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GOVERNOR OF HAWAII



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

FEB 13 1995

Ref: LM:CS

Mr. Gary Gill, Director
Office of Environmental Quality Control
220 South King Street, 4th floor
Honolulu, Hawaii 96813

Dear Mr. Gill:

**SUBJECT: Negative Declaration for Hilton Lagoon Project,
Hilton Hawaiian Village, Waikiki, Oahu**

The Department of Land and Natural Resources has reviewed and responded to the comments received during the 30-day public comment period. The Department of Land and Natural Resources has determined that this project will not have a significant environmental effect and has issued a negative declaration. Please publish this notice in the next OEQC Bulletin. Also, enclosed are four copies of the Final Environmental Assessment for the project.

Should you have any questions, please contact Cecil Santos of the Oahu Land District at 587-0433.

Very truly yours,

MICHAEL D. WILSON

cc: Mr. C. Matsumoto
Mr. M. Nekoba

8.23 526
MICHAEL D. WILSON
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
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GILBERT S. COLOMA-AGARAN

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WATER RESOURCE MANAGEMENT

1995-03-08-0A-FEA - Hilton Hawaiian Village Lagoon Project

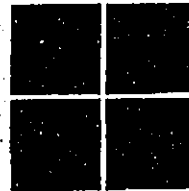
AECOS No. 748

Final
Environmental Assessment
for the
Hilton Lagoon Project
Hilton Hawaiian Village
MAR - 8 1995

Prepared For:



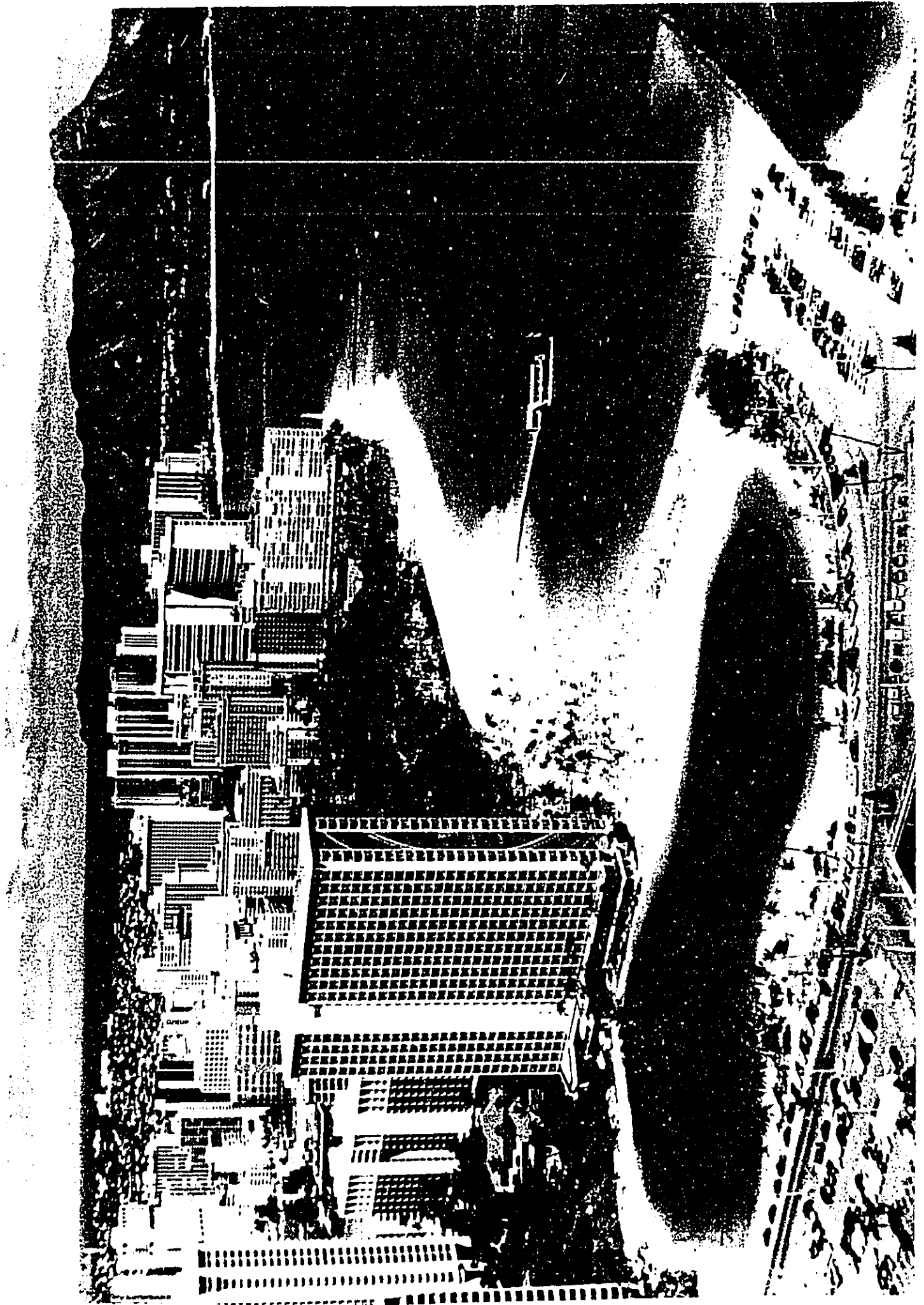
THE
ENTEROCEAN
GROUP



Prepared By:

AECOS, Inc.
970 N. Kalaheo Ave., Suite C300
Kailua, Hawaii 96734

January 1995



**Final
Environmental Assessment
for the Hilton Lagoon Project
Hilton Hawaiian Village**

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Frontispiece: Oblique aerial view of the Hilton Hawaiian Village (left center) and Kahanamoku Lagoon. The Kahanamoku section of Waikiki Beach extends from the breakwater on the right to the catamaran pier. Parking areas in the lower portion of the photo are at the Ala Wai Boat Harbor.

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APPENDIX C - Water Quality Considerations for the Hilton Lagoon
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APPENDIX E - 1955 Deed and Indenture

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at the Southwest End of Kahanamoku Beach, Waikiki

1.0 INTRODUCTION AND SUMMARY

1.1 Environmental Assessment Document

This revised Final Environmental Assessment (EA) document has been prepared to accompany a Conservation District Use Application (CDUA) for submittal to the State of Hawaii, Department of Land and Natural Resources (DLNR) in compliance with HRS Chapter 343 and State Administrative Rules, Title 11, Chapter 200. This document will also be submitted in support of requirements for use of State Lands (Chapter 343-5, HRS) and a Special Management Area Permit application to the City and County of Honolulu.

Applicant	Hilton Hawaiian Village Joint Venture and The EnterOcean Group
Address of Applicant	The Hilton Hawaiian Village Joint Venture 2005 Kalia Road Honolulu, Hawaii 96815 The EnterOcean Group, Inc. 2045 Kamehameha IV Road Honolulu, Hawaii 96819
Land Owner	Hilton Hawaiian Village Joint Venture (part) and State of Hawaii (part)
Tax Map Key (TMK)	2-3-37:21 (Kahanamoku Lagoon) 2-6-08:34 (Hilton Hawaiian Village) 2-6-09: 1 (" " ")
Land Use Classifications:	Zoning Districts: P-2 and Resort Mixed Use State Land Use: Conservation (R),(G) and Urban.
Accepting Agency:	State of Hawaii Department of Land and Natural Resources Keith Ahue, Director

1.2 Project Summary

The Hilton Lagoon project (herein referred to as the "attraction" or "commercial facility") is an aquatic recreation facility proposed by The EnterOcean Group and Hilton Hawaiian Village Joint Venture designed for entertainment, education, and visitor involvement. The Hilton Lagoon attraction will be a replica tropical, marine environment with captive marine animals (fishes and invertebrates) contained in a large, swim-through aquarium to be constructed in a part of the existing Duke Kahanamoku Lagoon (herein referred to as the "lagoon" or the "public lagoon") located closest to the Hilton Hawaiian Village (see Figure 1). The attraction will consist of approximately 60,000 square feet of re-created underwater environments. Visitors will have access to a network of winding, shallow channels among tropical "islets" complete with lush foliage. Marine fishes and corals native to the Hawaiian Islands will be stocked in these waterways, and sea water will be continuously flushed through at a high turnover rate to insure both the health of the marine biota and the quality of the water exiting the commercial facility.

Visitors will pay an admission fee, change into swimsuits, don masks and fins, and, after suitable orientation, embark on a one-half hour underwater tour through a variety of tropical marine habitats. While the facility is being designed for flexibility of use, most visitors will travel via an innovative new towing vehicle and will breathe compressed air through short supply hoses. They will be able to hear their tour guide describing the fish and other tropical life on special underwater headphones. For most visitors, this will be their first underwater ocean experience. The facility will also be utilized for night diving, SCUBA classes, and other related activities of an educational nature.

The public lagoon at the west end of Waikiki Beach is currently little used. A thick layer of silt on the bottom and aquatic life typified by tilapia and large jellyfish discourage recreational uses of this amenity located in an area otherwise heavily visited by residents and tourists alike. The present condition of the lagoon results from inadequacies of the sea water exchange system, designed in the 1950's by the Territorial Harbors Commission. The lagoon exchanges water with the sea directly off Kahanamoku Beach through long pipes as water is pumped from the lagoon into the middle basin of the Ala Wai Boat Harbor. The turnover rate of water in the lagoon is about once every two days and the nearshore source water is frequently turbid. These conditions promote the accumulation of silt on the bottom and the presence of the large jellyfish.

The proposed Hilton Lagoon attraction will require a constant supply of high quality ocean water obtained by high volume pumps and a sea water intake line extending about midway out the Catamaran Channel. This water will pass through the attraction

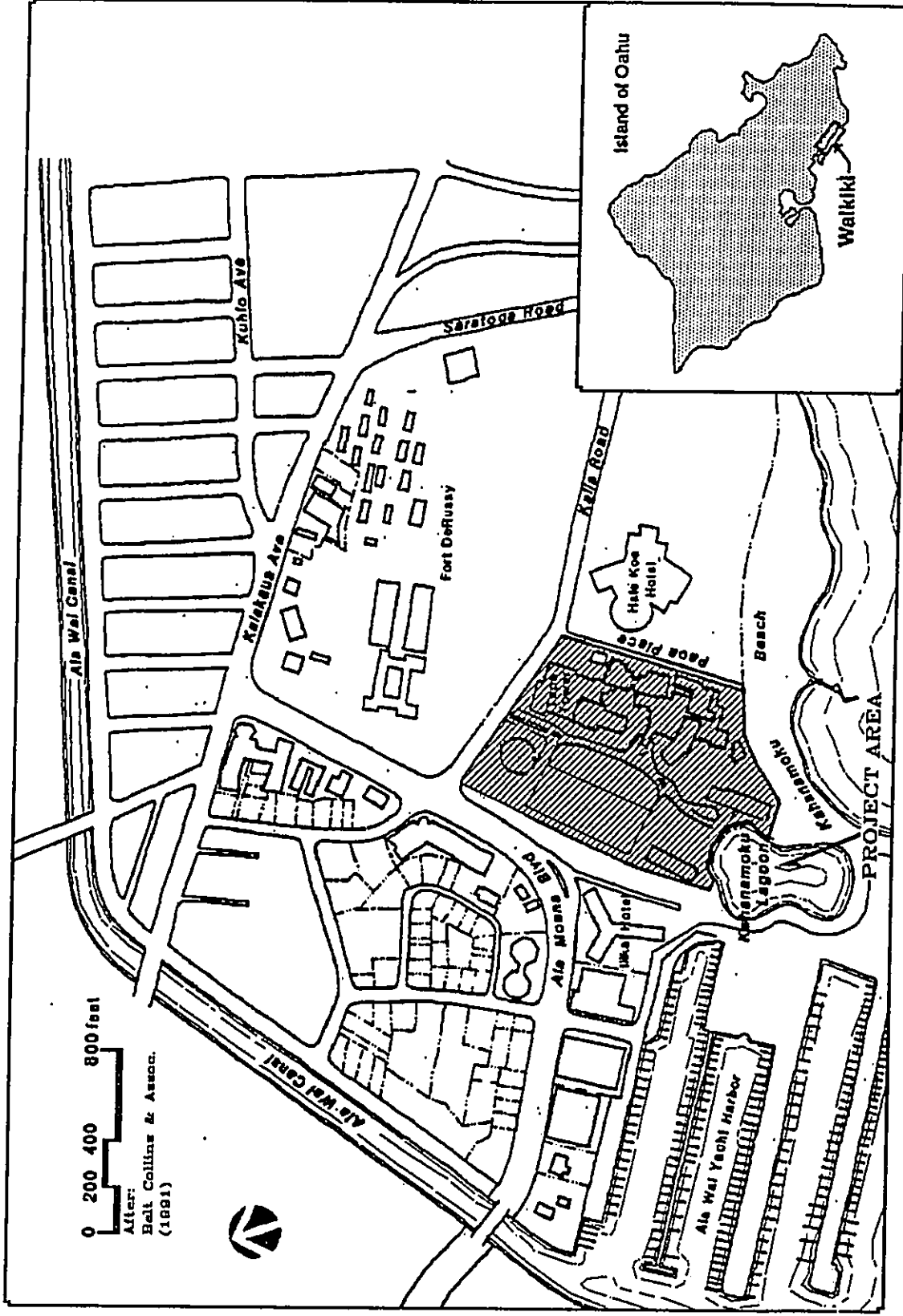


Figure 1. Project location, Hilton Hawaiian Village, Waikiki, O'ahu.

once before being discharged. Because of the rapid turnover of water in the attraction, the quality of the discharge will not differ markedly from the quality at the source offshore. By adding this high quality sea water discharge to the public lagoon, the turnover of water in the public lagoon will increase from once in 48 hours to about once in 8 hours, greatly improving conditions in the public lagoon. To accommodate this greater water flow, the capacity of the present system pumping water out of the lagoon will have to be increased. The developer proposes to add a second discharge system directed into the inner part of Ala Wai Boat Harbor. The water being discharged will be of a higher quality than that presently coming from the lagoon, thus providing a benefit to the users of the Ala Wai Boat Harbor.

Construction and operation of the Hilton Lagoon attraction will result in tremendous improvements to the existing lagoon, including silt removal, increased sea water refreshment rate, and regular monitoring of the water quality. Although the public lagoon will be reduced in size from 170,000 to 110,000 square feet, the improved public portion will support a much higher level of use and a greater diversity of uses.

1.3 Project Approvals and Permits

This section provides a listing and brief discussion of relevance to the proposed project of the numerous permits, certifications, and zoning provisions applicable to the activity. The agencies listed will be consulted during the normal course of seeking required permits and approvals, and will be provided review copies of this draft EA.

Special Management Permit (SMP) - The entire project is within the Special Management Area (SMA) and will require a major SMP from the City and County of Honolulu, Department of Land Utilization and approval from the City Council.

Waikiki Special District Permit - The project is within the Waikiki Special District (WSD), requiring consideration by the City and County of Honolulu, Department of Land Utilization .

Building Permits, Grading Permits, and other construction-related permits will be required from the City and County of Honolulu, Department of Public Works after the discretionary permits are obtained.

Shoreline Setback Variance - A City and County of Honolulu variance is required for any aspects of the project within the 40-foot setback zone from the shoreline (see Figure 2). A shoreline map is presently under review for State Shoreline Certification. The certified shoreline is expected (based on previous certifications) to parallel Kahanamoku Beach

Beach between the beach and Kahanamoku Lagoon. Thus, only the intake and discharge pipelines are within the shoreline setback area.

Conservation District Use Permit (CDUP) - State waters and submerged lands seaward of the shoreline are in the State Conservation District, and construction in the Conservation District requires obtaining of a CDUP from the Department of Land and Natural Resources and the State Land Board. The Duke Kahanamoku Lagoon is State property and classified as Conservation District, General Subzone ("G"). Figure 2 shows the relationship between the project and the State Land Use Districts.

Federal Insurance Rate Map (FIRM) Zone - Kahanamoku Beach is zoned AE (EL 6), the Kahanamoku Lagoon and immediate surrounding shore is AE (EL 5). Much of the Hilton property, including the portion on which the entrance building will be constructed is zoned A0 (DEPTH 2). No floodway is involved. Zone AE is a "special flood hazard area inundated by 100-year flood, with base elevations determined" (5 and 6 feet in these cases). Zone A0 is also a special flood hazard area described as "flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined" (2 feet in this case).

Shorewaters Work Permit - Construction in the ocean requires a permit from the State Department of Transportation (combined with the CDUP).

Section 402 Permit - Review for compliance with NPDES General Permit Provisions (HAR §11-55) by the Department of Health will be necessary for all construction activities.

Department of the Army Permit - Construction in navigable waters (broadly defined) requires consideration by the U.S. Army Corps of Engineers. The proposed sea water intake and discharge structures are covered under Nationwide Permit No. 7. A permit for maintenance dredging of Kahanamoku Lagoon was issued in the past.

Section 401 Water Quality Certification - State Department of Health review and certification under Section 401 of the Clean Water Act is required to qualify for Nationwide Permit No. 7.

Section 7 Consultation - Review of the proposed project under Section 7 of the Endangered Species Act is required to qualify for Nationwide Permit No. 7.

Consistency with Coastal Zone Management Act - Review of the proposed project by the Office of State Planning, Coastal Zone Management Program is required to qualify for Nationwide Permit No. 7.

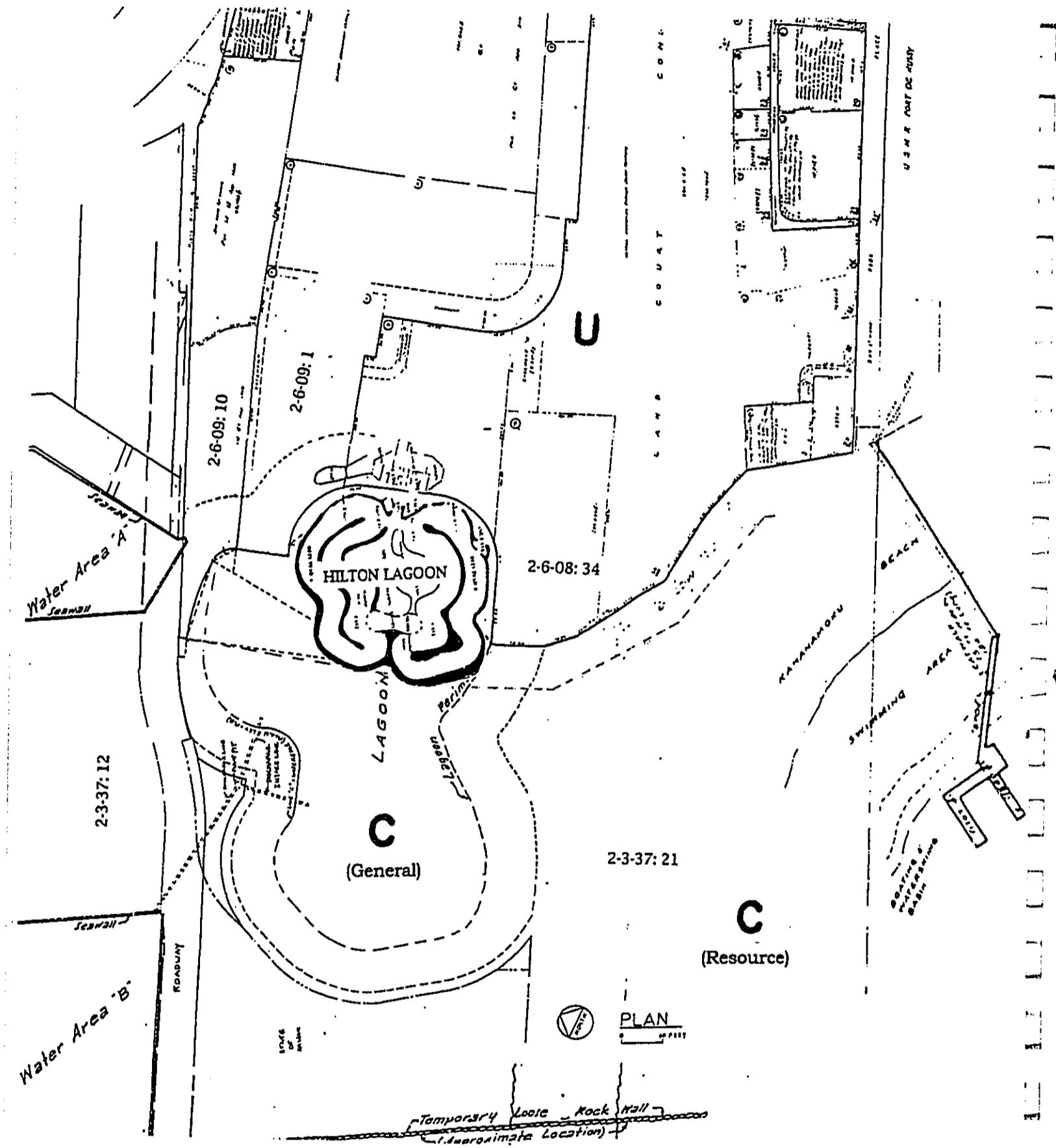


Figure 2. Composite of several maps to show relationships between parcel boundaries, the Kahanamoku Lagoon, and the proposed Hilton Lagoon project.

NPDES Permit - The sea water discharge may be subject to the provisions and requirements of the National Pollutant Discharge Elimination System (NPDES), as administered by the State of Hawaii, Department of Health and the U. S. Environmental Protection Agency.

Pipeline Easements - Necessary easements for the extension of intake and installation of optional discharge pipelines will be negotiated the appropriate State agencies.

Lease of Submerged Land Under Project - Modifications to existing covenants and necessary lease documents will be negotiated with appropriate State agencies.

1.4 Agencies and Interest Groups Consulted

During the conceptual design and feasibility phases of the project informal meetings were held with the Governor's Office, the Office of State Planning, the Waikiki Yacht Club, the Hawaii Community Development Authority, the Waikiki Improvement Association, the Waikiki Neighborhood Board No. 9, the Hawaii Yacht Club, the Waikiki Bowls Coalition, and the Office of Hawaiian Affairs. A pre-draft Environmental Assessment was circulated to the Department of Land and Natural Resources and the Department of Land Utilization (City & County of Honolulu). Comments and concerns were solicited and the early draft document was revised accordingly. Appendix A.1 provides written responses received from DLNR expressing concerns arising out of this review process. Availability of the draft EA was subsequently announced in the *OEQC Bulletin* of April 8, April 23, and May 8, 1994. A revised draft EA was distributed to a list of parties as shown in Appendix A.2 on or before April 23, 1994 or, in the case of requests arising out of the *Bulletin* announcements, as these were received. All comments received on or before June 30, 1994 and the written responses generated by the applicant and/or its consultants are provided here in Appendix A.2. On October 20, 1994 the Hilton Hawaiian Village hosted a meeting of all agencies and entities expressing concerns or having questions about the project in order to answer these concerns in an open forum.

1.5 Summary of Environmental Impacts

A summary of environmental impacts of the project is presented as Table 1. This table is intended to provide the reader with a brief summary of the positive and negative impacts of the project during and after construction, and reference the page(s) in this EA where each impact is discussed.

TABLE 1. A SUMMARY OF IMPACTS ASSOCIATED WITH THE PROPOSED HILTON LAGOON PROJECT

SUBJECT AREA	SHORT TERM				LONG TERM			
	Neg.	Pos.	IMPACT DESCRIPTION	EA PAGE	Neg.	Pos.	IMPACT DESCRIPTION	EA PAGE
Access	✓		some restrictions	p. 25, 53			no impact	p. 9
Air Quality	✓		dust, odor	p. 61			no impact	p. 61
Archaeology / History			no impact	p. 65			no impact	p. 65
Biological Resources								
Terrestrial			no impact	p. 61			no impact	p. 61
Lagoon	X		sediment removal	p. 53		X	improved habitat	p. 55-56
Waikiki Reef	✓		ocean intake line	p. 57-58			no impact	p. 47, 57
Other marine areas			n/a	--	X		stocking	p.37,49,62
Drainage	✓		ground disturbance	p. 7, 70		✓	rerouted	p. 26, 56
Education / Research								
Visitor			n/a	--		+	ecotourism	p. 62, 70
Resident			n/a	--		X	school programs	p. 18, 62
Aquarium Industry			n/a	--		✓	maintenance experience	p. 62
Electrical Power			n/a	--			no impact	p. 64
Fire protection			n/a	--			no impact	p. 62
Geology	✓		Reinject dewater fluid	p. 24			no impact	--
Landscaping, plants			no impact	p. 61		✓	enhanced landscaping	p. 52
Noise	X		construction noise	p. 69			no impact	p. 52
Parking								
Attraction			no impact		✓		Hilton garage	p. 60-61
Beach	✓		access thru harbor	p. 20	✓		increased public use	p. 60-61
Police Protection			n/a	--			no impact	p. 62
Recreation								
Surfing sites			no impact	p. 58			no impact	p. 58
Waikiki Beach	✓		some areas closed	p. 57			no impact	p. 57-58
Lagoon	+		closed	p. 71		+	Improved resource	p. 54-56
Attraction			n/a	--		X	New recreational experience	p. 38, 70
Socioeconomics								
Waikiki	✓		n/a	--		+	visitor attraction	p. 70
State of Hawaii			no impact	p. 51		X	lease/tax revenues	p. 70
Employment		✓	employment	p. 50		X	~125 new jobs	p. 70
Cultural			lagoon man-made	p. 65	✓		promotes tourism	p. 52, 62
Solid Waste	✓		sediment disposal	p. 53			no impact	p. 65
Traffic								
Pedestrian			no impact	p. 54	✓		increased at Hilton	p. 52
Vehicular, Waikiki	✓		construction equip.	p. 51	✓		bus/shuttle traffic	p. 52
Vehicular, elsewhere			n/a	--		✓	vistors arrive on foot	p. 52
View planes	X		construction	p. 56		✓	landscaping	p. 56
Waikiki Aquarium, UH		✓	culture animals	p. 37		✓	joint projects	p. 18
Wastewater Treatment			n/a	--			no impact	p. 63-64
Water Quality								
Lagoon	X		desiltation	p. 53		+	greatly improved	p. 53-56
Boat Harbor			no impact	p. 53		X	improved	p. 59
Waikiki Beach	✓		dredging	--			no impact	p. 58
Ocean			no impact	--			no impact	p. 58
Water Supply			n/a	--			no impact	p. 63

n/a - not addressed because not applicable or very minor. Increasing relative magnitude of impacts: ✓ X +

2.0 PROJECT DESCRIPTION

2.1 General

A swim-through, "reef" tank is proposed to be situated at one end of the existing Duke Kahanamoku Lagoon (Figures 3, 4, & 5) in Waikiki. The makai two-thirds of the existing lagoon will remain as a public amenity, while the mauka one-third of the 170,000 square feet of existing lagoon will be transformed into the visitor attraction called the "Hilton Lagoon". The swim-through lagoon will be a large tank holding approximately 2 million gallons of sea water within an area occupying 60,000 square feet. The project will preserve all existing public access routes to the public lagoon with the exception that a portion of the lagoon access through the Hilton Hawaiian Village will be altered (however, access around the attraction to the lagoon or to Waikiki Beach next to the Rainbow Tower will not be lost). Use of the lagoon will be curtailed only during a portion of the construction phase of the project.

All of the swim-through portions of the project will be constructed within the boundaries of the existing lagoon, on land to be leased from the State of Hawaii. An admissions area, gift shop, and changing rooms will be located on adjacent property belonging to the Hilton Hawaiian Village. The project will be physically separated from the public portion of the Kahanamoku Lagoon (Figure 6). The water level in the attraction will be about 3 feet higher than that of the existing lagoon. This elevation change will provide a barrier to reduce disturbances created by extremely high wave conditions, will help control access to the attraction, and is necessary to solve construction/design problems associated with the high ground water table in the area.

All of that portion of Waikiki Beach which merges into the Kahanamoku Lagoon will remain a public area. This public recreational amenity will benefit tremendously from the improved water quality provided by the proposed project. Sea water pumped from a new ocean intake into the proposed attraction will overflow into the public lagoon. The water quality will be maintained by the high volume exchange of sea water, resulting in healthy, marine environments for both recreational uses and marine life. Outflow from the public lagoon will be directed into the Ala Wai Boat Harbor where additional improvements in existing water quality will be realized.

2.2 Entrance Building

The "shore" facility for the Hilton Lagoon facility, to be built on Hilton Hawaiian Village property, will consist of a single-story building of approximately 7,000 square feet under roof and constructed at the same level as water surface in the swim-through

attraction. This building will be partially buried (relative to the ground surface on the hotel side) so that from above, it will appear to be a foliage-covered, rock outcropping (Figure 4). Within this building will be the following:

- Main Entrance
- Ticketing/Admissions
- Changing or Dressing Rooms/Restrooms
- Clothing Storage Rooms
- Equipment Dispensing/Storage
- Food and Beverage Facility
- Pre-Orientation Lanai
- Warm Water Showers
- Gift Shop
- Mechanical/Service Area

2.3 Hilton/EnterOcean Attraction

The main part of the proposed attraction will consist of two simulated reef trails, a predator lagoon separated from the dive trails by acrylic underwater viewing windows, and a free-snorkeling area where visitors may remain after their guided tour (Figures 4 & 5). The entire environment will be fully naturalized to resemble winding inlets and lagoons such as exist naturally in Pacific islands. Marine fishes and invertebrates will be placed in the attraction to recreate a tropical diving experience. Service pathways and access trails for maintenance and animal operations will be incorporated into the surface landscaping. Each of the separate water areas will be divided by fabricated reef outcroppings and tropical plantings. The entire project will be heavily landscaped with tropical plants and rock outcroppings in keeping with the tropical island feeling and underwater landscape.

Reservations for the dive experience will be made on the basis of a definite starting time. Upon arrival, participants will first shower with soap and water and be given access to toilet facilities. Use of tanning oils after showering will be actively discouraged. Visitors will then enter a waist deep training/orientation area and be introduced to a special vehicle developed to provide "hookah" type breathing while diving. Learning to use hookah gear is actually easier than either SCUBA or snorkeling gear and users require no certification. This patented vehicle will gently pull up to 6 persons, submerged about 18 inches, through the underwater trails under the control of a tour guide. Participants will grasp rails on the vehicle, keeping them at a safe distance from the marine life inhabiting the man-made environments. Thus there will be little, if any, stressful impacts on the marine life in the exhibit. At peak use (around 100 persons

THE ENTEROCEAN GROUP

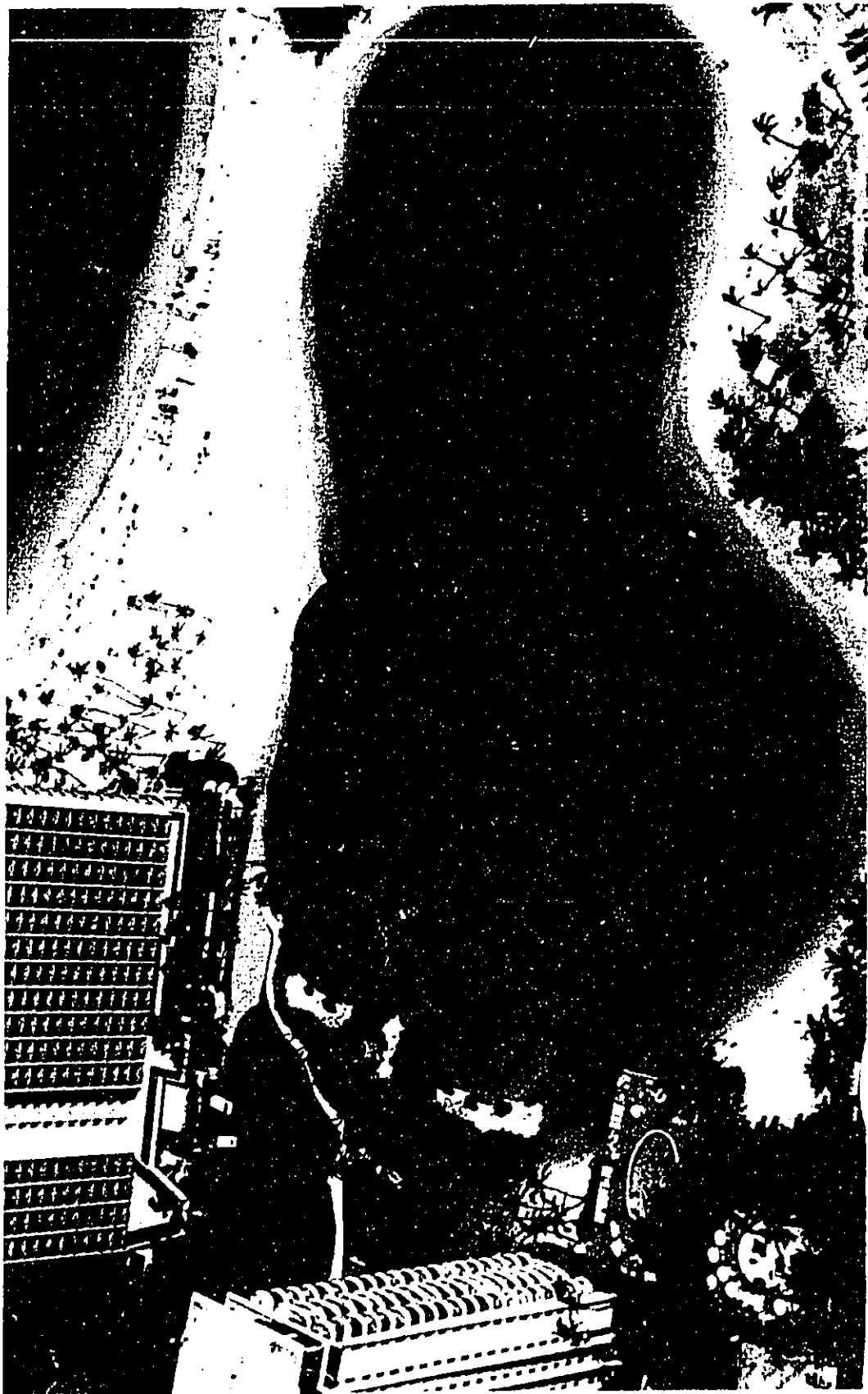


Figure 3 HILTON LAGOON



Figure 4
HILTON LAGOON **VIEW OF ENTRANCE**

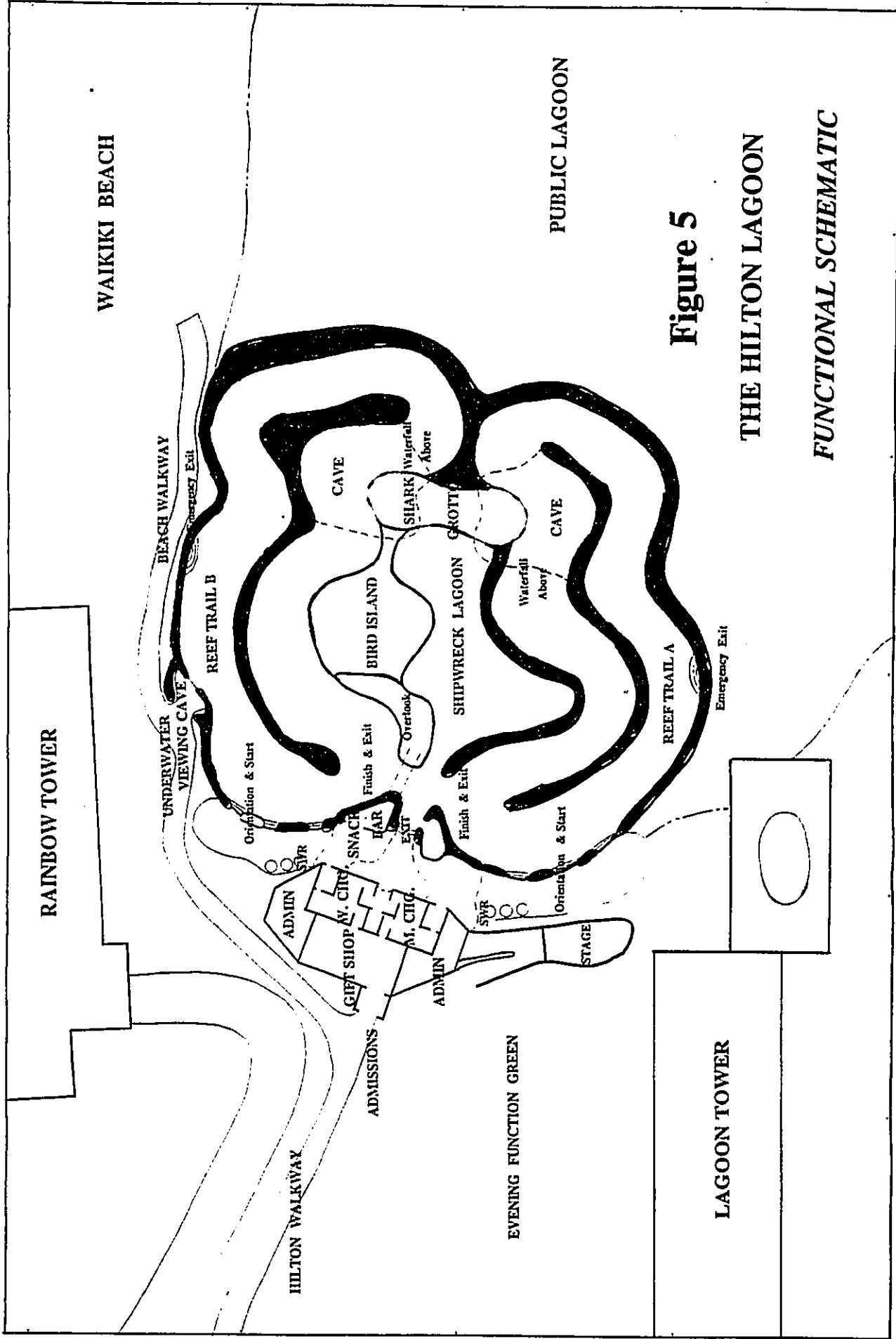


Figure 5

THE HILTON LAGOON

FUNCTIONAL SCHEMATIC

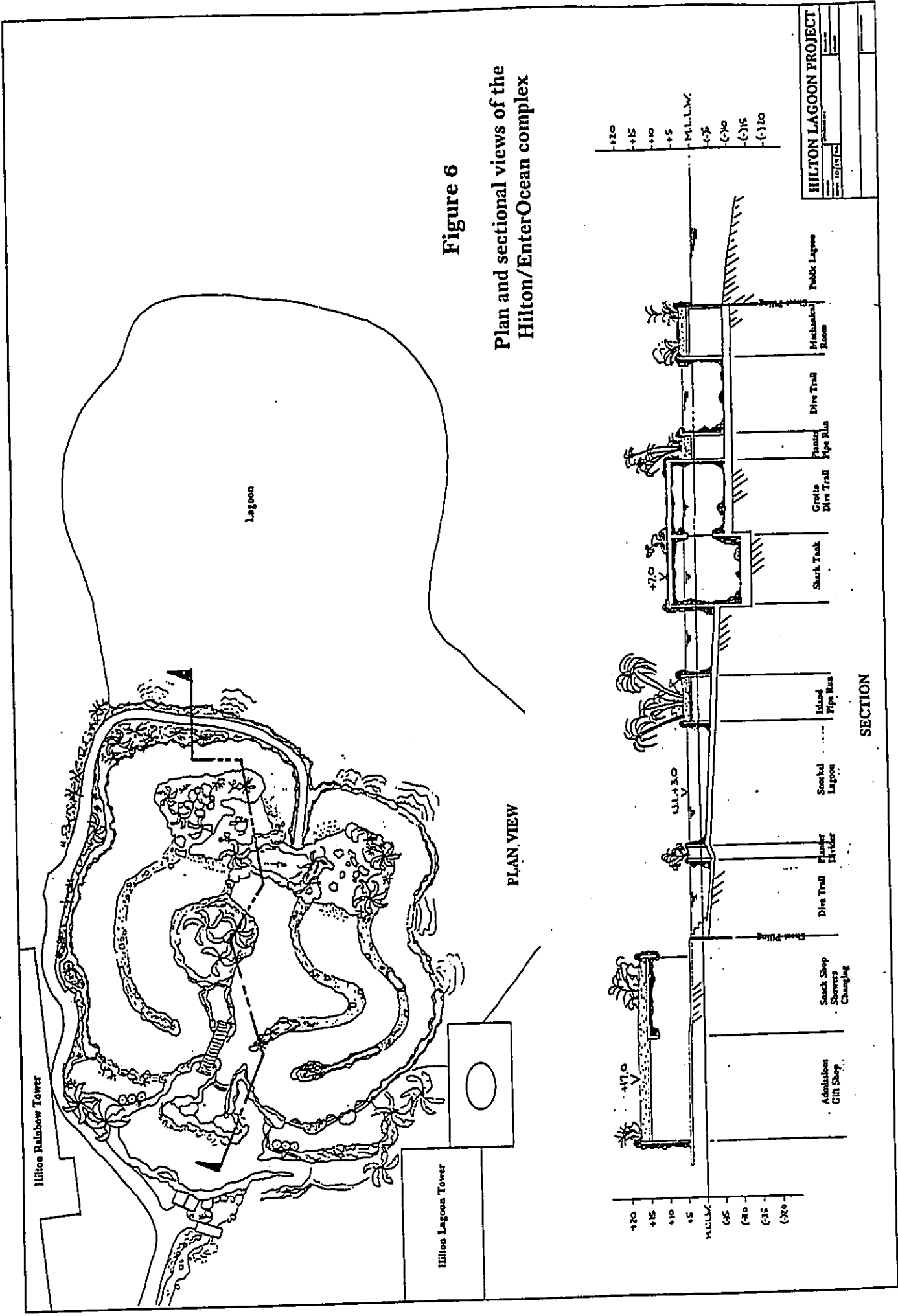


Figure 6
 Plan and sectional views of the
 Hilton/EnterOcean complex

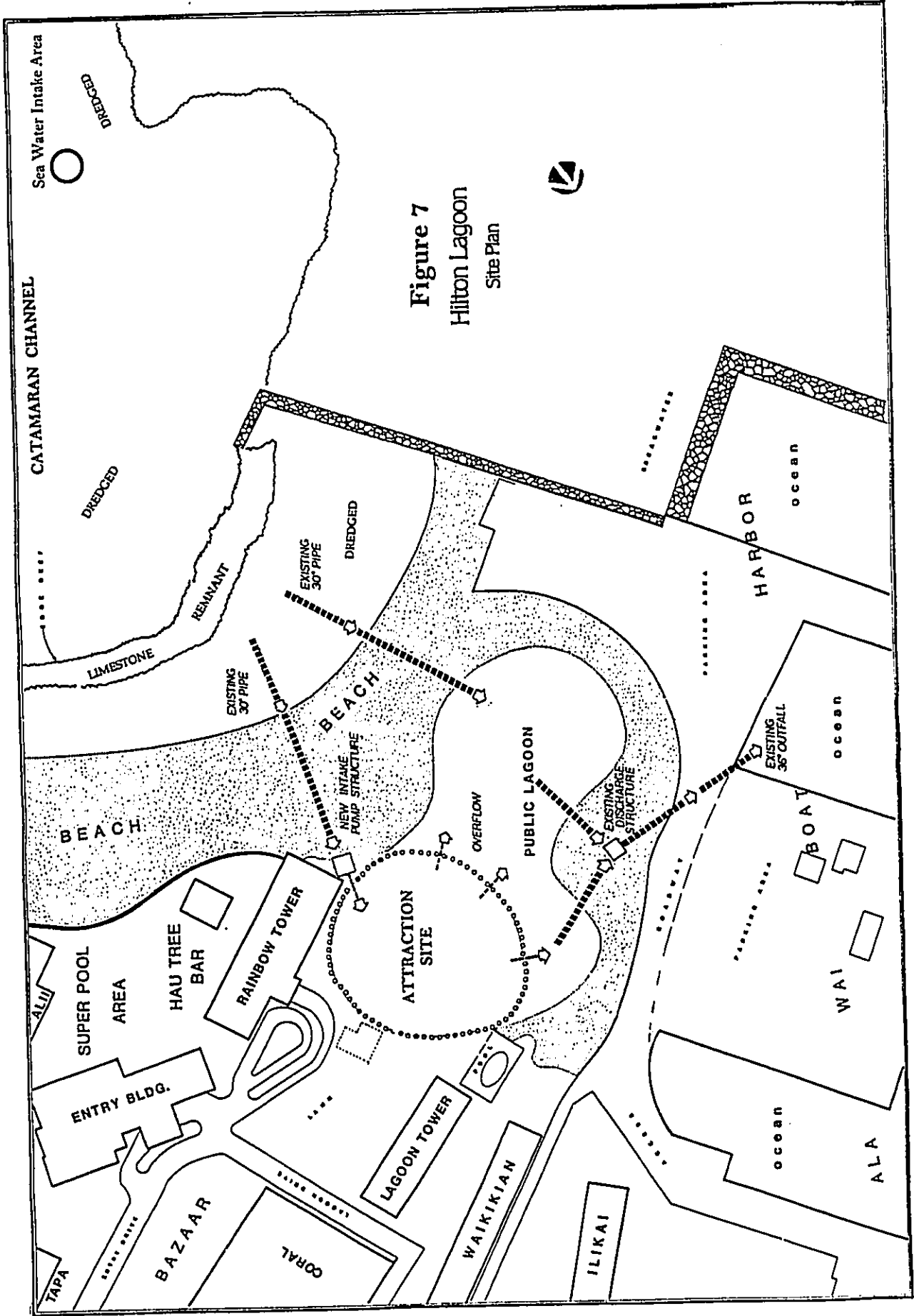
per hour) the density of "divers" in the submerged trails works out to one person per 15,000 gallons of sea water, or one person per 2000 cubic feet (e.g., a small swimming pool at 20' x 20' x 5'). This value is a "static" volume; during the approximately 1 hour that an individual spends within the guided trails and snorkeling area, some 900,000 gallons of sea water will have entered (and left) the facility. Per individual, this works out to nearly 9000 gallons, increasing the volume of sea water per individual to a "dynamic" volume of about 24,000 gallons.

There are two alternate trails in the attraction; both are similar in character and range in depth from 4 to 12 feet. The trails pass over and through various kinds of bottoms and underwater features designed to showcase different habitats. At the mid-point of each trail, the visitors pass under a low waterfall and into a grotto. Within the grotto, sharks and rays will be visible through underwater acrylic viewing panels

After completing the tour, swimmers are dropped off and will have the option of snorkeling in a large pool in the center of the facility designed for individual exploration. This area contains a number of interesting areas to explore: caves and grottoes, another view into the "Shark Lagoon", and a replica shipwreck. The intent of this area is to provide options for extension of the visit and complete satisfaction with the facility by providing some flexibility in the time spent in the water by the individuals.

The emphasis during the tour will be on natural history and conservation. A program of cooperative education and research activities will be developed and coordinated through the Waikiki Aquarium Foundation and the State educational system. Planned support facilities will include an orientation lecture area and underwater viewing windows where non-participants may view friends or relatives participating in the activities. An exciting aspect of the group towing vehicles is the ability to conduct night "dives" in the comparative safety of the controlled environment.

The Hilton Lagoon facility will be a professionally managed entertainment attraction. Staff biologists, administrators, tour guides, and others will be recruited from the local work force, and administered by The EnterOcean Group, a Honolulu-based enterprise comprised of key personnel with long experience in the design, construction, and operation of ocean entertainment attractions. The operation will be fully insured, with proper indemnifications to protect the State against liability. The developers will be responsible for maintenance of both the attraction and the public portion of the existing lagoon, including the sea water pumping systems and all aesthetic aspects. Regular water quality monitoring will be undertaken to insure compliance with State of Hawaii water quality regulations, discharge permit requirements imposed under NPDES, and the State standards applicable to recreational waters.



2.4 Duke Kahanamoku Lagoon

The Duke Kahanamoku Lagoon is a 170,000 sq. ft. body of water constructed in 1956 on publicly owned land. The maximum depth is around 10 to 12 feet (3 to 4 meters). The proposed attraction will utilize approximately 60,000 sq. ft., reducing the public lagoon to 110,000 sq. ft. The basic structure of the lagoon will remain the same. Although the proposed attraction will occupy about 1/3 of the lagoon area, the actual loss of shoreline (lagoon beach frontage) to public use would be only 26%, all from the part of the lagoon closest to the Hilton Hawaiian Village (Figure 7). Other improvements discussed below will increase the recreational value of the lagoon to compensate for the loss of public use area. The depth within the public portion will not be changed except for the removal of silt (see Section 2.5.1) that has accumulated over many years. In most places away from the shore, the silt layer is 1 to 2 feet thick.

Presently, water enters the lagoon through two, 30-inch (29-inch I.D.) pipes laid under Kahanamoku (Waikiki) Beach. Water flows through these pipes in response to tidal changes and a pumping system which moves water from the lagoon into the Ala Wai boat harbor (see Figure 7). A new sea water intake system will be built as part of the proposed swim-through attraction (Figure 8), and this system will supply sufficient water to maintain high water quality within the new feature and greatly improve the turnover of water in the public lagoon. The source of sea water supplying the attraction and the public lagoon will be shifted seaward from the present passive intake pipes opening just off Kahanamoku Beach to an area further seaward within the catamaran channel (Figure 6) where the water quality is far superior. The quality of the sea water directed into the public lagoon will not be degraded by flowing through the proposed attraction. A bypass will be provided to enable sea water to be supplied to the lagoon in the event that the sea water system in the attraction is temporarily turned off. Emergency generators at the Hilton Hawaiian Village will provide power to the supply pumps during power failures.

