residents. The environmental impact statement should describe the major fisheries resources of the bay and adjacent waters, and should include invertebrate resources (crustaceans, mollusks) as well as fish.

Page 17, paragraph 1. A brief description of recreational fishing in Wailoa and Wailuku River, Waiakea Pond, Waialama Canal, and Hilo Bay is needed in this section. Recreational and commercial fishing are hard to differentiate in Hawaii since many recreational fishermen often sell part or all of their catch. Therefore, the majority of species listed under fisheries resources would also fall under recreational resources.

Page 24, paragraph 1. The statement is made that "Less pollution to Hilo Bay from sediment and nutrients will result in cleaner waters, enhancing the esthetic and fishery resources of the shoreline." This statement should be substantiated. A discussion of the obvious benefits of the reduction of sediment and nutrients to the benthic biota, particularly the coral reefs of the bay


C-4-4

- 4 -

and adjacent coastal waters, would enhance the final environmental impact statement.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving two copies of the final statement.

Sincerely,


Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs



C-5-1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
100 CALIFORNIA STREET
SAN FRANCISCO, CALIFORNIA 94111

Mr. Francis C. H. Lum
State Conservationist
Soil Conservation Service
440 Alexander Young Building
Honolulu, HI 96813

APR 29 1975

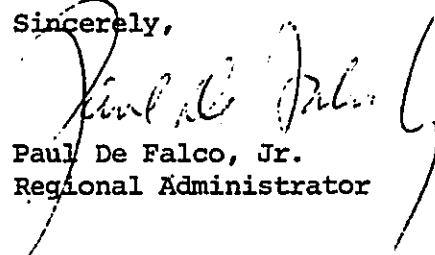
Dear Mr. Lum:

The Environmental Protection Agency has received and reviewed the draft environmental statement for the Wailuku-Alenaio Watershed Project, Hawaii, Hawaii. The review of the Draft EIS has been prepared in conjunction with an examination of the Draft Watershed Workplan. The comments presented focus on the EIS; however, for a greater clarity of issues, reference is made to the Watershed Workplan document.

EPA's comments on the draft environmental statement have been classified as Category LO-2. Specific comments are noted in the enclosure. Definitions of the categories are provided on the second enclosure. The classification and the date of EPA's comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions under Section 309 of the Clean Air Act. Our procedure is to categorize our comments on both the environmental consequences of the proposed action and the adequacy of the environmental statement.

EPA appreciates the opportunity to comment on this draft environmental statement and requests one copy of the final environmental statement when available.

Sincerely,


Paul De Falco, Jr.
Regional Administrator

Enclosures

cc: Council on Environmental Quality

EIS CATEGORY CODES

Environmental Impact of the Action

LO--Lack of Objections

EPA has no objection to the proposed action as described in the draft impact statement; or suggests only minor changes in the proposed action.

ER--Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating Federal agency to reassess these aspects.

EU--Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

Adequacy of the Impact Statement

Category 1--Adequate

The draft impact statement adequately sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2--Insufficient Information

EPA believes that the draft impact statement does not contain sufficient information to assess fully the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft statement.

Category 3--Inadequate

EPA believes that the draft impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement.

If a draft impact statement is assigned a Category 3, no rating will be made of the project or action, since a basis does not generally exist on which to make such a determination.

COMMENTS ON THE WAILUKU-ALENAIO WATERSHED PROJECT
HAWAII COUNTY, HAWAII

On pages 23 and 26 of the Draft EIS, there is discussion of reduction in sediment yield of 26% (9,500 tons) resulting from the land treatment measures. EPA commends the SCS for the land treatment efforts to reduce sediment yield. However, the erosion rates per acre presented on page 23 (i.e. 1.5-5.0 tons per year post land treatment) indicate a significant remaining sediment yield. EPA is interested in the affects of channelization of the flood flows and whether this channelization will exacerbate the sedimentation rate downstream. One method of assessing this aspect of channelization would be to compare the downstream sedimentation resulting from land treatment measures alone to downstream sedimentation with channelization.

On page 15 of the Watershed Workplan it is stated that, "Alenaio Stream and Wailuku River become very turbid during periods of intense rainfall." EPA is interested in the quantification of the turbidity. Is information available on the ranges of turbidity? In the review of the EIS and workplan there appears to be a dearth of information on existing water quality. EPA suggests that specific water quality data be included so that base level (pre-project) water quality conditions can be established. This might include such parameters as temperature ranges; maximum, minimum, and mean flows; turbidity; sediment loads; nutrients; and coliforms. In addition, is information available on the expected water quality which would discharge into the various streams and Wailuku River?

On page 14 of the Watershed Workplan it is stated, "Within 5 to 10 years, residential development is planned for the wooded area between Chongs Bridge and Komohana Road. The Alenaio Stream flood plain goes through the center of this area, and damageable values could increase as a result of development." Since this area is being afforded no protection by the project, to what degree might the channelization and diversion of sheet flows into the channels deliver an even greater quantity of water to this area than under present conditions? EPA is interested in how much additional flood water will be reaching this area and what may be the concomitant effects.

In the draft Watershed Workplan (Part 2-1) "debris basins" are mentioned as a component of the project; however, there is no information on location or the number of debris basins nor the quantity of the sediment load they are expected to trap.

C-6-1



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
100 CALIFORNIA STREET
SAN FRANCISCO, CALIFORNIA 94111

Mr. Francis C. H. Lum
State Conservationist
Soil Conservation Service
U. S. Department of Agriculture
440 Alexander Young Building
Honolulu HI 96813

SEP 4 1975

Dear Mr. Lum:

Thank you for your letter of July 23, 1975 requesting EPA to review the responses which SCS prepared pursuant to the comments submitted by EPA in the review of the Draft Environmental Impact Statement for the Wailuku-Alenai Watershed project.

The Draft EIS was rated LO-2 (lack of objections, inadequate information). As indicated by our rating, EPA has no major objection to the proposed project; however, it was felt that additional water quality information, if available, should be presented in the EIS. Upon review of the responses prepared by SCS, it appears that EPA's concerns have been addressed. In particular, responses to EPA's comments 1 and 2 are quite adequately addressed. It is somewhat of a disappointment that more specific water quality information is not available for inclusion in the EIS. In view of the limited water quality data available, EPA is interested in the feasibility of SCS developing a post-project water quality monitoring program. A program of this type might include establishing maximum levels for turbidity with proposed mitigation measures should these levels be exceeded.

EPA is looking forward to reviewing the final EIS, and reserves the opportunity for final comment in review process of the final EIS. If we can be of further assistance, please do not hesitate to contact this office.

Sincerely,

A handwritten signature in cursive script that reads "Paul De Falco, Jr.".

Paul De Falco, Jr.
Regional Administrator

Handwritten initials "Atig" in cursive script.



