80:430-07

August 18, 1980

Mr. Donald A. Bremner, Chairman
Environmental Quality Commission
550 Halekauwila Street
Honolulu, Hawaii 96813

Dear Mr. Bremner:

Based upon the recommendation of the Office of Environmental Quality Control, I am pleased to accept the document, Revised EIS for Kihei Drainage Project, Kihei, Maui, as satisfactory fulfillment of the requirements of Chapter 343, Hawaii Revised Statutes. This environmental impact statement will be a useful tool in the process of deciding whether or not the action described therein should or should not be allowed to proceed. My acceptance of the statement is an affirmation of the adequacy of that statement under the applicable laws, and does not constitute an endorsement of the proposed action.

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

With warm personal regards, I remain,

Yours very truly,

George R. Ariyoshi

cc: Honorable Ralph Hayashida, Director
Department of Public Works, County of Maui

bcc: Office of Environmental Quality Control

REVISED ENVIRONMENTAL IMPACT STATEMENT

KIHEI DRAINAGE PROJECT

Department of Public Works • County of Maui
April, 1980

REVISED

ENVIRONMENTAL IMPACT STATEMENT

KIHEI DRAINAGE PROJECT

COUNTY OF MAUI

RALPH HAYASHI, DIRECTOR
DEPARTMENT OF PUBLIC WORKS

Prepared By

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APRIL 1980

SUMMARY

1. Administrative Action

   Environmental Impact Statement

2. Project Description

   The proposed Kihei Drainage Project is located in the Kihei District, on the leeward, southwest coast of the Island of Maui. The project area covers approximately 800 acres, which extends about 0.6 miles, paralleling the shoreline for 2.0 miles. The proposed interior drainage project consists of a system of about 28,500 feet of drain lines, 3,200 feet of box culverts, 560 feet of pipe culverts, 320 feet of open channel and the improvements of an existing channel. This proposed project is designed to provide adequate flood plain drainage during storm conditions.

3. Environmental Impacts

   A major adverse environmental impact of the proposed project will be the addition of more sediment into Maalaea Bay, resulting in an expected increase in turbidity and discoloration of coastal waters in the immediate vicinity of the ocean outlets. Impact on the relatively sparse marine life offshore from the project area at Kihei will be small, because inputs of sediment already occur and because the increase in sediment discharge over the present discharge volume will be slight over time.

Installation of the improved drainage facilities may cause an increasing trend toward urbanization, if and when adequate public service facilities become available. The system will also provide protection against the design flood, help safeguard life and property and assure the well-being of residents and visitors in Kihei.

Open channel outlets crossing the beach zone will divide the beach into segments, but will have pedestrian bridges to allow movement across the channels. Sand will accumulate because of longshore drift along one side of the outlet groins and shall require occasional transfer by trucks and tractors to restore the natural distribution of beach sand. Open channels without groins will cause water to pond behind sand plugs which will form at the mouth of the channels.

4. Mitigation Measures Proposed to Minimize Impact

Special architectural and engineering design measures will be considered to minimize the adverse aesthetic impact of the channel outlets on the beach environment. Construction activities which may disrupt traffic will be scheduled during off peak hours. Newly exposed soil will be left uncovered for the least amount of time possible to prevent erosion. Grading ordinances and erosion standards and guidelines will be observed.

5. Alternatives

Two conceptual alternatives, in addition to no action, were considered for storage of excessive runoff - a system of drywells and the use of ponds or sediment basins. Both alternatives were considered not feasible. The first would require a large number of wells, because of the high water table. The second was considered not feasible because of the difficulty and cost of acquiring the land area necessary to construct the ponds or sediment basins. Alternative drain line alignments to the one proposed in this EIS shall be discussed during informational meetings on the matter.

Kihei Drainage Project - Environmental Impact Statement

TABLE OF CONTENTS

	Page
SUMMARY	i
1. PROJECT DESCRIPTION	1
Location	1
Objectives	3
Applicable Statutes, Programs and Projects	6
Technical Characteristics of the Project	8
Design Criteria	8
Drainage Structures	10
Project Costs	16
2. DESCRIPTION OF THE ENVIRONMENT	18
Physical Environment	18
Climate	18
Geology	18
Soils	20
Topography	22
Flora and Fauna	24
Oceanography	26
Marine Life	30
Humpback Whales	31
Other Surveys of Marine Life in Maalaea Bay	33
Kealia Pond	36
Drainage and Flooding	37
Hydrology	37
Statement of Flooding Problems	43
Existing Drainage Facilities	46
Significant Floods and Flood Damages	50
Land Use Distribution	54
State Land Use	54
County General Plan	54
Historic Sites	56
Recreational Sites	58
Land Ownership	59
Socio-Economic Patterns and Trends	61
Industry	61
Tourism	62
Construction	63
Land Development and Utilities Expansion	66
Water	67
Sewage	69
Roads	71
Electricity	71

		Page
	Employment and Population	71
	Water Moratorium	73
3.	PROBABLE IMPACT ON THE ENVIRONMENT	75
	Impact on Physical Resources	75
	Sediment Discharge	75
	Tsunami Inundation	76
	Water Quality	78
	Marine Life	79
	Humpback Whales	79
	Air Quality and Noise	80
	Usage of Space	80
	Beaches and Movement of Sand	82
	Historical and Archaeological Resources	84
	Aesthetics	85
	Secondary Impacts of Urbanization	86
	Economic Impact	87
	Employment and Construction	88
	Tax Base	88
	Land Use and Urbanization	88
	Social Impact	89
	Public Health and Safety	89
	Displacements	90
	Population	90
4.	UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS OF THE PROPOSED PROJECT	92
5.	ALTERNATIVES TO THE PROPOSED PROJECT	94
6.	RELATIONSHIP BETWEEN SHORT-TERM USE AND LONG-TERM PRODUCTIVITY	97
7.	MITIGATION MEASURES TO MINIMIZE ADVERSE ENVIRONMENTAL IMPACTS	98
8.	IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES	100
9.	ORGANIZATION AND INDIVIDUALS CONSULTED	101
10.	LIST OF REQUIRED APPROVALS	102
11.	REFERENCES	103
12.	APPENDIX	111
13.	GLOSSARY	130
14.	RESPONSES TO WRITTEN COMMENTS	133

LIST OF FIGURES

		Page
1.	Location Map	2
2.	Corps of Engineers' Flood Control Program (1964)	5
3.	Proposed Kihei Drainage Areas	9
4.	Proposed Kihei Drainage Project	(facing Page 10)
5.	Schematic Outlet Structure for Culverts	11
6.	Suggested Open Channel Outlet Structure	12
7.	Typical Section Through Box Drain	14
8.	Isohyet Map	19
9.	Geologic Map	21
10.	Soils Association Map	23
11.	Location Map for Benthic Surveys	28
12.	Hydrology Map	39
13.	Flood Plain and Tsunami Inundation Limit	42
14.	Existing Drainage Facilities Map	48
15.	Kihei Civil Development Plan	55
16.	Location of Archaelogical Sites	57
17.	Land Ownership Map	60
18.	Condominium Units in Kihei	64
19.	Population Projections	72
20.	Construction Equipment Noise Ranges	81
21.	Rainfall Factor, R	115

LIST OF TABLES

		Page
1.	Project Cost Estimate	17
2.	Water Quality Analysis of Marine Waters Off Kihei	29
3.	Plankton Quality	32
4.	Annual Rainfall Data	40
5.	Projected Additional Units	68
6.	Runoff From Piilani Highway	77
7.	Population Growth Rate	91

1. PROJECT DESCRIPTION

Location

The Kihei District of Maui is a narrow, relatively flat coastal plain located on the central, leeward side of the island between the eastern shore of Maalaea Bay and the western base of Haleakala. It lies along the leeward coast of the Central Maui isthmus, which connects the two major mountain masses of Haleakala and the West Maui Mountains (see Figure 1, Location Map). The project area is characterized by stretches of good coral sand beaches at the shoreline, hotel resorts, condominiums and residences along Kihei Road, and sporadic subdivision developments on the gently sloping uphill flanks of Mount Haleakala.

The Kihei Drainage Project is proposed within the area commonly referred to as the Kihei Flood Plain. The project covers about 800 acres, which is an area bounded by the Bureau of Standards building to the north on Kihei Road, the Kihei Fire Station to the south at the intersection of Waimahaihai Street and Kihei Road, the shoreline to the west, and lateral structures to the east proposed by the Army Corps of Engineers in its Report on Survey for Flood Control, 1964. The project area extends about 0.6 miles inland and parallels the shoreline for approximately two miles, roughly from the shoreline to the 40-foot contour of elevation.

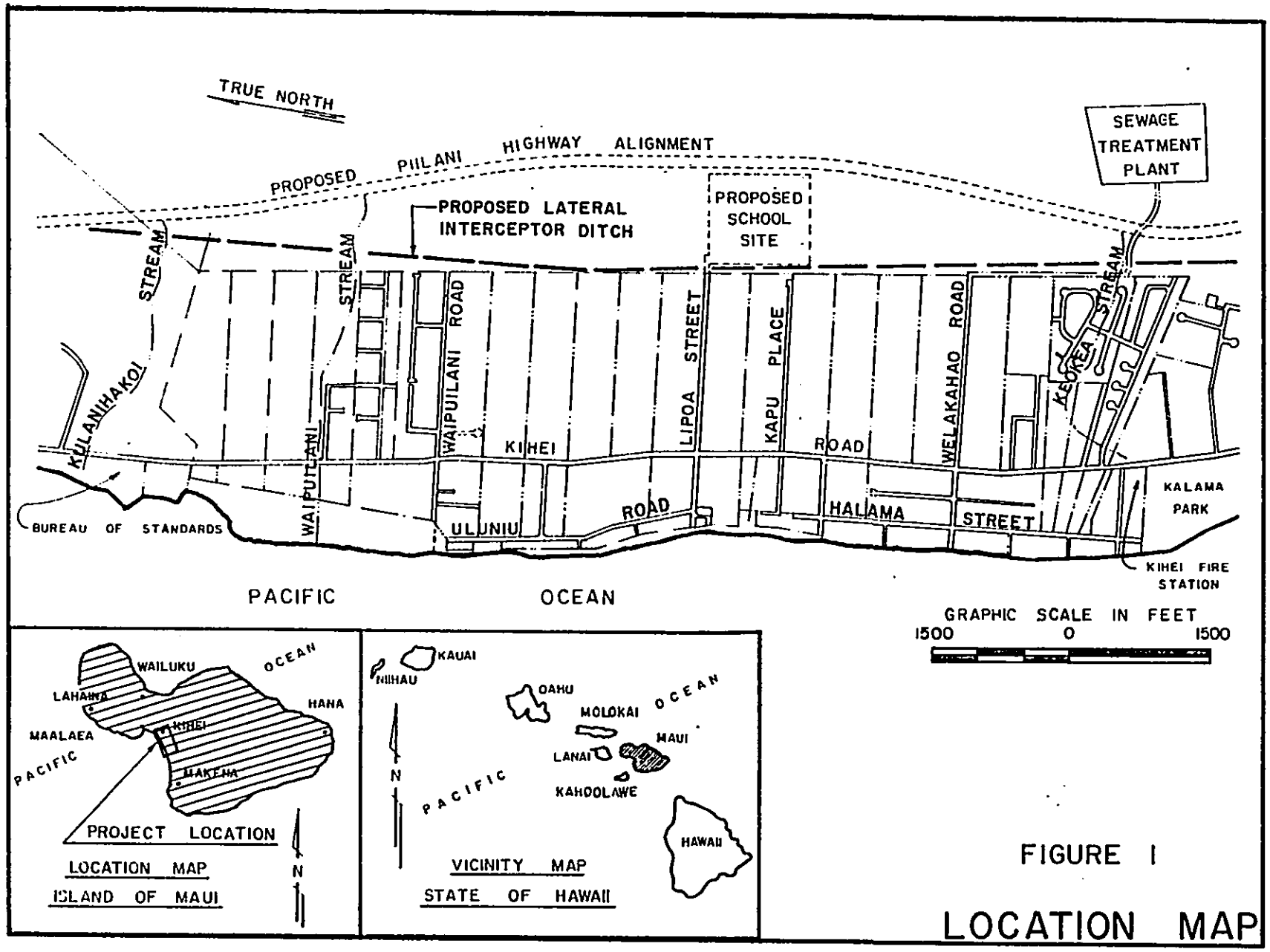


FIGURE 1

LOCATION MAP

Objectives

The objectives and purpose of the proposed Kihei Drainage Project are twofold: (1) to develop an interior drainage system that is consistent with the goals and intent of the Drainage Master Plan for Maui County (Reference 18), and (2) to alleviate existing drainage problems and hazardous, flood-prone conditions that characterize the Kihei coastal zone.

The interior drainage project, which encompasses those areas presently planned for urban development over the next 20 years, is intended to be used by governmental agencies and businesses for coordinating drainage improvement activities. The project will establish a general concept for and a functional pattern of drainage facility types and locations which satisfy the objectives outlined above.

The Kihei Drainage Project is an integral part of the flood control program outlined by the Corps of Engineers in their Report of Survey for Flood Control, Kihei District, Maui, issued in 1964. The basic operational difference between the proposed drainage system and the Corps' flood control program is that the purpose of drainage is to receive, collect and convey surface runoff into a watercourse. The purpose of the flood control program, on the other hand, is to confine storm runoff within natural watercourses (Reference 14).

In the 1964 report, the Corps of Engineers concluded that the cost of the "most effective protective measures against flooding were considerably in excess of the projected monetary

benefits from damage prevention and land enhancement." (Reference 2). Therefore no further action was taken at that time to control floods in that area. However, in the interim since this previous study was completed, the urbanization and new construction on the Kihei coastal plain have greatly increased potential property losses by flooding.

The protective measures envisioned by the Corps of Engineers were comprised of riprapped outlet channels with levees for each of the main drainage courses, a series of debris traps at their inlets, and a rock groin on both sides of the channel outlets to the ocean for prevention of sand berm formation. On the inland side of the flood plain there would be a supplementary connecting series of lateral interceptor ditches for the diversion of sheet flow and discharge from lesser stream courses. These structures are located in Figure 2. Several drainage basins delineated by the Kihei Drainage Project will have their storm runoff channeled into the riprapped outlets which form part of the Corps of Engineers' control program.

The Corps of Engineers is presently involved in a second flood control study in the Kihei District in order to "review previous reports for the Kihei District to determine whether any modifications are necessary in light of changed conditions" in the area (Reference 45). The study on flood control is scheduled for completion in 1979. If this final flood control program is approved, construction would commence several years

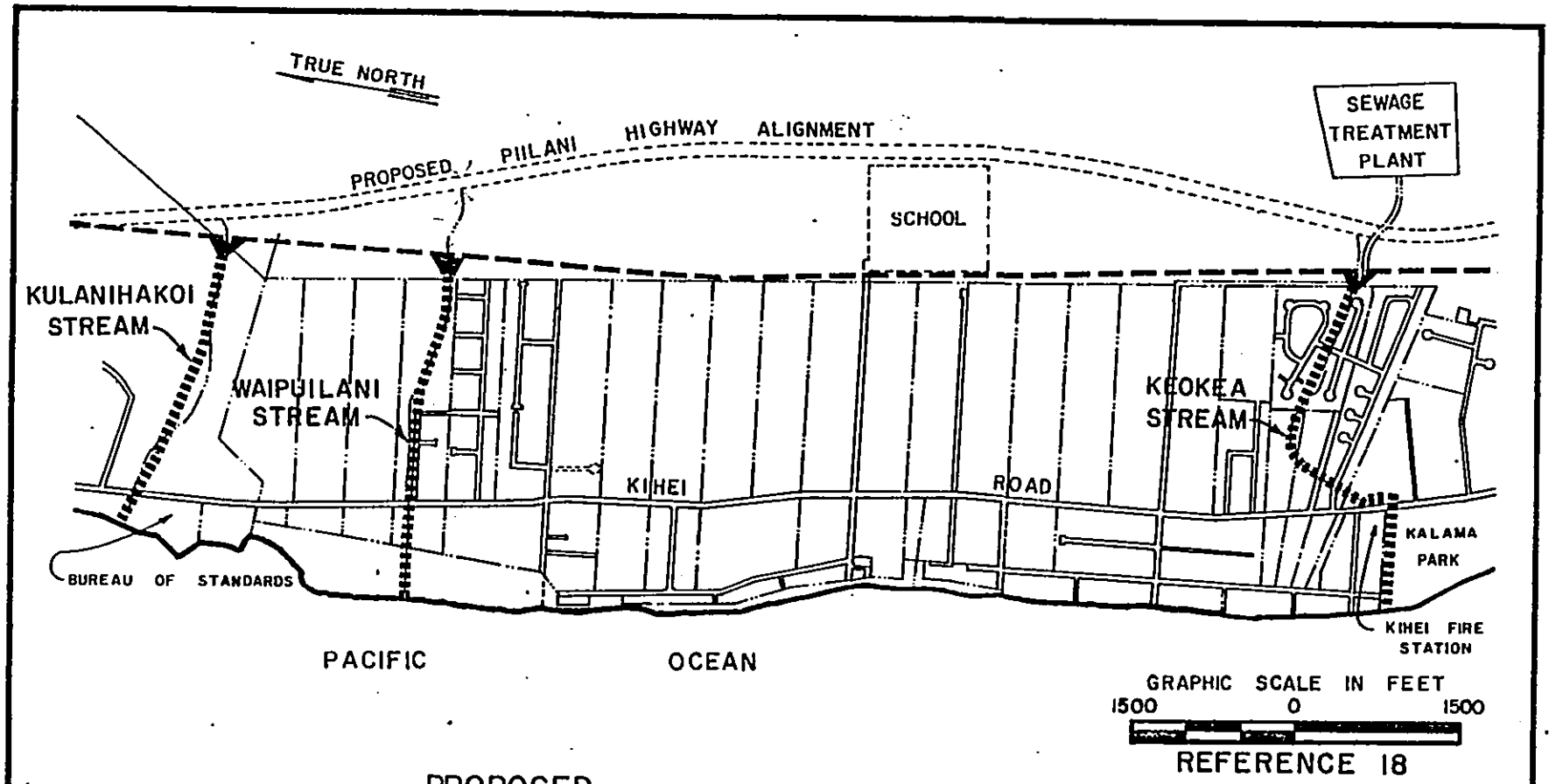


FIGURE 2

CORPS OF ENGINEERS'
FLOOD CONTROL PROGRAM (1964)

later. A separate Environmental Impact Statement will be issued for that project.

Implementation of portions of the proposed Kihei Drainage Project, however, is not contingent upon the completion of the Corps of Engineers flood control program and may be constructed without waiting for the other Corps programs. Construction of the drainage facilities will take place in phases, and final completion is forecasted to occur 10 to 15 years after the design is finalized.

The design of the drainage project assumes that the concept of the flood control program will remain the same: lateral interception ditches to collect sheet flow and the lining of the three natural watercourses. The County of Maui has accepted this concept in its Drainage Master Plan (Reference 18.) Coordination between the Kihei Drainage Project and the flood control program will take place continuously while the latter is under study.

Applicable Statutes, Programs and Projects

Ordinance No. 719 - Flood Plain and Tsunami Inundation Area Ordinance. Maui County Ordinance No. 719 divides areas subject to flooding into Floodway, Flood Fringe and Tsunami Inundation Districts and regulates further land development in those areas. It also requires that new structures built in

Flood Fringe District be flood-proofed up to one foot above the level of the 100 year storm.

State Flood Control Program. The Department of Land and Natural Resources is the designated State Flood Control Agency responsible for coordinating the flood control activities of the various governmental agencies, organizations and private individuals. It also provides information and assistance to the general public as well as to local government organizations which are in the process of formulating flood control programs (Reference 14).

Drainage Master Plan for the County of Maui. Local area drainage is a direct concern and responsibility of the County government, while flood control measures, as distinct from drainage, have been to a great extent assumed by the Federal Government and the State of Hawaii. However the Drainage Master Plan encompasses all of the flood water conservation measures proposed by the different governmental agencies and develops them into a coordinated program to be followed by the County.

Flood Insurance Study is a federally authorized and funded program presently being conducted by the Corps of Engineers to determine the existence and severity of flood hazards in Maui. The results of the study will be used by the Federal Insurance Administration in its flood insurance program.

The Piilani Highway is now under construction and is scheduled to be completed in 1980. The alignment of Piilani

Highway approximates that of the lateral interceptor ditches proposed by the Corps of Engineers in 1964. Therefore, the highway has been used in this report as the upper boundary of the drainage basins covered by the project.

Technical Characteristics of the Project

Design Criteria

The design criteria used in the design of the drainage system (sizing of pipes and location of inlets, etc.) are listed below.

a. The drainage basin or watershed is defined as the land area which contributes runoff into the proposed facilities. The first step in the design of drainage facilities, therefore, is the separation of the study project area into drainage basins as depicted on Figure 3.

b. The runoff anticipated from a drainage basin is estimated by using the Rational Method formula:

$Q = CIA$:

where Q = estimated runoff in cubic feet per second,

C = runoff coefficient which represents the proportion of rainfall that becomes surface runoff,

I = design intensity of rainfall in inches per hour,

A = area of the watershed in acres.

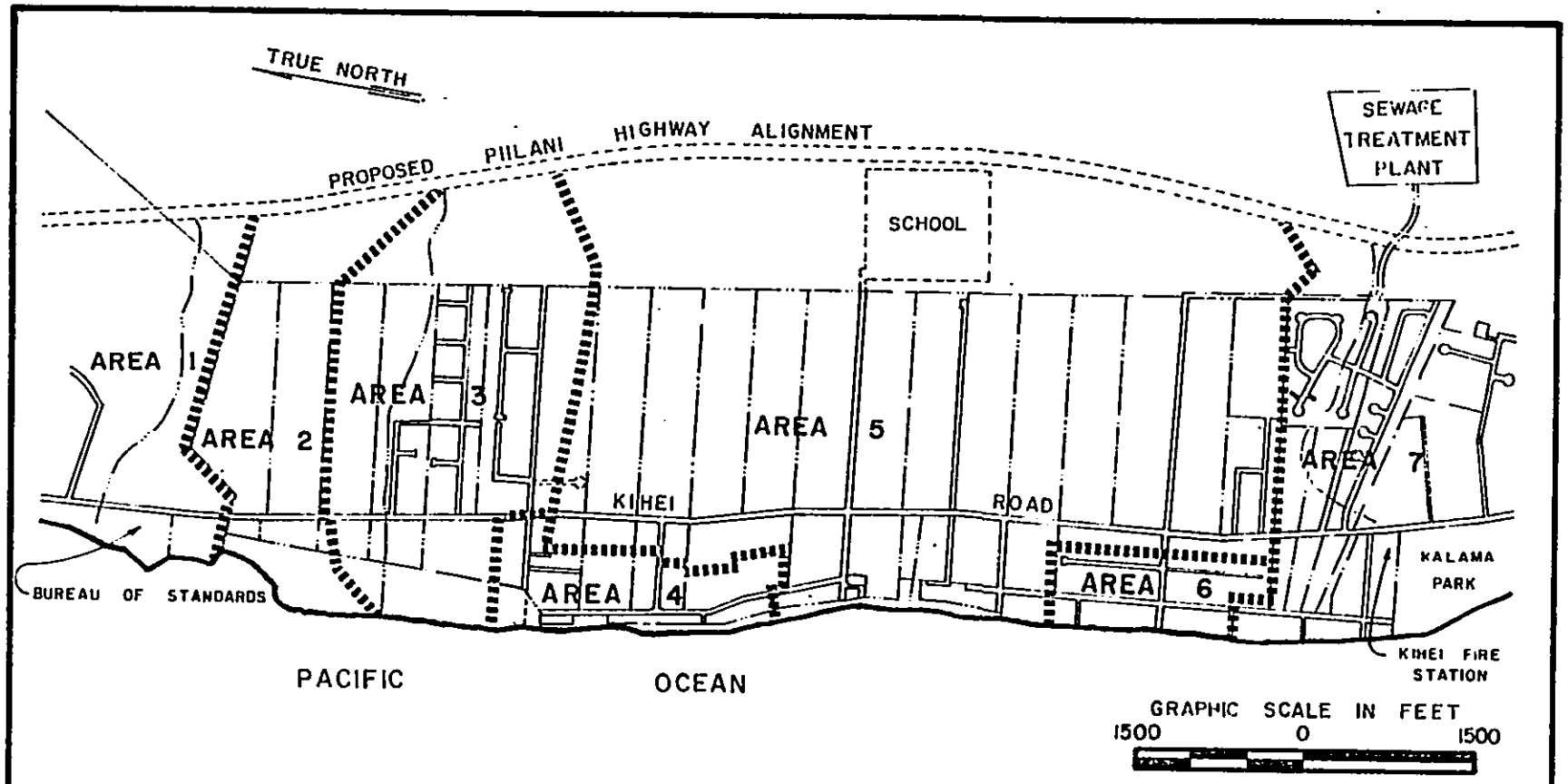


FIGURE 3

PROPOSED KIHEI DRAINAGE AREAS

The recurrence interval, representing the average interval of time within which a particular flow will be exceeded once, will be 50 years for preliminary design.

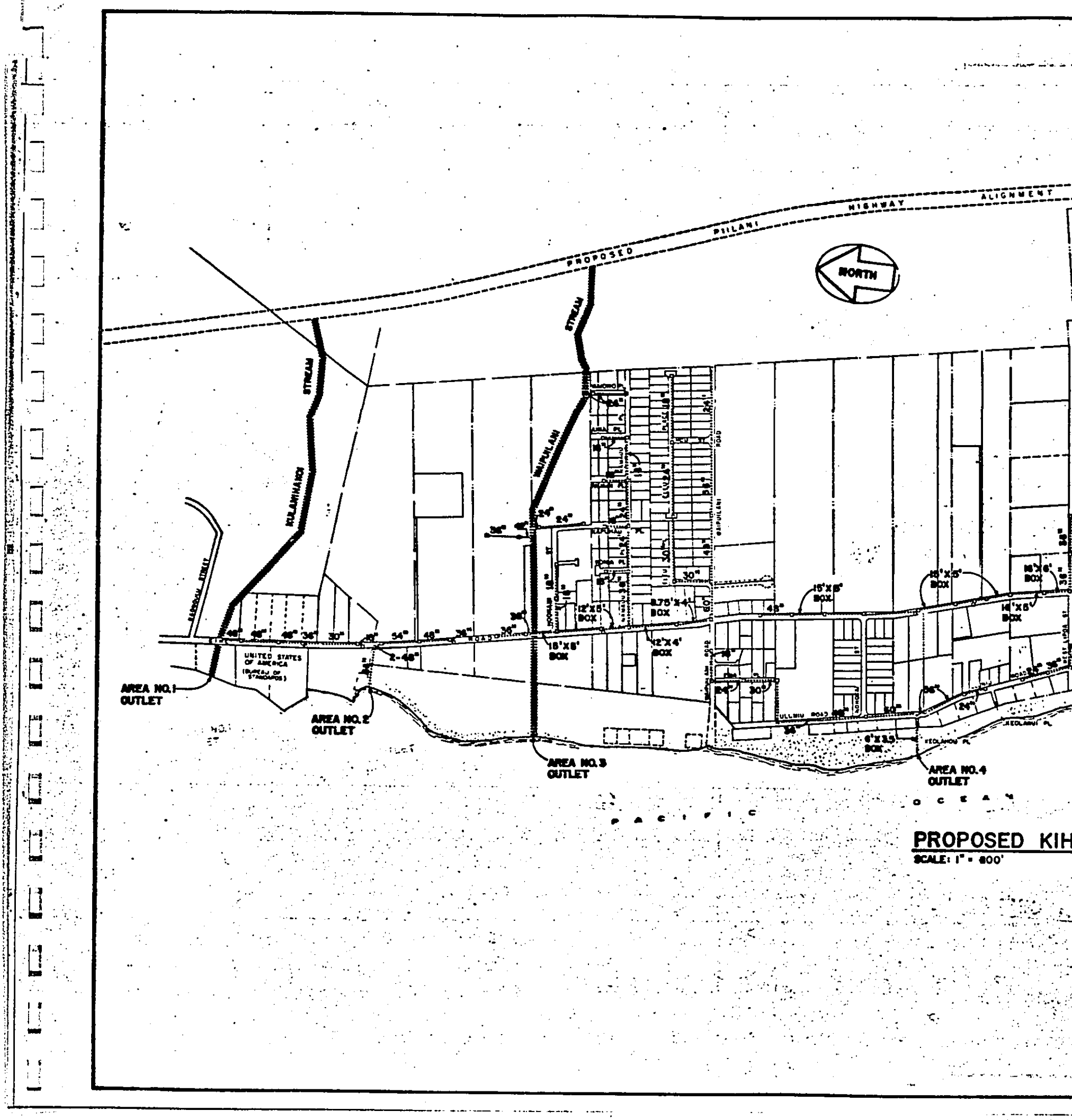
c. Runoff estimation is based on proposed land use within the respective drainage basins as outlined in the Kihei Civic Development Plan (Reference 10).

d. Although culverts near the shore may be partially filled during high tide, the entire cross sectional area of the culverts will provide discharge capacity since they will be under a hydraulic head during the 50-year storm.

e. Other criteria recommended in the Drainage Master Plan for the County of Maui will be adhered to for the planning of the interior drainage system and associated appurtenances.

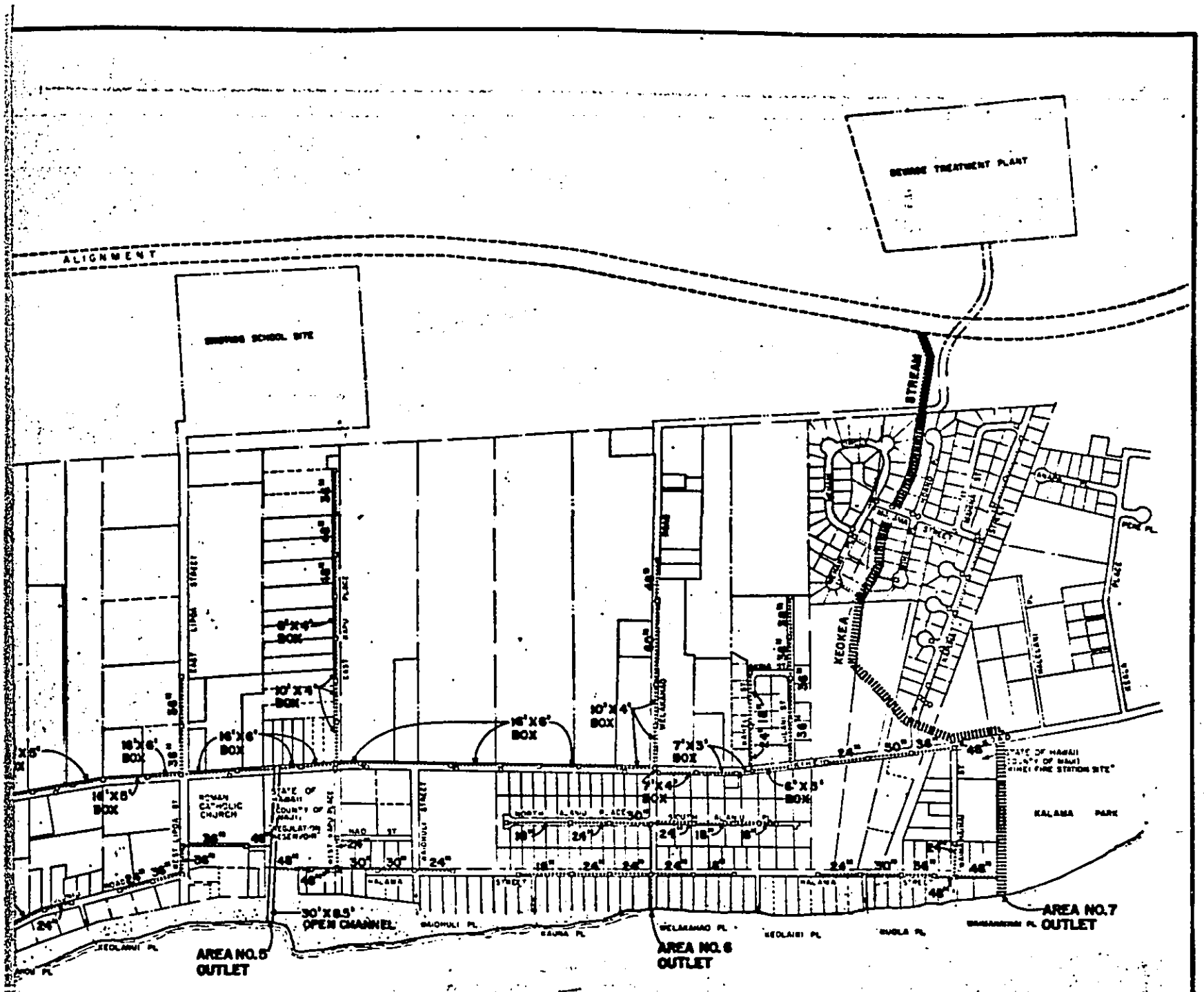
Drainage Structures

The proposed drainage system is based in part on the flood control channelization of the three existing streams - Kulanihakoi, Waipuilani and Keokea - as proposed in the County of Maui's Drainage Master Plan and the 1964 Corps of Engineers report. The Kihei drainage basin will be separated into seven drainage networks (Figure 4). Schematic drawings of suggested outlet structures for Areas 2, 4, 5 and 6 are shown in Figures 5 and 6. These structures are preliminary only and are subject to changes in their design and configuration.