The existing pumping system for the lagoon removes about 4,000 gpm of water from the lagoon to the middle channel of the Ala Wai Boat Harbor. Although this system could handle up to 10,000 gpm with a new pump, it is proposed to keep this system intact and functioning essentially as is, and an entirely new system added to handle the proposed increase in sea water supplied to the lagoon. Figure 7 shows the existing and the proposed new sea water return systems. A new pump station will draw water from two points in the lagoon and discharge at a new outfall within the innermost basin of the Ala Wai Yacht Harbor. The new pump station and pipes will be capable of pumping about 11,000 gpm. The intake points will be protected by grates and positioned about 2 feet above the bottom in the deepest part of the lagoon (the same design as the existing system). Pipes will be installed in a trench under the harbor access road, accomplished in two stages to maintain traffic flow. The discharge point into the boat harbor will be

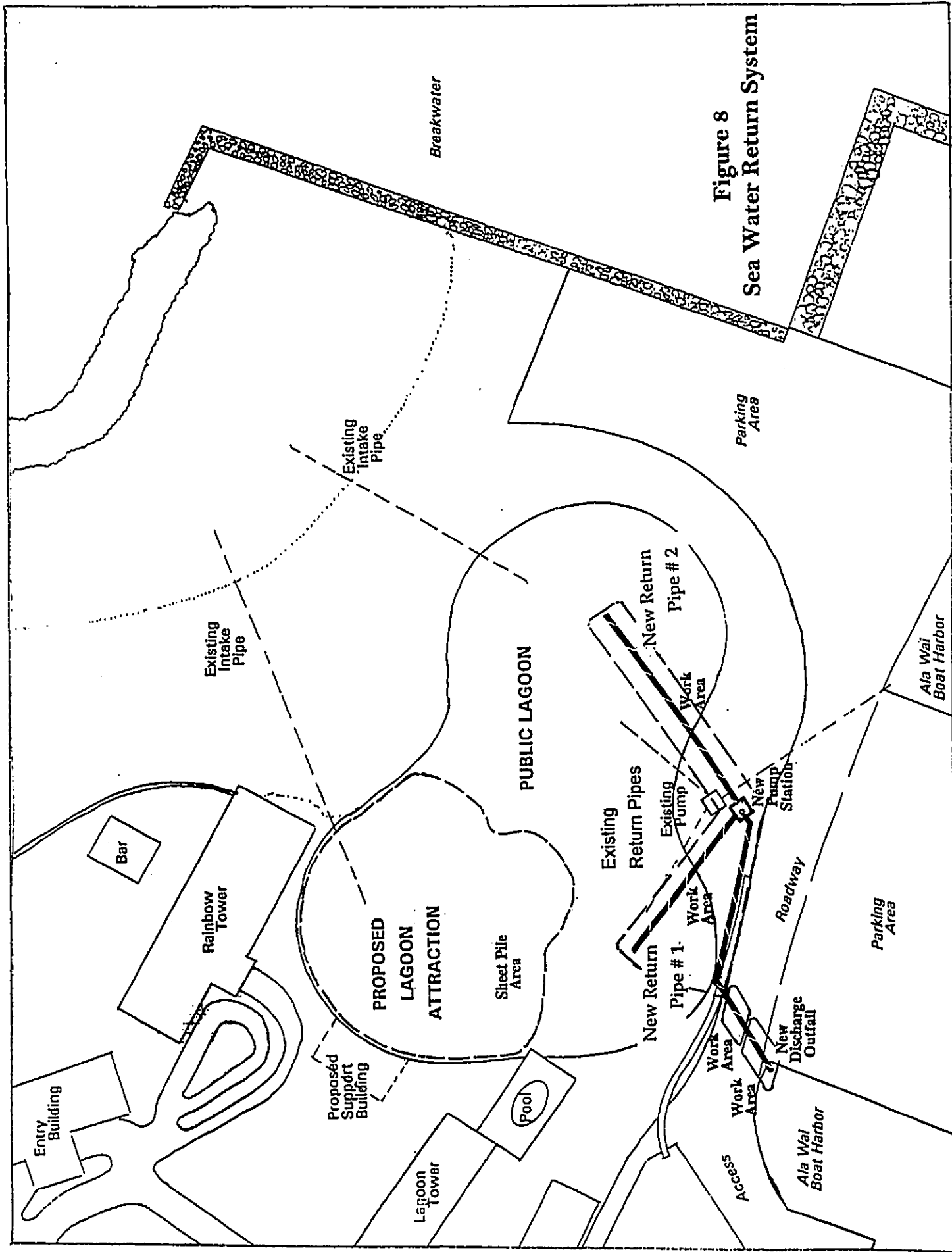


Figure 8
Sea Water Return System

designed to produce a subsurface outflow of less than 1 foot per second velocity. The system will be constructed to prevent water from flowing back into the lagoon from the boat harbor in the event of pump failure, power outage, or exceptional high tides.

2.5 Construction Descriptions

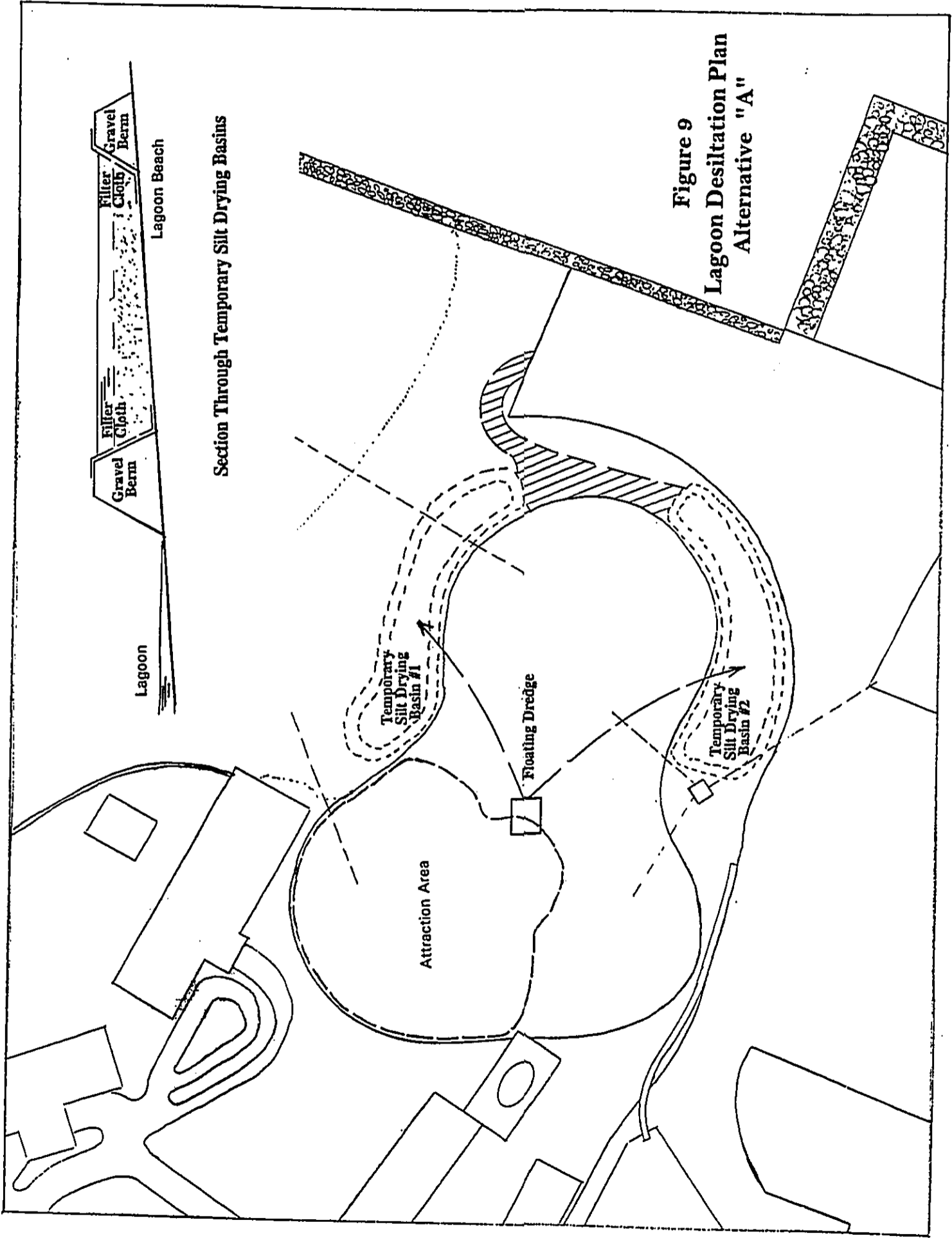
The construction of the Hilton swim-through attraction within a part of the existing Duke Kahanamoku Lagoon presents a number of unusual construction challenges. During the preliminary concept development phase, a number of specialized consultants were employed to study these issues, and formulate practical solutions. Development of specific construction engineering details and sequences is presently ongoing and subject to review and input from Federal, State and City & County agencies. However, the potential problems arising from the construction can be reasonably described and various mitigations and/or alternatives presented here. In keeping with all past construction activities at the Hilton Hawaiian Village, the developers of the marine attraction project will minimize inconveniences to the hotel guests and the adjacent private and public areas.

2.5.1 Lagoon Desiltation

An accumulation of about 9,000 cubic yards of silt (Belt Collins & Assoc., 1987) will be removed from the existing lagoon. This material must be dried before it can be transported to an approved disposal site. The dredging and silt drying processes must avoid contamination of other bodies of water (e.g. the boat harbor into which lagoon water is presently pumped) and, at the same time, maintain acceptable water quality in the lagoon so that the existing lagoon circulation/flushing system can be operated during most of the construction process.

Two methods of silt removal have been considered: dragline bucket removal and suction dredging. The use of a dragline bucket from shore would create very turbid water in the lagoon and result in large amounts of silt returning to the lagoon with each "scoop." In order to minimize adverse impacts on adjacent areas (e.g., the Ala Wai Boat Harbor and Waikiki Beach), the lagoon would have to be closed off from exchanging with these areas. Stagnation of the lagoon could further contribute to a deterioration of water quality. Hence, the use of a small floating suction dredge is preferred. Suction dredging would allow removal of the bottom silt layer with minimal disturbance of the adjacent deposit: any silt stirred into the water column would be sucked into the suction pipe. A disadvantage of suction dredging is the production of more liquid slurry, requiring a large settlement/drying area.

Two approaches to drying the silt have been considered: alternative "A" involving the installation of temporary drying basins on lands surrounding the lagoon; and



alternative "B" utilizing the attraction construction site after partial isolation by sheet piles from the main lagoon. The temporary drying basins shown for alternative A (Figure 9) would be constructed of crushed stone lined with filter fabric. Water contained in the silt would seep and/or flow back into the lagoon after the silt had settled out in the detention basin. Dredging operations would need to alternate between two basins in order to handle the relatively large volume water generated by the suction dredge. Each basin would need to be around 30,000 sq. ft. in area. Access for heavy equipment to haul out the dried silt would be required.

Alternative B would take advantage of the fact that the attraction construction site must be isolated from the lagoon and then dewatered before the concrete work can proceed (see Section 2.5.2). A layer of geotextile filter cloth would be installed on the side of the berm enclosed by the sheet piles. Placement of the sheet piles would be delayed in one or two sections to permit water flow through the berm (Figure 10). The suction dredge would discharge into the isolated area enclosed by the sheet pile berm, with the return water filtering through the geotextile fabric and berm while the silt accumulates within the construction site. The existing lagoon flushing system will continue to operate as long as water clarity is not significantly changed by the desilting process.

Once the majority of the silt has been removed from the lagoon to the attraction construction site, dewatering of this latter area will begin (Section 2.5.2). The silt would be dried and removed along with the other material excavated from this area.

2.5.2 Construction of the Attraction

Construction of the Hilton/EnterOcean swim-through attraction will require shaping of the bottom and casting of a concrete slab of varying thickness. This concrete and steel "mat" slab will serve three purposes: (1) it will further reduce the inflow of water through the lagoon bottom and reduce the dewatering volume; (2) it will serve as the structural support of the swim-through lagoon; and (3) it will counteract the hydrostatic uplift on the entire structure when there is no water in the attraction, as during the construction period, or if ever the lagoon were to be drained for repairs or maintenance.

Before this slab can be poured, the site must be isolated from the lagoon and then dewatered. Coated steel sheet piles will be vibrated into the sand and soil surrounding the entire site to form a ring extending upwards to + 3 and downwards to -22 feet relative to mean sea level. A berm of crushed coral rock will be built within the lagoon to allow access to the equipment placing the sheet piles in this area (Figure 10). A dewatering system will be installed with some of the water injected into wells on the landward margin to prevent disturbance to surrounding soils and structures and the balance discharged (after treatment) into the lagoon. Excess material will be removed from the dewatered area and the bottom recontoured. Dewatering will be discontinued

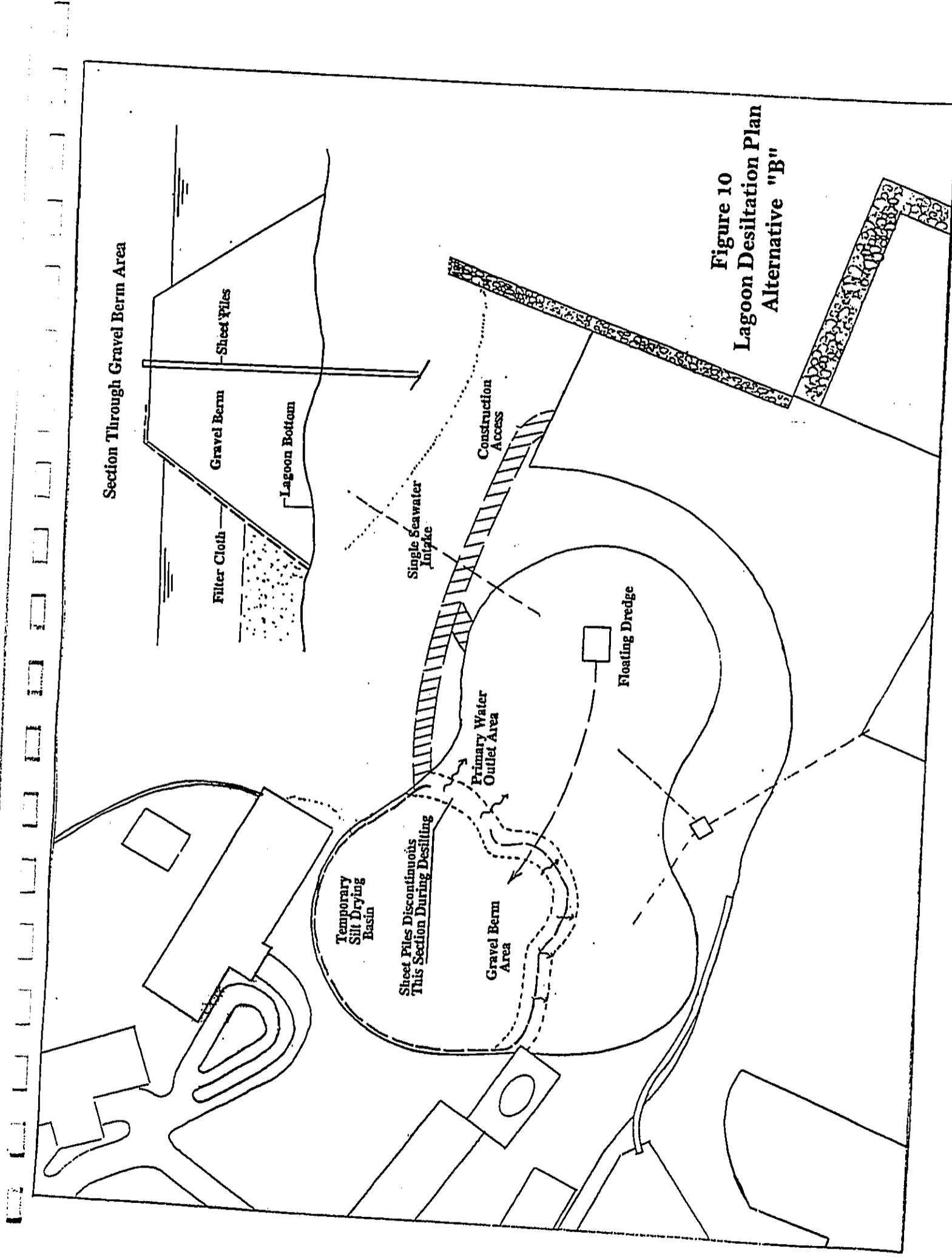


Figure 10
Lagoon Desiltation Plan
Alternative "B"

once the structure is finished and the sea water supply system (see Section 2.5.4) is supplying water to the swim-through lagoon. A reinforced concrete mat slab will be poured within the sheet pile ring. Construction of the internal structures, including dividing walls, islands, shark tank structure, etc. will then proceed under dry conditions. Steel reinforced gunite and synthetic rock work will be used in the construction of the rock formations and artificial substrata. Construction techniques normally used in the aquarium and water feature construction industry will be used to create the natural surface finishes within the facility. The entrance building will be constructed from reinforced concrete, with water-proofed roof systems designed to withstand the loadings from plants, soil, and artificial rock forming the garden area located atop the structure. Interior finishes of this building will be conventional.

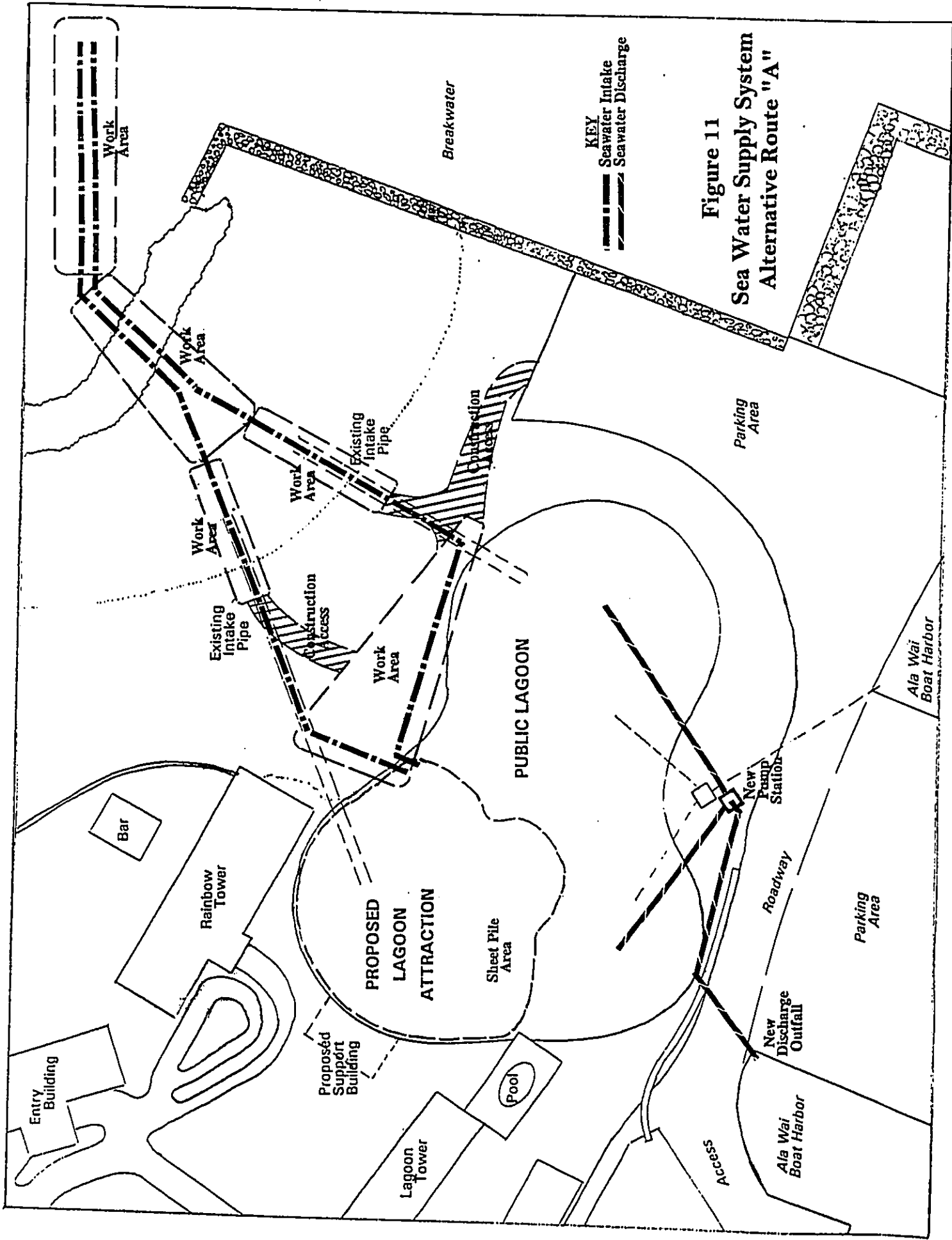
Construction of the attraction is expected to take about 12 months. During construction, the site and an equipment corridor (shown in Figure 10) will be closed to public access. Best Management Practices (BMP) will be employed as required to comply with NPDES general permit requirements for construction and construction dewatering.

2.5.3 Land Runoff Isolation

A sump and force main system may be installed to divert the Hilton property storm water runoff into the existing lagoon water discharge line which presently feeds the middle channel of the Ala Wai Boat Harbor. A storm water drainage system for the Hilton Lagoon project "land" features may also be connected to this diversion system. This internal drainage system will be designed to insure that the numerous planters to be constructed within the attraction will not discharge soil, nutrients, or pesticides into the attraction or the public swimming lagoon. However, the actual disposition of this drainage, as well as that proposed to be diverted from the Kahanamoku Lagoon, will depend upon discussion of options with the Department of Health considering existing State and Federal regulations under the Clean Water Act.

2.5.4 Sea Water Intake System

In order to provide the attraction and the public lagoon with a plentiful source of clean sea water, pumps and intake pipes will be installed as part of the project. Based upon engineering (Makai Ocean Engineering, Inc.; OCEES International, Inc. 1989) and water quality considerations (*AECOS*, 1992), the location selected for the intake manifold is the catamaran channel approximately midway seaward to the reef margin (Figure 7). This point is about 170 feet (50 m) from the breakwater at the end of Kahanamoku Beach and 550 feet (170 m) offshore from the beach. The proposed sea water supply system consists of two 22-inch diameter, HDPE (polyethelene) pipes



KEY
 - - - - - Seawater Intake
 - / - / - / Seawater Discharge

Figure 11
Sea Water Supply System
Alternative Route "A"

capable of delivering a total of 15,000 gallons of sea water per minute. A pumping station will be located within the attraction and will consist of several high volume, quiet-running, corrosion-resistant pumps. These pumps will be directly coupled to the two new intake lines, and will supply sea water at a rate of 15,000 gpm to an extensive distribution system within the attraction designed to ensure that all portions of the swim-through complex will be regularly flushed with fresh sea water. After the water passes through the complex, it will overflow into Kahanamoku Lagoon.

The draft EA (AECOS, 1994) proposed that existing pipes under Kahanamoku Beach serve as sleeves for new 22-inch HDPE pipes to be laid between an offshore intake structure in the catamaran channel and a pump station associated with the proposed attraction. Designated alternative "Route A", this concept is shown in Figure 11. Provided that the existing intake pipes are in reasonable condition to function as sleeves, this approach was deemed desirable because it precludes the necessity of excavating through the heavily utilized beach area. Seaward of the beach, the new pipes would extend along the bottom of the swimming area, pass through a shallow, 60-foot wide limestone remnant separating the swimming area from the catamaran channel, and extend out along the side of the channel to the intake point. Both intake pipes would be concealed beneath the beach and beneath sand in both the nearshore and lagoon swimming areas. The cut through the limestone remnant would be restored with close-packed limestone boulders and concrete (Figure 14) to both conceal the pipes and to restore the barrier between the swimming area and the catamaran channel.

Trenching in the beach would need to be accomplished by a crane and clamshell, with the crane positioned within a closed-off area of the beach. Trenching off the beach through the limestone remnant would need to be accomplished by a crane situated on a barge anchored on the outside of the limestone shelf. The approximately 300 feet (90 m) of pipeline extending from the limestone shelf to the water intake area would be installed directly on the bottom of the catamaran channel, secured by rock anchors and/or concrete weights (Figure 14).

In the event that the existing 30-inch pipes are not suitable to act as sleeves for the new intake pipes, alternative routings for the intake lines have been considered. Alternative "Route B" (shown in Figure 12) would be a single larger pipe installed in a 500 foot (150 m) trench from the pump room of the attraction in a straight line to (and through) the offshore limestone shelf. The pipe would be buried beneath the beach to a point offshore where the water depth exceeds 5 or 6 feet (2 m). The limestone shelf would be cut through as described above in "Route A", and the pipe extended to the intake point in the catamaran channel. Trenching through the beach would be accomplished in stages so as to maintain access for beach users. A single staging area for the crane would be required.

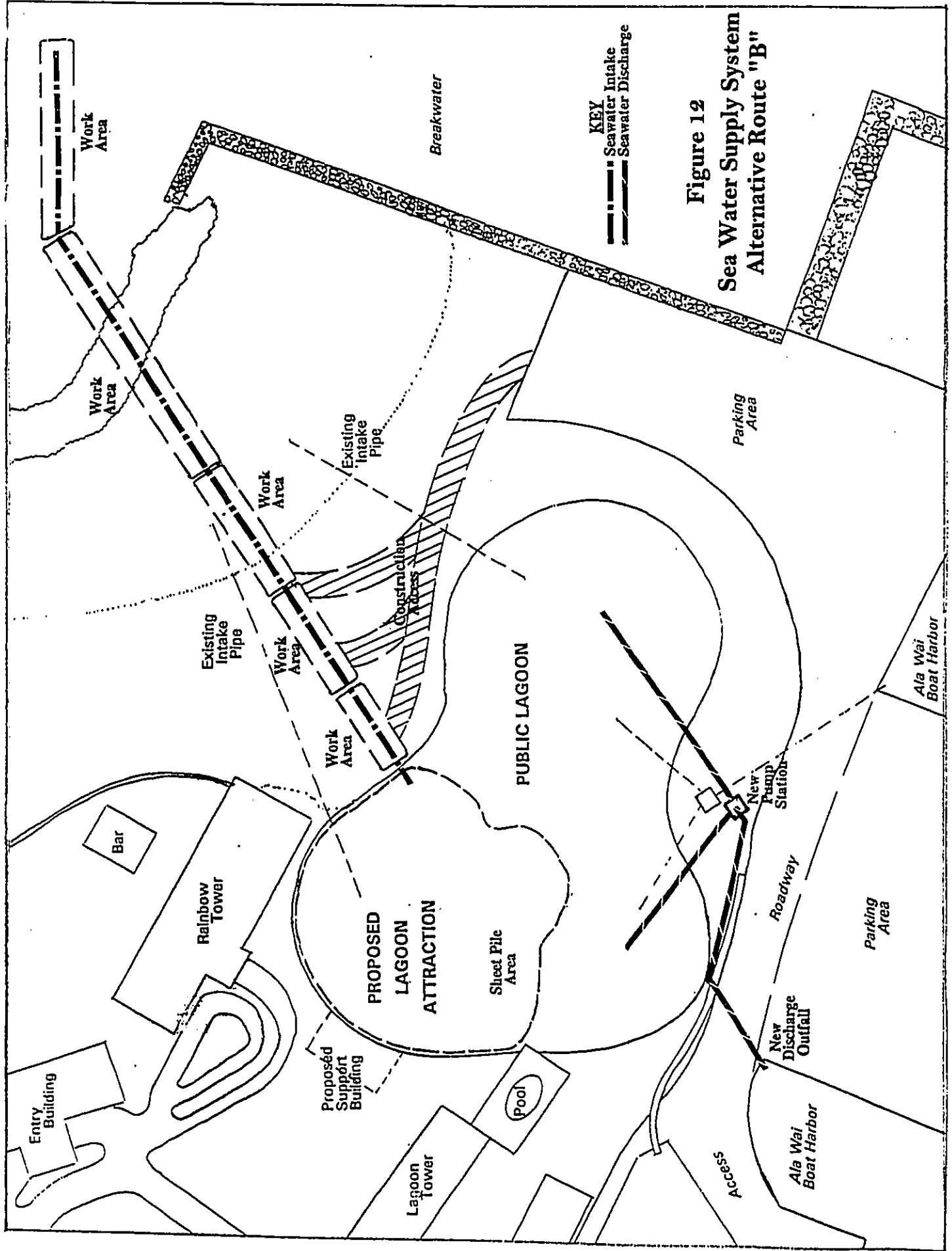


Figure 12
Sea Water Supply System
Alternative Route "B"

A third routing considered is designated "Route C" and shown in Figure 13. This alternative would place a single, 36-inch intake pipeline in a 600 foot (180 m) long trench on land, extending from the attraction pump room to the breakwater at the west end of the dredged swimming area, then in a 400 foot (120 m) trench located just inside the breakwater to, and under, the small hook at the end of breakwater structure. The section of breakwater under which the pipe passes would be dismantled and reassembled after installation of the pipe. Once outside the breakwater, the pipe would be installed for about 170 feet (50 m) along the catamaran channel bottom to the intake point and anchored as described above.

After consideration of all factors, the developers propose that **Route C** is the preferred routing and would have the least impact on Kahanamoku (Waikiki) Beach and the nearshore swimming area. This plan does not require the cutting and restoration of the limestone shelf and attendant offshore construction difficulties. The route just inside the breakwater is essentially devoid of significant biota, and a pipe submerged and buried in this location would be exposed less to storm wave forces than would be the case with the other alternative routings. Finally, Route C will permit a larger pipe to be installed than with alternative Route A, providing for future increases in pump size and flow rate should this become necessary or desirable for any reason (see Section 5.4).

The intake location (see Figure 7) and design would be essentially the same for all of the alternative pipe routes discussed above. The intake will be designed to maintain intake velocities below 0.5 feet per second (15 cm/sec) to prevent swimmers or divers (or other creatures) from being held by suction on the manifold if they accidentally or purposely cover some of the intake holes (Figure 14).

2.6 Project Rationale and Operational Considerations

Similar projects developed at Marineland of the Pacific ("Baja Reef") in Palos Verdes, California, Disney World ("Shark Reef") in Orlando, Florida, and Pacific Islands Club in Guam, have demonstrated that the concept of a swim-through aquarium display is valid. Observations and experiences gained from these facilities serve as the basis for the proposed operations at the Hilton Lagoon and provide assurance that facilities of this kind can be managed safely while delivering an excellent visitor experience.

2.6.1 Natural Attractions on Oahu

Visitors come to Hawaii with a plethora of images, fantasies, and expectations. Many of the those who depart most satisfied have been able to experience firsthand the power and beauty of the ocean resources surrounding these islands. In few places in the world has the appeal of the marine ecosystem become more popular than at Hanauma Bay

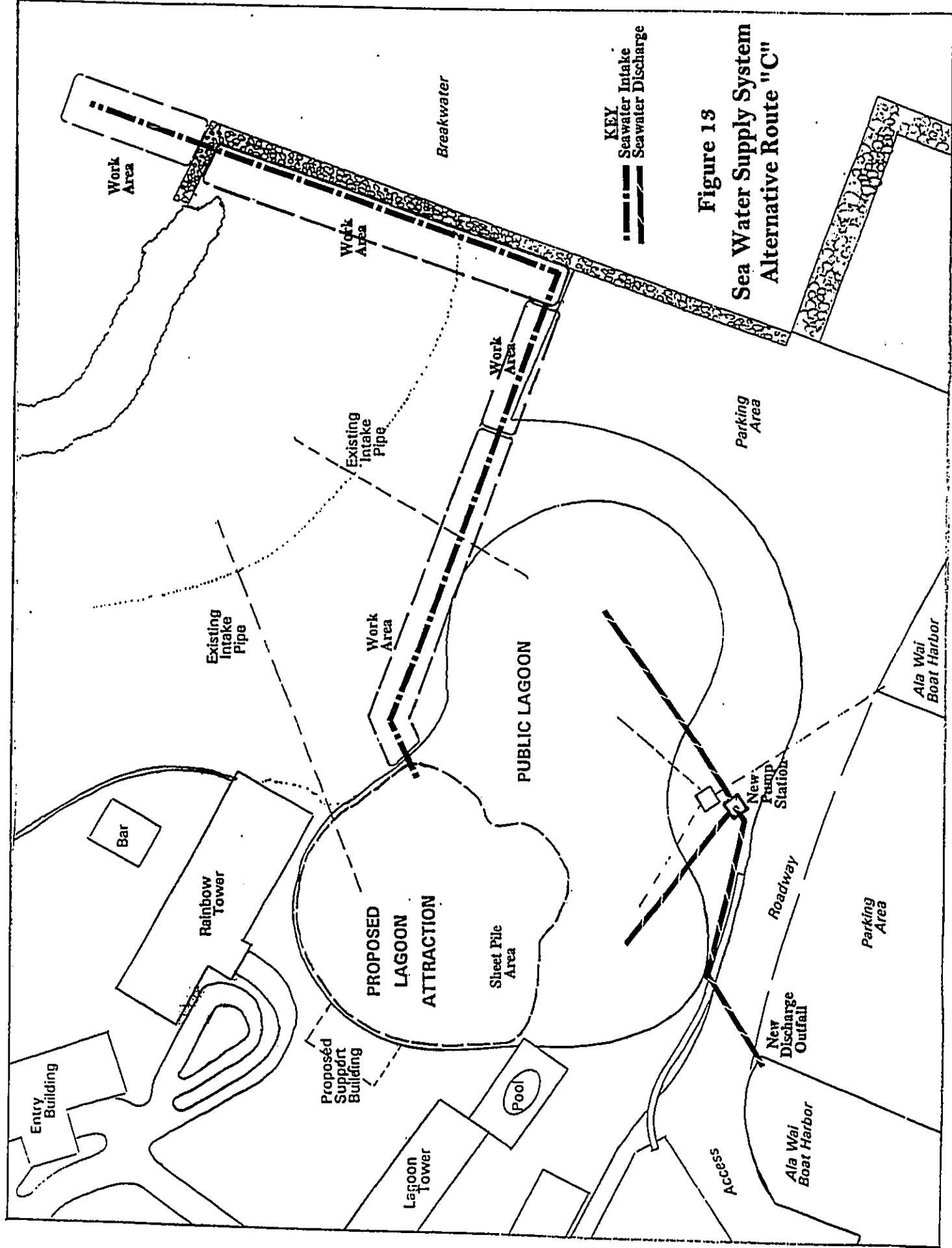
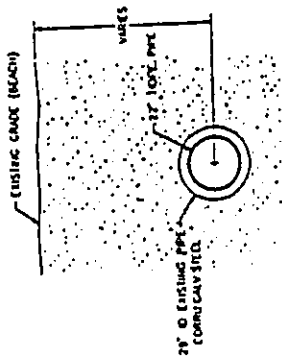
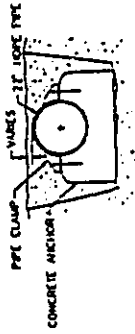


Figure 13
 Sea Water Supply System
 Alternative Route "C"

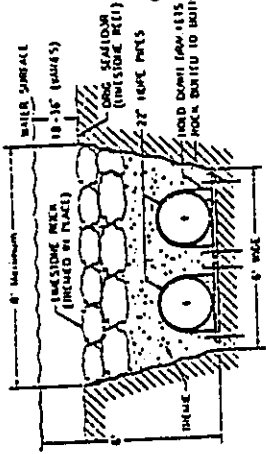
KEY
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 ————— Seawater Discharge



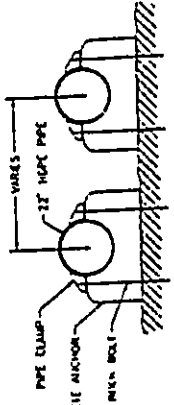
SECTION A-A
SCALE 1" = 2'



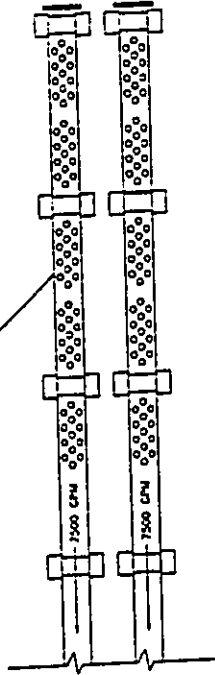
SECTION B-B
SCALE 1" = 2'



SECTION C-C
SCALE 1" = 2'



SECTION D-D
SCALE 1" = 2'



NOTE 1. THE SEAWATER INTAKE WILL BE DESIGNED TO POSE NO DANGER TO THE SURROUNDING ECOSYSTEMS. FLOW VELOCITIES WILL BE KEPT TO A MINIMUM TO PREVENT SWAMERS FROM GETTING STUCK ON THE SCREENS. IF THEY ACCIDENTALLY OR PURPOSELY COVER THE HOLES.

DETAIL 1 SEAWATER INTAKE
SCALE 1" = 4'

		THE ENTEROCEAN GROUP	
		HILTON HAWAIIAN LAGOON SEA WATER INTAKE	
PIPE SECTIONS & DETAILS		Project Director: [Name] Project Engineer: [Name] Date: 8-11-81	Sheet No.: 2 of 02

Figure 14

Beach Park on Oahu's southeast shore. In 1990, peak use estimates put park users at over 12,000 within a 10 hour period. At one point, it was reported that forty-nine percent (49%) of all first-time visitors from Japan went to Hanauma Bay. This tremendous popularity has actually become a problem. Like most urban centers with delicate reefs in close proximity, Oahu's marine life is under increasing pressure from development, overuse, and pollution. In the early 1990's the City and County of Honolulu enacted regulations directed toward restricting use of the Bay. However, despite ever more stringent controls, the flow of visitors to Hanauma Bay persists. The threat of irreversible damage has prompted environmental experts such as Ray Tabata of the University of Hawaii Sea Grant Extension Service to call for the creation of man-made attractions to replace over utilized, natural aquatic resources (*Honolulu Advertiser*, 1993).

2.6.2 Tour Operations

Scheduling. People wishing to participate in the Hilton/EnterOcean Lagoon experience will be advised to call for an assigned start time. The facility will have telephone receptionists on duty during open hours to make these reservations. Guests will be advised as to the location of the facility, the most convenient form of transportation (usually Waikiki Trolley or by foot), and to arrive sufficiently in advance of their "start time" to allow them to change and shower (to remove sun tan oils, etc.) before their underwater orientation begins.

The Dive Tour. The telephone receptionists, assisted by a computerized scheduling system, will reserve start times for two underwater trails, scheduling guests into groups of six. After changing into swimming suits and taking obligatory hot water showers, guests will be issued a sanitized face mask, swim fins, and a slightly buoyant wet suit top, and then directed to an orientation area (Figure 5). Groups of six are then instructed by their tour guide in the use of the patented underwater tow vehicle, including use of the breathing regulator, the mask, the waterproof audio headsets, and the emergency signaling system.

Upon completion of the orientation program, the dive tour will begin. The underwater tow vehicle is operated by a tour guide, and has handrail positions for six participants. The vehicle is equipped with an onboard, silent electrical generator. The generator utilizes propane gas as fuel because it is clean-burning and, should a spill occur during refueling, the liquefied gas evaporates rather than fouling the water. The generator supplies power to an onboard, oil-free air compressor for breathing, electrical thruster motors to propel the vehicle, underwater lights, and a sophisticated onboard audio system. Participants hold on to a handrail, which positions their heads about 18 inches below water level, and are pulled at an average velocity of 6 inches per second (15 cm/sec) around the trail.

A guide will steer the vehicle, positioning the participants to the best views of each of the several underwater habitat areas found along the 550-foot (170 m) trail course. As new species of marine life are encountered, the guide activates a waterproof switch on an audio control panel pertaining to that species or subject. Each participant then will hear a 5 to 15 second nature lecture on that species. Each participant's listening device can be programmed for his or her native language, and the lecture will be delivered in that language. At one point along the trail the vehicle enters a rocky tunnel. Along the side of the tunnel are large openings covered with transparent acrylic panels. Beyond the clear panels is a deep grotto, which will be the habitat for several species of marine predators, including sharks. At the end of the guided tour, guests separate from the tow vehicles and are offered the opportunity to swim on their own in a separate area called the "Shipwreck Lagoon" (see Figure 5). Snorkels are issued to participants wishing to visit this area.

Shipwreck Lagoon. Shipwreck Lagoon will be constructed to resemble a natural marine lagoon, complete with a sunken ship replica. The depth will vary from chest-deep to about 8 feet. It will be stocked with hardy species of reef fish. Participants are welcome to snorkel in Shipwreck Lagoon following the dive experience; however, once they exit the water, they may not return and must exit the facility.

2.6.3. Security and Safety

The entire operation of the proposed facility is designed to ensure that participants have a totally safe experience. Face masks, regulator mouthpieces, and snorkels are sanitized after each use. Bone microphones will be used rather than insertable ear pieces. The underwater tow vehicle is designed so that guests will not be able to descend more than 2 feet beneath the surface of the water, thus eliminating the potential for embolism or nitrogen sickness. The velocity of the vehicle is slow enough to make it very easy to hold on to during the experience, and swimmers will not be allowed to proceed along the trail without holding on to the tow vehicle's grab rail. This design prevents anyone from touching the rocks or marine life along the trail and being injured. A second rail is provided just below the surface of the water on the tow vehicle, so that a guest that panics during the tour need only grasp this upper bar and lift their head above water level. Guests will wear a slightly buoyant wet suit top, designed to provide sufficient flotation to those who are negatively buoyant. Interspersed throughout the audio lectures on the trail are sound bites reminding guests of safety considerations, as well as information concerning the fragility of natural reef systems and the importance of environmental awareness on the part of would-be open ocean divers.

Facility safety personnel will be stationed strategically around the dive trails. Each will be equipped with a radio, tuned to an emergency transmitting system on each tow vehicle. A signal from one of the tour guides will direct safety personnel to assist.

Participants who wish to or need to leave may be guided to one of many exit points around each trail. Life guards will also be stationed to watch the snorkeling lagoon. Unauthorized entry from the outside will be difficult because of the elevation difference between the attraction and the water surface of the public lagoon (see Figure 6).

Both the facility and the tow vehicles will be equipped with lights for night dives. General facility lighting will be subtle but adequate to prevent anyone from being injured. The tow vehicles will be equipped with a lighting system which will serve two purposes. Normally, the vehicle lights will generate a soft glow around the vehicle which will enable the tour guides to see each participant through their mirrors and by sideways glances. However, when notable marine life are encountered, the guide can alter the lighting system to spotlight the animals of interest, showcasing their color and beauty. The predator tank will be equipped with an unobtrusive but effective cover, to prevent anyone, authorized or unauthorized, from entering this tank.

The owners and operators of the facility, as well as the State of Hawaii, will be fully insured for extended bodily injury, property damage, personal injury, advertising injury, premises and operations liability, contractual liability, medical payments, fire damage legal liability, products liability, completed operations, defense costs, incidental medical malpractice, and host liquor liability, including endorsements for contractual liability coverage.

2.6.4 Systems Operation and Maintenance

The sea water system will be operated at all times. Redundant pumping equipment will be installed, so that periodic maintenance may be performed on these vital elements without shutting the system down. In the event of a HECO power failure, power will be supplied by the Hilton emergency standby generating system. The sea water intake has been located so as to bring in clean sea water a majority of the time. However, under some storm conditions the water may become too turbid and it may be necessary to temporarily cease operations. Under these conditions, the turbid sea water will still be pumped through the facility, and it may be necessary to subsequently vacuum out excessive particulates that settle out in the reef trails. An aeration system will be available in the event that the sea water intake system must be temporarily turned off for any reason.

The special tow vehicles are designed for in-water maintenance of most onboard systems. A mobile crane will be used to remove any vehicles requiring major repairs, which will be accomplished at a remote facility(not on site).

Artificial corals are subject to slime growth, and will need to be removed periodically on a rotational basis and transported to a remote location for cleaning. All other

maintenance on the underwater trails will be performed by divers. Periodic draining is not contemplated for any sea water systems, because of the potential loss of biological system balance which would occur.

2.6.5 Marine Animals and Biological Maintenance

The proposed Hilton/EnterOcean Lagoon will consist of several different marine environments each populated with marine animals typical of the habitats provided. Overall habitat design will be undertaken by BIOS, Inc., one of the founders of the EnterOcean Group. BIOS, Inc. has a worldwide reputation in the aquarium design field, having been responsible for the Monterey Bay Aquarium, Aquarium of the Americas, Oregon Coast, and Sea-Cliffs (at the New York Aquarium), among others. The fishes and mobile invertebrates, of course, will be free to distribute themselves as they will, with the exception of those animals kept in the predator tank which will be confined and separated from the human participants. The minimum water volume per animal is anticipated to be on the order of 100 gallons, putting the maximum capacity of the attraction at approximately 20,000 individual fishes and larger invertebrates. The following generalized habitat areas are planned:

Shore to Reef: A sand bottom area, populated by bottom feeders such as goatfishes (Mullidae). These fishes will be mostly schooling species that feed on inhabitants (small polychaetes and crustaceans) establishing naturally in the sand substratum.

The Reef Margin: Rugged, simulated rock and coral providing habitat space to colorful but common reef fishes such as the butterflyfishes (Chaetodontidae) that feed mostly upon algal growth, with lesser numbers of species which feed on small invertebrates.

Beyond the Reef: Deeper channel areas where pelagic fishes such as ulua (jacks) will swim by the diver groups.

Safely contained behind thick acrylic glass panels in the **Predator Tank** will swim larger animals sharks and rays. This tank will be specially designed for these constantly-swimming animals and will have a volume of 200,000 gallons.

The animals will be cared for by experts trained in marine animal husbandry. A full-time curator will be employed to attend to the care and feeding of the marine life. Qualifications of the curator will include a university degree in the life sciences and experience with large aquarium curation. Animals will be maintained on special diets with measured amounts of food distributed to ensure good health and to prevent the release of excessive food particles which, if uneaten, could end up as detritus either in the trails or in the outflow to the public lagoon.

A variety of sources will supply marine animals for the facility. Because the sea water system is an open one, only species naturalized in Hawaiian marine environments will be used. Specific species selection will be based on both availability and the ability of the animals to thrive in controlled environments. Typical species expected to be utilized within the swim-through feature are rudderfish (nenuue or *Kyphosus cinerescens*), mullet (*Mugil* sp.), milkfish (*Chanos chanos*), goatfishes (Mullidae), butterflyfishes. (*Chaetodon* spp.), triggerfishes (e.g., humuhumu; Balistidae), surgeonfishes (*Acanthurus* spp. such as manini and yellow tang, *Zebrasoma flavescens*), ulua and papio (*Caranx* sp.), kahala (*Seriola* sp.), and mahimahi (*Coryphaena hippurus*). These and other species will be selected based first upon suitability for the aquarium-like environment, then availability from sources other than the "wild" (e.g., aquaculture or culture research projects), and finally abundance in the wild (i.e., rare species will not be captured).

The Oceanic Institute will be contracted to grow and supply fishes from their ongoing aquaculture research programs, including mullet, milkfish, and mahimahi. The Waikiki Aquarium may be another source of marine species bred in captivity. Other animals will be obtained either from licensed collectors around the islands, or will be collected by the licensed collection staff employed by the facility itself. Care will be taken to insure that natural reef systems are not damaged or depleted in the process. Rare or unusual species prone to do poorly in captivity will not be used. Obviously, some trial and error will be involved in establishing many of the species because of the unique nature of the facility habitats. However, the success of the venture and enjoyment of the participants is not dependent upon presenting an ever-changing array of unusual animals, but on displaying an abundance of healthy animals that can be successfully maintained.

The water system has been designed to exchange all of the water in the facility once every two hours. This water comes directly from the ocean and will carry in it many small organisms such as plankton and propagules of algae, crabs, corals, anemones, molluscs, worms, etc. that will develop populations within the underwater trails. These organisms will contribute to the ecology of the system and to the maintenance of some of the captured animals. Animals that settle out on internal, submerged surfaces will be "selected" naturally from the plankton as species that are adapted to living under the conditions developed within the waterways.

2.6.6 Projected Usage of the Hilton Swim-through Lagoon

Waikiki hosts about five million visitors a year. Any facility or attraction that can service clients within Waikiki is desirable for several reasons:

- Provides an alternative to overused public facilities and natural resources including beaches, parks, and near-shore waters;

- Reduces traffic congestion because visitors can and will walk to the attraction;
- Improves the overall image of Waikiki as a complete resort destination;
- Affords an opportunity for marine education and conservation within the context of a highly enjoyable experience.

Between 80 and 120 people will visit the proposed attraction at the Hilton Hawaiian Village hourly if projections of anticipated interest in the facility prove to be correct. These projections are based upon a sophisticated economic projection model which factored in both visitor and resident population counts, and interest based upon attendance at a number of existing attractions. To insure a quality experience for all, the flow of swimmers through the facility will be controlled by the special tow vehicles (see Section 2.3). Thus, if interest proves to be much greater than projected, the flow of users will still be maintained within the 80 to 120 persons/hour. In most cases, visitors will need to book reservations in advance. The planned hours of operation are 8:30 AM to 5:30 PM and 6:30 PM to 9:30 PM. Special events, group activities, and other programs will be developed to encourage Oahu residents to utilize the Hilton Lagoon. Much of the expected local traffic will include Scout troops, school groups, etc. at reduced prices to stimulate local marine awareness, education, and appreciation, as well as to build positive public relations in the community. Educational programs will be developed for these local group tours.

The proposed attraction will provide a unique format for viewing marine life. The nature lectures visitors and residents will receive while touring the facility's underwater environments will provide information on the fragility and need for preservation of Hawaii's marine ecosystems. The developers will establish a close working relationship with the Waikiki Aquarium, rather than compete with it. The Waikiki Aquarium bases its programs on visitor and community education, utilizing teaching exhibits, video programs, reef walks, and the like. The developers envision the attraction to be the interactive extension and continuation of the educational programs conducted at the Aquarium. Visitors, adult residents, and school children may visit the Aquarium to become informed about life in the ocean, then visit the Hilton Lagoon to further experience marine life in the prime element of the sea, observing while swimming with the creatures. Preliminary discussions have already been held with Aquarium staff regarding cooperative educational programs and promotion.

2.7 Project Schedule and Cost

Construction should begin in early 1995. The attraction is expected to be completed and in operation in 1996. The overall estimated cost of the project is \$16 million.

3.0 DESCRIPTIONS OF THE AFFECTED ENVIRONMENTS

3.1 Waikiki

Waikiki can be described as a mature, urban resort. Over 90% of the vacation units on the Island of O'ahu are located in Waikiki, and this section of Honolulu is regarded by tourists and residents alike as the locus of tourist activities on the island (Belt Collins & Assoc., 1991). Waikiki offers primarily an urban vacation experience, although Waikiki Beach, the near shore reef waters, and, via Atlantis Submarines, the deeper offshore waters, distinctly tie this experience to the ocean.

3.2 The Hilton Hawaiian Village

The Hilton Hawaiian Village is the single largest resort complex in Waikiki covering 20 acres of beach front property off Kalia Road at the west end of Waikiki Beach. The resort complex includes six towers with 2,542 guest rooms, 279 apartment units, a multistory parking garage with 1,725 stalls, and retail shop areas. In 1986, the hotel implemented a Master Plan (Helber, Hastert, Van Horn, and Kimura, 1984) designed to decrease hotel rooms and increase open space, significantly upgrading the physical plant and reinforcing the garden-like atmosphere (Belt Collins & Assoc., 1991).

3.3 Duke Kahanamoku Lagoon

3.3.1 Historical Perspective

The existing Duke Kahanamoku Lagoon at the Hilton Hawaiian Village is man-made. It was constructed in 1955 by Henry J. Kaiser to a design created by the (then) Territorial Harbors Commission. Lagoon construction was part of a littoral rights exchange between the abutting property owners (Kaiser and the Paoa Estate) and the Territory of Hawaii, and was originally only a part of a planned significant enlargement of "Crescent Beach". After construction of the lagoon, however, the planned additional beach improvements were never made. Following construction, ownership of the lagoon passed to the Territory of Hawaii, under deed covenants specifying, for the Paoa property, that the Territory would preserve the lagoon as a "safe and sanitary" body of water (Anon., 1955a); and for the Hilton property, that Hilton maintain the lagoon for as long as economically practical to do so (see Appendix E). Should the hotel wish to discontinue maintenance of the lagoon, the State of Hawaii could fill the lagoon in to make a flat land area, provide an easement to Hilton, and create a "no buildings" zone (Anon., 1955b).

In accordance with the original design by the Territorial Harbors Commission, water exchange in the lagoon is presently achieved by means of a pump station, which pulls water from the lagoon and discharges it into the outer channel of the Ala Wai Boat Harbor (see Figure 6). Two pipes run under Duke Kahanamoku Beach, connecting the lagoon with the nearshore area off the beach, and sea water flows into the lagoon through these pipes as water is pumped out the other side into the Ala Wai. The pumping rate is on the order of 4,000 gpm (Wm. Dean Alcon & Assoc., 1987).