C-7-1

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGIONAL OFFICE
50 FULTON STREET
SAN FRANCISCO, CALIFORNIA 94102

OFFICE OF
THE REGIONAL DIRECTOR

Office of Environmental Affairs

April 11, 1975

Mr. Francis C. H. Lum
State Conservationist
Soil Conservation Service
Department of Agriculture
440 Alexander Young Bldg.
Honolulu, Hawaii 96813

Dear Mr. Lum:

The Draft Environmental Impact Statement for the Wailuku-Alenaio Watershed Project, Hawaii County, Hawaii has been reviewed in accordance with the interim procedures of the Department of Health, Education and Welfare as required by Section 102(2)(c) of the National Environmental Policy Act, PL 91-190.

The material provided appears to describe adequately the impacts of the proposed action as well as the alternatives that were presented. The major concerns of this department are related to possible impacts upon the health of the population, services to that population and changes in the characteristics of the population which would require a different level or extent of services. Our review does not identify problems related to these specific concerns.

The opportunity to review this statement was appreciated.

Sincerely,

Evelyn Wachtel
for James F. Knochenhauer
Regional Environmental Officer

cc: P. Hayes
W. Muir

C-8-1

Advisory Council
On Historic Preservation

U.S. Department of the Interior
Washington, D.C. 20540

APR 8 1975

Mr. Francis C. H. Lum
State Conservationist
Soil Conservation Service
U.S. Department of Agriculture
440 Alexander Young Building
Honolulu, Hawaii 96813

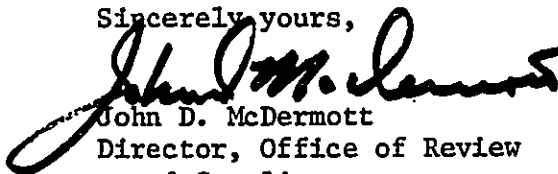
Dear Mr. Lum:

This is in response to your request of February 28, 1975 for comments on the draft environmental statement (DES) and watershed work plan (WWP) for the Wailuku-Alenaio Watershed Project, Hawaii County, Hawaii. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council has determined that the DES and WWP appear adequate concerning compliance with Section 106 of the National Historic Preservation Act of 1966 and the provisions of Executive Order 11593 "Protection and Enhancement of the Cultural Environment" of May 13, 1971.

However, the Council notes in its review that should previously unidentified cultural remains be discovered during the construction phases of the project, arrangements will be made to avoid or salvage them. The Soil Conservation Service is reminded that if such remains are encountered, prior to initiating any action which would result in the destruction or substantial alteration of the property, it should seek a determination from the Secretary of the Interior respecting the property's eligibility for inclusion in the National Register of Historic Places. Further, should the Secretary of the Interior determine such properties are eligible for inclusion in the National Register, it is required to afford the Council an opportunity to comment in accordance with the "Procedures for the Protection of Historic and Cultural Properties" (36 C.F.R. Part 800) which sets forth the steps for compliance with Section 106 and the Executive Order 11593.

Should you have questions or require additional assistance in this matter, please contact Michael H. Bureman of the Council staff at (303) 234-4946.

Sincerely yours,


John D. McDermott
Director, Office of Review
and Compliance

The Council is an independent unit of the Executive Branch of the Federal Government charged by the Act of October 15, 1966 to advise the President and Congress in the field of Historic Preservation.



C-9-1

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER-75/190

MAY 15 1975

Dear Mr. Lum:

Thank you for the letter of February 28, 1975, requesting our views and comments on a work plan and draft environmental impact statement for the Wailuku-Alenaio Watersheds in Hawaii County, Hawaii.

We have completed our review of the work plan and draft statement. Both the work plan and draft statement do not contain an adequate discussion of the existing aquatic resources in the study area or provide a valid analysis of the project's impact on these resources. We also believe these two documents could be improved by providing an adequate discussion on what specific mitigation measures will be employed to reduce or eliminate the project's adverse effects on the wildlife resources of the study area.

We also believe the work plan and draft statement are deficient in the coverage of the cultural resource base of the study area. We believe that a survey of the project area is necessary to determine the presence or absence of historic or archeological values and to carry out a meaningful evaluation as to the importance of this value. Such knowledge is essential to determine how this project should be modified to avoid unnecessary damage to the resources detected and what, if any, salvage may be required. Sound planning would require that this information be developed before final plans for the project are established and an impact statement written prior to the availability of this information on cultural resources can never fully develop the project's impact on these resources.

The work plan, page 10, and the impact statement, page 16, mention that numerous waterfalls in the Wailuku River limit fish populations to smaller species such as guppies and swordtails. This statement, while partially true, does not accurately describe the fresh water species present and their importance to this river system. We recommend that the statement be changed to reflect the facts that, although the Wailuku River is physically and biologically comparable



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to other rivers in Hawaii in that such physical barriers as waterfalls restrict the movement of some fish species, the stream supports approximately seven major species of aquatic forms including two fresh water shrimps, two mollusks and at least three gobies. Six of these species are diadromous, thus requiring salt water during part of their life cycle. The major period of their lives is spent in the upper fresh water reaches of the stream after migrating up the river, including ascending the falls. Hence, waterfalls are really not an effective barrier to these aquatic life forms.

On page 11 of the work plan and page 16 of the impact statement, some common and some scientific names are incorrect and we suggest further review and correction of this information.

Work Plan

One of the planning objectives of this work plan is to maintain wildlife habitat (see page 18). There are several references to acreages of habitat that will be lost. However, the work plan provides no clear insight as to the location and acreage of habitat to be developed to offset this project-induced loss. Maintenance of the overall wildlife habitat in the watershed appears to be uncertain when the cooperation of the individual landowners is a voluntary action. The text of the work plan contains such statements as "The back slopes of the maintenance road and fill areas will have grass and shrub plantings with wildlife value to replace some of the habitat lost" (see page 31). Yet, figures 4 through 7 on channel design do not show such plantings nor indicate where they would be located. The description of the proposed structures (page 25-27) does not discuss the specification for cover plantings. Further, there is no location or size given to eroded areas planned for improvements. Because of the lack of specificity as to the plans for grassing and shrub planting, it appears that this activity is an incidental rather than a planned measure to reduce project-induced losses to wildlife habitat. Specific plans which designate the location and size of these land treatment measures should be clearly set forth before the action can be truly deemed a mitigation measure.

The proposed action will not affect any existing or proposed units of the National Park System or any existing, proposed, or known potential sites or properties listed or to be listed as National Landmarks.

Design figures in the subject documents for flood discharges appear reasonable. A reduction of floodwater, sediment, and erosion damage on 970 acres by 99 percent is projected, but it appears possible that the proposed diversion ditches and channel improvements could increase flood peaks below the confines of the project area. It is noted that among other planned county projects is some channel work on Alenaio Stream, in the area downstream of this project, indicating that flooding exists under even present conditions.