PROPOSED KIH

SCALE: 1" = 800'



EA NO.4
TLET

OPOSED KIHEI DRAINAGE PROJECT

E: 1" = 600'

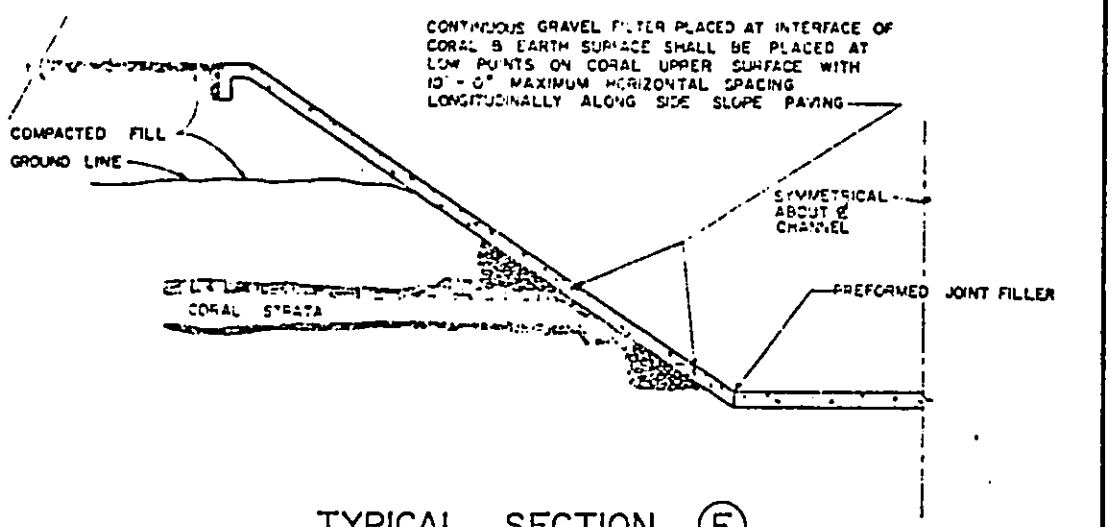
LEGEND:

MAJOR FLOOD CONTROL CHANNEL BY OTHERS

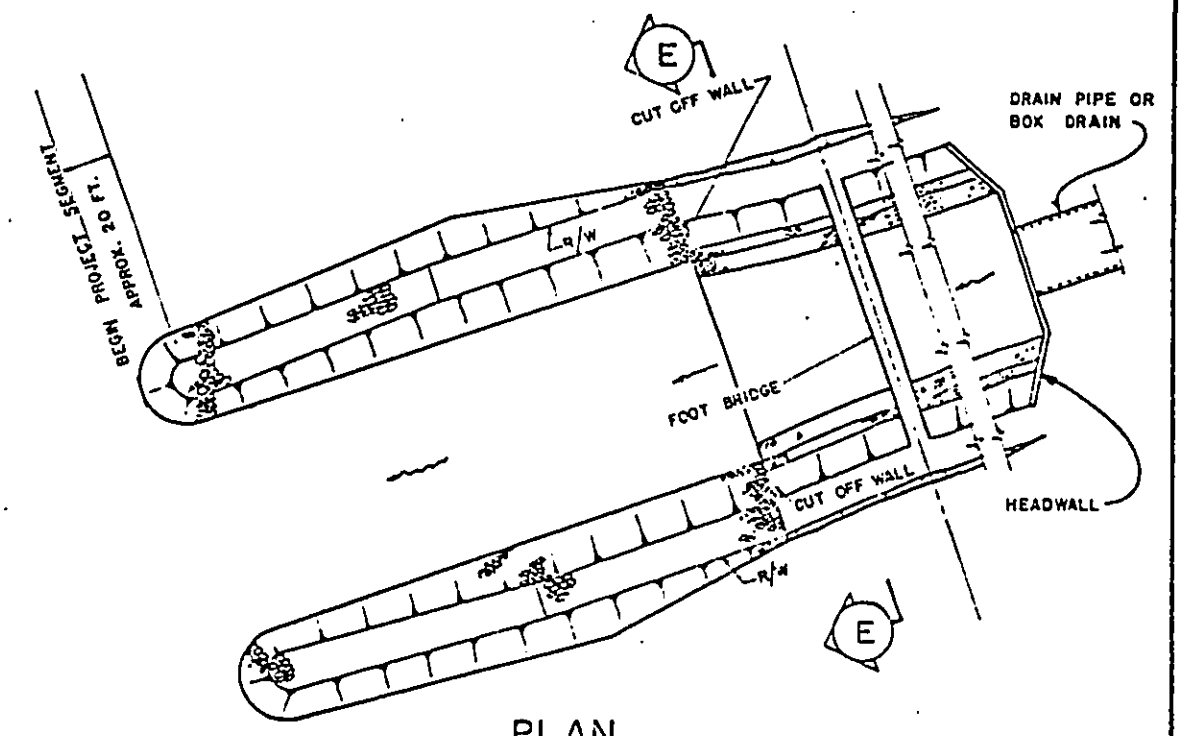
DRAINLINE, INLET AND MANHOLE LOCATION WITH PIPE SIZE

FIGURE 4

PROPOSED KIHEI DRAINAGE PROJECT



TYPICAL SECTION (E)

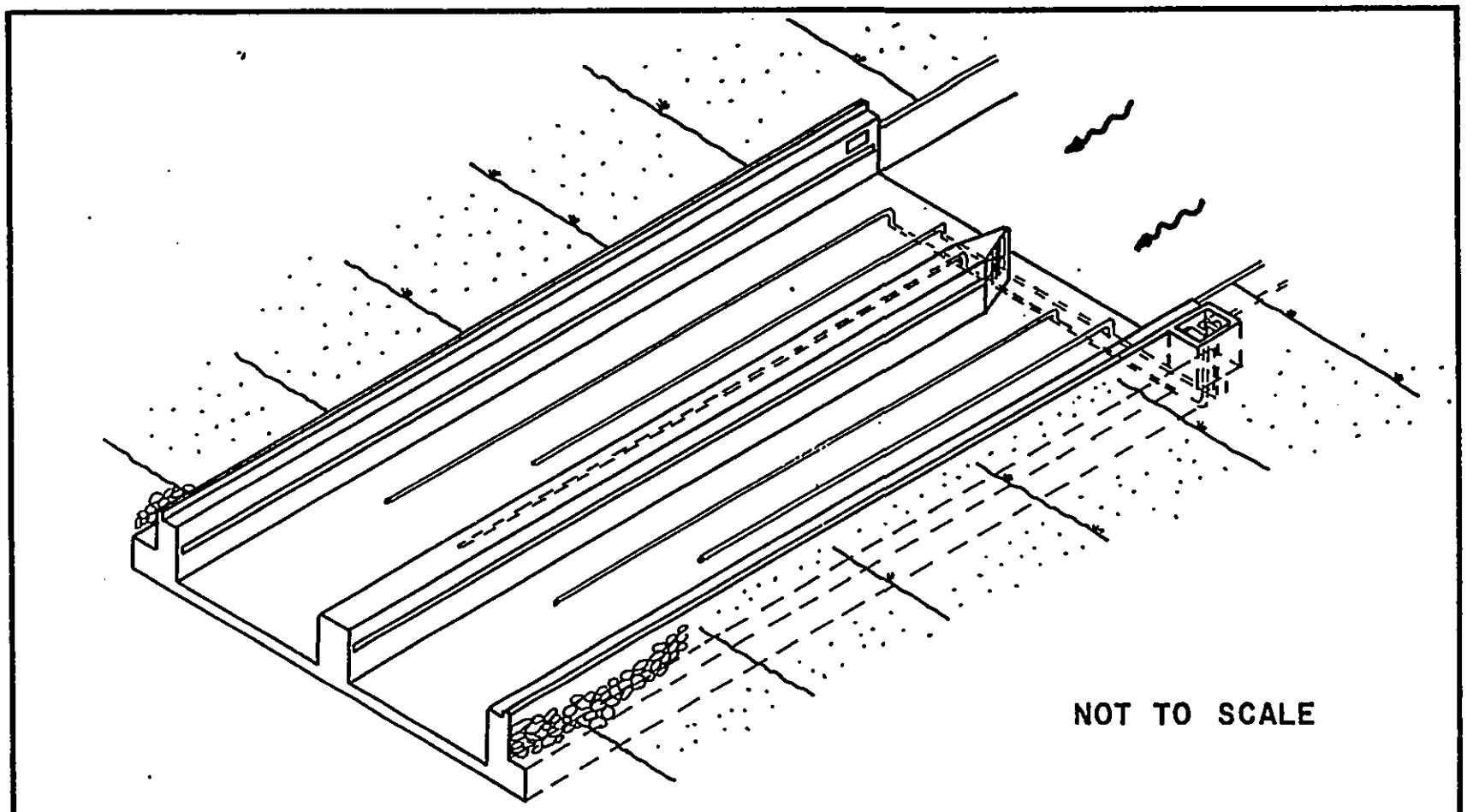


PLAN

SCHEMATIC OUTLET STRUCTURE FOR CULVERTS

NOT TO SCALE

FIGURE 5



NOT TO SCALE

FIGURE 6

SUGGESTED OPEN CHANNEL
OUTLET STRUCTURE

Area 1 - consists of 1,060 feet of drain lines along existing Kihei Road to intercept runoff from properties east (up slope) of Kihei Road. Runoff will be discharged into the Kulanihakoi Flood Control Channel.

Area 2 - consists of 660 feet of drain lines along Kihei Road which will collect runoff from the two large land parcels east of Kihei Road and divert it through an 84-inch pipe culvert 310 feet to its ocean outfall (Figure 5).

Area 3 - consists of 430 feet of drain lines and 1,405 feet of box drains (Figure 7) along Kihei Road. These lines will intercept discharges from 6,650 feet of drain lines in the Ka Hinano Acres, Kihei Estate and F & S Subdivisions to the east of Kihei Road, and areas to the west of Kihei Road. All runoff will be eventually discharged into the Waipuilani Flood Control Channel.

Area 4 - consists of 240 feet of drain pipes and 560 feet of box drains along Kihei Road to accommodate runoff from the properties mauka of Kihei Road, and 2,080 feet of drain lines and 1,240 feet of box drains to service the area between Kihei Road and the ocean. The runoff will be channeled out to sea through a box drain 320 feet long x 3 feet high x 6.5 feet wide located along Keolahou Place (Figure 5).

Area 5 - consists of 4,480 feet of drain lines along Kihei Road to collect flows from 5,170 feet of drain pipes to the east of Kihei Road, and also 2,120 feet of drain lines to

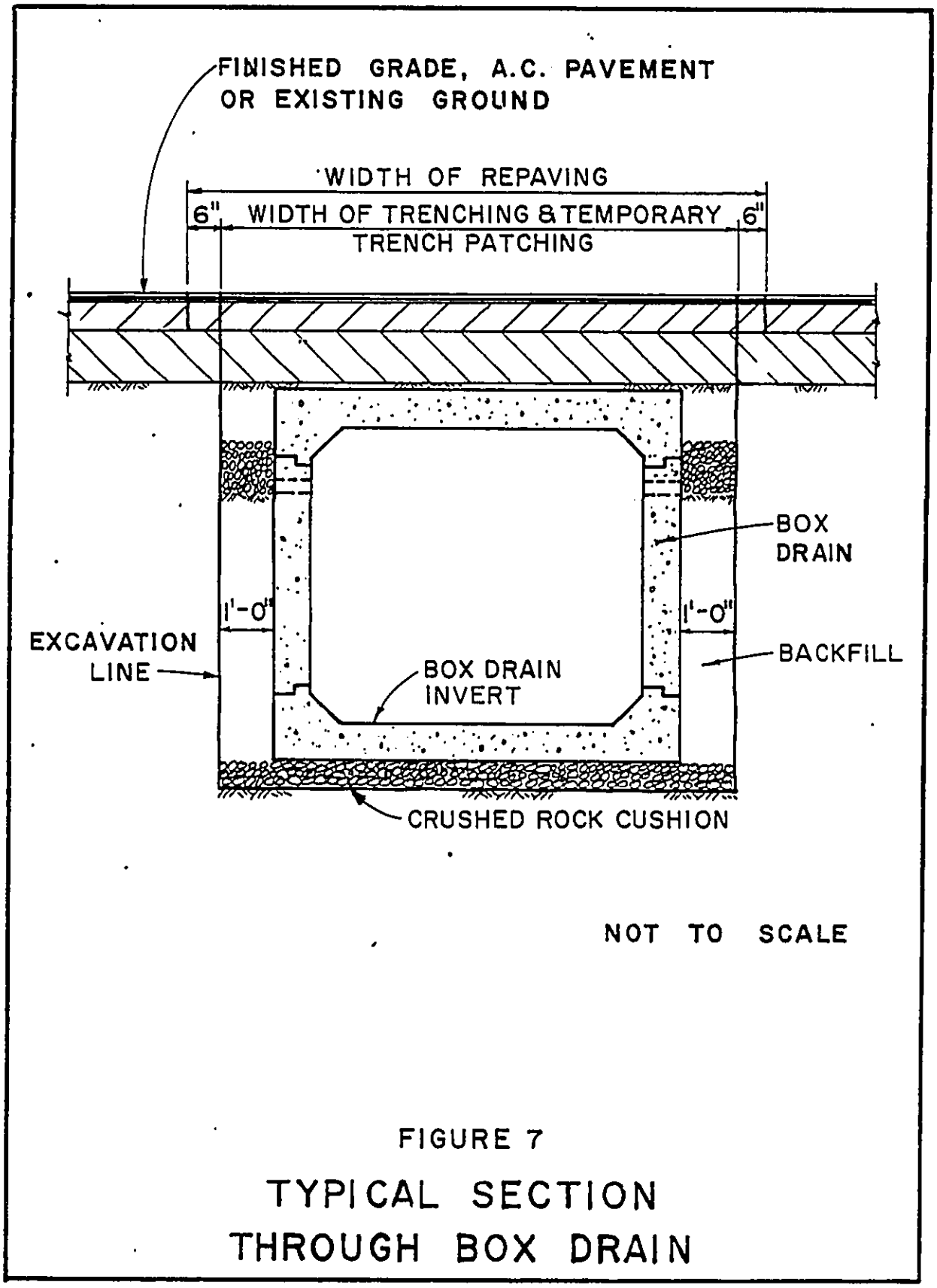


FIGURE 7

TYPICAL SECTION
THROUGH BOX DRAIN

the west of Kihei Road. Storm flows will be diverted into the proposed improved channel which exits into the sea (Figure 6).

Area 6 - consists of 3,050 feet of drain lines along Alaniu Place and Halama Street that service an area between Kihei Road and the ocean. A 60-inch pipe culvert 250 feet long along Welakahao Place will collect the runoff and exit at an ocean outlet (Figure 5).

Area 7 - consists of 740 feet of drain lines along Kihei Road to collect runoff to the east of the road and 1,260 feet of drain lines along Halama and Waimahaihai Streets to service areas west of Kihei Road. Storm runoff will be carried to the sea by the Keokea Flood Control Channel. The localized drainage facilities for the Kalama View and Waimahaihai Subdivisions to the far east of Kihei Road in this area will feed into the same flood control channel.

No silt or debris catch basins have been incorporated into the Kihei Drainage Project. The urbanized sector of Kihei which this system has been designed to serve is well protected from the erosion process by asphalt and concrete pavements, buildings and well grassed lawns. A negligible amount of dirt and trash in comparison with the sediment load accumulated from the watershed above Kihei will be collected by runoff from the project area.

Project Costs

The total proposed project cost will be approximately $12,818,276, representing the sum total of approximate estimates for each of the 7 drainage areas.

The following approximate cost estimates are based on current price trends and must be readjusted to include rise in construction costs at the time of actual construction. In the event that the proposed improvement within any one area is undertaken in increments, such undertaking will result in an overall increase in costs. (SEE TABLE 1 - PROJECT COST ESTIMATE)

Engineering costs are assumed to be 4% of the total project costs, or $512,731.

Land requisition costs for 10' easements, on privately owned lands, based on a land value of $8/sq. ft. is $256,000.

TABLE 1

PROJECT COST ESTIMATE

ITEM	DESCRIPTION	COST
1.	Drain lines and appurtenances	$ 119,511
2.	Special structures and channel outlet	40,425
3.	Miscellaneous restoration	18,228
	Area 1 Subtotal	$ 178,164
1.	Drain lines and appurtenances	$ 189,409
2.	Special structures and ocean outlet	88,935
3.	Miscellaneous restoration	14,994
	Area 2 Subtotal	$ 293,338
1.	Drain lines and appurtenances	$ 674,362
2.	Special structures and channel outlets	185,955
3.	Box culverts	1,002,613
4.	Utilities addition and relocation	39,690
5.	Miscellaneous restoration	188,307
	Area 3 Subtotal	$ 2,090,927
1.	Drain lines and appurtenances	$ 296,389
2.	Special structures and ocean outlet	125,685
3.	Box culverts	134,064
4.	Miscellaneous restoration	54,390
	Area 4 Subtotal	$ 610,528
1.	Drain lines and appurtenances	$ 660,213
2.	Special structures and channel outlets (Bypass System)	800,000
3.	Box culverts	5,695,221
4.	Miscellaneous restoration	471,429
5.	Concrete lined open channel	1,286,250
	Area 5 Subtotal	$ 8,913,113
1.	Drain lines and appurtenances	$ 253,207
2.	Special structures and ocean outlet	116,130
3.	Miscellaneous restoration	47,187
	Area 6 Subtotal	$ 416,524
1.	Drain lines and appurtenances	$ 208,078
2.	Special structures and channel outlet	72,030
3.	Miscellaneous restoration	35,574
	Area 7 Subtotal	$ 315,682
	TOTAL PROJECT COST	$12,818,276

2. DESCRIPTION OF THE ENVIRONMENT

Physical Environment

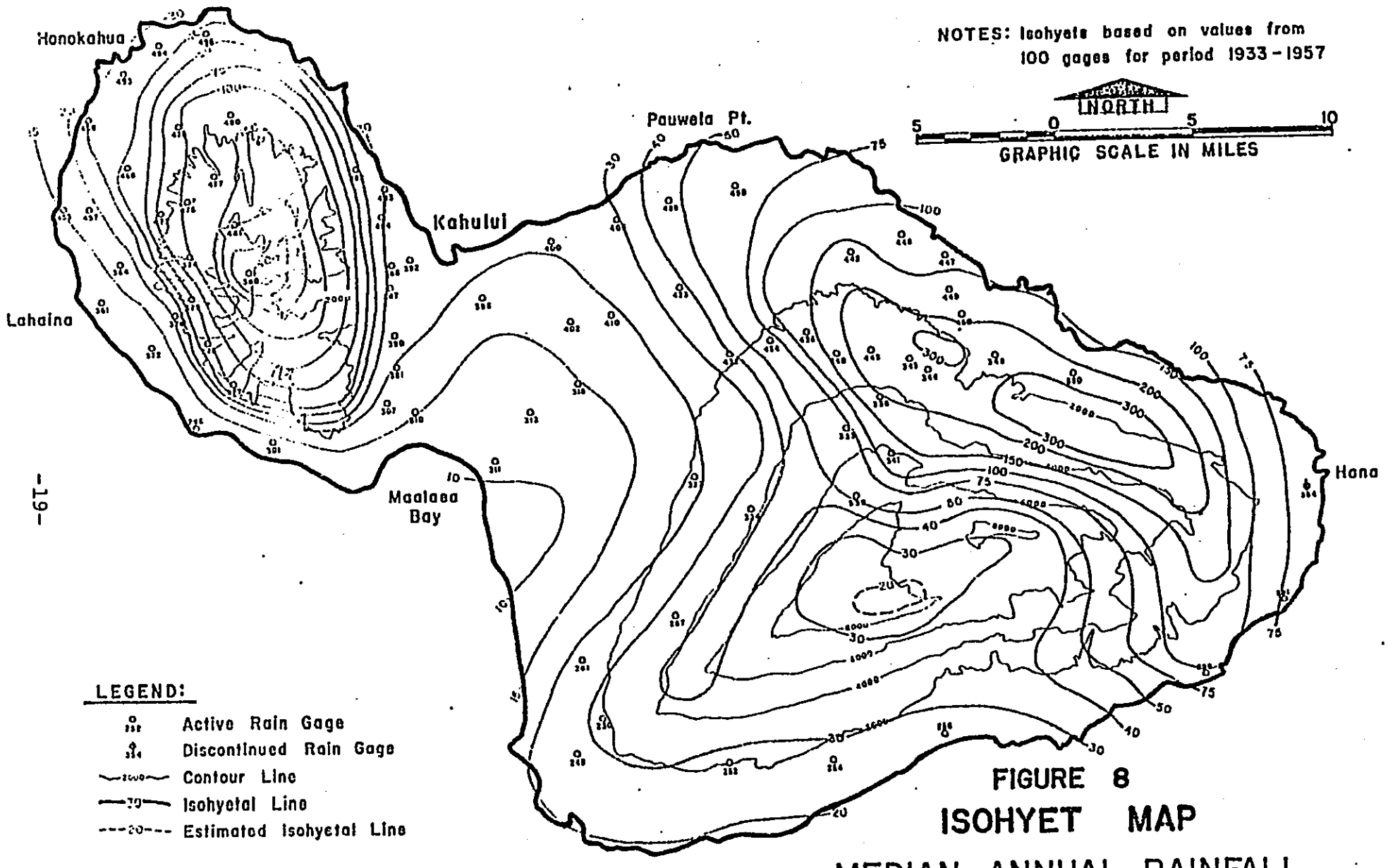
Climate

Kihei enjoys a climate that is sunny, semiarid and warm throughout the year, with a temperature averaging 77° near the shore and decreasing only slightly farther up the slopes (Reference 11).

Relative humidity on the Leeward lowlands and lower mountain slopes averages 60-70 percent (Reference 8). Along the dry Kihei coast the median annual rainfall is about 10 inches, most of it occurring during the few winter cyclonic Kona storms of brief duration (see Figure 8 - Isohyet Map, rainfall in inches). There may be as many as 340 dry days in a year in this arid area, yet rainfall during a 24-hour period may be as much as 7 inches, or more than half the median annual rainfall (References 10 and 1). The warm temperature and long daylight hours are ideally suited for a variety of crops, but successful crop production would require irrigation in this dry Leeward area (Reference 8). On the upper slopes of Haleakala, annual precipitation ranges from 30-40 inches (Reference 3).

Geology

The surface geological strata of the Kihei area are generally characterized by loose sedimentary rocks (see



LEGEND:

- Active Rain Gage
- Discontinued Rain Gage
- Contour Line
- Isohyetal Line
- Estimated Isohyetal Line

FIGURE 8

ISOHYET MAP

MEDIAN ANNUAL RAINFALL

ISLAND OF MAUI

REFERENCE 35

Figure 9, Geologic Map). The subsurface rock consists of impermeable sedimentary alluvium, lithified calcareous sand dune deposits, consolidated earthy or mudflow deposits, and lagoonal deposits (References 9 & 10). The coastal beaches are composed of unconsolidated white coral sand, blown inland when the sea level was 60 feet lower (References 4 & 5).

The underlying basement is composed of basalts and ash beds of numerous lava flows in past centuries which flowed down the western flank of Mount Haleakala. These lava flows become joined with the already existing slope of the West Maui Mountains to form the broad, gently sloping plane of the Maui Isthmus and the Kihei area (Reference 5).

The oldest lava flow from Haleakala is the Honomanu Volcanic Series, composed of thin-bedded pahoehoe and aa flows, averaging 15 feet in thickness and lying unexposed beneath the surface. Above sea level this series has been buried by later flows. Overlying the Honomanu Volcanic Series is the younger Kula Volcanic Series, with aa flows averaging 50 feet in thickness near the coast. The most recent Hana Volcanic Series, having thinner aa and pahoehoe flows ranging from a few inches to a few feet in thickness, formed the subsurface geological strata of the area (References 5 and 6).

Soils

The dominant soils within the project area are the Pulehu-Ewa-Jaucas association, which is composed of relatively recently formed soils, occuring on geologically young land that developed

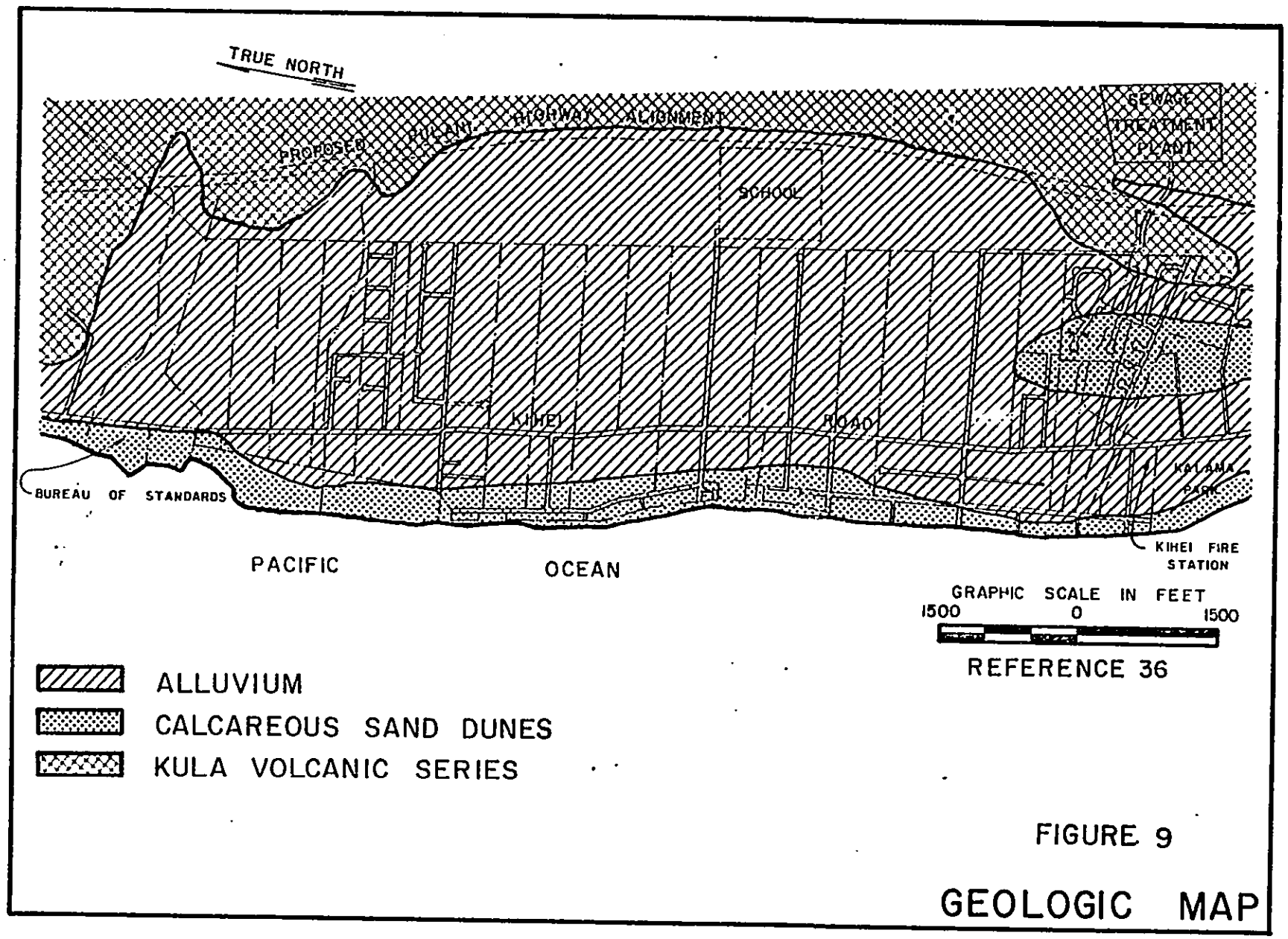


FIGURE 9

GEOLOGIC MAP

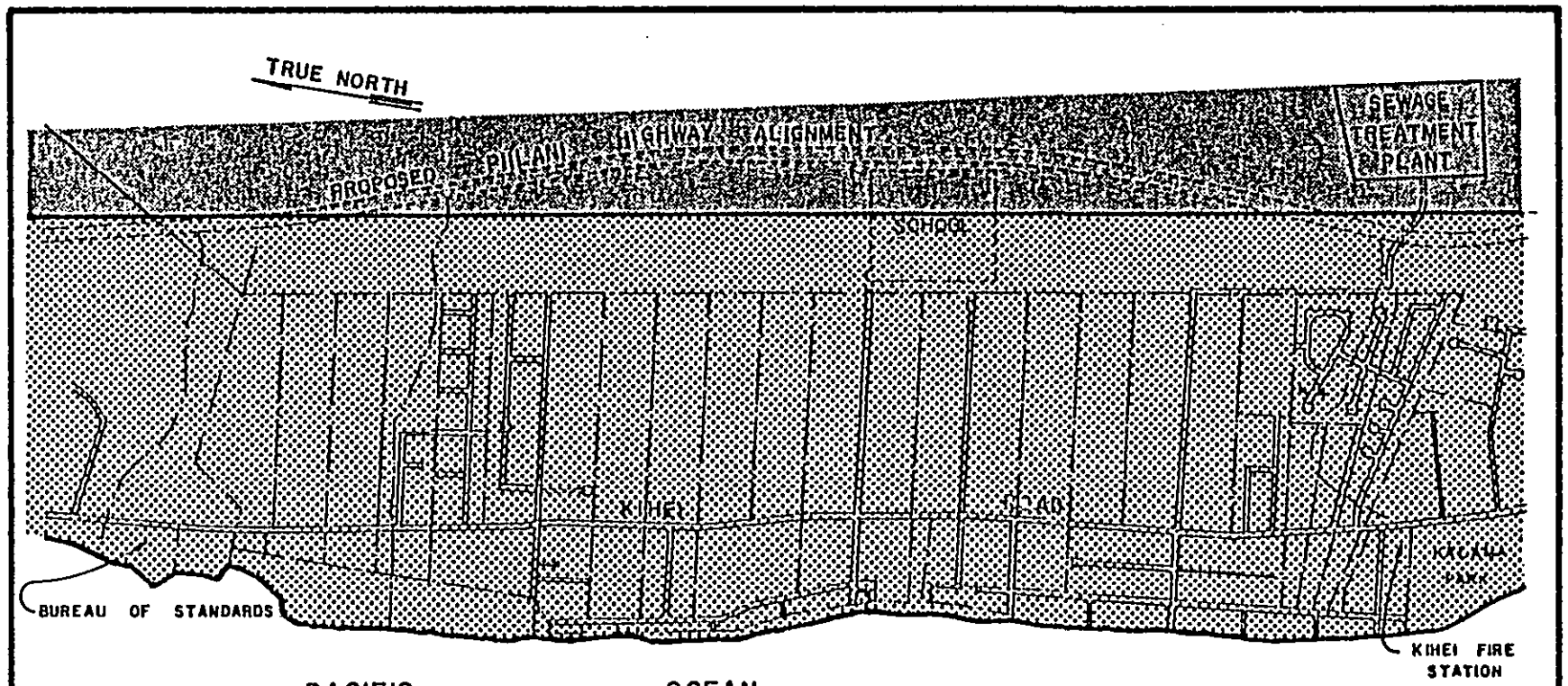
and weathered on coral, seashells, lava, alluvium or igneous rock (References 2, 4 and 7). A map that delineates the patterns of soils distribution that occur in the Kihei area into soil associations is suitable for planning of a general nature (see Figure 10 - Soils Association Map).

In the lowlands the soils are described as sand and mixed sand and silty clay with areas of clay-loam. These alluvial soils formed from gravel, sand, silt or clay deposits carried downhill by streams. On the mountain slopes, soils overlying rough lava are formed from material that has been moved down-slope by streams, soil creep, or local wash, and accumulated on the lower slopes and at the base of slopes (References 2, 4 and 7).

Moderately dry Kihei soils lack an adequate supply of moisture and precludes the use of these areas for cultivation. Generally, the Kihei soils are unsuitable for intensive agriculture (References 8 and 10).

Topography

The predominant topographic features of the Kihei area include sandy beaches of varying widths along the coast and relatively flat or low lying areas between the shore and the gently rising slopes of Mount Haleakala. The existing Kihei Road, which generally parallels the shoreline at distances of 350 feet to 1150 feet inland from the sea, provides the only continuous north-south route through the area that links Kihei with the rest of the island. Elevation of the lowland areas



PULEHU-EWA-JAUCAS ASSOCIATION

Deep, nearly level to moderately sloping, well-drained and excessively drained soils that have a moderately fine textured to coarse textured subsoil or underlying material; on alluvial fans and in basins.

WAIAKOA-KEAHUA-MOLOKAI ASSOCIATION

Moderately deep and deep, nearly level to moderately steep, well-drained soils that have a moderately fine textured subsoil; on low uplands.

REFERENCE 9

FIGURE 10

SOILS ASSOCIATION MAP

up to Kihei Road is approximately 5 to 6 feet above mean sea level. Features of land development include condominiums and hotels, subdivision improvements, scattered residences and farms, stretches of parks and patches of raw land (References 1 and 2).

The topography of the region further inland on the gentle slopes of Mount Haleakala, located between Kihei Road and the proposed Piilani Highway alignment, is streaked with intermittent and poorly defined gulches. Gradual slopes in this area approximate 4-5 percent with elevations ranging from 5 feet to 90 feet. These slopes establish little or no well defined surface drainage pattern.

The three principal streams in the area which flow westward and seaward only during periods of excessive rainfall are Kulanihakoi, Waipuilani and Keokea Streams. They are narrow and poorly defined waterways (Reference 3). Localized depressions, ponds, swales and ditches are typical of areas along Kihei Road not presently developed.

Flora and Fauna

No game animals presently exist in the urbanized areas of Kihei. Furthermore, there are no plans to establish a population of game mammals in the future. This was indicated by the Department of Land and Natural Resources, State of Hawaii, in August 1971, in connection with the environmental study for the proposed Piilani Highway from Kihei to Ulupalakua. However, wild goats can be found farther inland on the slopes of Haleakala.

The Kulanihakoi, Waipuilani and Keokea Streams are intermittent and therefore support no significant or otherwise valuable populations of fish or other microscopic aquatic plants and animals*.

Sparse vegetation characterizes the Haleakala slopes. The natural vegetative covering on raw land along the coastal lowland is predominantly kiawe, haole koa and lowland shrubs (References 2 and 4). In the residential community there are various types of common plants which include fruit trees, vegetable gardens, coconut and other types of trees, bushes, shrubbery and other ornamental plants. A cover of scrub mesquite pervades the lower mountain slopes.

Indigenous Hawaiian birds in the area include the permanent resident Hawaiian short-eared owl or Pueo, and the migratory Pacific golden plover, a shorebird that is a common winter visitor. Other birds of foreign lands that inhabit the area are the barred doved, spotted dove, cardinal, mockingbird and white eye (Reference 4).

Two species of birds (the Hawaiian Coot and Hawaiian Stilt) which are classified as "endangered" by the State Division of Fish and Game and by the U.S. Bureau of Sport Fisheries and Wildlife inhabit Kealia Pond approximately 1 mile northwest of Kihei (Reference 38).

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* Conversations with field crew members surveying gulch crossings for the proposed Piilani Highway revealed that all gulches were completely dry.

Oceanography

The Pacific Ocean around the Hawaiian Archipelago is a region of transition between Pacific Equatorial and North Pacific Central Water Masses each being characterized by a distinctive temperature-salinity diagram. These water masses occur in the North Equatorial Current and extensions of the North Pacific and Caifornia Currents, respectively. Around Hawaii in open water, the average winter and summer surface temperatures are 74.3°F (23.5°C) and 78.8°F (26°C) respectively, and the surface salinity is about 35 parts per thousand (Reference 34). Along the coastal regions of the Hawaiian Islands, however, deviations from these long-term averages are expected because of rainfall, runoff and heating of surface water in shallow depths. Generally, coastal waters will be lower in salinity and of higher temperature than the averages.

On the Leeward side of Maui, north of the project area, "the current at Lahaina usually sets northward and reaches a maximum velocity of 1 or 2 knots before low water. Before high water the current is normally weak and may set either northward or southward." At the southwest coast of Maui in Maalaea Bay, a "northwestward current has been reported in Maalaea Bay, but no reliable current observations seem to have been made anywhere along the southwest coast of Maui from Makena to Lahaina" (Reference 35). The currents in Maalaea Bay are probably weak and extremely variable, depending on the stage of tide and the wind velocity.

The marine waters fronting Kihei are presently classified as Class "A", in accordance to the Public Health Regulations -

Department of Health, State of Hawaii (Reference 57). The classification is highly restrictive in its regulation. The specific criteria for Class "A" waters is listed in Appendix A.

An investigation of water quality parameters was undertaken by Environmental Consultants, Inc. (ECI) for the Corps of Engineers during August 19-21, 1977 (Reference 46). Sites 2 and 3 of the ECI study coincide with the nearshore areas between Kulanihakoi and Waipuilani Streams and just offshore of the mouth of Keokea Stream, respectively, (See Figure 11).

The values for salinity, turbidity and nutrient concentrations for sites 2 and 3 are given in Table 2. Values of turbidity at the two sites were greater than those usually encountered in similar open coastal waters in Hawaii (Reference 46). Visibility was very poor in the discolored water at both sites. The sediments suspended in the water seemed to have originated from the land and conveyed by streamflow or as windblown particles into the ocean. The shallow depth of the nearshore waters (only 1.5 meters deep, 200 meters from the shore at Site 2) permitted wave action to keep these sediments suspended.

Sediment analysis indicated that the samples could be differentiated into a north-Kihei group (Site 2) and a south-Kihei group (Site 3). Principal differences between the groups involved grain size and calcium carbonate ($CaCO_3$) content. North-Kihei group sediments tended to be more finely grained and had a lower calcium carbonate content than South-Kihei group sediments. Although sediments carried into the ocean by streams were apparently dispersed along the coast in a few months and no large masses of sediment were encountered, terrigenous sediments were

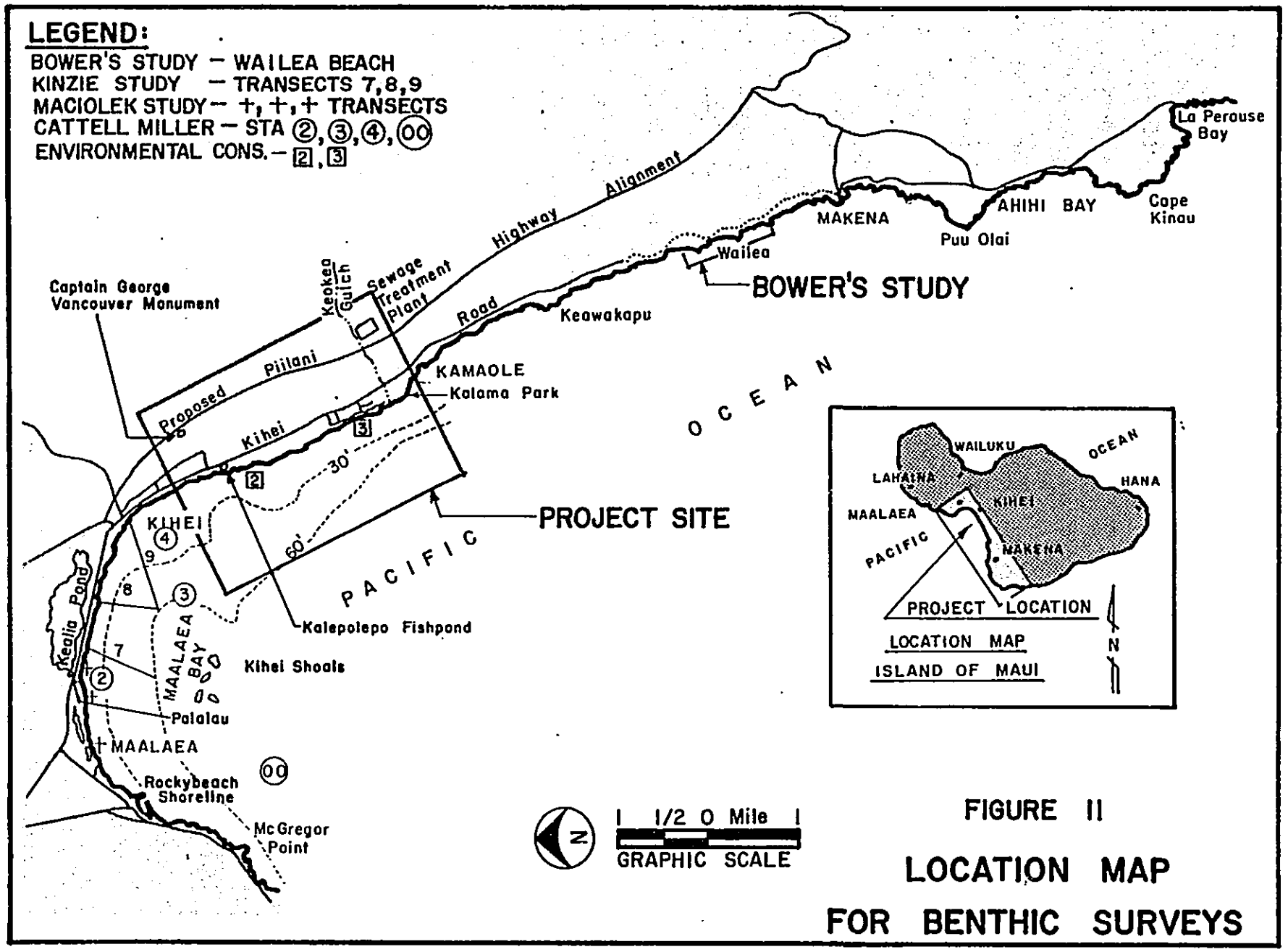


FIGURE II

LOCATION MAP

FOR BENTHIC SURVEYS

TABLE 2

WATER QUALITY ANALYSIS OF MARINE WATERS OFF KIHEI

	SITE 2	SITE 3
Salinity (0/00)	33	35
Turbidity (FTU)*	0.85	1.69
Ammonia Nitrogen (ug at N/l)	0.46	0.40
Nitrate Nitrogen (ug at N/l)	5.41	0.53
Inorganic Phosphous (ug at P/l)	0.27	0.11
Inorganic Nitrogen (ug at N/l)	5.87	0.93
N:P	21.7	8.4

*Formain Turbidity Units

REFERENCE 46

more commonly found at Site 2 than at Site 3. The reasons hypothesized for this reginal distribution were, 1) greater amounts of sediment are conveyed into the bay by the northern watercourses; or, 2) currents cause the accumulation of sediments at Site 2. The ECI assessed the utilization of the area near the Kihei Shores, "The more aesthetic beaches occur at the south end of the survey area (Keawakapu, Wailea, away from Kihei) and these beaches are the more heavily utilized for recreation. (Reference 46)

Marine Life

Marine life encountered during the ECI survey are similar at both sites and is representative of the small inventory of organisms offshore of Kihei. A few isolated heads of live coral dotted the flat, shallow and rubble covered sea floor. The coral heads were generally Porites lobata, but Porites evermanni, Porites compressa and Pocillapora meandrina were also seen. These coral heads do not indicate the presence of a bountiful reef community. Several dead coral heads were observed. Soft corals, Palythoa tuberculosa and Zoanthus pacificus, and the sea urchin, Echinometra mathaei, were common. Large members of the mussel, Hormomya crebristriatus, covered boulders near the shore.