Although the Deed and Indenture is silent as to the ownership of the improvements (pipe and pumping station), it does provide the Grantee (Kaiser) with an easement in order to provide electric power to the pump. Further, because the improvements were constructed and paid for by Kaiser, and installed with the knowledge, consent, and by design of the Territorial Government, the improvements are seen as belonging to the Grantee - in this case, Hilton as successor to Kaiser. The relationship can be equated to that of a Lessor/Lessee whereby the lessee owns the improvements until the term of the lease is up. At such time a transfer or a surrender of the improvements usually takes place or the lessee is required to return the land to its pre-existing condition.

The replenishment rate of sea water in the lagoon is very low by modern standards. The low replenishment rate, coupled with the influx of ground water and runoff from the surrounding area, results in less than ideal water quality in the lagoon. These sluggish conditions have also promoted the habitation of the lagoon by large numbers of bottom-dwelling, stinging jellyfish. Because of these factors, few people actually swim in the lagoon.

3.3.2 Water Quality

The quality of the Kahanamoku Lagoon has long been described as poor. In order to quantify this perception and relate the water quality to other adjacent recreational waters such as Waikiki Beach and the Ala Wai Boat Harbor, AECOS, Inc. was contracted to monitor the water quality in the lagoon as well as in the nearshore water off Duke Kahanamoku Beach, at potential sea water source locations in the catamaran channel, and at the existing lagoon water discharge point in the middle channel of the Ala Wai Boat Harbor (see Figure 14). Sampling at a second, proposed discharge point at the innermost channel of the boat harbor was added later in the study. Samples were analyzed for the following parameters:

- Temperature and salinity
- pH
- Dissolved oxygen
- Turbidity and suspended solids

- Nutrients (nitrate + nitrite, ammonia, total nitrogen, and total phosphorus)
- Fecal coliform and enterococcus bacteria
- Chlorophyll

A complete report (*AECOS*, 1994a) is included here as Appendix C and the study results are briefly discussed by location below and in Sections 3.4.3 and 3.5.1 that follow. Tables 2 and 3 provide summaries of most of the water quality data.

TABLE 2. Water quality data summary for Duke Kahanamoku Beach and the Catamaran Channel off Waikiki based on samples collected between May 1992 and December 1992.									
	W1 Kahanamoku Beach			W2 Turning Basin			W3 Outer Channel		
	n	mean	std. dev.	n	mean	std. dev.	n	mean	std. dev.
Temperature (°C)	15	28.5	27.5 - 29.5	0	---	---	0	---	---
Salinity (ppt)	14	33	31 - 35	1	---	---	1	---	---
Diss. Oxygen (mg/L)	15	6.15	4.4 - 7.9	0	---	---	0	---	---
pH (pH units)	22	8.23	8.17 - 8.29	21	8.24	8.18 - 8.30	17	8.21	8.15 - 8.25
Turbidity (ntu)	22	3.56	1.64 - 7.69	21	0.83	0.50 - 1.37	17	0.47	0.22 - 1.00
TSS (mg/L)	22	19.9	11.3 - 35.0	19	5.1	3.0 - 8.6	17	4.1	1.2 - 13.2
NO ₃ +NO ₂ (µg N/L)	22	2	1 - 9	21	2	1 - 7	17	2	1 - 7
NH ₃ (µg N/L)	22	4	2 - 9	21	5	3 - 11	17	5	2 - 13
Total N (µg N/L)	22	190	133 - 270	21	166	119 - 232	17	150	99 - 228
Total P (µg P/L)	22	16	6 - 47	21	6	2 - 23	17	5	1 - 24
Chlorophyll α (µg/L)	22	0.88	0.40 - 1.93	21	0.35	0.21 - 0.59	17	0.27	0.15 - 0.48

On average, the water in the Duke Kahanamoku Lagoon was more turbid (cloudier) compared with that off Waikiki in the catamaran channel (Sta. "W2" and "W3"), the lagoon exhibiting a mean turbidity of 2.42 ntu, whereas values of 0.47 to 0.83 ntu were

measured in the channel. (State of Hawaii mean turbidity standard for open coastal waters is 0.50 ntu; that is, the mean or average turbidity should not exceed 0.50 ntu). Water quality within the lagoon was expectedly similar in most respects with the water directly off Kahanamoku Beach (Sta. "W1") where a turbidity mean of 3.56 ntu was calculated. Chlorophyll was elevated in the lagoon, whereas dissolved inorganic nitrogen was not much different from that measured in the catamaran channel, suggesting that the long residence time of the water in the lagoon promoted phytoplankton growth (chlorophyll is a measure of the amount of phytoplankton present).

TABLE 3. Water quality data summary for Duke Kahanamoku Lagoon and the Ala Wai Boat Harbor based on samples collected between May 1992 and December 1992.

	L1			L2			A1		
	Kahanamoku Lagoon			Kahanamoku Lagoon			Ala Wai Harbor		
	n	mean	std. dev.	n	mean	std. dev.	n	mean	std. dev.
Temperature (°C)	17	27.9	26.2 - 29.6	17	28.8	27.3 - 30.3	16	27.5	26.0 - 29.2
Salinity (ppt)	16	32	28 - 36	16	32	28 - 36	15	30	22 - 37
Diss. Oxygen (mg/L)	18	6.4	5.3 - 7.5	17	6.8	5.6 - 7.9	17	5.7	4.6 - 6.7
pH (pH units)	22	8.22	8.13 - 8.31	22	8.25	8.15 - 8.33	22	8.17	8.09 - 8.25
Turbidity (ntu)	22	2.40	1.58 - 3.64	22	2.44	1.27 - 4.68	22	1.19	0.49 - 2.80
TSS (mg/L)	22	10.0	5.1 - 19.6	22	10.2	5.5 - 18.8	21	5.6	2.6 - 12.2
NO ₃ +NO ₂ (µg N/L)	22	2	<1 - 7	22	3	1 - 9	22	30	6 - 145
NH ₃ (µg N/L)	22	5	2 - 11	22	5	3 - 9	22	20	8 - 48
Total N (µg N/L)	22	199	146 - 271	22	212	169 - 265	22	288	180 - 453
Total P (µg P/L)	22	11	4 - 32	22	10	3 - 36	22	20	7 - 57
Chlorophyll α (µg/L)	22	2.6	1.04 - 6.48	22	2.4	1.22 - 4.95	22	3.4	1.68 - 8.88

Microbiological (bacteria) measurements by AECOS, Inc. indicate that the lagoon violates the recreational standard of more than 7 enterococci per 100 mls (on average)

about 23 percent of the time (see Table 4). This rate is comparable to that measured in the water off nearby Kahanamoku Beach. However, Harrigan (1991) reported that the recreational standard for enterococci was exceeded in the Lagoon 45.6 percent of the time during the wet season, and Kahanamoku Beach exceeded the standard 58.3 percent of the time (see Table 5A). When it is realized that the number of users in the lagoon is quite small — only a fraction of the number of people found in the water off Kahanamoku Beach — the value is seen as providing a false sense of "acceptable" water quality. If the two *AECOS* sample stations in the lagoon (see Figure 15) are viewed separately, the less used west shore exceeded the standard only 14 % of the time, whereas the east shore had a rate of 32%. These results suggest that were the density of users of the lagoon equal to that which occurs off Kahanamoku Beach with the present water circulation system, the lagoon water might seldom meet the State recreational standard for bacteria in marine waters.

Station	Location	Enterococcus		Fecal Coliform	
		n	Std. Exceeded	n	Std. Exceeded
W3	Waikiki, outer channel	12	8 %	12	8 %
W2	Waikiki, turning basin	21	24 %	21	none
W1	Waikiki, Kahanamoku Beach	22	27 %	22	4 %
L1	Kahanamoku Lagoon (SE)	22	32 %	22	4 %
L2	Kahanamoku Lagoon (NW)	22	14 %	22	9 %
A1	Ala Wai Yacht Harbor (middle)	22	36 %	22	18 %
A2	Ala Wai Yacht Harbor (inner)	6	83 %	6	67 %

Station No.	STATION	n	period of records	Percent of samples exceeding standard	
				Wet Season	Dry Season
155	Kahanamoku Beach	73	5/88 - 12/90	58.3	13.5
157	Kahanamoku Lagoon	124	7/86 - 4/91	45.6	19.6
158	Fort DeRussy	23	10/88 - 12/90	33.3	28.6
159	Gray's Beach	121	7/86 - 12/90	22.6	18.6
160	Tavern Beach	14	10/88 - 8/90	7.1	0
161	Kuhio Beach	93	10/86 - 12/90	54.2	37.8
162	Public Bath Beach	90	7/86 - 12/90	14.9	9.3
163	Elk's Club Beach	54	10/88 - 12/90	33.3	6.7

Microbiological measurements by the state Department of Health are ongoing at a number of Waikiki Beach locations. Table 5B summarizes data obtained from the DOH STORET (computerized data storage) system for locations nearest the project since 1990. The results of regular measurements are reduced to percent of samples exceeding the new (7 enterococci/100 ml) and the old (200 fecal coliform/100 ml) state recreational standards for easy comparison with Tables 4 and 5A.

Station No.	STATION	period of records	Percent of samples exceeding standard			
			Enterococcus standard exceeded	n	Fecal coliform standard exceeded	n
155	Kahanamoku Beach	1/91 - 8/94	24	165	1.5	133
157	Kahanamoku Lagoon	1/91 - 8/94	32	165	9.8	163
158	Fort DeRussy	1/91 - 8/94	38	63	1.6	62
159	Gray's Beach	1/91 - 8/94	28	170	2.9	136

3.3.3 Storm Water Runoff

Some storm water runoff presently enters the Kahanamoku Lagoon from the grounds of the Hilton Hawaiian Village. This runoff will need to be diverted from the project area. Only four options exist with regard to the diversion of this storm runoff: 1) into the Ala Wai Boat Harbor, 2) into the public portion of the lagoon, 3) into the ocean off Kahanamoku Beach, or 4) into the ocean off the breakwater at the end of the beach. Options 3 and 4 are least preferable with respect to impacts on marine resources and recreational activities and would be the most difficult to achieve. Option 1 would be the least objectionable environmentally. This diversion could be achieved by pumping from a sump catchment directly into the harbor or to the discharge pipe for the lagoon sea water return. However, water discharge regulations administered by the Department of Health will not allow pumping of runoff to a discharge point without a permit. Option 2, redirecting the run-off into another part of the lagoon not incorporated in the Hilton Lagoon project, would effectively represent a "no change" option from the present situation. The Hilton Hawaiian Village intends to pursue Option 1 with the Department of Health.

3.4 Waikiki Beach and Nearshore Waters

Waikiki Beach stretches for approximately two miles from the sand shore at the Outrigger Canoe Club on the east to Kahanamoku Beach off the Hilton Hawaiian Village on the west. Kahanamoku Beach was created in the 1950's by dredging parts of the nearshore reef flat and constructing groins at either end to stabilize the sand shore. At this time, the six-acre Kahanamoku Lagoon was dredged out behind the beach (ACOE, 1971; Clark, 1977).

Presently, two pipes extend beneath Kahanamoku Beach (northwest end of Waikiki Beach) connecting the lagoon with the ocean. Water flow into the lagoon occurs with tidal changes and as water is pumped out of the lagoon on the Ala Wai side. Water thus drawn into the lagoon comes from a depression on the reef flat directly off the beach. This depression is somewhat isolated from offshore waters by a remnant of limestone which projects upward to just below the water surface. On the seaward side of this remnant is a man-made depression which is the inner basin of the catamaran channel that was dredged through the fringing reef. Because of the limestone remnant, the inner reef area adjacent to the beach exchanges water only poorly with the ocean and is therefore suspect as a source of clean sea water for the lagoon. The water in the catamaran channel or the water seaward of the reef margin would be far better with respect to all water quality parameters of interest.

3.4.1 Water Currents

The only extensive study of currents on the reef flat off Waikiki Beach is found in a report by Chave, Tait, Stimson, and Chave (1979). This study looked at current patterns in two areas: inside and outside of the surf zone (generally occurring at or near the reef margin). The former would have particular relevance here if it is determined that the intake pipe will extend only into the catamaran channel and not as far seaward as the reef margin. The results of observations under conditions of high waves and conditions of low waves are summarized below.

Under low wave height conditions (less than 5 feet) currents near the shore off Fort DeRussy were found to be weak and variable in direction. Currents on the reef flat west of the catamaran channel were weak and northward (moving inward). Under high surf conditions (greater than 10 feet), weak currents (less than 0.5 ft/sec) were observed moving eastward across the catamaran channel towards a rip current which formed off the Royal Hawaiian. Stronger currents (between 0.5 and 4 ft/sec) flowed to the west on the reef flat close to the Ala Wai entrance channel. Apparently during these studies either scant attention was paid to the catamaran channel or the channel has little influence on nearshore currents. Consideration of sediment deposition patterns were used to assess long-term net current motion. Inshore movement across the reef flat with

longshore drift to the east is indicated for the area off Fort DeRussy. However, this pattern may not apply to the catamaran channel. It seems more plausible that the net movement of sand on the bottom of the channel is seaward.

3.4.2 Biological Surveys

A survey conducted with snorkeling gear was undertaken on August 4, 1989 (*AECOS*, 1990) in the waters off Waikiki Beach in the vicinity of the Hilton Lagoon and the catamaran channel. This survey was for the purpose of assessing water quality in the vicinity of the existing intake pipes for the Duke Kahanamoku Lagoon water circulation, and whether sensitive biological assemblages inhabited the area where extension of the intake pipes seaward might create adverse construction impacts. A second survey was conducted on December 9, 1994 specifically to assess the marine biota in the area that would be directly impacted by alternative Route C (Figure 13) for the sea water intake line. Notes from this survey are included in Appendix F.

The sand on that portion of Waikiki Beach known as Kahanamoku Beach terminates just below the water line, and the bottom then becomes limestone rubble mixed with sand out to a basin which is 3 to 4 meters deep and located between the shore and a shallow, off-shore remnant of consolidated limestone. The deeper bottom of the basin is silt, and water clarity within the basin was extremely poor on the day of the visit. The limestone remnant is some 20 meters across and extends between the end of a groin at the west end of the beach to the catamaran pier. Presumably, this feature, which can be seen clearly in aerial photographs (e.g., frontispiece herein), was left intact to reduce erosion of sand from Kahanamoku Beach. Although a few scattered coral heads were observed on the limestone remnant, these were small and total coverage would be well under 1% of the available hard bottom.

The catamaran channel and the reef flat west of the channel were followed seaward to just inside the surf zone. The channel was observed to have a sand bottom with low outcrops of reef rock along the margins. No significant coral growth was seen in this area. The return swim was made across the reef flat east of the channel. This area also lacks significant or sensitive marine biota. Water clarity was noted to improve substantially in the seaward direction, with the steepest gradient present across the reef rock remnant.

The reef flat areas seaward of the groin at the west end of Kahanamoku Beach and seaward of Fort DeRussy Beach were included in a series of biological transects conducted by Chave, Tait, Stimson, and Chave (1973) off Waikiki Beach. These transects extended from the shore to a depth of around 50 feet (i.e., seaward of the reef margin). Coral cover was found to be nil or insignificant at all reef flat stations. Along the reef front, coral diversity and abundance was generally greater off the northwest

end of Waikiki than off the southeast end. Although percent cover exceeded 30% at some northwest stations, average coral cover seaward of the reef margin was found to be only about 8%. Algal abundance and number of species was generally greatest on hard bottom substrata inside the reef margin. The most abundant invertebrates noted on the reef flat at the northwest end of the Waikiki were ophiuroids, sea urchins (*Tripneustes gratilla* and *Echinometra mathaei*), ghost shrimp (*Callinassa* sp.), and sea cucumber (*Holothuria atra*). The abundance and diversity of fishes followed closely coral abundance. Thus, although the northwest end harbored the most species and the greatest diversity, this generalization applied only to the stations seaward of the reef margin.

3.4.3 Nearshore Water Quality

Water clarity in the nearshore area off Kahanamoku Beach (Sta.1, Figure 9) was measured and seen to exceed the State of Hawaii coastal water standard, with mean values of 3.58 ntu, and total suspended solids measuring 20.6 milligrams per liter (Table 2). Only 100 meters away, in the turning basin of the catamaran channel, however, the turbidity improved dramatically to a mean of 0.95 ntu and 5.8 mg/l of suspended solids (Tables 2 and 3). Clarity did not improve significantly in the samples taken further out the catamaran channel. There were no significant differences between measurements taken in the wet season as opposed to the dry season, although the wet season showed slightly improved clarity values, possibly as a result of fewer wet season samples being collected.

Microbiological measurements also demonstrated the poor quality of the nearshore Kahanamoku Beach water, with the marine recreational standard (enterococcus) being exceeded 27 percent of the time (AECOS data, Table 4) and 13.5 to 58.3 percent of the time (DOH data, Table 5A). The AECOS study showed fecal coliform counts in the Kahanamoku Beach area to exceed the (old) State standards 4 percent of the time. Table 5B presents a summary of the most recent DOH data (1991 to 1993) from Waikiki Beach locations that show bacteria counts continue to be high on occasion.

3.5 Ala Wai Boat Harbor

3.5.1 Water Quality

Included in the program of water quality testing conducted between May 1992 and December 1992 was one station (Sta. "A1") in the Ala Wai Basin (Figure 9). A second station ("A2") located at the head of the innermost basin was added in October for microbiological measurements.

For most of the parameters, the means from the Ala Wai station (Sta. "A1") were not significantly different from the lagoon means, except that all nutrients and chlorophyll had higher mean values in the harbor, indicating a greater level of eutrophication in the harbor as compared with the lagoon. Dissolved inorganic nitrogen was significantly higher in the Ala Wai than in the lagoon, attributed to land runoff entering via the Ala Wai Canal, and partly attributed to ammonia generated by anoxic sediments on the bottom of the harbor.

Microbiological measurements proved especially revealing. The State standard for enterococcus was exceeded in the middle channel (Sta. "A1") of the boat harbor 36 percent of the time, while at the innermost channel (Sta. "A2"), the rate was 83 percent of the time. Fecal coliform counts exceeded the (old) State standard 18 percent of the time at the middle channel, and 67% of the time at the inner channel.

3.5.2 Biology

The biological assemblages in the Ala Wai Boat Harbor are partly known by studies that have been conducted in the Ala Wai Canal (Harris, 1975; Miller, 1975). In general, the results can be applied with reservation to the harbor area which is characterized by deeper water, more marine (i.e., less brackish) conditions, and high boat traffic and related human use. Although a number of species of crabs and fishes of interest to subsistence and recreational fishermen are found in the Ala Wai, pollutants have largely destroyed the value of this area to fishermen. The proposed introduction of clean sea water to the harbor could only improve fishing opportunity and value in the area of the discharge.

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4.0 IMPACTS ASSESSMENT

4.1 General

The proposed project has the potential to affect the surrounding environment in the following ways:

- Employment and employee payrolls would increase, with increases in business sales and tax revenues.
- Water quality within the project area (Duke Kahanamoku Lagoon) as well as in the proposed discharge area (Ala Wai Boat Harbor, Duke Kahanamoku Beach) will improve.
- The facility will provide recreational and educational opportunities for visitors and residents.

In addition to these long-term positive impacts, which would be associated with the on-going operation of the proposed facility, implementation of the project could have a number of adverse construction impacts. These short-term impacts would include noise emissions, temporary disruption of the use of the ocean recreation area in the immediate vicinity of the sea water intake pipeline, temporary but longer term disruption of the recreational and aesthetic values of the Duke Kahanamoku Lagoon, potential water quality problems associated with dredging in the Kahanamoku Lagoon and dewatering of the Hilton Lagoon site, and temporary increase in traffic as a result of the presence of the construction work force and equipment.

Potential adverse impacts associated with the completed project include increased traffic (both pedestrian and vehicular) in the project vicinity, increased use of recreational resources by tourists and residents attracted to the area, loss of use by the public at large of a portion of the Duke Kahanamoku Lagoon, and alteration of the nearshore bottom off Kahanamoku Beach. A summary of the impacts identified is presented in Table 1 (Section 1.5). In the following Section, the various project impacts are discussed and assessments are made regarding the severity of these impacts. Mitigating aspects and measures taken to minimize identified adverse impacts are presented in Section 6.0 of the environmental assessment.

4.2 Waikiki and Vicinity

This project is expected to attract visitors already staying in Waikiki. Indeed, a positive aspect of the project is that it will provide a desirable activity which these visitors can reach on foot. While it is certainly hoped that the project will have a positive impact on visitor numbers to Waikiki, the project is not expected to be a driving force in the sense of creating a demand that exceeds present hotel capacities. Economic viability of the project is based on realistic projected penetrations of the existing market of visitors to Waikiki.

The project is designed to be entirely compatible with the ambiance and activities at the Hilton Hawaiian Village. A portion of the delivery area for the Hilton's Rainbow Tower would be converted into a landscaped walkway providing access to Kahanamoku Beach around the proposed Hilton Lagoon and access to the entryway of the project (Figure 5). While the Kahanamoku Lagoon is of limited recreational use to the hotel guests and visitors, the waterscape does contribute immensely to the ambiance of the Hilton Hawaiian Village, providing impressive views from the hotel grounds, as well as separation of the hotel from the extensive parking lot of the nearby Ala Wai Boat Harbor. The project is designed to present an entirely natural appearance, extending the tropical garden appearance of the Hilton Hawaiian Village grounds in the makai direction. The entrance structure will be covered with rock and vegetation, so as to appear to be part of the tropical garden (Figure 4).

The proposed project would result in a considerable increase in activity level over that which presently characterizes the mauka end of the Kahanamoku Lagoon. The activity level would be entirely in character with that occurring in many other parts of the hotel grounds and adjacent areas, including the swimming pool, Rainbow Bazaar shops, nearby Waikiki Beach, and the Ala Wai Boat Harbor. However, increased activity around the Hilton Lagoon will not interfere with public access or activities on Waikiki Beach or in and around Kahanamoku Lagoon because of the project orientation (the entry is on the hotel side of the lagoon feature) and the physical separation resulting from the elevational differences between the Hilton Lagoon and the Kahanamoku Lagoon.

4.3 Duke Kahanamoku Lagoon

Impacts on the Duke Kahanamoku Lagoon include short-term construction impacts and the long-term impacts resulting from improved water quality in the lagoon. Because of the nature of the construction activities, including removal of accumulated silt from the lagoon bottom, it can be anticipated that use of the lagoon by the public would be curtailed for approximately 3 to 4 months during the early phases of the construction.

Other inconveniences would attend construction of the sea water intake and discharge pipes through the area, with construction sites and access areas moving with the work as shown in Figures 8 through 13. Once the lagoon dredging is completed, use of the lagoon (except the northeast one-third) would be returned to the public, with one passive intake pipe and the existing sea water return pump operating to maintain water circulation.

4.3.1 Desiltation of the Lagoon and Site Dewatering

The project proposes to remove a layer of silt present on the deeper portions of the lagoon bottom (Wm. Dean Alcon & Assoc., 1990). Several options to accomplish silt removal and drying are described in Section 2.5.1. The preferred options are use of a suction dredge and discharge of dredged silt into either the isolated attraction site at the northeast end of the lagoon or drying basins along the shore of the lagoon for subsequent drying and removal. The dewatered silt would then be trucked to a landfill site. During the dredging operations, circulation (pumping) of sea water through the lagoon would be halted only briefly if necessary to avoid discharge of turbid water into the Ala Wai Boat Harbor. Use of the lagoon by swimmers would have to be curtailed during some or all of this operation. Adjacent beach areas can easily absorb the expected number of beach users displaced by any temporary closing of the lagoon. This proposal does not present any significant environmental problems, although the process would have to be accomplished in a manner satisfactory to surrounding residents and guests at the Hilton and other hotels and apartments with respect to noise and odors. No important biological resources are associated with this body of water. Physical and/or chemical testing of the dewatered silt may be required by the landfill operator prior to acceptance of the material.

Initially in order to remove the silt, and throughout the construction of the attraction, dewatering of the construction site will be required. A Best Management Practices (BMP) plan will be developed and submitted to the Department of Health as part of the required Notice of Intent for a General Permit under NPDES, construction activity dewatering. (HAR §11-55, App. G) to insure that state waters are not degraded by the dewatering discharge. Circulation (pumping) of sea water through the lagoon would be continued to allow use of the lagoon and to avoid stagnation of the lagoon water.

4.3.2 Water Quality

The proposed modifications to the sea water flushing system for the lagoon include (1) providing an improved source of sea water and (2) increasing the flow rate of the water to yield a residence time of under 3 hours in the Hilton/EnterOcean attraction and under 10 hours in the public lagoon. The difference in residence time for the two lagoons is due to the difference in their respective volumes. The rate of flow of sea

water through both features will be the same: around 15,000 gpm. The determination of turnover rates for the modified lagoons were based partly on an assessment conducted by *AECOS* of decorative ponds on the Big Island (*AECOS*, 1992). This study is extensively summarized in the *AECOS* (1994a) study provided as Appendix C in the EA. The decorative pond systems were sampled to provide indications on the kinds of water quality changes that occur in flow-through sea water ponds stocked with marine fishes and other animals and limu. The Hilton/EnterOcean Lagoon turnover rate is designed to be several times greater because of the increased depth of the swim-through feature compared with most decorative ponds, the desire to support higher fish stocking densities, and the fact that people would be spending time in the water with the biota.

The increase in flow through the public lagoon from the present 4000 gpm is expected to improve the quality of lagoon water in several important respects (*AECOS*, 1994a; see Appendix C). Water clarity is expected to be excellent in both lagoons. The source water is of much greater clarity (lower particulates concentration) than the existing source from behind the limestone remnant off Kahanamoku Beach. The high flow-through in the swim-through lagoon is predicted to minimize the addition of organic particulates, even though there will be a greater concentration of marine life. The same is forecast to be true in the public portion of the lagoon.

Microbiological contamination is also expected to decrease in the lagoon, principally because of the reduction in bacteria counts in the source water (i.e. the catamaran channel), but also due to the diversion runoff from the hotel grounds and higher turnover rate of the water in the lagoon. The swim-through portion of the lagoon is forecast to provide a healthy environment for the population of marine life it will harbor based on comparison of project design parameters with those employed in major aquarium installations, including quality of source water, flow-through rates, and marine life population characteristics. Water quality monitoring related to the construction and to the operation of the facility will be conducted in accordance with applicable monitoring plans that shall be acceptable to the DOH, State of Hawaii or other applicable government agency.

4.3.3 Recreational Uses

During construction, it can be anticipated that use of all or much of the lagoon by the public would be curtailed for approximately 3 to 4 months. Other inconveniences would occur during construction of the sea water intake and discharge pipes through the area, although construction activities outside the lagoon area would be brief in duration.

The completed project will result in a smaller lagoon area for public use than is presently the case. However, improvements in water quality and the marine environment in general (including removal of the silt bottom and anticipated demise of

the jellyfish population) should greatly enhance the recreational value of the remaining lagoon. The Hilton Lagoon project is confined to those parts of the existing Kahanamoku Lagoon which are generally regarded by the public to be part of the Hilton Hawaiian Village simply by virtue of close proximity. The more popular, public use areas are the strand adjacent to the Ala Wai Boat Harbor parking lot, and the sand "spit" between Kahanamoku Beach and the lagoon. Use of these areas will not be curtailed by the project, and the public will benefit by the improved conditions in the lagoon. All present use levels of Kahanamoku Lagoon will be accommodated within the reduced public lagoon and beach areas.

For the existing Kahanamoku Lagoon to become an improved recreational facility the flow of water (that is, the exchange of clean sea water) must be increased. No other improvements (e.g., various water treatments, opening of a large connection through Kahanamoku Beach, removal of silt, etc.) can offer the same promise of success with no or minimal adverse consequences. While the issue ultimately comes down to water quality, several factors can be listed as probably responsible for the present low recreational usage of the lagoon:

- a silt layer covering much of the bottom;
- the presence of nuisance biota (jellyfish);
- high coliform/enterococcus counts;
- a perception that the water exchange is poor; and
- sometimes turbid water conditions.

The silt layer on the bottom can be removed as an isolated action, but this would not remedy the other factors, and the poor quality (with respect to suspended solids) of the present inflow and slow turnover rate would promote continued accumulation of silt. The HHV/EnterOcean proposal includes removal of the silt layer and is expected to reduce inputs of turbid water from the sea. Additional particulates will be generated by the proposed attraction, and these will be swept into the public lagoon. The more rapid turnover of water in the public lagoon will reduce the opportunity for settlement of particulates from either source (from the source water off Waikiki or from the attraction), but exactly how much will be retained in the public lagoon and how much will be entrained in the discharge to the Ala Wai would be very difficult to predict without more detailed knowledge of the nature of the particulates and current patterns in the newly configured lagoon.

The nuisance jellyfish can be removed by hand with limited success. Only by altering the environment, will this species be eliminated from the lagoon. The proposal to increase the flow of water through the lagoon to 15,000 gpm (a factor of four) has the potential for successfully achieving eradication, but not enough is known about this

species to guarantee that the population will be unable to survive in the improved lagoon environment.

Studies have suggested that the high microbial counts in the lagoon are related to the source water: the nearshore area off Kahanamoku Beach. Counts would be even higher if more land drainage were directed into the lagoon or more users utilized this confined body of water. The proposal to move the intake to an area of low enteric bacteria counts and increase the turnover rate of the water will reduce the microbial count substantially. The applicant has also suggested redirecting storm drain runoff presently entering the lagoon (see Section 3.3.3). Although there may be objections to directing runoff into the recreational area, the proposed project is adding only a small amount to existing storm runoff which enters the lagoon. Any runoff resulting from watering of plantings on the proposed structure would be directed into perforated drain lines or otherwise infiltrated on the grounds of the Hilton Hawaiian Village. The impact of storm runoff into the lagoon will be mitigated, perhaps quite significantly, by the enhanced turnover of lagoon water resulting from the proposed project.

The design of the Hilton Lagoon attraction, with water flowing over low waterfalls into the public lagoon, the potential for substantial improvement in water clarity (attending the improvement of source water and more rapid turnover rate), and the probability that marine life will increase in the lagoon, should all contribute to a perception that the environment is a healthier one than is presently the case.

The *AECOS* (1994a) water quality study of the lagoon and adjacent areas showed that on average, the lagoon was slightly more turbid than even the inner parts of the Ala Wai Yacht Harbor (Table 3). Only the area directly off Kahanamoku Beach (where the present lagoon intake pipes draw water) had higher average turbidity and suspended solids (expected since waves and swimmers stir the bottom here). Moving the source of water to the middle or outer part of the Catamaran Channel would improve water clarity in the public lagoon to a level above that experienced by adjacent recreational areas and comparable to offshore water clarity, further contributing to the perception that the environment is very suitable for recreation.

4.3.4 Visual Impacts

Visually, the lagoon is a pleasant amenity, particularly at night. The expanse of open water and the small island with palm trees are often photographed at sunset. Both the Hilton Hawaiian Village and the EnterOcean Group agree that the positive visual aspects of the lagoon should be retained in developing the attraction. The view towards the hotel from the Ala Wai Boat Harbor or the south end of the lagoon will not be changed substantially by the project. This view is presently one combining landscaping and functional hotel use areas.

4.4 Waikiki Beach

The portion of Waikiki Beach located closest to the project is known as Duke Kahanamoku Beach and was created in the 1950's as part of more ambitious plans to develop a peninsula park in the style of Magic Island (at Ala Moana) at the extreme west end of 2 mile long Waikiki Beach. While the entire project was never realized, the completed portion of the beach is now a popular area for beach-going tourists and residents. The lagoon built behind Kahanamoku Beach has never realized the utilization by these visitors or by residents of Ala Wai and Waikiki that was anticipated, and has served largely as a visual amenity.

The proposed project would take a portion of the lagoon from public use, but would return a more valuable recreational amenity with the improved water circulation in the public portion. With improved water quality, the Kahanamoku Lagoon should attract more users, and thus relieve some of the crowding on nearby Waikiki Beach. Because of proximity to the Ala Wai Boat Harbor and public parking areas at the harbor, the lagoon would be attractive to local residents. Thus, a direct public benefit will result which may exceed the indirect benefits to the public from the Hilton/EnterOcean facility.

The proposed alternatives for the installation of new sea water intake lines involve 1) threading the pipes through existing pipes located beneath Kahanamoku Beach or 2) trenching through the beach. Alternative Route C (Figure 19) would produce the least disruption of beach use by the public because this route minimizes the offshore work opposite the high use beach area. Although trenching through this latter area would be avoided by Route A (Figure 11), trenching through the dry beach along Route C could be accomplished relatively quickly. Trenching offshore of the beach and through the limestone remnant, as well as the need for construction access to accomplish laying the pipe through the nearshore area decreases the advantage of threading the pipes through the existing system.

4.5 The Reef off Waikiki

4.5.1 Extending the Saltwater Intake Structures

Construction of the offshore intake pipes, including creation of a breach through the limestone remnant (alternative Routes A & B) required to extend the intake pipes seaward along the bottom of the catamaran channel, can be accomplished without significant impact to biological resources on the Waikiki reef. No important biological resources are present in the immediate area that would suffer permanent or long-term impact from removal of the limestone substratum. The breach in the limestone remnant

will be repaired utilizing medium-sized limestone boulders, arranged in a close-packed fashion. Although leaving the trench open would probably contribute to improved water quality adjacent to Kahanamoku Beach, the impact of the opening on sand dynamics of the beach is unknown. The reconstruction should result in no or minimal effect on the sand dynamics of Kahanamoku Beach. Alternative Route C avoids trenching through the limestone remnant. Instead, portions of an existing breakwater would be temporarily removed to allow placement of the pipe underneath. The area between the shore and the catamaran channel is mostly sand and rubble reef flat with almost no live coral along the proposed route (Appendix F). Portions have been dredged in the past.

The catamaran channel bottom is sand, and placement of an intake pipe in this area would not have any adverse impacts on the environment. Present indications from water quality studies are that an intake manifold placed on the sand on the seaward side of the limestone remnant will provide water of sufficient clarity most of the time to satisfy the project requirements (see Appendix B; OCEES International, Inc., 1990; AECOS, 1994a).

4.5.2 Water Quality

The proposed project would have no long term impact on water quality off Waikiki Beach. The hydrological relationship between Kahanamoku Lagoon and the nearshore waters might change from negative (water now flows into the lagoon because the lagoon is lowered by the existing pump system) to positive (water would flow out of the lagoon because of sea water pumped into the Hilton Lagoon feature). This change may alter flow through the beach sand and through the pipes connecting the lagoon and Kahanamoku Beach. However, with improved water quality in Kahanamoku Lagoon, any exchange with the waters off the beach will generally benefit the beach area.

Adding clean sea water to the Ala Wai will tend to dilute pollutants present in that water, resulting in lower concentrations in the water moving seaward with the tidal ebb and canal outflow. Because the daily net flow seaward will be increased, the total loading of pollutants to the ocean will remain unchanged, but the concentration of any pollutants in that water will be less. Concentration usually determines the adverse effect of a pollutant on the environment. The net effect of the proposed project on the ocean and any offshore or coastal areas downstream of the Ala Wai basin will be minimal; but can be assessed as either beneficial as a result of reduced pollutant concentrations or unchanged as a result of unchanged loadings.

4.5.3 Offshore Recreation

Surf sites do occur in the general area of the proposed sea water intake manifold (e.g., "Fours" shown in Figure 15). This structure will be constructed to rise no more than one or two feet off the bottom (Figure 14) along the margin of the catamaran channel so as to pose no hazard to either surfers or boats.

4.6 The Ala Wai Boat Harbor

4.6.1 Water Quality

At the present time, water in the Hilton Kahanamoku Lagoon is pumped into the middle basin of the Ala Wai Boat Harbor. The proposed project could more than double the rate of discharge into the harbor, and the quality of the water discharged would be considerably improved over that currently discharged. It is proposed to add a second discharge point in the harbor; i.e. at the east end of the innermost channel. It is felt that, if this were done, the overall quality of water in this area would be substantially improved, both from a clarity and microbiological standpoint (*AECOS*, 1994a).

An estimate of the improvement possible assuming all of the discharge were directed into the inner basin can be made as follows: The inner basin (excluding the portion directly opposite the entrance to the Ala Wai Canal) is roughly 710,000 sq. feet in area. Assuming a depth of 20 feet (actual depth is probably a little less), the volume would be 105 million gallons. Perhaps 10 to 15 % of this volume is exchanged each day through tidal action. The discharge of 15,000 gpm of sea water from the lagoon represents 900,000 gph or nearly 22 million gallons per day. Since this is 20% of the inner basin volume, the opportunity for improving water quality through reducing residence time of the water would easily exceed the benefit presently provided by the tide. The tide represents an oscillating body of water, with some lesser proportion of the water added to the basin during the flood actually representing new ocean water. Therefore, a volume comparable to the tidal prism added as a continuous flow into the blind end of the basin would have a greater influence on average residence time and water quality than does the tide in that basin. Water quality near the lagoon outlet would come to resemble that of the discharge (i.e., the water quality of the lagoon) all of the time, and this water would be progressively diluted (with water derived from both the ocean outside the Ala Wai and water from the Ala Wai Canal) away from the outlet structure.

A plume model might provide a more comprehensive prediction of the water quality improvement theoretically achievable, but situations resulting in improved conditions as a by-product of some other action are not subject to the same pressures to quantitatively predict the proposed change. However, a second pipe constructed to

discharge some substantial portion of the lagoon water into the inner channel of the Ala Wai Boat Harbor (as shown in Figure 8) would provide a constant flow of clean sea water to enhance circulation and water quality within that part of the Ala Wai Boat Harbor which could benefit the most. A similar scheme has been suggested recently as a means of cleaning up the Ala Wai Canal (Edward K. Noda and Assoc., 1992).

4.7 Transportation and Parking

The Hilton Hawaiian Village submitted a Parking Management Plan in support of its Waikiki Design District (WSD) application for the Kalia Tower/Recreation Deck. (Hilton Hawaiian Village, 1993; see Appendix D) This plan was accepted by the City Department of Land Utilization and a WSD permit granted in September 1993. As the vast majority of Hilton Lagoon users will either come from on-site or walk from nearby hotels, and the hotel has an excess of parking stalls for those arriving via private vehicle, no material changes to the Plan are anticipated with the construction of the proposed Lagoon project. However, it should be noted that an updated plan will be prepared when the developers of the proposed project seek a WSD permit from the City.

As the 1993 report notes, "the design of the Hilton Hawaiian Village effectively disperses transportation activities to different areas of the property. The parking structure is located at the Ewa end, whereas the bus arrival/departure area is located at the Diamond Head side of the property." This dispersing of traffic helps improve the overall property traffic flow by quickly getting vehicles off public roads and expediting handling once on the Hilton grounds.

For those lagoon users arriving via bus, the Army-initiated realignment of Kalia Road has prompted Hotel management to redesign the bus arrival/departure area located near the intersection of Paoa Place and Kalia Road. The new design has separated bus traffic from luggage delivery as well as from the loading dock activities, thus creating a larger, more efficient and attractive waiting space for passenger loading and unloading. For those lagoon users arriving via private car, validated parking will be available in the HHV parking garage which contains 1725 spaces. The number of stalls is currently in excess of that required by the WSD regulations. The nearby Hale Koa Hotel recently opened a new 1,287-stall parking garage off Kalia Road, open to the public at reasonable rates.

Although the developer will provide validated parking and thus anticipates no problem accommodating Hilton Lagoon users in the existing HHV parking garage, concern has been raised by members of the boating community that the improved public portion of the lagoon will attract more users. Not including the 50 public stalls located within the

Hawaii Prince Hotel parking garage, there are 999 State-controlled parking stalls in the Boat Harbor vicinity (Helber, Hastert, & Kimura, 1991). Most of the parking is free for up to 72 hours, while some is metered.

The public benefit of improving the under-utilized lagoon is viewed as a positive one for a community which has a finite amount of safe swimming beaches in the Honolulu metropolitan area. It is difficult to quantify how many more people would use the public portion of the lagoon — but clearly it would be more attractive and thus receive more use than it does currently. The private portion of the lagoon will accommodate the users it expects in the Hilton's parking garage. Reassessing and developing a parking management plan for the state-controlled spaces should be considered by the state. Proper management, regulation, and enforcement will allow the current spaces to be better utilized and allow the public to enjoy the increased ocean-front activity that this project will provide at no charge.

4.8 Air Quality

Construction activities have the potential for generating both fugitive dust and odors from heavy equipment and silt drying. In keeping with all past construction activities at the Hilton Hawaiian Village, the contractor will be required to minimize inconveniences to the hotel's clientele and the surrounding community. Generation of dust, even if blowing mostly seaward with the prevailing winds would not be tolerated because of the difficulty it would present the Hilton Hawaiian Village in marketing itself. The silt drying process will need to be closely monitored to control unpleasant odors and avoid inconveniences to surrounding residents, beach goers, and hotel guests.

The proposed entry building structure and recreational facilities are not expected to create significant adverse impacts on ambient air quality. Traffic generated by the project would only slightly increase total pollutant emissions. To the extent that the project reduces visitor trips by car or bus out of Waikiki, air quality improvements could be a net result.

4.9 Flora and Fauna

Because the proposed project is proposed for a highly urban setting, adverse impacts on existing introduced flora and fauna are not anticipated. No animal or plant species on the proposed site are identified as either threatened or endangered, nor are any known to be candidates for such status. The project proposes increasing the existing landscaping by planting additional coconut trees and other indigenous plants.

The attraction will provide habitat for a variety of marine life. However, no mammals such as dolphins, would be kept in the Hilton Lagoon. The size and capacity of the sea water system is such that the ratio of participants to water area is about the same as if there were one diver for every 250 square feet of bottom area, comparable to a group of divers spaced 30 feet apart over a reef with 7 to 8 feet of water depth. The minimum water volume per animal is anticipated to be on the order of 100 gallons, putting the maximum capacity of the attraction at approximately 20,000 individual fishes and larger invertebrates.

By offering visitors an opportunity to swim with reef fish right in Waikiki, the attraction may well reduce the numbers of visitors to natural ocean recreation areas such as Hanauma Bay, thus contributing to preserving those valuable ocean resources for future generations. Of course, the facility must acquire marine animals, and some of these will be collected from marine environments around the Hawaiian Islands (see Section 2.6.5). Only licensed collectors will provide specimens for use in the facility, allowing the state (through DLNR) to maintain control over the numbers of various species collected. Mariculture sources will be utilized as much as possible to minimize collecting impacts on natural areas. Because the sea water system is an open one, only species naturalized in Hawaiian waters will be used. Emphasis will always be on obtaining only those species that can be readily maintained in the facility. Rare or unusual species prone to do poorly in captivity will not be needed to provide the kind of experience envisioned for this attraction. The success of the venture and enjoyment of the participants is dependent upon presenting an abundance of healthy animals.

4.10 Socio-economic Issues

The proposed project would be constructed within an existing resort complex in a well-established visitor destination area. Increased direct employment during the construction and operational phases of the project is expected. In addition, some induced and indirect employment would be generated. The approximately \$16 million construction expenditure would increase State and County tax revenues as well as ongoing economic benefit from employment opportunities created and payment of government taxes. Recent studies and expert testimony have suggested that Waikiki is losing some of its appeal as a resort destination, partly as a result of little or no addition of things for visitors to do. Proper promotion of this new and novel attraction in Waikiki should contribute to a rejuvenation of interest by the travel industry in the State's most important tourist destination.

4.10.1 Public Services and Utilities

The proposed project would generate only marginal demands on public services and facilities such as police, fire, and medical facilities. Therefore, no significant adverse impact would be anticipated on these ancillary services.

No utilities or easements cross the site. The project would not be expected to result in a significant impact upon the capacity of any of the public infrastructure servicing the site. All hook-ups will be from the existing infrastructure via the Hilton utility loop/grid.

4.10.2 Fresh Water Supply

The Honolulu Board of Water Supply provides potable water for the Hilton Hawaiian Village property. The present Hilton Hawaiian Village water system consists of a loop of 8-inch pipe feeding from the 12-inch water main on Ala Moana Boulevard, running through the Village site, and reconnecting to the 8-inch water main running along Kalia Road. As part of the Kalia Tower project, the Board of Water Supply recommended that the Hotel upgrade approximately 900 linear feet of pipe along Kalia Road.

Type of Use	Number of Users	Use Rate	Expected Consumption
Restrooms: toilets	600 ¹	1.6 gallons	960 gpd
faucets		.5 gallon	300 gpd
Showers	1200	3.75 gallons ²	4500 gpd
TOTAL			5760 gpd

This proposed action includes no new hotel rooms and will not be as great a consumer of fresh water as a hotel tower. Thus, the anticipated demands placed on the existing infrastructure will be minimal. Fresh water will be used in the facility's restrooms and outdoor fresh water showers for users to rinse off before entering and after exiting the swim-through attraction. The Hilton Hawaiian Village has already retro-fitted all of its shower fixtures and faucets with water conservation devices and all new fixtures will be likewise outfitted. All of the toilets in the proposed new facility will be ultra-low flush (1.6 gallons per flush) type. Expected water consumption is outlined below:

¹ Assuming half of all participants will use restroom facilities, flow rate of faucets calculated at 20 seconds per use; toilet use figure is high because it assumes only toilets (not urinals for men) will be used.

² Assuming shower flow of 2.5 gallons/minute; average user taking 30 seconds to rinse off entering the facility and 1 minute upon exiting.

4.10.3 Wastewater Treatment and Disposal

Wastewater from the Hilton Hawaiian Village flows into the City and County's collector system at five separate points. Four of these lines connect directly to the 12-inch gravity main that underlies Kalia Road. This main carries effluent to a 24-inch gravity main along Ala Moana Boulevard which begins at Kalia Road. The fifth sewer connection is a 15-inch line that links the Lagoon apartments, Rainbow Tower, and central core area directly with the 24-inch Ala Moana Boulevard sewer main, bypassing the 18-inch sewer main running immediately adjacent to the Hilton property along Ala Moana Boulevard up to Kalia Road. This latter is the main that the project will tie into.

Although the Department of Public Works (DPW) reports no sewer backup problems in the vicinity, the municipal sewer system is reported to be inadequate (Belt Collins & Associates, 1991). The 24-inch gravity main along Ala Moana Boulevard is currently deemed by the DPW to need relief, although the City has no plans to relieve the line at this time. The City Council has required the developer to secure a Special Management Area Use Permit for a relief line to the Ft. DeRussy pumping station prior to construction of the Kalia Tower unless the improvement is constructed by JAMI Corporation for the Waikikian Hotel.

However, because the Hilton Lagoon project includes no new hotel rooms, which is traditionally a more intensive wastewater generator, the anticipated new demands placed on the existing sewerage will be minimal. Wastewater will be generated in the facility's restrooms and outdoor fresh water showers and will total an estimated 5760 gpd.

4.10.4 Electrical Power

The Hilton Hawaiian Village and the surrounding area is served with electrical energy from Hawaiian Electric Company's (HECO) Ena Substation. The substation contains four 10 MVA transformers with two 12.47 KV circuits from each unit. The Village is presently served by three of these 12.47 KV circuits which are capable of handling approximately 9,000 KVA. Present total Hawaiian Village billing demand is 6,816 KVA, which includes power to the existing lagoon pump. This pump consumes 11 KVA. According to Hawaiian Electric Company officials, "the electrical system is adequate and there are no problems with the system" (HECO, 1991). If the Kalia Tower project is constructed, the total billing demand would increase by 904 KVA.

The proposed Lagoon Project will be served with primary power from the existing HHV switchgear. The project is anticipated to consume about 214 Kilowatt hours per day. All components of the existing Hilton Hawaiian Village distribution system and

the HECO feeder have sufficient capacity to absorb the load increase. A breakdown of the estimated additional power consumption by use can be seen in the table below:

Type of Use	Number of Units	Use Rate	Expected Total
Retail Shops/Office	6000 sf	0.008 kw/sf/day	48 kw/day
Snack Bar	1000 sf	0.010 kw/sf/day	10 kw/day
Maintenance Shops		10 HP Total	7.7 kw/day
Landscape Lighting	variable	variable	6 kw/day
Pumping System		190 HP	142 kw/day
TOTAL			214 kw/day

4.10.5 Solid Waste Disposal

Solid waste at the Hilton Hawaiian Village is collected by Waste Management Inc., a private contractor, and removed to City and County landfills and the H-power garbage to energy plant. Solid waste generation would increase nominally due to the proposed Lagoon Project. It should be noted that the Hilton Hawaiian Village has received several awards in recognition for recycling programs which have led to a reduction in the amount of solid waste going into the City and County disposal system.

4.11 Historical and Archaeological Sites

During pre- and post-contact times Waikiki was marshy wetlands and sand dunes. The sand dunes were used in burial practices. A 1977 archaeological survey of the Hilton Hawaiian Village by Bishop Museum encountered no surface features or remains. It is noted that urban development had probably displaced or destroyed any archaeological sites on the property.

From 1985 to 1987, Paul H. Rosendahl Inc. conducted a program of archaeological surveying and monitoring at the Hilton Hawaiian Village in connection with Hilton Master Plan improvements. Over 4000 historic artifacts were identified during the monitoring. The artifacts included ceramics, glass, metal fragments and miscellaneous building materials and hardware. No evidence of prehistoric occupation was encountered in the project area (Rosendahl, 1992). Should any archaeological remains be discovered during construction of the Hilton Lagoon project, work will be stopped immediately and the State Office of Historical Preservation will be contacted at 587-0047.

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5.0 ALTERNATIVES CONSIDERED

The management and owners of the Hilton Hawaiian Village looked at and evaluated several alternative means of achieving the objectives of creating an attraction or otherwise better utilizing the resource represented by the Duke Kahanamoku Lagoon. These are discussed below. Alternative locations for the proposed attraction outside of the Hilton Hawaiian Village would not have the financial backing of the project as proposed and would therefore not be viable within the context of this proposal. No other location on the grounds of the Hilton Hawaiian Village is available for the project.

5.1 Other uses of the site

At the urging of the State authority directing the redevelopment of the Kakaako area, the partners considered relocating the University of Hawaii, Kewalo Basin Marine Mammal Laboratory to the Kahanamoku Lagoon. This alternative was attractive in light of potential educational aspects and perhaps visitor interest, but was viewed as difficult to achieve based on the laboratory's need for security and relative isolation. It was deemed that this use was not compatible with present uses of the lagoon.

5.2 Improving Water Flow

Additional circulation within the public lagoon might be achieved by increasing the pump size of the existing sea water return system. Although increasing the flow of water through the Kahanamoku Lagoon should result in improved water quality, increasing the existing pumping capacity would not address the problems associated with the source of the water, which is too near the shore off Kahanamoku Beach. The build-up of silt on the bottom would still need to be addressed. There would be little increase in recreational activity in the lagoon because the adjacent ocean would offer the same amenities. Further, there would be no economic incentive for the project to proceed, nor any pay-back to the state and county governments.

5.3 No Action Alternative

The Hilton has the option of taking no action. However, this would not achieve any particular objective. The lagoon water quality and its deteriorating value as a recreational amenity would continue unabated. No economic incentive would exist for

increasing circulation within the lagoon to the extent possible with the present proposal.