The watershed work plan adequately discusses the only known mineral resource in the area. Lava rock is used for various types of construction.

Draft Environmental Statement

Cultural Resources - The statement should include a more detailed appraisal of the possible adverse environmental impacts of the project. A description of the esthetic qualities of the area and the impact on these qualities resulting from the project should be mentioned. Flood control projects in the past have been delayed and aborted due to public protest over adverse changes in such qualities. The description of the natural riparian vegetation as "weedy brush" is inadequate and this description should be either changed or qualified.

The draft statement lists a number of land treatment and structural measures, which could produce adverse effects upon archeological resources. The following measures outlined on pages 5-7 of the draft statement involve surface modification, which could be potentially hazardous to archeological resources, if any exist in the area: in-field diversions, stream channel stabilization, grade stabilization structures, streambank protection, four floodwater diversions, stream channel work in Waipahoe Stream, and a concrete rubble masonry wall. Those areas within the watershed where these or any other earth-moving activities are planned should be surveyed by a professional archeologist. If significant archeological resources are identified, they should be described and evaluated

for their National Register of Historic Places and compliance with Title 36, CFR 800.4 should be documented. The survey and evaluation of all identified sites for their National Register potential should be made early enough in the planning stages of the project so that the results of the evaluation can be incorporated into the decisionmaking process for selecting the best alternative and in developing final designs for the project.

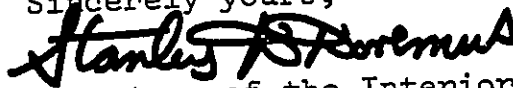
A copy of the archeologist's report should be made available to the Arizona Archeological Center, National Park Service, P.O. Box 49008, Tucson, Arizona 85717, in accordance with Section 3(a) of Public Law 93-291. The survey report should detail the intensity and methodology of the survey and the precise location of areas examined. Only with this information will we be able to adequately assess the impact of the project upon archeological resources.

Geologic and Mineral Resources - Potential adverse environmental impacts related to geologic conditions have been given adequate consideration in the draft environmental statement and Watershed Work Plan. Further, mineral development should not be adversely affected by the project.

Both the draft watershed work plan and the draft environmental impact statement discuss potential recreation areas that will lie within the watershed area. The EIS should make note of any possible impacts of the project on these potential recreation resources. In addition, the EIS does not address mitigation for any impacts, recreation or otherwise. We trust the final statement will address this issue.

We hope the foregoing comments will be of assistance in finalizing your work plan and final environmental statement.

Sincerely yours,



Deputy Assistant Secretary of the Interior

Mr. Francis C. H. Lum
State Conservationist
Soil Conservation Service
U.S. Department of Agriculture
440 Alexander Young Building
Honolulu, Hawaii 96813

C-10-1



DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
U.S. COAST GUARD (G-WS/73)
400 SEVENTH STREET SW.
WASHINGTON, D.C. 20590
PHONE: (202) 426-2262

• 25 APR 1975

• Mr. Francis C. H. Lum
State Conservationist
Soil Conservation Service
440 Alexander Young Building
Honolulu, Hawaii 96813

Dear Mr. Lum:

This is in response to your letter of 28 February 1975 addressed to the Commandant, U. S. Coast Guard concerning a draft environmental impact statement for the Wailuku-Alenaio Watershed, Hawaii County, Hawaii.

The Department of Transportation has reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

The opportunity to review this draft statement is appreciated.

Sincerely,

A handwritten signature in cursive script that reads "W. E. Caldwell".

W. E. CALDWELL
Captain, U.S. Coast Guard
Deputy Chief, Office of Marine
Environment and Systems
By direction of the Commandant

STATE

C-11-1

GEORGE R. ARIYOSHI
GOVERNOR



JOHN FARIAS, JR.
CHAIRMAN, BOARD OF AGRICULTURE

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

March 31, 1975

MEMORANDUM

TO: Mr. Richard E. Marland, Director
Office of Environmental Quality Control

SUBJECT: Draft EIS, Wailuku-Alenaio Watershed Project

The Department of Agriculture has reviewed this statement. The proposed project incorporates best available and feasible practices to achieve the desired goal.

No additions or changes are recommended.

John Farias, Jr.
John Farias, Jr.
Chairman, Board of Agriculture

JF:d:c

C-12-1

GEORGE R. ARIYOSHI
GOVERNOR



RICHARD E. MARLAND, PH.D.
DIRECTOR
TELEPHONE NO.
548-6915

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

April 24, 1975

Francis C. H. Lum
State Conservationist
Soil Conservation Service
440 Alexander Young Building
Honolulu, Hawaii 96813

SUBJECT: Draft Environmental Impact Statement for Wailuku-
Alenaio Watershed Project, Hawaii County, Hawaii

Dear Mr. Lum,

This Office has received a late comment from the Department of Army dated April 22, 1975. Please append this letter to our correspondence dated April 10, 1975 on the subject above.

Your cooperation in this matter is greatly appreciated.

Sincerely,

Shelue Takemoto for
Richard E. Marland
Director

Attachment

C-13-1

GEORGE R. ARIYOSHI
GOVERNOR



RICHARD E. MARLAND, PH.D.
DIRECTOR

TELEPHONE NO.
548-6915

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

April 15, 1975

Francis C. H. Lum
State Conservationist
Soil Conservation Service
440 Alexander Young Building
Honolulu, Hawaii 96813

SUBJECT: Draft EIS for Wailuku-Alenaio Watershed Project

Dear Mr. Lum,

This Office received a comment from Department of Transportation dated April 4, 1975. Please append this letter to our correspondence dated April 10, 1975.

Your cooperation in this matter is greatly appreciated.

Sincerely,

A handwritten signature in cursive script, appearing to read "Richard E. Marland".

Richard E. Marland
Director

Attachment

C-14-1

GEORGE R. ARIYOSHI
GOVERNOR



RICHARD E. MARLAND, PH.D.
DIRECTOR

TELEPHONE NO.
548-6915

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

April 14, 1975

Francis C. H. Lum
State Conservationist
Soil Conservation Service
440 Alexander Young Building
Honolulu, Hawaii 96813

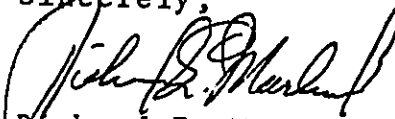
SUBJECT: Draft Environmental Impact Statement for Wailuku-
Alenaio Watershed Project, Hilo, Hawaii

Dear Mr. Lum,

This Office has received a late comment from the Department of the Air Force dated April 10, 1975. Please append this letter to our correspondence dated April 10, 1975.

Your cooperation in this matter is greatly appreciated.