Fish present included the manini, Acanthurus triostegus sandvicensis, the maomao, Abudefduf abdominalis, and the wrasse, Thalasomma duperreyi. Other species of fish may have been present but were not observed because of the turbid condition of the water.

Several types of algae were found offshore including species regarded as food items: Ulva fasciata, Gracillaria coronopifolia (ogo) and sargassum echinocarpum.

The nearshore waters lack variety and an abundance of benthic biota and fish. The diversity of marine life along the flat reef area seems to be related to topographic features of the sea bottom. The boulder walls of the fish pond in Site 2 contained many more urchins and fish than elsewhere in the area. The poor quality and quantity of reef life is apparently the direct result of the turbid waters.

Water samples from Maalaea Bay were taken for nutrients, plankton, and productivity at weekly intervals between January 8-29 and on February 12 and 19, 1972 at five stations in the northern portion of the bay (Cattell and Miller, 1972). Three of these five stations were off Kihei at depths of approximately 5 (Station Number 4), 10 (Station Number 3) and 30 (Station 00) fathoms, and one station, Number 2, was off Kealia Pond at about 5 fathoms depth (Figure 11). The data for these stations showed that in the winter of 1972 Maalaea Bay was still relatively oligotrophic, that is low in mineral nutrients, phytoplnakton crops, primary productivity and particulate carbon (see Table 3 - Plankton Quality). In addition, counts and identifications of larval fishes were made, which indicated the presence of mostly "inshore" forms, such as species of damselfish (Pomacentridae), gobies (Gobiidae), blennies (Blenniidae).

HUMPBACK WHALES

In 1978, the Humpback Whale became the official Hawaii State Maine Mammal. They are now protected by the Endangered Species Act of 1973 (amended USC 1531), the Marine Mammal

TABLE 3

PLANKTON QUALITY

Means and the range of measured parameters for plankton of Maalaea Bay between 8 January and 19 February 1972 (Cattell and Miller, unpublished).

Parameter	Station Number			
	2	4	3	00
	5 fm depth off Kealia	5 fm depth off Kihei	10 fm off Kihei	20 fm off Kihei
Chlorophyll a, mg/m^3	0.35 0.17-.55	0.37 0.24-.45	0.15 0.10-.22	0.12 0.09-.14
Particulate Carbon, mg/m^3	155 89-214	135 108-167	96 46-140	89 78-100
Primary Productivity, $mgC/m^3/h$	3.9 1.0-9.0	3.8 2.2-4.6	1.1 1.0-1.2	1.0 - -
Nitrate, µg-at./l	0.17 0-.48	2.25 0.65-5.4	0.27 0-.72	0.27 0-.54
Ammonia, µg-at/l	0.30 0-.60	0.35 0.26-.48	0.46 0.26-.57	0.59 0.50-.67
Phosphate, µg-at/l	0.09 0.05-.14	0.15 0.12-.19	0.18 0.13-.23	0.11 - -
Zooplankton volumes, 10^{-5} ml/m^3	6.8 1.6-25	--	--	--

REFERENCE: CATTELL & MILLER, UNPUBLISHED

Protection Act of 1972 (amended 16 USC 1361) and the convention on International Trade in Endangered Species of Wild Faura and Flora, March 3, 1973 (T.I.A.S. No. 8249) (Reference 62).

Approximately 300-500 Humpback Whales arrive at the islands every year for the purposes of calving, nursing and breeding. They populate the waters during the December to April months, usually peaking by mid-February and remaining constant throughout mid-March. They usually congregate near the islands. At times as near as the 600-ft. depths. By April, the Humpback Whale begins its annual northward migration and by June most will have left the Hawaiian waters.

Maalaea Bay has been considered as a possible National Marine Sanctuary for Humpback Whales. Final implementation of this site as a sanctuary is expected in 1981 (Reference 62).

Other Surveys of Marine Life in Maalaea Bay

Offshore of the present project area and to the north and south in Maalaea Bay, there have been three benthic surveys of the types of substate and organisms that occur there: Bowers (1973, unpublished), Kinzie (1972, unpublished), and Maciolek, 1971. These benthic biological surveys covered the following regions (see Figure 11 - Location Map for Benthic Surveys):

a. The Bowers Study - 50-m long transects were investigated at four sites in the nearshore waters between Keawakapu Beach and Polo Beach off the Wailea, Maui coastline about 3-4 miles south of Kalama Park (Figure 11).

b. The Kinzie Study - studies of nine transects from the shore to about 10 fathoms depth were conducted

in the northern region of Maalaea Bay from the small boat harbor near McGregor Point to a region at the northern edge of Kihei town.

c. The Maciolek Study - three transects of the inshore waters of the Palalau sector of the bay between Kanaio and Kealia Pond were surveyed.

The surveys nearest the project area and therefore the most applicable in their description of the marine nearshore biota are: transect 9 of the Kinzie Study; the Maciolek (1971) study 2-3 miles north of Kihei at Palalau; and the Bowers study off Wailea about 3-4 miles south of Kalama Park.

Off Wailea, Bowers (Bowers, unpublished) found the substate to be 50 to 60 percent "non-living" (i.e. rock, rubble, dead coral and sand), with 20 to 40 percent of the bottom being dead coral. The live corals comprised 40 to 52 percent of the bottom, with the percentage area covered per species varying from about 1 to 27 percent. The seven species of coral present in decreasing order of abundance were: Pocillopora meandrina, Porites compressa, Porites lobata, Leptastrea bottae, Cyphastrea ocellina, Montipora verrucosa and Fungia scutaria. Also present in the study area were five species of urchins: Echinometra mathaei, Echinothrix calamaris, Echinothrix diadema, Tripneustes gratilla and Heterocentrotus mammillatus. Along the four 50-m

transect sites, 203 to 525 individual fishes from 34 to 50 species were sighted, most of which were small reef-dwelling forms (no species names were given in the Bowers data).

In the study by Kinzie (Kinzie, unpublished), transect 9 off Kihei was nearest the present project area. Along the transect were extensive sand bottom areas with 100 percent cover and a soft-bottom community for both transect 9 and 8 (off Kealia Pond). The sandy bottom was lacking in coral and had the following faunal types: gobies with alpheid shrimps in burrows, Macropthalmus telescopicus (a crab), Portunus sanguinolentus (haole crab) and sabellid polychaetes (worms). Very few molluscs, urchins, coelenterates and fish were present over sandy bottoms as compared to over coral reefs or rocky bottom substates. The sediment off Kihei, and in deeper parts of Maalaea Bay, is a mixture of calcareous marine sediment and terrigenous sediments from streams (Kinzie, unpublished).

An outstanding formation revealed in the study was the Kihei Shoals (Figure 11), a bottom formation of shallower depth (ca. 6m) than the surrounding sea bottom, which was covered by coral with abundant associated fish fauna. Farther to the north in Maalaea Bay and along the rocky beach shoreline (Figure 11) there was a much richer macroalgae cover

and subtidal fauna including coral, other coelenterates, fish and molluscs.

Farther to the north of the present project at Palalau (Figure 11), between Kihei and the small boat harbor, there is a very rich and diverse biota (Maciolek, 1971), including macroalgae, corals, molluscs and fish. There were 59 species of macroalgae identified, mainly red, green and brown algae, all at depths less than 12 feet. There were 17 species of corals in six genera: Fungia, Leptastrea, Montipora, Parona, Pocillopora and Prites. There was also a wealth of molluscs, 165 species in 87 genera representing 39 families of gastropods and 10 families of bivalves. Maciolek (1971) did not specifically survey the fish, but noted abundant, small demersal species of goatfishes (Mullidae), surgeon fishes (Acanthuridae) and butterfly fishes (Chaetodontidae). Also probably present were species of wrasses (Labridae), damsel fishes (Pomacentridae) and parrot fishes (Scaridae).

KEALIA POND

National Wildlife Refuge: The importance of Kealia Pond for waterbirds has long been recognized by resource agencies (Reference 54). Kealia offers safe refuge to several species of waterbirds. Two of the principal species are the Hawaiian Stilt or "aeo" (Himantopus himan topus knudseni) and the Hawaiian Coot or "alae Keokeo" (Fuliua americana alai). They are classified

as "endanagered" by the U.S. Department of the Interior as well as the State Department of Land and Natural Resources (DLNR). Subsequently, Kealia Pond has been proposed to be part of an endangered species recovery plan and to be included in the National Wildlife Refuge System (Reference 54). However, Kealia has not yet been formally designated as a critical habitat.

Section 7 of th Endangered Species Act of 1973 (PL 93-205) instructs all federal agencies to take appropriate action to prevent destruction or modification of habitat considered critical to the survival of any endangered or threatened species. The pond provides intermittent habitat for the Hawaiian Stilt and Coot, in addition to other waterfowls. These birds use Kealia for resting, feeding and nesting.

Aquaculture: Due to the brackish waters, only top minnows (Poealia vittata) and channel catfish (Ictalurus punctatus) are presently being produced commercially (Reference 54).

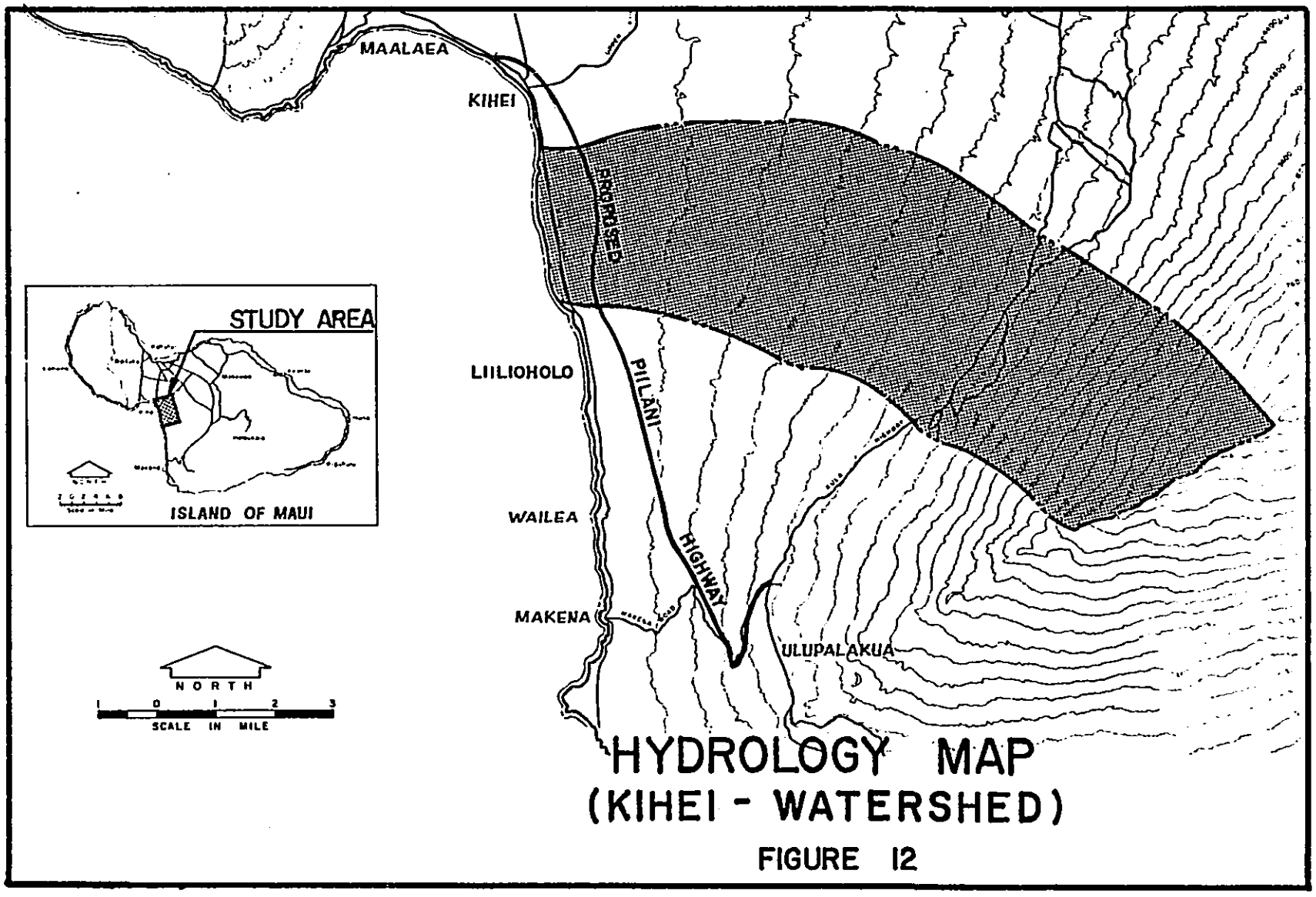
Drainage and Flooding

Hydrology

Hydrological conditions in the project area are described by the: 1) location and area of the Kihei Watershed, 2) distributional patterns in rainfall, and 3) characteristics of stream discharge and land drainage. The Kihei Watershed is the source area for surface runoff entering the three gulches

which are seasonally intermittent streams, Kulanihakoi, Waipuilani and Keokea (Reference 17). The watershed, or drainage area is approximately 38 square miles above and 2 square miles below the proposed Piilani Highway, and it extends from the 9,000-foot elevation to the seashore (See Figure 12 - Hydrology and Map). The project area is generally dry much of the year, with an annual median rainfall less than 15 inches (See Figure 8 - Isohyet Map). The topography and prevailing tradewinds produce an isohyetal pattern in which rainfall increases with higher elevation and shows low rainfall on leeward slopes and high rainfall on windward slopes (Reference 12).

The long-term (10-50 years of complete records) annual median and ranges in rainfall (Reference 12) along the Kihei-Makena coastal zone (three rain gage stations) and at higher elevations in the Kihei watershed (two stations) indicate a median of 12-15 inches per year up to about 1,000-foot elevation and about 30 inches per year at 3,500-foot elevation (see Table 4 - Annual Rainfall Data). Of great importance is the large range in the annual rainfall (about a five to ten-fold ratio of maximum/minimum). At Kihei and Maalaea, the minimum annual rainfall is about 1/5 of the median while the maximum is about twice the median, suggesting more extreme dry seasons than wet ones. At Keawakapu and higher elevations, the rainfall values are more symmetrical with respect to the median, the maximum being about twice the median and the minimum being about one-half the median (See Table 4). However, the annual rainfall data show only general patterns



HYDROLOGY MAP
(KIHEI - WATERSHED)

FIGURE 12

TABLE 4

ANNUAL RAINFALL DATA

Gage No. and Name	Gage Elevation Feet	No. Years Complete Records (period of record)	Median Range inches/year
A. Stations near Sea Level	80	48 (1900-)	14.9 33.4-2.5
#310 Village F (Maalaea)			
#311 Kihei Village 3	60	36 (1903-)	12.3 26.5-2.8
#260 Keawakapu	350	10 (1948-)	13.7 27.1-4.9
B. Upper Kihei Watershed			
#318 Waiakoa	1,250	21 (1937-)	12.2 26.5-4.7
#330 Alelani	3,500	22 (1936-)	30.8 52.8-15.2

Reference 29

the bed material in the streams appears to be very similar to the general soil composition of the general watershed, the sediment transport (in the streams) could be categorized as soil erosion rather than bed-load discharge.

d. Sheet flow runoff conditions are created by the steep and relatively uncut slopes that possess minimal water retention or other absorbtive features to retard runoff. The type of natural vegetation found in the arid lower elevations also has little or no effect in retarding runoff.

e. The limited access of flood waters further complicates the flooding problem. Sand dune formation caused by littoral drift and alluvium build-up in the lower courses and at the stream outlets become natural barriers that restrict flood water flow into the open sea. The blockage of ocean outlets has resulted in the backup of floodwater into the low lying and depressed areas (References 2, 3 and 18).

f. Undersized and inadequate drainage openings along Kihei Road become either quickly filled to capacity or obstructed, resulting in the inundation of nearly every drainage structure in the area, backup of water and ponding in low lying areas (Reference 2).

g. Urbanization has also changed the natural drainage pattern and increased the runoff quantities considerably. Landscaping and grading have developed new paths of flow for storm runoffs while impervious layers of concrete and asphalt preclude absorption of rainfall into the ground. Many new developments in the area which lack sufficient drainage facilities (References 17 and 18) have compounded the existing flooding condition.

Summarily, the lack of an overall flood control system and a comprehensive interior drainage plan has caused repeated flooding in this area during periods of heavy rainfall, cyclonic storms, tsunamis or storm surge action. Past floods have threatened and/or caused damage and losses to improvements in the area, human and animal life, property, crops, public installations such as roads, utilities, parks, bridges and foundations, (Reference 1).

Existing Drainage Facilities

The existing drainage system consists of drainage facilities with capacities which are insignificant compared to the volume surface runoff generated by the urbanized Kihei area during a 50-year storm. These facilities were installed piecemeal with no overall plan in mind, resulting in sporadic locations of facilities throughout the project area. Existing drainage facilities and structures are limited to a few unlined

In summary, the Kihei coastal zone is subjected to serious flooding as a result of three major hydrological features: 1) short-duration, intense rainfall characteristic of Kona storms; 2) an extremely large watershed (about 40 square miles) from which water descends as sheet flow and in three major gulches; and 3) a relatively flat coastal plain, without sufficient drainage channels and outlets, which allows water to collect in low-lying areas before it can eventually flow into Maalaea Bay.

Statement of the Flooding Problems

Three intermittent streams, Kulanihakoi, Waipuilani and Keokea Streams, flow in an east to west direction and drain a large percentage of the watershed. The streams do not maintain stabilized channels and are generally narrow and poorly defined because of intermittent rainfall and minimal runoff throughout most of the year. They are normally dry gulches, flowing only during periods of excessive rainfall. Consequently, the natural drainage system is poorly developed and the streams, susceptible to overflowing, contribute heavily to flash floodings in the Kihei drainage basin when filled in excess of their physical limits during storms or heavy rains. The high volumes and velocities of the flood waters of these streams, on their approach to the Kihei flood plain, cause the overtopping of nearly every existing drainage structure crossing Kihei Road. This flat low lying coastal area is the recipient of all of this surface runoff and contributes to the flood problems

in the Kihei area (Reference 1, 2, 3, 17 and 18).

High seas and tsunamis have also been responsible for large amounts of flood damage in the past. The shoreline areas in the project site that are subject to tsunami damage, as well as those areas of the flood plain subject to inundation due to 100 year storms are shown in Figure 13 - Flood Plain and Tsunami Inundation Limit.

Frequent occurrences of floodings in the area can be summarized as follows:

a. The existing streams, which drain a large portion of the Kihei watershed, are not well-defined water courses, and have limited channel capacities that are unable to contain peak flows during storm periods. As a result, runoff from the upper areas of the watershed descends onto the Kihei flood plain in voluminous quantities creating flood problems in the area (Reference 3).

b. The estimated amount of soil loss from erosion to be expected during the average or normal year for the entire watershed is 1,958 tons. (See Appendix B)

c. Bedload discharges for the three major streams (Kulanihakoi, Waipuilani, and Keokea Streams) have been computed in Appendix C. However, the bed materials for the streams appear to contain only medium to fine sands and silts. Since

and amounts of rain in the project area, and the rainfall over 24 hours during severe storm conditions can amount to 50 percent of the annual median value (i.e. 6 inches in 24 hours).

Whereas it is the extremely large amount of rain in a short time period which ultimately causes the flooding, the characteristics of land drainage and stream flows are also major contributors to the problem. The coastal zone, which is flood-prone, extends from about the 20-foot elevation to the seashore (see Figure 13 - Flood Plain and Tsunami Inundation Limit). The area of this map represents regions threatened by flooding with a 100 year recurrence interval or 1 percent average probability per year. Of the three seasonally intermittent streams which drain the Kihei Watershed, only Kulanihakoi has regularly measured discharge data (Reference 29). The predicted peak discharge for Kulanihakoi Stream is 5,850 cubic feet per second (cfs) with a 50-year recurrence interval or 2 percent average probability per year (Reference 29). During the major storm of March 23-24, 1967, peak discharges measured in the three streams in the project area were:

Kulanihakoi	2,740 cfs
Waipuilani	1,340 cfs
Keokea	778 cfs (Reference 17).

The rainfall which caused these stream peak discharges was 6 inches in 24 hours at Kihei-Maalaea and 4 to 7 inches in 24 hours for the project area and its upper watershed (Reference 17).

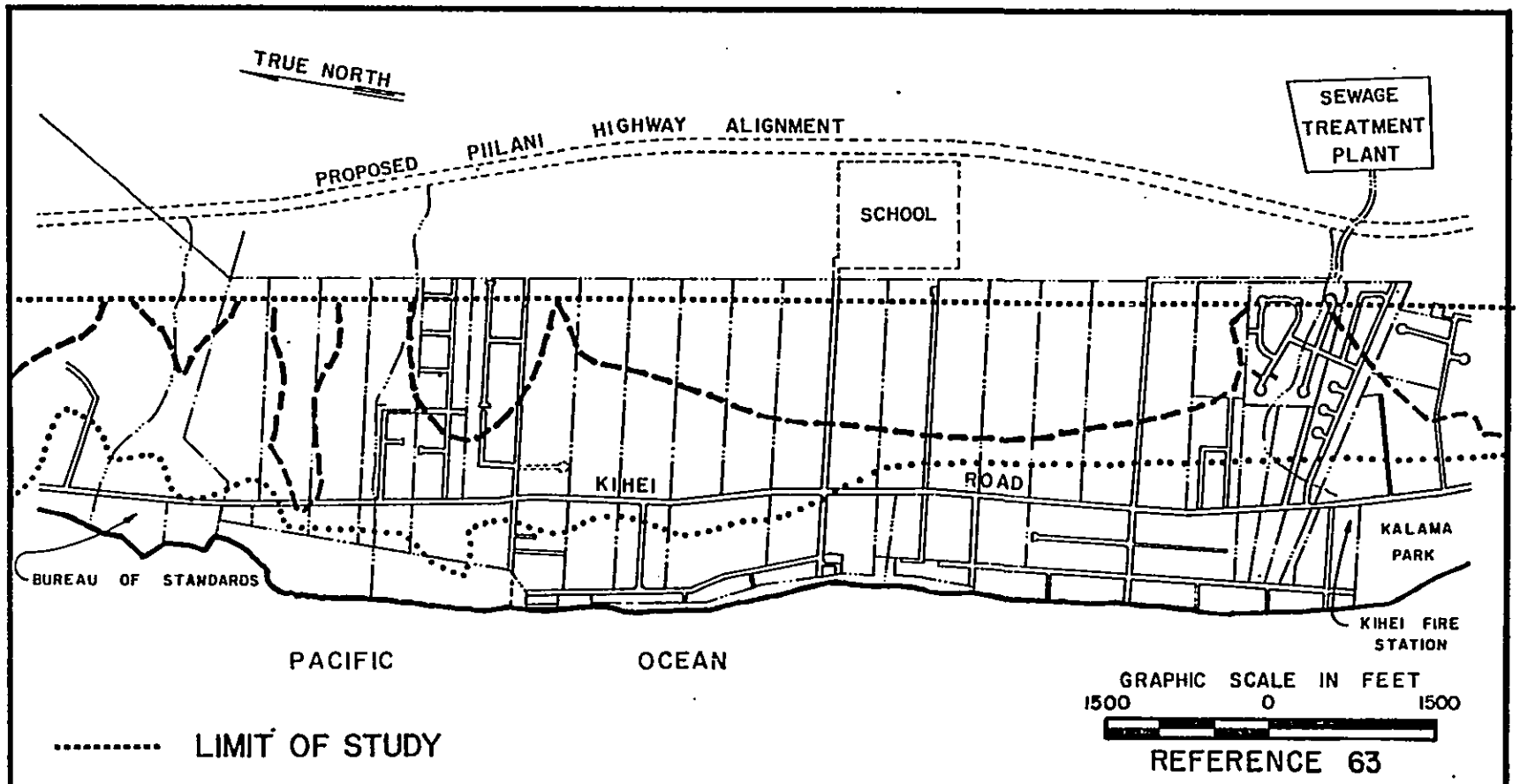


FIGURE 13

FLOOD PLAIN AND TSUNAMI INUNDATION LIMIT

channels, drain lines, scattered pipe crossings, pipe or box culverts and rather hazardous roadside ditches. These are mostly located in the vicinity of Kihei Road (See Figure 14 - Existing Drainage Facilities Map). Specifically, they consist of the following:

1. A 25-foot long bridge along Kihei Road at the Kulanihakoi Stream crossing near Kaonoulu Street.
2. A pipe culvert across Kihei Road midway between Kulanihakoi and Waipuilani Streams crossings.
3. A 3.5 x 12-foot concrete box culvert across Kihei Road at the Waipuilani Stream crossing.
4. A concrete box culvert across Kihei Road in the vicinity of St. Theresa's Church and Lipoa Street that drains into an unlined channel in an area currently serving as a ponding area.
5. Two open unlined interceptor ditches which are narrow and shallow along both sides of Kihei Road between Nohokai Street and Welakahao Road for an approximate length of 4200 feet.
6. A 2 x 3-foot box culvert along the west side of Kihei Road across Lipoa and Waiohuli Streets.
7. A 24" corrugated metal pipe along the east side of Kihei Road across Lipoa Street.
8. A 24" concrete pipe culvert along the west side of Kihei Road across Welakahao Road.
9. Two 24" corrugated metal pipes along Welakahao Road across Halama Street.

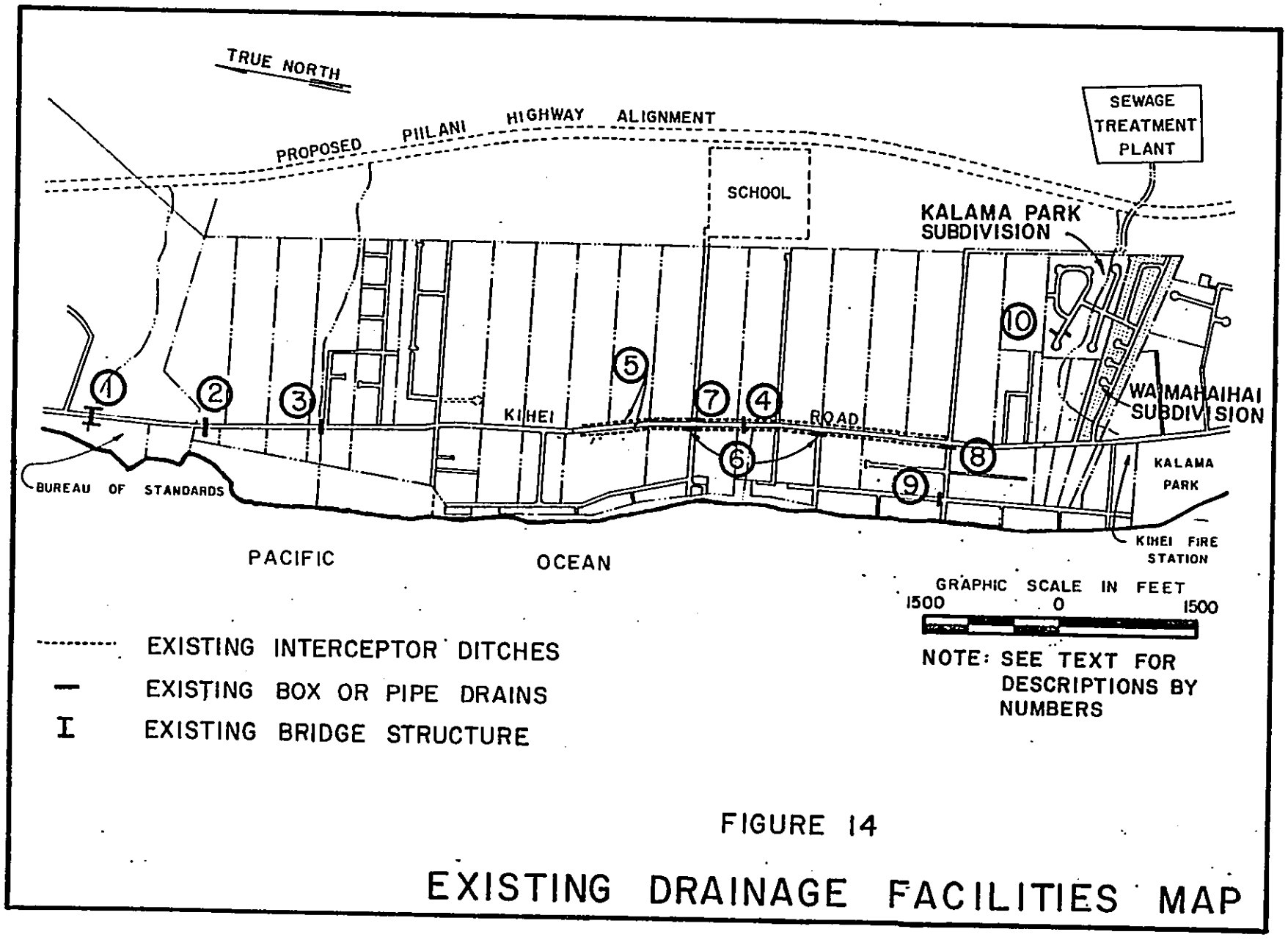


FIGURE 14

EXISTING DRAINAGE FACILITIES MAP

10. A pipe drainage system servicing the needs of the new Waimahaihai and Kalama View Subdivisions which channels runoff into Keokea Stream or into inplace drywells.

The existing facilities mentioned above are inadequate to handle storm surface runoff, the principal existing facilities being the roadside ditches, the bridge at the Kulanihakoi Stream crossing, and the box culvert at Waipuilani Stream. The open, unlined dirt ditches, which run along both sides of Kihei Road for over 3/4 mile are approximately 2 to 3 feet wide and 2 feet deep. These ditches are of major concern to County authorities as they pose both health and traffic hazard problems.

Health hazards exist during times of heavy rains and winter storms when these ditches become filled and in many instances overflow into the surrounding roadways and properties. Subsequent water collection in low-lying areas then creates standing water caused by the slow overall drainage of the excess discharges. The problem of maintenance then occurs. Clearing is required after every major storm to remove and dispose of debris collected in these shallow ditches.

Traffic hazards continuously exist for this stretch of Kihei Road lined with roadside ditches and narrow shoulders. They account for the increased risk to motorists when traffic accidents do occur, or cars are pulled over to the roadside. Although the ditches are fairly shallow, the high occurrence of vehicles being caught in them causes concern for the welfare and safety of drivers.

The following alternatives have been suggested for the alleviation of the traffic problems along this particular stretch of Kihei Road: 1) the ditches be filled with granular material which would permit some storage of storm runoff; 2) the ditches be separated from the travelway by guardrails; or 3) the ditches be completely filled and covered. Any of the above actions could be implemented prior to the completion of the new drainage facilities.

Other existing facilities such as for the two new subdivisions of Kalama View and Waimahaihai, do not provide a solution to the flooding problems in the area, due to the disposal of runoff into Keokea Stream (which terminates its course just above Kihei Road). In general, due to the lack of overall flood control measures and a comprehensive interior drainage system, Kihei has been plagues by frequent flooding which has resulted in extensive damages to the entire region.

Significant Floods and Flood Damages

In an attempt towards understanding the flooding problem in the Kihei project area, one only has to consider the record of historical events. The Kihei Drainage Project area, having been subject to periodic inundation since 1900 with considerable flood damage to public and private properties, has had a history of 12 "significant floods" up to 1971. The area below the 40-foot elevation, particularly the region inland from Kihei Road, is considered the main flood plain and flash flood area (see Figure 14 - Flood Plain and Tsunami Inundation Limit).

Floods in the project area are caused by storm waves, tsunamis, heavy rains and storm runoff from the mountain slopes of Haleakala. Floods affect developed areas in many ways: 1) disrupting normal activities of the area; 2) impairing production capacity; 3) disrupting utilities services; 4) damaging property of all types; 5) erosion or major loss of soil; 6) endangering or loss of human and animal life; and 7) undermining of structural foundations.

Significant floods and their resulting damages were reported in the following publications:

a. Flood Plain Information, Kihei
   County of Maui, Corps of Engineers, 1970.

b. Flood Hazard Information, Island of Maui
   Dept. of Land & Natural Resources, Corps of Engineers, 1971.

c. Flood of March 24, 1967, Kihei and Olowalu Areas
   Dept. of Land & Natural Resources, 1968.

d. Drainage Master Plan for the County of Maui
   State of Hawaii, 1971.

e. Report on Survey for Flood, Kihei District
   Corps of Engineers, 1964.

Floods which have caused considerable damage to public and private property in the Kihei area are briefly described below:

a. November 1900
   Three cabins were destroyed and machinery covered by landslides caused by excessive runoff.

b. January 1910, 1930, 1949, 1950, 1951, 1956 (Reference 1)

Heavy rains inundated low lying areas, closed off the highways and caused considerable damage to crops and other private property.

c. January 16-20, 1916 (Reference 1 and 3)

The worst storm in the history of the island brought on heavy rains, high seas and strong winds of hurricane strength and caused $500,000 worth of damage in the Kihei area including livestock drowned the destruction of six railroad bridges and small culverts, damage to cane and irrigation ditches and roads covered with sand, water and debris.

d. February 24, 1951 (Reference 1, 2 and 3)

Greatest known flood in the Kihei flood plain caused by intense rainfall (6.5 inches in 24 hour period). Flood waters from the heavy rains resulted in $60,000 worth of damage to private property and $15,000 damage to public property (roads, bridges, parks, and waterlines).

e. July 1953 - December 1954 (Reference 1)

Heavy rains and the resultant runoff flooded the Bureau of Standards, highways and low lying areas, stranded cars and deposited debris and mud over the highway.

f. December 21, 1955 (Reference 1, 2 and 3)

Rainstorm caused an estimated $40,000 worth of damage

to crops, homes highways and parks. Highways became impassable due to swift flowing floodwaters.

g. January 1959 - January 1963 (Reference 1 and 3)
Heavy surf conditions and storm wave activity caused serious erosion of beachfront property, deposition of substantial amounts of sand along the Kihei coastline and minor flooding.

h. May 22, 1960 (Reference 1 and 3)
Tsunami or seismic waves caused $23,000 worth of camage to houses, roads and utilities inundated along the coast.

i. March 24, 1967 (Reference 1, 3, 17 and 18)
Heavy rains (6.0 inches in 4 hour period) caused waters to stand 2 feet deep across Kihei Road, a broken water main, acres of ruined crops, torn pavements and eroded shoulders with damage totaling $71,300. This was considered the most extensive flooding since 1951.

j. January 28, 1968 (Reference 3)
Storm with the highest runoff since 1963.

k. January 27-28, 1971 (Reference 3)
Storm caused damage of $95,000 to Kihei with the Kihei flood plain inundated up to 6 feet deep.

The above chronological summary briefly outlines some of the major flooding events up to 1971 reported by different County, State or Federal agencies.

One interesting trend in the frequency of major storm data is the occurrence of storms in January and the regular, near 20-year interval of recurrence (viz. 1910, 1930, 1949-1951, 1969-1971, etc.)