5.4 Project Alternatives

This environmental assessment presents several design alternatives for the sea water intake line, the construction of which will have the greatest impact on the high use public beach area. Once constructed, the sea water system will have no impact on recreational uses on or seaward of Waikiki Beach. The alternative pipe routes are discussed in Section 2.5.4. Route C is judged to produce the least disruption of public use of the beach. Because alternative Routes B and C do not entail threading pipe through existing openings, the size of the pipe is not restricted. With these alternatives, a single 36-inch diameter pipe can be used. The larger pipe size would allow for additional flexibility in maximum pumping rates. While the present proposal is deemed to be more than adequate to produce good water quality in the attraction and the public lagoon, additional pumping capacity could be achieved with the larger pipe by increasing the pump size.

6.0 Mitigation Measures

Mitigation measures to reduce adverse environmental and social impacts address both short-term and long-term impacts. Short-term mitigation measures include performing construction activities (sheet pile installation, etc.) in compliance with applicable noise quality regulations in order to minimize potential noise impacts on adjacent developed areas; use of dewatering plume control devices and systems, and use of traffic control and safety systems. Further, the project will fully comply with applicable federal, state, and county archaeological, historical and cultural features preservation laws, rules and regulations.

6.1 Short -Term Impacts

The site is located amidst a populous resort. Adjacent buildings on the site and nearby properties would be most affected by the proposed construction activities. The construction of the offshore pipe line will take place across a shore and in waters visible to large numbers of residents and visitors. Thus, construction practices will require close scrutiny throughout the planning and implementation process to avoid encountering problems and complaints on a regular basis.

Noise impacts would be minimized by limiting construction activities to daylight hours, generally between 7:30 a.m. and 4:30 p.m., Monday to Friday (excluding holidays). Properly muffled equipment would be used in accordance with State Department of Health guidelines. Impacts on air quality would be decreased by use of dust control measures, keeping vehicles on paved areas when possible, and conforming to State Department of Health regulations regarding noise, vehicle, and fugitive dust emissions.

Use of proper signs, barricades, and flag persons would minimize traffic problems during construction and ensure safety of motorists and pedestrians. Considering no thoroughfare currently exists, there would be minor to no impact on vehicular/pedestrian circulation. In the event that utility disruptions would be necessary, and this is extremely unlikely, they would be coordinated with the appropriate utility companies and announced to those affected.

Construction of the offshore intake pipes will potentially generate turbidity during trenching through the limestone remnant. A barge will have to be positioned in the catamaran turning basin. The spread of turbid water can be mitigated by the use of turbidity screens under some conditions, and will be employed. Use of alternative Route C with the pipe passing along and then under the basalt stone breakwater will probably generate less of a sediment plume if the material through which trenching would

proceed is loose (sand and limestone rubble). Construction methods and best management practices will be subject to detailed review by State of Hawaii, Department of Health as part of the Section 401 Water Quality Certification required by the Department of the Army permit for this work.

6.2 Long-Term Impacts

The proposed Hilton Lagoon project will result in a one-third decrease in the area of the Duke Kahanamoku Lagoon available to the public. This impact is not considered significant because of the small number of users of the lagoon (particularly the mauka or east end) in its present state. However, this impact will be offset by the following benefits to the State and the public:

- The lagoon will be desilted and the water circulation system vastly improved at no cost to the State;
- Replenishment of beach sand along the southwest side of the lagoon would follow silt removal, vastly improving the beach conditions in this area;
- The recreational value of the lagoon will be enhanced, resulting in an overall increase in public use of both the lagoon waters for swimming and the adjacent public beach for sunbathing;
- The developers would be fully responsible for maintenance of water quality in the public and private portions of the Duke Kahanamoku Lagoon;
- The proposed commercial facility will increase (and diversify) recreational and educational opportunities for visitors and residents alike without significant environmental disturbance;
- Improvements in the water quality of the State-owned Ala Wai Boat Harbor could result as a by-product of the proposed lagoon circulation improvements;
- Additional employment in the ocean recreation field for 80 to 120 persons, 75% anticipated to be students and graduates of ocean-oriented programs at the University of Hawaii, the Community College system, and other local colleges;

- The State will receive lease rent income and tax income from the Hilton Lagoon operations.
- Two water quality monitoring stations set up according to Department of Health standard operating procedures, enabling the DOH to increase it's recreational waters monitoring network.

6.2.1 Water Quality Monitoring

The project proposes to improve the water quality and recreational potential of the Duke Kahanamoku Lagoon for the benefit of the public. Post-construction monitoring which relates to the operation of the facility shall take place based upon a monitoring plan that shall be acceptable to the Department of Health, State of Hawaii or other applicable government monitoring agency.

This environmental assessment discusses a number of water quality parameters that can be used to indicate one or another aspect of water quality (Section 3.3.3 and Appendix C) and it is anticipated that monitoring for parameters listed in the State of Hawaii water quality regulations (DOH, 1992; HAR §11-54-06) would be undertaken on a some regular basis to demonstrate that water quality improvements have occurred in the public lagoon as well perhaps in the Ala Wai Boat Harbor at the sea water return discharge points. These programs will be developed as part of compliance requirements for a Section 401 Water Quality Certification (U.S. Army Permit) and NPDES permit requirements (DOH). During construction monitoring may be imposed as part of the Section 401 WQC and/or general permit requirements for construction site dewatering activities. Monitoring of the water quality within the proposed attraction will be part of the overall operations and maintenance plan to insure the health and safety of the participants as well as the resident biota. However, within the state's water quality regulations, recreational "suitability" in marine waters is determined by regular monitoring of enterococcus bacteria (HAR §11-54-08 Specific Criteria for Recreational Areas).

About 20 years ago the State Department of Health set up stations for recreational water quality monitoring at various state beaches (including one station in Kahanamoku Lagoon) based on popularity, accessibility, and available funding. The Department originally sampled once every six days so that a 7 week cycle would yield samples from every day of the week. Due to budget cuts in the last few years, the DOH has cut back sampling to once every week, sampling on a Monday or Tuesday, in order not to incur weekend overtime costs. Comparison of data has suggested no difference in the means between sampling at the beginning of the week as opposed to sampling on all days of the week.

The following proposed monitoring plan is based on the recreational water quality standard outlined in HAR §11-54-08. Samples will be collected at the Kahanamoku Lagoon at two sites (L1 and L2 in Figure 15). The samples will be analyzed for salinity, temperature and enterococcus. Based on the recommendation of Dennis Lau (Chief, Clean Water Branch, Department of Health) sampling will occur once every six days for a year. Once a data base is established, sampling once a week would be undertaken. The monitoring data would be provided directly to the Department of Health allowing them to eliminate an existing sample station in the lagoon and utilize the funds to establish a station elsewhere on Oahu.

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APPENDIX A.1
Comments Received

(and reproduced in the draft EA dated April 1993)



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

P. O. BOX 521
HONOLULU, HAWAII 96809

LAND AND NATURAL RESOURCES
DEPARTMENT

DEPT. OFFICE -
CONS. DIVISION

ACQUATIC DEVELOPMENT
PROGRAMS
BOATING AND BOAT REGISTRATION
CONSERVATION AND
DIVERSITY
CONSERVATION AND
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DIVERSITY
CONSERVATION AND
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CONSERVATION AND
DIVERSITY

REP:OCEA:SNK

FILE NO.: SOA-12
DOC. NO.: 3653

Mr. Daniel Dinell
Assistant to the Senior Vice President
Hilton Hotels Corporation
Hilton Hawaiian Village JV
2005 Kalia Road
Honolulu, Hawaii 96815

Dear Mr. Dinell:

SUBJECT: Request to Use State-Owned Lands in the Conservation District to Create an Underwater Swim-through Attraction in the Duke Kahanamoku Lagoon and Extend the Existing Seawater Intake System Seaward of MK: 2-3-37: 21 at Waikiki, Honolulu, Oahu

We are sorry to inform you that after a review by our Department, your application to use State-owned lands for the subject purposes must be considered incomplete and rejected for processing. As discussed with staff at the Office of Conservation and Environmental Affairs, we routed your application within the Department for review and comments. Comments received include the following:

Division of Aquatic Resources

The proposal actions set forth by the applicants are incomplete and therefore it is difficult to provide a full assessment. There are several concerns regarding whether the State would be liable for accidents which are possibilities of this activity, whether access has been granted for commercial use of State land, the disruption to nearby ocean-front activities and the projects' impact on aquatic resources that have not been addressed including the sea water line extending 800 feet offshore which is not clearly described to be buried or exposed on the sandy bottom.

Mr. D. Dinell

-2-

File No.: SOA-12

Regarding the impact to aquatic resources, it is not clear how siltation can be fully avoided during the desiltation process and construction. It also seems that siltation will increase in the remaining portion of the lagoon and ultimately the Ala Kai Boat Harbor and nearshore due to the high flow-through rate of 15,000 gallons per minute. This, and the potential for added nutrients due to the increased concentration of people in the water could lead to deterioration of the lagoon and nearshore environment. There is also concern for the maintenance of the marine life within the attraction. This project is partially located on Conservation District Land as well as within the 40-foot shoreline setback zone. The merit of a for-profit project would have to be hard pressed to justify the described use of conservation land with such potential detriment to aquatic resources.

Division of Land Management

Oahu District Office of Land Management would like to raise the following issues:

1. A lease of this nature would have to be sold at public auction and not issued directly as the draft environmental assessment implies;
2. That the applicant further address the issue of parking accommodations as they anticipate a flow of 300,000 users per year;
3. How the applicant would maintain the remaining 114,000 sq. ft. of the lagoon not impacted by the proposed project;
4. How the applicant would address the issue of public benefits derived from the project such as education;
5. The proposed project would also require the issuance of two easements by the State for the intake pipe and the (optional) Lagoon Discharge.

We are making these comments but would like to point out that by doing so, this does not constitute that we will approve acceptance of the application.

Historic Preservation Division

A review of our records shows that archaeological inspection of trenches in the vicinity of this proposed project revealed fill soils on top of beach sands. No historic sites were found in these trenches. Therefore, we believe this project will have "no effect" on historic sites.

Mr. D. Dinelli

-3-

File No.: SOA-12

It is possible that historic sites, including human burials, will be uncovered during routing construction activities. Should this be the case, all work in the vicinity must stop and the Historic Preservation Division must be contacted at 587-0047.

Office of Conservation Environmental Affairs

Both the Master Application Form and Draft Environmental Assessment lack sufficient detailed information to clearly understand and adequately review the proposed project. For example, some information provided is confusing: some conclusions lack supportive evidence; a few of the figures have no identification; some studies are cited, but others are not, and there are no appendices attached. Further, specific information about the existing conditions, proposed work (including operational aspects), and potential impacts in the Conservation District are deficient. There is also no identification regarding the ownership and maintenance responsibilities of the existing seawater intake pipe.

We suggest that you make an appointment with Ms. Cathy Tilton of the Office of Conservation and Environmental Affairs to discuss your Conservation District Use Application.

Thank you for your cooperation in this matter. Should you have any questions, feel free to contact Cathy Tilton at our Office of Conservation and Environmental Affairs staff at 587-0377.

Very truly yours,

John P. Keppeler
KEITH W. HEE

Attachment

Division of Aquatic Resources



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

P O BOX 621
HONOLULU, HAWAII 96809

REF:OCEA:SKK

FILE NO.: 94-520
DOC. NO.: 4373

APR 12 1994

Mr. Daniel Dinelli
Assistant to the Senior Vice President
Hilton Hotels Corporation
Hilton Hawaiian Village JV
2005 Kalua Road
Honolulu, Hawaii 96815

Dear Mr. Dinelli:

SUBJECT: Revised Draft Environmental Assessment for the Hilton Lagoon Project that Proposes to Create an Underwater Swim-through Attraction in the Duke Kahanamoku Lagoon and Extend the Existing Seawater Intake System at Waikiki, Honolulu, Oahu

As a follow-up to your February 25, 1994, meeting with Staff from the Office of Conservation and Environmental Affairs, we have routed your revised environmental assessment (dated Feb., 1994) to the applicable Divisions of the Department. Their comments are provided below.

Division of Aquatic Resources

In response to earlier Aquatic Resources concerns, the applicants state in the revised draft environmental assessment that: 1) the operation will be fully insured with proper indemnification to protect the State against liability, 2) the project will preserve all existing access routes to the public portion of the lagoon, 3) impacts resulting from the project on nearby ocean activities would include noise emissions and temporary disruption of the use of the ocean recreation area in the immediate vicinity of the ocean intake pipeline, 4) the intake pipe will either be buried or concealed for its entire length and 5) the applicant plans to utilize the silt in the construction of a temporary berm used in installing the sheet piling system and finally disposing of the silt by means of a drying retention area at the south end of the public lagoon after which the dried silt would be transported to a landfill site. A special plume control system would be used during the desilting operation.

Mr. D. Dinell

-2-

File No.: 94-520

We suggest that the applicant establish a permanent periodic monitoring program for the water quality in the private, public and adjacent waters, especially at the discharge points; provide a plan for their projected maintenance removal of accumulated particulate material from the lagoon; plan to incorporate the recommendations by the consultant to monitor and adjust the feeding to prevent excess feed from being discharged into the public lagoon and nearshore waters.

The idea of the applicant's artificial reef trail is exciting and should have positive effects on the tourist industry by providing aquatic education, and will undoubtedly add to the local economy as far as dollars spent in Hawaii and create more job opportunities. However, it would be appropriate to locate the "attraction" entirely on the non-state section of the lagoon. Placement of the facility on private property would prevent or at least limit potential future conflicts with the public and reduce the chance of State liability for accidents. Further this action may significantly expedite the permit process.

Division of Land Management

1. Upon completion of all permits and requirements under law, Land Management will be able to sell a commercial lease at the public auction for the site.
2. The Department of Land and Natural Resources and the Hilton Hawaiian Village Joint Venture will have to amend its September 22, 1955 agreement to allow for the installation of a structure in the Lagoon.
3. The Department of Land and Natural Resources will have to acquire from the Hilton Hawaiian Village Joint Venture a utility and access easement from Kalia Road to the project site to insure the operator and lessee of the project has legal access and legal utility corridor rights to the Lagoon so the project can be operated independently. This will also aid the financing of the project, lease assignments and re-sale of the leasehold if it should be necessary.
4. An entrance way with reasonable sufficient signage coming in from Duke Kahanamoku Beach shall be provided so that the public utilizing the beach may have readable access to the attraction.
5. The Department of Land and Natural Resources, as condition to the lease, will have final approval on the construction and landscaping plans of the facility.
6. The construction materials and the construction of the Lagoon and landscaping shall have a Hawaiian theme.

Mr. D. Dinell

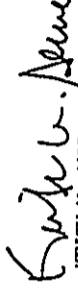
-3-

File No.: 94-520

7. The lessee shall maintain all governmental water quality standards during the operation of the attraction.
8. Hilton Hawaiian Village Joint Venture shall continue to maintain the salt water circulation system of the entire lagoon as established by the September 22, 1955 agreement.
9. Hilton Hawaiian Village Joint Venture must maintain the water quality of the outer lagoon pursuant to all governmental rules and regulations at all times.

Thank you for your cooperation in this matter. Should you have any questions, feel free to contact Cathy Tilton at our Office of Conservation and Environmental Affairs staff at 587-0377.

Very truly yours,


KEITH W. AHUE

APPENDIX A.2
Comments Received

(in response to the draft EA distributed in April 1994)

APPENDIX A.2

The following list represents agencies and individuals provided one or more copies of the draft EA. Comment letters were received from each of the individuals or entities marked by a ✓ on the list. Comment letters and responses to comments are included in this appendix. The comment letters are arranged in the order presented by the list with the associated response letter immediately following.

Federal Agencies:

✓ U.S. Army Corps of Engineers
Pacific Ocean Division, Bldg. 230
Fort Shafter, Hawaii 96858

✓ U.S. Department of Interior
Fish and Wildlife Service
PO. Box 50156
300 Ala Moana Blvd.
Honolulu, Hawaii 96850

U.S. Department of Commerce
National Marine Fisheries Service
2570 Dole Street
Honolulu, Hawaii 96822

Department of Hawaiian Home Lands
335 Merchant Street
Honolulu, Hawaii 96813

✓ State Historic Preservation Division
Department of Land and Natural
Resources
33 So. King Street, 6th Floor
Honolulu, Hawaii 96813

✓ Department of Health
919 Ala Moana Blvd., 3rd Floor
PO. Box 3378
Honolulu, Hawaii 96801

✓ Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813

Office of State Planning
Coastal Zone Management Office
PO. Box 3540
Honolulu, Hawaii 96811-3540

State Agencies:

✓ Department of Land and Natural
Resources
1151 Punchbowl Street
Honolulu, Hawaii 96813

✓ Department of Accounting
and General Services
1151 Punchbowl Street
Honolulu, Hawaii 96813

✓ Department of Business, Economic
Development and Tourism
220 S. King Street, 11th Floor
Honolulu, Hawaii 96813

✓ Department of Business, Economic
Development and Tourism
State Energy Office
335 Merchant Street, Room 110
Honolulu, Hawaii 96813

✓ Department of Education
1390 Miller Street
Honolulu, Hawaii 96813

✓ Office of Hawaiian Affairs
711 Kapiolani Blvd., Suite 500
Honolulu, Hawaii 96813

✓ University of Hawaii
Water Resources Research Center
2540 Dole Street, Holmes Hall 283
Honolulu, Hawaii 96822

University of Hawaii
Environmental Center
2550 Campus Road, Crawford 317
Honolulu, Hawaii 96822

City & County Agencies:

- ✓ Department of Land Utilization
City and County of Honolulu
650 So. King Street
Honolulu, Hawaii 96813
- ✓ Board of Water Supply
630 S. Beretania Street
Honolulu, Hawaii 96813
- ✓ Department of General Planning
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813
- ✓ Department of Parks and Recreation
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813
- ✓ Department of Public Works
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813
- ✓ Department of Transportation
Services
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813
- Honolulu Police Department
801 S. Beretania Street
Honolulu, Hawaii 96813
- Mr. Ben Lee
Office of Waikiki Development
City & County of Honolulu
Honolulu Hale
Honolulu, Hawaii 96813

Interested Organizations:

- ✓ Ray Tabata
Sea Grant Extension Service
University of Hawaii
1000 Pope Road, MSB 216
Honolulu, Hawaii 96822

- ✓ Dean Chuck Gee
School of Travel Industry
Management
University of Hawaii
George Hall 346
2560 Campus Road
Honolulu, Hawaii 96822
- Bruce Carlson
Waikiki Aquarium
2777 Kalakaua Avenue
Honolulu, Hawaii 96815
- ✓ Christina Kemmer
Waikiki Improvement Association
2270 Kalakaua Avenue, Suite 1700
Honolulu, Hawaii 96815
- Tom Sakata
Hawaii Visitors Bureau
2270 Kalakaua Avenue
Honolulu, Hawaii 96815
- Paul Lister
Chamber of Commerce of Hawaii
1132 Bishop Street, Suite 200
Honolulu, Hawaii 96813
- American Lung Association
245 North Kukui Street
Honolulu, Hawaii 96817
- Outdoor Circle
1110 University Avenue Suite 406
Honolulu, Hawaii
- ✓ Steve Langford
Commodore
Hawaii Yacht Club
- ✓ Frank Thomas
Commodore
Waikiki Yacht Club

John Kelly
Save our Surf
Honolulu, Hawaii 96816

Judy Stryuk
Ala Moana Bowls Coalition
c/o 4188 #4 Keanu Street
Honolulu, Hawaii 96816

Ms. Janet Clark
Waikiki/Oahu Visitors Association
Pauahi Tower
1001 Bishop Street, Suite 477
Honolulu, Hawaii

Ms. Pat Tummons
Environment Hawai'i
200 Kanoilehua Ave., # 103-325
Hilo, Hawaii 96720

Ms. Briana Poilon
Waikiki Tenants United
c/o Waikiki Community Center
310 Paoakalani Room 205E
Honolulu, Hawaii 96815

Interested Individuals:

George Downing
3021 Waialae Avenue
Honolulu, Hawaii 96816

Rick Bernstein
4373 Hopeloa Place
Honolulu, Hawaii 96816

Col. Wright Hiatt c/o Representative
Duke Bainum's Office
Hawaii State Capitol
Honolulu, Hawaii 96813

Elected Officials (State):

Senator Bert Kobayashi
Hawaii State Capitol
Honolulu, Hawaii 96813

Representative Duke Bainum
Hawaii State Capitol
Honolulu, Hawaii 96813

✓ Senator Joe Tanaka
Hawaii State Capitol
Honolulu, Hawaii 96813

Representative Romy Cachola
Hawaii State Capitol
Honolulu, Hawaii 96813

Elected and Appointed Officials (City):

Mayor Frank Fasi
Honolulu Hale
Honolulu, Hawaii 96813

Jeremy Harris
Managing Director
Honolulu Hale
Honolulu, Hawaii 96813

Gary Gill
Chair, City Council
Honolulu Hale
Honolulu, Hawaii 96813

Andy Mirikitani
City Council
Honolulu Hale
Honolulu, Hawaii 96813

John DeSoto
City Council
Honolulu Hale
Honolulu, Hawaii 96813

Leigh-Wai Doo
City Council
Honolulu Hale
Honolulu, Hawaii 96813

John Henry Felix
City Council
Honolulu Hale
Honolulu, Hawaii 96813

Steve Holmes
City Council
Honolulu Hale
Honolulu, Hawaii 96813

Donna Mercado Kim
City Council
Honolulu Hale
Honolulu, Hawaii 96813

Rene Mansho
City Council
Honolulu Hale
Honolulu, Hawaii 96813

Arnold Morgado, Jr.
City Council
Honolulu Hale
Honolulu, Hawaii 96813

✓ Brett White
1909 Ala Wai Blvd. #301
Honolulu, Hawaii 96815

Waikiki Neighborhood Board Members:

Sam Bren
1717 Ala Wai Blvd #504
Honolulu, Hawaii 96815

Richard Felker
2415 Ala Wai Blvd., #301
Honolulu, Hawaii 96815

Joe Bowen
1778 Ala Moana Blvd., #3020
Honolulu, Hawaii 96815

Scott Hamilton, Jr.
PO. Box 8803
Honolulu, Hawaii 96815

Rodger Snow
1819 Lipeepee Street
Honolulu, Hawaii 96815

Georgia Miller
2457 Ala Wai Blvd. #3
Honolulu, Hawaii 96815

Frances Delany
469 Ena Road #2207
Honolulu, Hawaii 96815

Carol Sword
243 Liliuokalani Avenue, #106
Honolulu, Hawaii 96815

Mary-Jane McMurdo
469 Ena Road # 2403
Honolulu, Hawaii 96815

John Van Olden
2572 Lemon Road #508
Honolulu, Hawaii 96815

Chris Zivalich, Jr.
1778 Ala Moana Blvd, #2901
Honolulu, Hawaii 96815

Adjacent Neighborhood Boards:

Anita Benfatti
430 Kaiolu Street #409
Honolulu, Hawaii 96815

Chair, Moilili-McCully Neighborhood
Board
c/o Neighborhood Commission
530 S. King Street
Honolulu, Hawaii 96813

Joan King
2211 Ala Wai #1514
Honolulu, Hawaii 96815

Chair, Ala Moana Neighborhood
Board
c/o Neighborhood Commission
530 S. King Street
Honolulu, Hawaii 96813

Betty Johnson
417 Namahana Street #14
Honolulu, Hawaii 96815

Clifford Reynolds
2092 Kuhio Avenue #1601
Honolulu, Hawaii 96815

✓ Duke Sturgeon
444 Namahana Street #2C
Honolulu, Hawaii 96815



DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FT. SHAFTER, HAWAII 96815-5440

SENT TO
ATTENTION OF

May 23, 1994

Planning Division

Mr. Daniel Dinell
Hilton Hawaiian Village
2005 Kalua Road
Honolulu, Hawaii 96815-1999


Dear Mr. Dinell:

Thank you for the opportunity to review and comment on the Draft Environmental Assessment for the Proposed Hilton Lagoon Project, Waikiki, Hawaii. The following comments are provided pursuant to Corps of Engineers authorities to disseminate flood hazard information under the Flood Control Act of 1960 and to issue Department of the Army (DA) permits under the Clean Water Act; the Rivers and Harbors Act of 1899; and the Marine Protection, Research and Sanctuaries Act.

a. As noted on page 3, the project involves extensive work in waters of the U.S.; therefore, a DA permit will be required. A determination of the applicability of different permit processing options can only be made upon receipt of a complete application. Please contact our Operations Division at 438-9258 for further information and refer to file number P094-051.

b. The flood information provided on page 3 of the environmental assessment is correct.

Sincerely,


Ray H. Jyo, P.E.
Director of Engineering


Hilton Hawaiian Village

June 6, 1994

Mr. Ray H. Jyo, P.E.
Director of Engineering
Department of the Army
U.S. Army Engineer District, Honolulu
Ft. Shafter, Hawaii 96858

Dear Mr. Jyo:

Mahalo for your letter of May 23, 1994. The EnterOcean Group and the Hilton Hawaiian Village appreciate the Department of the Army's Planning Division taking the time to review the Hilton Lagoon Project draft Environmental Assessment.

Your letter has been incorporated into the final Environmental Assessment which is in the process of being finalized based on all the comments received.

Our environment consultant, AECOS, Inc. will be in contact with the Department of Army's Operations Division relative to the permits required for this project.

We sincerely believe that this proposed project is a win-win for all parties involved.

Again, thank you for your input.

Sincerely,


Daniel Dinell

02



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Office
P.O. Box 50167
Honolulu, Hawaii 96850



In Reply Refer To: MEM

Mr. Daniel Dinell
Hilton Hawaiian Village
2005 Kalua Road
Honolulu, HI 96815-1999

JUN 13 1999

Re: Draft Environmental Assessment for the proposed Hilton Lagoon Project, Hilton Hawaiian Village, Honolulu, Oahu, Hawaii.

Dear Mr. Dinell:

The U.S. Fish and Wildlife Service (Service) has reviewed the April 1994 Draft Environmental Assessment (EA) for the proposed Hilton Lagoon Project at the Hilton Hawaiian Village in Honolulu. The project sponsors are The EnterOcean Group and Hilton Hawaiian Village Joint Venture. As stated in the Draft EA, the purpose of the proposed project is to create "...a replica tropical, marine environment, with real marine animals and living coral 'reefs' constructed in the part of the existing Duke Kahanamoku Lagoon located closest to the Hilton Hawaiian Village." This newly-created environment would be called the "Hilton Lagoon." Among other features, the Hilton Lagoon would include a network of winding, shallow channels with continuous seawater flushing that would be stocked with native Hawaiian marine animals, including corals. Paying visitors to the attraction would be towed through the waterways during half-hour underwater tours intended to recreate a tropical diving experience. The Service offers the following comments for your consideration.

The Service believes that the Draft EA does not contain sufficient information relevant to the proposed project. Major deficiencies of the Draft EA include (1) an incomplete presentation of the existing biota within the project area, (2) a lack of proposed methodologies for establishing and maintaining native biota in the swim-through channels, (3) an insufficient presentation and analysis of proposed project alternatives, and (4) an incomplete assessment of potential project-related impacts on water quality and marine species.

The Service recommends that the revised Draft EA include species lists of (a) the organisms existing within the proposed project area, including the federally threatened green sea turtle, *Chelonia mydas*, and (b) the organisms proposed for relocation into the Hilton Lagoon, including native Hawaiian species. Detailed descriptions of where these

Draft EA
Hilton Lagoon, Hilton Hawaiian Village
Honolulu, Oahu, Hawaii

The Service recommends that the revised Draft EA present only proposed project alternatives that are practicable and reasonable. The Service believes that relocating the Kewalo Basin Marine Mammal Laboratory to the lagoon or increasing the water flow rates through the lagoon are not practicable alternatives that would achieve the purpose of the proposed project, which is to create a revenue-generating recreational facility. Thus, the only reasonable alternative to the proposed action presented in the current Draft EA is "No Action."

The Service recommends that the revised Draft EA fully assess the potential project-related effects on fish and wildlife resources associated with the alternatives proposed. For example, the potential for young, green sea turtles to be adversely affected by the seawater intake system should be fully assessed. Also, the EA should address the potentials for the increased, concentrated human use of the lagoon and the on-going feeding of marine animals in the lagoon to cause elevated levels of nutrients to be introduced into nearshore coastal waters by way of the lagoon discharge.

In summary, additional details are required for the Service to adequately understand the proposed project and evaluate potential project-related impacts to fish and wildlife resources. The Service recommends that a revised Draft EA be prepared and resubmitted for public review. The Service appreciates the opportunity to comment on the Draft EA. If you have questions regarding these comments, please contact Fish and Wildlife Biologist Michael Molina at 808/541-3441.

Sincerely,

Brooks Harper
Field Supervisor
Ecological Services



970 N. Kalia Avenue, Suite C300 • Kailua, Hawaii 96734
Telephone: (808) 254-3884

June 24, 1994

U.S. Department of the Interior
Fish and Wildlife Service
Pacific Islands Office
P.O. Box 50167
Honolulu, Hawaii 96850

Ref: MEM
Hilton Lagoon draft Environmental Assessment

Dear Sirs,

Thank you for reviewing the draft Environmental Assessment for the Hilton Lagoon Project. Daniel Dinell of the Hilton Hawaiian Village has requested that I address the concerns raised by your letter. We finalized the EA on June 10, 1994, two months after the draft EA was announced in the OEQC Bulletin, but the project sponsors have allowed to include all letters and responses in the final EA document if received before the end of the month. The Service will have an opportunity to participate further in the planning process for this project within the context of the U.S. Army permit application. Allow me to respond at this time to the specifics raised by your letter.

(1) Biota within the project area - The draft EA did include descriptions of the biota in the project area and reference to surveys upon which the brief descriptions were based (EA pages 32-33). The EA did not include species lists covering marine or terrestrial biota. The level of detail for such surveys in an EA is based upon the significance of the biological assemblages and the potential for disruption of these assemblages by a proposed project. In this case, the biota is unremarkable and the proposed changes would be minor outside of the lagoon. Involved is a man-made channel across a significantly degraded reef flat, a man-made beach, a man-made lagoon with relatively poor circulation, and a man-made harbor with even poorer water quality characteristics. All of this is located in a highly urban setting with a large resident and transient

population. The project proposes to improve water quality within the aquatic environments that presently have the worst water quality, the results of which can only be an expansion of habitats for those marine species that tend to do poorly in environments highly influenced by human activities.

The green sea turtle is an exception and could have been mentioned. Young *Chelonia mydas* occur on the reef flat off Waikiki. The project will have no impact on this species, which is federally listed as "threatened". A small portion of the limestone remnant off Kahanamoku Beach will be removed to accommodate the intake pipes, but will be replaced with hard substratum (limestone boulders; EA page 19). Everywhere else, the bottom along the intake pipe route is sand and supports very little algal growth of potential food value to turtles. The intake manifold will be designed to prevent creating a suction that might hold a turtle against it (EA page 19). Turtles do not occur in Kahanamoku Lagoon or the Ala Wai Boat Harbor to my knowledge.

(2) Methodologies for establishing and maintaining marine biota - Obviously the kinds of species to be held in the proposed swim-through feature will depend upon such factors as availability and suitability. Specimens will need to be acquired by licensed individuals from local waters, as is done for the Waikiki Aquarium and Sea Life Park, among others. It is not being proposed to stock this feature with rare and/or highly sensitive species doomed to be short-lived once displayed. The experience of the EnterOcean group and other relevant experience as exists within the aquarium industry in Hawaii will be utilized to develop the enclosed marine habitat over time and to establish "permanent" resident populations as well as a track-record for species suitability. The facility will not be stocked with organisms that will have to be regularly replaced because of steady depletion from die-off. A suggested list of species and proposed source locations could be provided based upon experiences from other large tank systems in Hawaii, although such detail is beyond the scope of an environmental assessment. We understand your point, however.

(3) Project alternatives - Projects that are conceived and funded by the private sector seldom carry the same burden for alternatives analysis that government projects do, mainly because significant decisions concerning alternatives are usually made before a project proceeds to the environmental assessment stage. Some of the early considerations for the lagoon are presented in EA Section 5.0. You are correct in concluding that these are not really "project alternatives", but were included because the project proposes an alternative use for a public amenity (namely,

Kahanamoku Lagoon, located on State land). The "no project" alternative (i.e., no change to the existing lagoon) is a reasonable topic for discussion in this context.

The real "project alternatives" appear at different places in the document and include consideration of the alternative discharge point for water pumped (or gravity fed) from the public lagoon (EA pages 40 and Figure 6). The client would benefit most from utilizing the existing discharge point, but has offered to consider other locations if the State wishes to capitalize on the potential to improve water quality elsewhere in the Ala Wai. Alternative intake locations were considered, but the mid-channel location proposed appears to offer the best balance of minimizing construction impacts and obtaining clean sea water for the project. Placement of the intake structure will have no impact on young turtles, no matter which alternative location is selected. Alternative routings for the intake lines were considered, but the one presented results in the least disruption of the beach area during construction.

(4) Assessment of project on water quality and marine species - Appendix C addresses water quality impacts of the proposed project. Since the impacts are assessed as positive (improvements in water quality), the impact on marine species would be difficult to predict. Species which are adapted to living in marginal habitats and waters adversely impacted by human activities may suffer declines, while many others may find the new public lagoon and parts of the harbor environment more habitable. The existing lagoon is a man-made feature intended for human use. The impact of this usage on "fish and wildlife" resources in the lagoon is minor, although consideration of where the fish and wildlife resources will be acquired for "display" in the proposed Hilton Lagoon, may not be trivial. The potential for impacts to water quality from feeding of marine animals in the proposed Hilton Lagoon is discussed in Appendix C (page 18). The impact cannot be measured before the fact because it will depend upon management practices. Adjustment of feeding procedures in concert with water quality monitoring will minimize impacts from this source.

I hope this response provides the additional details you require to understand the nature of the proposed Hilton Lagoon project.

Sincerely,


Eric B. Guinther

JOHN MARRIS
Assistant Secretary



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF LAND MANAGEMENT

P.O. BOX 211
HONOLULU, HAWAII 96815

AGRICULTURE DEVELOPMENT PROGRAM
ADULTS SERVICES
COMMUNITY DEVELOPMENT
CONSERVATION AND RECREATION
CONTRACTS
ENVIRONMENTAL IMPROVEMENT
HAWAIIAN PRESERVATION PROGRAM
LAND MANAGEMENT
NATURAL RESOURCES
NEIGHBORHOOD DEVELOPMENT

September 13, 1994

OD-93-07

Mr. Fred Ing
Rehab Section
Hilton Hawaiian Village
2005 Kalia Road
Honolulu, HI 96815-1999

Dear Mr. Ing:

Subject: Response, Environmental Assessment, Hilton Lagoon Project

Attached is a copy of a memorandum from our Office of Conservation and Environmental Affairs responding to the draft Environmental Assessment for your review. We would appreciate it if you didn't contact them directly for responding to their queries rather it would be better to wait until we have the meeting for you to query them.

I am waiting for the County's write up and then we should meet shortly after that. Please forward all comments your office has received. Maybe Rick Ginther who worked with Dan Dinell has received comments. Please forward copies to us.

Very truly yours,

Cecil Santos

Cecil Santos
Oahu District Land Agent

Enc.
cc: Mr. M. Kekoba
Mr. L. Landgraf

cc: Peter Schall

RECEIVED
DIVISION OF
LAND MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
Office of Conservation and Environmental Affairs
Honolulu, Hawaii

AUG 23 1994

FILE: 95-44

MEMORANDUM

TO: W. Mason Young, Division of Land Management
ATTN: Cecil Santos
FROM: *Roger C. Evans*
SUBJECT: Final Environmental Assessment for the Hilton Lagoon Project at Waikiki, Oahu

This is in response to your July 18, 1994, memorandum requesting our review of the Final Environmental Assessment (FEA) for the subject project. We have reviewed the FEA and have the following comments:

We initially reviewed an August 1993 Draft Environmental Assessment (DEA) for the Hilton Lagoon Project in September 1993 as part of Conservation District Use Application SOA-12. At that time we commented that the EA "lack(ed) sufficient detailed information to clearly understand and adequately review the proposed project."

Following the review of this FEA we still believe that the document lacks adequate discussion and disclosure of the entire project, its various phases, and its effects on the directly affected environment as well as the surrounding environment. This information is necessary to allow the Board to make a sound decision on any action that may be taken concerning this project.

Therefore, based on the information provided, we recommend that an Environmental Impact Statement be required for the subject project as there may be a significant impact on the environment.

We have also attached other general comments on the FEA for your information.

Other General Comments: The application is general and conceptual in nature. There are minimal hard supporting facts that accompany conclusions made by the applicant. Sources of data used to evaluate environmental effects should be clearly noted. The burden should be on the applicant to provide the necessary information to the Department to adequately review the effects of this project on the environment.

Below are some concerns and issues that were generated when we reviewed the PEA. Agencies with specific expertise may also be able to provide information related to their functional area.

1. Section 1.1 (P. 1): Besides preparing an EA for the Conservation District Use Application, an EA is also required for the use of State lands (see Chapter 143-5, HRS). Additionally, the City and County of Honolulu may also require the preparation of an EA document for their permit requirements.

If the applicant intends to use this document for other permit requirements, then we recommend that this section be amended to include all applicable classes of action identified in Chapter 143, HRS, which trigger the EA requirement. The document should be expanded to include proposed activities, structures, and impacts to areas outside the Conservation District.

2. Procedures should be included to handle emergencies and natural disasters that may occur at the project site.
3. Page 7, "General": the applicant asserts that the "project will preserve all existing public access routes to the swimming lagoon." However, no existing public access routes were identified in the EA.
4. Data should be included that discusses the existing conditions and proposed impacts of both daytime and nighttime noise and lighting generated by the proposed project on the surrounding environment (including nearby residents).
5. A visual impact analysis should be done.
6. It is unclear on Figure 2, page 6, what State Land Use District the Kahanamoku Beach area is in. Is it also the Conservation District?
7. Figure 6 on page 16 should have a legend identifying the different symbols for the intake and discharge pipes.

8. Besides the total length of the proposed new intake pipes, what are the lengths of the existing and proposed sections of both the intake and discharge pipes?

9. An in-depth study should be done to assess recreational impacts caused by the implementation of the proposed project (e.g. identify who the existing users of the area are; and how will the project impact these users).

On August 17, 1994, we took a site visit to the project area. At the site we noticed several different users of the lagoon and surrounding area (including two people fishing in the lagoon). We also noticed an existing fence that extends out into the lagoon along the northeast portion of the lagoon. This fence prevents public passage beyond this point unless you walk in the lagoon. Is this fence legal? (We show no CDUP for the fence.)

10. Water Quality of Public Lagoon Portion:

Page 7 states: "Sea water pumped from a new ocean intake into the Hilton Lagoon will overflow into the Duke Kahanamoku Lagoon. The water quality will be maintained at a high level . . ." (emphasis added).

Page 37 states: "Water clarity is expected to be excellent in both lagoons" (emphasis added).

However, in reviewing AECOS' June 27, 1994, response to the Department of Land Utilization (see appendix A.2), AECOS states, "(i)n the worst case, the water in the public lagoon will only be a little better than is presently the case (instead of a lot better)" (emphasis added).

Additionally, Appendix B states: "Under most conditions a direct intake in this area will supply water of acceptable quality to the lagoon, however under storm conditions and during those times then the discharge from the Ala Wai Canal moves along the shoreline in the Diamond Head direction the water quality at the proposed new intake site will be unacceptable. During those times an alternative intake system using an in-place sand filter is proposed" (emphasis added).

The applicant should clarify what the water quality of the public portion of the lagoon will be once the project is completed: High level, excellent, unacceptable, or "a little better than is presently the case."

11. Page 23: the proposed attraction will be available for both visitors and residents. However, does the applicant intend to allocate a percentage of daily ticket sales to visitors versus residents? (Or will ticket sales be on a first come, first serve basis?)
12. Page 26: According to the EA, the Dead and Indenture is silent as to the ownership of the improvements (pipe and pumping station). It is our opinion that the ownership of these improvements should be definitively resolved between the State and applicant before proceeding further with this project.
13. Does the applicant propose any dredging of the lagoon bottom, other than removing the silt layer? What is the volume of material to be removed? How long will the temporary retention area on the south end of the public lagoon remain? When dewatering the lagoon, where will the applicant dispose of the lagoon water?
14. What types of aquatic plant and animal life exist in the lagoon (are there turtles)? What are the impacts during and after construction to the aquatic life? During construction when the lagoon is dewatered, will there be an odor problem due to the decay of the plant and animal life left in the lagoon?
15. Page 19 discusses a conceptual design that "assumes" the new intake pipes will use the existing intake lines. In the event that the existing lines are unsuitable the new intake lines would be buried beneath the beach. The EA should identify the proposed location and impacts of the new intake lines should the existing lines be unsuitable.
16. Currently the lagoon has stinging jellyfish. The applicant claims that the proposed project is expected to eliminate the jellyfish population (see p. 19). If the project is unsuccessful in eliminating the jellyfish, is the applicant willing to remove the jellyfish using another method at their expense?
17. The EA should include data and assess the impacts of each of the three proposed options to divert the storm water from the Hilton Hawaiian Village Hotel (which currently enters the lagoon). Page 31 provides a general description, but lacks any detailed information or assessment. Analysis should also be included on diverting the storm water drainage system for the Hilton's "land" features (see page 18).

18. Detailed data should be provided about the existing discharge (water quality, velocity, etc.) from the lagoon into the Ala Mai Boat Harbor. Additionally, discussion should include the proposed discharge into the harbor, including velocity, water quality data, and how the outflow will effect existing circulation patterns in the Harbor, if at all.
19. Page 38: The EA states "(m)icrobiological contamination is also expected to decrease in the lagoon, principally because of the reduction in bacteria counts in the source water . . ." the diversion of runoff from the hotel grounds and the higher turnover rate of the lagoon water. The applicant should include hard data regarding the nutrient loading to the lagoon and subsequent discharge point from the aquatic life and sunbathers' suntan lotion/chemicals.
20. What is the existing and proposed topography of the lagoon bottom? Also, what are the existing and proposed changes in water level depth? How high is the ground water table in the area and what are the "construction problems" associated with the water table in the area (see page 7)?
21. Parking: according to the applicant, the lagoon proposal would likely attract more use by the public of the portion of the lagoon (see page 42). Yet, the applicant states, "(r)eassessing and developing a parking management plan for the State-controlled spaces should be a top priority for the State."
- We believe that if the implementation of the applicant's proposal results in a secondary impact or a commitment for larger resources, then the applicant, and not the State, should be burdened with the costs of developing and implementing a parking management plan for the effected area. A traffic impact study should also be done.
22. Page 45, Electrical Power, should include a discussion on an emergency generator system.
23. Will the existing island in the lagoon be impacted by the proposed project?
24. A detailed maintenance plan should be included in the EA. The maintenance plan should include a discussion about the care and management of the aquatic life in the lagoon attraction.

RESPONSES TO OCEA MEMO TO DLM
October 20, 1994

File No.: 95-44

Memo to Land Management

-6-

25. Alternatives Considered (p. 47): As shown in Section 11-200-17, HAR, content requirements for Draft FISS should contain "... alternatives which could feasibly attain the objectives of the action--even though more costly--shall be described and explained as to why they were rejected." We believe the applicant needs to explore other alternatives that could meet the objectives of their project. Additionally, we would like the applicant to consider the following ideas:

- Consider placing a grate over the opening of the intake pipe to further reduce the potential for the suction of aquatic life.
- Consider providing separate intake and discharge pipes for the public and private portions of the lagoon.
- Consider incorporating design elements created by the Territorial Harbors Commission when the lagoon was constructed in 1955 (such as the "planned additional beach improvements" that were never made, see page 25).

26. Appendix A.2: In reviewing Appendix A.2 of the FEA, several agencies' comments also refer to the inadequacy of the Draft EA. Even the applicant's own consultants recommend that detailed field observations and studies be conducted (see OCEES' and AECOS' reports). Although the applicant (or agent) has responded to the commenting agencies, we wonder if the agencies' concerns have been alleviated. Also, it appears that some pertinent information provided in the appendices have not been adequately incorporated into the text of the FEA.

1. **Comment:**
Section 1.1 (p. 1): Besides preparing an EA for the Conservation District Use Application, an EA is also required for the use of State lands (see Chapter 343-5, HRS). Additionally, the City and County of Honolulu may also require the preparation of an EA document for their permit requirements.

If the applicant intends to use this document for other permit requirements, then we recommend that this section be amended to include all applicable classes of action identified in Chapter 343, HRS, which trigger the EA requirement. The document should be expanded to include proposed activities, structures, and impacts to areas outside the Conservation District.

Response:
We have no disagreement with this recommendation/style; all environmental permit requirements are clearly stated on pages 4 to 7 of the EA. The Final EA does discuss proposed activities, structures, and impacts to areas outside the Conservation District.

2. **Comment:**
Procedures should be included to handle emergencies and natural disasters that may occur at the project site.

Response:
Hilton Hawaiian Village has in place a comprehensive emergency procedure manual which includes procedures for medical assistance, bomb threat, power failure, weather, earthquake, tsunami, food borne crisis and communications. These procedures have been reviewed by the City and County of Honolulu emergency agencies, as well as various Federal agencies. We have been commended for the proactive and reactive emergency plans in place. We will incorporate the Lagoon project in all of these emergency procedure requirements and will be pleased to present those procedures in response to a requirement made by DLNR within the CDUA process.

3. **Comment:**
The applicant asserts that the "project will preserve all existing public access routes to the swimming lagoon." However, no existing public access routes were identified in the EA.

Response:
As shown in Figures 1, 2, and 7 of the Final Environmental Assessment (FEA), access to the lagoon is possible from all sides except along the

north where the water feature abuts private land. Access to the lagoon from the Hilton end is not restricted in any form. In fact, the Hilton Hawaiian Village is open to the public. Many visitors presently circulate through our site for events, our fireworks display, and to enjoy our facilities and services. Currently, we have prominent walkways that lead into and through the Hilton Hawaiian Village. In addition, public access from Paoo Road and public beach walkway between the Iikai and the Waikikian leading to the Duke Kahanamoku Beach provide additional access to the beach and Hilton lagoon.

4. Comment: *Data should be included that discusses the existing conditions and proposed impacts of both daytime and nighttime noise and lighting generated by the proposed project on the surrounding environment (including nearby residents).*

Response: Currently, daytime activities around the beach area consists of people enjoying sunbathing, swimming, and other beach related activities. The current level of noise is to such an extent that is conducive to a leisurely and relaxing atmosphere; noise levels are at a minimum. With the new project, we expect between 80 and 120 people per hour. Because users of the Lagoon will enter into an enclosed 7,000 square foot structure, then proceed underwater to the swimthrough reef, the noise level from these groups of users will be at a minimum. At night, the current level of noise and lighting is non-existent, due to the lack of evening activities at the present Kahanamoku Lagoon. We expect the same levels of noise during the evening that we expect during our daytime activities. The attraction will close at 9:00 pm. All lighting used in the project will be underwater, directional (to accent our tropical plant materials), footlights (for the sidewalks leading to the Entrance Building), or necessary lighting for the Entrance Building structure. All lighting will be designed to be shielded from the surrounding residences so that the lighting system will have minimal impacts and only add to the overall ambiance of the Hilton Hawaiian Village.

5. Comment: *A visual impact analysis should be done.*

Response: A visual impact analysis would be appropriate where the potential exists for degradation of existing views from public areas or from adjacent properties. The visual impact of this project would be on the views southward from the entrance/lobby area of the Hilton Hawaiian Village as is discussed on page 56 of the FEA, and the hotel would clearly want to maintain and/or enhance this view plane. The addition of tropical

landscape materials and indigenous rock formations will enhance the lagoon area and views from the beach. We have constructed a model along with other elevation and perspective sketches that provides a true representation of the visual character of the Lagoon Project. These materials have already been shown to neighborhood boards and other groups concerned with the visual impact of the project.

6. Comment: *It is unclear on Figure 2, page 6, what State Land Use District the Kahanamoku Beach area is in. Is it also the Conservation District?*

Response: All ocean shoreline beaches in the State of Hawaii are in the Conservation District and Kahanamoku Beach (which is the west end of Waikiki Beach) should be no exception. An attempt was made to clarify the boundaries of the conservation district relative to the lagoon since it is possible that the certified shoreline could cross between the lagoon and Kahanamoku Beach or could curve around the outside of the lagoon. State records (Land Use Commission) provide no more detail than is shown in Figure 2 of the FEA, indicating only that the lagoon is in the State Conservation District.

7. Comment: *Figure 6 on page 16 should have a legend identifying the different symbols for the intake and discharge pipes.*

Response: Differentiating intake and discharge pipes by "symbols" was not intended because these features are clearly labeled and have directional arrows.

8. Comment: *Besides the total length of the proposed new intake pipes, what are the lengths of the existing and proposed sections of both the intake and discharge pipes?*

Response: The two existing seawater intake pipes are 480 and 320 feet long. The existing discharge pipe is 240 feet long from the pumping station north of the lagoon to the point of discharge into the outer channel of the Ala Wai Boat Harbor. The proposed extended intakes will extend seaward approximately 550 feet from the existing intake point.

It is proposed to maintain the existing discharge system into the Ala Wai Boat Harbor, and add a second discharge pump station and pipe. The second pump station would be located in the same area as the existing one, and the new discharge pipe would extend from that location approximately 250 feet to an outlet in the inner channel of the boat harbor.

9. **Comment:** *An in-depth study should be done to assess recreational impacts caused by the implementation of the proposed project (e.g. identify who the existing users of the area are; and how will the project impact these users).....We also noticed an existing fence that extends out into the lagoon along the northeast portion of the lagoon. This fence prevents public passage beyond this point unless you walk in the lagoon. Is this fence legal? (We show no CDUP for the fence.)*
- Response:** The number of users of the lagoon is quite small in comparison with the adjacent ocean beach and an "in-depth" study would not serve a valuable purpose relative to the assessment of impacts. Your observation ("several different users") is typical. The proposed changes will impact these users during construction (as stated in the FEA, pages 53 & 54. After completion of the proposed improvements, the lagoon will easily accommodate all current uses, and will very likely prove to be attractive to additional users. Given the small number of persons presently using the resource, the best value from a survey would be to demonstrate an increase in use after the project.
- The fence which extends along the northeast portion of the lagoon is on private property which belongs to the Waikikian.
10. **Comment:** *Water Quality of Public Lagoon Portion:*
Page 7 states: "Sea water pumped from a new ocean intake into the Hilton Lagoon will overflow into the Duke Kahanamoku Lagoon. The water quality will be maintained at a high level."
Page 37 states: "Water clarity is expected to be excellent in both lagoons".
However, in reviewing AECOS' June 27, 1994 response to the Department of Land Utilization (see appendix A.2), AECOS states, "(i)n the worst case, the water in the public lagoon will only be a little better than is presently the case (instead of a lot better)".
Additionally, Appendix B states: "Under most conditions a direct intake in this area will supply water of acceptable quality to the lagoon, however under storm conditions and during those times when the discharge from the Ala Wai Canal moves along the shoreline in the Diamond Head direction the water quality at the proposed new intake site will be unacceptable. During those times an alternative intake system using an in-place sand filter is proposed".