Sincerely,


Richard E. Marland
Director

Attachment

C-15-1

GEORGE R. ARIYOSHI
GOVERNOR



RICHARD E. MARLAND, PH.D.
DIRECTOR

TELEPHONE NO.
548-6915

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

April 10, 1975

Francis C. H. Lum
State Conservationist
Soil Conservation Service
440 Alexander Young Building
Honolulu, Hawaii 96813

SUBJECT: Draft Watershed Work Plan for Wailuku-Alenaio Watershed
Project, Hawaii County, Hawaii

Dear Mr. Lum,

This Office appreciates the opportunity to review the draft watershed work plan. Because of the similarity of this document to the draft EIS, we have directed our major comments to the draft EIS. However, we have reviewed the work plan and have the following comments to offer:

1. As in the draft EIS, the project map does not show Waipahoehoe Stream connecting with Alenaio Stream.
2. What type of fish habitat will be threatened as a result of the concrete channel for Waipahoehoe Stream?
3. How will bank erosion be reduced with clearing and snagging?
4. Other alternatives to the project are:
 - a. develop the flood plain area into a park or recreational area
 - b. develop a wildlife preserve
5. A discussion on the effect of the proposed project on the marine life in Hilo Bay is recommended.
6. This Office would like to point out that channelization does have adverse environmental effects which warrant discussion.

We trust that these comments are helpful to you. Thank you for the opportunity to review this document.

Sincerely,

A handwritten signature in cursive script, appearing to read "Richard E. Marland".
Richard E. Marland
Director

C-16-1

GEORGE R. ARIYOSHI
GOVERNOR



RICHARD E. MARLAND, PH.D.
DIRECTOR

TELEPHONE NO.
548-6915

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

April 10, 1975

Francis C. H. Lum
State Conservationist
Soil Conservation Service
440 Alexander Young Building
Honolulu, Hawaii 96813

SUBJECT: Draft Environmental Impact Statement for Wailuku-
Alenaio Watershed Project, Hawaii County, Hawaii

Dear Mr. Lum,

As of this date, this Office has received nine (10) comments on the above subject. An attached sheet lists the responding agencies.

In our evaluation and comments provided on the draft EIS (dEIS), we have found several areas in which the discussion in the final EIS should be expanded. The following comments are offered:

1. On page 6, the dEIS states, "The channel work on Waipahoehoe Stream consists mainly of deepening and removing boulders and trees to increase stream capacity above Chong's Bridge." However, throughout the rest of the EIS there is no mention of the deepening of the channel. Thus, this Office recommends a discussion as to how much deepening is involved and what happens to the fill from the deepening operation. Also, clarification is necessary since the dEIS seems to imply inundation of Waipahoehoe Stream is caused by debris blocking the water passage rather than the inadequate capacity of the stream itself.
2. Although reference is made to Waipahoehoe Stream being a tributary of Alenaio Stream on page 13 of the dEIS, the project map does not show any connection between the streams.

3. The discussion of the fish and wildlife population affected by the proposed project is inadequate. The effect of temperature changes in the stream, water quality, and erosion should be discussed in the final EIS as to their relationship to the fish and wildlife.
4. Although Wailuku River is mentioned as part of the title for the EIS, will any more work be done on the river itself besides the diversion? The project map seems to indicate some type of small channelization work or are the marks along the river something else that has not been identified.
5. Page 19 of the dEIS indicates that, "Below Chong's Bridge in the nearly flat area where Waipahoe Stream becomes Alenaio Stream, floodwaters inundate a large area, including a portion of Kaumana Terrace Subdivision." Since the flat area is a factor in the change of water velocity (i.e. a decrease in water velocity), we question whether the concrete channelization above the bridge will be adequate to control or alleviate the flooding in the area below the bridge. To further complicate matters, the "Inadequate stream and bridge capacities and the meandering of Alenaio Stream cause flooding in the residential and commercial areas of downtown Hilo." Thus, is channelization an effective mitigation measure for the area below Chong's Bridge? A discussion is strongly recommended.
6. If only a diversion leading to Wailuku River is needed in the upper region about a mile before the beginning of Ainako Stream, what is the justification for the phrase on page 19, "inadequate capacity of Ainako Stream"? Since no improvements for the length of Ainako Stream are proposed, will the area throughout the stream be benefited? Or is the project designed for protection of the upper regions?
7. The discussion of short-term vs. long-term use of resources should be expanded to include quantified estimates of potential increase for urbanization as a result of this project.
8. Will safety features such as fences in the residential areas be provided when the project is implemented?

Page 3

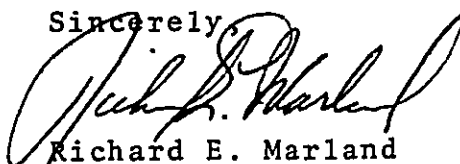
9. Although SCS has followed NEPA guidelines, there seems to be conflict with Act 246, SLH 1974. The statute states, "Whenever an agency proposes to implement an action proposing the use of state or county lands or the use of state or county funds, ...that agency shall assess such action at the earliest practicable time to determine whether an environmental impact statement shall be required." Under the definition of "agency" in Act 246, SCS is not the "agency" that determines whether an EIS is necessary. Thus, why is SCS making the determination for an EIS instead of the appropriate agency established by statute? Who is the appropriate proposing agency in this case? What other agencies are involved with this project? What is SCS's role in this project? Are any state/county lands or state/county funds involved? We strongly recommend a discussion of the relationship of this action to Chapter 343, H.R.S.

For brevity and fairness, this Office did not summarize other review comments. Instead, we strongly recommend that each comment be given careful consideration.

We further recommend that (1) written responses be sent to all commentors including this Office, indicating how specific concerns were considered, evaluated, and disposed; (2) all comments and your responses should be incorporated as an appendix to the final EIS; (3) a copy of the final EIS should be sent to those individuals that provided substantive comments to the draft EIS.

We trust that these comments will be helpful to you in preparing the final EIS. Thank you for the opportunity to review the draft EIS. We look forward to the final EIS.

Sincerely,



Richard E. Marland
Director

Attachments

LIST OF RESPONDING AGENCIES

FEDERAL

STATE

Department of Transportation	January 23, 1975
Department of Planning and Economic Development	March 17, 1975
Department of Agriculture	March 31, 1975
Department of Land and Natural Resources	April 1, 1975
Department of Health	April 1, 1975
Department of Health	April 3, 1975

COUNTY OF HAWAII

Department of Public Works	March 27, 1975
Planning Department	April 3, 1975
Water Supply	April 8, 1975

UNIVERSITY OF HAWAII

Environmental Center	April 4, 1975
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C-17-1



EXECUTIVE CHAMBERS
HONOLULU

GEORGE R. ARIYOSHI
GOVERNOR

April 15, 1975

Mr. Francis C. H. Lum
State Conservationist
Soil Conservation Service
440 Alexander Young Building
Honolulu, Hawaii 96813

Dear Mr. Lum:

I appreciate the copies of the Draft Environmental Impact Statement and the Draft Plan for the Wailuku-Alenaio Watershed. I have referred this matter to the Office of Environmental Quality Control. That office will review and coordinate comments on the documents before the April 30, 1975, deadline.