Land Use Distribution

State Land Use

The State Land Use Law of 1961 created a Land Use Commission whose responsibilities include the classification of all lands in the State of Hawaii into four general use categories (urban, rural, agriculture and conservation), and the establishment of district classification boundaries for these lands. Most of the coastal areas and lands west of the proposed Piilani Highway alignment in the study area are designated urban. These are generally defined as lands or areas characterized by city-like concentrations of people, structures, streets, and other related land uses (Reference 16).

County General Plan (Kihei Civic Development Plan)

The County General Plan breaks down even further the broad categories of land use as designated by the State Land Use Law. The County of Maui has designated specific land uses and development standards and has developed the Kihei Divic Development Plan as the basic guide for controlled growth along the southerly coastline of Maui (see Figure 15 - Kihei Civic Development Plan). In full congnizance of the long range

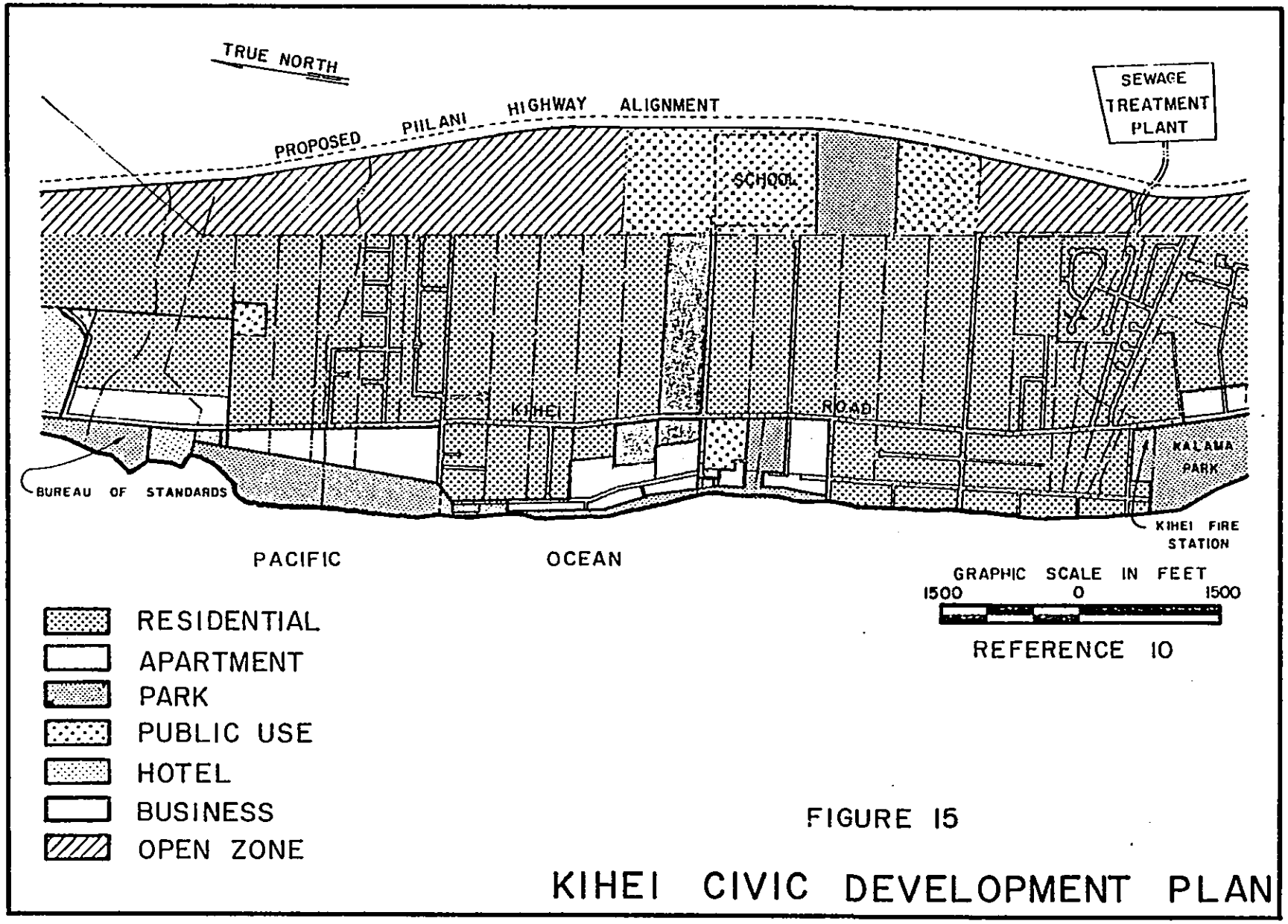


FIGURE 15

KIHEI CIVIC DEVELOPMENT PLAN

benefits of exercising prudence in land use designations, this comprehensive plan provides for the balanced and orderly development of the Kihei area over a 20-year period by encouraging but also controlling economic development.

The urban district of the Kihei study area is divided into residential, apartment, hotel business, resort commercial and park areas. Most of the lands in the study area have been planned for residential development and the second largest amount of land has been planned for hotel, condominium-apartment type developments. The 1.3 miles of beach frontage owned by the State has been set aside for park lands (Reference 10). However, there are areas that are either vacant and unused, or in marginal use as pasture lands (Reference 16).

Historic Sites

Fourteen sites were found within the Kihei Drainage site boundaries (Figure 16). Appendix D lists the descriptions for all of the sites. Of the 14 sites, only the potential fishponds (Sites 1704 and 1738) seem to have preservation significance (Reference 55).

The updated Hawaii Sites Register indicates that the Hawaii Register of Historic Places Review Board has classified the Kalepolepo Fish Pond (Site 1704), a huge ancient Hawaiian pond that is naturally protected by an old semi-circular coral seawall, as a valuable historic resource. The enclosed pond area encompasses a 34 acres of the ocean and provides a haven for various water activities such as swimming, snorkeling and fishing. The pond fronts a large tourist-oriented condominium type complex (Reference 20). Site 1738 is presently classified as an unnamed fishpond.

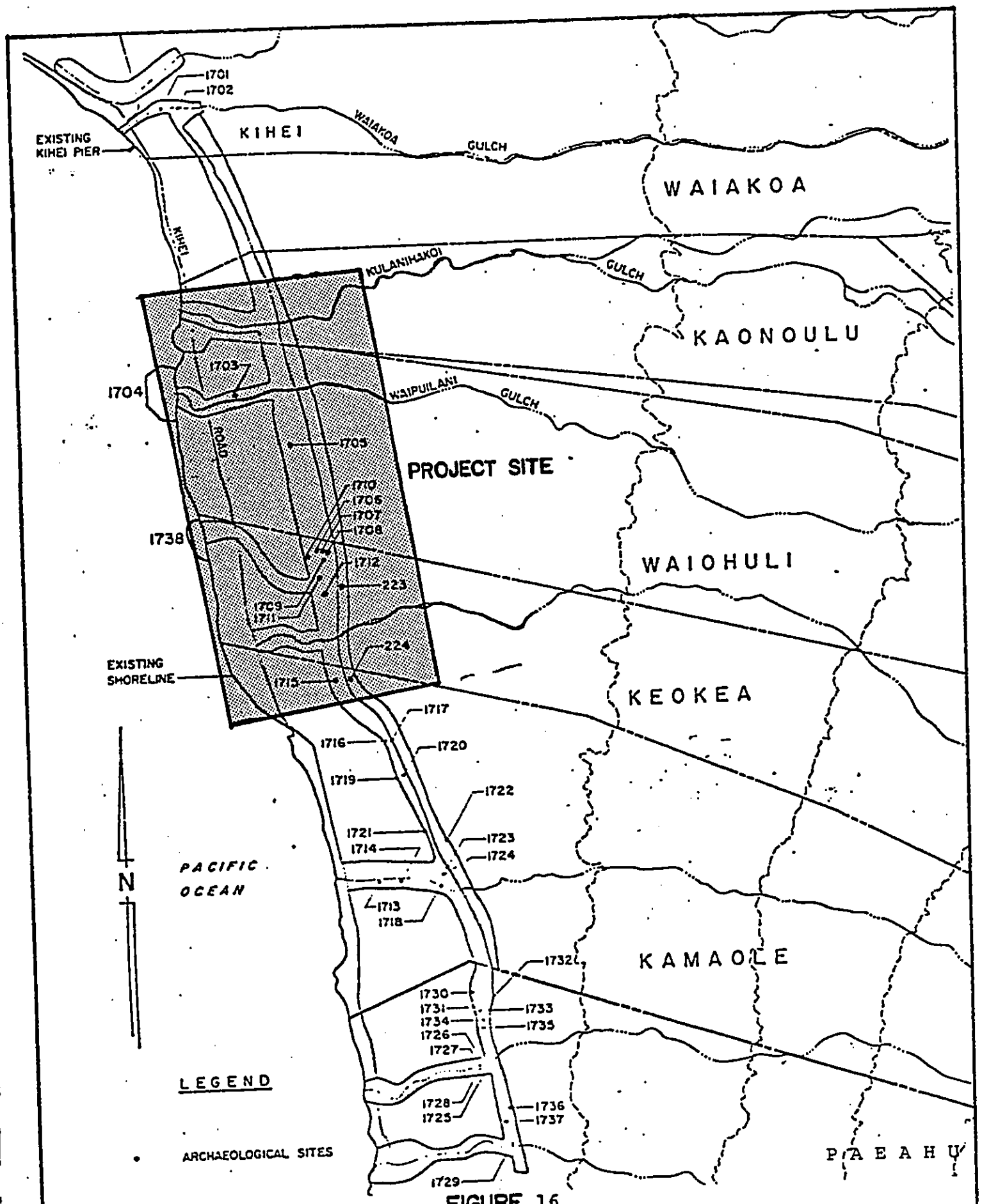


FIGURE 16

REFERENCE 55 LOCATION OF ARCHAEOLOGICAL SITES

The Captain George Vancouver Monument located opposite the Maui Lu Resort is a Hawaii Visitor's Bureau marker commemorating the visit in 1792 of Captain George Vancouver (See Figure 11). The Thunderbird Totem pole carved by Nootka Indians on Vancouver Island stands as a monument to honor the arrival of Vancouver and the Canadian pioneers to Maalaea Bay.

Other historical or significant sites that may have existed prior to urbanization in the area have been destroyed by bulldozers in the clearing and grubbing process to make way for improvements.

Recreational Sites

Recreational activities in Kihei are primarily centered around beach oriented activities, although hunting and golfing are also past-times for residents and visitors to the area. Hunting of wild pigs and goats is allowed on the lower slopes of Haleakala all year round. Golfing is a new activity at golf facilities at the Maui Lu Resort and a new championship golf course at Wailea, part of a large Kihei development project.

Beach parks in the Kihei area are among the most popular recreational sites for local as well as outside communities. Ocean shorelines and sandy beaches attract a great number of people for outdoor recreation. The Kihei area has great spots for swimming, snorkeling, skin diving, beachcombing, net, spear and pole fishing along the shore, as well as deep sea fishing. Many little sandy beaches are accessible from dirt roads leading off Kihei Road and it is along these coastal areas where shoreline fish are plentiful.

One of the outstanding county parks or recreational sites near the study area is Kalama Beach Park, consisting of 36.5 acres of park area with public facilities for game activities, picnicking, camping and boating.

The Kihei area has the potential for creation of the most outstanding beach-oriented recreational areas because it possesses natural amenities (mild climate, attractive sand beaches, relatively unspoiled environment, etc.) equal or superior to any resort area in the world. It is expected that Kihei will become a major tourist destination area. In anticipation of the expanding recreational needs and demands of the visitor and resident population, more park developments and open spaces are being planned for the 1.3 miles of beach reserve lands owned by the State in the study area. One of the primary objectives of the Kihei Civic Development Plan of the Maui County Planning Commission, is to preserve all government-owned shoreline areas for public use (Reference 10).

Land Ownership

Property in the study area belongs primarily to individual owners whose lands are mainly in residential use (see Figure 17 - Land Ownership Map). Land parcels are generally small and ownership is scattered. The two largest land owners are Hale-akala and Kaonoulu Ranches, located inland to the east. A substantial acreage of beach-front property is State of Hawaii government owned, and has been designated park areas for public recreational use by Maui County in the Kihei Civic Development Plan.

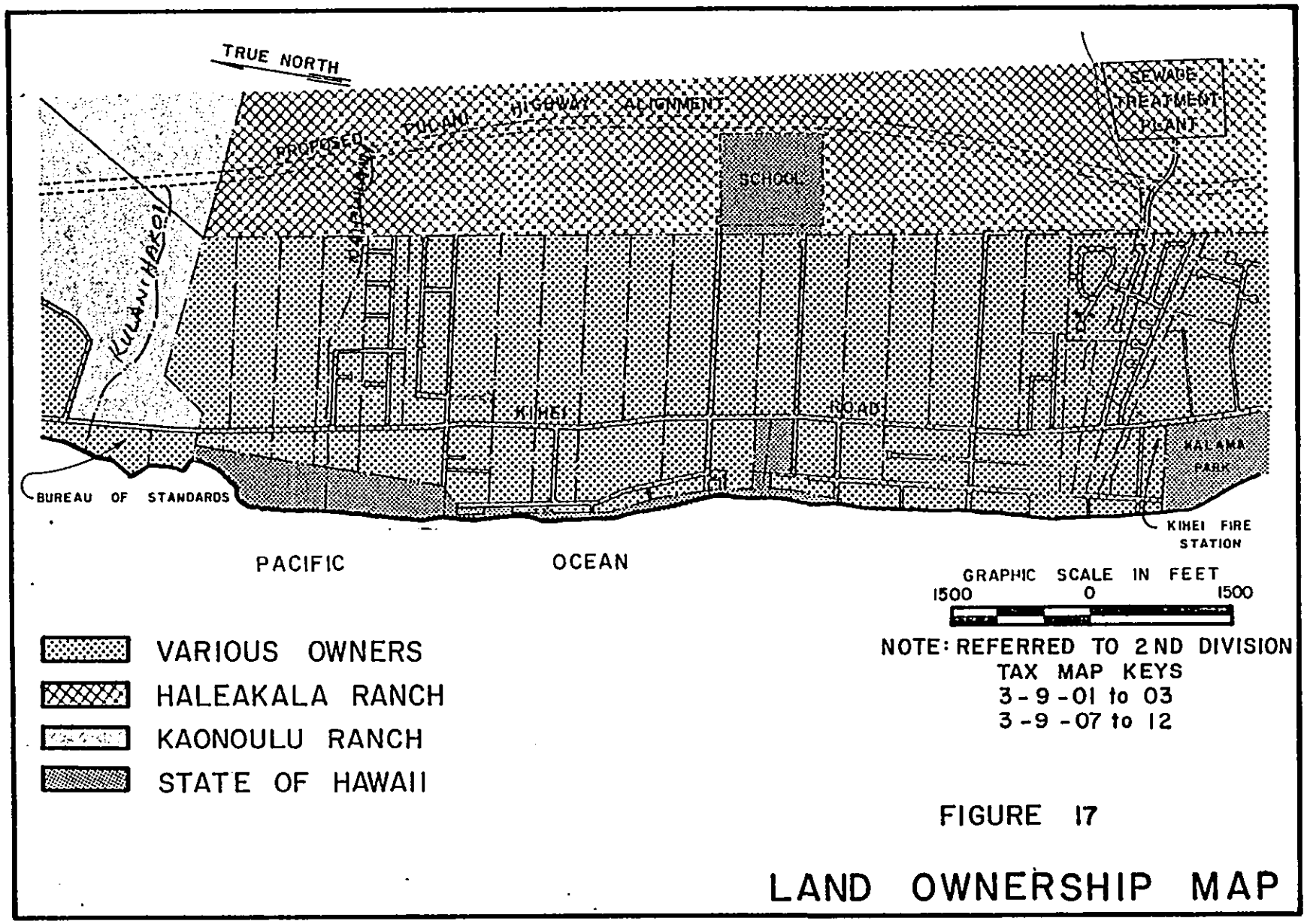


FIGURE 17

LAND OWNERSHIP MAP

Socio-Economic Patterns and Trends

Industry

Despite the increased activity in the tourist industry in Kihei, agriculture still plays a relatively important role in the economy of this rural community. Sugar farming in northern Kihei remains a principal land use of the area. The sugar industry is maintained by the Hawaiian Commercial and Sugar Company (HC&S) plantation (owned by Alexander and Baldwin, Inc.) which covers most of Central Maui Isthmus and is the largest sugar farm in the nation. In 1974, despite the effects of the 1973 drought which brought the lowest yield in 10 years and resulted in a substandard crop, HC&S posted record revenues due to skyrocketing world sugar prices (Reference 24).

The pineapple industry in Maui is supported by the island's biggest grower, Maui Land and Pineapple Company which annually produces and cans 125,000 to 140,000 tons of pineapples. In 1975, dollar sales reached a new record high despite the fact that the total case volume of sales was 10 percent less than in 1974. Further improvements in production were predicted for 1976. The company has just recently invested in a 575 acre deluxe resort facility in west Maui which is to include two hotels, a golf course, two shopping areas and several areas for low-rise condominiums (Reference 39).

In Kihei a new industry is the production of seed corn on a 138 acre parcel located at Mokulele Road and Kihei Road junction. The weather in Kihei makes possible the production of

seed corn year round. The Minnesota based Trojan Seed Company is in its 8th year of hybrid feed corn production (Reference 24). The discovery of large beds of black coral fields in deep waters off Maui have led to the development of a new industry in creative Hawaiian jewelry.

Tourism

During the last 20 years, the visitor industry has emerged as a vigorously growing segment of the Hawaiian economy. The pace of tourism in Maui's resort areas is evidenced by the 850,000 annual visitors to the island (Reference 21). In 1974, the Maui County Visitor Association, prodded by condominium and hotel developers, other builders and planners, waged a half million dollar promotional campaign with emphasis on luring quality tourists to Maui's shores. The publicity was based on the current trends of: 1) increasing number of tourists; 2) rising hotel occupancy rates; and 3) increasing average length of stay (Reference 25).

During the winter of 1974, the hotels sustained occupancy rates in the high 80 and low 90 percentages. The Hawaii Visitors Bureau reported Maui as being the host to half of all tourists who visit the Neighbor Islands, with Canadians making up an increasing percentage of the visitors and becoming a potent spending force in Maui's visitor industry (Reference 24 and 25).

Attention is being focused on the Kihei area where the continuing influx of visitors who stay in condominiums has

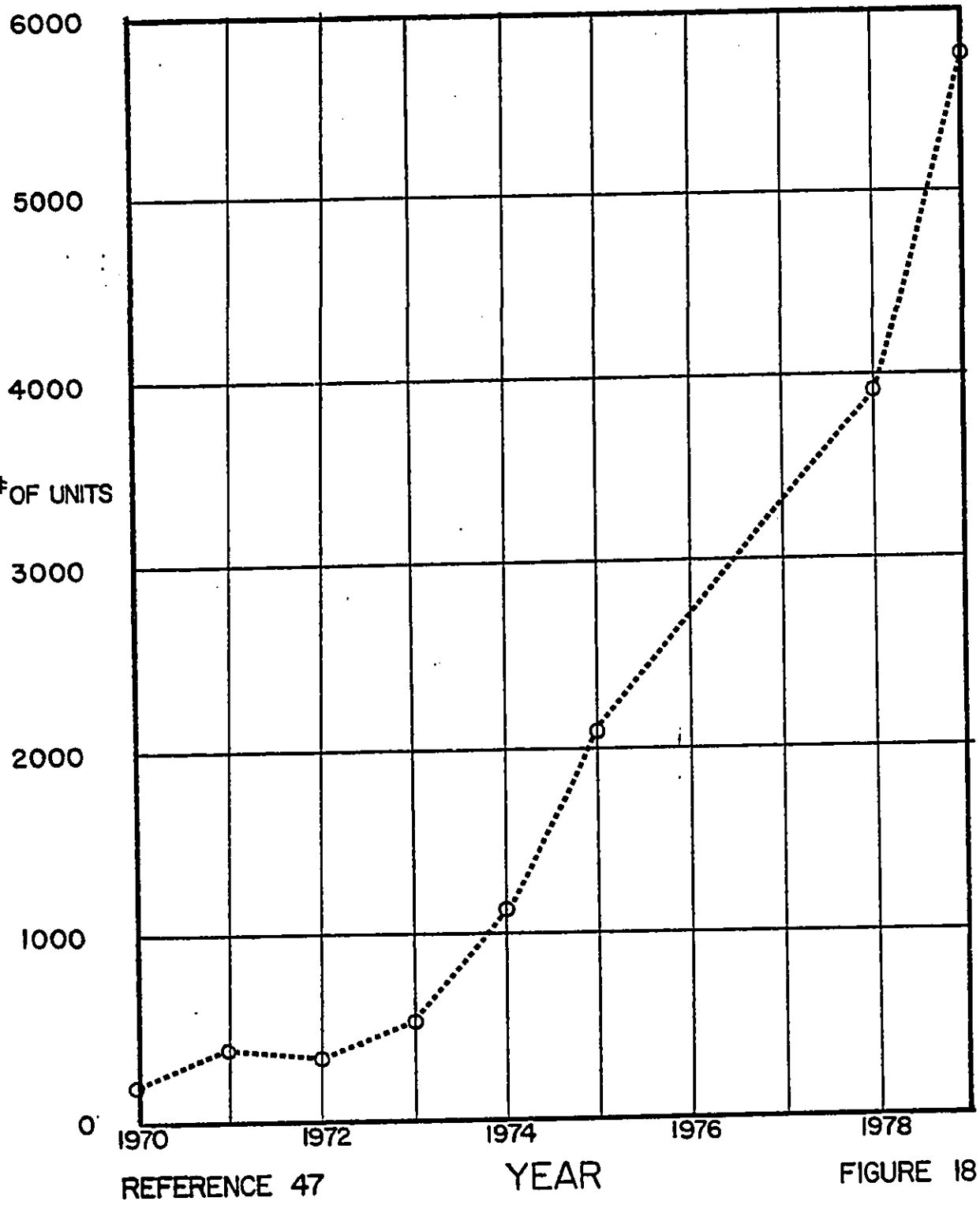
resulted in the visitors' length of stay being extended from one to six weeks (Reference 26). The concentration of tourist-oriented development is increasing economic activity along the shoreline.

Construction

Most of the island's construction is concentrated on West Maui's shores and the southern East Maui shores of Kihei. A high level of construction activity is being sustained with tourism as the principal growth stimulant. Resort growth on Maui is taking on large proportions with the biggest project being built on the coast just south of Kihei. In 1974, the dollar volume of new construction as derived from new building permit figures was an astronomical $115 million, an increase of 60 percent over figures of 1973, the latter being an increase of 50 percent over figures of 1972. By mid-1975, 2026 condominium units were completed (Figure 18 - Condominium Units in Kihei). However, this was also the year that construction was drastically reduced and construction activity on condominium projects came to a virtual halt as a result of a national recession.

In 1976, construction activity has resumed and Hotel-Condominium building was back in full swing again with construction of the 1500-acre, $21 million Wailea Hotel and condominium village development and the 1030-acre development in Makena (Reference 21 and 28).

CONDOMINIUM UNITS IN KIHEI
(FROM MAALAEA TO WAILEA)



REFERENCE 47

FIGURE 18

Today, visitor accomodations in Maui County have increased more than fivefold since 1965 (Reference 46). In October, 1978, there were 8,697 hotel units on Maui Island, of which 3,078 units came from the Kihei area (Reference 46). Kihei thus comprises 35% of Maui's total for hotel units. Plans for 1,881 new hotel units on the Island of Maui have been announced (Reference 46).

Existing Hotel, Condominium, Apartment facilities in the Kihei Drainage Project Site consist of the following:

FACILITY	HOTEL UNITS	FLOORS
Kihei Holiday	48	6
Hale Kai OKihei I	30	3
Hale Kai OKihei II	29	3
Island Surf	80	6
Kauhale Makai	168	6
Menehune Shows	162	6
Koa Lagoon	42	6
Leilani Kai Resort	9	2
Maalaea Resort Apartments	5	1
Maui Lu Resort	207	2
Luana Kai	114	4
Kihei Bay Surf	118	7
Puuhala Apartments	52	2
Hale Mahialani	6	2
Vicent Dias	8	2
Kihei Garden Estates	84	2
Maui Sunset	225	5
Wailana Sands	10	2
Kalama Plaza	44	11
Waipuilani	42	3
The Boardwalk	10	2
Leinaala	24	4
Waiohuli Beach Hale	53	4

FACILITY (continue)	HOTEL UNITS	FLOORS
Hale Wailana (Proposed)	6	2
Fumio Tsuji (Proposed)	8	2
Dave Sharp Apartments (Proposed)	5	2

SOURCES:

1) HAWAII VISITORS BUREAU PLANT INVENTORY (Oct. 1979)
2) MAUI DRIVE GUIDE (Nov. 1979-Jan. 1980)
3) CONDO '79 - SUPPLEMENT/MAUI SUN (April 9, 1979)

It is estimated that less than 50% of Maui County's hotel and apartment-zoned lands have been used (Reference 47). Figures for proposed development indicate the potential for adding more than 20,000 units along the western and southern coast of Maui (Reference 47). A significant amount of expansion is being proposed in the Kihei area (Reference 48). In Kihei, there has been proposals for new multi-family projects totaling over 6,000 units. Condominiums will comprise the majority of these figures. According to projections, 4-5 condominium units will be built for every one hotel unit (Reference 49).

Land Development and Utilities Expansion

In the 1960's, land development and the tourist industry on the Island of Maui were relatively dormant. Economic growth at the time seemed remote, and no one envisioned the construction explosion that was to occur in the 1970's. Today, the condominium or apartment complexes are fast becoming a prominent characteristic of the Kihei area. The trend is toward larger, higher density projects, whether they be condominiums, hotels or apartments as developers react to spiraling land and construction costs. Geared to resort use, these condominium developments

have produced an accelerating growth rate best evidenced by the continuing change in its coastline profile (Reference 19, 20, and 21).

Obviously, the wave of development along the Kihei shores is placing a heavy burden on public service facilities. The County government is striving to keep pace with the ever increasing demands on sewage, water, roadway, and other public facilities. Assuming 1990 development occurs at a level midway between high and low projects (See Table 5), the additional population (visitors and residents) may be estimated at 8,800 (Reference 46). Therefore additional facilities and services will be required to serve the growing population of the Kihei area.

Water

Greater demands are being made on the Maui County water supply and water distribution system. Planners for the County Department of Water Supply, mindful of the lingering effects of the debilitating drought of 1973, are laboring to tap an already marginal water table and are working to upgrade the current County system.

The new Central Maui Transmission Line is the product of a public-private joint venture which includes: the County of Maui; Wailea Development Company (a joint venture subsidiary

TABLE 5

PROJECTED ADDITIONAL UNITS

Unit Type	Existing 1980	1980-1985 Low	1980-1985 High	1980-1990 Low	1980-1990 High
Hotel	1345	600	900	900	1200
Apartment/Condo	5358	2400	2600	5100	5800
TOTAL UNITS	6703	3000	3500	6000	7000

Reference 47

of A&B and Northwestern Mutual Insurance Company); and Seibu Hawaii, Inc. The County, Wailea Development Company, and Seibu Hawaii, Inc. contributed $4 million, $4.455 million, and $2.555 million respectively, in order to construct the transmission line between Waiehu and Makena (Reference 49).

Under terms of the agreement between the three partners, the County will reimburse Wailea and Seibu for a major part of their investment over a 15-year period beginning January 1, 1976. Reimbursement will equal 70% of the revenues generated by new water meter hookups made possible by the new source and pipeline as specified by existing Water Board rules (Reference 50). There is a proposal to increase water source development at a rate of 1.5 mgd per year. This will be financed by the County's existing assessment fee of $2,700 per unit for all new multi-unit structures (Reference 47).

Sewage

Responding to increased development along Kihei Road, the County Public Works Department operates the Kihei Sewage Treatment Plant (STP) and sewer systems to service the Kihei area. Funding the bulk of the $10.8 million cost of the project was the County and State (Reference 47). To offset some of the initial cost, the Wailea Development Company paid $2.3 million toward total cost of the treatment plant designed to service the Kihei area and their 1500 acre Wailea resort development in Wailea. The capacity of the Kihei STP was 4.0 million

gallons per day (mgd) in 1978. Several existing sewage pumping stations (SPS) contribute sewage to the Kihei STP. Seven SPS and a network of gravity lines located along Kihei Road, pump sewage from the North Kihei and Wailea areas to the Kihei STP (located above Kalama Park). In addition, the Wailea SPS pumps sewage along the South Kihei Road to the Kihei STP (Reference 47).

There have been several proposed improvements that will increase stress on the Kihei STP. These include:

1. An addition to SPS #2, to permit Maalea waste water to be pumped to the Kihei STP. This proposal will not be implemented until 1989.
2. SPS in Makena will permit Makena sewage to be pumped to the Kihei STP.
3. Pressure Relief and Relief Gravity lines will transport waste water from Kihei Road to the proposed Kihei-Ulupalakua Road, if developments in Wailea and Makena require it. Gravity lines will feed directly into the Kihei STP (Reference 47).

To accommodate these improvements, there has been proposals to expand the Kihei STP capacity to 9 mgd. Presently though, this has not been included in the CIP budget. Loads on the existing Kihei STP capacity will be relieved with the Seibu's private STP in its Makena Development (Reference 47).

Roads

A portion of Piilani Highway between Mokulele and Wailea Iki is presently under construction. Completion is set for 1982. Present construction costs are $15.9 million. The State will finance $5.7 million of this total. After 1985, the State proposes to extend Piilani Highway from Wailea Iki to Kula Highway (Reference 47).

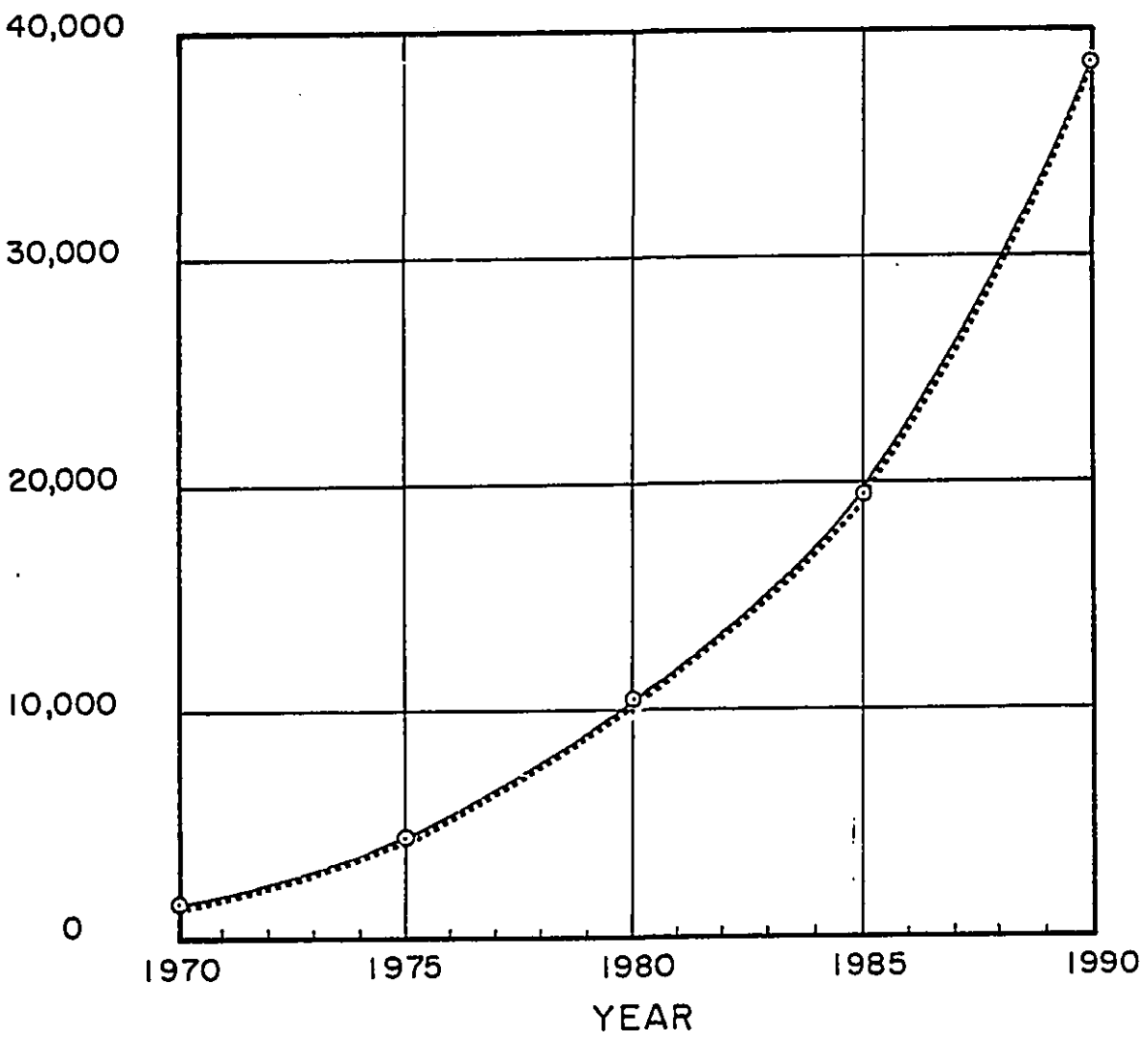
Electricity

Electrical power is presently being supplied to Kihei via 4 steam generators in Kahului and 10 diesel generators in Maalaea. The generators at Kahului and Maalaea generate 39.5 and 58.7 megawatts of power respectively. There have been proposals to place three more generators in Maalaea. The first generator will be constructed in October 1980; the second in 1982; and the third in 1983. Each will have the potential to generate 13.5 megawatts of power (Reference 51).

Employment and Population

The upsurge in resort activity has meant new employment opportunities for the island's resident population. More Maui residents have occupations connected with tourism by direct employment in hotels, resort shops, restaurants, airlines and ground transportation, than with the sugar and pineapple industries (Reference 31). Accompanying the growth of tourism is the demand for workers in service and skill occupations, such as the need for electricians, painters, carpenters,

POPULATION PROJECTIONS
(From Kihei to Makena)



REFERENCE 10

FIGURE 19

plumbers and truck drivers (Reference 15). Although new visitor accommodations create more job opportunities, the unemployment rate is boosted by a large, young transient population and seasonal plantation works (Reference 21).

With condominiums along the shoreline being geared to resort use, the trend is directed toward hotel-type of management in these condominiums. Condominium developments, however, still fail to provide as many employment opportunities as do hotels. They currently employ 3 people for every 4 units, whereas larger hotels hire 2 workers per room.

According to the 1975 Census Update Survey for the 7 districts of Maui County, the Kihei-Kula District has 55.9 percent of its 14 year and older population employed parttime or full time. Approximately 9,350 persons live in this district and comprise 15.7 percent of the total population of Maui County. Population projections for the area between Kihei and Makena reflect population estimates from the Kihei Civic Development Plan (See Figure 19 - Population Projections).

Water Moratorium

The Maui Board of Water Supply (BWS) has imposed an emergency moratorium regulating the issuance of water meters, the approval of subdivision applications, and the approval of building permits. Restrictions will be enforced until such time that adequate water sources are developed. According to the Maui BWS, the Central Maui Water Transmission Line presently

does not have the capacity to service the water demanded at Kihei. Therefore, the moratorium was implemented to limit the number of proposed developments. However, there are several exemptions (Reference 58) to these limitations. Applications for subdivisions, building permits and water meters will be allowed under the following conditions:

1. ....if one single family residential dwelling unit is provided for each subdivision lot.
2. ....if construction is to be used for public purposes.
3. ....for single family or multiple dwelling units will be allowed if such units are used solely for housing employees of the developers or government-sponsored groups.
4. ....if each subdivision lot is limited to one 5/8 inch meter for each subdivided lot.

Although the moratorium will impede growth and development in Kihei, it will in no way extinguish it completely. The Kihei Drainage Project will insure the residents protection from flood hazard.

3. PROBABLE IMPACT ON THE ENVIRONMENT

Impact on Physical Resources

Sediment Discharge

Present conditions allow water to stand on the Kihei flood plain during high volume rainstorms. As the flood waters pond over the coastal area, large amounts of sediment are settled out and deposited. The rest of the sediment load is carried out into the sea, and is eventually deposited on the ocean floor.

The proposed drainage structures would preclude ponding and allow all of the sediment load, the bulk of which originates in the upper levels of the Kihei Watershed, to enter the ocean. For example, the sediment load for a 50-year storm is estimated to be approximately 6545 tons, 1500 tons of which is presently deposited on the Kihei flood plain. The remaining 4600 tons enters the sea. The Kihei Drainage Project will drain flood waters from the flood plain without affording sediments the opportunity to settle and will, thereby, increase the sediment discharge into Maalaea Bay by 1500 tons or 30 percent (see Appendix E). Watershed sediment discharges into the ocean for smaller storms will also increase over their present value. The proposed drainage system would increase sediment inputs of a storm supplying approximately one-fifth the runoff volume of the 50-year storm by 37 percent (see Appendix F). In this case, the weight increase would be 374 tons over the present 1001 tons discharged into the bay.