The applicant should clarify what the water quality of the public portion of the lagoon will be once the project is completed. High level, excellent, unacceptable, or "a little better than is presently the case."

Response: The terms quoted are partly the result of several authors contributing to the FEA, and are all relative terms that are true in context. The citations do not all refer to the same water or the same criteria being used to judge the quality of the water. The EA contends, backed by the consultant's report, that the water quality in the attraction and in Kahanamoku Lagoon will be maintained in excellent condition by virtue of the proposed improvements in source water and the enhanced flow of water through the system.

11. **Comment:** *Page 23: the proposed attraction will be available for both visitors and residents. However, does the applicant intend to allocate a percentage of daily ticket sales to visitors versus residents? (or will ticket sales be on a first come, first serve basis?)*

Response: We intend to allocate a percentage of ticket sales to visitors versus residents. As mentioned in the FEA, we intend to develop special events, group activities and other programs to encourage Oahu residents to utilize the project. In addition, we will offer special rates to school and other institutional groups to stimulate local marine awareness, education and appreciation of our aquatic environment.

12. **Comment:** *Page 26: According to the EA, the Deed and Indenture is silent as to the ownership of the improvements (pipe and pumping station). It is our opinion that the ownership of these improvements should be definitively resolved between the State and applicant before proceeding further with this project.*

Response: What is stated is fact. Resolving this issue, if important, could be made a condition of a permit, part of negotiations, or determined by the courts. It is stated in the original deed for the Kahanamoku Lagoon that "...The Grantor shall permanently maintain said beach after its construction in the general location and configuration...". For the Hilton Lagoon project, the State DLNR would need to grant Hilton a Lease of Easement. The conditions would be that any constructed improvements will have to be maintained by Hilton, and that upon expiration of the Lease all improvements would revert to the State in good condition, or would have to be returned to its original state. As a part of the Lease of Easement, Hilton would need to assure that a constant water supply to the Duke Kahanamoku Lagoon be maintained.

13. **Comment:** Does the applicant propose any dredging of the lagoon bottom, other than removing the silt layer? What is the volume of material to be removed? How long will the temporary retention area on the south end of the public lagoon remain? When dewatering the lagoon, where will the applicant dispose of the lagoon water?
- Response:** As described in the FEA, page 22, the purpose of dredging is to remove silt which entered into the Kahanamoku Beach swimming area intakes and accumulated over time in the lagoon. The construction of the attraction will require, in addition, the removal of approximately 4,000 cubic yards of sand and gravel from the area within the sheet pile ring in order to attain the necessary depths for the underwater trails. The temporary retention basins will be in place for 3 - 4 months. The purpose of these basins is to provide a discharge point for saturated material (both silt and excavate) and allow the water to drain from the material back into the existing lagoon, before the dry material is removed.
- The dewatering discussed in the FEA, page 24, refers to the removal of water within the attraction perimeter. This water will largely be reinjected into the ground to maintain existing subsurface hydrostatic balance. The remainder will be discharged into the lagoon behind silt curtains. This program will be subject to review and monitoring requirements under the dewatering permit program administered by DOH.
14. **Comment:** What types of aquatic plant and animal life exists in the lagoon (are there turtles)? What are the impacts during and after construction to the aquatic life? During construction when the lagoon is dewatered, will there be an odor problem due to the decay of the plant and animal life left in the lagoon?
- Response:** The present Kahanamoku Lagoon is a man-made feature with poor circulation and not conducive to the growth and maintenance of any important aquatic resources. Turtles are not kept there. Some odor problems could arise if reducing sediments are present and brought to the drying area. Odors can be minimized by covering the drying material with a layer of crushed coral material, which will counteract a shift toward acidic pH, and thus reduce the formation of hydrogen sulfide. The main lagoon will not be dewatered (only that portion where construction of the attraction is occurring); thus, the sparse animal and plant life presently existing in the lagoon will not be killed and left to decay.
15. **Comment:** Page 19 discusses a conceptual design that "assumes" the new intake pipes will use the existing intake lines. In the event that the existing lines are unsuitable the new intake lines would be buried beneath the beach. The EA should identify the proposed location and impacts of the new intake lines should the existing lines be unsuitable.
- Response:** If the pipes have to be placed in a trench across Kahanamoku Beach, other routes to the proposed intake location could be considered since the point at which the pipes enter the water off the beach would not be predetermined. Trenching through the beach is not a significant impact. A limited area would be disturbed over a period of one to three weeks. The trench would be backfilled and use of the beach returned to normal the next day. The exact location would not much alter the nature or magnitude of the impacts.
16. **Comment:** Currently the lagoon has stinging jellyfish. The applicant claims that the proposed project is expected to eliminate the jellyfish population (see p. 19). If the project is unsuccessful in eliminating the jellyfish, is the applicant willing to remove the jellyfish using another method at their expense?
- Response:** No method of removal would be effective at total eradication. Jellyfish could only be eradicated as a consequence of changing environmental conditions. It is speculative that reduced residence time of the water will discourage new recruits to the water body. The Hilton Hawaiian Village is currently removing the jellyfish from the existing lagoon as part of their regular maintenance/cleaning program. Although it is impossible to extract every jellyfish from the lagoon, HHV is continually reducing the jellyfish population.
17. **Comment:** The EA should include data and assess the impacts of each of the three proposed options to divert the storm water from the Hilton Hawaiian Village Hotel (which currently enters the lagoon). Page 31 provides a general description, but lacks any detailed information or assessment. Analysis should also be included on diverting the storm water drainage system for the Hilton's "Tand" features (see page 18).
- Response:** The four options for disposal of storm runoff from the Hilton property (EA page 45) were provided because only these four possibilities exist (aside from onsite retention). The contribution of "runoff" from the project will be quite small, but would be combined with the Hilton

Hawaiian Village runoff which currently flows into the Kahanamoku Lagoon. If proposing that this runoff be diverted elsewhere (an intended benefit to the public recreational resource) is perceived as a problem to be addressed in great detail, then the EA should have simply stated that the existing runoff system would be maintained. In fact, it should not be difficult to perceive that continuing this discharge into a lagoon with a much improved turnover will be a positive impact, and redirecting this runoff into the outflow stream (as depicted on Figure 6) will be an even more positive impact. Either way, the loading to the Ala Wai Boat Harbor is unchanged: before and after the project, with or without redirection.

18. **Comment:** *Detailed data should be provided about the existing discharge (water quality, velocity, etc.) from the lagoon into the Ala Wai Boat Harbor. Additionally, discussion should include the proposed discharge into the harbor, including velocity, water quality data, and how the outflow will effect existing circulation patterns in the Harbor, if at all.*

Response: Results of water quality measurements are discussed or at least summarized on page 48 of the FEA and in greater detail in Appendix C of the FEA. The water quality study (Appendix C) did take into account existing water pumped from the lagoon into the Ala Wai basin (by sampling at Station A1).

Harbor circulation is complex (subject to tides as well as discharge from Ala Wai Canal) and could be studied further. However, the basic effect of the proposed discharge on circulation is as described on page 59 water pumped in at the blind end of the yacht basin would flow out via the harbor mouth. Velocities would be comparable to those presently experienced as a result of tidal exchange (as indicated by the estimates of relative volumes). Of course, the tide will complicate the velocities (and possibly directions of flow), being sometimes additive and sometimes subtractive from the one-way flow imposed by the project discharge.

19. **Comment:** *Page 38: The EA states "(m)icrobiological contamination is also expected to decrease in the lagoon, principally because of the reduction in bacteria counts in the source water..." the diversion of runoff from the hotel grounds and the higher turnover rate of the lagoon water. The applicant should include hard data regarding the nutrient loading to the lagoon and subsequent discharge point from the aquatic life and sunbathers' suntan lotion/chemicals.*

Response: Such data are difficult to obtain before the facility is built, although Appendix C in the FEA attempts to estimate nutrient levels in the discharge relative to the intake by comparison with other "similar" kinds of features. In particular, this assessment addressed the impact of biota on the nutrient loading. Because population densities will be similar to natural densities, adverse impacts would be difficult to imagine. Concern for nutrient loading really comes mostly from substances added to the system as part of any feeding programs. Monitoring of nutrient levels in the discharge would provide feedback to the caretakers of the biota to insure that nutrients are not being added to the feature faster than the biota can utilize.

We have no data relating impacts on water quality from swimmers. Contrary to normal swimmers use of nearshore waters, the operation plan for the proposed attraction includes a requirement that participants shower with soap and water before entering the underwater trails, to remove suntan lotion, dead skin, etc. Since the attraction is not deemed suitable for incontinent people (either the very young or the very old), and toilet facilities will be incorporated into the changing rooms and thus easily accessible, it is felt that biological contamination of the seawater should be minimal.

20. **Comment:** *What is the existing and proposed topography of the lagoon bottom? Also, what are the existing and proposed changes in water level depth? How high is the ground water table in the area and what are the "construction problems" associated with the water table in the area (see page 7)?*

Response: Removal of silt from the lagoon should return the topography to the original design depths. The water table is effectively the same as sea level at the project site, because of the high permeability of the beach sand. Isolating the construction area for dewatering in these sandy soils presents problems. Also, because the Hilton Lagoon structure is essentially a large pool, the surface elevation must always be above the water level (lagoon or ground water) outside to maintain downward pressure (weight). Thus, water level in the Hilton Lagoon structure must be above high tide at all times.

21. **Comment:** *Parking: according to the applicant, the lagoon proposal would likely attract more use by the public of the public portion of the lagoon (see page 42). Yet, the applicant states, "(?) assessing and developing a parking management plan for the State-controlled spaces should be a top priority for the State."*

We believe that if the implementation of the applicant's proposal results in a secondary impact or a commitment for larger resources, then the applicant, and not the State, should be burdened with the costs of developing and implementing a parking management plan for the effected area. A traffic impact study should also be done.

Response: The statement on page 21 of the EA is an opinion not shared by the reviewer, but who takes responsibility for conducting a parking management plan is not important to assessing impacts of the project. Traffic at and around the Hilton Hawaiian Village would not be impacted by the project (pages 50-6), although we agree that if the commercial Hilton Lagoon project results in direct or indirect impacts on traffic and/or parking, the responsibility would lie with the applicant to remedy such problems.

22. Comment: *Page 45, Electrical Power, should include a discussion on an emergency generator system.*

Response: In anticipation of a general power failure at our project site, an emergency generator system is logical and will be incorporated into our overall electrical system.

23. Comment: *Will the existing island in the lagoon be impacted by the proposed project?*

Response: Because of the construction of the lagoon reef, structure, and planting areas, the existing island will be removed. In its place, a larger, more vegetated island will be constructed. The design of this new island, complete with palm trees, understory shrubs and tropical groundcover, will more than mitigate the removal of the existing decorative island.

24. Comment: *A detailed maintenance plan should be included in the EA. The maintenance plan should include a discussion about the care and management of the aquatic life in the lagoon attraction.*

Response: Maintenance practices are certainly very important to water quality and aquatic resource issues. However, maintenance plans per se are not beneficial in an EA or EIS for two reasons: 1) the applicant would always represent that the highest level of maintenance would be achieved; and 2) the EA/EIS process has no provisions for later collaboration of these claims. Maintenance plans become important later in the process as working documents required in permits because

permits can have provisions for monitoring and periodic review of representations.

25. Comment: *Alternatives Considered (p. 47): As shown in Section 11-200-17, HAR, content requirements for Draft EIS's should contain "...alternatives which could feasibly attain the objectives of the action -- even though more costly -- shall be described and explained as to why they were rejected." We believe the applicant needs to explore other alternatives that could meet the objectives of their project. Additionally, we would like the applicant to consider the following ideas:*

- *Consider placing a grate over the opening of the intake pipe to further reduce the potential for the suction of aquatic life.*
- *Consider providing separate intake and discharge pipes for the public and private portions of the lagoon.*
- *Consider incorporating design elements created by the Territorial Harbors Commission when the lagoon was constructed in 1955 (such as the "planned additional beach improvements" that were never made, see page 25).*

Response: Requirement cited (HAR Sec. 11-200-17) pertains to Draft EIS preparation.

A grate over the intake pipe (see EA page 19) could be incorporated or would not be necessary, depending upon design. Clearly the design would have to consider preventing objects (such as fish) from entering the pumps.

Construction and maintenance of a separate sea water system for the public lagoon would be difficult to justify given the considerable benefit in water quality improvement already anticipated from the project as proposed. However, the sea water intake system could be designed such that the public lagoon is not dependent upon water flowing through the HHV/EnterOcean lagoon. In the unusual event that the latter were shut down for any reason, a bypass could be provided that would continue water flow through the public portion (i.e., the pumps would continue to provide clean sea water from offshore).

These proposed improvements (made in 1955) were along the lines of a Magic Island development seaward of the Ala Wai Yacht Harbor and would not be appropriate for this area today.

26: **Comment:** *Appendix A.2: In reviewing Appendix A.2 of the FEA, several agencies' comments also refer to the inadequacy of the Draft EA. Even the applicant's own consultants recommend that detailed field observations and studies be conducted (see OCEES's and AECOS's reports). Although the applicant (or agent) has responded to the commenting agencies, we wonder if the agencies' concerns have been alleviated. Also, it appears that some pertinent information provided in the appendices have not been adequately incorporated into the text of the FEA.*

Response: OCEES report (FEA, Appendix B) recommended that additional studies would be necessary to determine the best design for a subsand filter in the Catamaran Channel; AECOS report (FEA, Appendix C) suggested that "detailed studies" would be necessary to quantify the relationship between the public lagoon and the Hilton Lagoon with respect to nutrients and particulates. It is doubtful that the latter "studies" could be done in advance of completion of the project without more detailed knowledge of the nature of the particulates and current patterns in the newly configured lagoon.

JOHN WAIKAE
JUN 1994



STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 111, HONOLULU, HAWAII 96810

ROBERT P. TAKUSHI
COMPTROLLER

LLOYD I. NEBASAMI
DEPUTY COMPTROLLER

LETTER NO. (P) 1305.4

APR 21 1994

Mr. Daniel Dinell
Assistant to the Senior Vice President
Hilton Hawaiian Village
2005 Kalia Road
Honolulu, Hawaii 96815

Dear Mr. Dinell:

Subject: Hilton Lagoon Project
Honolulu, Hawaii
Draft Environmental Assessment (Draft EA)

Thank you for the opportunity to provide input to the subject project. We have no comments to offer at this time.

If there are any questions, please have your staff call Mr. Ralph Yukumoro of the Public Works Division at 586-0488.

Very truly yours,

Gordon Matsuoka
GORDON MATSUOKA
State Public Works Engineer

RY:ln

Hilton Hawaiian Village

June 6, 1994

Mr. Gordon Matsuoka
State Public Works Engineer
Department of Accounting and General Services
P.O. Box 119
Honolulu, Hawaii 96810

Dear Mr. Matsuoka:

Mahalo for your letter of April 21, 1994. The EnterOcean Group and the Hilton Hawaiian Village appreciate the Department of Accounting and General Services taking the time to review the Hilton Lagoon Project draft Environmental Assessment.

We have noted that you have no comments to offer at this time; however, your letter has been incorporated into the final Environmental Assessment which is in the process of being finalized based on all the comments received.

We sincerely believe that this proposed project is a win-win for all parties involved.

Again, thank you for your input.

Sincerely,

Daniel Dinell
Daniel Dinell

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM
LAND USE COMMISSION
Room 194, Old Federal Building
113 Merchant Street
Honolulu, Hawaii 96813
Telephone: 571-3822

JOHN W. BAKER
COMMISSIONER

JOHN W. BAKER
Commissioner
MARTI HANHEMANN
Director
RICK LOGGID
County Director
JEANNE Z. SCHMIDT
County Director
DAVID J. BIRDA
County Director

DEPARTMENT OF BUSINESS,
ECONOMIC DEVELOPMENT & TOURISM

Central Post Office, 270 South King Street, 15th Floor, Honolulu, Hawaii
Mailing Address: P.O. Box 2137, Honolulu, Hawaii 96810 Telephone: (808) 586-2100 Fax: (808) 586-2177



April 29, 1994

Mr. Daniel Dinell
Assistant to the Senior Vice President
Hilton Hawaiian Village
2005 Kalia Road
Honolulu, Hawaii 96815-1999

Dear Mr. Dinell:

The Department of Business, Economic Development & Tourism is pleased to submit the enclosed comments on the Draft Environmental Assessment for the Proposed Hilton Lagoon Project.

The comments were provided by the Land Use Commission. Questions regarding these comments may be directed to Esther Ueda, LUC Executive Officer, at 587-3826.

Thank you for the opportunity to comment.

Sincerely,

Mufi Hanhemann
Mufi Hanhemann

Enclosure

April 26, 1994

SUBJECT: Director's Referral No. 94-133-D
Draft Environmental Assessment(EA) for the Proposed
Hilton Lagoon Project

We have reviewed the subject draft EA submitted with your letter dated April 14, 1994, and have the following comments to offer:

1) We confirm that the Tax Map Keys for the project site are in the following State Land Use Districts:

- THK: 2-3-37:21 State Land Use Urban and Conservation Districts
- THK: 2-6-08:34 State Land Use Urban District
- THK: 2-6-09:1 State Land Use Urban District; portions may also be within the Conservation District

We would like to note that the Kahanamoku Lagoon is located in the State Land Use Conservation District.

2) We suggest that the final EA include a map showing the project site in relation to the State Land Use Districts.

We have no other comments to offer at this time.

EU:km

54:57 5:00:00



June 6, 1994

Mr. Muji Hannemann
Director, Department of Business, Economic Development & Tourism
P.O. Box 2359
Honolulu, Hawaii 96804

Dear Mr. ~~Hannemann~~:

Mahalo for your letter of April 29, 1994. The EnterOcean Group and the Hilton Hawaiian Village appreciate the Department of Business, Economic Development & Tourism and specifically the Land Use Commission taking the time to review the Hilton Lagoon Project draft Environmental Assessment.

Based upon your suggestion, we will include in the Final Environmental Assessment a map showing the project site in relation to the State Land Use Districts. The final Environmental Assessment is in the process of being finalized based on all the comments received.

We sincerely believe that this proposed project is a win-win for all parties involved. Again, thank you for your input.

Sincerely,


Daniel Dinell



DEPARTMENT OF BUSINESS,
ECONOMIC DEVELOPMENT & TOURISM

ENERGY DIVISION, 335 MERCHANT ST., RM. 110, HONOLULU, HAWAII 96813 PHONE: (808) 547-3300 FAX: (808) 547-3320

JOHN WAHLEE
Governor
MAUI HUKUWAIWAH
Director
JANNE SCHLITZ
Deputy Director
ROCK LEGGEND
Deputy Director
VALENE YOSHIMURA
Deputy Director



May 3, 1994

Mr. Daniel Dinell
Assistant to the Senior Vice President
Hilton Hawaiian Village
2005 Kalia Road
Honolulu, Hawaii 96815-1999

Dear Mr. Dinell:

Subject: Draft Environmental Assessment for Hilton Lagoon Project,
Hilton Hawaiian Village.
Tax Map Key Numbers: 2-3-37:21 (Kahanamoku Lagoon)
2-6-08:34 (Hilton Hawaiian Village)
2-6-09: 1 (Hilton Hawaiian Village)

Land Use Classifications: Zoning Districts: P-2 and
Resort. Mixed Use State Land
Use: Conservation (R), (G)
and Urban.

This is to inform you that we have no comments on the subject Draft
Environmental Assessment for Hilton Lagoon Project, Hilton Hawaiian Village.

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

Sincerely,

Maurice H. Kaya
Maurice H. Kaya
Energy Program Administrator

HHK/hke1s107

SP:G: S

June 6, 1994

Mr. Maurice Kaya
Energy Program Administrator
Department of Business, Economic Development & Tourism
335 Merchant Street, Room 110
Honolulu, Hawaii 96813

Dear Mr. Kaya:

Mahalo for your letter of May 3, 1994. The EnterOcean Group and the Hilton
Hawaiian Village appreciate the Energy Division of the Department of Business,
Economic Development & Tourism taking the time to review the Hilton Lagoon
Project draft Environmental Assessment.

We have noted that you have no comments to offer at this time; however, your
letter has been incorporated into the final Environmental Assessment which is in
the process of being finalized based on all the comments received.

We sincerely believe that this proposed project is a win-win for all parties involved.

Again, thank you for your input.

Sincerely,

Daniel Dinell
Daniel Dinell



STATE OF HAWAII
DEPARTMENT OF EDUCATION
P. O. BOX 2360
HONOLULU, HAWAII 96804

HERMAN M. AIZAWA
Acting Superintendent

Hilton Hawaiian Village

OFFICE OF THE SUPERINTENDENT

April 25, 1994

June 6, 1994

Mr. Daniel Dinell
Assistant to the Senior Vice President
Hilton Hotels Corporation
Hilton Hawaiian Village JV
2005 Kaliea Road
Honolulu, Hawaii 96815

Herman Aizawa, Ph.D.
Superintendent
Department of Education
P.O. Box 2360
Honolulu, Hawaii 96804

Dear Mr. Dinell:

Dear Dr. Aizawa:

SUBJECT: Draft Environmental Assessment
Hilton Lagoon Project
Hilton Hawaiian Village

Mahalo for your letter of April 25, 1994. The EnterOcean Group and the Hilton Hawaiian Village appreciate the Department of Education taking the time to review the Hilton Lagoon Project draft Environmental Assessment.

We have reviewed the subject environmental assessment and have determined that the proposed development will have no impact on the schools in the area.

We have noted that you have no comments to offer at this time; however, your letter has been incorporated into the final Environmental Assessment which is in the process of being finalized based on all the comments received.

Thank you for the opportunity to comment.

We sincerely believe that this proposed project is a win-win for all parties involved and one of the more exciting aspects of this project are the educational opportunities for Cahu youngsters to learn about our marine environment. Dr. Aizawa, we look forward to working with you and the DOE on establishing appropriate learning opportunities.

Sincerely,

Herman M. Aizawa
Herman M. Aizawa, Ph.D.
Acting Superintendent

Again, thank you for your letter.

HMA:hy

Sincerely,
Daniel Dinell
Daniel Dinell

cc: A. Suga
E. Masagatani

43:03:01...

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

DEPT. OF LAND AND NATURAL RESOURCES
BOARD OF LAND AND NATURAL RESOURCES
CHIEF OF BUREAU
DONALD MARRAS
AGRICULTURE DEVELOPMENT PROGRAM
AGRI. RESOURCES
CONSERVATION AND RECREATION AFFAIRS
NATURAL RESOURCES DEPARTMENT
CONSERVATION
FORESTRY AND WILDLIFE
NATURAL PRESERVATION DIVISION
STATE PARKS
LAND AND WATER DEVELOPMENT
WATER AND LAND DEVELOPMENT

May 18, 1994
Mr. Daniel Dinell
Assistant to the Senior Vice-President
Hilton Hawaiian Village
2005 Kalua Road
Honolulu, Hawaii 96815-1999
Dear Mr. Dinell:

LOG NO: 11583
DOC NO: 9405EJ09

SUBJECT: Draft Environmental Assessment: Hilton Lagoon Project,
Hilton Hawaiian Village
Maikiki, Kona, O'ahu
THK: 2-3-37:021; 2-6-08:034, 2-6-09:001

Thank you for the opportunity to review the Draft Environmental Assessment (DEA) for the Hilton Lagoon Project. We have previously commented on this project to the DLMR/Office of Conservation and Environmental Affairs under a request for Use of State-Owned Lands (Log No. 9505/Doc No. 9309TD35). Our comments consisted of the following:

A review of our records shows that archaeological inspection of trenches in the vicinity of this proposed project revealed fill soils on top of beach sands. No historic sites were found in these trenches. Therefore, we believe this project will have "no effect" on historic sites.

It is possible that historic sites, including human burials, will be uncovered during routine construction activities. Should this be the case all work in the vicinity must stop and the Historic Preservation Division must be contacted at 587-0047.

Sincerely,

Don Hibbard, Administrator
State Historic Preservation Division

EJ:jt



June 6, 1994

Mr. Don Hibbard
Administrator, State Historic Preservation Division
Department of Land and Natural Resources
33 South King Street, 6th Floor
Honolulu, Hawaii 96813

Dear Mr. Hibbard:

Maalo for your letter of May 18, 1994. The EnterOcean Group and the Hilton Hawaiian Village appreciate the State Historic Preservation Division taking the time to review the Hilton Lagoon Project draft Environmental Assessment.

Your letter has been incorporated into the final Environmental Assessment which is in the process of being finalized based on all the comments received. As noted in Section 4.11, of the EA, all work in the vicinity will stop and your office notified in the unlikely event any historic sites are uncovered during routine construction activities.

We sincerely believe that this proposed project is a win-win for all parties involved. Again, thank you for your letter.

Sincerely,

Daniel Dinell



STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HAWAII 96811

JOHN C. LEWIN, M.D.
DIRECTOR OF HEALTH

JOHN C. LEWIN, M.D.
DIRECTOR OF HEALTH

IN REPLY, PLEASE REFER TO:

May 26, 1994

94-065/epo

Mr. Daniel Dine11
Assistant to the Senior Vice President
Hilton Hawaiian Village
2005 Kalia Road
Honolulu, Hawaii 96815-1999

Dear Mr. Dine11:

Subject: Draft Environmental Assessment (DEA)
Hilton Lagoon Project
Hilton Hawaiian Village

Thank you for allowing us to review and comment on the subject project. We have the following comments to offer:

Wastewater

We have no concerns in this area, because the domestic wastewater will be discharged into the city sewer system.

Water Pollution

We have no specific comments at this stage of the project. Generally speaking, however, a National Pollutant Discharge Elimination System (NPDES) permit is required for any discharge to waters of the State including the following:

1. Storm water discharges relating to construction activities for project equal to or greater than five acres;
2. Storm water discharges from industrial activities;
3. Construction dewatering activities;
4. Cooling water discharges less than one million gallons;
5. Ground water remediation activities; and
6. Hydratesting water.

Mr. Daniel Dine11
May 26, 1994
Page 2

Any person wishing to be covered by the NPDES general permit for any of the above activities should file a Notice of Intent with the Department's Clean Water Branch (CWB) at least 90 days prior to commencement of any discharge to waters of the State.

Also, a Section 401 "Water Quality Certification" will probably be required from the Department's Clean Water Branch.

Any questions regarding this matter should be directed to Mr. Denis Lau of the Clean Water Branch at 586-4309.

Very truly yours,

John C. Lewin

JOHN C. LEWIN, M.D.
Director of Health

c: Clean Water Branch
Wastewater Branch

2 11:30



June 6, 1994

Dr. Bruce Anderson
Department of Health
State of Hawaii
P.O. Box 3378
Honolulu, Hawaii 96801

Dear Dr. Anderson:

Mahalo for your letter of May 26, 1994. The EnterOcean Group and the Hilton Hawaiian Village appreciate the Department of Health taking the time to review the Hilton Lagoon Project draft Environmental Assessment.

We note that the Department has no concerns relative to wastewater disposal and this proposed project. As for water discharge, we are aware of the requirement to secure an NPDES permit. Our water quality consultant, AECOS, Inc., will be contacting the DOH's Clean Water Branch to acquire the necessary permits prior to any discharge into State waters. Your letter has been incorporated into the final Environmental Assessment which is in the process of being finalized based on all the comments received.

We sincerely believe that this proposed project is a win-win for all parties involved.

Again, thank you for your input.

Sincerely,

A handwritten signature in dark ink, appearing to read "Daniel Dinelli".

Daniel Dinelli

JOHN W. WAKE
GOVERNOR



STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5007

May 23, 1994

Mr. Daniel Dinell
Assistant to the Senior Vice President
Hilton Hawaiian Village
2005 Kalifa Road
Honolulu, Hawaii 96815-1999

Dear Mr. Dinell:

Subject: Draft Environmental Assessment
Hilton Lagoon Project
Hilton Hawaiian Village
TMK: 2-3-37: 21; 2-6-08: 34; 2-6-09: 1

The intersection of Ala Moana Boulevard with Kalifa Road is of particular concern. On occasion, during major special events, it has been observed that turning movements onto Kalifa Road experience delays, resulting in queuing of vehicles on Ala Moana Boulevard. With an additional projected attraction of between 80 and 120 people per hour, the ability of the intersection to accommodate the increase in traffic during peak periods of use may be exacerbated. Hilton Hawaiian Village should monitor the traffic after the attraction opens and institute additional traffic management measures as necessary to prevent aggravating the existing operations of the intersection.

We appreciate the opportunity to provide comments.

Sincerely,

Rex D. Johnson
Rex D. Johnson
Director of Transportation

READ JOHNSON
DIRECTOR
DEPUTY DIRECTORS
KAMAHAWA HOLT
GLENN M. OKIMOTO
JOYCE T. OAHNE
CALVIN M. TSUDA

IN REPLY REFER TO
STP 8.6032

27 210:06

Hilton Hawaiian Village

June 6, 1994

Mr. Glenn Okimoto
Deputy Director
State Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Okimoto:

Mahalo for your letter of May 23, 1994. The EnterOcean Group and the Hilton Hawaiian Village appreciate the DOT for taking the time to review the Hilton Lagoon Project draft Environmental Assessment.

Your concern with the intersection of Ala Moana Boulevard and Kalifa Road is one that the developers take very seriously. As the EA states in Section 4.7, "the vast majority of Hilton Lagoon users will either come from on-site or walk from nearby hotels Some will also arrive by bus, but because all participants will be assigned specific "dive times" and the facility can only accommodate a finite number per hour, we do not anticipate a significant additional generation of vehicles coming to the Hotel. Off-duty police officers will continue to be hired by the Hotel during special events to control traffic in the immediate vicinity.

Although we do not anticipate any significant decline from the present level of service (LOS) at this intersection, the developers will, as your Department suggests, monitor the traffic situation after the attraction opens.

Your letter and this response will be incorporated into the final Environmental Assessment which is in the process of being finalized based on all the comments received.

We sincerely believe that this proposed project is a win-win for all parties involved.

Again, thank you for your input.

Sincerely,
Daniel Dinell
Daniel Dinell



STATE OF HAWAII
 OFFICE OF HAWAIIAN AFFAIRS
 711 KAPOLAHU BOULEVARD, SUITE 500
 HONOLULU, HAWAII 96813-3249
 PHONE (808) 594-1848
 FAX (808) 594-1845

April 29, 1994

Mr. Daniel Dinell
 Assistant to the Senior Vice President
 Hilton Hawaiian Village
 2005 Kalia Road
 Honolulu, Hawaii 96813

Re: Draft Environmental Assessment for the proposed Hilton Lagoon Project.

Dear Mr. Dinell:

Thank you for the opportunity to review the above-referenced Environmental Assessment (EA). We have several concerns with this project.

We find that some sections of the EA contain insufficient information. For example, Paragraph 2.6.2 "PROJECTED USAGE OF THE HILTON LAGOON" indicates an anticipated 80 to 120 visitors per hour to the private lagoon. The EA does not, however, indicate how these numbers were reached. The final document should include this essential background information. Other sections of the EA also lack background references.

More importantly, we question the wisdom of using the public property as suggested in the EA. First, we are opposed to creating an artificial visitor attraction. Culturally and environmentally Hawaii is unique. Those unique qualities should be protected, not recreated in an artificial attraction.

Second, we are opposed to using the public portion of the lagoon as a waste water basin for the private section of the lagoon. The EA states that fresh water will circulate in the private sections every three hours but the public sections will circulate only once in every ten hours. We

Mr. Daniel Dinell
 April 29, 1994
 Page two

question the rationale for holding water in the public section three times longer than in the private sections. In addition, the process of dumping water from the private section to the public section every three hours would proportionally decrease oxygen and increase pollutants in the public section. We find this use of public facilities unacceptable.

If you have any question on these or other concerns, please contact Lynn Lee, Land Planner, at 594-1936.

Ma ka 'oia'io

Dante K. Carpenter
 Administrator



June 6, 1994

Mr. Dante Carpenter
Administrator, Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

Dear Mr. Carpenter:

Mahalo for your letter of April 29, 1994. We were also delighted to have had the opportunity to personally meet with OHA's Land Planner, Lynn Lee, to discuss this project in more depth. The EnterOcean Group and the Hilton Hawaiian Village appreciate the Office of Hawaiian Affairs taking the time to review the Hilton Lagoon draft Environmental Assessment.

Following is our response to the concerns you raised:

- 1) The visitor usage figures were arrived at via a sophisticated economic projection model which factored in visitor and resident population counts, and attendance at current attractions. The numbers are a function of what the facility and the marine specimens can accommodate in order to ensure a quality experience. This will be made clear in the final EA.
- 2) In reference to your request to supply more background data, we learned during our meeting with Ms. Lee that this comment was relative to base line water quality sampling. The meeting gave us the opportunity to point to Appendix C which addresses that particular concern.
- 3) The EnterOcean Group and the Hilton Hawaiian Village agree that culturally and environmentally Hawai'i is very unique. As such, we intend to harmonize the attraction with the natural environment. It is important to note that the existing lagoon is artificial. The proposed project is not taking a natural, pristine environment and changing it, rather we propose developing an attraction in an already man-made environment to relieve some of pressures placed on our unique natural marine eco-systems such as Hanauma Bay. The attraction will be sensitive to and complementing the host culture by sharing with visitors and residents alike Hawai'i's ocean environment and habitats. As well we will emphasize the need to preserve

Mr. Dante Carpenter
June 6, 1994
Page 2 of 2

such an environment and its natural resources. Additionally, we are planning to offer special underwater excursions for local school children and will emphasize this aspect more in the final EA.

- 4) The public portion of the lagoon will not be a waste water basin. Rather, water flow will improve dramatically from the current residency time to just 10 hours. There will be a continuous flow of water into the attraction, which will then overflow via waterfalls into the public lagoon. The time difference is because the public lagoon will contain about three times more water volume than the attraction, so the water is in the public lagoon three times longer before it is pumped into the boat harbor. Please keep in mind that the source area for intake will be of much better water quality and therefore will be a considerable improvement of quality in all environments affected by this system including the public portion and ultimately the Ala Wai Boat Harbor.

We anticipate that a water quality monitoring program will be a condition of operation. As such, we will closely monitor dissolved oxygen, salinity, temperature, pH, turbidity, suspended solids levels etc. We will ensure that the attraction and the public portion of the lagoon are safe and sanitary bodies of water for people as well as marine life.

Your letter and this response will be incorporated into the final Environmental Assessment which is in the process of being finalized based on all the comments received.

We sincerely believe that this proposed project is a win-win for all parties involved.

Again, thank you for your input.

Sincerely,

Daniel Dineen



University of Hawaii at Manoa

Water Resources Research Center
Holmes Hall 283 • 2540 Dole Street
Honolulu, Hawaii 96822

5 May 1994

Mr. Daniel Dinell
Hilton Hawaiian Village
2005 Kalifa Road
Honolulu, Hawaii 96815-1999

Dear Mr. Dinell:

Subject: Environmental Assessment for the Proposed Hilton Lagoon Project

We have reviewed the subject Environmental Assessment and offer the following comment:

The Environmental Assessment has not addressed the negative effect of the effluent flow into the Ala Wai Yacht Harbor because while seemingly beneficial, the contaminants presently contained in the harbor will be flushed out of the harbor mouth and carried east along Waikiki Beach by the prevailing current. Thus, while flushing the harbor, the contaminants have the potential for polluting all of Waikiki Beach. Flushing of the Kahanamoku Lagoon and the Inner Section of the Ala Wai Yacht Harbor would improve the water quality but the flushed material will be displaced into another body of water, specifically the ocean environment. The records show that the percent of samples for enterococcus exceeding the standard is high at Kahanamoku Beach, flushing of the Ala Wai Yacht Harbor with effluent from the lagoon project and the discharge of storm runoff into the same area would increase the pollutants at the beach areas. Since the inner harbor receives only 20% flushing from tidal effects, increased flushing with sea water (heavier than freshwater from Manoa and Palolo Streams) might flush sediments or cause dissolution of toxic metals that has accumulated from paints flaking off the boats into the bottom sediment layers. The assessment did not present nutrient and microbiological data for Ala Wai Canal waters during the study of the lagoon, beach and yacht harbor areas. From the given data, it must be concluded that the yacht harbor can be one of the sources of bacterial contamination of Kahanamoku Beach and increased flushing would only increase the problem in the offshore waters.

The Environmental Assessment has not addressed the negative effect of the effluent flow into the Ala Wai Yacht Harbor because while seemingly beneficial, the contaminants presently contained in the harbor will be flushed out the harbor mouth and carried east along Waikiki Beach by the prevailing current. Thus, while flushing the harbor, the contaminants have the potential for polluting all of Waikiki Beach.

Thank you for the opportunity to comment.

Sincerely,

Roger S. Fujioka, Ph.D.
Director, WRRRC

RSF:jmn

AN EQUAL OPPORTUNITY EMPLOYER



970 N. Kalia Avenue, Suite C300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

June 8, 1994

Dr. Roger Fujioka, Director
Water Resources Research Center
University of Hawaii
Holmes Hall 283
2540 Dole Street
Honolulu, Hawaii 96822

Dear Dr. Fujioka

Thank you for responding and providing some thought provoking questions concerning the draft Environmental Assessment for the proposed Hilton Lagoon Project. The Hilton Hawaiian Village/EnterOcean partnership requested that I respond to your comments because water quality issues were involved. Your comments indicate a need for us to elaborate on the water quality relationships between the Ala Wai and Waikiki Beach in the Final EA. We have not conducted or planned any additional studies, but I think we can provide perspective on the potential for the problems that you allude to from existing data.

I do not see a basic problem with improving the exchange of sea water between the harbor and the ocean. The Ala Wai Harbor is at best a temporary environmental sink and cannot be regarded as a filter or storage site for pollutants generated either on the land or by boats in the harbor. Whatever presently accumulates in the harbor (that is, pollutants entering the harbor that are NOT flushed out daily with the tides and the net seaward flow from the canal) will be removed to the sea by either exceptional floods from the canal or by dredging. Increasing the flushing rate of the harbor may reduce pollutants in the harbor by removing these a little faster than is presently the case, but this process is independent of the reasons for and the rates of pollutants entering the harbor in the first place.

Another way to view the impacts on water quality of the proposed discharge is to consider that the addition of clean sea water to the Ala Wai Harbor will dilute pollutants (including enterococcus) present in the water column, resulting in lower concentrations in the water moving seaward with the tidal ebb and canal outflow. Because the daily net flow seaward will be increased,

the total loading of pollutants to the ocean will remain unchanged, but the concentration of any pollutants in that water must be less. Concentration often if not usually determines the adverse effect of a pollutant on the environment.

It should also be pointed out that water flushed from the canal by whatever means is not exactly "...carried eastward along Waikiki Beach" as stated in your letter. Flow from the canal enters the ocean seaward of the reef off Waikiki. The general flow outside the reef is eastward most of the time (Bathen 1978; Chave, et al., 1973); flow on the reef flat adjacent to the entrance channel is westward most or all of the time (Chave, et al., 1973). Admittedly, water at Waikiki beach must come from the offshore body of water between Ala Wai and Diamond Head, and the Ala Wai contributes something to the latter. However, the portion that is Ala Wai discharge would be considerably diluted before reaching Waikiki Beach. The project cannot have any significant influence on water circulation off Waikiki, but the water offshore that serves as a source for water moving onshore will be either more dilute with respect to any pollutants originating in the harbor or unchanged with respect to these pollutants, depending upon how the increased outflow from the canal interacts with the offshore circulation.

MICROBIOLOGY - Our data dispute the contention that enterococcus at Kahamoku Beach presently comes from the Ala Wai. Enterococcus counts decrease dramatically offshore of the beach (i.e., in the direction of water influenced by the Ala Wai). Our data and Department of Health data suggest that high levels of bacteria at Waikiki are associated with land runoff and poor flushing in nearshore areas. Your own studies in Kailua Bay came to a similar conclusion for Kailua Beach. Nearshore elevated values for enterococcus and coliforms do not usually come in from the sea. Since water coming out of the Ala Wai as a result of the project discharge would have lower counts of enterococcus (because of dilution), the risk to Waikiki Beach would be lessened, not increased.

METALS - The relationship between the overlying water and metals in the sediment will not be much changed by the discharge of clean sea water into the harbor. This water will have less ability to dissolve those metals whose solubility is enhanced by lower pH because the pH is likely to be higher than at times when the brackish water is present. Metals whose solubility is greater in oxidizing versus reducing environments may see improved mobility if flushing of the harbor is improved. This would be a slow process, gradually stripping metals from the surface layer of the harbor sediment. Slow release of metals occurs now. Flushing with clean sea water should have the effect of decreasing the concentration of metals in the harbor waters even if the net effect is one of an increase in the loading of metals exiting the harbor. That of course is the whole point of increasing flushing of any body of water: to keep concentrations from reaching levels which cause harm.

The proposed discharge outflow will not result in a significant movement of sediments because flow velocities will not be high enough and the outfall can be designed to minimize disturbance of bottom sediments in the vicinity of the

discharge. Initial adjustment in the bottom sediment surface might occur directly off the outflow, but this process would be a temporary one. The flow of water simply will not result in scouring of the Ala Wai Harbor. At the narrowest point in the Ala Wai Harbor, flow attributable to the proposed discharge will amount to about 0.5 cm/sec. Certainly, major rainfall events accomplish a good deal more movement of bottom material into and out of the main basin of the harbor.

I will amend the draft EA to clarify the points raised in your letter. Again, thank you for participating.

Sincerely,



Eric B. Guinther

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU

630 SOUTH KING STREET
HONOLULU, HAWAII 96813 • PHONE 833-4433



FRANK FASI
Mayor

DONALD A. CLEGG
Director
LORETTA K. C. CHIE
Deputy Director

MC No. 18839
94-02744 (LC)

May 9, 1994

Mr. Daniel Dinell
Assistant to the Senior Vice President
Hilton Hawaiian Village
2005 Kalua Road
Honolulu, Hawaii 96815-1999

Dear Mr. Dinell:

Mayor Frank Fasi referred your letter of April 14, 1994, requesting comments on the draft of the Environmental Assessment for the proposed Hilton Lagoon Project to this office for review.

This Department along with various City agencies, will review it and will respond to you directly.

Very truly yours,

Donald A. Clegg
DONALD A. CLEGG
Director of Land Utilization

DAC:ea

cc: The Honorable Frank F. Fasi, Mayor
City and County of Honolulu

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96813



May 13, 1994

FRANK FASI, Mayor
WALTER HANSON, Jr. Chairman
WALTER H. YAMASAKI, Vice-Chairman
SCOTT J. DAVENPORT, CHC-CSP
DAN W. MCDONNELL, JR.
RICHARD J. ADAMS
KELLY L. KENNETH
KARU H. HANAU, SR.
SPRAGUE
Manager and Chief Engineer

Mr. Daniel Dinell
Assistant Senior Vice President
Hilton Hawaiian Village
2005 Kalua Road
Honolulu, Hawaii 96815-1999

Dear Mr. Dinell:

Subject: Your Letter of April 14, 1994 on the Draft Environmental Assessment (DEA) for the Hilton Lagoon Project, Honolulu, TMK: 2-3-37: 21; 2-6-08: 34; 2-6-09: 01

We are still evaluating the DEA for the proposed project and will complete our review by May 27, 1994.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

Kazu Hayashida
KAZU HAYASHIDA
Manager and Chief Engineer

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DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU

830 SOUTH KING STREET
HONOLULU HAWAII 96813 • (808) 523 4422



FRANK E. ZAH
DIRECTOR

DONALD A. CLEGG
DIRECTOR
LORITA L. CHIE
DEPUTY DIRECTOR

94-02343 (ASK)

June 15, 1994

Mr. Daniel Dinell
Assistant to the Senior Vice President
Hilton Hotel Corporation
Hilton Hawaiian Village
2005 Kalua Road
Honolulu, Hawaii 96815

Dear Mr. Dinell:

Draft Environmental Assessment for the Hilton Lagoon Project

Tax Map Keys: 2-3-37; 2-6-8; 34; 2-6-9; 01

We have reviewed the Draft Environmental Assessment (DEA) for the Hilton Lagoon Project and offer the following comments:

- The Environmental Assessment (EA) should include an improved site plan identifying the existing lagoon, adjacent parking and beach areas.
- Parcels identified by Tax Map Keys 2-6-8: 34 and 2-6-9: 01 are currently within the Resort Hotel Precinct. Page 1 of the DEA indicates that they are within the Resort Mixed Use District.
- The EA should more clearly describe the type of barrier which will be constructed to prevent the public from entering the private section of the lagoon.
- The Waikiki Special District permit should include a map clarifying the Waikiki Special District Precinct boundaries relative to proposed improvements.

Water Quality

1. The potential impacts of dewatering activities on surrounding foundations and structures should be addressed in the EA.
2. We are concerned that the public lagoon will not be provided with an independent seawater intake. In the event that the

Mr. Daniel Dinell
Page 2
June 15, 1994

privatized lagoon area cannot adequately supply the volume, or quality of water required, water quality within the public lagoon will deteriorate.

3. We encourage all efforts to improve water quality. To that end, construction of a second discharge pipe into the inner channel of the Ala Wai Boat Harbor, and diversion of storm water runoff into Ala Wai Boat Harbor, seem to be desirable elements which would promote improved water quality.

Traffic and Parking

4. We are concerned that the project will adversely affect traffic congestion and the demand for the limited public parking in the area. The EA should include a discussion of existing traffic conditions and anticipated project impacts. Mitigative measures should include alternative means of public access to the lagoon through the boat harbor, increased public parking and possible relief to the Kalua Road/Ala Moana Boulevard intersection.

5. Parking for the proposed uses must be in accordance with the requirements of the Land Use Ordinance. The EA should indicate whether the excess on-site parking is adequate, or whether additional spaces will be needed.

If you have any questions, please contact Ardis Shaw-Kim of our staff at 527-5349.

Very truly yours,

DONALD A. CLEGG
Director of Land Utilization

DAC:ak

cc: Eric Guinther

G:Lagoon.ask



970 N. Kaliahoe Avenue, Suite C300 • Kailua, Hawaii 96734
Telephone: (808) 234-5884

June 27, 1994

Department of Land Utilization
City and County of Honolulu
650 So. King Street
Honolulu, Hawaii

Attn: Donald A. Clegg
Director

Dear Mr. Clegg,

Thank you for reviewing the draft Environmental Assessment for the Hilton Lagoon Project. Daniel Dinell of the Hilton Hawaiian Village has requested that I respond to the concerns raised by your letter. We finalized the EA on June 10, 1994, two months after the draft EA was announced in the OEQC Bulletin, but the project sponsors have allowed to include all letters and responses in the final EA document if received before the end of June. The Department of Land Utilization will have an opportunity to participate further in the planning process for this project within the context of the Special Management Area, Waikiki Special District, and Shoreline-Setback permits. Allow me to respond at this time to the specifics raised by your letter.

1) We have included in the final EA a map (as Figure 2) which relates property boundaries and zoning to the proposed project layout. Our Figure 6 shows the existing lagoon and adjacent parking and beach areas.

2) Within the Waikiki Special District, the project will be located on parcels designated Public Precinct (the Hilton Lagoon) and Resort Hotel Precinct (the admissions/administration facility).

3) The basic form of the barrier is described on page 7 of the final EA, although not included are any details concerning the finish work, as inferred by the conceptual model shown as Figure 4. From the lagoon side, the approximately 3 foot high (above lagoon water level) wall will be finished in rock work, plantings, and include several water falls (over flow from the Hilton Lagoon) intended to provide a visually pleasing view to blend in with the existing backdrop of the hotel and extensive landscaping of the Hilton Hawaiian Village (see also p. 36).

4) Figure 2 will be modified to provide the information requested as part of the permit application.

Water Quality

1) Any impacts of dewatering on surrounding foundations and structures (all part of the Hilton Hawaiian Village) would be considered serious and would be avoided. Construction damage to walkways, etc., however caused, would be repaired as part of the merging of the proposed project into the existing grounds of the hotel.

2) The proposed project will greatly enhance the flow of water and the quality of water through the public lagoon. We are unclear as to what situation would arise to cause this volume to be "inadequate". In the worst case, the water in the public lagoon will only be a little better than is presently the case (instead of a lot better). Because the privatized lagoon will be more dependent on continuous water flow, the project must always supply water to the public portion. In the event of financial failure, the intake pipes and pumps would still exist to provide water to the public lagoon.

3) Your support of this alternative is noted.

Traffic and Parking

4) Traffic and parking issues are addressed in Section 4.7 of the final EA (p. 41-42). As the attraction is intended to draw most heavily from the Waikiki visitor population, the project anticipates that a great many of the users of the Hilton Lagoon will arrive by foot from various Waikiki locations. Others may arrive by bus or by private automobile, for which both adequate loading/unloading areas and parking exist on the grounds of the Hilton Hawaiian Village. Users of the facility will be required to make reservations in advance, giving the Hilton some control over

demand for onsite parking. At the present time, public parking at the Ala Wai Boat Harbor for those interested in using the public lagoon is adequate, although if the improved lagoon becomes popular, then parking space could become a limitation on the number of beach goers arriving by private automobile. Public access already exists from the harbor parking lot to the lagoon and Waikiki Beach.

5) As noted on page 41 of the final EA, a parking management plan developed for the Kalia Tower project (included as Appendix D) indicates that excess on-site parking is adequate considering the needs of both the Kalia Tower and Hilton Lagoon projects.

Again, thank you for your participation.

Sincerely,


Eric B. Guinther

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU

130 SOUTH KING STREET
HONOLULU, HAWAII 96813 • (808) 532-4232



AGENCY NAME
LOCATION

DONALD A. CLEGG
DIRECTOR
LORETTA L. CHAN
DEPUTY DIRECTOR

94-04827 (ASK)

October 14, 1994

The Honorable Keith W. Ahue, Director
Department of Land and
Natural Resources
State of Hawaii
Kalanimoku Building
1151 Punchbowl Street, Room 130
Honolulu, Hawaii 96813

Attn: Mr. Cecil Santos

Dear Mr. Ahue:

Final Environmental Assessment (FEA)
Hilton Lagoon Project
Tax Map Keys: 2-3-37; 21; 2-6-8; 34; 2-6-9; 01

The applicant, The Hilton Hawaiian Village Joint Venture and The EnterOcean Group, Inc., propose to construct a swim-through, artificial reef and support structures. To do this, the applicant plans to convert a portion of the existing public Kahanamoku Lagoon into a private recreational attraction. Our concerns regarding improved water quality in the public recreational area are still not fully addressed.

According to the FEA, the proposal will adversely impact public access and will alter water quality. The applicant intends to mitigate public access impacts and expects that water quality will be improved.

The applicant proposes to mitigate diminished public access by offering to upgrade the remaining public area to a level which will allow public recreation. The existing water quality and stinging jellyfish population deter individuals from using the lagoon. As such, the lagoon is currently of little public recreational value.

This rationale has merit and the proposal will likely result in improved water quality within the public lagoon area. However, the question which remains is whether or not water quality will be sufficiently improved to allow public recreation.

The Honorable Keith W. Ahue, Director
Page 2
October 14, 1994

The applicant is relying on increased flow-through volumes, reduced residence time, and a higher quality input water to achieve improved water quality. While we agree that it is reasonable to conclude that quality will be improved, the applicant does not qualify the degree of improvement. The impact of increased particulate organics is only generally addressed. As modification of the lagoon to create a public recreational amenity is being offered as a mitigation for project impacts, it is important to ensure that water quality will be improved to a level that will allow public recreational use of the lagoon.