Thank you for keeping us informed of your projects.

With warm personal regards, I remain,

Yours very truly,


GEORGE R. ARIYOSHI

cc: Hon. Richard E. Marland

C-18-1

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII



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

April 1, 1975

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

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

MEMORANDUM

To: Dr. Richard E. Marland, Interim Director
Office of Environmental Quality Control

From: Deputy Director for Environmental Health

Subject: Draft Environmental Impact Statement (EIS) for Wailuku-Alenaio
Watershed Project, Hawaii County, Hawaii

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


JAMES S. KUMAGAI, Ph.D.

George R. Ariyoshi
GOVERNOR

C-19-1



George A. L. Yuen
DIRECTOR OF HEALTH
Audrey W. Mertz
M.D.
DEPUTY DIRECTOR OF HEALTH

APR - 4 1975
PUC

DEPARTMENT OF HEALTH
STATE OF HAWAII
P. O. BOX 916
HILO, HAWAII 96720

BU
BU 4/7/75
and copy
to OEQC

April 3, 1975

To: Planner, EPHSD
From: Environmental Engineer, Hawaii
Subject: Wailuku-Alonaio Watershed Project, Draft Environmental Impact Statement
Comments on the Draft EIS

1. Not enough alternatives were considered. We would recommend to investigate also the following alternatives:
 - a) Hydroelectric energy generation potential
 - b) Recreation potential by creating lakes
 - c) Water resource potential by dammed up reservoirs
 - d) Aqua cultures, fishponds, etc.
 - e) Tourist potential in creating exotic, tropical gardens, etc.

Investigate availability of federal and other funds for these more imaginative alternatives. Investigate opposite actions. Instead of spending money for fast removal of excess water, what would be the cost benefit ratio of using this mass of water.

2. What would be the penalty of not using these potentials now. How the recommended action will negate future projects like those (a, b, c, d, e) recommended in 1.
3. Meteorological and climatic effects of fast removal of pondings. How it influences draft conditions, natural ecological balance (more contained water versus less, evaporation, precipitation, etc.) How the insect population will be affected and as a results of that, how the bird and wild-life will be changed, if less fresh water will be available for them for shorter periods.
4. Geological, seismic and lava flow effects might be investigated in connection with the structural measures. Is there any seismic danger during its useful life.
5. Is this project in conformity with future water resource needs which "call for expanding both ground and surface sources". How this planned measure correlate to the ongoing water resources study? Is there any coordination considered between the two?

Planner, EPHSD

-2-

April 3, 1975

Conclusion: In these times of the energy getting scarcer and scarcer it is unwise to spend money to waste quickly such precious resource of huge amounts of fresh water which this watershed area occasionally can provide.

Would it be rather more in tune with our timely needs to use all these resources in a more profitable way, such as a hydroelectric plant and a series of water reservoirs retained by suitable dams.

Therefore, instead of making this piecemeal solution of the problem now with limited imagination, it would be more appropriate to go slow now or do as little as possible and to use all our imagination and possible financial resources to develop a far reaching, farsighted general plan of hydroelectric power generation, water preservation, recreation, wildlife promotion, tropical gardens, parks, bird sanctuaries, etc. or at least investigate these possibilities in depth, before the final commitment to this project.



ENDRE TOTH, P.E.

ET:hy

C-20-1

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII



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

CHRISTOPHER COBB, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

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

April 1, 1975

MEMORANDUM

TO: Honorable Richard E. Marland, Director
Office of Environmental Quality Control

FROM: Christopher Cobb, Chairman and Member
Board of Land and Natural Resources

SUBJECT: Environmental Impact Statement for the Wailuku-
Alenaio Watershed Project, Hawaii

We have no objections to the Environmental Impact Statement, however, corrections should be made to the discussion of wildlife on page 16 of the statements as follows:

"Black francolin and Gambel's Quail" are not found in the watershed.

"California Quail" and Valley Quail" are synonymous, and thus listing both is redundant.

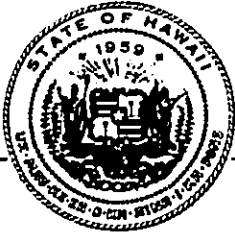
The "Maui Amakihi" and "Maui Creeper" are found on Maui, not Hawaii. Correct listing should be "Hawaii Amakihi (Loxops virens)"; "Hawaii Creeper (Loxops parva)"

The Hawaiian Hawk has been seen at Kaumana in Hilo, thus it is erroneous to say that it is not found in area where structural improvements are planned.

With the above corrections, discussions of impact on environment with respect to wildlife are valid.

Thank you for the opportunity to comment on this Statement.


CHRISTOPHER COBB
Chairman and Member of the Board



DEPARTMENT OF PLANNING
AND ECONOMIC DEVELOPMENT

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

GEORGE R. ARIYOSHI
Governor

HIDETO KONO
Director

FRANK SKRIVANEK
Deputy Director

March 18, 1975

Ref. No. 3224

Mr. Francis C. H. Lum
State Conservationist
U.S. Department of Agriculture
Soil Conservation Service
440 Alexander Young Building
Honolulu, Hawaii 96813

Dear Mr. Lum:

Thank you for sending us a copy of the draft watershed plan and environmental impact statement for Wailuku-Alenaio Watershed project for our review.

Upon examination of both reports, which we have found to be comprehensive and well prepared, we would like to indicate our concurrence with its assessment and proposed work plan.

In addition, we would like to add that the program from which funds are being requested, Watershed Protection and Flood Prevention - Catalog No. 10.904, is required by the Office of Management and Budget to be reviewed through the A-95 Project Notification and Review System. According to PNRS procedures, a Notification of Intent to Apply for Federal Assistance for the subject development is required to be filed with the State Clearinghouse prior to submission of the formal application to the Federal funding agency.

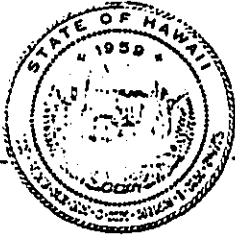
We have no other comments to offer at this time.

Sincerely,

A handwritten signature in cursive script, appearing to read "Hideto Kono".

HIDETO KONO

C-22-1



DEPARTMENT OF PLANNING
AND ECONOMIC DEVELOPMENT

GEORGE R. AKIYOSHI
Governor

HIDETO KONO
Director

FRANK SKRIVANEK
Deputy Director

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

March 17, 1975

Ref. No. 3215

MEMORANDUM

TO: Dr. Richard E. Marland, Interim Director
Office of Environmental Quality Control

FROM: Hideto Kono, Director *Hideto Kono*

SUBJECT: Draft EIS for Wailuku-Alenaio Watershed Project, Hawaii County,
Hawaii

We have reviewed the subject draft and find that the environmental concerns that can be anticipated by the proposed project has been well assessed.