With the construction of Piilani Highway, the runoffs originating above the Highway will pass through the highway's culverts and filter into the Kihei Drainage System. 26,055 cfs of runoff, or 0.4 tons/sec of sediment will pass through 10 drainage crossing stations of Piilani Highway (See Table 6). 23,649 cfs or 0.36 tons/sec of sediment will be diverted into the three major stream channels. The remaining 2,406 cfs or 0.04 tons/sec of sediment will infiltrate the interior systems (Appendix G).

Construction activities during rainstorms may also produce sediment discharge into the sea. Excavation and grading work will destroy or loosen the existing ground cover to expose soil to weathering. Periods of rainfall or watering as a preventive measure for dust control will cause runoff flow over newly exposed ground and convey sediment to the ocean.

Tsunami Inundation

The Kihei area is characterized by a non-breaking (non-bore) wave condition that acts like a rapidly rising tide. The incident current velocities with this type of tsunamis are low. Therefore damages will be less than the bore-type tsunami that devastated Hilo in 1946. However, there has been incidence of non-bore tsunamis lifting homes off the foundations (See Reference 56). This type of damage is a potential hazard that exists for residents living within the tsunami inundation limits (See Figure 13).

TABLE 6

RUNOFF FROM PIILANI HIGHWAY

Drainage Crossing Station	Design Discharge (Q_{50} in cfs)
593 + 40	895
603 + 00	9,681
615 + 76	259
625 + 50	7,871
636 + 52	423
649 + 65	132
661 + 78	404
669 + 80	169
675 + 03	124
692 + 00	6,097
TOTAL DISCHARGE	26,055 cfs

Reference 60

Water Quality

The immediate result of increased sediment discharge would be higher levels of turbidity and discoloration of the receiving waters in the immediate vicinity of the drainage outlets for the duration of the storm and for a short period after the storm passes. Turbulence generated by the high velocity discharge and by wave action will keep the fine silt and clay size particles of sediment dispersed in the water column until runoff decreases and settling occurs.

The rate of sediment accumulation on the ocean floor will increase slightly as the extra load is distributed onto the bottom. Because significant additional quantities of sediment (30 percent increase over existing loads) will be added mainly when major flooding (i.e. 50-year storm) occurs, the increase in the accumulation rate is expected to be so small over time as to be negligible.

The total weight of total dissolved solids in the storm water discharge will remain the same. Dissolved solids are picked up by runoff via the erosion process in the watershed which remains unchanged by the construction of the drainage system.

Under natural conditions, the water quality existing at Kihei does not meet all the standards set by the State regulations. The high turbidity and discoloration has limited the recreational and aesthetic uses of the water. Thus, the project will not alter the present uses of the water.

Marine Life

Surveys offshore from Kihei indicate that the variety and quantity of marine life there is limited and sparse on a mixed mud-sand and rocky bottom. This coastal area differs greatly from the much richer and more diverse areas to the north and south of Kihei (Reference 46). Inputs of additional sediment during occasional storm discharges such as the 50-year storm, therefore, are not expected to constitute a highly damaging external shock to the normal activities of the marine ecosystem which even now experiences sediment inputs.

Humpback Whales

Whales populate the Maalaea Bay - Kihei Waters during the winter months, when the islands are experienceing high occurrences of storms. The turbidity level of the waters will increase due to the excess runoff and sedimentation. Exactly how turbidity does in effect, impact the whales has never been quantifibly or scientifically examined.

The adverse effects on whales from increased turbidity due to the project will not be significant, because the Kihei waters are presently highly turbid (Reference 46). Since the whales have been populating the turbid Kihei waters in the past, they should continue to populate the waters after construction of the project, experiencing no significant harassments.

Air Quality and Noise

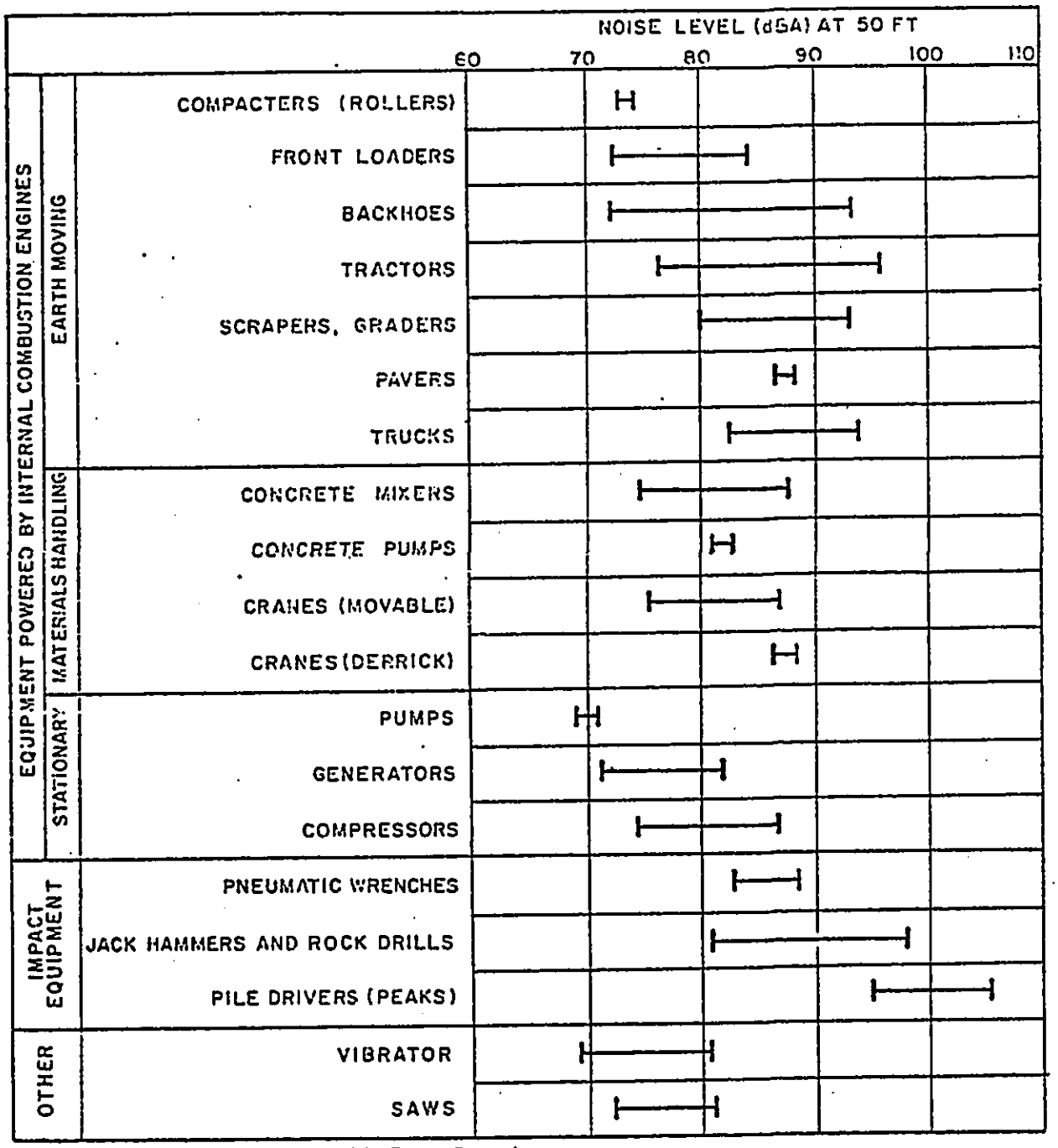
A certain amount of dust and noise will be generated during construction operations. Air quality is expected to be affected somewhat by increased dust emissions during the construction phase of the proposed drainage project. With strict control of dust dispersion at the project site to minimize the effect of dust particles on the surrounding air quality, no permanent impact on the air quality is anticipated.

A higher level of noise will be sustained during construction and installation of the drainage system. This will present a temporary nuisance to specific surrounding areas. Those areas include: Kalama Park, Kihei Fire Station, Bureau of Standards, Kihei Elementary School, St. Theresa Church, Kihei Beach, and the residents presiding near the construction. Conventional construction equipment will be used. Generated noise ranges are presented in Figure 20.

Noise will be generated during all phases of construction, or approximately 10-15 years. The application of specific control measures for minimizing or completely eliminating problem associated with air and noise qualities are discussed in the section concerning "Minimizing Adverse Environmental Impacts."

Usage of Space

The proposed drainage facilities, where exposed, will alter the visual character of the gulches and shoreline areas especially at the ocean outlets. Visual asthetics may be affected by the proposed drainage structures and their accompanying protective fencing. However, most of the drainage installations consisting



Note: Based on Limited Available Data Samples

FIGURE 20. CONSTRUCTION EQUIPMENT NOISE RANGES.

REFERENCE 61

of concrete box structures and approximately 6 miles of pipe drain lines will be underground and out of view.

Most of the proposed facilities will not require additional purchase of land, but rather will share the same right-of-way for the existing county roadways. This multiple use of space will minimize the acreage of land that may have to be acquired by the County for drainage easement purposes. The acquisition of some private lands adjacent to the proposed drainage structures may be required for construction and maintenance purposes.

Beaches and Movement of Sand

Use of the beach at pipe and channel outlets will be required to accept and disperse storm water collected by the new drainage facilities. These outlets will restrict free passage along the shore, since the channels will be relatively deep and must be fenced to protect unwary beach-goers. Pedestrian bridges across the outlets will be constructed to provide access to other parts of the beach.

A pair of boulder groins at each culvert outlet (Figure 5) will prevent collection of sand at the mouth of the channel which would block storm water discharge into the sea. These groins, however, interrupt the natural longshore movement of the sand. The result of this interruption will be the build-up of sand on the up-current side of the channel and the gradual disappearance of sand from the down-current side. The rate of accumulation and erosion will be proportional to the rate of longshore sand transport while the amount of sand accreted on the up-current side of

the outlets will be determined by the impounding capacity (i.e. length) of the groins.

Because few observations of the current have been made, the current direction in Maalaea Bay is not well defined. In fact, observations have indicated that at times the current runs in a clockwise direction in the bay while at other times, it runs counter clockwise (Reference 46). The implication for this project, therefore, is that the "up-current" and "down-current" sides of the outlets may switch and the effect of sand movements over the long term will be dampened, although short term accumulation or erosion will occur. Erosion to adjacent beaches, resulting in property loss and value could be significant. Some method of restoring the natural distribution of sand will be required to alleviate the expected erosion. The occasional transfer of sand by trucks from one side of the outlets to the other may suffice.

With the construction of the groins, the use of the beach for recreational activities such as pole, net or spear fishing may be positively affected in and around the proposed outlets. The groins may act as solid substrates to which algae and marine plants used for food by fish may attach themselves. The tips of the groins will provide easier access to the deeper waters of Maalaea Bay.

The preliminary open channel outlet design (Figure 6) does not include groins. This permits the longshore movement of sand along the coast to continue unheeded. The lack of groins,

however, allows a sand plug to form at the mouth of the outlet which ponds low drainage flows behind it. A special design feature of the open channel outlet, called a bypass channel, causes the quick breakup of the sand plug during heavy flows to provide a clear path to the ocean.

Floodwaters (travelling down the channel) are diverted into the wall that allow the water to by-pass the sand plug. The water will then erode the sand from the ocean-end, thereby cutting a pilot trench through the plug. Floodwaters will then pass through the breached plug. The advantages for the by-pass system are numerous. The system does not extend out into the ocean and therefore, does not change the configuration of the beach (Reference 52). The structure uses the force of storm water flow to remove the sand and thereby eliminates the necessity of mechanically opening the stream mouth during a storm.

Historical & Archaeological Resources

The large majority of pipes, culverts and channels proposed as part of the Kihei Drainage Project will be installed in already cleared and worked areas. Since the drainage system will be installed in the existing street right-of-ways, any sites of historical or archaeological interest that had existed in those areas will have already been destroyed. According to the reconnaissance (Reference 55), the interior drainage should not affect any archaeological sites. In order to protect all sites near the proposed construction, all identified sites should be clearly flagged so they can be avoided and protected. Should any sites of potential historic or archaeological interest be encountered

during construction, activity in that area will be halted to allow examination by a qualified archaeologist. If these sites are judged as significant, they will be protected under Chapter 6, Hawaii Revised Statutes. If any burial sites are uncovered, the Department of Health, in accordance with Chapter 321, Hawaii Revised Statutes, must be notified to ensure that the burial site is indeed "ancient."

The four drain outlets proposed by this project will necessarily cross the beach to discharge into the sea. There is the possibility of sand burials being disturbed by this section of the project although the existence of such burials has not been recorded in the Kihei area.

Since silt will not be discharged directly into the Kalepolepo Fishpond, no significant disturbance to the south wall is expected. The Area 2 outlet is part of the Kihei interior drains and not of the larger channels. Therefore, less discharge will impact the Fishpond. But due to its close proximity to the outlet, the water quality within and surrounding the Kalepolepo Fishpond will be affected.

All potential actions that may alter water quality will be monitored by the Department of Health, to insure that water quality will never be afftected to such an extent so as to be inconsistent with existing standards.

Aesthetics

Except for the outlet portions of the drainage system all pipe will be buried and out of sight. Design of the outlets has

not been finalized, however, all structures will conform as closely as possible to the existing ground topography. Aesthetics of the structures shall be considered during the design of the outlets. The final design will require approval by the Corps of Engineers and the Department of Land and Natural Resources before the outlets are constructed.

Secondary Impacts of Urbanization

A possible consequence of the Kihei Drainage Project may be the increased trend of the area toward urbanization. Future development in the watershed above Kihei would change the characteristics of the discharge (i.e. volume and suspended load) from the watershed in various ways. The size of the development will determine the magnitude of these changes.

Of prime importance would be the volume increase in surface runoff from pavements and buildings constructed over areas which were formerly protected by vegetative cover. Impervious surfaces would also reduce the amount of sediment picked up by the runoff, but may add to the storm flow residues commonly found on streets and pavements such as grease and rubbish. Storm drains are presently discharging these residues from Kihei into Maalaea Bay. Construction activity in the watershed may temporarily cause sediment discharge increases.

Traffic volume to and from Kihei will show increases corresponding to increasing urbanization. Significant heightened traffic volume, however, would occur on the proposed

Piilani Highway which is scheduled for completion in 1980. Traffic following Kihei Road would most probably decrease when the new highway is made operational.

Air and noise pollution problems associated with traffic movements in 1993 are estimated to be small. The worst case condition of the maximum 1-hour carbon monoxide concentration along the new highway is 1.342 ppm. The State of Hawaii Standard 1-hour CO concentration is 9.0 ppm. Estimated noise levels along the proposed highway do not exceed the 70 dBA allowed by the Federal Highway Administration's PPM 90.2 (Reference 41). Moreover, traffic volume increases associated with the urbanization of Kihei alone are only part of the projected traffic flow predicted in 1993.

Waterfowl (the Hawaiian Coot and Stilt) inhabiting Kealia Pond are not expected to be affected by these low levels of noise and air pollution.

Economic Impact

A more efficient drainage system in conjunction with the Maui County Drainage Master Plan would serve to enhance the development and economic potential of the area in accordance with the County Kihei Civic Development Plan. The new development will affect the overall economy of Kihei in the following areas:

Employment and Construction

Construction of the project will result in immediate benefits of employment and economic activity. The proposed drainage improvements will generate construction activity in the area, which in turn will provide both temporary employment opportunities and permanent employment opportunities for maintaining the project after completion.

Tax Base

The proposed drainage system will affect land values and taxes in the area. The acquisition of some private lands adjacent to the proposed channel courses will remove these lands from the tax rolls. However, the surrounding areas that will benefit from the new drainage improvements will generate higher property taxes because of higher land values subsequent to the improvements. In general, the improvements will result in a stabilized economic base, with a slightly smaller tax base generating larger tax volumes.

Land Use and Urbanization

Increases in land values may extend beyond the boundaries of the proposed project. As property values rise and land taxes increase accordingly, economic pressure may induce agricultural companies to turn to alternative uses for their land. Increased urbanization may be the result should adequate public service be available. These services include roads and utilities and must be provided before further development is possible. The trend toward urbanized land development is

typified by Maui Land and Pineapple Company's initiation of the Kapalua Golf Resort.

An effective drainage system will alter the present boundaries of flood hazard districts laid out by County Ordinance 716. Development of uncleared land and improvements of existing property will be less restricted as certain areas of Kihei are re-districted into flood secure districts.

The reduction of potential flood damage will also affect the insurance rates determined by the study presently being conducted under the Federal Flood Insurance Program. Decreased premiums will mean less of a burden to the property owner and add a further incentive for development.

Social Impact

Public Health and Safety

The proposed interior drainage system should be beneficial to the health and general welfare of the people by providing the necessary facilities to afford protection from flood disasters caused by the lack of an adequate drainage system. The primary consideration in the development of a drainage system is the public's health and safety. Based on the past history of floods in Kihei and the high probability of future floods, the local government is concerned with minimizing the threat of floods in the area. Threats of costly flood damage, monetary losses and intangible sufferings beyond economic measure without an adequate drainage system are always present. The proposed

improvements will serve to minimize such threats. In general, the drainage improvements will ensure the safety of the general public occupying the low lying flood-hazard areas of the Kihei flood plain, thereby enhancing the sense of social well-being of the people.

Displacements

The proposed drainage system is not anticipated to require the displacement and relocation of people and businesses.

The proposed drainage structures are located to conform as closely as possible to existing roadway right of ways. Where diversion from these right of ways is considered necessary, the drain lines have been placed so as to create the least amount of disruption to normal activities.

Population

Population projections for the Kihei-Makena area reveal an upward trend in the residential population (see Figure 19 - Population Projections). This is most likely caused by the upsurge in employment and construction activities centered around the Kihei resort area.

The proposed interior drainage plan will serve the ever increasing population in the Kihei area which has shown population changes beginning around 1968. Table 7 shows: 1) the population growth rate for specified periods, and 2) the Kihei population expressed as a percentage of the overall Maui Island population (Reference 4).

TABLE 7

POPULATION GROWTH RATE

Year	Growth Rate
1960-1970	51.6%
1968-1970	10-13%
1970-1973	16%

Year	Percentage of Island Population
1960	3%
1970	4.2%

The above reflects the positive increase in the population growth for Kihei.

4. UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS OF THE PROPOSED PROJECT

The proposed drainage system, during construction and installation or after completion, will cause some adverse environmental effects. Lined channels and other associated appurtenances, which include concrete box culverts and several outfall structures, will provide negative visual impacts to the natural environment. In those cases where structures are lcoated near beaches and the sea, the aesthetics of the shoreline and beach areas will be adversely affected.

The proposed project will accommodate high volume runoff, conveying more sediment into the sea than presently transmitted under existing conditions during periods of concentrated runoff. The installation of siltation basins and debris barriers, as suggested in the "Report on Survey for Flood Control" by the Corps, will still allow some debris and suspended sediment to enter the system and be disposed of at the ocean outlets in Maalaea Bay.

Construction disturbances will also generate temporary adverse environmental effects. Noise emissions and airborne emissions of dust and exhaust caused by the operation of heavy construction equipment are unavoidable but can be substantially minimized during construction. Inconvenience to local traffic, motorists, pedestrians and abutting owners will also occur.

The necessary earthwork of excavation and backfill operations required for the drainage improvements will be a necessary intrusion upon the environment.

As in most developments, preventive measures can be taken to minimize these effects to the visual environment, noise, air and water qualities, and soil. These are discussed in a following section.

5. ALTERNATIVES TO THE PROPOSED PROJECT

One alternative to the proposed drainage system would be the drilling of drywells at appropriate points in the flood plain to store runoff before it could accumulate above ground. The collected water would then empty by slowly percolating into the underground soil. Borings taken along Kihei road revealed a water table at the 2 to 3 foot elevation (Reference 42). Taking an average elevation of the flood plain as 10 feet, wells 7 feet in depth could be drilled. Complete storage of the 50 year storm flood water require 943,000-four foot diameter wells, clearly much too many to be accommodated in the Kihei area. In addition, the soils at Kihei are low in permeability. Silt and other suspended sediments tend to clog within the soils. Therefore, percolation into the soil is almost an impossibility.

A second alternative solution to the flooding problem is a system of ponds or sediment basins. During and after the storm the ponds would release water at flow rates which could be adequately handled by the existing natural drainage courses without resulting in overflow into the surrounding lands. Some surface grading and an underground pipe system would be required. However, there are several difficulties to this solution. The existing stream courses need to be modified into defined channels to handle the discharge. Without defined stream courses, storm runoff will spread over the entire Kihei area. Also, the cost and land area needed to manage 4.2×10^8 cubic feet of stormwater

runoff is astronomical. For example, a sediment basin 200' in width would need to be approximately 500,000' in length to handle the 50-year storm. Cost would be $500 million in excavation work (Appendix H). Finally, to permit gravity flow of storm water, the ponds need to be located in the lowest areas of the drainage basin unless some type of energy consuming pumping system was utilized to transfer the water to high elevations. There is no space large enough within the project site to treat the large volume of runoff during the 50-year storm.

A third alternative is terracing. The problem foreseen with this solution is the cost needed in grading the entire Kihei watershed. Also all vegetative cover will be destroyed during grading work.

Kihei today experiences extreme vulnerability to floods. The aforementioned solutions addresses erosion and floodwater control above the project site, within the watershed. An interior drainage system is still needed to drain flood runoff within the Kihei project site.

Discharge into Kealia Pond is not recommended. The pond is managed as a wildlife sanctuary (Reference 54). Thus any resulting discharge of silt or runoff from developed areas will severely disrupt management of the sanctuary. Presently, several streams drain into Kealia Pond. Waikapu stream drains some of the eastern slope of West Maui and much of the cane fields of South Central Maui (Reference 54). The feeding, resting and nesting of the wildlife community are not adversely affected by these loads.

The Hawaiian Stilt and other shorebirds desire shallow water depths of approximately 6", levels existing at the pond, today (Reference 54). Added discharge from the Kihei Drainage System will possibly increase the water depth levels. Water quality may also be affected by the discharge loads originating from Kihei. Hydrocarbons and other debris will flow into the Kihei Drainage System (Reference 53) and be discharged with runoff, into Kealia Pond. The marine ecosystem will thus be impacted, possibly damaging the normal activities of the wildlife community.

The proposed alignment of drain lines and outlet channels has been chosen to most effectively protect the project area from floods at the least inconvenience to property owners. Opportunity for discussion and comments by the public will be provided at public informational meetings before the alignment of the drainage system is finalized.

A third alternative is no action and continued floodprone vulnerability.

6. RELATIONSHIP BETWEEN SHORT-TERM USE AND LONG-TERM PRODUCTIVITY

The short-term benefit of the project is to provide for immediate and future relief from localized floodings and the resulting damage to natural resources, property, homes, roads, and utilities, and human lives. The long-term use of the proposed facilities will also provide for relief from major flood damage and erosion.

In view of the County's planned expansion and economic growth of the project area as outlined in the "Kihei Civic Development Plan", the new "Kihei Drainage Project" could be classified as a long-term productive facility. The project will establish a guide for a definite drainage pattern for the orderly development of this rapidly growing urban area. Future residents of the region will also be spared the constant threat of floods. This facility will help to stabilize and improve social and economic well-being of the residents by providing the community with a more permanent flood-control drainage system.

7. MITIGATION MEASURES TO MINIMIZE ADVERSE ENVIRONMENTAL IMPACTS

Unavoidable adverse effects to visual, air, noise and water qualities can be minimized by careful architectural design in the siting and landscaping of these structures, and utilizing various preventive measures during construction operations.

Special architectural and aesthetic design considerations will help to reduce the overall visual effects of these structures and thereby minimize the impact of a modern intrusion upon the natural environment.

The adverse effects of noise and dust on the environment are temporary, occurring during construction and can be substantially minimized at the point of their occurrence. The effect of noise generated by heavy equipment can be reduced by limiting construction work to specific daylight hours and by employing construction machinery with residential type mufflers. Airborne emissions of dust and exhaust, generated by the operation of heavy construction equipment during excavation and backfill, will be regulated by applicable standards and regulated by applicable standards and regulations of the Department of Health, State of Hawaii.

The Department of Health 208 Program (Reference 53) proposes erosion controls in an attempt to limit adverse impacts to the water quality during construction of the project. Utilizing

grading regulations and soil and sediment control ordinances, non-point source pollution can be controlled. Basically, these controls attempt to keep as much soil on the site as possible. Some include: Maui County has developed a grading ordinance which requires a permit from the County Department of Public Works for grading, grubbing and stockpiling.

Conservation Standards, Chapter 37B of the State Public Health Regulations, states that all land disturbing activity is subject to being assigned a severity rating number. This number helps to determine whether a project exceeds the standard set to indicate a possible environmental hazard.

Maui County Ordinance 639 states that excavation will be left uncovered for a minimum aount of time before being back-filled or covered by concrete or stone courses. After completion of the Kihei Drainage Project, the Department of Health, in conjunction with the 208 Program will monitor the water. The effects of sediments in the ocean will be examined and checked for its compliance with the State's Water Quality Standards.

Should any sites of potential historic or archaeological interest be encountered during construction, activity in that area will be halted to allow examination by a qualified archaeologist.

Inconvenience to local traffic during the construction phase of the proposed drainage system will be relieved by providing temporary access to adjacent properties affected.

8. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The drainage project, by its function and design, will result in irreversible commitment of land resources by its acquisition of properties where the proposed facilities do not fall within the existing rights-of-way for the present roadways. The project will also commit expenses, construction materials and labor which represent many irretrievable resources.

The only major use of this drainage development is to confine and convey stream and storm runoff safely and efficiently to the ocean. In this proposed system storm runoff will be collected and disposed of at the ocean outlets resulting in discharge loss of freshwater resources, which could otherwise have been retained and stored for irrigational, agricultural or other purposes.

9. ORGANIZATIONS AND INDIVIDUALS CONSULTED

a. Fish and Wildlife Service, U.S. Department of the Interior

b. Corps of Engineers, Department of the Army

c. U.S. Coast Guard, Department of Transportation

d. Soil Conservation Service, U.S. Department of Agriculture

e. Department of Agriculture, State of Hawaii

f. Department of Health, State of Hawaii

g. Department of Land and Nautral Resources, State of Hawaii

h. Department of Social Services and Housing, State of Hawaii

i. Department of Planning and Economic Development, State of Hawaii

j. Department of Accounting and General Services, State of Hawaii

k. Water Resources Research Center, University of Hawaii

l. Department of Defense, State of Hawaii

m. Planning Department, County of Maui

n. Kihei Community Association

o. Cynthia B. Quisenberry

p. Leslie Skillings, Jr.

q. Mr. Rikio Nishioka, State Public Works Engineer, Department of Accounting and General Services

r. Mr. Douglas Mellen, Secretary, Shoreline Protection Agency

s. George J. Krasnick, Environmental Consultants, Inc.

10. LIST OF REQUIRED APPROVALS

a. State of Hawaii, Board of Land and Natural Resources (for discharges into the ocean)

b. Department of the Army, Corps of Engineers (for structures in tidal waters)

c. County of Maui, Planning Department (Special Management Area Permit)

d. County of Maui Department of Public Works (Permit for grading, grubbing, stockpiling)

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12. APPENDIX

CORRECTION

THE PRECEDING DOCUMENT(S) HAS BEEN REPHOTOGRAPHED TO ASSURE LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

62. Kahoolawe EIS, Environmental Impact Study, Corp.

63. Flood Insurance Rate Map, U.S. Army Corps of Engineers

64. Erosion and Sediment Control Guide for Urbanizing Areas in Hawaii, U.S. Department of Agriculture, Soil Conservation Service, January 1976.

65. Telephone interview with Mr. F. Cerizo, (County of Maui, Department of Land Use and Codes) regarding data from the Kihei Beach Condominiums and Kihei Sewage Systems - 1st Increment Soils Reports on January 31, 1980.

12. APPENDIX

A. Water Quality Standards for the Open Coastal Waters of Kihei

TABLE 8

Water Quality Standards for Class A, Open Coastal Waters
(Reference 57)

Parameter	Geometric mean not to exceed the given value	Not to exceed the given value more than 10% of the time	Not to exceed the given value
Total Kjeldahl Nitrogen (ug N/l)	150.00 * 110.00 **	250.00 * 180.00 **	350.00 * 250.00 **
Ammonia Nitrogen (ug NH_4-N/l)	3.50 * 2.00 **	8.50 * 5.00 **	15.00 * 9.00 **
Nitrate + Nitrite Nitrogen (ug (NO_3 + NO_2)-N/l)	5.00 * 3.50 **	14.00 * 10.00 **	25.00 * 20.00 **
Orthophosphate Phosphorus (ug PO_4-P/l)	7.00 * 5.00 **	12.00 * 9.00 **	17.00 * 13.00 **
Total Phosphorus (ug P/l)	20.00 * 16.00 **	40.00 * 30.00 **	60.00 * 45.00 **
Light Extinction Coefficient (k units)	0.20 * 0.10 **	0.50 * 0.30 **	0.85 * 0.55 **
Chlorophyll a (ug/l)	0.30 * 0.15 **	0.90 * 0.50 **	1.75 * 1.0 **
Turbidity (Nephelometric Turbidity Units)	0.50 * 0.20 **	1.25 * 0.50 **	2.00 * 1.00 **
Non-Filtrable Residue (ug/l)	20,000.00 * 10,000.00 **	30,000.00 * 15,000.00 **	40,000.00 * 20,000.00 **

* "Wet" criteria apply when the open coastal waters receive more than three million gallons per day of fresh water discharge per shoreline mile.

** "Dry" criteria apply when the open coastal waters receive less than three million gallons per day of fresh water discharge per shoreline mile.

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

p^H Units shall not deviate more than 0.5 units from a value of 8.1.

Dissolved Oxygen - Not less than 75% saturation.

B. Soil Erosion Loss from the Kihei Watershed During a Normal Year

Soil erosion loss from the Kihei watershed can be determined through the use of the Universal Soil Loss Equation (USLE) from Reference 64.

E = RK (LS)(CP) where;

E = annual soil loss is tons/acre.

R = a factor representing the total erosive effect of an average year's rainfall.

K = a soil erodability factor. The soil Conservation Service Soil Survey was used to locate the various soil types. Each soil type corresponds to a soil erodability factor. The majority of soil types had a consistent factor of 0.17.

LS = a factor for length and steepness of slope combined.

$$= \left(\frac{\tau}{72.6} \right)^{m} \left(\frac{430\ X^{2} + 30y + 0.43}{6.57415} \right)$$

where;

τ = field slope length in feet

m = slope in %

y = SIN θ, θ is the angle of slope in degrees

CP = a combined factor for the protective effect of ground cover and mechanical or engineering erosion control measures. If no controls of any kind are applied, as in the case of the Kihei Drainage Project, the value of CP = 1

NOTE: TOTAL DRAINAGE AREA = 38.50 mi
SEE PG 38

The Kihei watershed was divided into three separate areas according to the rainfall factor, R (Figure 21).

1. AREA 1 (0.95 acres)

R = 155
K = 0.17
LS = 4.14

where; m = 0.4 (slope = 4% and $\theta = 2.29^{\circ}$)
τ = 34320 ft.
χ = sin θ = 0.04

CP = 1
E = RK (LS) (CP)
= 109. Tons/Acre

∴ = The Annual Soil Erosion Loss for Area 1 (0.95 acre) = 104 Tons

2. AREA 2 (0.57 acres)

R = 180
K = 0.17
LS = 15.27

where; m = 0.5 (slope = 8% and $\theta = 4.57^{\circ}$)
τ = 23760 ft.
χ = 0.08

CP = 1
E = RK (LS) (CP)
= 467 Tons/Acre

∴ = The Annual Soil Erosion Loss for Area 2 (0.57 acres) = 266 Tons

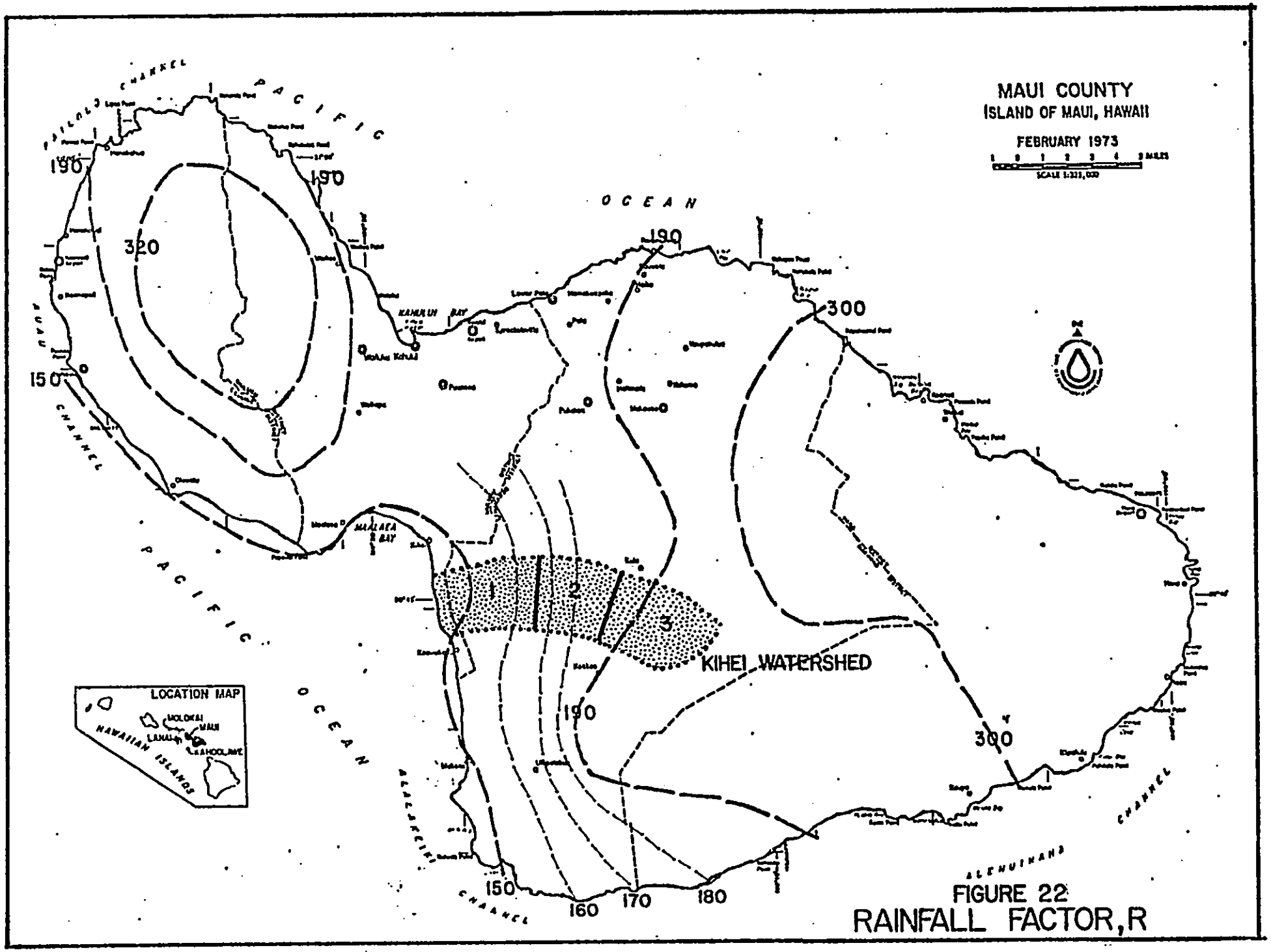


FIGURE 22
RAINFALL FACTOR, R

3. AREA 3 (0.63 acres)

R = 195

K = 0.17

LS = 76.00

where; m = 0.5 (slope = 21% and $\theta = 11.86^{o}$)

τ = 27456 ft.

χ = 0.21

CP = 1

E = RK (LS)(CP)

= 2520 Tons/Acre

∴ = The Annual Soil Erosion Loss for Area 3 (0.63 acres) = 1588 Tons

4. TOTAL SOIL EROSION LOSS FOR AREAS 1, 2, and 3

The Annual Soil Erosion Loss for the entire watershed is 1958 Tons (2.15 acres)

C. Bedload Discharge for Kulanihakoi, Waipuilani, and Keokea Streams

The Bedload Load discharge for the three major streams in the Kihei Watershed can be calculated using the following equation (Reference 59):

$$g_s = 1.606 \left[3.306 \left(\frac{Q_s}{Q}\right) \left(\frac{D_{90)}^{1/6}}{Ns}\right)^{3/2} d\, S^{-0.627}\, Dm \right]^{3/2}$$

where;

g_s = bedload discharge, in tons/day per foot of width

Q_s = discharge quantity determining the bedload transport, in cubic feet per second

Q = total water discharge, in cubic feet per second

D_{90} = particle size at which 90% of the bed material is finer, in millimeters (Table 8)

Dm = effective size of bed material (millimeters) = Σ DAP, where D is the average size of particles in a size fraction, in millimeters, & p is the percentage in that size fraction (Table 8)

d = depth of flow, in feet

s = slope of the energy grade line (usually taken as slope of the water surface)

Ns = manning's n for the streambed

and;

$$\frac{Q_s}{Q} = \frac{1}{1 + \frac{2d}{B}\left(\frac{n_w}{n_s}\right)^{3/2}}$$

where;

n_w = Manning's n for channel sides

B = Stream width, in feet

The hydraulic data (d, S, n_s, n_w, and B) for the three streams were obtained from hydraulic analysis done by the Corps of Engineers. The hydraulic data was adjusted to approximate the general conditions for each of the three streams.