Page 15 of the FEA states that the applicant will be responsible for maintenance of both the private attraction and the public portion of the lagoon, including sea water pumping systems and all aesthetic aspects. From this, we conclude that the applicant is committed to taking the necessary steps to ensure creation of a usable public amenity. We recommend that this be a condition of state approvals which may be granted. Maintenance responsibilities for the public lagoon area should be clearly defined and address levels of water quality which must be met, removal of accumulated organic material, and maintenance dredging.

We continue to be concerned that the public lagoon will not be provided with an independent seawater intake. The applicant should address how the water quality in the public lagoon should be maintained in the event that the public lagoon cannot adequately supply the volume or quality of water needed; if, for example, when the private lagoon is closed for repairs. It appears that the volume of water flowing into the public lagoon will be a function of the water level in the private lagoon. If, for any reason the water levels drop, it appears that the volume of water entering the public lagoon area would diminish and water quality could deteriorate. The seawater inputs should be located to generate adequate mixing. A means should be provided to ensure that water quality within the public lagoon is maintained.

The following comments relate to Special Management Area and Shoreline Variance application requirements:

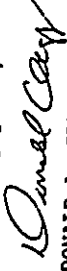
Page 31 of the FEA discusses existing drainage patterns for stormwater runoff and outlines three different options. As part of the Special Management Area Use Permit application, we will require more definitive information in terms of changes in runoff patterns and volumes, and the constituents present in runoff. As was indicated in our letter of June 15, 1994, we generally would prefer that storm water be diverted from the public lagoon and off-shore waters.

The Honorable Keith W. Ahue, Director
Page 3
October 14, 1994

In addition, we will require more detailed plans for proposed structures including elevations of buildings and a cross section for the lagoon. If our concerns are adequately addressed by the applicant, we can support a negative declaration. If not, we recommend that a full EIS be required.

If you have any questions, please contact Ardis Shaw-Kim of our staff at 527-5349.

Very truly yours,



DONALD A. CLEGG
Director of Land Utilization

DAC:fm

cc: Eric B. Guinther

hlltem:esk



970 N. Kalia Avenue, Suite C300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

October 19, 1994

Donald A. Clegg

Director

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

Final Environmental Assessment (FEA)

Hilton Lagoon Project

Tax Map Keys: 2-3-37: 21; 2-6-8: 54; 2-6-8: 01

Dear Mr. Clegg,

Thank you for your review and response to the subject EA which was addressed to Kieth Ahue, Director of DLNR. We have been in communication with Mr. Art Challacomb and Ms. Ardis Shaw-Kim on your staff. As the preparer of the EA document we offer the following responses to the comments you sent.

Water Quality Improvement

Establishing quantitative estimates of water quality improvement in the Kahanamoku Lagoon as a consequence of the operation of the HHV/EnterOcean attraction is made difficult by 1) the many parameters comprising "water quality" which may be of interest, but will each behave differently as sea water is passed from the intake through the lagoons to the discharge point, and 2) quantitative uncertainties of the physical and biological processes within each lagoon that will alter the forms and concentrations of materials and substances in that water. The EA (and particularly Appendix C of the EA, a technical report prepared by AECOS) attempts to describe the processes that will influence many of the water quality parameters, make comparisons with "similar" artificial systems, and relate how existing water quality (measured in the project area by AECOS over an eight month period) would likely change. Additional information pertinent to this approach is provided below.

page 2

However, to answer the question as posed by your letter it should not be necessary to predict concentrations of all of the parameters that might be of interest to the Department of Health, for example, when considering a discharge permit for the project. For the existing Kahanamoku Lagoon to become an improved recreational facility the flow of water (that is, the exchange of clean sea water) must be increased from the present 4000 gpm or less. No other improvements (e.g., various water treatments, opening of a large connection through Kahanamoku Beach, removal of silt, etc.) can offer the same promise of success with no or minimal adverse consequences. While the issue ultimately comes down to water quality, we believe you are requesting that the applicant demonstrate that the proposed changes and improvements have a strong likelihood of conferring recreational value on the Kahanamoku Lagoon. Several factors can be listed as probably responsible for the present low recreational usage of the lagoon:

- a silt layer covering much of the bottom;
- the presence of nuisance biota (jellyfish);
- high coliform/enterococcus counts;
- a perception that the water exchange is poor; and
- sometimes turbid water conditions.

The silt layer on the bottom can be removed as an isolated action, but this would not remedy the other factors, and the poor quality (with respect to suspended solids) of the present inflow and slow turnover rate would promote continued accumulation of silt. The HHV/EnterOcean proposal includes removal of the silt layer and is expected to reduce inputs of turbid water from the sea. Additional particulates will be generated by the proposed Hilton Lagoon, and these will be swept into the public lagoon. The more rapid turnover of water in the public lagoon will reduce the opportunity for settlement of particulates from either source (from the source water off Waikiki or from the Hilton Lagoon), but exactly how much will be retained in the public lagoon and how much will be entrained in the lagoon discharge would be difficult to predict without more detailed knowledge of the nature of the particulates and current patterns in the newly configured lagoon.

The nuisance jellyfish can be removed by hand with limited success. Only by altering the environment, will this species be eliminated from the lagoon. The proposal to increase the flow of water through the lagoon to 15,000 gpm (a factor of four) has the potential for successfully achieving eradication, but not enough is known about this species to guarantee that the population will be unable to survive in the improved lagoon environment.

Studies have suggested that the high microbial counts in the lagoon are related to the source water: the nearshore area off Kahanamoku Beach. Counts would be even higher if more land drainage were directed into the lagoon or more users utilized this confined body of water. The proposal to move the intake to an area of low enteric bacteria counts and increase the turnover rate of the water will reduce the microbial count substantially. The applicant has also suggested redirecting storm drain runoff presently entering the lagoon (amplified below).

The design of the Hilton Lagoon attraction, with water flowing over low waterfalls into the public lagoon, the potential for substantial improvement in water clarity (attending the improvement of source water and more rapid turnover rate), and the probability that marine life will increase in the lagoon, should all contribute to a perception that the environment is a healthy one than is presently the case.

The AECOS (1994) water quality study of the lagoon and adjacent areas showed that on average, the lagoon was slightly more turbid than even the inner parts of the Ala Wai Yacht Harbor. Only the area directly off Kahanamoku Beach (where the present lagoon intake pipes draw water) had higher average turbidity and suspended solids (expected since waves and swimmers stir the bottom here). Moving the source of water to the middle or outer part of the Catamaran Channel would improve water clarity in the public lagoon to a level above that experienced by adjacent recreational areas and comparable to offshore water clarity, further contributing to the perception that the environment is very suitable for recreation.

The determination of turnover rates for the public lagoon were partly based on an assessment conducted by AECOS of decorative ponds on the Big Island (AECOS, 1992). This study is extensively summarized in the AECOS (1994) study provided as Appendix C in the EA. The decorative pond systems were sampled to provide indications on the kinds of water quality changes that occur in flow-through sea water ponds stocked with marine fishes and other animals and limu. The Hilton/EnterOcean Lagoon turnover rate is several times greater because of the increased depth of the swim-through features compared with most decorative ponds, the desire to support higher stocking densities, and the fact that people would be spending time in the water with the biota.

Long-Term Maintenance

The applicant agrees with the points raised to provide long term maintenance of both the commercial and public lagoons created out of this project and supply the public lagoon with high quality water at all times.

Independent Sea Water Intake

Construction and maintenance of a separate sea water system for the public lagoon would be difficult to justify given the considerable benefit in water quality improvement already anticipated from the project as proposed. However, the sea water intake system could be designed so that the public lagoon is not dependent upon water flowing through the HHV/EnterOcean Lagoon. In the unusual event that the latter were shut down for any reason, a bypass could be built to divert incoming water directly to the public portion (i.e., the pumps would continue to provide clean sea water to the public lagoon).

Storm Water Runoff

The three options for disposal of storm runoff from the Hilton property (EA page 31) were provided because only these three possibilities exist (aside from onsite retention). The contribution of "runoff" from the project will be quite small, but would be combined with the Hilton Hawaiian Village runoff which currently flows into the Kahanamoku Lagoon. Proposing that this runoff be diverted elsewhere is intended as a potential benefit to the public recreational resource. Continuing this discharge into a lagoon with a much improved turnover will be a positive impact, and redirecting this runoff into the outflow stream (as depicted in Figure 6 of EA) will be an even more positive impact. We will provide more definitive information about the source and drainage area(s) contributing to this storm water discharge as you request in the Special Management Area Use Permit application.

Detailed Plans

Enclosed is a plan showing general arrangement and sections of the proposed structure and lagoon.

We hope these responses have adequately addressed your concerns and we remain available to respond to any additional questions at (808) 254-5884.

Sincerely,



Eric B. Guinther

encl.: AECOS (1992) report entitled "Measurement of the quality of the effluent from decorative salt water pond systems in Hawaii" Report No. 645, 19 p.
Drawing entitled "Hilton Lagoon Project".

cc: Cecil Santos, Department of Land and Natural Resources.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU HAWAII 96813



June 16, 1994

FRANK P. FISHER
VALERIO ANISCA, A CONSULTANT
WALTER HARRISON, A CONSULTANT
ESTER J. HARRISON, A CONSULTANT
DORIS HARRISON, A CONSULTANT
TERRY JOHNSON
WELSON
KENTHIE E. SPRAGUE
Manager and Chief Engineer

Mr. Daniel Dinell
Assistant to the Senior Vice President
Hilton Hawaiian Village
2005 Kalia Road
Honolulu, Hawaii 96815-1999

Dear Mr. Dinell:

Subject: Your Letter of April 14, 1994 on the Draft Environmental Assessment (DEA) for the
Hilton Lagoon Project, Honolulu. TMK: 2-3-37: 21: 2-6-08: 34: 2-6-09: 01


Thank you for the opportunity to review and comment on the DEA for the proposed renovations
and improvements to the Hilton lagoon.

We have the following comments to offer:

1. There are two (2) existing fire meters and three (3) existing domestic meters serving
the Hilton Hawaiian Village.
2. The availability of water will be determined when the Building Permit Application is
submitted for our review and approval. If water is made available, the applicant
will be required to pay our Water System Facilities Charges for source-transmission
and daily storage.
3. The cross-connection control requirement will be determined prior to the approval
of the building permit application.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,


KAZUY HAYASHIDA
Manager and Chief Engineer



970 N. Kaliaheo Avenue, Suite C300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

June 27, 1994

Board of Water Supply
City and County of Honolulu
630 So. Beretania Street
Honolulu, Hawaii 96843

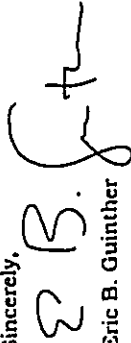
Attn: Kazu Hayashida
Manager and Chief Engineer

Dear Mr. Hayashida,

Daniel Dinell of Hilton Hawaiian Village has requested that I respond to
your comments concerning the draft EA for the Hilton Lagoon Project
recently reviewed by Mr. Barry Usagawa of your staff. Let me thank you
for participating in the process. As indicated in your letter, the comments
provided are really points that will need to be addressed during the
Building Permit Application stage. The Hilton Lagoon Project proposes
very minimal use of existing fresh water resources and/or facilities. Your
letter will be incorporated into the final EA for the project.

Again, thank you for your input.

Sincerely,


Eric B. Guinther

PLANNING DEPARTMENT
CITY AND COUNTY OF HONOLULU
810 SOUTH KING STREET
HONOLULU HAWAII 96813



ROBIN FOSTER
CHIEF PLANNING OFFICER
ROLAND LIBBY, JR.
DEPUTY CHIEF PLANNING OFFICER

LR 4/94-3486

May 25, 1994

FRANK FASH
MAYOR

Mr. Daniel Dinell,
Assistant to the Senior Vice President
Hilton Hawaiian Village
2005 Kalia Road
Honolulu, Hawaii 96815-1999

Dear Mr. Dinell:

Draft Environmental Assessment (EA) for the
Proposed Hilton Lagoon Project
TKMS: 2-3-37:21; 2-6-8:34; & 2-6-9:1

Thank you for the opportunity to comment on the subject
Environmental Assessment. The proposed project appears to be
generally consistent with the goals and policies of the Waikiki
Master Plan. On a more detailed level, we would encourage the
project to include improvements to the adjacent beachwalk and
planting of coconut palms as called for in the Plan.

Should you have any questions, please contact Lin Wong of
our staff at 523-4485.

Sincerely,

ROBIN FOSTER
Chief Planning Officer

RF:ft

51:23 18:00:00

55

Hilton Hawaiian Village

June 6, 1994

Mr. Robin Foster
Chief Planning Officer
City and County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813

Dear Mr. Foster:

Mahalo for your letter of May 25, 1994. The EnterOcean Group and the Hilton
Hawaiian Village appreciate the City Planning Department taking the time to review
the Hilton Lagoon Project draft Environmental Assessment.

We have noted your suggestion relative to improvements to the adjacent
beachwalk. As you may recall, the Hilton Hawaiian Village was one of the driving
forces behind the Waikiki Gateway Plan which was initiated by the Waikiki
Improvement Association. We are also supportive of the Waikiki Master Plan.

Your letter has been incorporated into the final Environmental Assessment which
is in the process of being finalized based on all the comments received. We
sincerely believe that this proposed project is a win-win for all parties involved.

Again, thank you for your input.

Sincerely,

Daniel Dinell

THE
ENTEROCEAN
GROUP

HAWAII



WALTER M. OZAWA
DIRECTOR
ALVIN K. C. AU
DEPUTY DIRECTOR

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU

450 SOUTH KING STREET
HONOLULU, HAWAII 96813



June 8, 1994

Mr. Daniel Dinell
Assistant to the Senior Vice President
Hilton Hawaiian Village
2005 Kalia Road
Honolulu, Hawaii 96815-1999

Dear Mr. Dinell:

Subject: Hilton Lagoon Project

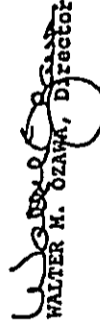
Thank you for the opportunity to review and comment on the draft environmental assessment for the proposed Hilton Lagoon project.

We welcome this development as it addresses two significant issues in which we hold interest. First, the existing man-made lagoon has been in need of significant improvements for many years. The lagoon project will improve water quality through a vastly superior water circulation system employing technology not available when it was originally constructed several decades ago.

Second, the development will provide an interesting, albeit commercial, alternative to visitor attractions such as our Hanauma Bay Nature Park. It is located in Waikiki and will service visitors with minimal impact on traffic.

If you have any questions, please contact Bob Bevacqua of our Advance Planning Branch at 527-6316.

Sincerely,


WALTER M. OZAWA, Director

WMO:ct

We Add Quality to Life

June 8, 1994

Mr. Walter Ozawa
Director, Department of Parks and Recreation
City and County of Honolulu
630 South King Street
Honolulu, Hawaii 96813

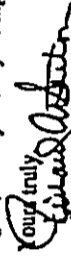
Dear Mr. Ozawa:

Mahalo for your letter of June 8, 1994. The EnterOcean Group and the Hilton Hawaiian Village appreciate the Department of Parks and Recreation taking the time to review the Hilton Lagoon Project draft Environmental Assessment.

Your letter has been incorporated into the final Environmental Assessment which is now being finalized.

We agree with your conclusions that this proposed project will provide numerous positive benefits for Waikiki as well as all the residents of Honolulu.

Again, thank you for your input.

Yours truly,


Richard A. Heaton

2045 Kamehameha IV Road
Suite 200
Honolulu, Hawaii 96819
Phone (808) 845-2453
Fax (808) 841-3004

InterActive
Marine
Recreation
Design
Construction
& Management

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



KENNETH E. SPRAGUE
DIRECTOR AND CHIEF ENGINEER

ENV 94-123

May 3, 1994

FRANK PASK
MAYOR

Mr. Daniel Dinell
Assistant to the Senior Vice President
Hilton Hawaiian Villags
2005 Kalia Road
Honolulu, Hawaii 96815-1999

Dear Mr. Dinell:

Subject: Draft Environmental Assessment (DEA)
Hilton Hawaiian Village - Hilton Lagoon
THK: 2-2-37, 2-6-08, 3-4 and 2-6-02, 101

We have reviewed the subject DEA and have no comments to offer at this time.

Should you have any questions, please contact Mr. Alex Ho, Environmental Engineer, at 523-4150.

Very truly yours,


KENNETH E. SPRAGUE
Director and Chief Engineer

94:5:3



June 6, 1994

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

Dear Mr. Sprague:

Mahalo for your letter of May 3, 1994. The EnterOcean Group and the Hilton Hawaiian Village appreciate the Department of Public Works taking the time to review the Hilton Lagoon Project draft Environmental Assessment.

We have noted that you have no comments to offer at this time; however, your letter has been incorporated into the final Environmental Assessment which is in the process of being finalized based on all the comments received.

We sincerely believe that this proposed project is a win-win for all parties involved.

Again, thank you for your input.

Sincerely,


Daniel Dinell

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU

PACIFIC PARK PLAZA
311 KAPOLANI BOULEVARD SUITE 1200
HONOLULU, HAWAII 96813



FRANKIE JASH
44100

JOSEPH H. MAGALDI, JR.
DIRECTOR
AMAR SAPPAL
ASST. DIRECTOR

Hilton Hawaiian Village

May 16, 1994

Mr. Daniel Dinell
Assistant to the Senior Vice President
Hilton Hawaiian Village
2005 Kalia Road
Honolulu, Hawaii 96815-1999

Dear Mr. Dinell:

Subject: Hilton Lagoon Project
Draft Environmental Assessment (EA)
TRK: 2-3-37; 21: 2-6-8; 34: 2-6-9: 1

This is in response to your letter of April 14, 1994 requesting our comments on the subject draft EA.

Based on our review, we have no comments or objections to the proposed project at this time.

Should you have any questions, please contact Lance Watanabe of my staff at 523-4199.

Sincerely,

JOSEPH H. MAGALDI, JR.
Director

June 6, 1994

Mr. Joseph Magaldi, Jr.
Director, Department of Transportation Services
City and County of Honolulu
711 Kapiolani Boulevard, Suite 1200
Honolulu, Hawaii 96813

Dear Mr. Magaldi:

Mahalo for your letter of May 16, 1994. The EnterOcean Group and the Hilton Hawaiian Village appreciate the City Department of Transportation Services taking the time to review the Hilton Lagoon Project draft Environmental Assessment.

We have noted that you have no comments to offer at this time; however, your letter has been incorporated into the final Environmental Assessment which is in the process of being finalized based on all the comments received.

We sincerely believe that this proposed project is a win-win for all parties involved.

Again, thank you for your input.

Sincerely,

Daniel Dinell

MAY 2 1994

UNIVERSITY OF HAWAII

Sea Grant Extension Service
School of Ocean and Earth Science and Technology

Richard A. Heaton, President
The EnterOcean Group
2045 Kamehameha IV Road
Suite 200
Honolulu, HI 96819

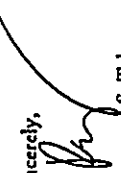
Dear Richard,

Thanks for the opportunity to learn more about your various underwater experience projects planned or underway. After reading the EA for the Hilton Hawaiian Village project and meeting with you, I believe the theme parks being planned have potential for providing educational experiences for residents and visitors in controlled environments. This would be a desirable alternative for novices and inexperienced snorkelers and divers, especially with regard to places such as Hanauma Bay that are overly popular with visitors seeking an introductory experience in the ocean.

Personally, I would prefer that beachgoers interested in seeing hundreds of tame fish in a relatively safe environment go to places such as the proposed Hilton facility. Places such as Hanauma Bay and Moloiki Crater should be visited by divers and snorkelers who have already gained some appreciation and understanding of the sensitivity of Hawaiian reefs to inappropriate practices such as touching and brushing against corals, picking up live organisms, or trampling on reef surfaces. Your facility has the potential to help residents and visitors become more sensitive to marine conservation concerns and to conduct themselves in a more responsible manner.

If you need further assistance with the educational or interpretive aspects of your plans, I'd be happy to help. Thank you again for the opportunity to meet with you last week.

Sincerely,


Raymond S. Tabata
Associate Extension Agent
Coastal Recreation and Tourism

cc: Dorian Travers, Hanauma Bay Educational Program

Community Outreach and Technology Transfer for the Sea Grant College Program
1000 Pope Road - Room 216 - Haeahala, Hawaii 96822
Telephone: (808) 956-6191 - Facsimile: (808) 956-4338 - Cable Address: UNIHAW
An Equal Opportunity/Affirmative Action Institution



June 6, 1994

Mr. Raymond Tabata
Associate Extension Agent, Coastal Recreation and Tourism
University of Hawaii
Sea Grant Extension Service
1000 Pope Road, Room 226
Honolulu, Hawaii 96822

Dear Mr. Tabata:

Mahalo for your letter of May 4, 1994. The EnterOcean Group and the Hilton Hawaiian Village appreciate the Sea Grant Extension Service of the University of Hawaii taking the time to review the Hilton Lagoon Project draft Environmental Assessment.

Your letter has been incorporated into the final Environmental Assessment which is in the process of being finalized based on all the comments received. We agree with you that the Hilton Lagoon facility will assist residents and visitors become more sensitive to marine conservation; in fact, this is one of our goals.

We sincerely believe that this proposed project is a win-win for all parties involved. Again, thank you for your input.

Sincerely,


Daniel Dinell

2005 Kalia Road, Honolulu, Hawaii 96815-1999 Telephone 808-919-4321 Telex 8100
Reservations 1-800-HILTONS



University of Hawai'i at Mānoa

School of Travel, Industry Management
Hotel, Restaurant, Tourism and Transportation Administration
George Hall - 2560 Campus Road • Honolulu, Hawaii 96822
Cable Address: UNHIAW • Telex 7431701
Telephone: (808) 950-8948 • Facsimile: (808) 956-5378

May 24, 1994

Mr. Daniel Dinell, Assistant to the Senior Vice President
Hilton Hawaiian Village
2005 Kalia Road
Honolulu, HI 96815-1999

Dear Mr. Dinell:

On behalf of Dean Chuck Gee of the School of Travel Industry Management at the University of Hawaii at Manoa, I appreciate this opportunity to respond to your May 10 letter requesting comments regarding the proposed Hilton Lagoon Project. My background is in land-use planning and design. As you know, the School supports opportunities to diversify the visitor industry product in a sustainable way. After having reviewed the draft of the Environmental Assessment document, the proposed lagoon project appears to meet this goal. However, a few items for consideration that I hope will be addressed in the final EA document are as follows:

1. In your cover letter, you imply that the lagoon will "provide educational... opportunities" and "create job opportunities...in the ocean sciences." How? and How many? It would be helpful to have seen these issues specifically addressed as social impact concerns.
2. The argument that such a facility will provide an alternative to Hanauma Bay implies that visitor usage at Hanauma Bay will decrease. There is the likelihood that such a facility may actually stimulate greater interest in island snorkeling, scuba diving, and reef habitats overall thereby increasing usage of Oahu's natural reef areas.
3. Will the stocking of marine fishes and invertebrates be "native" or will there be exotic species as well? There is risk of unfortunate environmental consequences with the latter should the area ever be flooded.
4. There is the possibility that the lagoon might be "over-stocked" beyond natural conditions in order to boost visitor satisfaction. This could create an

ecological imbalance. Although the report hints at maximum number of participants in the lagoon, the carrying capacity of the lagoon -- both in terms of tourists and marine life -- might need to be further analyzed.

I believe the project is overall sound and merits praise for attempting to provide Waikiki (and Oahu) with an alternative, sustainable attraction. With the future convention center site nearby, it should be quite popular, and as such will no doubt add to the long list of Hilton's success stories here in Hawaii.

Sincerely,

Joseph D. Patoskie
Joseph D. Patoskie, Ph.D.
Assistant Researcher



Hilton Hawaiian Village

June 6, 1994

Dr. Joseph D. Patoskie
Assistant Researcher
School of Travel Industry Management
University of Hawaii at Manoa
George Hall, 2560 Campus Road
Honolulu, Hawaii 96822

Dear Dr. Patoskie:

Mahalo for your letter of May 24, 1994. The EnterOcean Group and the Hilton Hawaiian Village appreciate the School of Travel Industry Management taking the time to review the Hilton Lagoon draft Environmental Assessment.

1) The project will create a number of employment positions for students and graduates in the marine science field. When the facility is in full operation, we anticipate that approximately 50 such positions will need to be filled.

The educational programs are as yet in the initial planning stages. We have had discussions with Dr. Bruce Carlson of the Waikiki Aquarium, who will be assisting us with the development of cooperative educational programs with his facility. In addition, we anticipate the establishment of an active program wherein the swim-through experience can be offered to local school schools.

2) We agree with you that a safe dive experience may in fact stimulate greater interest in open ocean experiences. However, the EnterOcean Group will be working with one of their Advisory Board members, Mr. Ray Tabata, to infuse our natural history lectures with information on marine life preservation. We hope that those who do undertake subsequent open ocean experiences are thus better informed about the fragile nature of our natural ocean wonders and treat them accordingly.

3) You raise question about "native" marine species. Only endemic or indigenous species will be maintained in the attraction.

Dr. Joseph D. Patoskie
June 6, 1994
Page 2 of 2

4) With regard to the possibility of "overstocking," clearly the expense of securing and caring properly for the marine life in the attraction makes it uneconomical to endanger the population by intentional overstocking.


The question of the maximum number of people and fish in the system has been raised by others. The entire system will contain 2 1/2 million gallons of water and thus equivalent to approximately 125 normal sized backyard swimming pools containing 20,000 gallons of water each. Thus, at the maximum, the density of humans in the system is roughly equivalent to one person in a normal size swimming pool. It is therefore very low. The estimated visitor numbers are a function of what the facility and the marine specimens can handle in order to ensure a quality experience. This will be expanded upon in the final EA.

Your letter and this response will be incorporated into the final Environmental Assessment which is in the process of being finalized based on all the comments received.

We sincerely believe that this proposed project is a win-win for all parties involved.

Again, thank you for your input.

Sincerely,



Daniel Dinelli



W A I K I K I
I M P R O V E M E N T
A S S O C I A T I O N

2270 Kalakaua Avenue
Suite 4750
Honolulu, Hawaii 96815
Telephone (808) 932-1094
FAX (808) 932-2822
Christina Kemmer
President

David J. Schall
General Manager
Hilton Hawaiian Village
2270 Kalakaua Avenue
Honolulu, Hawaii 96815
Telephone (808) 932-1094
FAX (808) 932-2822
Christina Kemmer
President

Mr. Peter Schall
General Manager
Hilton Hawaiian Village
2270 Kalakaua Avenue
Honolulu, Hawaii 96815
Telephone (808) 932-1094
FAX (808) 932-2822
Christina Kemmer
President

Dear Peter,
Thank you for the opportunity to comment on the Environmental Assessment for the proposed Hilton Lagoon Project.

The Waikiki Improvement Association continues to work with the community to achieve physical improvements that will enhance Waikiki's position as a competitive resort destination and provide educational and entertainment opportunities for residents and visitors alike.

Our comments focus on the many positive aspects we feel this development will provide for our community. It will:

- Provide relief alternatives to natural marine reserves
- Improve the water quality of the Lagoon and the surrounding marina
- Improve the beach conditions in the area
- Improve the landscaping of the surrounding land area while retaining openness and uninterrupted view planes to the ocean for the surrounding properties
- Provide education and entertainment field for 80 to 120 persons

We ask that during the construction period mitigation measures to reduce adverse environmental and social impacts be implemented as outlined in section 6.1 of the Draft Environmental Assessment.

Once again Hilton Hawaiian Village sets another benchmark for a win/win Waikiki improvement project.

With Aloha,
Christina Kemmer
Christina Kemmer
President

May 26, 1994

Mr. Peter Schall
General Manager
Hilton Hawaiian Village

Dear Peter,

Thank you for the opportunity to comment on the Environmental Assessment for the proposed Hilton Lagoon Project.

The Waikiki Improvement Association continues to work with the community to achieve physical improvements that will enhance Waikiki's position as a competitive resort destination and provide educational and entertainment opportunities for residents and visitors alike.

Our comments focus on the many positive aspects we feel this development will provide for our community. It will:

- Provide relief alternatives to natural marine reserves
- Improve the water quality of the Lagoon and the surrounding marina
- Improve the beach conditions in the area
- Improve the landscaping of the surrounding land area while retaining openness and uninterrupted view planes to the ocean for the surrounding properties
- Provide education and entertainment field for 80 to 120 persons

We ask that during the construction period mitigation measures to reduce adverse environmental and social impacts be implemented as outlined in section 6.1 of the Draft Environmental Assessment.

Once again Hilton Hawaiian Village sets another benchmark for a win/win Waikiki improvement project.

With Aloha,
Christina Kemmer
Christina Kemmer
President

June 6, 1994

Ms. Christina Kemmer
President
Waikiki Improvement Association
2270 Kalakaua Avenue, Suite 1700
Honolulu, Hawaii 96815

Dear Christina:

Peter Schall asked me to respond to your letter of May 26, 1994. The EnterOcean Group and the Hilton Hawaiian Village appreciate the Waikiki Improvement Association taking the time to review the Hilton Lagoon Project draft Environmental Assessment.

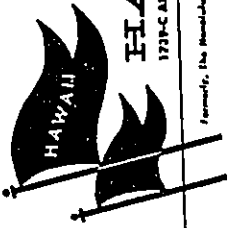
Thank you for the many positive comments regarding our proposed project. We have noted your suggestion relative to minimizing disturbance during the construction period. Your letter has been incorporated into the final Environmental Assessment which is in the process of being finalized based on all the comments received.

We are pleased that the WIA shares our view that the Hilton Lagoon as a win-win improvement project for Waikiki.

Again, thank you for your input.

Sincerely,

Daniel Dinell
Daniel Dinell



HAWAII YACHT CLUB

1739-C ALA MOANA BLVD. • HONOLULU, HAWAII 96815 • 1973

Formerly, the Honolulu Yacht Club, The Cruising Club of Hawaii and the Alo Moana Nautical Club.

May 26, 1994

Mr. Peter Schall, General Manager
Hilton Hawaiian Village
2005 Kalua Rd.
Honolulu, Hawaii 96815

Dear Peter:

It was again my pleasure to meet with you and Richard Heaton. The presentation concerning the proposed project for the Hilton Lagoon given by yourselves and Richard was most informative.

Please feel assured that you have the full support of the Hawaii Yacht Club and its nearly 2,000 members. Development of this type is long overdue in that it not only helps beautify the area, but also has economic and educational benefits as well. We all applaud your efforts.

If there is anything that I can do, or anything that the Hawaii Yacht Club can do to be of assistance please feel free to call upon us.

Thank you again and good luck with your project.

Sincerely,

Steven Langford
Commodore, HVC, 1994

1994 05 31 14:40

Crane and Fish Among "The Trenches" of Island, Anchored in the Ocean.



June 6, 1994

Mr. Steven Langford
Commodore, Hawaii Yacht Club
1739-C Ala Moana Blvd.
Honolulu, Hawaii 96815

Dear Commodore Langford:

Peter Schall asked me to acknowledge your letter of May 26, 1994. The EnterOcean Group and the Hilton Hawaiian Village appreciate the Hawaii Yacht Club taking the time to review the Hilton Lagoon Project draft Environmental Assessment.

Thank you for the many positive comments relative to our proposed project as well as your offer of assistance. We truly appreciate your support and that of your members. Your letter has been incorporated into the final Environmental Assessment which is in the process of being finalized based on all the comments received.

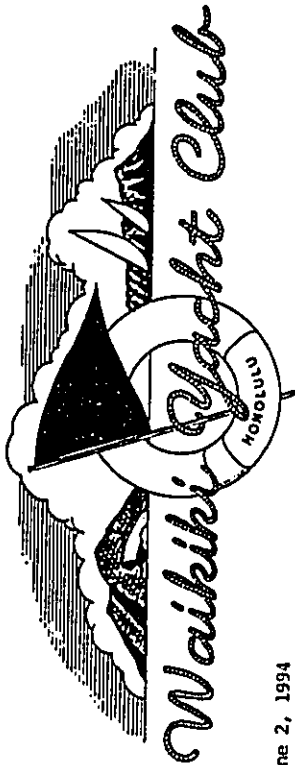
We sincerely believe that this proposed project is a win-win for all parties involved. We look forward to continuing to work with you and keeping you informed about this exciting project.

Again, thank you for your input.

Sincerely,

Daniel Chinell

2005 Kalua Road, Honolulu, Hawaii 96815-1999 Telephone 808-919-4321 Telex 8330
Reservations 1-800-HELLOSS



June 2, 1994

Daniel Dinell
Assistant to the Senior Vice President
Hilton Hawaiian Village
2005 Kalua Road
Honolulu, HI 96815-1999

Dear Daniel:

The Board of Directors of Waikiki Yacht Club have reviewed your proposal for the Hilton Lagoon and agree to its exciting and desirable addition to our tourist industry.

It will be good for the local economy as well as educational. We also support your efforts to provide cleaner water through the Ala Wai Harbor area.

If we can be of further assistance to you on this project, please call me.

Sincerely,

Frank Thomas
Frank Thomas
Commodore WYC



June 6, 1994

Mr. Frank Thomas
Commodore, Waikiki Yacht Club
1599 Ala Moana Blvd.
Honolulu, Hawaii 96814

Dear Commodore Thomas:

Mahalo for your letter of June 2, 1994. The EnterOcean Group and the Hilton Hawaiian Village appreciate the Waikiki Yacht Club taking the time to review the Hilton Lagoon Project draft Environmental Assessment. Your letter has been incorporated into the final Environmental Assessment which is in the process of being finalized based on all the comments received.

We certainly agree that the project will be good for the local economy as well as prove to be educational. An ancillary benefit will be cleaner water in the Ala Wai Boat Harbor as well. Thank you too for your offer of assistance. We truly appreciate your support and that of your members. We look forward to continuing to work with you and keeping you informed about this exciting project.

We sincerely believe that this proposed project is a win-win for all parties involved.

Again, thank you for your input.

Sincerely,

Daniel Dinell
Daniel Dinell

JUN 2 04:51

HONOLULU DISTRICT
PRESIDENT
VICE PRESIDENT
DELEGATES TO TERRITORY
SECOND AICE PRESIDENT
MAJORITY LEADER
MINORITY LEADER
ALONG WITH LEADER
MAJORITY POLICY LEADER
MAJORITY FLOOR LEADER
ALONG WITH LEADER
MAJORITY FLOOR LEADER
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MINORITY LEADER

The Senate
The Seventeenth Legislature
of the
State of Hawaii
STATE CAPITOL
HONOLULU, HAWAII 96813



Hilton Hawaiian Village

June 6, 1994

Senator Joe Tanaka
Chair, Senate Tourism Committee
State Capitol
Honolulu, Hawaii 96813

Dear Senator Tanaka:

Mahalo for your letter of May 3, 1994. The EnterOcean Group and the Hilton Hawaiian Village appreciate your taking the time to review the Hilton Lagoon Project draft Environmental Assessment and thank you for your offer of assistance.

Your letter has been incorporated into the final Environmental Assessment which is in the process of being finalized based on all the comments received.

We sincerely believe that this proposed project is a win-win for all parties involved.

Again, thank you for your letter.

Sincerely,

Daniel Dinell
Daniel Dinell

May 3, 1994

Mr. Daniel Dinell
Assistant to the Senior
Vice President
Hilton Hawaiian Village
2005 Kalia Road
Honolulu, HI 96815

Dear Mr. Dinell,

Thank you for providing me with a draft of the Environmental Assessment for the proposed Hilton Lagoon Project. Your consideration is greatly appreciated.

If there is anything I can do to assist you in the future, please feel free to contact me at 586 - 7110.

Once again, thank you.

Sincerely,

Joe S. Tanaka
Joe S. Tanaka
State Senator
JST/mg

45:03 6 11:10

2003 Kalia Road, Honolulu, Hawaii 96813-1999 Telephone 808-949-1221 Telex 8330
Reservations 1-800-HILTONS

May 1, 1994

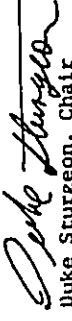
Mr. Daniel Dinell
Assistant to the Senior Vice President
Hilton Hawaiian Village

Dear Mr. Dinell,

Here are some questions the Waikiki Neighborhood Board Planning and Zoning Committee raised at our last committee meeting after reading your EA on the HILTON LAGOON PROJECT.

If you could incorporate the answers into your presentation before the Board on Tuesday May 3, 1994 it will help us get a better grasp of the proposed project.

Thank you,


Duke Sturgeon, Chair
Planning and Zoning Committee
Waikiki Neighborhood Board #9

My unlisted phone number is

05/02/94 xc: Peter Schall
Fred Ing

81

HILTON LAGOON PROJECT--ENVIRONMENTAL ASSESSMENT

How long has the EnterOcean Group been a Honolulu-based enterprise? With what other operations and in what capacity have they also been associated?

p.35- who or what entity made the statement that "this project can be accomplished without significant impact, etc"?

p. 45--How will traffic flow change be coordinated with the Convention Center traffic flow change taking place at the same time? Where does traffic go after it leaves HHV property? If lease is cancelled or abandoned after project is started, is an easement over HHV property being given to the new leasee? Describe the muffled equipment, where are the guidelines and who enforces them?

p.46--What are the arrangements about the lease rent income? Hopefully, it will be used as a separate fund to serve the public good in Waikiki. Could this issue be part of the EIS?

What impact will this project have on the Waikikian during and after construction?

How will the "private sector" be separated from the "public sector"? Appendix A--How do you justify a "for profit" project on Conservation District Land? Would not the needed lease have to be put out for public bid? doesn't parking have to be addressed as some of the hotel seems to have be "pledged" for other use in the Waikiki Master Plan. If it already projected to be used, it does not seem to be used for the new attraction also: Who is responsible for the maintenance of the in-flow and out-flow pipes?

Is any provision being made for the leasee to tear down this project at the end of the lease. If HHV abandons the current lagoon, the State of Hawaii (taxpayers) have to shoulder the demolition costs.

It states the HHV Joint Venture will be responsible for the water quality of the project; aren't we in the present mess today because the HHV has not kept up the water quality?

Could you bring copies of the original 1955 lease (signed by Mr. Kaiser and the State of Hawaii) on the current lagoon project.

Why can't the present water quality be improved with out this present proposal, which will have many impacts on Waikiki, the shoreline, etc.?

HILTON LAGOON PROJECT

On page 20 under Water Quality Considerations in the back portion of the draft booklet, it states that material may accumulate on the bottom of the lagoon, requiring maintenance removal. Will Hilton be responsible for maintaining the removal, and how often will it be done?

On page 18 of this same section it states that feeding the animals in the aquarium environment will need to be monitored and adjusted to prevent excess feed from being discharged into the public lagoon. How will this be done?

On page 27 of the first section it states that storm water runoff from the grounds of the hotel would have to be diverted to the Ala Wai Boat Harbor or the public portion of the lagoon. If you don't want the water runoff in the Hilton Lagoon, why would it be acceptable in the public lagoon?

Page 32 of the first section mentions the physical separation resulting from elevational differences between the two lagoons. How high would the barrier be and what is the difference in depths between the two lagoons?

Page 33 states that the residence time of water in the Hilton Lagoon would be 3 hours, and the time in the public lagoon would be under 10 hours. Why is there a difference in time? Is there a pipe being built to conduct the overflow from the Hilton Lagoon to the public lagoon? Will the depth of the public lagoon be affected during the overflow?



May 14, 1994

Mr. Duke Sturgeon
Chair, Planning and Zoning Committee
Waikiki Neighborhood Board
c/o 444 Namahana St. #2C
Honolulu, Hawaii 96815

Dear Mr. Sturgeon:

Mahalo for your letter of May 1, 1994. The EnterOcean Group and the Hilton Hawaiian Village appreciate the Waikiki Neighborhood Board Planning and Zoning Committee taking the time to review the Hilton Lagoon draft Environmental Assessment.

Although many of the concerns raised were addressed in the Board presentation we made on May 3, we do want to be responsive and address all issues raised. I have taken the liberty of dividing up the questions and assigning numbers to each. Following is our response to each of your questions which have been repeated verbatim:

1) How long has the EnterOcean Group been a Honolulu-based enterprise? With what other operations and in what capacity have they also been associated?

The EnterOcean Group, Inc. is a Hawaii-based corporation specializing in the design, construction, and operation of interactive ocean-related entertainment facilities. The Company was founded by the owners of four companies: Hardscapes Hawaii, Ltd. (Hawaii) a leading firm in the design and construction of natural water amenities for tropical resorts as well as zoo and aquarium exhibits; Ocean Adventures (Guam), a leader and pioneer in underwater tour operations in the Pacific; Underwater Recreational Vehicles, Inc. (Florida), a developer of recreational submersibles for use in the tourism industry; and BIOS:inc (Washington), a specialist and world leader in the field of aquarium design and planning.

2) Page 35 -- who or what entity made the statement that "this project can be accomplished without significant impact, etc.?"

The question takes a statement out of context. Page 35 states the following: "Construction of the intake pipes . . . can be accomplished without significant impact to biological resources on the Waikiki reef." AECOS performed the biological study of the limestone remnant which we plan to cut through, and the statement is theirs. AECOS is a well-known biological and water quality consultant.

- 3) How will traffic flow change be coordinated with the Convention Center traffic flow change taking place at the same time? Where does traffic go after it leaves HHV property?

As the Board members are aware, the Waikiki traffic circulation plan is currently under review by the City as well as by the State Convention Center Authority. Until this plan is finalized it is impossible to say where traffic will go after it leaves the HHV, except to say that under all 3 scenarios being evaluated (one-way counterclockwise, one-way clockwise, and two-way). Kalia Road continues to accommodate 2-way traffic and will be expanded to 4 lanes.

- 4) If lease is cancelled or abandoned after project is started, is an easement over HHV property being given to the new lessee?

These issues have not been addressed yet, but will be determined by the State Board of Land and Natural Resources.

- 5) Described the muffled equipment, where are the guidelines and who enforces them?

The type of equipment used on normal construction projects will be utilized, except that no concrete pile drivers will be required. The State Department of Health issues the permits and monitors the noise level of equipment.

- 6) What are the arrangements about the lease rent income? Hopefully, it will be used as a separate fund to serve the public good in Waikiki. Could this issue be part of the EIS?

The rent is subject to the Board of Land and Natural Resources and the bid process. It is our understanding that a special fund would need to be established by the State legislature not by the DLNR or the successful bidder.

- 7) What impact will this project have on the Waikikian during and after construction?

During the desiltation and construction process use of the lagoon by swimmers may have to be curtailed during some or all of this operation. Once construction has been completed, the Waikikian will have the same access it now enjoys except to a lagoon with vastly improved water quality.

- 8) How will the "private sector" be separated from the "public sector"?

The swim-through attraction will be elevated about 3 feet above the public lagoon. On the public lagoon side the rise will be clad with synthetic rock and will contain waterfalls which will discharge into the public lagoon, providing the source of water for flushing.

- 9) Appendix A -- How do you justify a "for profit" project on Conservation District Land; would not the needed lease have to be put out for public bid?

Hawaii State law allows conservation district land to be used for various purposes including profit making entities. In fact, publicly held lands are often used by commercial enterprises so that the benefits derived (lease rents, tax revenues, employment, etc.) can be enjoyed by all the people of Hawaii. The DLNR has indicated that the lease would have to be put out for public bid.

- 10) Doesn't parking have to be addressed as some of the hotel seems to have been "pledged" for other use in the Waikiki Master Plan? If it already projected to be used, it does not seem to be used for the new attraction also.

As noted in the EA, according to current Waikiki Special District regulations the hotel has an excess number of parking stalls. This is the case even if the Kalia Tower and the lagoon project were developed.

- 10) Who is responsible for the maintenance of the in-flow and out-flow pipes?

The developers will be.

- 11) Is any provision made for the lessee to tear down this project at the end of the lease? If HHV abandons the current lagoon, the State of Hawaii (taxpayers) have to shoulder the demolition costs.

Again, this will be determined by the DLNR and part of the bid specification package.

- 12) It states the HHV Joint Venture will be responsible for the water quality of the project; aren't we in the present mess today because the HHV has not kept up the water quality?

The system currently in place was designed by the Territory of Hawaii (now the State of Hawaii) and constructed 40 years ago. The source of the water just off

Kahanamoku Beach probably was of very different quality then. The water quality problems which have developed are not the fault of the maintenance, but rather the original design and the deterioration of the offshore water source.

- 13) Why can't the present water quality be improved without this present proposal, which will have many impacts on Waikiki, the shoreline, etc?

A large capital expenditure will be required. This project will justify and pay for that expenditure, plus provide an environmentally responsible attraction for Waikiki. Regarding impact on the shoreline, there will be little or no impact on the shoreline.

- 14) On page 20 under Water Quality Considerations in the back portion of the draft booklet, it states that material may accumulate on the bottom of the lagoon, requiring maintenance removal. Will Hilton be responsible for maintaining the removal, and how often will it be done?

The project developer will be responsible for maintenance. Given that the new water source contains, on the average, one-seventh the amount of suspended solids, and that the water will move through the lagoon 4 times faster than it presently does, it is difficult to predict a precise sedimentation rate; however, it is predicted to be much less than at present.

- 15) On page 18 of this same section it states that feeding the animals in the aquarium environment will need to be monitored and adjusted to prevent excess feed from being discharged into the public lagoon. How will this be done?

The operators will establish a regular water quality monitoring program which will measure water changes in the entire system (public and private portions). We will utilize this data to adjust the environment/feeding levels in order to ensure a high quality of water both inside and outside the system.

- 16) On page 27 of the first section it states that storm water runoff from the grounds of the hotel would have to be diverted to the Ala Wai Boat Harbor or the public portion of the lagoon. If you don't want the water runoff in the Hilton Lagoon, why would it be acceptable in the public lagoon?

Because: a) the attraction is at a higher elevation than sea level; b) the public lagoon is much larger and thus much more dilution will take place; c) although it probably would be OK, we are not willing to take the chance of salinity variations in a system with the large number of fish and other animals we expect to have in the attraction; and d) our recommended course of action is not to deposit storm runoff into the lagoon, but directly to the Ala Wai Boat Harbor where storm runoff currently drains to.

- 17) Pages 5 and 32 of the first section mentions the physical separation resulting from elevational differences between the two lagoons. How high would the barrier be and what is the difference in depths between the two lagoons?

The attraction will vary in depth when compared to the more uniform concave bottom of the public lagoon, but the surface will be 3 feet higher.

- 18) Page 33 states that the residence time of water in the Hilton Lagoon would be 3 hours, and the time in the public lagoon would be under 10 hours. Why is there a difference in time? Is there a pipe being built to conduct the overflow from the Hilton Lagoon to the public lagoon? Will the depth of the public lagoon be affected during the overflow?

There will be a continuous flow of water into the attraction, which will then overflow via waterfalls into the public lagoon. (See answer #8.) The time difference is because the public lagoon will contain about three times more water volume than the attraction, so the water in the public lagoon will be there approximately three times longer before it is pumped into the boat harbor.

As you requested in your letter, at your May 3rd meeting we gave the Board a copy of the original 1955 deed and indenture signed by Henry Kaiser and the Territory of Hawaii. This document can also be reviewed at the State Bureau of Conveyances.

Your letter and this response will be incorporated into the final Environmental Assessment which will be finalized based on the comments received. I have taken the liberty of sending a copy of this letter to the Neighborhood Commission office so it can be included as correspondence in the Board's May meeting minutes. We want to not only be responsive to the Planning & Zoning Committee concerns, but be a good neighbor as well.

Again, thank you for your input and especially for the Board's vote May 3rd in favor of the concept. We look forward to working with the Waikiki Neighborhood Board in ensuring that this proposed project is a win-win for everyone.

Sincerely,



Daniel Dinell

cc: Neighborhood Commission Office



WAIKIKI NEIGHBORHOOD BOARD NO. 9

719 NEIGHBORHOOD COMMISSION - CITY HALL, ROOM 400 - HONOLULU, HAWAII 96813

MINUTES OF REGULAR MEETING
MAY 5, 1994
WAIKIKI COMMUNITY CENTER

CALL TO ORDER: Chair Mary-Jane McMurdo called the meeting to order at 7:05 p.m. A quorum was assembled.

MEMBERS PRESENT: Sam Bran, Frances Delany, Mary-Jane McMurdo, Rodger Snow, Chris Zivalich, Anita Benfatti, Betty Johnson, Joan King, Clifford Reynolds, Duke Sturgeon, Brett White, Richard Falke, Scott Hamilton, Georgia Miller, Carol Sord, John Van Olden.

MEMBERS ABSENT: Joe Bowen.

GUESTS: Alicia Carol, Briana Pollon, and Mathella Neauao (Waikiki Tenants United), Newt Pratt, Fred Ing, Peter Schall, and Jean Daka (Hilton Hawaiian Village), Tom Laidlaw and Bob Lee (EnterOcean Group), Representative Duke Baimum, Jeffrey Young (Honolulu Fire Department), Kenneth Tano and Harrison Kim Han (Honolulu Police Department), Jim Koshi (Neighborhood Commission), Peggy Ferris, Harry Ball-Wilson, Ben Lee (Office of Waikiki Development), Senator Bertrand Kobayashi, Richard Seto-Hook (Honolulu Fire Department, Mayor's Representative), Lloyd LaRue (Aloha Preservation Association), Scott Lasater (Neighborhood Commission Office staff).

MATERIALS DISTRIBUTED: Minutes from the April 5, 1994 regular meeting, reports from the Committees on Planning and Zoning, Business and Tourism, Environment and Parks and Recreation, Housing, and Cost of Living, fact sheet from Hilton Hawaiian Village on proposed lagoon project, corporate fact sheet from The EnterOcean Group, Inc., and report from Councilmember Andy Mitikiri.

APPROVAL OF APRIL 5, 1994 REGULAR MEETING MINUTES: The April report from the Committee on Cost of Living was omitted from the record. The Board agreed to include the report in the May 5 meeting minutes. The April 5, 1994 minutes were approved as circulated.

TREASURER'S REPORT: As of March 31, 1994 the Board's Operating and Central Account balances stood at \$ 110.29 and \$ 0.00 respectively.

COMMUNITY REPORTS

Honolulu Police Department - Capt. Ken Tano reported the following: IPD arrested a suspect for the May 2 robbery of Bank of America's Waikiki branch; watches recently stolen from Waikiki retailers valued in excess of \$ 100,000 were recovered in New York.

Honolulu Fire Department - Jeffrey Young discussed HFD's recent response to an apartment fire on Ewa Road.



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WAIKIKI NEIGHBORHOOD BOARD NO. 9
MINUTES OF REGULAR MEETING
MAY 3, 1994
PAGE 2

Representative Duke Baimum - Representative Baimum discussed bills which passed the Legislature relating to education reform, mandatory reductions in State jobs, prostitution, creation of parking spaces, and brewpubs.

McMurdo announced that \$ 300,000 was included in the Capital Improvement Project budget for restoration of the Natatorium.

Senator Bertrand Kobayashi - Senator Kobayashi announced that bills which would have created a convention center citizen's advisory committee died in the Legislature.

Mayor's Representative - Ben Lee announced that the traffic circulation plan for the Waikiki Special District has been completed.