We would also like to add that the program from which funds will be solicited, Watershed Protection and Flood Prevention - Catalog Number 10.904, is required by the Office of Management and Budget to be reviewed through the A-95 Project Notification and Review System. According to PNRS procedures, a Notification of Intent to Apply for Federal Assistance for the subject proposal is required to be filed with the State Clearinghouse prior to submission of the formal application to the funding agency.

We have no other comments to offer at this time but appreciate the opportunity to review the subject statement.

C-23-1

GEORGE R. ARIYOSHI
GOVERNOR



E. ALVEY WRIGHT
DIRECTOR

DOUGLAS S. SAATHI
DEPUTY DIRECTOR

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

IN REPLY REFER TO:
ATP 8.2926

January 23, 1975

Dr. Richard E. Marland
Interim Director
Office of Environmental
Quality Control
550 Halekauwila St., Rm. 301
Honolulu, Hawaii 96813

Dear Dr. Marland:

Subject: Draft Environmental Impact Statement
Wailuku-Alenaiio Watershed Project

In reference to the subject environmental impact statement, please be informed that:

1. On page 24, 2nd paragraph, the words "coastal highway" should read "Hilo Bayfront Highway."
2. The Statement should discuss the potential floodwater diversions at Konoehana Road and from Waialama Canal across Kamehameha Avenue and Hilo Bayfront Highway, and the possible detours when replacing Chong Bridge.

Sincerely,

Douglas S. Saathi
for E. ALVEY WRIGHT
Director

GEORGE R. ARIYOSHI
GOVERNOR

C-24-1



E. ALVEY WRIGHT
DIRECTOR

DEPUTY DIRECTORS
DOUGLAS S. SAKAMOTO
WALLACE AOKI

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

IN REPLY REFER TO:

April 4, 1975

ATP 8.3037

Dr. Richard E. Marland
Interim Director
Office of Environmental
Quality Control
550 Halekauwila St., Rm. 301
Honolulu, Hawaii 96813

Dear Dr. Marland:

Subject: Draft EIS for Wailuku-Alemaio Watershed
Project

In reference to the subject environmental statement, we have no
comments to offer as it relates to and affects our transportation
system.

Sincerely,

Douglas S. Sakamoto
for E. ALVEY WRIGHT
Director



University of Hawaii at Manoa

Environmental Center
Maile Bldg. 10 • 2540 Maile Way
Honolulu, Hawaii 96822
Telephone (808) 948-7361

Office of the Director

April 4, 1975

MEMORANDUM

TO: Richard E. Marland
FROM: Doak C. Cox *Doak C. Cox*
RE: Review of Draft EIS for Wailuku-Alenaio Watershed Project
Hawaii County, Hawaii

The Environmental Center review has been prepared by Nancy Lopez, Hydrologist, Hawaii Environmental Simulation Laboratory, Doak C. Cox and Jacquelin N. Miller, Environmental Center.

A number of questions have been raised in our review of this DEIS particularly with respect to the overall environmental impact of the project as proposed.

The flood hazard in Hilo is admittedly severe, and the commercial importance of that city to the island and the State is significant. Therefore, we seriously question the wisdom of incremental planning and installation of flood control channels above Hilo, before a general protection plan is provided specifically for Hilo. Since the general purpose of channelization and diversion is to reduce storage of flood water on the land, won't this project aggravate downstream flooding? Was the entire drainage basin, including Hilo, considered in evaluating the hydraulic and hydrologic impact of the project plan? The "Potential Floodwater Diversion" shown in Appendix B on the Project Map would seem to indicate that the problem was recognized. Were possible increased damages downstream subtracted from the damage reduction benefits claimed, especially for Evaluation Unit 1?

Under the urban land treatment, 1200 acres will be treated (DEIS, p. 5). Would this acreage need the treatment if the flood control measures were not installed? What is the location of the 1200 acres? Why is this treatment necessary if no land use changes are expected (DEIS, p. 24)? A map showing the general location of the land treatment measures would be helpful in assessing the impacts of the treatments.

Richard E. Marland

2

April 4, 1975

What recourse does SCS have if the land treatment measures and O & M agreements are not kept once the flood control structures are complete? What would be the impact of the structures if the agreements were not carried out over the project life?

Are the 430 acres of urban land in the floodplain actually developed or are some of the lands only zoned urban at this time? (DEIS, p. 11).

What are the ownership patterns in the areas benefitted?

Is development expected in the bushlands and woodlands in the benefitted area below Akolea Road?

How was the \$160,200 average annual damage figure derived for the residential area? The entire amount is claimed as a damage reduction benefit (Workplan, p. 46). What average annual damages will still exist after the project provides protection up to the 100-year flood threshold?

We note in figures 1A, 1B, and 1C as well as in the text, that "spoil will be placed on the downhill side" of each of the flood water diversion channels. Will this fill result in a levee effect and thus increase damage if overtopping occurs? What is the expected frequency of overtopping? On Figure 3A a significant portion of agricultural and open space land appears to be protected by Structure 6. What share of the project benefits result from Structure 6?

What kind of protection will be provided for the planned residential development between Chong's Bridge and Komohana Road (DEIS, p. 20)? What would the combined effect of the SCS proposal and the protection for the proposed development be on the Hilo flood hazard downstream?

The benefit cost ratio for the structural measures is cited in Appendix A of the DEIS as 2.4:1.0. Such a ratio is surprisingly high for an area benefitted which is mostly agricultural. What specific percent of the total damage reduction was used to estimate damage reduction for land treatment measures? Why were Evaluation Units 1 and 2 combined for the benefit/cost ratio, but analyzed separately otherwise?

Under Alternative 2, flood plain zoning, floodproofing and flood insurance are all lumped together and \$5.3 million is the estimated cost (DEIS, pp. 26-27). What are the details of this alternative? Would flood insurance be cost effective in any part of the project area? Which residents could afford to buy it? Are any residents currently purchasing flood insurance? If not, why not, considering the hazard? What areas are considered by SCS to be candidates for the zoning alternatives? What would the downstream effects of this alternative be?

What percent of the net average annual "benefits foregone" in Alternative 4 result from protecting only Ainako (DEIS, p. 28)?

Richard E. Marland

3

April 4, 1975

What wetland areas exist in the project area and how will they be modified by the project? How will the modification affect wildlife? To what extent do the six wildlife species listed in "Threatened Wildlife of the United States" (p. 16) depend on floodplain habitats? The single sentence devoted to the project's possible impact on these species is inadequate. Was a survey of the area done by professional biologists?