Soil size distribution data for the three stream beds were approximated by comparing data from soil reports for the general project location (Reference 65). Most soil reports indicate a composition of medium to fine sands and silts. However, a sample approximately 1100 feet south of Waipuilani stream near Kihei Road at a depth between 6 and 8 feet below the existing ground contained coarser material. Therefore, sample was used to approximate the bed material of the three streams, the values of D_{90} and Dm were 1.0 mm and 0.7 mm respectively.

The bedload discharge rates can only be estimated because specific data on the stream bed soil conditions are presently unavailable. The sample soils contain large grain size material that may reflect stream bed movement.

1. BEDLOAD DISCHARGE (50-YEAR) FOR KULANIHAKOI STREAM

d = 8.8 ft.

S = 0.04 ft/ft

n_s = 0.04

n_w = 0.04

B = 173 ft.

$\frac{Q_s}{Q}$ = 0.91

D_{go} = 1.0 mm

Dm = 0.7 mm

BEDLOAD DISCHARGE

g_s = 2434 Tons per day per foot of width

2. BEDLOAD DISCHARGE (50-YEAR) FOR WAIPUILANI STREAM

$d = 2.8$ ft.

$S = 0.03$ ft/ft

$n_s = 0.04$

$n_w = 0.04$

$B = 260'$

$\frac{Q_s}{Q} = 0.98$

$D_{go} = 1.0$ mm

$Dm = 0.7$ mm

BEDLOAD DISCHARGE

$g_s = 313$ Tons per day per foot of width

3. BEDLOAD DISCHARGE (50-YEAR) FOR KEOKEA STREAM

$d = 6.3$ ft.

$S = 0.046$ ft/ft

$n_s = 0.004$

$n_w = 0.04$

$B = 151$ ft.

$\frac{Q_s}{Q} = 0.92$

$D_{go} = 1.0$ mm

$Dm = 0.7$ mm

BEDLOAD DISCHARGE

$g_s = 1846$ Tons per day per foot of width

D. DESCRIPTION OF HISTORIC SITES (REFERENCE 55)

Site No.	Site Description
223	Trail located in corridor of Waiohuli section
224	Trail and cave located in corridor of Keokea section
1703	Collapsed frame house of recent construction. Located in Kaonoulu section near Waipuilani Gulch.
1704	A wall extending offshore. Wall encloses a large area (Kalepolepo Fishpond). Located in Waichuli section near Waipuilani Gulch.
1705	Wall, .7 meters wide, .4-.5 meters high and incorporated fence-posts. Located in Waiohuli section, in corridor.
1706 *	A mound and a wall at the base of a low knoll. The mound was 3 meters in diameter, .7 meters high and not fenced. Four meters south, the low, 1 meter wide and 10-20 meter long wall exte-ded out from the knoll.
1707 *	Site 1707 was located on the knoll. It was an enclosure consisting of an alignment of stones (terraced on the ocean side of the knoll. The dimensions were 6 by 7.5 meters (45_m2) by .3-.4 meters high).
1708 *	Two contiguous are stone high enclosures and a contiguous, low (.3 meters high) platform. The enclosures cover a total area of 6 by 11.5 meters (35 m^2). All are terraced on the coastal

Site No.	Site Description
	side of the knoll. Midden re visible on the surface of the central enclosure.
1709 *	Two small enclosures (3x2x.2-.5 meters high--6 m^2; 5x5x.2-.5 meters high--25 m^2) Soil is visible inside.
1710 *	Walled enclosure built on sandy soil and against a high outcrop. The walls are well-built (vertical, .9 meters wide) and high (.8 meters).
1711 *	Small C-shaped low (2x1.5 meters--3 m^2) in length, 2-3 stones high.
1712 *	Small, low rectangular enclosure. (2x3 meters--6 m^2) (.2-.3 meters high) Was built on bare pahoehoe lava and has no visible midden or artifacts.
1715	Three small C-shapes on a low outcrop overlooking a small gulley from the south side. The C-shapes are low (.2-.3 meters high) and small (2x2 meters-4_m2 and 2x3 meters-6_m2) The site is roughly 200' in from the ranch jeep road which extends above the houses. Soil is present at the site. Located in Keokea section in corridor.
1738	Possible fishpond. Located in Waiohuli section by coast.

* (Sites 1706-1712 are located in Waiohuli section, in corridor.)

E. Calculation of 50-year storm sediment loads

1. Total volume of runoff is estimated using hydrographs of the 6 largest drainage basins in the watershed, the areas of which sum to 95% of the total watershed area.

   Total volume of runoff = 4.2×10^8 cubic feet = 11.9×10^9 liters

2. Data from water quality stations throughout Hawaii indicate that 500 mg/l suspended solids concentration is a reasonable average value for the sediment load of high volume stream discharges (Ref. 43, 44).

3. Total sediment load from the Kihei Watershed

   = Total volume of runoff x suspended solids concentration

   = 11.9×10^9 liters x 500 mg/l = 5.95×10^{12} mg = 6545 tons

4. Area of the 100-year storm flood plain (use of the 100-year flood plain makes the result of this computation conservative) is estimated to be 2.4×10^7 square feet.

5. Estimate the depth of flood water over the flood plain to be four feet. (During the flood of February 1951 - the greatest known flood in the Kihei flood plain - water stood to a depth of four feet at the intersection of Waiakoa Stream and Kihei Road.) (Ref. 1)

6. The volume of water standing on the flood plain
   = Area of the flood plain x depth of water
   = 2.4×10^7 sq. ft. x 4 ft. = 9.6×10^7 cu. ft. = 2.7×10^9 liters

7. Assume that the entire sediment load in the water on the flood plain is deposited on the area.
   Total sediment load deposited on the flood plain
   = volume of standing water x suspended solids concentration
   = 2.7×10^9 liters x 500 mg/l = 1500 tons
   Assume by difference, total sediment load presently entering the ocean = 6545 tons - 1500 tons = 5045 tons

8. The percentage increase in sediment load resulting from drainage of the flood plain
   $= \frac{\text{Additional sediment load}}{\text{Existing sediment load}} = \frac{1500}{5045} \times 100 = 30\%$

Determine equivalent inches of rainfall over watershed area for 50-year storm:

Total Watershed Area = 38.6 sq. mi. = 1.08×10^9 sq. ft.

Total Runoff = 4.2×10^8 cu. ft.

Equivalent inches of rainfall.
= 4.2×10^8 cu. ft./1.08×10^9 sq. ft.
= 0.39 ft. = 4.7 inches.

F. Calculation of sediment loads from 1 inch equivalent rainfall falling on the Kihei Watershed.

1. Let a 1 inch equivalent rainfall represent a small storm.
2. Total volume of runoff entering the Kihei flood plain
   = depth of rainfall x watershed area
   = 1/12 foot x 1.08×10^9 sq. ft. = 9.0×10^7 cu. ft.
   = 2.5×10^9 liters
3. Total sediment load of runoff
   = volume of runoff x suspended sediment concentration
   = 2.5×10^9 liters x 500 mg/l = 1375 tons
4. Assume that flood waters will stand to a depth of 1 foot over the 100 year flood plain. (Use of the 100-year flood plain makes the result of this computation conservative. The depth of standing water has decreased from the 50-year storm because of decreased runoff.)
5. Total volume of water standing on the flood plain
   = depth of standing water x area of 100-year flood plain
   = 1 foot x 2.4×10^7 sq. ft. = 2.4×10^7 cu. ft.
   = 6.8×10^8 liters
6. Assume that the entire sediment load of the standing water is deposited in the area:
   Total sediment load deposited on the flood plain
   = volume of standing water x suspended solids concentration
   = 6.8×10^8 liters x 500 mg/l = 374 tons
7. Assume that the remaining portion of the runoff presently enters the ocean and deposits its sediment load there.
   Total sediment load deposited in the ocean
   = 1375 ton - 374 tons = 1001 tons
8. The percentage increase in the amount of sediment entering the ocean resulting from drainage of the flood plain

$$= \frac{\text{Additional sediment load}}{\text{Existing sediment load}} = \frac{374}{1001} \times 100 = 37.3\%$$

G. Runoff passing through Piilani Highway into the Kihei Drainage Project

1. Rate of sediment load for runoff passing through Piilani Highway:

   26,055 cfs = 729,540 liters/sec.
   = 729,540 l/s x 500 mg/l = 3.64×10^8 mg/sec.
   = .4 tons/sec.

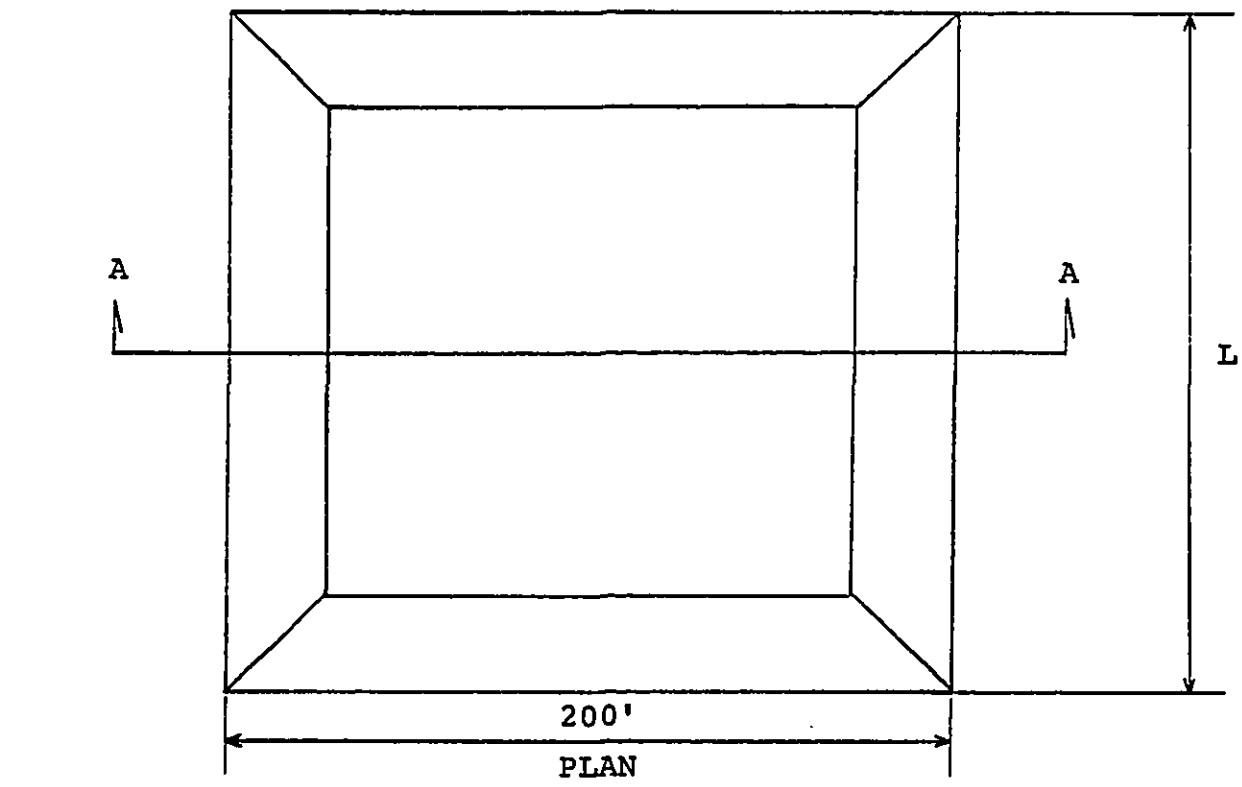
2. Rate of sediment load for runoff passing through 3 major stream channels:

   23,649 cfs = 662,172 liters/sec.
   = 662,172 l/s x 500 mg/l = 3.31×10^8
   = .36 tons/sec.

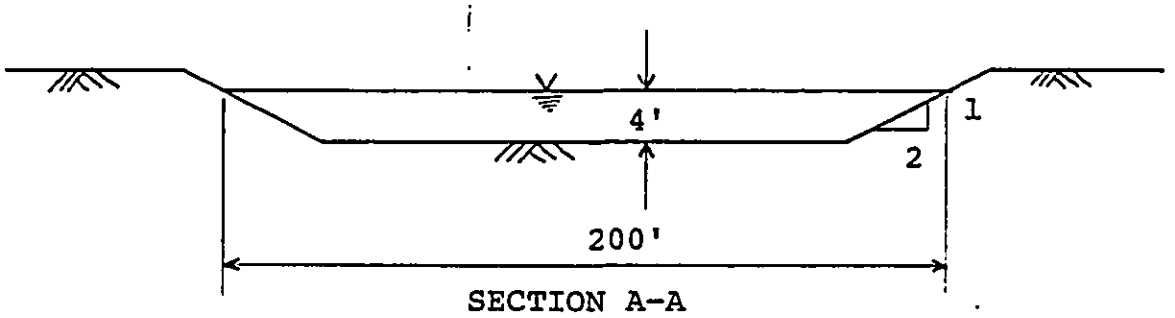
3. Rate of sediment load for runoff passing into Kihei interior drainage:

   2406 cfs = 67368 liters/sec.
   = 67,368 l/s x 500 mg/l = 3.36×10^7
   = .04 tons/sec.

H. Sizing of a 4.2×10^8 c.f. Sediment Basin with a 200' width



PLAN



SECTION A-A

1 Length of Basin

$$\text{Volume of Basin} = \left[\frac{(200)(L) + (192)(L-16)}{2} \right] 4$$

$$4.2 \times 10^8 \text{ CU.FT.} = \left[\frac{(392L - 3072)}{2} \right] 4$$

$$4.2 \times 10^8 \text{ CU.FT.} = 784\ L - 6144$$

$$784\ L = 420{,}000{,}000 - 6144$$

$$L = 535{,}707 \text{ FT}$$

2. Cost of Excavation

Based on a $15.00/cu.yd. Excavation cost:

$$= (4.2 \times 10^8 \text{ CU.FT.}) \left(\frac{1 \text{ cu.yd.}}{27 \text{ cu.ft.}} \right) (\$15.00/\text{cu.yd.})$$

$$= \underline{\$233{,}333{,}333.00}$$

13. GLOSSARY

13. Glossary

Drainage Master Plan (1971) - A plan for the County of Maui which encompasses all of the flood water conservation measures proposed by different governmental agencies and develops them into a coordinated program to be followed by the County.

Drainage System - A system of drain lines, channels and appurtenances to receive, collect and convey surface runoff into a watercourse.

Flood - The temporary inundation of usable lands caused by the overflow of an adjacent natural watercourse or standing body of water.

Flood Control Channel - An artificially lined (concrete, boulders or rubble, etc.) natural watercourse. Also, a major structure in a flood control program. In the Kihei area Kulanihakoi, Waipuilani and Keokea Streams are proposed flood control channels.

Flood Control Program - A system of drainage structures designed to confine storm runoff within natural water-courses and convey it into the ocean. The flood control program for the Kihei area was described in the 1964 Corps of Engineers, Report on Survey for Flood Control, Kihei District, Maui.

Flood fringe - The portion of the flood plain not lying within a floodway which serves as a temporary storage area for flood waters during a base flood.

Flood plain - Any land area susceptible to being inundated by water from any source.

Floodway - The channel or river and adjacent surrounding land area required to convey the base flood without increasing the water surface elevation above a designated height.

50-year storm - The storm that will produce a volume of runoff which has a 2 percent chance of being equalled or exceeded in any given year.

14. RESPONSE TO WRITTEN COMMENTS

The following form letter, dated April 18, 1979, was sent to those agencies or individuals who submitted written comments regarding this Environmental Impact Statement. Attached to the letter were the responses to the comments and excerpts of the appropriate section of the EIS.

April 18, 1979

SUBJECT: KIHEI DRAINAGE PROJECT EIS

Your comments on the subject Environmental Impact Statement were received, evaluated and incorporated into the final EIS document.

The County of Maui is now prepared to submit the final EIS to the Environmental Quality Commission for public review.

On behalf of the County, we, Sam O. Hirota, Inc., the consultant during the preparation of the EIS, are enclosing a copy of your letter along with the responses to your comments which have been included in the EIS.

You will have a period of thirty (30) days after the availability of the EIS is published in the EQC Bulletin to comment again on the EIS.

Very truly yours,

SAM O. HIROTA, INC.

Alan Hee
Civil Engineer

Enclosures

PLANNING COMMISSION
Lee Pete, Jr., Chairman
Steve Hokama, Vice Chairman
Carvoya Macpherson
Patrick Kawano
Charles Oki
Marcus Ramos
Marlene Rich-Apt
Wayne Ueunae, Ex-Officio
Shigeto Murayama, Ex-Officio

Elmer F. Cravalho
Mayor

Yoshikazu "Zuke" Matsui
Deputy Planning Director

COUNTY OF MAUI
PLANNING DEPARTMENT
200 S. HIGH STREET
WAILUKU, MAUI, HAWAII 96793

February 14, 1977

Mr. Wayne Uenae, Director
Department of Public Works
County of Maui
200 S. High Street
Wailuku, Hawaii 96793

Dear Mr. Uenae:

Re: Environmental Impact Statement -
Kihei Drainage Project

We have reviewed the subject EIS and submit the following comments:

1. Section F, page 55, Socio-Economic Patterns and Trends. Please be advised that Maui Land and Pineapple Company, Inc. is not a subsidiary of Alexander and Baldwin, Inc. Furthermore, the pineapple industry on Maui today is a viable industry and probably will continue to be so. The EIS states that the pineapple industry will cease to exist in 10 years due to the explosive growth of the tourist industry. We question the validity of this statement. How was such a conclusion reached and upon whose economic analysis? For your information, Kapalua Land Company, Ltd., a subsidiary of Maui Land and Pineapple Company, Inc., has started work on a major tourist destination resort at Kapalua, Maui. This should not imply that Maui Land and Pineapple Company is phasing out its pineapple industry.

The list of visitor facilities in the Kihei area on page 58 is unrealistic and should be updated to reflect the current number. The list does not correspond to Figure 12.

2. It is quite difficult to ascertain whether siltation basins and debris barriers are an integral part of the proposed project. While it may be true the proposed project will reduce soil erosion from the project area, most of the soils entering Maalaea Bay comes from the areas mauka of the proposed project limits. The EIS should clarify the construction of siltation basins and debris barriers for the proposed project.

3. Surveys of Maalaea Bay done nearly five years ago should be used with caution. The EIS should reflect present water quality parameters of Maalaea Bay and the effects the proposed will have on these parameters. Studies done in the past can only serve as an indication of what was present at that particular time and does not reflect changes that may have occurred.

4. We find that the EIS did not discuss the Flood Insurance Program and its relationship with the proposed project. We do not understand why the two alternatives (Floodproofing Structures and Flood Plain Zoning) which are an integral part of the Flood Insurance Program are listed as alternatives. The section on alternatives should be further expanded and discussed. Also, please be advised that the County does have a Flood Plain and Tsunami Inundation Area Ordinance (Ord. No. 716).

5. A Special Management Area Permit shall be required for the proposed project.

Thank you for the opportunity to comment on the subject EIS.

Very truly yours,

TOSHIO ISHIKAWA
Planning Director

cc: OEQC

Letter from the Planning Department, County of Maui.

1. Comment: Maui Land and Pineapple Company, Inc. is not a subsidiary of Alexander and Baldwin, Inc.

   Response: That statement has been corrected.

2. Comment: "...the pineapple industry on Maui today is a viable industry and probably will continue to be so."

   Response: We have modified our conclusions on page 58, Socio-Economic Patterns and Trends.

3. Comment: "The list of visitor facilities in the Kihei area... is unrealistic and should be updated to reflect the current number."

   Response: The list on page 62 has been modified to include only hotel facilities while Figure 17 - Condominium Units in Kihei, has been corrected.

4. Comment: "It is quite difficult to ascertain whether siltation basins and debris barriers are an integral part of the proposed project."

   Response: Siltation basins and debris barriers are not part of the Kihei Drainage Project, but may be incorporated into the Corps of Engineers Flood Control Program.

5. Comment: Studies done five years ago on water quality parameters may not be applicable to the present situation and should be used with caution.

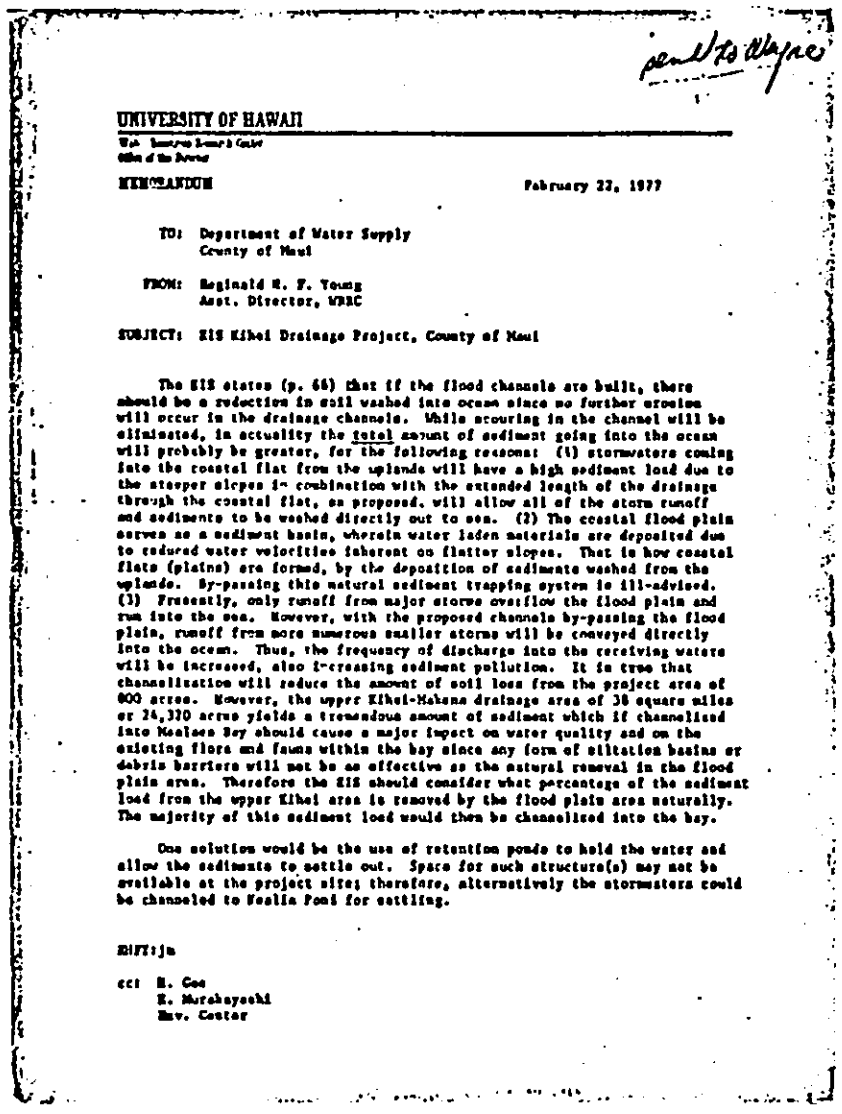
   Response: It is felt that the conditions under which the previous studies were made have not considerably or significantly changed. Therefore, data produced by those studies are still accurate and can be used to forecast potential impacts to the marine habitat.

6. Comment: The Flood Insurance Program and Ordinance 716 are not discussed.

   Response: Both are discussed in the section entitled, Applicable Statutes, Programs and Projects, on page 6, and Land Use and Urbanization, on page 76.

7. Comment: A Special Management Area Permit is required for the proposed project.

   Response: Required approvals are listed in Section X, page 89.



UNIVERSITY OF HAWAII

Water Resources Research Center
Office of the Director

MEMORANDUM

February 22, 1977

TO: Department of Water Supply
County of Maui

FROM: Reginald H. F. Young
Asst. Director, WRRC

SUBJECT: EIS Kihei Drainage Project, County of Maui

The EIS states (p. 66) that if the flood channels are built, there should be a reduction in soil washed into ocean since no further erosion will occur in the drainage channels. While scouring in the channel will be eliminated, in actuality the total amount of sediment going into the ocean will probably be greater, for the following reasons: (1) stormwaters coming into the coastal flat from the uplands will have a high sediment load due to the steeper slopes in combination with the extended length of the drainage through the coastal flat, as proposed, will allow all of the storm runoff and sediments to be washed directly out to sea. (2) The coastal flood plain serves as a sediment basin, wherein water laden materials are deposited due to reduced water velocities inherent on flatter slopes. That is how coastal flats (plains) are formed, by the deposition of sediments washed from the uplands. By-passing this natural sediment trapping system is ill-advised. (3) Presently, only runoff from major storms overflow the flood plain and run into the sea. However, with the proposed channels by-passing the flood plain, runoff from more numerous smaller storms will be conveyed directly into the ocean. Thus, the frequency of discharge into the receiving waters will be increased, also increasing sediment pollution. It is true that channelization will reduce the amount of soil loss from the project area of 800 acres. However, the upper Kihei-Makena drainage area of 38 square miles or 24,320 acres yields a tremendous amount of sediment which if channelized into Maalaea Bay should cause a major impact on water quality and on the existing flora and fauna within the bay since any form of siltation basins or debris barriers will not be as effective as the natural removal in the flood plain area. Therefore the EIS should consider what percentage of the sediment load from the upper Kihei area is removed by the flood plain area naturally. The majority of this sediment load would then be channelized into the bay.

One solution would be the use of retention ponds to hold the water and allow the sediments to settle out. Space for such structure(s) may not be available at the project site; therefore, alternatively the stormwaters could be channeled to Waalia Pond for settling.

RHFY:jm

cc: H. Coe
H. Murakoyoshi
Env. Center

Letter from the Water Resources Research Center, University of Hawaii.

1. Comment: "...the total amount of sediment going into the ocean will probably be greater" than if no drainage system were present.

   Response: The observation is valid and is discussed in the section entitled, Sediment Discharge, page 67.

2. Comment: Retention ponds are an alternative to the proposed drainage facilities.

   Response: The alternative of storage ponds is discussed on page 82, Alternatives to the Proposed Project.

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. HAHARY
DEPUTY TO THE CHAIRMAN

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

February 18, 1977

Environmental Quality Commission
550 Halekauwila St., Rm. 301
Honolulu, HI 96813

Gentlemen:

We have reviewed the EIS for the Kihei Drainage Project.

Our primary concern is for that part of the system which discharges into the ocean. Any such discharge will require approval of the Board of Land and Natural Resources as required under Conservation District regulations.

It appears to us that additional design details for these outlets may be needed before impact evaluation is possible. It may also be desirable to reconcile the description of the watershed with the description of the project service area.

The effect of future development of the watershed might also be touched upon in more direct fashion than afforded by pp. 55-64.

We concur with the need for drainage improvements in this area and would like to voice our support of planning efforts in this regard.

Very truly yours,

GORDON SOH
Program Planning Coordinator

cc: DOWALD
Historic Sites
Land Management

Letter from the Department of Land & Natural Resources.

1. Comment: Approval by the Board of Land and Natural Resources is required for that part of the system which discharges into the system.

   Response: Required approvals are listed in Section X, page 89.

2. Comment: Additional design details for outlets required.

   Response: Schematic design details are provided in Figures 5 and 6 and on page 73, Aesthetics.

3. Comment: "...reconcile description of watershed with the description of the project service area."

   Response: The descriptions are clarified on page 36, Hydrology and in Figure 12.

4. Comment: Discuss the effect of future development of the watershed.

   Response: Effects of future development are discussed on page 74, Secondary Impacts of Urbanization.

GEORGE R. ARIYOSHI
GOVERNOR

JOHN FARIAS, JR.
CHAIRMAN, BOARD OF AGRICULTURE

YUKIO NAGAMINE
DEPUTY TO THE CHAIRMAN

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

February 9, 1977

MEMORANDUM

To: Office of Environmental Quality Control

Subject: EIS for Kihei Drainage Project, County of Maui

We have reviewed the subject EIS and offer the following comments:

1. Maui Land and Pineapple Company, Inc., contrary to the statement on page 55, is not a subsidiary of Alexander and Baldwin.

2. The statement, on page 55, "There was no significant increase in yields during 1974 over the already low production of the previous year," is misleading. The 1974 Maui Land and Pineapple Company, Inc. Annual Report stated that "production volume was down 7 percent from 1973 due largely to continuing effects of abnormally dry weather and partly to fruit lost during a three week industry wide strike in April." However, the same report also states that, "Our revenues (from pineapple sales) were up 27 percent," and "Total number of cases sold was about the same as the prior year although sales exceeded production by over 10 percent, reducing our inventories to extremely low levels."

   Furthermore, the 1975 Annual Report states, "Because of the extremely low level of our beginning inventory and with production virtually the same as last year, our total supply of canned pineapple and juice was less than the previous year. Consequently, total case volume of sales for the year was down 10 percent from 1974. In spite of this, 1975 was another record year, the most profitable for pineapple in the history of our company."

   Considering the foregoing quotations, it is apparent that the pineapple industry on Maui is hardly in a critical economic situation, as implied by the statement referring only to yield.

3. Exception is taken with the statement, also on page 55, that, "With the explosive growth of tourism in recent years is the expectation that pineapple farming will disappear within 10 years, with its product priced out of the market by cheaply produced pineapples grown in Taiwan and the Philippines." It does not necessarily follow that growth in tourism will be accompanied by decline in agriculture, especially the pineapple industry. Rather, agriculture plays an important role in the attractive environment that Hawaii offers the tourist and certainly pineapple has established itself as a sought after local product by the tourist.

   The "...expectation that pineapple farming will disappear within 10 years..." is, at best, a highly speculative statement. It seems highly unlikely that, given such an expectation, Maui Land and Pineapple Company, Inc., would have invested capital in projects such as improving and augmenting their irrigation systems at their Haliimaile plantation and installing an irrigation system at their Honolua plantation. Moreover, to anticipate the local impact of international agricultural competition on a long-range basis is to assume a multitude of variables to the extent that the predicted impact is not reliable. Weather alone cannot be predicted to such an extent, a recent example being the weather conditions in Brazil that destroyed the coffee crop there and subsequently affected the world's coffee market.

4. Of greatest concern is the agricultural impact of the Kihei drainage project. The EIS states that, "Despite the increased activity in the tourist industry in Kihei, agriculture still plays a relatively important role in the economy of this rural community. Sugar farming in northern Kihei remains a principal land use of the area." Also, "In Kihei a new industry has arisen in the production of seed corn on a 138-acre parcel located at Kekulele Road and Kihei Road junction. The weather in Kihei makes possible the production of seed corn year round."

   It can be envisioned that the Kihei drainage project may well contribute to the demise of agriculture in the Kihei area. As the EIS states, there will be "probable increases in the level of economic activity...as construction, employment and land values rise as a direct result of the drainage project." Increasing land values are a major factor in the irretrievable loss of agricultural land to urban use due to economic pressures and it is this kind of impact that needs to be adequately addressed in the EIS.

The Department of Agriculture finds that while the Kihei drainage project is confined to the existing urban designated area of Kihei, its impact may extend beyond and may well affect the area's agricultural activities. The EIS has not adequately addressed this possibility.

Thank you for the opportunity to comment.

John Farias, Jr.
Chairman, Department of Agriculture

Letter from the Department of Agriculture, State of Hawaii.

1. Comment: Maui Land and Pineapple Co., Inc. is not a subsidiary of Alexander and Baldwin.

2. Comment: "...the pineapple industry on Maui is hardly in a critical economic situation as implied by the statement referring only to yield."

3. Comment: "It does not necessarily follow that growth in tourism will be accompanied by decline in agriculture, especially the pineapple industry."

   Response to Comments 1, 2 and 3: The observations are valid and the section on the pineapple industry has been modified. See page 58, Industry.

4. Comment: The Kihei Drainage Project may contribute to the demise of agriculture because of increasing land values. The impact of the project may extend beyond the boundaries of the project area.

   Response: The impact of the proposed project on agriculture is discussed on page 76, Land Use and Urbanization.

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

February 23, 1977

FILE

Please handle | Please see me
Please file | Please reply

Signed _____ Date _____

Wayne Uemae, Director
Department of Public Works
County of Maui
200 South High Street
Wailuku, Maui 96793

Dear Mr. Uemae:

Subject: Environmental Impact Statement for the Kehei Drainage Project

In our review of the subject EIS, we find that the document fails in the intent and the spirit of Chapter 343, Hawaii Revised Statutes. Moreover, we find this doucment not in compliance with the requirements of preparing an environmental impact statement as set forth in the Environmental Impact Statement Regulations in Sub-part E, section 1:40 which state:

> "Chapter 343, Hawaii Revised Statutes has directed that in both agency and applicant actions where statements are required, the preparing party shall prepare the EIS, submit it to review and comment, and revise it taking into account all critiques and responses. Consequently, the EIS requires more than the preparation of a document, but involves the entire process of research, discussion, preparation of a Statement and review... An EIS is meaningless without the conscientious application of the EIS process as a whole, and should not be merely a self-serving recitation of benefits and a rationalization of the proposed action." (Emphasis added)

As a result, the present document is an environmental assessment without evidence of meeting the requirement for the consultation process. There are no comments or responses attached to the document that are required during the consultation process. We are aware that at least one agency, requesting to be a consulted party, did not even receive the EIS Preparation Notice for their review and comment. This alone, would cause failure of the document to meet the acceptance criteria in the EIS Regulations Section 1:71 (a). This sub-section states:

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COUNTY OF MAUI

> "...procedures for assessment, consultation process, a review responsive to comments, and the preparation and submission of the Statement, have all been completed satisfactorily as specified herein." (emphasis added)

In addition, the statement has numerous grammatical errors, inconsistencies, lacks basic information, and contains subjective unsubstantiated statements as indicated by other reviewers. (See attached comments) Hence, it would be a futile effort for this Office to further process this document as an EIS.

In other words,

> "...agencies and applicants shall endeavor to develop a fully acceptable EIS prior to the time the EIS is filed with the Commission, through a full and complete consultation process, and shall not rely solely upon the review process to expose environmental concerns..." (EIS Regulations section 1:41)

Thus, we strongly recommend that this statement be withdrawn until an acceptable Statement can be prepared and filed with the Environmental Quality Commission.

If you have any questions on this matter, please feel free to contact this Office.

Sincerely,

Richard E. Marland
Director

cc: Governor Ariyoshi w/o attachment
EQC w/o attachment.

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

GEORGE A. L. YUEN
DIRECTOR OF HEALTH

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

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

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

In reply, please refer to
File: EHAE - EIS

March 1, 1977

MEMORANDUM

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

From: Deputy Director for Environmental Health

Subject: Environmental Impact Statement (EIS) for Kihei Drainage Project, County of Maui

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

1. Another possible adverse effect of air pollution on the waterfowl from the increased traffic should also be mentioned on page 67 of the EIS.

2. The last statement on page 67 may not be entirely correct. Implementation of the drainage project will definitely lead to increased urbanization in the Kihei-Makena region. More specifically, increased urbanization will occur in the Kihei area as the result of:

   a. the decrease or elimination of the risk and/or economic losses due to frequent floods;

   b. the reduction in development costs (i.e., the developers will not pay for the construction of the major components of the drainage system) and possible increase in developer's profits; thereby, creating a strong incentive for urbanization;

   c. an increase in the supply of readily developable land within the flood plain; and

   d. the provision of future hook-up points for future drainage systems upstream of the project area.

3. Consideration should be given during the design stages to incorporate siltation basins and debris barriers into the drainage system (upstream and downstream) to minimize the entry of suspended sediment and debris to Maalaea Bay. These protective measures should in no way be deleted from the proposed system due to cost-saving reasons.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

JAMES S. KUMAGAI, Ph.D.

cc: Department of Public Works
DEO, Maui

Letter from the Department of Health,
State of Hawaii.

1. Comment: The effect of air pollution on waterfowl in Kealia Pond should be mentioned.

   Response: The effect of air pollution is discussed on page 74, Secondary Impacts of Urbanization.

2. Comment: "Implementation of the drainage project will definitely lead to increased urbanization in the Kihei-Makena region."

   Response: The effect of the proposed project on urbanization is discussed on page 76, Land Use and Urbanization.

3. Comment: Design should consider the inclusion of silt basins and debris barriers in the drainage system.

   Response: See page 10, Drainage Structures.

FEB 17 1977

(F)1143.7

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

Dear Dr. Marland:

Subject: Environmental Impact Statement
Kihei Drainage Project
County of Maui

We have the following comments to offer relative to the subject Environmental Impact Statement (EIS):

1. General - The maps used throughout the EIS should be revised to show an existing school site at the end of Lipoa Street in lieu of a proposed school. The new Kihei Elementary and Intermediate School is currently under construction and scheduled to open in September 1977.

2. Page 53, Land Ownership Map - The new Kihei Elementary and Intermediate School is owned by the State of Hawaii. A 100-foot corridor is available between the makai school boundary and the existing housing developments for existing utilities, access, and the proposed drainage channel.

Very truly yours,

HIDEO MURAKAMI
State Comptroller

RS:ly
cc: Maui County Department
of Public Works

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DEPARTMENT OF PUBLIC WORKS
COUNTY OF MAUI

Letter from the Department of Accounting and General Services.

1. Comment: The figures should be changed to show an existing school site owned by the State of Hawaii.

   Response: The figures have been corrected.

Letter from the Office of Environmental Quality Control.

1. Comment: "...the present document is an environmental assessment without evidence of meeting the requirement for the consultation process."