Zivalich requested that the malfunctioning pedestrian signal at Ala Moana Boulevard and Hobron Lane be repaired.

Councilmember Andy Mitikiri - Bill Wilson distributed Councilmember Mitikiri's monthly report, and discussed the following: the Policy Committee will schedule a special meeting to deliberate bills relating to charitable sales activities in Waikiki; the Council overrode the Mayor's veto and enacted Ordinance 93-78, which enables the Council to settle lawsuits against the City.

PRESENTATION

Peter Schall, General Manager of the Hilton Hawaiian Village, Richard Heaton, President of the EnterOcean Group, and Eric Gunther, President of AEOOS, Inc., presented plans to create an artificial swim-through reef at one end of the existing Duke Kahanamoku Lagoon adjacent to the hotel. The project will be developed on lands to be leased from the State of Hawaii, and an ocean intake system will be constructed to pump sea water into the lagoon. Schall, Heaton, and Gunther answered questions from the Board regarding the project.

McMurdo called a recess at 8:35 p.m., and reconvened the meeting at 8:45 p.m.

COMMITTEE REPORTS

Chair's Report - McMurdo referred recent correspondence received by the Board to the relevant subject matter committees.

Planning and Zoning - Sturgeon presented the committee's report which was ordered into the record.

Sturgeon moved to support the variance application of HRS Ltd. (93/VAR-107) to allow signs at 2520 and 2522 Kalaniana'olaha Avenue to encroach into the required road widening and yard setbacks. The motion was unambiguously carried.

WAIKIKI NEIGHBORHOOD BOARD NO. 9
MINUTES OF REGULAR MEETING
MAY 3, 1994
PAGE 3

Master Plan - Benfatti updated the Board on the April 24 Hawaii Convention Park Council meeting.

Business and Tourism - Delany presented the committee's report which was ordered into the record.

Environment and Parks and Recreation - Johnson presented the committee's report which was ordered into the record.

Housing - Snow presented the committee's report which was ordered into the record.

Emergency Management - Hamilton briefed the Board on the Office of State Planning's Hawaii Coastal Hazard Mitigation Plan.

Cost of Living - White presented the committee's report which was ordered into the record.

UNFINISHED BUSINESS

A resolution requesting denial of liquor license renewal at Cilly's Night Club and Lounge was distributed to Board members.

White moved and Van Olden seconded to adopt the resolution.

An amendment was offered and accepted by the maker of the motion to add HPD Maj. Gerrold Brown to the resolution's transmittal list.

The motion was unanimously carried.

Snow presented the report of the Ad Hoc Committee on Neighborhood Plan Amendments which was ordered into the record.

A resolution requesting the State of Hawaii to defer any increase in airport landing fees was distributed to Board members.

Snow moved and White seconded to adopt the resolution. The motion carried, 16-1. Zivalich cast the no vote.

NEW BUSINESS

White moved and Felker seconded to support the conceptual plans of Hilton Hawaiian Village and EnterOcean Group for the construction of an artificial swim through reef in Ikae Kahanamoku Lagoon. The motion carried, 13-1. Johnson cast the no vote. (Reynolds abstained.)

ADJOURNMENT: There being no further business before the Board, Hawaii adjourned the meeting at 10:20 p.m.

Submitted by,

Scott Lasater
Neighborhood Commission Staff

Hilton Lagoon project is example of responsible redevelopment

HONOLULU - When I was a little boy - enjoying Waikiki as my daily playground - one of my favorite swimming holes was the lagoon built by Henry Kaiser at what is now the Hilton Hawaiian Village.

I can still recall the sense of pride and accomplishment I felt the first time I swam the width of the lagoon and back without stopping to rest. The risk that the vicious monster turtle would eat me before I made my final strokes allowed the feat to be all the more meaningful to me.

The lagoon has always been a beautiful sight to see, but in recent years it has become essentially useless as a swimming spot. The water is dirty and mean spirited jellyfish have made it their home. Now, the folks at the Hilton have offered a \$16 million proposal to rehabilitate the lagoon and return it to its former user-friendly status.

Under the Hilton plan the lagoon would be divided into two parts. The makai two-thirds of the lagoon would remain open to the general public, while the mauka third would be redesigned as a visitor attraction for paying patrons.

About 35% of the 170,000 square foot lagoon would house a series of swim-through reef tanks and interconnected waterways. Marine critters - including sharks - would be housed behind acrylic panels for viewing by snorkelers.

The emphasis of the attraction would be on educating patrons about various aspects of marine science, but it would also be a fun



PARADISE RIGHT

By Brett White

experience for folks just wanting to swim around and view the fish.

The project offers a number of tangible benefits to Waikiki residents.

- The lagoon will be completely refurbished and the water quality will be returned to its former near-pristine state.

- Meaningful jobs will be created both during the construction phase of the project and after the attraction is operational.

- The surrounding area will be newly landscaped and made more attractive.

- The educational format of the attraction will encourage local students to become interested in the marine sciences.

- Waikiki will finally have the kind of attraction that can be used to promote the city within a city as a true resort destination.

In order to proceed with their plan, the Hilton folks will have to do a number of environmental impact studies and receive the approval of a variety of state and city agencies. The permit process could be lengthy and it is estimated that the construction time would be a bit more than one year.

To help move their project forward, the Hilton has prepared a Draft Environmental Assessment. The lengthy document is highly

technical in some of its parts, but it does manage to serve as an excellent primer on the project for readers trying to decide if the proposal has merit.

I have read the material - and understood most of it - and I am convinced that the Hilton has hit on a winning idea. I will be supporting the furtherance of the lagoon refurbishment and I will encourage others to do the same.

Waikiki has long needed a special attraction to entertain its tourists. The lagoon project has the clear potential to serve both residents and visitors. This mesh of served interests is the kind of melding that residents should demand in all future redevelopment within Waikiki.

There will be nay sayers to this excellent concept. Some will oppose the plan without even knowing all of the facts, some are against any changes to Waikiki. Such views are shortsighted and do not well serve the interests of Hawaii's working people.

For Waikiki to survive and prosper as a mature vacation destination, responsible redevelopment of its existing assets must be accomplished.

The operators of the Hilton Hawaiian Village have proven over the years that they are sensitive to the needs of Waikiki residents. Once again, they are leading the way as responsible corporate citizens by offering to make my favorite lagoon all that it can be.

Brett White is a conservative political activist living in Honolulu, Hawaii. 4-26-94

Revised 4/26/94



June 6, 1994

Mr. Brett White
1909 Ala Wai Blvd, #301
Honolulu, Hawaii 96815

Dear Mr. White:

Mahalo for sending us your "Paradise Right" column of April 26, 1994. The EnterOcean Group and the Hilton Hawaiian Village appreciate your taking the time to review the Hilton Lagoon Project draft Environmental Assessment.

Your column has been incorporated into the final Environmental Assessment which is in the process of being finalized based on all the comments received.

We sincerely believe that this proposed project is a win-win for all parties involved. We look forward to continuing to work with the members of the Waikiki Neighborhood Board and keeping you informed about this exciting project.

Again, thank you for your input.

Sincerely,

Daniel Dinell
Daniel Dinell

APPENDIX B

**Hilton Hawaiian Lagoon
Field Investigation
for a New
Water Intake System**

HILTON HAWAIIAN LAGOON
FIELD INVESTIGATION
FOR A NEW
WATER INTAKE SYSTEM

PREPARED FOR:
CORAL WORLD INTERNATIONAL

Copy Number: 4

PREPARED BY:
OCEES International, Inc.
3786 Pukalani Place
Honolulu, Hawaii 96816

December 1989

BACKGROUND

The present system for seawater circulation in the Hilton Hawaiian Lagoon consists of a pumped discharge and gravity inflow. This system inherently maintains a lower water level in the lagoon relative to the ocean and the ground water table. The proposed system would put the pump on the intake line and discharge by gravity. The proposed system would therefore prevent inflow from the groundwater and improve the water quality.

The water quality of the inflow then becomes the most important determinant of the water quality in the lagoon. Presently the intake is inside the reef just adjacent to the lagoon. The water in this area is continuously turbid because of poor circulation, a bottom consisting of very fine sediment and direct shoreline inflow. In order to avoid continuous water quality problems the intake has to be relocated outside of the reef in an area of better circulation. Under most conditions a direct intake in this area will supply water of acceptable quality to the lagoon, however under storm conditions and during those times when the discharge from the Ala Wai Canal moves along the shoreline in the Diamond Head direction the water quality at the proposed new intake site will be unacceptable. During those times an alternative intake system using an in-place sand filter is proposed.

The field observations reported herein were to assess the possibility of locating such an in-place filter system in the catamaran channel serving the Hilton pier.

OBSERVATIONS

SCUBA observations were conducted inside the reef, within the catamaran channel and in the lagoon. Water quality conditions were visually noted and the depth of sand or fine sediment was probed using a marked steel bar. The results supplemented previous observations and experience in the area.

The accompanying schematic figure shows the locations where observations were made. The water depth, sediment type and thickness as well as brief notes are given in the table. In general the observations showed that the conditions inside the reef would not be acceptable for the new intake while the area in the vicinity of the catamaran channel is likely to be a good location. The depth of sand found in the catamaran channel should be sufficient to serve as an in-place filter. However, as discussed later, further tests have to be done to quantify design parameters of such a filter system.

Both the area within the reef and the lagoon exhibited significant stratification. This indicates little mixing energy and the possibility of developing anoxic conditions in the bottom layer if sufficient organic material enters these areas. The black color of the fine sediment in both of these areas indicates the presence of hydrogen sulfide which is an indication of just such conditions. Another observation of some interest is the presence of small brown jellyfish (diameters of about 5 cm) covering the bottom in parts of the lagoon. These jellyfish caused stings to the exposed skin of the SCUBA divers.

RECOMMENDATIONS

Although the preliminary field observations indicated that an in-place filter could be located in the catamaran channel more detailed observations are needed to locate the piping system. It is recommended that such detailed field observations be conducted including accurate locations, sand depth determinations and sand samples for size distribution analyses. The final configuration of the in-place sand filter system will depend on the configuration and thickness of the sand area.

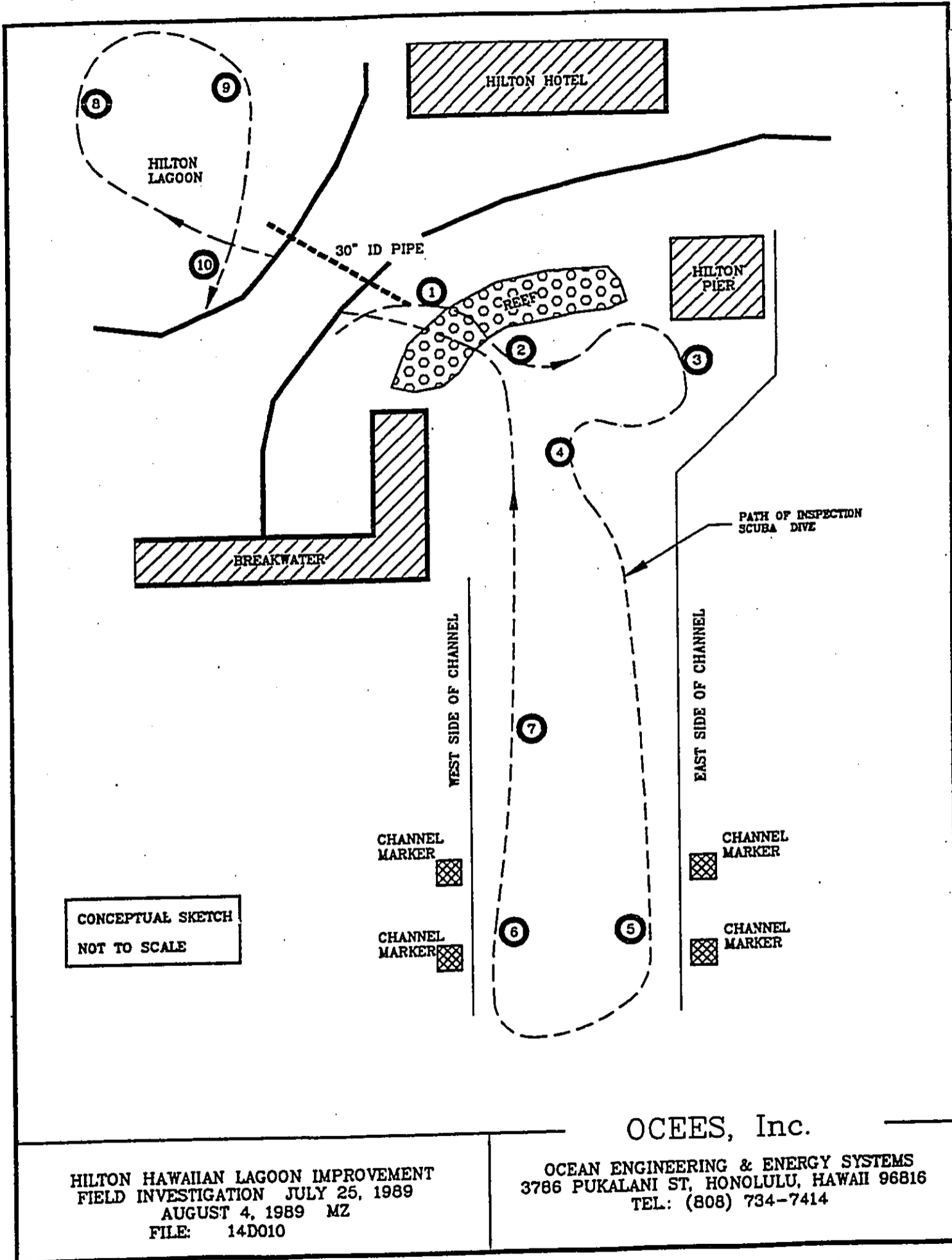
It is also recommended that a column filter test be conducted using sand found in the catamaran channel and the overlying seawater. This test will determine the head loss through the filter sand at the proposed flow rate of 0.5 GPM per square foot. It will also show what water quality can be expected from such a filtering system.

With this information a water intake system for the proposed Hilton Hawaiian Lagoon can be designed to supply water with acceptable water quality even under adverse ambient water quality conditions.

Hilton Hawaiian Lagoon Improvement
 Field Investigation of July 25, 1989
 Summary of Station Locations in Figure 14D010

Station #	Water Depth	Thickness of sand layer	Composition of sand layer	Comments
1	8 ft	3-3.5 ft	fine silt	notable water stratification
2	9 ft	6 inch	fine sand	
3	10 ft	4 ft	sand	white top layer approx. 2 inch thick; darker layer below 2 inch depth
4	11 ft	9 inch	sand	same as station No. 3
5	12 ft	3-4 ft	sand	white top layer approx. 3 inch thick
6	12 ft	3-4 ft	sand	same as station No. 3
7	8 ft	1 ft	sand	
8	8 ft	1-2 ft	mud, silt	Divers suffered jellyfish stings
9	8 ft	1 ft	mud, silt	same as station No. 8
10	8 ft	1-2 ft	mud, silt	same as station No. 8

Table 1



HILTON HAWAIIAN LAGOON IMPROVEMENT
 FIELD INVESTIGATION JULY 25, 1989
 AUGUST 4, 1989 MZ
 FILE: 14D010

OCEES, Inc.

OCEAN ENGINEERING & ENERGY SYSTEMS
 3786 PUKALANI ST, HONOLULU, HAWAII 96816
 TEL: (808) 734-7414

APPENDIX C

**Water Quality Considerations
for the Hilton Lagoon Project
Waikiki, Oahu**

AECOS No. 586B

**WATER QUALITY CONSIDERATIONS
FOR THE HILTON LAGOON PROJECT
WAIKIKI, OAHU**

Prepared For:

The Hilton Hawaiian Village Joint Venture
2005 Kalia Road
Honolulu, Hawaii 96815

&

The EnterOcean Group, Inc.
2045 Kamehameha IV Road
Honolulu, Hawaii 96819

Prepared By:

AECOS, Inc.
970 N. Kalaheo Ave., Suite C300
Kailua, Hawaii 96734

January 1994

WATER QUALITY CONSIDERATIONS
FOR THE HILTON LAGOON PROJECT
WAIKIKI, OAHU

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Previous Studies	9
Water Clarity	10
Microbiology	14
Nutrients	16
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Appendix A Water Quality Data Sets

INTRODUCTION

As part of a program initiated to address specific environmental issues for a proposed swim-through lagoon feature at the Hilton Hawaiian Village in Waikiki (Figure 1), a water quality sampling program was started in May 1992. The purpose of the sampling effort was two-fold: (1) to describe the water quality at several points off Duke Kahanamoku Beach in order to assess source water for the proposed lagoon; and (2) to describe the water quality in the existing Kahanamoku Lagoon and nearby Ala Wai Yacht Harbor to assess the potential improvement the discharge from the proposed feature might provide to these areas. Samples were collected at most locations weekly in May 1992, then once every other week (*fortnightly*) between June and December 1992. Most samples were analyzed for the following parameters, although for some locations only selected analyses were undertaken in order to answer specific questions:

- Temperature and salinity
- pH
- Dissolved oxygen
- Turbidity and suspended solids
- Nutrients (nitrate + nitrite, ammonia, total nitrogen, and total phosphorus)
- Fecal coliform and enterococcus bacteria
- Chlorophyll

A total of four locations were sampled off Kahanamoku Beach (Figure 2): "W1" located directly off the beach approximately where the beach shore is closest to the Kahanamoku Lagoon; "W2" located in the turning basin off the Hilton pier; "W2S" located approximately midway out from the pier to the outer channel markers for the Catamaran Channel; and "W3" located near the outer channel markers of the Catamaran Channel. Samples from the Catamaran Channel were collected off the Hilton catamaran during a regular scheduled shuttle to the Atlantis Submarines dive site off Waikiki. AECOS acknowledges the friendly cooperation of Atlantis Submarines and the shuttle boat captains in this effort. Because these samples were intended primarily to compare water quality at locations offshore which might serve as source water for the proposed lagoon project, an important consideration was a comparison of the turbidity and suspended solids in these locations. Only station "W1" was sampled regularly and samples analyzed for the full suite of properties and analytes. Stations "W2" and "W3" were sampled regularly for all of the parameters except temperature, salinity, and dissolved oxygen. Station "W2S" was sampled occasionally for selected parameters, primarily to assess whether this location more closely resembled the inside of the Catamaran Channel ("W2") or the outside ("W3").

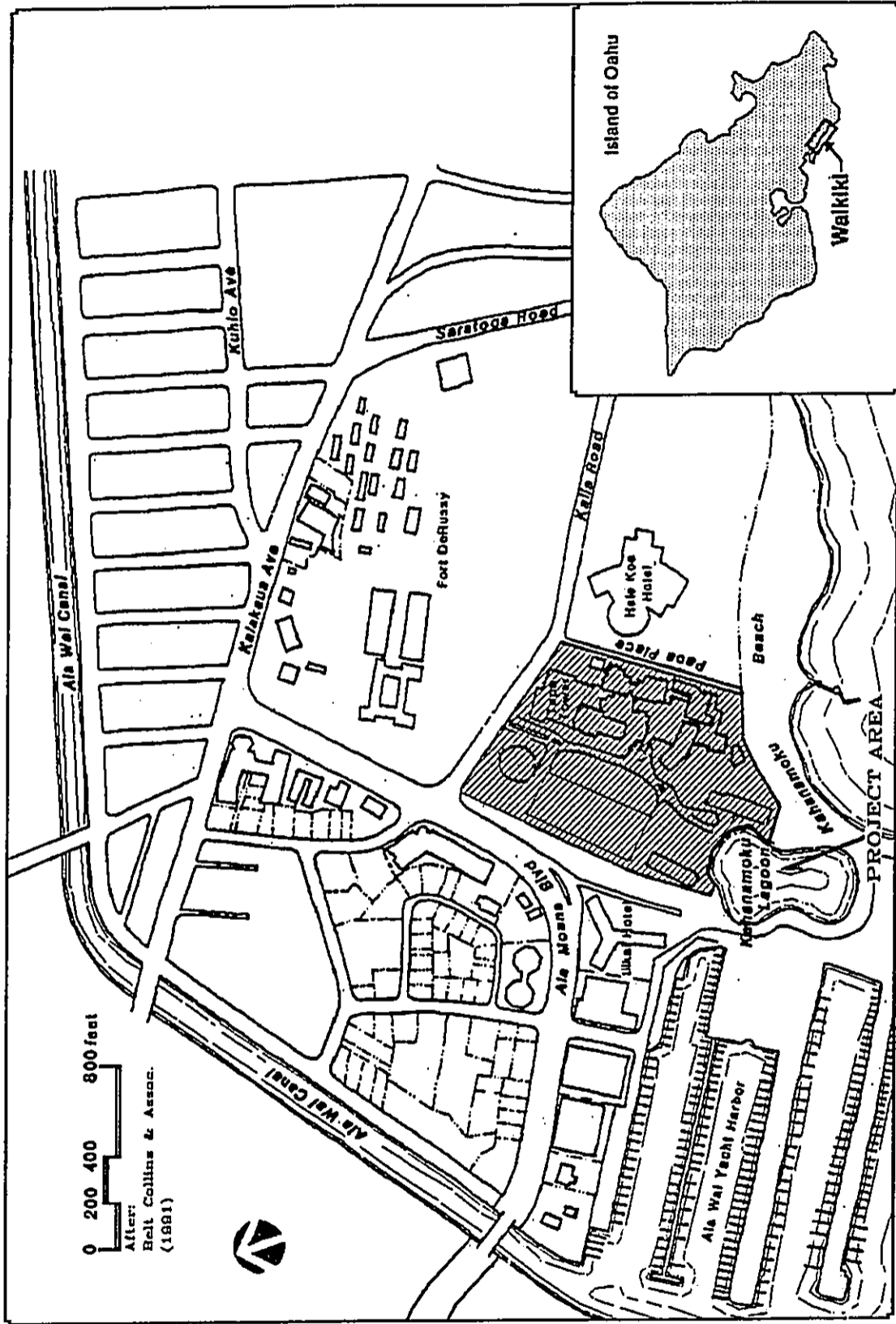


Figure 1. Project location, Hilton Hawaiian Village, Waikiki, O'ahu.

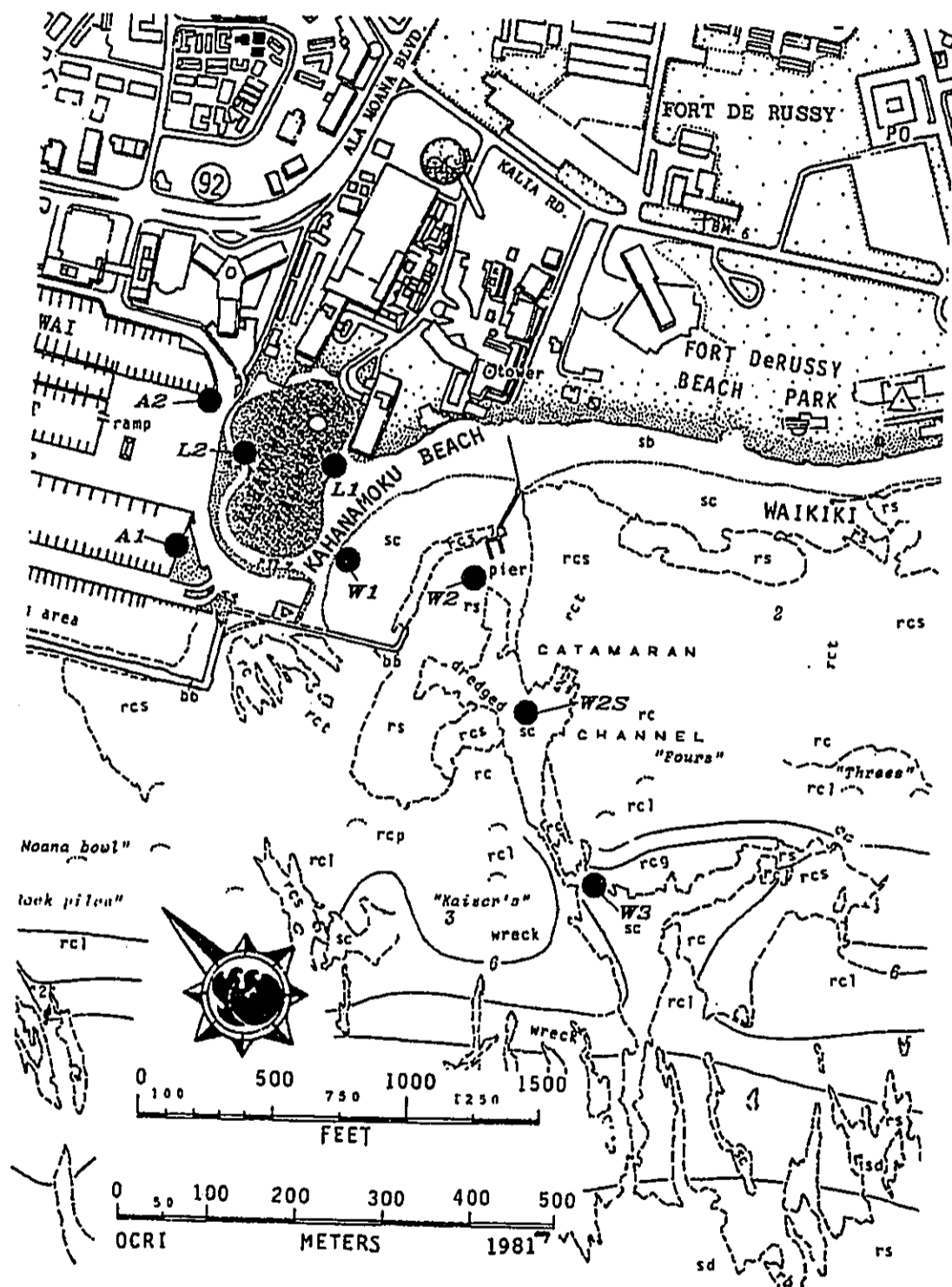


Figure 2. West end of Waikiki showing reef bottom types after AECOS (1981) and the water quality locations sampled between May and December, 1992.

Two locations were sampled in the lagoon (Figure 2): Station "L1" just off the east shore behind Kahanamoku Beach and Sta. "L2" off the northwest or Ala Wai side of the water body. Both locations were sampled regularly and samples analyzed for the full suite of properties and analytes. Two locations were also sampled in the Ala Wai Yacht Harbor (Figure 2): "A1" at the head of the middle basin, and "A2" at the head of the innermost basin, essentially off the culvert draining parts of the Hilton Hawaiian Village. Only "A1" was sampled regularly for the full suite of analyses. Station "A2" was sampled approximately fortnightly from October 26 for microbiological parameters only.

Table 1. Laboratory analytical methods and instruments used in the water quality study.

Analysis List	Method	Reference	Instrument
pH	EPA 150.1	EPA (1979)	Orion SA 250 pH meter
Temperature	thermister calibrated to NBS cert. thermometer (EPA 170.1)	EPA (1979)	YSI Model 57 DO meter
Dissolved Oxygen	EPA 360.1	EPA (1979)	YSI Model 57 DO meter
Salinity	field - refractive index		Reichert-Jung refractometer
Turbidity	Method 2130B (EPA 180.1)	Standard Methods 18th Edition (1992)	Turner nephelometer
Suspended Solids	Method 2540D (EPA 160.2)	Standard Methods 18th Edition (1992)	Mettler H31 balance
Nitrate + nitrite	EPA 353.2	EPA (1979)	Technicon AutoAnalyzer II
Ammonia	alkaline phenol	Solorzano (1969)	Technicon AutoAnalyzer II
Total Nitrogen	persulfate digestion /EPA 353.2	D'Elia (1977)	Technicon AutoAnalyzer II
Total Phosphorus	persulfate digestion /EPA 365.1	Koroleff (1977)	Technicon AutoAnalyzer II
Chlorophyll α	Method 10200	Standard Methods 18th Edition (1992)	Turner model 112 fluorometer
Fecal coliform	MF Method 9222 D	Standard Methods 17th Edition (1989)	
Enterococcus	MF Method 9230 C	Standard Methods 17th Edition (1989)	

ANALYTICAL METHODS

The analytical methods used for testing water samples in this study are listed in Table 1. Note that not all of the references cited in this table are given in the References Cited section of this report. Water samples were collected directly into sample bottles from just below the surface (i.e., within 0.3 m) at most locations. However, samples for Stations W2, W2S, and W3 were first collected into a 5-gallon plastic bucket, usually while the catamaran was underway. These samples also represent surface samples.

Measurements of temperature, dissolved oxygen (DO), and salinity were made in the field. Both temperature and DO were measured with a YSI oxygen meter. Salinity was measured by a hand-held refractometer. Because the sampling method at Stations W2, W2S, and W3 resulted in considerable agitation of the water, field measurement of dissolved oxygen (DO) and temperature were not made at these locations. All field instruments were calibrated in the laboratory prior to sampling. The DO meter was air calibrated in the field at the start of sampling and checked at each station prior to making a measurement. Turbidity and pH were measured in the laboratory immediately upon return from the field. All other measurements were made in the laboratory on water samples placed on ice in the field, then held refrigerated at 4°C until the analysis.

RESULTS

The results of the water quality analyses by sample are presented in detail in Appendix A. These data have been summarized in various ways in the text tables that follow. The sampling events are grouped into dry season and wet season periods in Appendix A based upon the definition provided in the State of Hawaii water quality regulations (DOH, 1992). The "dry season" is defined as all sampling dates between May 1 and October 31; the "wet season" is defined as dates between November 1 and April 30. For each season, mean values are calculated. These are arithmetic means (simple averages) for temperature, salinity, DO, and pH. For all other parameters, the values are geometric means.

The results of water testing at the established monitoring locations between the outer part of the Catamaran Channel and the nearshore area off Duke Kahanamoku Beach are summarized in Table 2. This table shows calculated means and standard deviations for the entire data set by location (that is, the wet season and dry season values have been combined). The column labeled "n" provides the number of data points. Although the data sets are weighted in favor of dry season measurements, this bias affects all of the locations more or less equally. Inclusion of the standard deviations provides a statistical basis for comparisons of the means. For temperature, salinity, dissolved oxygen, and pH the mean and standard deviation are calculated as normally defined. For all of the other parameters, the mean is a geometric mean and the standard deviation is calculated on the log values, then added and subtracted from the mean of the logs before conversion to antilogs.

Table 2 compares the results from three stations located between the beach and the outer channel marker off Kahanamoku Beach. Of particular interest in these data are the differences between the nearshore sample (Station W1) and the several channel locations (Stations W2, W2S, and W3) because the former is separated from the channel and turning basin by a shallow limestone remnant ("rsc" in Figure 2) which restricts water

circulation somewhat. Although temperature and DO were not measured at the offshore sites, the impact of the restricted circulation is evident. Significant differences exist between the turbidity and the suspended solids (or NFR) means from either side of the barrier (i.e., comparing W1 with W2). Turbidity, as expected, improves offshore, although the differences between the W2 and W3 means are not significant in this data set. Suspended solids is more variable at the seaward end of the Catamaran Channel, and a probable explanation is that wave action on the reef front sometimes stirs very fine sand into the water column. Sand particles generally do not much influence nephelometric turbidity readings (the particles settle too fast in the instrument), but would be weighed in a suspended solids measurement.

TABLE 2. Water quality data summary for Duke Kahanamoku Beach and the Catamaran Channel off Waikiki based on samples collected between May 1992 and December 1992.

	W1			W2			W3		
	Kahanamoku Beach			Turning Basin			Outer Channel		
	n	mean	std. dev.	n	mean	std. dev.	n	mean	std. dev.
Temperature (°C)	15	28.5	27.5 - 29.5	0	---	---	0	---	---
Salinity (ppt)	14	33	31 - 35	1	---	---	1	---	---
Diss. Oxygen (mg/L)	15	6.15	4.4 - 7.9	0	---	---	0	---	---
pH (pH units)	22	8.23	8.17 - 8.29	21	8.24	8.18 - 8.30	17	8.21	8.15 - 8.25
Turbidity (ntu)	22	3.56	1.64 - 7.69	21	0.83	0.50 - 1.37	17	0.47	0.22 - 1.00
TSS (mg/L)	22	19.9	11.3 - 35.0	19	5.1	3.0 - 8.6	17	4.1	1.2 - 13.2
NO ₃ +NO ₂ (µg N/L)	22	2	1 - 9	21	2	1 - 7	17	2	1 - 7
NH ₃ (µg N/L)	22	4	2 - 9	21	5	3 - 11	17	5	2 - 13
Total N (µg N/L)	22	190	133 - 270	21	166	119 - 232	17	150	99 - 228
Total P (µg P/L)	22	16	6 - 47	21	6	2 - 23	17	5	1 - 24
Chlorophyll α (µg/L)	22	0.88	0.40 - 1.93	21	0.35	0.21 - 0.59	17	0.27	0.15 - 0.48

The nutrient data provide only a suggestion of influence of the limestone barrier. The dissolved, inorganic mean values for ammonia are slightly lower close to the beach. To the contrary, the total nitrogen and total phosphorus values are slightly greater. Although inputs are not known, these differences suggest that the water near shore has a greater residence time on the reef, allowing for more uptake of dissolved nutrients by algae. The higher mean chlorophyll α value inshore supports this conclusion.

Table 3 compares three stations representing somewhat confined waters. Stations L1 and L2 are Kahanamoku Lagoon stations, positioned on opposite sides (east to west) of this manmade marine lagoon. Station A1 is from the innermost part of one of the Ala Wai Yacht Harbor basins as shown in Figure 2.

The summary indicates that while some minor differences in water quality may exist between the western and eastern sides of Kahanamoku Lagoon, the differences are not statistically significant. For most of the parameters, the data from the Ala Wai Harbor station (Station A1) are not significantly different from the lagoon data, although several trends are apparent. For example, all of the nutrient values and chlorophyll α have higher mean values in the harbor, indicating a greater level of eutrophication in the harbor as compared with the lagoon. On the other hand, mean turbidity and suspended solids values for the harbor are somewhat lower than those for the lagoon. Perhaps if more samples had been collected during the wet season, these differences would be less or reversed, since runoff from heavy rains should have a greater impact on the Ala Wai than on the lagoon.

Dissolved inorganic nitrogen (nitrate, nitrite, and ammonia) is significantly higher in the Ala Wai than in Kahanamoku Lagoon. The total nitrogen and total phosphorus also are greater on average in the yacht basin, although the differences are not significant in the data set (a consequence partly of the high variability of these constituents in the Ala Wai samples). Nitrate plus nitrite and ammonia concentrations were also highly variable in the yacht basin ($\text{NO}_3 + \text{NO}_2$ range was < 1 to $685 \mu\text{g N/L}$ in 22 samples; NH_3 range was 3 to $96 \mu\text{g N/L}$ in 22 samples), quite possibly reflecting the intermittent nature of land runoff into the Ala Wai canal which presumably has a considerable influence on nutrient content of the canal waters.

When a comparison is made between the waters directly off Waikiki Beach in front of the Hilton and those of the Kahanamoku Lagoon and the inner Ala Wai Yacht Harbor, we see that most differences are not statistically significant. However, the turbidity and suspended solids are significantly higher directly off the beach. This may be due simply to the considerable activity there by swimmers and waders. Certainly, the waters from the turning basin outwards (Stations W2 and W3) are significantly better with respect to water clarity. Considering nutrients and chlorophyll concentrations, the lagoon waters differ significantly from the waters off Kahanamoku Beach only in having a higher mean

chlorophyll α content, a usual consequence of a longer residence time. The lagoon and harbor waters further the evidence of a trend of increasing total N and total P apparent from outside to inside, with the harbor samples representing the "innermost" of the locations sampled. With respect to inorganic nutrients (nitrates and ammonia), the lagoon and reef waters are not much different from each other, but the harbor waters have significantly higher mean concentrations than the reef waters.

TABLE 3. Water quality data summary for Duke Kahanamoku Lagoon and the Ala Wai Yacht Harbor based on samples collected between May 1992 and December 1992.

	L1			L2			A1		
	Kahanamoku Lagoon			Kahanamoku Lagoon			Ala Wai Harbor		
	n	mean	std. dev.	n	mean	std. dev.	n	mean	std. dev.
Temperature (°C)	17	27.9	26.2 - 29.6	17	28.8	27.3 - 30.3	16	27.5	26.0 - 29.2
Salinity (ppt)	16	32	28 - 36	16	32	28 - 36	15	30	22 - 37
Diss. Oxygen (mg/L)	18	6.4	5.3 - 7.5	17	6.8	5.6 - 7.9	17	5.7	4.6 - 6.7
pH (pH units)	22	8.22	8.13 - 8.31	22	8.25	8.15 - 8.33	22	8.17	8.09 - 8.25
Turbidity (ntu)	22	2.40	1.58 - 3.64	22	2.44	1.27 - 4.68	22	1.19	0.49 - 2.80
TSS (mg/L)	22	10.0	5.1 - 19.6	22	10.2	5.5 - 18.8	21	5.6	2.6 - 12.2
NO ₃ +NO ₂ (µg N/L)	22	2	<1 - 7	22	3	1 - 9	22	30	6 - 145
NH ₃ (µg N/L)	22	5	2 - 11	22	5	3 - 9	22	20	8 - 48
Total N (µg N/L)	22	199	146 - 271	22	212	169 - 265	22	288	180 - 453
Total P (µg P/L)	22	11	4 - 32	22	10	3 - 36	22	20	7 - 57
Chlorophyll α (µg/L)	22	2.6	1.04 - 6.48	22	2.4	1.22 - 4.95	22	3.4	1.68 - 8.88

Microbiological results (fecal coliforms and enterococci) are presented in Appendix A and summarized in the Discussion section of this report. Because of the considerable variability in bacteria levels in several of the locations sampled, instances of "TNTC" (too

numerous to count) or "CONFL 4x" (confluent growth at ¼ dilution, essentially TNTC) were obtained. These TNTC results indicate high counts: bacterial concentrations exceeding the water quality standards. However, such results can not be used in calculating mean values and for this reason the microbiological results are not summarized in Tables 2 and 3. Mean values given in Appendix A are geometric means calculated after substituting 0.5 col./100 ml for any < 1 counts and ignoring any TNTC (or CONFL 4x) counts. Thus, the means would underestimate the true temporal averages at some stations.

The following can be said to summarize the results of our May through December 1992 sampling efforts. Fecal indicator bacteria were usually not detected in the offshore waters (Station W3). Levels of these bacteria were variable, but generally low in nearshore waters off Kahanamoku Beach (Stations W1 and W2). In the Kahanamoku Lagoon (Stations L1 and L2) during the dry season, levels rose slightly compared with the water off the beach, while in the wet season the increase was considerable. Counts at Station A1 in the Ala Wai were similar to those in Kahanamoku Lagoon. A brief period of sampling in the innermost basin of the yacht harbor (Station A2) showed this area to be more contaminated than the middle basin.

DISCUSSION

PREVIOUS STUDIES

A study of the Waikiki fringing reef conducted by the University of Hawaii (Chave, Tait, Stimson, and Chave, 1973) included water quality sampling. However samples were collected only in areas where water depths exceeded 8 feet (essentially only seaward of the reef margin). To quote the report, "The analyses [revealed] little of an unusual nature". Many of the total nitrogen and total phosphorus concentrations were in excess of State of Hawaii standards for Class A waters. This fact is not unusual for surface samples off urban Oahu and given the limited nature of the U. H. sampling effort.

A detailed study of the water quality of the Ala Wai Canal is presented in Harris (1972). This study mostly ignored the yacht harbor basin, but provides an excellent picture of the water quality conditions in the canal from two decades past.

A survey of the water quality of the Ala Wai Canal by OI Consultants involved multiple samples collected between October 1991 and January 1992. Sampling was conducted once a month at 16 locations (plus some stream samples) between the ocean outside the outer channel markers for the Ala Wai Yacht Harbor and innermost parts of the Ala Wai Canal. Three depths were sampled at most stations. It is interesting to note that these samples were collected to assess a proposal to enhance the water quality of the Ala Wai

Canal by pumping sea water from off Waikiki into the upper end of the long channel mauka of Waikiki (Edward K. Noda & Associates, 1992).

WATER CLARITY

Water clarity is an important consideration in manmade water features, particularly where the view is through the water column as in the case of aquariums and the proposed Hilton Lagoon project. One measure of water clarity is the nephelometric turbidity (reported as ntu or nephelometric turbidity units) which essentially quantifies, by comparison to a set of (formazin) standards, the amount of light reflected by a water sample. A more direct measure related to water clarity is the dry weight of the particulates in a given volume of sample, determined by filtration on a standard filter. This measure is called the *non-filterable residue (NFR)* or the *total suspended solids (TSS)* value. Although nephelometric turbidity and TSS may correlate in samples from the same general area, they do measure different properties. For example, an equal content or weight of dark particles reflects less light, thus yielding a lower ntu value. Fine sand stirred by wave action will add considerably to the TSS, but may have little influence on the ntu value because the particles settle out rapidly in the instrument.

Samples from various distances off Kahanamoku Beach are of interest in assessing the source of water for the proposed Hilton Lagoon water feature. Water clarity generally improves with increasing distance from shore, away from such adverse influences as waves breaking against a reef or shore, and soil laden runoff from land drainage. Nutrient inputs to nearshore waters, particularly the confined waters of bays and lagoons, can promote the growth of microscopic algae called phytoplankton. The density of phytoplankton influences the color and clarity of the water. For example, Harris (1972) found that some 20 to 30 % of particulate matter in the Ala Wai was phytoplankton. Edward K. Noda and Associates (1992) concluded that factors (such as residence time and nutrient inputs) which promoted phytoplankton growth in the canal were key to improving water clarity. Thus, the discussion here of particulates in relation to water clarity is only part of the picture. Additional considerations are treated in the discussion under Nutrients beginning on page 16.

Table 4 summarizes (as geometric mean values) the 1992 measurements of water clarity for both the dry (May 7 through October 26) and wet (November 11 through December 26) season samples off Kahanamoku Beach. Included in Table 3 are geometric means of turbidity and total suspended solids for samples collected by OI Consultants in the Ala Wai entrance channel, midway out (Sta. 2) and just seaward of the outer channel markers (Sta. 1). These geometric means represent six sampling events each, with three depths (surface, mid-depth, and near bottom) sampled each event during one dry (October) and

five wet season (November through March) months. The most seaward sampling location (OI Sta. 1) was further off the reef front than our Station W3.

Station (season)	Location	Number of samples	Turbidity (ntu)	Suspended solids (mg/l)
W1 (dry season)	Kahanamoku Beach	17	3.7	20.3
W1 (wet season)	" "	5	3.2	18.3
W2 (dry season)	Turning basin	16	0.83	5.1
W2 (wet season)	" "	5	0.84	5.0
W2S (dry season)	Mid-channel	10	0.66	3.6
OI Sta. 2 (wet season)	Ala Wai Channel	18	0.82	3.2
W3 (dry season)	Outer channel	13	0.44	3.9
W3 (wet season)	" "	4	0.57	4.6
OI Sta. 1 (wet season)	Outside Ala Wai	18	0.36	2.5

The results of sampling off Kahanamoku Beach demonstrate that, as expected, an onshore-offshore gradient exists: water quality improves with distance from shore. However, the most marked change occurs between Sta. W1 located just off the shore at the beach and Sta. W2 located in the catamaran turning basin some 100 meters off the shore. The wet and dry season means were not that different in our data set. Surface (0.5 meter) values for both turbidity and suspended solids were higher on nearly every occasion than the values from deeper samples, although this relationship was not as consistent for Station 2 or other OI Consultants stations inside the Ala Wai.

Comparisons should also be made with the OI Consultants 1991 measurements at their Stations 3 and 4 representing the middle of the main turning basin of the yacht harbor and the place where the Ala Wai Canal enters the main turning basin, respectively. Geometric means for the suspended solids measurements (n=18) were 4.5 mg/l (Sta. 3) and 3.9 mg/l (Sta. 4). Turbidity geometric means were 1.2 ntu (Sta. 3) and 1.5 ntu (Sta. 4). These values reflect slightly better water clarity than our mean values for the Kahanamoku Lagoon and the inner part of the Ala Wai Yacht basin (except for mean turbidity, which was 1.19 ntu at our Station A1).

The State of Hawaii (DOH, 1992), water quality criteria provide a sense of what might be typical values for "pristine" waters. No state standard currently exists for suspended

solids in nearshore waters. Table 5 gives the criteria applicable to the Waikiki reef and offshore areas. The "geometric mean values not to be exceeded" for these waters are 0.50 ntu (wet season measurements) and 0.20 ntu (dry season measurements). Essentially only the more seaward locations sampled off Waikiki (our Station W3 and OI Consultants Stations 1 and 2) met the geometric mean criteria, which simply indicates that the waters here are somewhat more turbid than would be considered ideal.

Table 5. State of Hawaii water quality criteria for turbidity in open coastal waters.			
	Geometric Mean not to exceed:	Not to exceed more than 10 % of the time:	Not to exceed more than 2 % of the time:
Turbidity (as ntu)			
wet season	0.50	1.25	2.00
dry season	0.20	0.50	1.00

Table 6 summarizes the data sets for each station in terms of the turbidity water quality criteria. For the geometric mean criteria, the calculated mean either exceeds or does not exceed the criterion. For the other criteria, the table relates the percent of measurements which exceeded each respective criterion value. In these cases, only OI Consultants Station 1 and our Station W3 in the wet season met all of the various "limits". Not meeting the State water quality standards does not constitute a "violation" of any kind. The implication is that these waters are of less than ideal quality with respect to turbidity. In any event, moving water of the quality found at Stations W2, W2S, or W3 through the Hilton Lagoon project and eventually discharging either into the Ala Wai or off Kahanamoku Beach would not cause turbidity problems in these areas. Without considering possible removal through filtering beneath the Catamaran Channel sand and settlement en route, or additions from whatever sources within the system, the discharge would always be of equal or superior water clarity with respect to the receiving waters. A different set of criteria applies to the Ala Wai, and these are less stringent than those for open coastal waters: the "geometric mean values not to be exceeded" for harbor waters are 1.50 ntu (wet season measurements) and 0.40 ntu (dry season measurements).

Predicting the amount of particulates that could be added to the water stream passing through the proposed Hilton Lagoon water feature is difficult. The use by swimmers would actually contribute very little. Before entering, swimmers would be required to shower, and any sand-size particles tracked in by swimmers, blown in by the wind, or entrained in the intake stream will tend to settle out within the facility because of the large cross-sectional area. Smaller particles (silt and clay) will mostly pass through the

lagoon. Fishes and other organisms (e.g., attached growth) will contribute particulates to the outflow water. These particulates will be mostly organic and have a wide range of sizes, but nearly neutral density in sea water.

	Geometric Mean not to exceed:		Not to exceed more than 10 % of the time:		Not to exceed more than 2 % of the time:	
	dry	wet	dry	wet	dry	wet
Station W1	exceeded	exceeded	100 %	100 %	88 %	80 %
Station W2	exceeded	exceeded	81 %	40 %	31 %	none
OI Station 2	no data†		†	22 %	†	6 %
Station W2S	exceeded	no data	60 %	no data	10 %	no data
Station W3			31 %	none	8 %	none
OI Station 1	no data†		†	none	†	none

† - Only a single October sampling event qualifies for dry season data; here these values have been combined with the wet season values.

Factors which influence particulate concentrations would be density of the biota and the rate at which water moves through the system. In an earlier study, AECOS (1992) analyzed water entering and leaving decorative marine fish ponds at a hotel on the Kona Coast. These decorative pond systems typically contained one fish per 100 to 150 gallons and were operated at flow rates resulting in residence times of from 1 to 8 hours. Density of fishes in the proposed Hilton Lagoon would be similar, and operating flow rates would give a residence time on the order of 2 to 3 hours. Overall residence time of the water from the time it enters the Hilton Lagoon until discharged from the public lagoon would be longer (about 8 hours), but the public lagoon is not expected to generate additional particulates because of the low density of biota predicted to naturally occur there. On balance, the public lagoon may become a sink for some of the particulates generated in the swim-through feature. A part of the Hilton/EnterOcean Group Joint Venture proposal includes removal of a bottom layer of fine sediment that has accumulated there over the nearly four decades since the lagoon was built.

The AECOS (1992) study measured suspended solids changes of between 118% and 728% of input values during a 24-hour period in three decorative marine systems. A report on effluent quality for aquaculture (CTSA, 1990) gave 350% rise as typical for marine fish culture. Assuming that 5 mg/l might be an average input value for the Hilton Lagoon, an increase of 350% would yield an output of 22.5 mg/l. However, there is no basis for the expectation of output levels to be a factor (i.e., a multiple) of the input levels. Biological

activity within the feature will usually add to the input amount as the water passes through. Output values for the systems measured on the Big Island (where inputs ranged from 0.3 to 2.8 mg/l) ranged between 1.3 and 11.8 mg/l and geometric means of the discharge TSS ranged from 2.4 to 5.8 mg/l. These values are not much different from the values reported for the Waikiki reef flat (see Table 4), and are generally below values observed in our measurements of the Kahanamoku Lagoon and Ala Wai Yacht Harbor (see Table 3). The actual amount of particulates added (mean output minus mean input, $n = 3$) ranged from 1.3 to 5.1 mg/l. If these amounts are added to the 5 mg/l average input anticipated for the Hilton Lagoon without subsand filtration, average output levels might range from 6 to 11 mg/l. It becomes clear that output levels are not that much different from input levels in these systems, which is not surprising given the modest densities of organisms and high pass-through rates of the sea water. Of course, while concentrations are low (and thus water clarity remains high), particulate loading still might be relatively high because a loading is calculated as the concentration times the flow volume. This aspect of the water quality impacts is considered further in the Conclusions section beginning on page 19.

MICROBIOLOGY

Microbiological testing of recreational waters is generally directed towards assessing numbers of enteric bacteria from warm-blooded animals because most pathogenic organisms are introduced into waters either directly or indirectly from fecal sources. Enteric bacteria survive for a limited time in marine waters, and any warm-blooded animal (including birds) defecating in the water or in an area where runoff flows into the water will add enteric bacteria. These bacteria are not harmful, but are used to indicate the possible presence of pathogenic organisms, which are difficult to isolate and culture from the water. In recent years, Hawaii has changed from a standard based upon fecal coliforms to one based upon enterococci for marine waters because of the rapid die-off of fecal coliforms in tropical marine waters. If an "indicator" disappears before the pathogens it is purported to indicate, its value is lessened considerably. The federal standard for enterococci in recreational waters is 35 enterococci per 100 ml; the State of Hawaii standard is 7 per 100 ml. The state recreational standard for fresh waters is 200 fecal coliforms per 100 ml. While none of these waters is fresh, the enterococci standard is relatively new and comparisons with fecal coliform results is desirable.

Comparison of microbiological results provides the clearest distinction between the different locations monitored in our study. Table 7 shows calculations of the percentage of each measure that exceeded the corresponding standard. The patterns are fairly clear and consistent between enterococci and fecal coliform, although the more stringent enterococci standard resulted in a higher percentage of exceeded samples. Our microbiological measurements indicate that the Kahanamoku Lagoon violates the State

of Hawaii recreational standard of more than 7 enterococci per 100 mls (on average) about 23 percent of the time. This rate is comparable to that measured in the water off nearby Kahanamoku Beach (Station W1). However, when it is realized that the number of users in the lagoon is quite small — only a fraction of the number of people found in the water off Kahanamoku Beach — the value is seen as providing perhaps a false sense of "acceptable" water quality. If the two sample stations in the lagoon are viewed separately, the little used west shore exceeded the standard only 14 % of the time, whereas the east shore had a rate of 32%. These results suggest that were the density of users of the lagoon equal to that found off Kahanamoku Beach with the present water circulation system, the lagoon water might seldom meet the recreational standard.