It seems reasonable to conclude that with reduction in shut flow and general decrease in flooding in the area indicated on Appendix B, project maps, that a significant and possibly severe negative impact will be felt on the predominantly forest, grassland and pasture areas. Marked ecological changes would be expected in this area both in plant life and the accompanying animal populations. The potential affect of this decrease in water should be more fully assessed in the final EIS.

A final comment must be appended to our overall review of this DEIS and the accompanying Draft Watershed Work Plan. It is particularly annoying to encounter and review repetitious documentation such as is presented in the bulk of the Watershed Work Plan. The first 35 pages of text of the Watershed Work Plan are covered, for the most part, verbatim, in the DEIS. Figures 2, 3A, 3B, 3C, 3D, 4, 5, 6, 7 and the Project Maps are identical, yet carry different figure numbers, to those included in the DEIS. Since the basic organization of the two documents is not the same, and since sentence and paragraph structure has been slightly altered, one can not simply ignore the first 35 pages and the maps but must sift through the pages of repetitious material in search of possible interjected meaningful sentences. The difference between the two reports in 75-80% of the text is confined to the grammatical construction of the sentences:

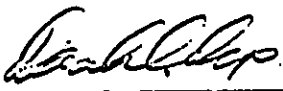
DEIS, pg. 20

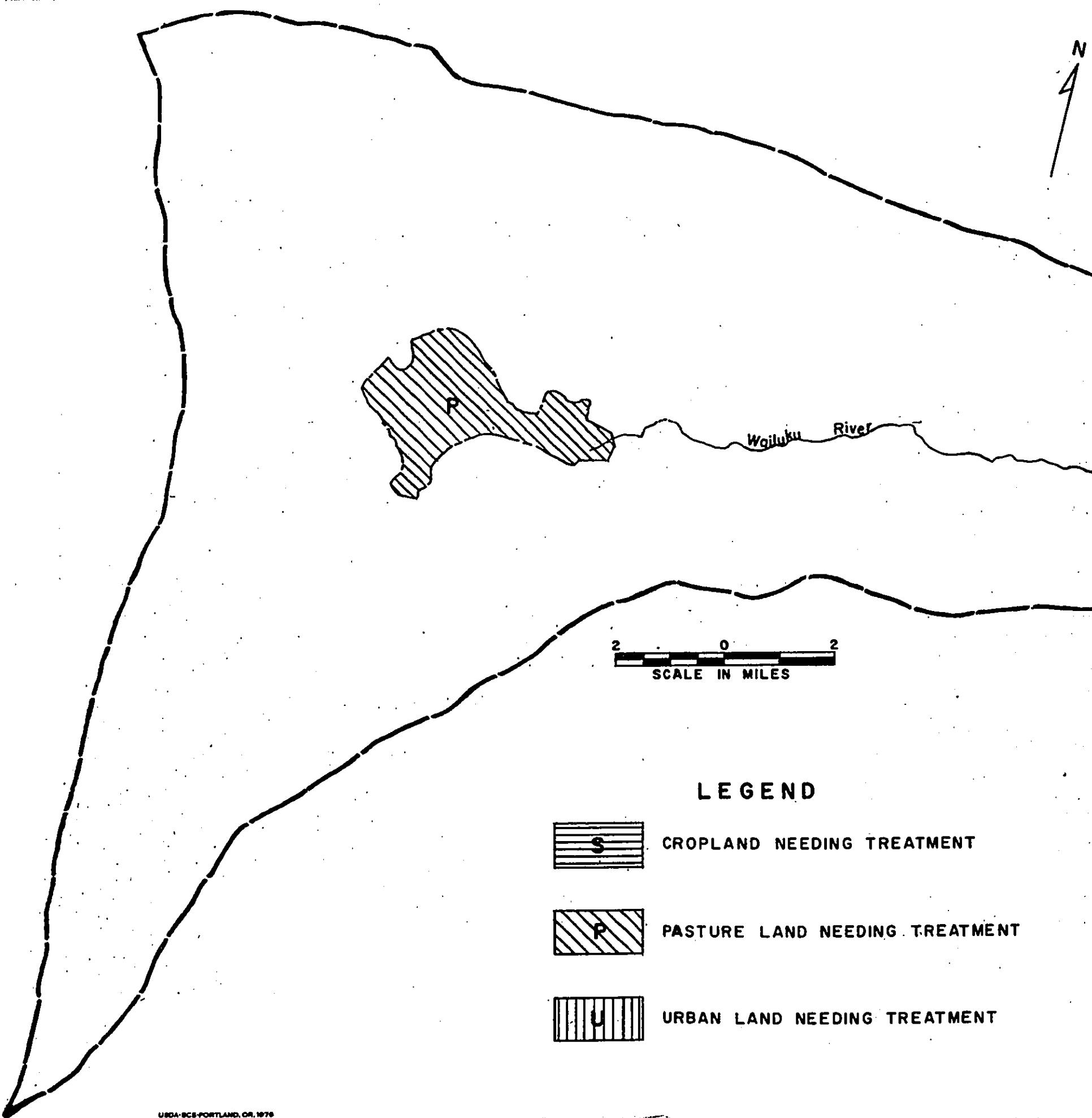
"Under present conditions, a 100-year frequency storm is expected to cause serious damage"

Watershed Work Plan, pg. 14

"A 100-year storm under present conditions would be expected to cause"

We would strongly urge that hereafter supporting documents to a DEIS be carefully compiled to eliminate unnecessary and wasteful duplication which results in inefficiency in the review process.