   Response: A list of government agencies, organizations and individuals to whom this EIS has been sent is included in the text.

2. Comment: "...the statement has numerous grammatical errors, inconsistencies, lacks basic information and contains subjective unsubstantiated statements..."

   Response: Full effort has been made to rectify errors, provide relevant information and clarify statements.

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

February 10, 1977

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

Dear Sir:

Subject: Environmental Impact Statement for Kihei Drainage Project, Kihei, Maui Island

Thank you for the opportunity to comment on the draft EIS for the subject undertaking.

Section III 4, item 9 does not address the effects of the proposed project to presently identified archaeological resource areas or incorporate any further recommendations for mitigating adverse effects should they occur.

It is recommended that an archaeological reconnaissance of the seven areas being considered as sites for drainage facilities be initiated before construction commences. The findings of that reconnaissance will determine what mitigative measures, if any, will be required and should be included as a supplement to the final EIS.

Sincerely yours,

Jane L. Silverman
Historic Preservation Officer
State of Hawaii

cc: Department of Public Works

Planning Office, Department of Land and Natural Resources

Letter from the State Parks Division, Department of Land and Natural Resources.

1. Comment: The EIS does not discuss the project's impact on archeological resource areas or propose mitigating measures. An archeological reconnaissance is recommended for the seven drainage areas.

   Response: A discussion is included in the section, Historical and Archeological Resources, page 73 and in Mitigation Measures to Minimize Adverse Environmental Impacts, page 85.

DEPARTMENT OF PLANNING
AND ECONOMIC DEVELOPMENT

GEORGE R. ARIYOSHI
Governor

HIDETO KONO
Director

FRANK SUENAGA
Deputy Director

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

February 17, 1977

Ref. No. 2991

Mr. Wayne Umose, Director
Department of Public Works
200 South High Street
Wailuku, Maui, Hawaii 96793

Dear Mr. Umose:

Subject: Environmental Impact Statement for the Kihei Drainage Project

We have reviewed the subject E.I.S. and find that, in general, it has adequately addressed the major environmental impacts which can be anticipated to result from the proposed project.

To protect the value of the Kihei shoreline as a natural recreational resource, we strongly recommend that the special architectural and aesthetic design considerations for the channel outlets be fully developed and implemented.

We have no further comments to offer, at this time, but appreciate the opportunity to review this document.

Sincerely,

HIDETO KONO

cc: Dr. Richard E. Harland, Director
Office of Environmental Quality Control

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DEPARTMENT OF PUBLIC WORKS
COUNTY OF MAUI

Letter from the Department of Planning and Economic Development.

1. Comment: "To protect the value of the Kihei shoreline as a natural recreational resource, we strongly recommend that the special architectural and aesthetic design considerations for the channel outlets be fully developed and implemented."

   Response: The special design considerations will be included in the design phase of the outlets and carried out into the construction phase.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Division of Ecological Services
821 Mililani Street
Honolulu, Hawaii 96813

Reference: ES

February 16, 1977

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

Dear Sir:

This provides comments on the draft Environmental Impact Statement for the Kihei Drainage Project, Maui, Hawaii.

II.A.C.4. Flora and Fauna, page 16, second paragraph. We suggest the assessment of upstream waters and brackish ponds be expanded to include the following data: a location map of these sites, size and relative abundance of resident macrofauna, flow rates and other pertinent physical-chemical measurements.

II.D.1. Agency Responsibility and Project History, page 30, first paragraph. The discussion indicates that in 1964 the U.S. Army Corps of Engineers recommended no action for their "most effective protective measure for flood control," but suggested smaller drainage improvements. We now note that this originally infeasible structural concept is again being considered for implementation. In view of the Corps' earlier recommendation, it appears appropriate to examine past efforts toward formulating an effective flood plain management plan.

III.A.1. Land Resources, last sentence, page 67. The statement should be expanded to identify those factors conducive to accelerated urbanization.

III.A.3. Water Quality, page 70. Identification of the areal limits of sedimentation within the project's nearshore waters is suggested to permit evaluation of existing erosion conditions and provide some basis of projecting the influence of future discharges. We are specifically concerned with high velocity flows that are anticipated to funnel stream pollutants further offshore. If a decrease in sediment loads are anticipated, the statement should be well illustrated by examples, or other data.

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COUNTY OF MAUI

III.A.3. Subsitrate Types and Benthic Biota in Maalaea Bay, page 76. Figure 14 should be modified to clearly describe the proximity of these different study sites to the proposed project area.

Same section, page 79. Descriptions of a widely diverse habitat in Maalaea Bay and adjacent waters reinforces the requirement for a site specific study designed to describe present conditions, as well as evaluate primary and secondary project effects. The development of both the interior drainage system and its associated flood control measures would most likely determine the future consequences of water quality in nearshore waters. Stormwaters have been recognized as probably the most chronic pollutant source in Kaneohe Bay, whereas, in Waikiki, it has been diverted, but at the expense of the Ala Wai Canal and its receiving waters. A development of such crucial impact requires a marine survey of sufficient detail to identify current patterns, coral coverage, existing sedimentation problems, relative abundance of fish and shellfish, and other relevant environmental parameters.

Sec. V. Minimizing Unavoidable Adverse Environmental Effects, page 92, first paragraph. We suggest that the discussion over construction impacts be expanded to identify protective erosion control measures.

VI.A.1. General, page 94, first paragraph. We recommend that the statement be expanded to clearly indicate the kind of commitment the County has with the federal government in developing the previously described flood control measures. If there is no firm commitment the statement should reevaluate project impacts.

VI.A.3. Design Features, page 97. We suggest that project phasing and duration of construction be identified. Although the interior drainage system is described in the narrative, its features would be more readily discerned in diagrams depicting alignments, accompanied by legends for the various types of drain lines. We further suggest that the statement provide descriptions and diagrams of any proposed flood control measure. If siltation basins are part of these plans, characteristics of its functional features should be detailed.

VI.B.3. Flood Plain Zoning, page 103. This section should be expanded to discuss Ordinance 716, Flood Plain and Tsunami Inundation Area Ordinance. A discussion of pertinent portions of the Flood Insurance Program would also be desirable.

We appreciate this opportunity to comment.

Sincerely yours,

Maurice H. Taylor

Maurice H. Taylor
Field Supervisor

cc: ARD, AE - HA
WPAO
PW, Maui

Letter from the Fish and Wildlife Service, U. S. Department of the Interior.

1. Comment: Expand the assessment of upstream waters and brackish ponds.

   Response: See page 24, Flora and Fauna.

2. Comment: "...examine past efforts toward formulating an effective flood plain management plan."

   Response: The Kihei Flood Control Program is now under review. All effort will be made to coordinate between flood control programs for the watershed and the proposed interior drainage system.

3. Comment: "...identify those factors conducive to accelerated urbanization."

   Response: Those factors associated with this project which may contribute to increased urbanization are discussed on page 76, Land Use and Urbanization.

4. Comment: Identify "the areal limits of sedimentation within the project's nearshore waters..."

   Response: The exact area of the influence of the land-derived terrestrial sediments can not be determined without a careful, costly study of the spatial distribution of bottom sediments; however, the Kinzie study mentions the mixture of calcareous marine sediments mixed with terrigenous sediments in the deeper parts of Maalaea Bay (his transects went to a 10 fathom or 60 foot depth) off and to the north of Kihei. One would expect that these terrigenous sediments comprise part of the bottom materials at least to a depth of the 10 fathom contour off the project area.

5. Comment: Modify Figure 14 to indicate the locations of the previous marine life survey sites.

   Response: The information has been placed on Figure 14. (Changed to Figure 11)

6. Comment: A site specific study of the offshore waters is required to evaluate primary and secondary effects of the project.

   Response: A recent survey of the coastal waters off Kihei was conducted and the information acquired is contained in the section entitled, Marine Life, page 29.

7. Comment: Expand "the discussion over construction impacts... to identify protective erosion control measures."

   Response: Erosion control measures are discussed on page 85, Mitigation Measures to Minimize Adverse Environmental Impacts.

8. Comment: "...indicate the kind of commitment the County has with the Federal government in developing... flood control measures."

   Response: See page 3, Objectives, and page 7, Drainage Master Plan for the County of Maui.

9. Comment: Identify project phasing and construction scheduling.

   Response: See page 3, Objectives.

10. Comment: "...features (of the interior drainage system) would be more readily discerned in diagrams depicting alignments..."

    Response: See Figure 4 - Proposed Kihei Drainage Project.

11. Comment: Expand discussion to include Ordinance 716 and the Flood Insurance Program.

    Response: Both are discussed in the section entitled, Applicable Statutes, Programs and Projects, on page 6, and Land Use and Urbanization, on page 76.

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

22 February 1977

Office of Environmental Quality Control
State of Hawaii
550 Halekauwila Street, Rm 301
Honolulu, Hawaii 96813

Gentlemen:

We have reviewed the Environmental Impact Statement for the Kihei Drainage Project, County of Maui, and wish to offer the following comments for your consideration:

a. The amount of land to be covered by the channels and modified portions of the gulches mentioned on page 66 is very small relative to the total drainage land of the project area. Since soil erosion is likely to occur anywhere in the drainage area, it does not follow that there will be a significant reduction in the quantity of soil and turbid water to be discharged into the ocean, nor will there be any beneficial impact to offshore marine ecosystems attributed to the project. It is more likely that construction and land clearing activity associated with the project will result in temporary increases of soil erosion, sediment discharge, higher turbidity, and adverse impacts to offshore marine life and water quality. Are there any provisions for erosion control in the surrounding watersheds?

b. Water and sediment entering the ocean more quickly via the proposed channels from the upper Kihei watershed (pg 63) also may temporarily increase adverse impact to marine life compared to the regular discharge rates without the project.

c. On page 70, the report states that neither the horizontal transport of sediment, nor water turbidity in Maalaea Bay nor the "...'threshold response' of numerous benthic and pelagic (sic) species to changes in suspended loads and water clarity" can be predicted accurately. It would appear that the severity of environmental impact from these sources likewise cannot be predicted; thus it may be premature to conclude that "the overall impact of the proposed project on marine biota is judged not to be major" (pg 59).

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COUNTY OF MAUI

POED-P 22 February 1977
Office of Environmental Quality Control

d. The Location Map for Benthic Surveys (Fig. 14) shows neither the locations of the benthic surveys nor the location of the project site.

e. Kiawe and mesquite trees (pg. 17), as the names are used in Hawaii, are the same plant.

f. We suggest that a freeboard designed to contain a 100-year flood be considered as it may alleviate future flood insurance problems.

g. All work or structures in the tidal water will require Department of the Army permits.

We appreciate the opportunity to review this statement.

Sincerely yours,

WILLIAM J. MATHEWS
Acting Chief, Engineering Division

Copy furnished:
Department of Public Works
200 South High Street
Wailuku, Hawaii 96793

Letter from the Corps of Engineers,
Department of the Army.

1. Comment: "...it does not follow that there will be a significant reduction in the quantity of soil and turbid water to be discharged into the ocean...It is more likely that construction and land clearing activity associated with the project will result in temporary increases of soil erosion..."

   Response: See page 67, Sediment Discharge.

2. Comment: "Are there any provisions for erosion control in the surrounding watersheds?"

   Response: The Kihei Drainage Project is not expected to affect erosion in surrounding watersheds.

3. Comment: "Water and sediment entering the ocean...may temporarily increase adverse impact to marine life compared to the regular discharge rates without the project."

   Response: See page 67, Sediment Discharge.

4. Comment: Because of the lack of information about the physical, chemical and biological aspects of the watershed and marine life in Maalaea Bay," it may be premature to conclude that 'the overall impact of the proposed project on marine biota is judged not to be major'".

   Response: The small amount and only occasional occurrences of extra sediment load input into Maalaea Bay is not expected to be of major impact on the already sparse marine biota inhabiting the coastal area off Kihei. See page 29, Marine Life.

5. Comment: "The Location Map for Benthic Surveys shows neither the locations of the benthic surveys nor the location of the project site."

   Response: The figure has been corrected. See page 32.

6. Comment: Keawe and mesquite trees are the same plant.

   Response: The statement has been revised.

7. Comment: "We suggest that a freeboard be designed to contain a 100-year flood be considered..."

   Response: Consideration shall be given to the 100-year storm as the basis for design during the appropriate design phase.

8. Comment: "All work or structures in the tidal water will require Department of Army permits."

   Response: Required approvals are listed in Section XI, page 89.

GEORGE R. ARIYOSHI
GOVERNOR

VALENTINE A. STEFANAKOS
MAJOR GENERAL
ADJUTANT GENERAL

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
Fort Ruger, Honolulu, Hawaii 96816

HIENG

31 JAN 1977

Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Gentlemen:

Kihei Drainage Project

Thank you for sending us a copy of the Kihei Drainage Project Environmental Impact Statement. We have received the publication and have no comments to offer.

Yours truly,

Frederick W. Kleven, Jr.
for WAYNE R. TCHOYASU
Captain, CE, HARNG
Contr & Engr Officer

CPT, CE, HARNG

Enclosure

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 15th AIR BASE WING (PACAF)
APO SAN FRANCISCO 96543

ATTN OF: DEEE (Mr. Nakashima, 4492158)

25 FEB 1977

SUBJECT: Environmental Impact Statements

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

1. This headquarters has no comment to render relative to the following environmental impact statements:

Kihei Drainage Project
County of Maui

East Kakaako Area Major Drain and
Kapiolani Boulevard-Beretania Street Relief Drain
Honolulu, Oahu, Hawaii

2. We greatly appreciate your cooperative efforts in keeping the Air Force apprised of your development projects throughout the State and the opportunity to review the subject statements.

Thomas L. Hedge
THOMAS L. HEDGE, Colonel, USAF
Director of Civil Engineering

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

AFZV-FE-EE

31 JAN 1977

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

Gentlemen:

Reference is made to Environmental Impact Statement for Kihei Drainage Project, Maui, Hawaii dated January 1977.

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

Thank you for the opportunity to review the document.

Sincerely yours,

CARL P. RODOLPH
Colonel, CE
Director of Facilities Engineering

CF:
Dept of Public Works
200 South High Street
Wailuku, Maui. 96793

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

Address reply to:
COMMANDER (oap)
Fourteenth Coast Guard District
677 Ala Moana
Honolulu, Hawaii 96810

16475
23 FEB 1977

Mr. Wayne Uenae
Director
Department of Public Works
200 South High St.
Wailuku, Maui, Hawaii 96793

Dear Mr. Uenae:

Staff review of the "Environmental Impact Statement for the Kihei Drainage Project" has been completed and the Coast Guard has no objections or comments to offer at this time. There is no mention of any bridges over any navigable waters being affected by this project.

The opportunity to review and comment on this project is appreciated.

Sincerely,

V. C. [illegible]
Captain, U. S. Coast Guard
Chief of Staff
Fourteenth Coast Guard District

Copy to:
COMDT (G-WEP-)
CEQ Washington DC
OEQC Hawaii
COE Honolulu

GEORGE R. ARIYOSHI
GOVERNOR

ANDREW I. T. CHANG
DIRECTOR OF SOCIAL SERVICES & HOUSING

STATE OF HAWAII
DEPARTMENT OF SOCIAL SERVICES AND HOUSING
P. O. Box 339
Honolulu, Hawaii 96809

January 31, 1977

MEMORANDUM

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

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

SUBJECT: Environmental Impact Statement
Re: Kihei Drainage Project, County of Maui

Subject draft has been reviewed for its effect on our department program areas.

We have no comments to make and we are returning this EIS for your usage.

Thank you for the opportunity to review and comment.

DIRECTOR

Attachment
cc: Office of Environmental Quality Control
Department of Public Works (Maui)

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

February 25, 1977

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

Dear Dr. Marland:

Subject: EIS Kihei Drainage Project, County of Maui, HI

We have reviewed the above draft environmental impact statement and have no comments to offer.

Thank you for the opportunity to review this document.

Sincerely,

Jack P. Kanalz
State Conservationist

Kihei Community Association
P. O. Box 662 • Kihei, Maui, Hawaii 96753

Department of Public Works
County Building
Wailuku, Maui, Hawaii 96793

February 20th, 1977

Attention: Mr. Wayne Uemae, Director

Subject: E.I.S. Draft - Kihei Drainage Project, dated January 1977

Dear Sir:

The Kihei Community Association is in general quite pleased with the Drainage Plan E.I.S. The plan appears to have been well thought out and to offer a practical solution to an immense problem at a reasonable cost.

However, there are several items concerning appearance which we trust will be satisfactory but we are unable to determine this from the E.I.S. They are as follows:

1. There are to be 10,090 feet of drain lines installed on the East side of Kihei Road. These must be buried and out-of-sight.

2. There are to be 1965 feet of box drains along Kihei Road to intercept discharges from above. These must be buried and out-of-sight, or located far enough East of the roadway to maintain an adequate shoulder between them and the edge of the road.

3. The 84" diameter pipe culvert 310 feet long between Kihei Road and the ocean in Area 2 must be out-of-sight from the road or suitably landscaped. This applies also to the 60" diameter pipe culvert along Welakahao Place between Alaniu Place and the ocean, in Area 6.

4. There is a box drain 320 feet long, 20 feet wide and 6.5 feet high along Keolahou Place in Area 4. We assume from its function that the top will be at ground level. If not, it will be a terrible eyesore.

5. One of the Kihei Community Association's major projects is to obtain a pedestrian walkway along the West side of Kihei Road, and a bicycle path along the East side, from Suda's Store all the way South to Wailea. The entire drainage system must be compatible with this plan and should, in fact, be coordinated with it to reduce the total cost. A copy of our recent letter to Mayor Cravalho on this subject is enclosed.

Kihei Community Association
P. O. Box 662 • Kihei, Maui, Hawaii 96753

We also have several other questions and comments:

1. What is the relationship between this project and the "Plan of Study on Flood Control for Kihei District, Maui" recently funded by the government and authorized to be conducted by the U.S. Army Corps of Engineers, Honolulu District? (See enclosed letter from Col. P.M. Pender.) Will this study delay the county project?

2. The E.I.S. plan (Figure 8) refers to "Flood Control Channels proposed by the Corps." Are these now in place or does the county plan depend on their completion? If the latter, are funds available for this work and what is the completion schedule?

3. The E.I.S. chart on "Population Projections" (Page 65, Figure 13), although possibly the latest officially available, is hopelessly out of date. My own review, made earlier this month, indicates that the current population of Kihei including visitors, is nearly 18,000 people and will increase to around 25,000 people in about 18-24 months. In other words, we are already to 1984 on the chart and still climbing rapidly. This is important because it emphasizes the possibility of a heavy loss of life as well as property when the next severe flood occurs, such as those in 1967 (water 2 feet deep), 1968, and 1971 (water 6 feet deep).

For your information, our organization now has nearly 400 members, most of whom live in the areas affected by this project. In addition, we are strongly supported by many of the condominiums, apartments, hotels and businesses which will be directly affected unless action is taken soon to prevent flood damage.

If the items of concern listed above are properly treated, you can expect our strong support for this project. We are determined that Kihei's wondrous natural beauty shall not be marred any further by poorly planned man-made structures.

Kihei Community Association
P. O. Box 662 • Kihei, Maui, Hawaii 96753

Page 3.
Contd.

Thank you for giving us the opportunity to express our comments. We would appreciate receiving copies of any future publications dealing with this project or any other matters affecting the Kihei area.

Respectfully,

William E. Maschal

William E. Maschal
President

Two enclosures

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

Letter from Kihei Community Association.

1. Comment: All drain lines and culverts must be out of sight or be suitably landscaped.

   Response: No drain line or culvert will be exposed to view. The open channel outlets however will be visible. See Figures 5 and 6 and page 73, Aesthetics.

2. Comment: The drainage project should be coordinated with the Kihei Community's bicycle path-pedestrian walkway project along Kihei Road.

   Response: Construction of the drainage project and the bicycle path and walkway will be coordinated with the Department of Public Works.

3. Comment: What is the relationship between this project and the Corps of Engineers "Plan of Study" and the proposed Flood Control Channels?

   Response: See page 3, Objectives.

4. Comment: The Population Projections chart is out of date. The current population of Kihei is nearly 18,000 including visitors.

   Response: The population projections shown on the chart pertain to Kihei residents only and do not include visitors and tourists.

3/6/77

Department of Public Works
County Building
Wailuku, Maui, HI

Dear Sirs:

I realize that this letter is late, but I had a question regarding the storm drains planned for the Kihei area. According the news article on the draft environmental impact statement, there is little negative impact seen from the drains. I realize the positive result will be flood control, but, at the same time, won't there be increased siltation on reefs from the run-off water which will result in the loss of marine life? Taking Kaneohe Bay as an example, reefs die when storm drains shoot tons of silt onto them. Obviously, Kihei has much less rain than Kaneohe, but it seems there will be a similar result whenever there's a Kona storm and the run-off is channeled rapidly into the ocean. The coral will be covered by silt and will die with the subsequent loss of all the marine life that depends on the reef. To me, this seems like a fairly major impact.

Therefore, I would very much appreciate an answer to this question as to whether or not there will be increased siltation. I'd also like to know if anything is planned to control the siltation in the event that it starts to take place. My husband dives and brings home fish for us to eat as I'm sure many people do, and we're very concerned about the loss or destruction of marine resources.

Thank you very much.

Sincerely,
Cynthia B. Quisenberry

Cynthia B. Quisenberry

RR 1, Box 776
Haiku, Maui, HI 96708

P.S. Since the County is advocating a larger role for itself in the Coastal Zone Management program, it would seem that the county ought to take significant and positive steps to control siltation that may result from the new drains in order to prove its ability to protect coastal resources.

Letter from Cynthia B. Quisenberry.

1. Comment: "...won't there be increased siltation on reefs from the run-off which will result in the loss of marine life?"

   Response: The projects' impact on marine life is discussed on page 69, Marine Life.

2. Comment: "...the County ought to take significant and positive steps to control the siltation that may result from the new drains..."

   Response: See page 10, Drainage Structures.

Leslie Skillings Jr.
154 Alililani Place
Kihei, Hawaii 96753

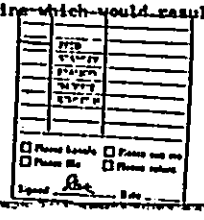
COMMENTS ON THE KIHEI DRAINAGE PROJECT ENVIRONMENTAL IMPACT STATEMENT January 25, 1977

Generally, the Kihei Drainage Project EIS is vague in what is being proposed. Drawings of the box culverts and their placement are necessary.

The assumption of continued growth does not touch on the external events which will make this assumption invalid. For example, the national birth rate has declined for the past twenty (20) years. There is little reason to believe the U.S. population will ever increase much over replacement (2.1) in the next 20 years from its present 1.7 fipure. Can we assume everyone is moving to Maui vs. every place else? The price of land and housing has risen rapidly and will serve as a dappening effect on growth. This was not considered in the EIS.

The growth of tourism, an "energy intensive industry", is totally dependent on petroleum products. The recent and forseeable increases in the price of petroleum will have a chilling effect on such an energy intensive dependant industry. This too was not dealt with in the assumptions of the EIS.

The statement is silent on the environmental effects of breaching the coastal zone. The littoral current movement of sand at each of the proposed out lets is not discussed. I can only conclude that the authors are either ignorant of these effects or have not chosen to deal openly with this important subject because of the erosion of the shoreline which would result from this project.



The EIS also fails to deal with the depth and breadth of alternatives open to kihei residents. This is primarily because of our habit of centralized decision making.

The liability of the County of Maui is only hinted at in this statement. The County has been remiss in its generous approval of building permits without sufficient safeguards for the people who would purchase and/or occupy these structures. (i.e. Kihei Kai Nani and Kihei Beach Condos are two of the most glaring examples) The County in its approval of these projects is giving tacit assurance of reasonable safety. This is an interesting variation of Russian roulette the County government is playing with the residents and guest of the kihei shoreline.

Copies to: Director of:
Dept. of Public Works
200 S. High Street
Wailuku, Hawaii 96793

Office of Environmental Quality Control
550 Halleamwila Street
Room 301
Honolulu, Hawaii 96813

Michael S. Downing

Letter from Leslie Skillings Jr.

1. Comment: "The assumption of continued growth does not touch on the external events which will make this assumption involved," viz. decline in the national birth rate, price of land and housing, increases in the price of fuel.

   Response: Population and growth projections are estimates and should not be taken as exact figures. Although the national birth rate and prices of land, housing and fuel do influence population and growth, the fact remains that Kihei shall experience rapid expansion.

   The population projections recently issued by the Department of Planning and Economic Development (The Population of Hawaii 1958-2025, Recent Trends and Projections, Statistical Report 114, May 1976) are based upon assumptions regarding fertility, mortality and net migration. The report recommends that the series E-2 projection (replacement level fertility and net in-migration of 34.3 persons per 1,000,000 US population) be used for planning purposes. The projection forecasts a population of 1,027,600 in 1985, 1,349,000 in 2000 and 1,927,400 in 2020. Similarly, Maui County's population will be 69,900 in 1985, 107,600 in 2000 and 174,200 in 2020. Even under the assumptions of replacement level fertility and zero net migration, the population will continue to rise up to the year 2025 because of the present age and sex structure of the State.

2. Comment: "The littoral current movement of sand at each of the proposed outlets is not discussed."

   Response: Sand movement is discussed in the section entitled, Beaches and the Movement of Sand, page 70.

3. Comment: "The EIS...fails to deal with the depth and breadth of alternatives open to Kihei residents."

   Response: Residents of the Kihei area will be given the opportunity to comment on any aspect of the drainage system during public hearings to be scheduled and held before the proposed drainage system is installed.

4. Comment: "The liability of the County of Maui is only hinted at in this (Environmental Impact) statement."

   Response: The County of Maui is fully committed to the protection of Kihei residents from flooding. One of the objectives of the Kihei Civic Development Plan which was adopted by the Maui County Planning Commission in 1970, is to "Provide for adequate public works anticipating the best solutions to problems of site-location, structural design, esthetic impact, location economics and programming." The Kihei Drainage Project represents the County's implementation of this section the Development Plan.

The following comments on the Kihei Drainage EIS were received after the thirty day Public Review period. Letters were sent to those agencies or individuals who submitted comments. Attached to the letters were the responses to the comments and excerpts of the appropriate sections of the EIS.

GEORGE R. ARIYOSHI
GOVERNOR

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

RICHARD L. O'CONNELL
DIRECTOR
TELEPHONE NO.
548-6915

FELIX
FRED
STANLEY
FRANCO
INGRID
KENNETH
JO

☐ Please handle ☐ Please ...
☐ Please file ☐ Please return
Signed _____ Date. _____

May 23, 1979

Mr. Wayne Uemae, Director
Department of Public Works
County of Maui
Wailuku, HI 96793

Dear Mr. Uemae:

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR KIHEI DRAINAGE PROJECT, KIHEI, MAUI

We have reviewed the subject EIS and offer the following comments for your consideration:

1) The alignment of the flood control channels as shown in figure 4 does not coincide with that shown on our copy of the Kihei Civic Development Plan. This is especially so for Keokea Stream where the Plan has a straighter alignment. We recommend a clarification on this topic.

2) Page 16. What is the estimated total project cost, including costs for engineering and land acquisition? What are the estimated State and County shares of the estimated costs? What State and County lands would be used for the project?

3) Page 29, Marine Life. Which survey is being referred to in the first sentence of this section? We note that there is no discussion on the topic of the endangered humpback whales which use these waters for that portion of the year most likely to have major flooding and sediment discharges. The relationship of the project to the whale habitat must be discussed in the EIS.

4) Page 32. The location of the Kalepolepo fishpond should be shown on a map of the project area.

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MAY 29 1979
ENGINEERING DIV.
DEPT. OF PUBLIC WORKS

RECEIVED
MAY 25 1979
DEPARTMENT OF PUBLIC WORKS
COUNTY OF MAUI

5) Page 45. Items a through i should be renumbered 1 through 9 to correspond to their use in figure 14.

6) Page 62. Most of the land use/development data appears three to four years old and should be updated.

7) Page 67. What is the present classification of the offshore receiving waters? What effects will the project have on the designated uses of these waters?

8) Page 69. The discussion on noise impacts is too general. How much noise will be generated? How long will a particular area be subjected to the noise impact? Who will be affected by the noise, eg. schools, residences or businesses?

9) Page 73. Any undisturbed areas should receive a walk-through survey by a qualified archaeologist.

10) Page 83. Please expand the section on how discharge of silt or runoff from developed areas would severely disrupt the wildlife community of Kealia Pond.

11) We note that there is no discussion on the relationship of this project to the "208" water quality program. How will that program affect the generation of sediment upslope of the Kihei floodplain and the project's effects on coastal waters?

12) Page 92. We believe Laevastu is the author's name and not the title of the report.

13) Page 96-99. Some of the calculations in this appendix are not consistently rounded off and those figures involving conversion from miligrams (mg) to tons appear underestimated when compared to our figures. The results of our calculations are as follows: page 96 #3, 6545 tons; page 97 #7, 1500 tons and 6545 − 1500 = 5045 tons; #8, 1500/5045 = .30 x 100 = 30%; page 98, #2, 2.56×10^9 liters #3, 1410 tons; page 99 #6, 374 tons; #7, 1410 − 374 = 1036 tons; #8, 374/1036 x 100 = 36.1%. Also, on page 98, at the top, 1.08×10^8 should be 1.08×10^9 sq. ft.

Our figures indicate that the sediment load figures were underestimated in the appendix calculations. A correction of the 29% figure on page 68 appears necessary.

As of this date, we have received a total of ten (10) comments as indicated on the attached list.

This Office has not attempted to summarize comments made by other reviewers but recommend that careful consideration be given to each comment.

The EIS Regulations allow the accepting authority or his authorized representative to consider responses received after the fourteen day response period. This Office will exercise that option and will consider responses after the response period.

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

Sincerely,

Richard L. O'Connell
Director

Attachment

List of Commentors on Kihei Drainage Project EIS.

State Agencies	Comment Date
Dept. of Agriculture	4-26-79
Dept. of Planning and Economic Development	5-1-79
Dept. of Defense	5-1-79
Dept. of Health	5-2-79
Dept. of Accounting and General Services	5-4-79
Dept. of Land and Natural Resources	5-10-79
Hawaii Housing Authority	5-15-79

Maui County Agencies	
Dept. of Water Supply	4-30-79

Federal Agencies	
Dept. of the Army - DAFE	5-1-79
Soil Conservation Service	5-9-79

HANNIBAL TAVARES
Mayor

RALPH HAYASHI
Director of Public Works

DIVISIONS
Engineering
Highway Construction and Maintenance
Land Use and Codes Enforcement
Sewers

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

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

Attention: Richard O'Connell
Director

Gentlemen:

Subject: KIHEI DRAINAGE PROJECT EIS

Thank you for your letter of 23 May 1979, regarding the subject EIS. We have examined your comments and respond to each as follows:

1. The flood control channels as shown in Figure 4 is not the responsibility of the "Kihei Drainage Project." They are channels that are proposed by the U.S. Army Corps of Engineers. The alignments depicted on the Kihei Civic Development Plan were "predicted" drainage lines that eventually may be constructed (Land Use Division - DPED). The "Drainage Master Plan for the County of Maui, 1971, reflects a more accurate plan and alignment. One that is consistent with the Corps' flood control channels (See Figure).

2. The estimated cost will be approximately $13 million for the project (See Pages 16-17 of the EIS). Engineering cost are assumed to be 4% of the total project cots or $520,000.00.

   Land acquisition costs for 10-foot easements, on privately owned lands, based on a land value of $8.00 per square foot is $256,000.00.

3. No State lands will be used for the project. Drainage easements will be located on county and privately owned lands as follows:

County Owned

Kihei Road
Hoonani Street
Waiono Place
Aina Place
Pauahi Place
Kapuhau Place
Konia Place
Namauu Place
Eleu Place
Waipuilani Road
Ulunia Road
West Lipoa Street
East Lipoa Street
Halama Street
North Alaniu Place
Welakahao Road
Kahele Street
Uilani Street
Akina Street
Waimahaihai Street

Privately Owned

Ewa Place
East Kapu Place
West Kapu Place
South Alaniu Place

4. The State and County shares of the estimated costs for the Kihei Drainage Project are unknown at this time.

5. The survey being referred to in the first sentence of the "Marine Life" section on page 29 was:

> A Reconnaissance Survey of Nearshore Marine Environments at Kihei, Maui, prepared for the U.S. Army Engineer Division, Pacific Ocean, September 1977 by Environmental Consultants, Inc.

6. The location of Kalepolepo Fishpond is shown in Figure 11. Items "a" through "i" on pages 47 and 49 have been renumbered 1 through 9 to correspond to their use in Figure 14 on page 46.

7. The land use/development data regarding construction activity and utilities have been updated on pages 63 to. 74 of the EIS.

8. The present Water Quality Standards classification of the Kihei waters in accordance to State of Hawaii, Department of Health is Class A (See Appendix A).

9. The Kihei Drainage Project will not alter activities being exercised at Kihei today. This is discussed on pages 78 and 79 of the EIS.

10. The impacts due to noise generated during construction are discussed on page 80 of the EIS.

11. An Archaeological Reconnaissance was conducted for the Army Corps of Engineers by Ross Cordy, Archaeologist in 1977. Fourteen sites were located and are described in Appendix D.

12. The effects of silt and runoff discharge, from developed areas, on the wildlife community of Kealia Pond is discussed on pages 95 and 96 of the EIS.

13. The implementation of the Department of Health's "208" Water Quality Management Plan for the area mauka of Piilani Highway would aid in the reduction of sediment entering the Kihei Drainage Project Area. The source control of sediment above Piilani Highway could result in a major reduction of sediment discharge into the coastal waters. Section 5 "Alternatives to the Proposed Project," in the EIS, examines various "208" concepts for use within the project site but, these alternatives do not appear to be feasible.

14. The Laevastu Report is entitled "Coastal Currents and Sewage Disposal in the Hawaiian Islands", by Taivo Laevastu, Don E. Avery, and Doak C. Cox, 1964.

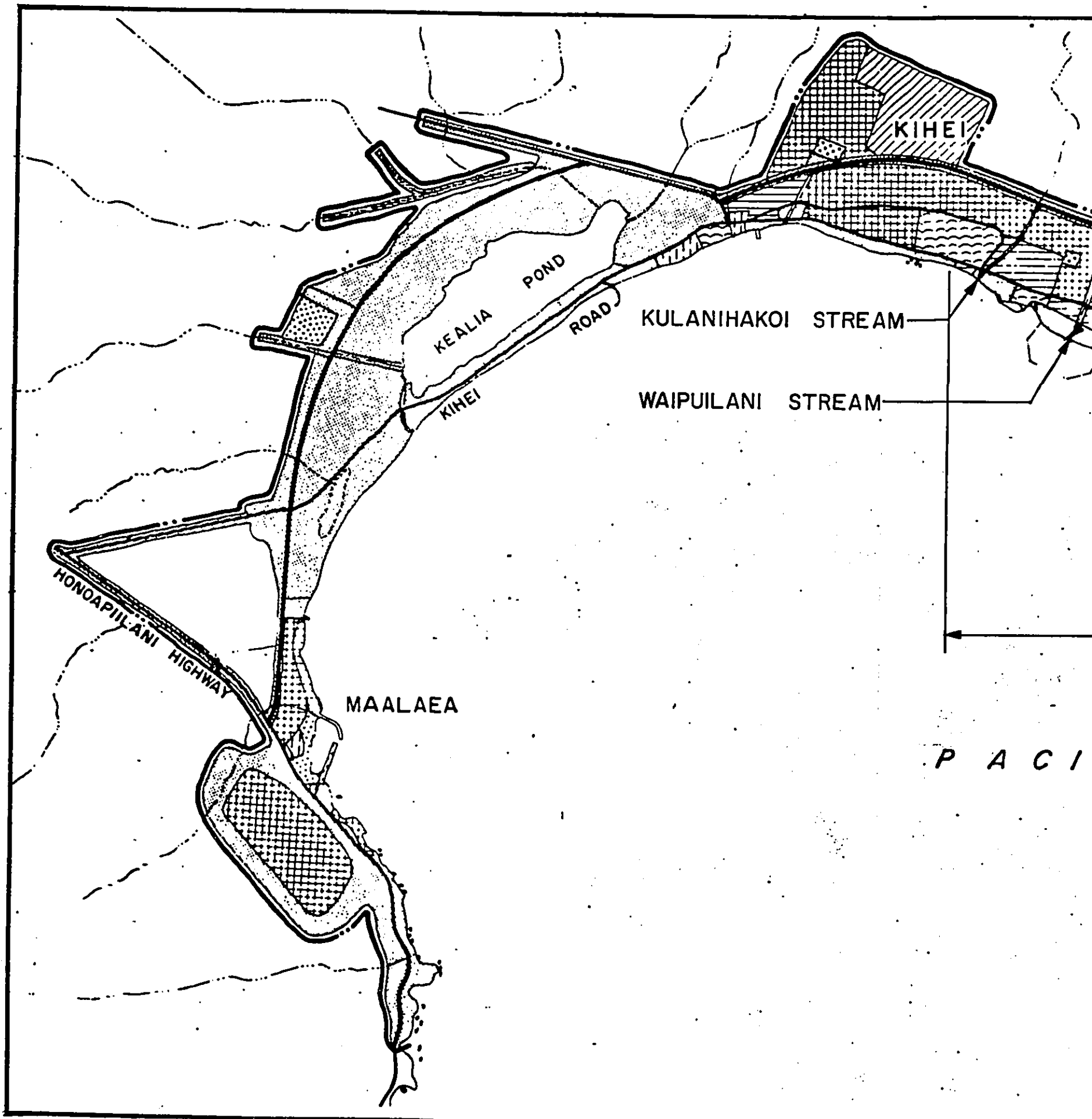
15. The sediment load figures in Appendix E have been corrected in the EIS.