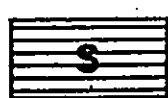



Doak C. Cox, Director

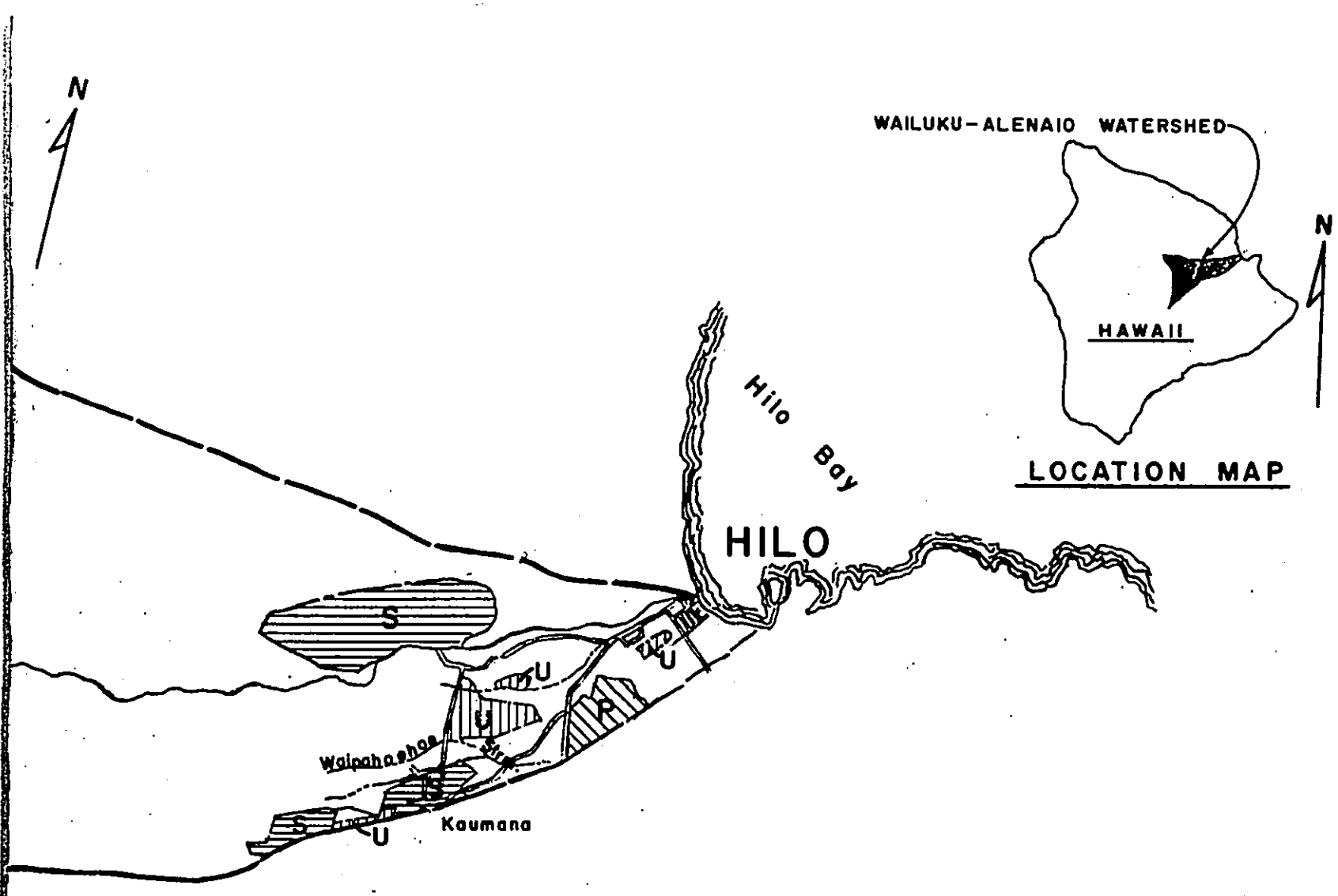


Wailuku River

2 0 2
SCALE IN MILES

LEGEND

-  CROPLAND NEEDING TREATMENT
-  PASTURE LAND NEEDING TREATMENT
-  URBAN LAND NEEDING TREATMENT



APPENDIX D
 LAND TREATMENT MAP
WAILUKU-ALENAIO WATERSHED
 ISLAND OF HAWAII, HAWAII
 U. S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE
 SEPTEMBER 1975

APPENDIX E - ECONOMIC EVALUATION

The existing trends of agricultural operations and urban development were analyzed in terms of their probable economic impact on the future economy of the watershed. Watershed land use and state policy for preserving cropland was analyzed to determine the effects of the project on future land use patterns and damages. The forming of a sugar cooperative and a long-term lease were also taken into consideration. The sugar cooperative will reduce cost of processing which will help sustain sugar production. The long-term lease guarantees that cropland will remain in sugar production.

Floodwater damage estimates were based on field schedule information obtained from land owners and operators in the Wailuku-Alenaio watershed. Damage information was gathered on the 1948, 1966, and 1969 storms. Post-flood damage surveys were conducted by SCS for the 1966 and 1969 storms and were analyzed to evaluate past damages under existing conditions.

Damages were classified according to types, i.e., sediment, erosion, and floodwater. Data was further categorized into residential, commercial, agricultural, and public property. Public property includes damages to public roads, bridges, utilities, and emergency operations. This provided a basis for the evaluation.

Damage appraisal in agricultural areas was based on losses to crops and property, including private roads. Crop damage was determined from actual crop losses and estimated losses in net income for major crops affected. Historical data was brought up to a common base year for the damage evaluation.

A combination of the overland flow and stage damage methods was used in the analysis of floodwater damage reduction benefits. An evaluation was made on damages that would occur from a flood which could be expected on an average of once in 100 years. "Floodwater Damage Estimates on Residential and Commercial Property," released as TSC Technical Note Watershed PO-4, dated June 1971, was used as a basis for the residential damage estimates. Field checks and comparison with flood surveys were made to assure similarity of local conditions with the technical note. Damages were correlated with depths of flooding for each event used in the frequency analysis.

Floodwater damages were calculated "without project" conditions and "with project" conditions. Damages were reduced to average annual damage by using damage frequency curves as discussed in SCS's Economics Guide. The difference between "without project" and "with project" average annual damages constitutes the reduction of damages. Benefits from reduction of damages were estimated from the effect of reduced flood depths and areas.

The future increase in flood plain damages was based on the projected increase in per capita personal income, since future flood damage to urban properties will increase at about the same rate as projected personal income. The estimated increase in residential damages within the Hawaii resource planning area is based on personal income projected by OBERS.

Damage reduction resulting from installation of land treatment measures was calculated as a percent of the total damage reduction. A study of routings, with land treatment improvements only, was used to arrive at the percent factor.

Indirect damages are caused by disruption of travel to markets, extra travel time, delays in marketing, and extra expenses. Based on this data and information previously analyzed for watersheds, it was determined that 10 percent for agricultural, 15 percent for residential, and 20 percent for public utilities of the respective direct damages would be an equitable amount for indirect damages.

Project installation will provide opportunities for employment of presently unemployed or underemployed residents. Data from similar projects indicates that local labor costs will be approximately 20 percent of the construction costs. This value for the structural measures was amortized and converted to a redevelopment benefit. The value of local labor employed in project operation and maintenance was treated as a decreasing annuity for 20 years and converted to an average value for the project life. It was also used as a redevelopment benefit.

Secondary benefits, stemming from the increased production of goods and services created by the project, will be realized by workers, processors, and business establishments in the trade area. The evaluation of these benefits was limited to those which would occur locally as a result of project installation. These benefits were estimated to equal 10 percent of the primary benefits, with the exception of those resulting from a reduction of indirect damage, plus 10 percent of the project operation and maintenance cost.

Urban damage estimates were adjusted to current prices by using U.S. Department of Commerce Construction Costs Composite Index (1967 = 100) wherever applicable.

Details of the procedures used in the investigation are described in the SCS's Economics Guide for Watershed Protection and Flood Prevention.