16. The relationship of the Kihei Drainage Project to the Humpback Whales are discussed on pages 31, 32, and 79 of the EIS.

Your comments and the responses will be appended to the revised EIS.

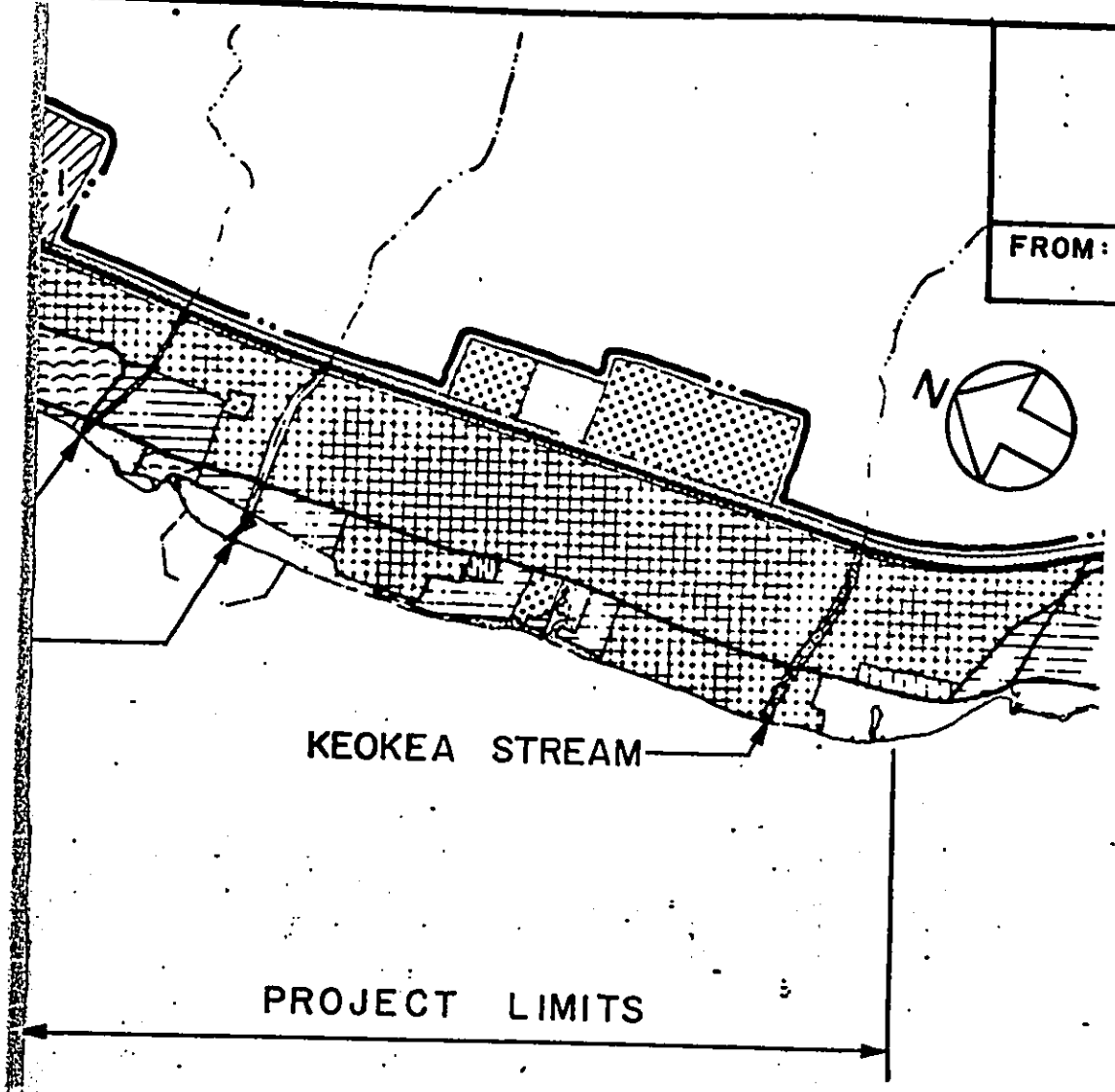
Very truly yours,

Ralph Hayashi
Director
Department of Public Works


KIHEI
KEALIA POND
KIHEI ROAD
KULANIHAKOI STREAM
WAIPUILANI STREAM
HONOAPIILANI HIGHWAY
MAALAEA
PACI

LAND USE MAP FOR KIHEI

FROM: COUNTY OF MAUI
DRAINAGE MASTER PLAN



LEGEND

- RESIDENTIAL
- APARTMENTS
- COMMERCIAL
- OPEN
- PUBLIC
- HOTEL
- PARK
- INDUSTRIAL
- RURAL

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES
EDGAR A. HAMASU
ACTING DEPUTY TO THE CHAIRMAN
CONSERVATION AND ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

RECEIVED
MAY 16 1979
ENGINEERING DIV.
DEPT. OF PUBLIC WORKS

May 10, 1979

Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

SUBJECT: Environmental Impact Statement
Kihei Drainage Project - Maui

Dear Sir:

In response to your letter of April 20, 1979 transmitting an Environmental Impact Statement for the above named project and request for our comments regarding issues addressed in this statement, the following is offered.

Although it has been stated on page 73 that the project does not expect any disturbance of Kalepolepo Fishpond (Site 50-09-1288) a site on the Hawaii Register of Historic Places, it is suggested that if an outlet is placed in Area 2 as illustrated on Figure 4 of the EIS that subsequent silting might be expected to impact the south wall of the pond. It is further suggested that the quality and salinity of the pond water may be altered by the proposed diversion of surface runoff.

Additionally, although it is stated in the EIS (page 73) that the majority of pipes, culverts and channels will be installed in already cleared and worked areas, the statement does not discuss possible effects on archaeological resources that may be located in areas that have not yet been cleared or worked.

In addressing the drain outlets that will be located in the beach area, the only archaeological data that is discussed is the possibility of burials. However, it is highly probable that far more important archaeological resources such as

habitation areas are located in the beach areas and the possible adverse effects to these resources and mitigative measures should be discussed.

It is therefore still our recommendation that:

1. A reconnaissance be conducted of the areas to be impacted by pipes, channels and culverts.

2. That subsurface testing be conducted for possible cultural resources in beach areas to be impacted by the project.

3. That studies be conducted to determine the possible effects to Kalepolepo Fishpond by changed drainage patterns and possible silting by adjacent channels.

4. The terminology 'historical resource officer' on page 86 be changed to qualified archaeologist.

Thank you for the opportunity to address these issues.

Very truly yours,

RALSTON NAGATA, Acting Director
Historic Preservation Program
Division of State Parks

CC: Department of Public Works
County of Maui
200 South High Street
Wailuku, Maui, Hawaii 96793

HANNIBAL TAVARES
Mayor

RALPH HAYASHI
Director of Public Works

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

DIVISIONS
Engineering
Highway Construction and Maintenance
Land Use and Codes Enforcement
Sewers

Department of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Attention: Susumu Ono
Chairman of the Board

Gentlemen:

Subject: KIHEI DRAINAGE PROJECT EIS

Thank you for your letter of May 10, 1979, regarding the subject EIS. We have examined your comments and respond to each as follows:

1. The impact of water quality due to the close proximity of drainage outlet near Kalepolipo Fishpond has been addressed on pages 84 and 85 of the EIS.
2. An archaeological reconnaissance was conducted for the Corps of Engineers by Ross Cordy, Archaeologist, in 1977. Four sites, located by Cordy, are described in Appendix D.
3. The terminology "historical resource officer" on page 99 has been changed to "qualified archaeologist."
4. Since the Kihei Drainage Project will be located in existing right-of-ways, any possible archaeological sites should have been previously displaced. However, if any additional sites are uncovered, during construction, several measures will be implemented, as an attempt to mitigate adverse effects on these sites. These measures have been discussed on pages 84 and 85 of the EIS.

Your comments and these responses will be appended to the revised EIS.

Very truly yours,

Ralph Hayashi
Director
Department of Public Works

913 Halekauwila St.
Honolulu, HI 96814
May 22, 1979

Environmental Quality Commission
550 Halekauwila St., Room 301
Honolulu, HI 96813

Gentlemen:

We have reviewed the Environmental Impact Statement for the Kihei Drainage Project, County of Maui, and wish to offer the following comments for your consideration:

It is astounding that this EIS makes no mention of the effects of this project on the habitat of the Humpback whale. Maalaea Bay is the most critical area for the largest and most visible endangered species in Hawaii. It is the area that has been proposed as the most-critical habitat for a Hawaiian Humpback Sanctuary. Most rainfall and thus most water turbidity will occur in the winter months (p. 18) when the Humpbacks are calfing and breeding in the bay. The EIS neither mentions nor offers data on the extent of disruption which might be caused by turbidity or other results from the run off, nor does it offer data on the sensitivity of Humpbacks to turbidity. Due to the importance of Maalaea Bay to the Humpback, we urge that these questions be addressed and that we be allowed to respond to any conclusions that are drawn before the EIS is accepted.

Flora and Fauna

The location of Kealia Pond relative to the proposed project should be shown on a map.

Oceanography

1. The locations of the sites studied by Environmental Consultants, Inc. are not clear. "The shallow depth of the nearshore waters (only 1.5 meters deep, 200 meters from the shore at Site 2)" is referred to on page 27, but in Fig. 2, Site 2 is shown on the 30 foot depth line. It is also not clear how large an area is referred to in the list of biota on page 29, and whether a systematic effort was made to census populations.
2. It is stated that, "No reliable current observations seem to have been made anywhere along the southwest coast of Maui from Makena to Lahaina." (p. 26) More data is obviously needed to assess the impact of the spreading of water turbidity in the area.

Marine Life

1. What is the basis for the statement, "These coral heads do not indicate the presence of a bountiful reef community " (p. 29)? Have populations of this

area been statistically compared to other reef areas?

2. It is not clear in which years the Bowers and Kinzie studies were done.

3. The Maciolek Study (1971) and the Cattell and Miller Study (1972) are both too old to be of use. In response (p. 103 and following) to a similar comment by the Maui Planning Department, it is stated that, "It is felt that the conditions under which the previous studies were made have not considerably or significantly changed." What is the basis for this blithe assumption? Since 1971,

    1. There has been a large increase in population of the area.
    2. "Resort growth on Maui is taking on large proportions with the biggest project being built on the coast just south of Kihei" (p. 60).
    3. Condominium units increased from approximately 340 in 1971 to over 2000 in 1975 (where the graph ends; Fig. 17).
    4. "...the County Public Works Department has recently completed the new sewage treatment plant and sewer systems to service the Kihei area" (p. 63).

    It is certainly not possible to assume that this great increase in population and activity have had no effect on the water quality and biota of Maalaea Bay.

4. A comprehensive site study is needed that will address the impact on the nearshore areas off of Kihei as well as the overall impact on the entire bay. It should address such factors as past and present conditions, areal extent of siltation that would occur, currents, extent of turbid water, affects on salinity and effects on the biota of the area. The study should be as broad as possible so as to address the impact of many sources of pollution whose combined effects might be sufficient to seriously harm the Humpback whales. The study by Environmental Consultants, Inc. can in no way be considered comprehensive enough to meet these needs.

5. The areas mentioned in the text should be clearly marked on the maps, specifically, Kihei Shoals, the rocky beach shoreline area, and the Palalau area.

Significant Floods and Flood Damages

The total dollar value of damages listed is $804,300. We question the wisdom of spending almost 8.5 million dollars and causing adverse effects on the marine and visual environments for a relatively small amount of damage. It is true that if the Kihei area is developed further, higher damage figures could result from a flood. But to use this as a justification for an expensive drainage project, which itself would contribute to the expansion, is a circular argument.

Historic Sites

The location of the Kalepolepo fish pond in relation to the project should be shown on a map.

Socio-Economic Patterns and Trends

Due to adverse environmental effects on Maalaea Bay, we question whether Kihei can or will continue to grow as fast as it has been. The bay will probably be designated a critical habitat or sanctuary for the Humpback whales. In either case, it is clear that the protection of the marine environment of the bay is imperative if the Humpbacks are to survive. The conflict between hasty development and sound environmental management will probably find resolution in cancellation of some projects and increased costs for others in order to meet stricter

regulations for environmental protection. We do not believe it is appropriate to encourage growth in this area by the funding of such projects as the Kihei Drainage Project.

Probable Impact on the Environment - Marine Life

It is stated, "The poor quality and quantity of reef life is apparently the direct result of the turbid waters" (p. 30) and "Visibility was very poor in the discolored water at both sites" (p. 27), but no data is supplied on how much additional damage will be done by the increased turbidity. Instead, it is stated that additional sediment "are not expected to constitute a highly damaging external shock to the normal activities of the marine ecosystem which even now experiences sediment inputs" (p. 69). There is no data given to support this conclusion; it seems to imply that if an area is already damaged, it is not important if more damage is done.

Alternatives to the Proposed Project

There are no estimated costs and little discussion for the alternative of sediment basins. A discussion of this alternative should be included to allow a realistic comparison with the drainage system.

Sincerely,

Kelley Dobbs
Greenpeace Hawaii

GREENPEACE

FELIX
FRED
SPENCER
THOMAS
HOWIE
CHRISTY

☐ Please handle ☐ Please see me
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Signed

913 Halekauwila St.
Hon., Hi., 96814
May 29, 1979

Office of Environmental Quality Control
550 Halekauwila St. Rm. 301
Hon., Hi., 96813

Gentlemen:

Subject: Additonal comments on on Kihei Drainage Project EIS

The enclosed article from the Honolulu Star-Bulletin (May 26,1979), mentions a moratorium on the issuance of water meters or building permits since 1976. It also says the ban may be extended, and that the water supply problems of the area are not over. No mention of this moratorium is made in the EIS.

One of the main arguments that the EIS advances for implementation of the drainage project is the continued rapid development of the area that the authors have forseen. For this reason it is extremely important that all factors which work againt this development are presented in their entirety.

Sincerely,

Kelley Dobbs

Encl.
cc: Dept. of Public Works,
County of Maui

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JUN 1 1979
ENGINEERING DIV.
DEPT. OF PUBLIC WORKS

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MAY 31 1979
DEPARTMENT OF PUBLIC WORKS
COUNTY OF MAUI

Star-Bulletin 5/26/77 A-2

Maui Water Woes May Lead to Ban

By Robert McCabe
Maui Bureau Chief

WAILUKU, Maui—Maui's Board of Water Supply, concerned about dense urban growth in the central Maui region, may impose a 120-day emergency moratorium banning issuance of water meters or building permits in the area.

A public hearing on the measure, which could be adopted under the board's emergency rule powers, will be held at 8 p.m. Wednesday in the council chambers.

There are too many requests for new water meters, according to Tatsumi Imada, director of the Department of Water Supply.

Imada said yesterday water sources developed under a joint venture by the county and developers of two private resorts at Wailea and Makena, are inadequate to take care of the areas needs.

THE WATER sources, located in Waiehu, are part of the joint venture's new $13 million Central Maui Water Transmission system that was dedicated last month.

The new system, which has the capacity of delivering up to 35 million gallons of water a day, has not been turned on yet. Its opening, scheduled to occur within the next 45 days, was supposed to bring about the end of an existing moratorium imposed in 1976.

Imada said the new emergency rule ban, good for 120 days, will replace the existing moratorium. When this occurs, some 3,000 new users will be hooked into the system and although Imada said the new connections may not take place all at once, "the committed, or vested rights of those waiting to get on to the new line will exceed the region's safe yield of 19.2 million gallons a day."

He estimated the connections may take up to three years to complete and would require a yield of 22.6 million gallons daily if the water supply is to remain adequate for all the region's users.

"We cannot fulfill this need based on our present resources. The new moratorium is necessary if we are to provide adequate water for the community," Imada said.

HE SAID THE joint venture partners, C. Brewer and the Wailea and Seibu development companies, have been asked to develop new water resources to augment the 8.5 million daily gallons that will be added to the system the new central Maui system is in operation.

But despite the pending increase in the water availability, Imada said measures to limit distribution is imperative because of a huge demand for building permits.

"Including those permits, which we are committed to approve, the total number of meters being sought is 5,428," Imada said.

He added that further limitations on the water hookups will be sought when the proposed 120-day emergency rule moratorium expires and that the ban will have to be continued until sufficient resources are developed.

He said geologists are confident sufficient water is available in the Iao-Waiehu area but that the problem involves getting it out.

If and when the emergency rule is adopted, Imada said no new meters or building permits will be issued except to applicants who do not add to the water load.

dependent Well Co
Next summer.

HANNIBAL TAVARES
Mayor

RALPH HAYASHI
Director of Public Works

DIVISIONS
Engineering
Highway Construction and Maintenance
Land Use and Codes Enforcement
Sewers

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

GREENPEACE
913 Halekauwila Street
Honolulu, Hawaii 96814

Attention: Kelly Dobbs

Gentlemen:

Subject: KIHEI DRAINAGE PROJECT EIS

Thank you for your letters of May 22 and 29, 1979, regarding the subject EIS. We have examined your comments and respond to each as follows:

1. The relationship of the Humpback Whale with Maalaea Bay has been addressed on pages 31 and 32 of the EIS. The effects of turbidity on the humback whale have also been addressed in Section 3 of the EIS, "Probable Impact on the Environment" (Page 79).

2. The location of Kealia Pond, relative to the proposed project, has been shown in Figure 11.

3. The locations of the sites, studied by Environmental Consultants, Inc., have been corrected on Figure 11 on page 28 of the EIS. The site locations are shown as numbered squares.

4. The list of biota, now on page 30, of the EIS, was surveyed by Environmental Consultants, Inc. The surveyed areas were sites 2 and 3 as shown in Figure 11. The method of survey at each location required adjustment due to the highly turbid waters. The basic procedure for the survey at Site 2 and 3 from "A Reconnaissance Survey of Nearshore Marine Environments at Kihei, Maui," September 1977 by Environmental Consultants, Inc. was as follows:

> Beginning at the shoreline opposite the entrance of the gulch or proposed channel alignment, a diver traversed a zig-zag course gradually moving offshore. Notes on benthic organisms, fishes, and the nature of the bottom were recorded on underwater slates. This process was continued until the nearest occurrences of living coral heads was determined and, either a distance of 150 meters offshore was reached, or bottom depth exceeded 10 meters. In fact, reconnaissance always extended to 150 meters offshore.

At Site 2 (between Kalepolepo and Waipuilani Gulch), four transect lines, each 50 meters in length, were laid out perpendicular to the shore. The base of each line was anchored in the intertidal (littoral) zone. The type of bottom (i.e., sand, rubble, boulder, etc.) was determined under each of the meter marks on the line. Abundance of foliose algae was assessed in two quadrats (one meter on a side) placed along each transect line. The quadrat positions were stratified, a randomly selected number determining one position in the inner segment (first 25 meters) and one in the outer segment (second 25 meters) of the transect. All of the foliose algae in a quadrat were gathered and placed in a numbered plastic bag. In the laboratory, the algae were sorted by species, dried in an oven set at 40-50°C until crisp (24-48 hours) and weighed on a Mettler (P-163) top-loading balance. Data on benthic fauna and fishes were obtained during reconnaissance swims.

Methods applied at Site 3 (Kalama Park) were essentially identical to those used at Site 2 except that a total of three transect lines were laid."

5. The data required to determine the spread of turbidity in the nearshore waters includes the following: 1) water current velocities and direction, 2) wind velocities and direction, and 3) temperature. Data collection must be done during and after major storms in order to determine the potential residual effects of stormwater runoff.

   The required data collection and evaluation will result in extensive and unjustifiable delays (possibly several years) for the development of an interior drainage system that is needed for the Kihei area.

6. The statement "These coral heads do not indicate the presence of bountiful reef community" is based on the observation of Dr. Jed Hirota, Marine Biologist at the University of Hawaii. Very few coral heads within the nearshore waters of the project site (Site 2 and 3), observed by Environmental Consultants, Inc., contained live coral.

Therefore, the limited quantities of live coral have apparently impeded the development of a large and diversified reef community.

7. The dates of the Bowers and Kinzie studies are indicated on page 33 of the EIS.

8. The rapid growth of the Kihei area has been directed to the resort and residential developments along the southern end of Kihei, beyond the Kihei Drainage project site. Dust and sediment from the movement of cars, people and machinery through the project site will be reduced once Piilani Highway is completed. Major traffic generated from the developments in Southern Kihei will eventually by-pass the existing shoreline route along Kihei Road.

   The Kihei Sewage Treatment Plant disposes wastewater into injection wells and also recycles effluent for the irrigation of parks and undeveloped county property.

9. A comprehensive site study on the nearshore area off Kihei may be unnecessary due to the limited marine biota within the Project Site. The need for a "broad study" on factors such as: past and present conditions, area extent of siltation, currents, extents of turbid water, and the effects of salinity is questionable for this area with its limited biota.

10. An estimated $804,300.00 of flood damages were incurred by historical storms dated from 1910 to 1971. Due to inflation, those costs are no longer accurate and need to be escalated to be consistent with present day increases. Undoubtedly, there have been major increases in construction, land, public and private infrastructure costs. The increased cost of damages reflect a more accurate account of losses, from an economic standpoint. The $804,300 figure also fails to take into account the recent urbanization on the Kihei coastal plain. An occurrence that was not present during 1910 to 1971. This boom in construction will greatly increase potential property losses due to floodings.

    In addition, the Kihei Drainage Project will develop an interior drainage system that is consistent with the goals and intent of the Drainage Master Plan for Maui County and will alleviate existing drainage problems and flood hazards that characterize the Kihei coastal zone.

The interior drainage project is intended to be used by governmental agencies and businesses for coordinating drainage improvement activities. The project will establish a general concept for a functional pattern of drainage facility types and locations.

As you stated, justification is indeed a circular argument. Presently, the project site has no system of interior drainage. During flooding, the population is subjected to hazardous conditions. The project will assist in alleviating this.

11. The location of Kalepolepo Fishpond is shown in Figure 11 of the EIS.

12. The statement that additional sediment "are not expected to constitute a highly damaging external shock to the normal activities of the marine ecosystem which even now experiences sediment inputs" merely reflects the fact that turbidity at any level (may it be existing or additional levels - after development) will have only limited effect on the marine life because the Kihei marine ecosystem is limited and sparse.

13. Several alternatives, including drywells, sediment basins, and terracing have been discussed on pages 94 to 96 of the EIS. The viability of each alternative in the context of cost, land acquisition and implementation has been evaluated.

14. The water moratorium for the Kihei area has been addressed on pages 73 and 74.

Your comments and these responses will be appended to the revised EIS.

Very truly yours,

Ralph Hayashi
Director
Department of Public Works

GEORGE R ARIYOSHI
GOVERNOR

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

RYOKICHI HIGASHIONNA, PH D.
DIRECTOR

DEPUTY DIRECTORS
WALLACE AOKI
DOUGLAS S. SAKAMOTO
CHARLES O. SWANSON
James R. Carras

May 23, 1979

IN REPLY REFER TO:
STP 8.5453

Office of Enviromental
Quality Control
550 Halekauwila St., Room 301
Honolulu, Hawaii 96813

Gentlemen:

Subject: Environmental Impact Statement
Kihei Drainage Project
Kihei, Maui

Thank you very much for giving us the opportunity to review and comment on the above-captioned statement. It appears that the Kihei Drainage Project does not make provision for the runoffs which are generated above and which are passed through the bridges and culverts of our proposed Piilani Highway. While we are led to believe that these runoffs will be accommodated by the future flood control project by the Corps of Engineers, we suggest that the proposing party insure that the affected actions by both the proposing party and the Corps of Engineers are complementary.

Very truly yours,

Ryokichi Higashionna

Ryokichi Higashionna

HANNIBAL TAVARES
Mayor

RALPH HAYASHI
Director of Public Works

DIVISIONS
Engineering
Highway Construction and Maintenance
Land Use and Codes Enforcement
Sewers

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813

Attention: Ryokichi Higashionna
Director

Gentlemen:

Subject: KIHEI DRAINAGE PROJECT EIS

Thank you for your letter of May 23, 1979, regarding the subject EIS. We have examined your comment and respond as follows:

> The design of the Kihei Drainage Project assumes that the concept of the U.S. Army Corpos of Engineers' flood control will remain the same as in their 1964 study: lateral interception ditches to collect sheet flow and the lining of the three gratural water courses. The County of Maui has accepted this concept in its Drainage Master Plan.
>
> Coordination between the Kihei Drainage Project and the flood control program will take place continuously while the latter is under study.

Your comments and the responses will be appended to the revised EIS.

Very truly yours,

Ralph Hayashi
Director
Department of Public Works

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

PODED-PV

25 May 1979

Mr. Wayne Uemae, Director
Department of Public Works
County of Maui
200 South High Street
Wailuku, Maui, Hawaii 96793

FELIX
FRED
STANLEY
FRANCO
INQUIRE
ED
☐ Please handle ☐ Please see me
☐ Please file ☐ Please return
Signed _____ Date _____

Dear Mr. Uemae:

We have reviewed the Environmental Impact Statement dated April 1979 for the Kihei Drainage Project.

We have inclosed a copy of a portion of the Preliminary Flood Insurance Rate Map for the project area (Incl 1). The map delineates the 100-year tsunami and riverine flood inundation areas for your use in updating the flood hazard map on page 46 of the Environmental Statement. The flood control study for the Kihei District by our office is presently scheduled for completion in 1982 rather than 1979 as indicated on page 4 of the statement. We note that your cost estimates for the project do not include the costs for the Kulanihakoi, Waipuilani and Keokea flood control channels which could be constructed by either the State or the Federal Government. The design of the drainage structures assumes that the flood control project recommended by the U.S. Army Corps of Engineers in 1964 will remain the same. You should consider in your design that Piilani Highway may not intercept sheet runoff mauka of the highway and that your proposed drainage structures may not have sufficient capacity to prevent flood damages or losses. The interceptor ditch along Piilani Highway may discharge into the three streams previously mentioned and may again affect the design of your drainage structures.

A copy of our "Cultural Resources Study, Archaeological Reconnaissance for the Kihei Flood Control Project" is provided for your information and use in assessing impacts to archaeological resources (Incl 2).

The location of recreational beaches and the Kalepolepo Fishpond and Captain Vancouver Monument could be shown on map to illustrate their locations relative to the project area and possible effect of the project on the resources.

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MAY 29 1979
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DEPT. OF PUBLIC WORKS

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MAY 29 1979
DEPARTMENT OF PUBLIC WORKS
COUNTY OF MAUI

PODED-PV 25 May 1979
Mr. Wayne Uemae

We suggest that you contact the U.S. Soil Conservation Service because of their experience with the sand plug by-pass system at Ulehawa Stream outlet. We understand that the by-pass system has been partially successful, but has not prevented ponding of water upstream of the sand plug. The feature is believed to be costly, and your cost estimates may be too low to permit construction of the by-pass. Your maintenance costs are not addressed in the cost evaluation.

As stated in the Environmental Statement, a Department of the Army permit is required for the construction of the drainage outlets on the shore. However, as indicated on page 73, we do not approve the design of the outlet; instead the Corps authorizes the work after an evaluation of the effect of the project on navigation, water quality and other factors of public interest.

We appreciate the opportunity of participating in the environmental and project review process.

Sincerely yours,

KISUK CHEUNG
Chief, Engineering Division

2 Incl
As stated

HANNIBAL TAVARES
Mayor

RALPH HAYASHI
Director of Public Works

DIVISIONS
Engineering
Highway Construction and Maintenance
Land Use and Codes Enforcement
Sewers

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

Department of the Army
U.S. Army Engineer District, Honolulu
Building 230
Fort Shafter, Hawaii 96858

Attention: Kisuk Cheung
Chief, Engineering Division

Gentlemen:

Subject: KIHEI DRAINAGE PROJECT, EIS

Thank you for your letter of 25 May 1979, regarding the subject EIS. We have examined your comments and respond to each as follows:

1. An update of the flood hazard map on page 46 has been made and is now shown on page 42 of the EIS.
2. The completion date for the flood control study for the Kihei District by the Corps of Engineers has been corrected from 1979 to 1982.
3. The Kulanihakoi, Waipuilani and Keokea Flood Control channels have not been considered as part of the Kihei Drainage Project cost. The project will utilize only the discharge outlets of these flood channels.
4. Should there be any changes in the design concept of either Piilani Highway or the Corps of Engineers' flood control project, the Kihei Drainage Project will be evaluated to accommodate such changes.
5. The locations of Kalepolepo Fishpond and the Vancouver Monument are shown in Figure 11. Due to the highly turbid waters at Kihei, the beaches are not heavily populated by residents and visitors. Some shell divers do utilize the waters within the project limits, but their numbers are few.
6. According to the U.S. Soil Conservation (SCS) Service, the sand plug by-pass system at Ulehawa Stream has a 100% success rate as a protective device against flood hazards. During heavy rains and subsequent flooding, sand plugs would be breached by the by-pass system, thereby eliminating the problem of ponding. The SCS has approximated the cost of the by-pass system, including material (steel and concrete), excavation, backfill, and labor, to be $800,000.

7. The sand plug by-pass system does require mechanical removal of sand from the ocean end of the structure and from inside the system. The maintenance section of the County of Maui's Public Works Department will occasionally maintain the system. This cost is estimated as being 4% of the total construction cost, approximately $32,000.00 per year.

Your comments and the responses will be appended to the revised EIS.

Very truly yours,

Ralph Hayashi
Director
Department of Public Works

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AH ✓
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University of Hawaii at Manoa

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

Office of the Director

May 25, 1979

	FELIX
	FRED
	STANLEY
	FRANCO
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	KENNETH
	ED

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Signed _____ Date _____

RECEIVED
JUN 5 1979
ENGINEERING DIV.
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Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Sir:

Draft Environmental Impact Statement
Kihei Drainage Project
Kihei, Maui

The Environmental Center has reviewed the above cited environmental impact statement with the assistance of Steven Smith, Hawaii Institute of Marine Biology; Paul Eckern, Water Resources Research Center; Jacquelin Miller and Barbara Vogt, Environmental Center. We have serious reservations about the adequacy of this document to assess the potential impacts which may result from the proposed construction.

The following areas are of specific concern:

We disagree with the statement that "the impact (from sediment) on the relatively sparse marine life offshore from the project area at Kihei will be small" (p. i). The County of Maui, Planning Department; the Water Resources Research Center, University of Hawaii; the State Department of Health; the U.S. Fish and Wildlife Service; the Army Corps of Engineers, and informed citizens have all expressed in writing their reservations over the validity of the potential silt assessment.

Sediment production rates and probable erosion hazards are very high for areas such as the Kihei flood plains. The figures indicating the potential sediment load (p. 96) appear low. Since the production of soil loss is unknown now, the Universal Soil Loss Equation would be more appropriate for assessing the potential erosion hazard.

Has any consideration been given to impounding runoff through terracing and/or use of a ponding system? We note that present discharge points must be periodically unclogged to function properly. There is no reason why similar problems will not occur in the future. Since plans have been made to fence the openings, maintenance of the discharge structures could pose a severe problem. What are the current plans for future maintenance?

No discussion has been given to bedload treatment. Articles by Jones, Nohara and Chinen (1971) and Eckern (1976) both discuss high velocity bed load transport. These references may have been included on page 94 which is missing from our copies.

We note the Kihei area receives an average of 10 inches of rain a year. Although we recognize the need for flood protection, we urge that consideration be given to the potential damage from tsunami inundation in reverse flow through the channels. What would be the extent of the increase in tsunami flooding due to the proposed construction? Will such inundation be modified in any way?

No mention was made in the EIS of the effect of further turbidity loads on marine animals further from shore. A proposal has been made to establish a national humpback whale sanctuary in the Maalaea Bay area. Concerns have been raised regarding the hazard of decreased visibility to the animals during the times when they come nearshore to calve. Is there a possible conflict between the proposed project and the federal guidelines for such sanctuaries? If so, what mitigate measures are available?

Several concerns were raised regarding the assessment of the marine biota. Since the currents are unknown, the dissipation of point sources of freshwater cannot be calculated. Since reef organisms may be killed by extended freshwater concentrations, calculations regarding the effect of freshwater inflows should be given. Discussion of extended periods of freshwater discharge, wind velocities as well as probable current patterns or alterations of such patterns during storm periods should be included. As noted, cyclonic storms are usually of brief intensity and this may not be a problem.

The bases for determining the scarcity of marine biota appears inappropriate. Appraisal of the marine life generally does not depend on the turbidity or clarity of the water. No discussion of the apparent decline in shells from the bay over the past few years was presented.

We question the appropriateness of a flood-project design utilizing groins without knowing the existing littoral currents. Erosion to adjacent beaches resulting in property loss and/.or value could be significant. Further consideration should also be made regarding the effect of outfalls on adjacent properties. Debris and silt could require frequent maintenance just to keep the area clean. Thus could result in an undue maintenance load for the County.

What is the rationale for proceeding with this project prior to the completion of plans for the possible assistance of the Army Corps of Engineers?

We appreciate the opportunity to comment.

Yours truly,

Donk C. Cox
Director

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JUN 4 1979
DEPARTMENT OF PUBLIC WORKS
COUNTY OF MAUI

DCC/ck

cc: Steven Smith
Paul Eckern
Jacquelin Miller
Barbara Vogt
Dept. of Public Works ✓

HANNIBAL TAVARES
Mayor

RALPH HAYASHI
Director of Public Works

DIVISIONS

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COUNTY OF MAUI
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University of Hawaii
Environmental Center
Crawford Hall, Room 317
2550 Campus Road
Honolulu, Hawaii 96822

Attention: Doak Cox
Director

Gentlemen:

Subject: KIHEI DRAINAGE PROJECT EIS

Thank you for your letter of 25 May 1979, regarding the subject EIS. We have examined your comments and respond to each as follows:

1. The major source of sediment, that enters the nearshore waters of Kihei, is from the steep slopes of Haleakala. The heavily sediment-laden runoff is deposited in the Kihei flood plain and compounds the problems of an interior drainage system.

   A prime objective of the Kihei Drainage Project is to provide adequate interior drainage of stormwater generated from within the project limits. The watershed characteristics for the project site are that of an urban area. The runoff from within the boundaries of the project is generated from areas such as: roadways, parking lots, and grassed property that do not contain high volumes of sediment. Therefore, the impact of sediment from solely within the project area is small.

2. The soil loss from erosion, using the Universal Soil Loss Equation, is shown in Appendix B.

3. The impoundment of runoff through the use of terracing and/or ponding systems have been analyzed for their respective feasibility as alternatives to the proposed project in Section 5 "Alternatives to the Proposed Project."

4. The Public Works Department of the County of Maui will periodically displace the sand plugs formed at the discharge outlets and clear the area of debris. The maintenance process will require loaders and bulldozers to remove the debris and breach the sand plugs.

5. The erosion and subsequent devaluation of property adjacent to the proposed outlet structures is discussed on pages 82 to 84 of the EIS.

6. The bedload discharges for Kulanihakoi, Waipuilani, and Keokea Streams are discussed in Appendix C of the EIS.

7. The potential damage of tsunami inundation in reverse flow through the proposed channels is limited. Ponding may result around the drainage inlets if the force of the tsunami is great enough to move water up the channels. The majority of the interior drainage lines are located within the potential tsunami inundation limit. Therefore, during the tsunami conditions, ponding will occur only in areas within the existing inundation zone. The potential damages include the inundation of homes and property as well as potential flotation of homes (discussed on page 76 of the EIS).

8. The effects of increased turbidity loads on the Humpback Whales are difficult to evaluate due to the lack of available research and data collection. However, this question has been addressed on page 79 of the EIS.

9. The establishment of a National Humpback Whale Sanctuary in the Maalaea Bay area is discussed on page 31 of the EIS. As of this writing, the rules and regulations for the sanctuary have not been implemented into law.

   The Kihei Drainage Project is consistent with the existing rules and regulations set forth by the National Marine Fisheries.

10. The basic quantity of freshwater discharged into the nearshore waters will not be altered through the development of the Kihei Drainage Project. The Project is not intended to increase the generation of stormwater, but to expedite its disposal. The concentration of freshwater in the nearshore waters off Kihei will increase during and directly after a major storm. However, the freshwater concentration will eventually be dispersed through wind and water currents (presently, no data is available regarding these patterns during storms). Since the population of reef organisms within the project boundaries are very sparse, the net effect of freshwater concentration from storm runoff is negligible.

11. Studies have not been conducted on the impact of runoff on shells. The decline of shells in the area can be attributed to existing deterioration and harvesting by shell divers.

12. The rationale for proceeding with this project is based on the need for an "interior drainage" system for the residential areas below the new Piilani Highway. The objective of the Army Corps of Engineers project is to provide flood control against major floods.

    At this time, the Corps of Engineers is still in the process of determining the feasibility and analyzing the cost-benefit relationships of their project.

Your comments and these responses will be appended to the revised EIS.

Very truly yours,

Ralph Hayashi
Director
Department of Public Works