Table 7. Percent of samples which exceeded Department of Health standard for enterococcus and fecal coliforms in recreational waters in the May through December 1992 monitoring program.

Station	Location	n	Enterococcus Std. Exceeded	n	Fecal Coliform Std. Exceeded
W3	Waikiki, outer channel	12	8 %	12	8 %
W2	Waikiki, turning basin	21	24 %	21	none
W1	Waikiki, Kahanamoku Beach	22	27 %	22	4 %
L1	Kahanamoku Lagoon (SE)	22	32 %	22	4 %
L2	Kahanamoku Lagoon (NW)	22	14 %	22	9 %
A1	Ala Wai Yacht Harbor (middle)	22	36 %	22	18 %
A2	Ala Wai Yacht Harbor (inner)	6	83 %	6	67 %

The Department of Health monitors a number of locations along the shore of Waikiki for enterococci. Kahanamoku Lagoon is listed as DOH Station 157 and Kahanamoku Beach is DOH Station 155. Results from these stations and several more in Waikiki and Waimanalo were recently reviewed as part of the process of revising the water quality standards (Harrigan, 1991). Data sets extended from 1986 to 1991 in some cases. Results are summarized here in Table 8. The DOH study also provides the median Enterococcus counts by calendar year for each location. For the most recent year given (1990), the value for Kahanamoku Lagoon was 4.0; for Kahanamoku Beach - 5.0. The highest values in 1990 were at Fort DeRussy Beach (9.0) and Kuhio Beach (8.0), both exceeding the State standard (Harrigan, 1991).

The relationship between numbers of swimmers and enteric bacteria counts in natural waters are not established, if indeed any simple relationship exists. The highest counts in nearshore waters are generally associated with stream and storm drain outlets (i.e.,

points of focus of land drainage). Harrigan (1991) reported that the locations she surveyed in Waikiki and Waimanalo were more likely to exceed the state standard during the rainy season. Chronic problem areas were those where water exchange rates were poor (e.g., Kuhio Beach which combines an offshore sea wall and a shoreline storm drain). Kahanamoku Lagoon was described as showing an intermediate pattern, with levels below the state standard in the dry season, but especially elevated levels in the wet season. The proposal to increase the exchange rate of water in the lagoon (both the proposed Hilton Lagoon water feature and the public lagoon) utilizing offshore sea water should produce a very marked decline in the wet season bacterial counts, and offset elevated counts anticipated from increased use of these lagoon waters.

Table 8. Department of Health Enterococcus data sets for Waikiki, summarized by station (after Harrigan, 1991).

Station No.	STATION	n	period of records	Percent of samples exceeding standard	
				Wet Season	Dry Season
157	Kahanamoku Lagoon	124	7/86 - 4/91	45.6	19.6
155	Kahanamoku Beach	73	5/88 - 12/90	58.3	13.5
158	Fort DeRussy	23	10/88 - 12/90	33.3	28.6
159	Gray's Beach	121	7/86 - 12/90	22.6	18.6
160	Tavern Beach	14	10/88 - 8/90	7.1	0
161	Kuhio Beach	93	10/86 - 12/90	54.2	37.8
162	Public Bath Beach	90	7/86 - 12/90	14.9	9.3
163	Elk's Club Beach	54	10/88 - 12/90	33.3	6.7

The return water from the proposed lagoon feature will also provide improvement within the Ala Wai Yacht Harbor, where bacterial counts are even higher than off Waikiki Beach. The innermost basin (represented by our Station A2) presently combines all three factors known to contribute to degradation relative to the recreational standard: heavy human use (i.e., essentially an "urban" environment on the water), storm water runoff, and confined water circulation.

NUTRIENTS

"Nutrients" are chemicals in the water which promote the growth of primary producers, namely algae and certain bacteria in the marine environment. Tropical oceanic waters are generally poor in nutrient content and usually can assimilate additions without adverse effects. Water quality concerns focus on nearshore environments, where excess nutrients

may alter the natural balance by promoting certain algae species over coral reef species, including corals, which have evolved in the nutrient poor waters of the tropics. Concerns also focus on enclosed or semi-enclosed bodies of water where high nutrient inputs produce eutrophication, with corresponding declines in water clarity and development of an abundance of benthic growth by algae, sponges, tunicates, etc.

Because land runoff can be a significant source of nutrients to the nearshore marine environment, the high nutrient values measured in the Ala Wai as compared with the Waikiki reef samples in the present study is expected. A broader picture of nutrient levels in the Ala Wai is provided by the measurements made by OI Consultants (Edward K. Noda & Assoc., 1992) in the study described previously in this report (see pages 9 to 10) and in Harris (1972). Table 9 summarizes the more recent nutrient measurements from two stations in the Ala Wai Yacht Harbor. If we compare these values with the geometric means for our Station A1 (presented in Table 3), we see that nearly all of the measures of nitrogen (nitrate, ammonia, total nitrogen) and phosphorus are lower at Station A1. Only the mean total nitrogen is higher at Station A1 than at Station 3. However, the differences are not statistically significant. The separate geometric means for wet and dry season values provided in Appendix A further demonstrate the point that elevated nutrients, and nitrate particularly, are associated with drainage from the land.

Table 9. Geometric means of nutrient measurements in the Ala Wai Yacht Harbor for October 1991 through March 1992 (n=18) from OI Consultants (1992).		
	OI Station 3	OI Station 4
Nitrate + nitrite ($\mu\text{g N/L}$)	39.8	52.4
Ammonia ($\mu\text{g N/L}$)	10.1	11.3
Total N ($\mu\text{g N/L}$)	236	304
Total P ($\mu\text{g P/L}$)	30.0	30.6

Again, without considering changes in water quality that might occur within the proposed lagoon feature as the water passes through it, the proposal to pump water from the vicinity of the Catamaran Channel into the Ala Wai Yacht Harbor would improve water quality in the harbor (and in Kahanamoku Lagoon) by reducing the concentration of nutrients. Because nutrients promote plankton growth, the visible consequence of reducing nutrients would be improvements in water clarity. Decreasing the residence time of the water in that part of the Ala Wai receiving the discharge would also contribute to improved water clarity by dispersing phytoplankton populations.

The proposed water feature would not be passive with respect to nutrient content in the water flushing through the system. The presence of swimmers and other biota (e.g., algae, fishes, and invertebrates) would allow for alterations in nutrient concentrations by either additions, biological excretions, and/or biological uptake. To some degree, processes classifiable under one or more of these categories will always be occurring. Additions come from whatever food supplements are used to maintain the captive populations of animals within this aquarium environment. Feeding will need to be monitored and adjusted to prevent excess feed from being discharged into the public lagoon, or entrained in the ultimate discharge to the Ala Wai.

A balanced or reasonably balanced flow-through aquarium system will convert inorganic nutrients (e.g., nitrates, ammonia, orthophosphates) into organic biomass, which will tend to remain in the system to be removed by management or be swept out as particulate matter. Much of this conversion will occur at the primary producer level in the phytoplankton, resulting in a decrease in inorganic nutrients and a corresponding increase in total N and total P (and particulates and chlorophyll α) in the discharge over values seen in the intake water. Residence time of the water passing through will partly determine the extent of these sorts of changes. Turnover rates of the order proposed (8 hours residence time for the entire system including the public lagoon) will preclude buildup and accumulation of phytoplankton populations.

Changes in nutrient values in marine, flow-through ponds on the Kona coast of Hawaii were studied by AECOS (1992). A fairly substantial reduction in inorganic nitrates and phosphates observed during the first study in 1991 was not so great in 1992, presumably because of real differences in the dynamics of the primary producers (algae) in the system. Thus, management practices (e.g., maintenance removal of attached flora and fauna) and perhaps "natural" cycles will change the system uptake rates of inorganic nutrients.

Ammonia was found to increase in all cases (AECOS, 1992). Ammonia in these systems results from aquatic animal excretions, and the amount of increase in the outflow water will depend upon the biomass present in the system and the water exchange rate. Systems with low biomass to volume ratios and high flow-through rates show the smallest increases in ammonia concentration. Mean discharge levels in the decorative marine ponds on the Big Island ranged from 7 to 18 $\mu\text{g N-NH}_3/\text{l}$ (ppb). Ammonia in the input waters ranged from 1 to 6 ppb and residence times in the systems from 1 hour to 8 hours.

Present ammonia levels in the Kahanamoku Lagoon are low, comparable to levels seen offshore. In the lagoon, ammonia generated locally or brought in with the tide is assimilated (that is, taken up by algae) and if levels in the discharge from the proposed

Hilton Lagoon feature are comparable to what is seen in marine aquarium systems with high flow-through rates, the levels in the public lagoon will remain low: the small rise in the discharge may be largely assimilated in the lagoon. Ammonia levels in the Ala Wai (at Station A1) are elevated, but probably reflect microbial activity in anoxic sediments on the bottom of the harbor. Thus, discharge of Hilton Lagoon water into the Ala Wai will result in improved water quality with respect to all of the inorganic nutrients.

CONCLUSIONS

Only the particulate organics have potential for increasing significantly over input levels in the outflow from the Hilton Lagoon feature. Results from sampling marine, flow-through systems on the Big Island (AECOS, 1992) failed to demonstrate a pattern with respect to total N and total P concentrations. Although particulates as a category (measured as suspended solids) tended to increase, the average total nitrogen and total phosphorus levels sometimes increased and sometimes decreased compared with input concentrations. Of course, total N and total P measurements incorporate inorganic levels which showed different patterns (e.g., nitrate tended to decrease, ammonia to increase). The 24-hour measurements suggested perhaps a slight decrease in total N as water flowed through the system. Such a result could occur as the system converts inorganic nitrogen into biomass which is stored and eventually removed by processes not measured in the study.

Intuitively, we expect organic particulate concentrations to vary substantially from moment to moment, requiring a large sampling effort to define in an average sense. Certainly when viewed from the perspective offered by discrete samples that are widely separated in time, the total N and total P do not change substantially in the water as it flows through these systems. However, much of the organic matter generated within the system (as biomass growth or solid excretory matter) is released at times of disturbance caused by maintenance activities or as larger "chunks" (e.g., fragments of seaweed) that would not ordinarily be considered in total N or total P analyses. Maintenance removes much of this organic matter for disposal on land, but some becomes mixed with the effluent.

Although, because of the large volumes of water involved, small increases in concentrations of organic particulates translate into large increases in loadings, these numbers must be kept in perspective. The Hilton Lagoon system is not a concentrated animal growout facility. Densities of organisms would not exceed natural densities in many reef environments. Reef communities easily handle, by both water exchange and internal recycling, the dissolved and particulate matter generated by the constituent biological populations. Aquariums generally lack the diversity of organisms required to adequately recycle matter, and the health of the populations that are present is

maintained by establishing a high rate of turnover of the water within the feature. This increase in flow does not contribute substantially to substance loadings, but simply reduces concentrations.

The conclusion from the decorative marine pond study (AECOS, 1992) provides further perspective on water quality impacts from water features such as that proposed for the Hilton Lagoon:

".... most parameters were reduced in concentration by flow through the system. Not surprising, particulates (NFR) and ammonia were exceptions. These results compare in a general way with marine aquaculture facilities (...after CTSA, 1990), where increases in ammonia and NFR are the most substantial changes effected on the supply water by the biomass of cultured organisms. In the latter, nitrate tends to be mostly unchanged (see also AECOS, 1987), but all other parameters show increases. Decorative pond systems resemble aquaculture to the extent that both share a common purpose of maintaining living aquatic organisms. Aquaculture management promotes the maximum, healthy growth of biomass of the cultured species as a primary purpose. Decorative pond management places a higher premium on water clarity, which is a goal consistent with minimizing effluent water quality impacts on receiving waters.

Because the proposed flow-through system comprises two parts with different residence times and different physical characteristics, the larger public lagoon will have influences on the water quality that are different from those of the proposed Hilton Lagoon. Much of the discussion above has centered on the Hilton Lagoon portion of the system. The public lagoon may, on balance, reduce both the ammonia and particulates in the outflow stream. As water velocity slows upon discharge into the public lagoon, particulates will tend to settle out and the opportunities for biological uptake of dissolved nutrients will be enhanced. Without detailed studies, predicting the response of the lagoon to these inputs would be uncertain at best. An enhancement of the water quality in the public lagoon from that which presently exists can be anticipated as a consequence of the increased flow rates, decreased residence time, and improved source of input water (from outside the nearshore limestone barrier off Kahanamoku Beach). A water volume turnover on the order of three times daily should minimize development of phytoplankton if the lagoon water is well mixed. However, the improvements will result in an environment which more closely resembles the Waikiki reef flat than the present, somewhat stagnant lagoon. More organisms, both animals and plants, will live here. Over the long term, material may accumulate on the bottom of the lagoon, requiring maintenance removal.

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APPENDIX A
[to report 586B]

WATER QUALITY DATA SETS

STATION W1 - Waikiki (Kahanamoku) Beach

EVENT NO.	DATE	TIME	TEMP. (°C)	SAL. (ppt)	D.O. (mg/l)	pH	TURB. (ntu)	NFR (mg/l)	NO ₃ NO ₂ (µg N/l)	NH ₃ (µg N/l)	TOTAL N (µg N/l)	TOTAL P (µg P/l)	CHL α (µg/l)	FECAL COLL. col/100ml	ENTERO. col/100ml
001	05/07/92	1605	---	---	---	8.20	0.75	5.4	<1	4	148	19	0.54	1	2
002	05/14/92	1455	---	---	---	8.14	2.21	9.4	1	2	209	33	0.61	5	7
003	05/21/92	1335	30.0	36	9.2	8.30	3.73	11.4	1	6	152	<2	0.63	<1	<1
004	05/28/92	1405	30.5	36	6.2	8.19	8.42	22.7	1	6	248	<2	0.70	9	45
005	06/03/92	1505	28.0	---	7.2	8.30	2.31	10.0	4	6	185	14	1.03	1	5
006	06/15/92	1300	28.0	---	6.3	8.27	4.68	31.8	4	<2	221	17	0.52	<1	5
007	06/27/92	1320	28.0	---	6.5	8.26	12.1	23.2	3	5	174	75	0.87	<1	7
008	07/09/92	1325	28.0	37	6.6	8.06	13.0	40.8	1	1	176	9	0.52	66	18
009	07/21/92	1325	29.0	35	6.6	8.17	3.18	9.1	<1	2	175	17	0.49	<1	2
010	08/02/92	1320	---	---	---	8.21	6.25	22.2	2	3	182	21	0.82	<1	1
011	08/14/92	1525	28.5	36	7.3	8.24	3.15	22.8	2	5	178	22	1.25	3	9
012	08/26/92	1335	29.0	---	6.5	8.25	0.51	22.6	1	6	174	16	7.63	6	5
013	09/07/92	1230	---	---	---	8.25	4.02	22.6	2	8	179	11	0.25	4	1
014	09/19/92	1235	26.5	32	6.0	8.27	5.02	37.0	2	6	175	23	1.43	<1	7
015	10/01/92	1230	28.5	32	3.5	8.25	7.00	32.9	3	7	185	13	0.94	<1	3
016	10/13/92	1240	---	30	---	8.16	4.01	47.6	13	9	218	45	1.06	CONFLAK	150
017	10/26/92	1215	28.5	32	5.2	8.34	2.50	32.6	3	1	179	31	0.80	5	1
<i>dry season means</i>			28.5	34	6.4	8.23	3.67	20.3	2	4	184	14	0.83	2	5
018	11/08/92	1230	27.2	32	3.2	8.24	5.83	14.1	2	5	137	16	0.77	3	12
019	11/20/92	1225	29.0	32	3.8	8.18	3.58	11.6	1	3	128	14	0.27	<1	<1
020	12/02/92	1230	---	32	---	8.22	2.22	23.4	3	10	118	24	0.78	3	6
021	12/14/92	1415	29.0	34	8.6	8.26	3.65	28.7	10	9	288	37	5.05	1	<1
022	12/26/92	1400	---	33	---	8.29	1.97	18.6	204	13	690	52	1.72	TNTC	TNTC
<i>wet season means</i>			28.4	33	5.2	8.24	3.20	18.3	7	7	210	25	1.07	1	2

STATION W2 - off Waikiki (Kahanamoku) Beach, Catamaran Channel turning basin

EVENT NO.	DATE	TIME	TEMP. (°C)	SAL. (ppt)	D.O. (mg/l)	pH	TURB. (ntu)	NFR (mg/l)	NO ₃ NO ₂ (µg N/l)	NH ₃ (µg N/l)	TOTAL N (µg N/l)	TOTAL P (µg P/l)	CHL α (µg/l)	FECAL COILI. col/100ml	ENTERO. col/100ml
001	05/07/92	1505	--	--	--	8.22	0.58	3.2	2	17	284	10	0.13	<1	<1
002	05/14/92	1415	--	--	--	8.22	0.50	3.1	1	2	144	16	0.32	<1	<1
003	05/21/92	1400	--	--	--	8.32	0.50	2.4	1	5	131	<2	0.30	<1	<1
004	05/28/92	--	--	--	--	8.22	0.95	5.3	<1	2	172	<2	0.35	<1	1
005	06/03/92	1410	--	--	--	8.26	0.45	2.9	2	5	130	10	0.24	<1	1
006	06/15/92	1510	--	--	--	--	--	--	--	--	--	--	--	--	--
007	06/27/92	--	--	--	--	--	--	--	--	--	--	--	--	--	--
008	07/09/92	1410	--	--	--	8.24	0.86	3.3	2	3	116	60	0.26	<1	<1
009	07/21/92	1410	--	--	--	8.08	1.15	8.3	2	6	166	9	0.36	1107	<1
010	08/02/92	1400	--	--	--	8.18	0.67	2.6	<1	2	132	13	0.29	38	94
011	08/14/92	1400	--	--	--	8.25	0.85	4.8	2	14	367	14	0.23	<1	<1
012	08/26/92	--	--	--	--	8.23	0.61	5.8	2	4	145	17	0.45	6	21
013	09/07/92	1410	--	--	--	8.29	0.93	5.9	10	9	133	10	0.71	3	5
014	09/19/92	1255	--	--	--	8.26	1.03	13.1	3	10	197	6	0.17	<1	<1
015	10/01/92	1250	--	--	--	8.31	1.27	11.9	3	5	174	12	0.84	57	190
016	10/13/92	1300	--	--	--	8.31	1.29	8.9	2	5	196	1	0.72	86	5
017	10/26/92	--	--	--	--	8.21	3.35	--	76	12	257	27	0.52	CONF-LX	200
						8.29	0.45	6.1	3	3	142	6	0.39	<1	2
<i>dry season means</i>															
						8.24	0.83	5.1	2	5	171	8	0.35	2	3
018	11/08/92	1310	--	--	--	8.26	1.30	2.69	1	3	94	2	0.28	<1	3
019	11/20/92	1245	--	--	--	8.22	0.46	--	2	4	120	1	0.22	<1	<1
020	12/02/92	1255	--	32	--	8.18	0.53	4.7	4	9	146	9	0.30	1	6
021	12/14/92	1255	--	--	--	8.21	1.26	5.3	6	14	252	15	0.57	2	2
022	12/26/92	1345	--	--	--	8.29	1.02	9.8	7	7	193	<1	0.78	31	26
<i>wet season means</i>															
						8.23	0.84	5.0	3	6	152	3	0.39	2	3

STATION W2S - off Waikiki (Kahanamoku) Beach, Catamaran Channel

EVENT NO.	DATE	TIME	TEMP. (°C)	SAL. (ppt)	D.O. (mg/l)	pH	TURB. (ntu)	NFR (mg/l)	NO ₃ +NO ₂ (µg N/l)	NH ₃ (µg N/l)	TOTAL N (µg N/l)	Ortho-P (µg P/l)	TOTAL P (µg P/l)	CHL α (µg/l)
001	05/07/92	1510	--	--	--	--	0.42	3.0	1	8	--	--	--	--
002	05/14/92	1420	--	--	--	8.11	0.35	3.1	--	--	--	--	--	0.26
003	05/21/92	1405	--	--	--	8.29	0.44	2.4	--	--	--	--	--	0.38
004	05/28/92	--	--	--	--	8.22	0.62	4.1	--	--	--	--	--	0.33
005	06/03/92	1415	--	--	--	8.23	0.42	2.1	<2	3	148	--	9	0.36
006	06/15/92	--	--	--	--	--	--	--	--	--	--	--	--	--
007	06/27/92	--	--	--	--	8.23	0.53	1.6	7	7	--	--	--	0.25
008	07/09/92	--	--	--	--	8.14	0.87	10.9	4	1	--	--	--	0.55
009	07/21/92	--	--	--	--	8.16	0.58	1.1	1	2	--	7	11	0.21
010	08/02/92	--	--	--	--	8.23	0.79	4.7	3	1	--	10	--	0.19
011	08/14/92	--	--	--	--	--	--	--	--	--	--	--	--	--
012	08/26/92	--	--	--	--	8.33	4.21	23.7	6	19	--	38	--	0.55
013	09/07/92	--	--	--	--	--	--	--	--	--	--	--	--	--
014	09/19/92	--	--	--	--	--	--	--	--	--	--	--	--	--
015	10/01/92	--	--	--	--	--	--	--	--	--	--	--	--	--
016	10/13/92	--	--	--	--	--	--	--	--	--	--	--	--	--
017	10/26/92	--	--	--	--	--	--	--	--	--	--	--	--	--
<i>dry season means</i>														
						8.22	0.66	3.6	2	3		14		0.32
018	11/08/92	--	--	--	--	--	--	--	--	--	--	--	--	--
019	11/20/92	--	--	--	--	--	--	--	--	--	--	--	--	--
020	12/02/92	--	--	--	--	--	--	--	--	--	--	--	--	--
021	12/14/92	--	--	--	--	--	--	--	--	--	--	--	--	--
022	12/26/92	--	--	--	--	--	--	--	--	--	--	--	--	--
<i>wet season means</i>														

STATION W3 - off Waikiki, Catamaran Channel entrance

EVENT NO.	DATE	TIME	TEMP. (°C)	SAL. (ppt)	D.O. (mg/l)	pH	TURB. (ntu)	NFR (mg/l)	NO ₃ -NO ₂ (µg N/l)	NH ₃ (µg N/l)	TOTAL N (µg N/l)	TOTAL P (µg P/l)	CHL-α (µg/l)	FECAL COLI. col/100ml	ENTERO. col/100ml
001	05/07/92	1515	--	--	--	8.21	0.34	3.7	1	6	160	12	0.15	<1	<1
002	05/14/92	1430	--	--	--	8.06	0.29	2.5	1	9	332	17	0.32	<1	<1
003	05/21/92	1410	--	--	--	8.26	0.56	4.6	<1	4	155	<2	0.17	<1	<1
004	05/28/92	--	--	--	--	8.19	0.30	2.1	<1	2	136	<2	0.32	<1	<1
005	06/03/92	1420	--	--	--	8.21	0.16	6.5	<2	2	89	10	0.12	<1	<1
006	06/15/92	--	--	--	--	--	--	--	--	--	--	--	--	--	--
007	06/27/92	--	--	--	--	8.22	0.34	6.3	3	3	110	54	0.24	<1	<1
008	07/09/92	--	--	--	--	--	--	--	--	--	--	--	--	--	--
009	07/21/92	--	--	--	--	8.15	0.29	0.1	<1	<1	132	12	0.19	<1	<1
010	08/02/92	--	--	--	--	8.22	0.75	4.1	2	7	269	15	0.15	<1	<1
011	08/14/92	--	--	--	--	--	--	--	--	--	--	--	--	--	--
012	08/26/92	--	--	--	--	8.27	0.34	2.2	2	8	109	8	0.85	<1	<1
013	09/07/92	--	--	--	--	8.24	0.51	15.6	1	8	90	<2	0.14	1	<1
014	09/19/92	--	--	--	--	--	--	--	--	--	--	--	--	--	--
015	10/01/92	1310	--	--	--	8.24	0.40	13.2	1	4	130	<1	0.63	<1	<1
016	10/13/92	1310	--	--	--	8.15	4.72	23.4	72	19	327	36	0.50	CONFL. x	240est
017	10/26/92	--	--	--	--	8.22	0.36	3.2	6	5	143	6	0.32	--	--
<i>dry season means</i>															
			--	--	--	8.20	0.44	3.9	2	4	152	6	0.26	0.5	1
018	11/08/92	1315	--	--	--	8.25	1.03	2.8	3	17	125	3	0.28	--	--
019	11/20/92	1310	--	--	--	8.20	0.27	4.1	2	6	112	<1	0.16	--	--
020	12/02/92	1305	--	32	--	8.22	0.38	4.3	5	11	131	10	0.36	--	--
021	12/14/92	1305	--	--	--	8.23	1.00	8.9	6	11	245	13	0.47	--	--
022	12/26/92	--	--	--	--	--	--	--	--	--	--	--	--	--	--
<i>wet season means</i>															
			--	--	--	8.22	0.57	4.6	4	10	146	4	0.30	--	--

Station A1 - Ala Wai Yacht Harbor

EVENT NO.	DATE	TIME	TEMP. (°C)	SAL. (ppt)	D.O. (mg/l)	pH	TURB. (ntu)	NFR (mg/l)	NO ₃ +NO ₂ (µg N/l)	NH ₃ (µg N/l)	TOTAL N (µg N/l)	TOTAL P (µg P/l)	CHL. α (µg/l)	FECAL COLI. col/100ml	ENTERO. col/100ml
001	05/07/92	1630	24.8	35	6.7	8.17	0.83	9.5	18	12	164	19	3.38	1	<1
002	05/14/92	1540	27.5	36	6.3	8.15	1.30	3.3	<1	3	164	20	6.40	1	<1
003	05/21/92	1310	---	31	6.2	8.17	0.63	8.6	94	32	424	4	8.16	<1	3
004	05/28/92	1320	27.8	36	6.7	8.18	1.28	4.3	3	12	239	<2	3.11	<1	1
005	06/03/92	1330	32.5	---	5.0	8.22	1.78	3.8	2	2	247	25	3.40	17	8
006	06/15/92	1235	27.0	---	5.3	8.11	0.30	7.6	23	26	288	17	14.13	<1	<1
007	06/27/92	1255	28.0	---	4.5	8.19	0.83	3.8	23	21	188	87	3.36	<1	1
008	07/09/92	1300	28.0	29	5.4	8.04	3.70	5.6	96	76	523	71	16.5	TNTC	200
009	07/21/92	1300	28.0	34	6.2	8.13	0.83	0.8	30	23	225	20	0.86	1	1
010	08/02/92	1305	---	---	---	8.13	0.86	2.4	22	10	214	19	0.90	<3	1
011	08/14/92	1340	28.0	35	5.4	8.21	0.72	4.2	38	29	310	36	4.90	4	3
012	08/26/92	1310	27.5	---	6.5	8.28	0.58	8.3	11	16	223	19	10.03	<2	96
013	09/07/92	1215	---	---	---	8.24	0.68	15.8	8	9	173	13	2.97	<1	<1
014	09/19/92	1200	27.5	32	5.1	8.23	0.84	16.0	23	27	302	19	2.14	<2	18
015	10/01/92	1210	27.7	32	5.0	8.19	1.05	13.6	21	23	227	15	3.43	2	1
016	10/13/92	1415	---	---	---	7.91	5.46	---	685	96	1060	80	6.84	CONFLX	CONFLX
017	10/26/92	1145	28.0	28	4.00	8.27	1.20	9.0	60	14	337	33	6.25	84	8
<i>dry season means</i>															
			27.8	33	5.6	8.17	1.03	5.8	20	17	274	20	3.7	2	3
018	11/08/92	1210	27.0	33	5.7	8.19	0.74	4.0	31	28	205	9	1.04	3	<3
019	11/20/92	1150	26.0	24	4.2	8.20	1.25	3.0	158	27	355	24	3.41	18	2
020	12/02/92	1200	---	25	---	8.20	1.88	5.0	93	27	326	24	5.18	220	81
021	12/14/92	1210	26.2	31	8.1	8.16	0.57	3.0	58	17	263	8	1.22	8	<1
022	12/26/92	1415	---	7	---	8.18	17.7	22.0	314	63	640	121	7.08	CONFLX	CONFLX
<i>wet season means</i>															
			26.4	24	6.0	8.19	1.8	5.2	96	29	331	22	2.75	18	3

Station A2 - Ala Wai Yacht Harbor

EVENT NO.	DATE	TIME	TEMP. (°C)	SAL. (ppt)	D.O. (mg/l)	FECAL COLL. col/100ml	ENTERO. col/100ml
017	10/26/92	1230	--	--	--	660	160
<i>dry season means</i>							
018	11/08/92	1205	--	30	--	3	8
019	11/20/92	1145	--	--	--	80	<1
020	12/02/92	1155	--	--	--	CONFL4X	CONFL4X
021	12/14/92	1205	--	--	--	380 est	120
022	12/26/92	1420	--	--	--	CONFL4X	CONFL4X

wet season means

STATION L1 - Duke Kahanamoku Lagoon, eastern shore

EVENT NO.	DATE	TIME	TEMP. (°C)	SAL. (ppt)	D.O. (mg/l)	pH	TURB. (ntu)	NFR (mg/l)	NO ₃ ,NO ₂ (µg N/l)	NH ₃ (µg N/l)	TOTAL N (µg N/l)	TOTAL P (µg P/l)	CHL. α (µg/l)	FECAL. COLL. col/100ml	ENTERO. col/100ml
001	05/07/92	1425	25.5	34	6.5	8.16	1.11	6.0	1	2	145	16	0.68	1	6
002	05/14/92	1515	---	34	7.1	8.18	1.65	8.4	<1	1	161	22	1.15	<1	3
003	05/21/92	1325	30.2	36	6.8	8.32	2.87	8.4	<1	4	224	2	7.84	<1	2
004	05/28/92	1345	28.8	36	6.6	8.14	2.50	5.7	<1	3	166	<2	0.98	<1	1
005	06/03/92	1510	28.0	---	4.2	8.26	2.49	5.1	7	7	216	20	5.74	7	4
006	06/15/92	1250	28.5	---	6.3	8.22	2.09	6.5	3	6	292	14	2.47	<1	1
007	06/27/92	1315	29.0	---	7.4	8.24	3.62	4.8	4	4	152	85	1.43	1	11
008	07/09/92	1315	29.0	29	7.4	8.01	2.26	4.4	1	9	233	21	8.24	110	7
009	07/21/92	1320	29.0	35	6.3	8.15	3.34	8.0	<1	<1	209	21	1.35	42	12
010	08/02/92	1315	---	---	---	8.23	3.17	6.7	2	2	189	17	1.89	1	4
011	08/14/92	1340	28.0	36	6.8	8.21	1.89	13.4	<1	3	197	17	2.08	1	140
012	08/26/92	1325	28.0	---	5.9	8.32	2.31	12.2	<1	6	155	11	9.02	3	2
013	09/07/92	1225	---	---	---	8.25	1.50	11.1	2	8	159	7	1.06	1	1
014	09/19/92	1220	28.0	32	5.7	8.25	3.69	19.5	3	17	319	18	3.63	2	11
015	10/01/92	1230	27.5	32	7.4	8.27	3.80	16.2	1	4	153	14	4.46	<1	<1
016	10/13/92	1230	---	20	---	8.06	6.02	52.0	29	9	368	52	12.8	1100 _{est}	70
017	10/26/92	1200	28.5	32	6.2	8.40	1.64	12.7	5	6	187	8	1.69	5	2
<i>dry season means</i>															
			28.3	32	6.4	8.22	2.49	9.4	2	4	199	14	2.7	3	4
018	11/08/92	1220	28.8	32	8.5	8.24	3.60	10.4	2	5	135	9	0.85	1	12
019	11/20/92	1220	28.0	32	3.8	8.19	1.79	3.6	1	2	132	2	1.96	22	4
020	12/02/92	1225	---	32	---	8.24	1.29	13.0	18	21	383	16	1.34	21	1
021	12/14/92	1230	27.5	32	7.6	8.18	1.60	36.6	4	12	234	3	2.21	40	1
022	12/26/92	1355	22.5	31	5.7	8.35	3.16	17.2	8	7	181	4	14.0	28	17
<i>wet season means</i>															
			26.6	32	6.4	8.22	2.11	12.5	4	7	196	5	2.3	14	4

STATION L2 - Duke Kahanamoku Lagoon, western shore

EVENT NO.	DATE	TIME	TEMP. (°C)	SAL. (ppt)	D.O. (mg/l)	pH	TURB. (ntu)	NFR (mg/l)	NO ₃ :NO ₂ (µg N/l)	NH ₃ (µg N/l)	TOTAL N (µg N/l)	TOTAL P (µg P/l)	CHL α (µg/l)	FECAL COLI. col/100ml	ENTERO. col/100ml
001	05/07/92	1410	25.5	34	6.3	8.21	1.70	11.7	1	4	212	35	1.43	1	<1
002	05/14/92	1530	28.2	34	6.7	8.19	1.04	4.7	<1	5	176	21	1.95	24	4
003	05/21/92	1320	31.0	36	8.0	8.34	3.80	5.2	<1	4	208	<2	6.86	3	1
004	05/28/92	1330	30.5	36	6.7	8.15	2.84	7.3	<1	9	232	<2	2.13	<1	1
005	06/03/92	1520	27.8	---	6.4	8.32	2.40	6.2	3	3	196	19	4.73	1	1
006	06/15/92	1240	29.0	---	6.4	8.29	11.8	24.6	4	3	270	20	1.56	6	<1
007	06/27/92	1310	28.0	---	6.4	8.27	11.3	5.5	3	3	223	68	1.72	2	2
008	07/09/92	1320	28.5	35	6.9	8.01	2.04	4.0	1	3	185	1	2.18	7	4
009	07/21/92	1310	29.0	35	6.7	8.19	1.86	5.5	1	3	207	19	1.22	2	2
010	08/02/92	1310	---	---	---	8.24	2.66	8.6	3	5	198	17	1.66	<1	2
011	08/14/92	1550	29.0	35	6.8	8.24	1.47	16.3	5	8	230	38	2.46	2	3
012	08/26/92	1330	31.0	---	7.8	8.35	1.71	3.8	2	5	145	8	2.68	<1	1
013	09/07/92	1220	---	---	---	8.31	2.12	20.5	4	10	182	9	1.14	<1	<1
014	09/19/92	1210	29.0	32	6.8	8.34	2.40	23.0	14	8	286	17	1.66	5	5
015	10/01/92	1215	30.5	32	9.0	8.32	2.95	22.8	9	6	180	4	4.50	7	2
016	10/13/92	1225	---	20	---	8.15	5.66	22.6	58	8	426	84	13.7	460 ^{est}	21
017	10/26/92	1210	28.0	32	5.8	8.34	1.31	13.7	2	4	204	9	3.12	3	1
<i>dry season means</i>															
			28.9	33	6.9	8.25	2.66	9.8	2	5	215	11	2.5	3	2
018	11/08/92	1230	27.0	32	6.4	8.23	3.80	7.7	2	12	174	7	1.77	100	28
019	11/20/92	1205	30.2	32	3.8	8.18	1.26	12.2	6	7	165	5	1.19	11	<1
020	12/02/92	1230	---	32	---	8.18	1.21	14.1	2	6	208	6	1.88	22	2
021	12/14/92	1220	28.0	32	8.6	8.21	1.52	11.3	7	6	240	19	1.49	43	2
022	12/26/92	1430	---	27	---	8.35	2.15	14.2	11	11	237	5	11.7	480 ^{est}	330 ^{est}
<i>wet season means</i>															
			28.4	31	6.3	8.23	1.80	11.6	4	8	202	7	2.3	55	7

APPENDIX D

**Hilton Hawaiian Village
Parking Management Plan**

Hilton Hawaiian Village

Parking Management Plan

For Submittal with the Kalia Tower/Recreation Deck

Waikiki Special District Application

September 1993

The design of the Hilton Hawaiian Village effectively disperses transportation activities to different areas of the property. The parking structure is located at the Ewa end, whereas the bus arrival/departure area is located at the Diamond Head side of the property. As this Plan later elaborates, the valet parking function is located at yet another area, near the main lobby, while deliveries are handled at the perimeter of the property unless destined for Rainbow Tower.

1) Number of parking spaces and loading spaces to be provided (see accompanying map for area locations).

The HHV accommodates entirely on property (specific breakout on page 2):

- a multi-level parking structure (#1);
 - delivery vehicles in multiple loading dock areas -- Tapa (#2), Rainbow (#3), behind Kobe Steak House (#4), Lagoon Apartments (#5);
 - large tour bus loading/unloading (#6);
 - spaces for immediate loading and unloading of private vehicles and small commercial PUC-licensed vans at multiple porte cocheres -- Diamond Head Tower (#7), Rainbow Tower (#8), Lagoon Apartments (#9), and the main lobby (#10) as well as adjacent to the Tapa Tower along Rainbow Drive near the entrance to the HHV (#12);
 - taxi queuing (#11); and
 - valet parking at the main lobby (#10) and Rainbow Tower porte cochere (#8).
-

*Hilton Hawaiian Village
WSD Parking Management Plan
September 1993
Page 2*

II) Users of spaces by category.

GARAGE STRUCTURE:

	<u>Spaces</u>
Transient Parking	1281
Lagoon/Diamond Head Apartment Residents (Reserved)	261
Valet Service Stalls	125
Staff Stalls (Reserved)	41
Handicapped Stalls	12
Hilton Limousine Stalls (Reserved)	3
Employee Of The Month Stalls (Reserved)	2
<hr/>	
TOTAL NUMBER OF STALLS	1275 1725

LOADING DOCK AREAS: (For large delivery vehicles such as 40' trailers, trash compactors, 20' covered luggage delivery trucks, utility vehicles, etc.)

	<u>Spaces</u>	<u>Queuing</u>
Tapa	5	2
Rainbow Tower	2	1
Behind Kobe Steak House	2	
Lagoon Apartments	1	1
<hr/>		
TOTAL NUMBER OF STALLS	10	4

LARGE TOUR BUSES:

Tapa Bus area has four spaces for passenger loading/unloading with an additional two to three spaces for bus queuing.

IMMEDIATE LOADING AND UNLOADING: (Private vehicles, limousines, and vans)
Diamond Head Tower, Rainbow Tower, Lagoon Apartments have six spaces each.
The Main Lobby porte cochere has space for 12 to 15 vehicles, while the loading area adjacent to Tapa Tower can accommodate four to five vehicles.

TAXIS:

Space for 50 taxis queuing on the Ewa side of the parking structure

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WSD Parking Management Plan
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III) Peak hours and typical hours of use of tour bus spaces.

The Army-initiated realignment of Kalia Road has prompted Hotel management to redesign the bus arrival/departure area located near the intersection of Paoa Place and Kalia Road. The new design will separate bus traffic from luggage delivery as well as from loading dock activities, thus creating a more efficient and attractive waiting space for passenger loading and unloading. This, along with the landscaping planned for the area, is in sync with the objectives of the Waikiki Master Plan.

Morning peak traffic for buses comes in two waves:

- Prior to 7:30 am to accommodate departures mainly from our Japanese market segment; and
- From 8:00 am to 9:30 am for boarding of customers going on day bus tours.

The above traffic is out going and has no impact on our parking facility. Pick-ups are normally handled quickly as the bus drivers have a set schedule to follow.

Afternoon peak traffic also occur during two general time periods:

- Typically between 3:30 pm and 5:30 pm to handle arrivals; and
- From 4:30 pm to 6:30 pm for customers returning from day tours as well as pick-ups for those going on cruises and other evening events.

Incoming traffic is handled extremely quickly as the buses simply drop-off passengers and leave for their next stop. Tour pick-ups are also generally short in duration as the buses are making multiple stops in Waikiki.

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WSD Parking Management Plan
September 1993
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IV) Plans to handle overflow parking demand for special events.

On an ongoing basis, HHV employees are encouraged to carpool, use the bus, or utilize other alternative means of travelling to and from work. Most recently, the Village cooperated with the Honolulu Public Transit Authority by spearheading the effort to establish semi-express bus service to Waikiki from Kalihi and Waipahu. This service started in August 1993.

During local banquet events, demand for parking is particularly heavy. In these situations the following actions are taken by management when heavy private vehicular usage is anticipated:

- The garage is closed to all employees on the day of the event;
 - A flyer is circulated and the expected situation discussed at departmental meetings. Employees are encouraged to use the bus, walk, bike, car pool, or be dropped off;
 - Those employees who are driving are directed to park at nearby garages. When the expected peak usage is in the evening, special arrangement with parking facilities in nearby commercial/office complexes allow maximum utilization by complementing the "low" usage of their lots (evening) with the "high" usage of the HHV's;
 - HHV garage staff open the entrance gate and manually hand out tickets to facilitate the flow of incoming traffic;
 - Additional garage employees are stationed within the garage to expedite traffic;
 - Upon exiting, all three of the garage exit booths are manned. If the manpower is available, an employee will direct traffic to the booths;
 - Hotel management hires three off-duty Honolulu Police Department officers for traffic control. One is positioned at the front of the hotel driveway and two are positioned at the Ala Moana/Kalia Road intersection. The lights are placed on blinking status.
-

*Hilton Hawaiian Village
WSD Parking Management Plan
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V) Valet parking scheme.

Valet parking is available at the main lobby as well as the Rainbow Tower porte cochere. This type of parking is used for two reasons:

- 1) as a convenience to customers; and
- 2) to divert private vehicular traffic into multiple destinations -- the parking garage entrance for self parking, and the main lobby and the Rainbow Tower porte cochere for valet parking.

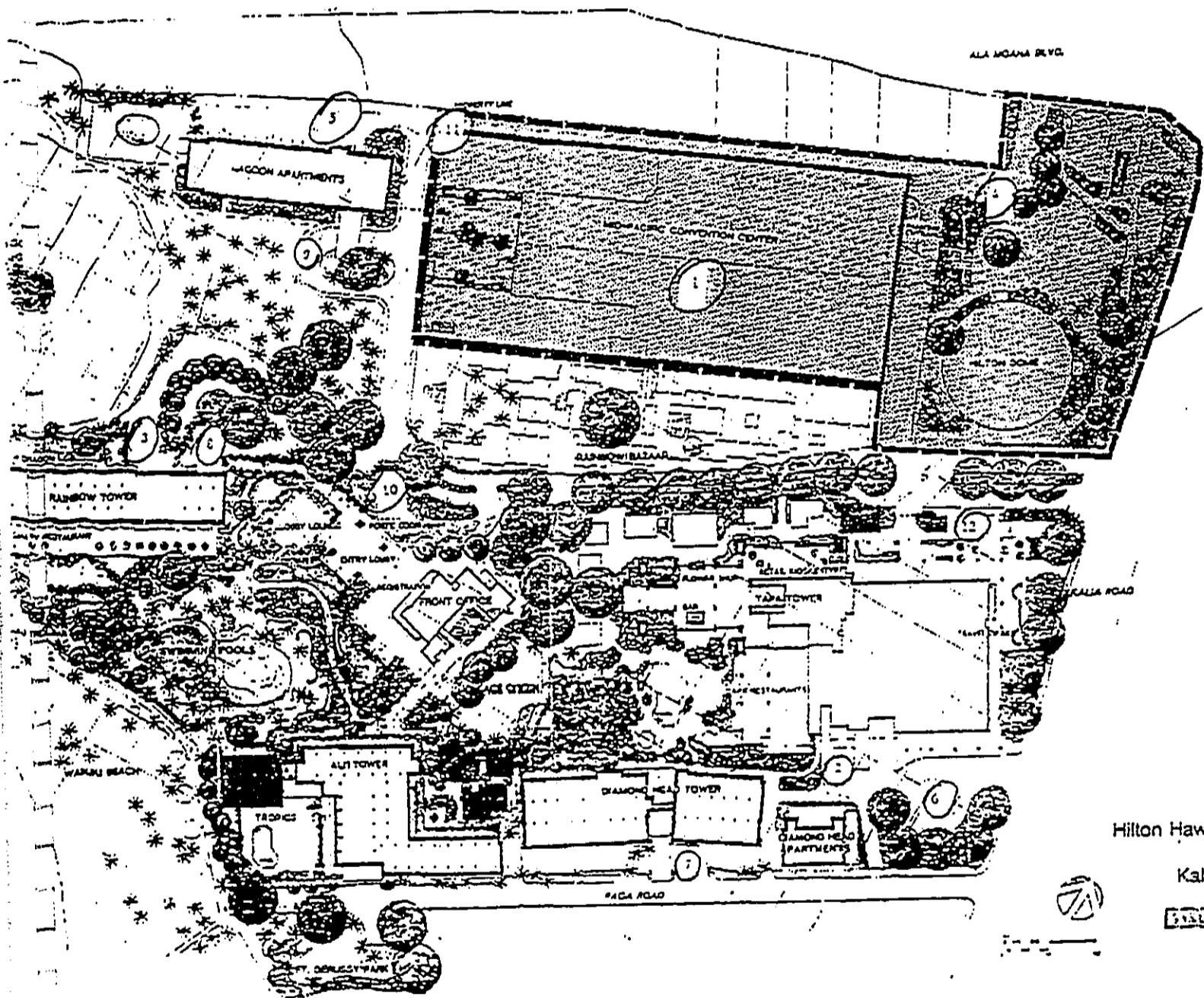
This dispersing of traffic helps improve the overall property traffic flow by quickly getting vehicles off public roads and expediting handling once on the Hilton grounds. Additionally, extra valet parking is utilized in the evening at the Rainbow Tower loading dock area when deliveries are finished for the day. This allows for efficient use of otherwise unutilized space.

Valet parking is available on a complementary basis for customers dining in Hilton restaurants to encourage valet parking use and meet management's goal of dispersing traffic to different destinations and quickly moving cars off of City streets and into the property.

*Hilton Hawaiian Village
WSD Parking Management Plan
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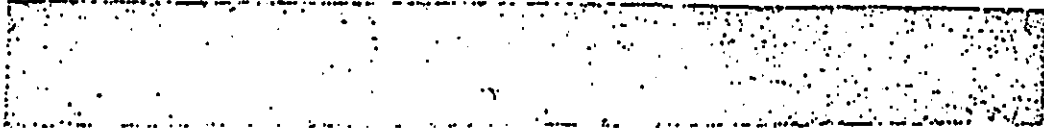
VI) Other Initiatives.

- The Hotel provides free covered bicycle and moped storage located conveniently on the ground floor of the parking structure.
 - A shower/locker room facility is available for employees who bicycle, run or walk to and from work.
 - All vendor services (i.e. food deliveries, laundry pick-up, etc.) are handled on-site and not on City streets. This is accomplished at multiple locations within the property.
 - Queuing by taxis is entirely accomplished on-property by lining up vehicles on the Ewa side of the parking structure with an addition 3-4 waiting taxis can be queued near Tapa Tower on Rainbow Drive and near the main lobby opposite Lappert's Ice Cream.
-



APPENDIX E
1955 Deed and Indenture

Houchstelt



7024
11/24/55 (220)

INDENTURE AND DEED

THIS INDENTURE executed this 22nd day of September, 1955, by and between the TERRITORY OF HAWAII, hereinafter called the "Grantor", and KAISER COMMUNITY HOMES, a California corporation authorized to do business in the Territory of Hawaii, having its principal place of business and post office address at 14418 Chaso Street, Suite A, Panorama City, California, and its office in said Territory at 2605 Kalia Road, Honolulu, Hawaii, hereinafter called the "Grantee",

WITNESSETH:

WHEREAS, Grantor has expended considerable sums of money in the development of Waikiki Beach and desires to expend further public funds in said development by constructing an artificial beach and groin in the area seaward of the lands hereinafter described; and

WHEREAS, the construction of said public beach and groin would interfere with the littoral rights appurtenant to the lands of Grantee abutting said area; and

WHEREAS, Grantor is willing to convey to Grantee that certain area, hereinafter described, provided that Grantee will waive and relinquish all claims for compensation or damages against Grantor heretofore made in connection with Grantee's said property, that Grantee will grant, convey, release and relinquish to Grantor all littoral rights appurtenant to or connected with its said lands, that Grantee will agree to the construction of said public

Grant her title, and that the owners of other shore lands abutting said area will do all of the same; and

WHEREAS, by Public Law 189, dated August 1, 1955, Chapter 441, 54th Congress, First Session, the Commissioner of Public Lands of the Territory of Hawaii, with the concurrence of the Board of Harbor Commissioners and the approval of two-thirds of the Board of Public Lands and of the Governor of the Territory of Hawaii, is authorized and empowered to convey to the owners of certain shore lands, of whom the Grantee is one, all or a certain portion of a certain tidelands area described in said Public Law, which tidelands area includes the lands hereinafter described as Parcel 1, upon the fulfillment of certain conditions; and

WHEREAS, the Board of Harbor Commissioners, at its meeting held September 21, 1955, has concurred in, and two-thirds of the Board of Public Lands of the Territory of Hawaii, at its meeting held September 9, 1955, and the Governor of the Territory of Hawaii, have approved the conveyance of said land, and the conditions referred to have been or are fulfilled by this instrument and by one or more instruments of like tenor made by and between the Grantor and the owners of other shore lands abutting on the tidelands area described in said Public Law;

NOW, THEREFORE, for and in consideration of the release and covenants of and the conveyance by the Grantee, hereinafter set forth, the Grantor does hereby give, grant, bargain and sell unto the Grantee, its successors and assigns, forever and in fee simple, the following property:

100-204-221

PARCEL 2

Being the area lying westerly of and adjacent to
Land Court Application 214, situated at Kalia, Naikiki,
Honolulu, Oahu, Territory of Hawaii,

Being a portion of the area transferred to the
Territory of Hawaii by Presidential Executive Order
1400 dated October 27, 1923.

Being also a portion of the area described in
Public Law 106, 44th Congress and approved August 1,
1878.

Beginning at an "x" cut in face of seawall, at
the south corner of this parcel of land, being also
the west corner of Land Court Application 1853, the
termination of said point of beginning referred to
Government Survey, Triangulation Station "Pohikaha"
being 10981.42 feet South and 2755.22 feet East, as
shown on Government Survey registered Map 4070, and
running by azimuths measured clockwise from True
South:-

1. 141° 36' 78.00 feet;
2. 241° 00' 99.00 feet;
3. Thence on a curve to the left with a radius of
100.00 feet, the chord
azimuth and distance being:
100° 45' 141.42 feet;
4. 155° 45' 99.81 feet;
5. Thence on a curve to the left with a radius of
100.00 feet, the chord
azimuth and distance being:
100° 45' 141.42 feet;
6. 60° 40' 11.00 feet;
7. 150° 40' 75.00 feet;
8. 145° 34' 30' 310.00 feet along Parcel 1;
- Thence along highwater mark of Land Court Applica-
tion 214 for the next four (4) courses, the
direct azimuths and distances between points along
said highwater mark being:
9. 30° 30' 35.00 feet;
10. 301° 10' 105.00 feet;
11. 330° 10' 105.00 feet;
12. 301° 00' 37.42 feet to a "4" cut in top
of seawall;

- 12. 61' 30" 200.00 Feet along Land Court Application 1982 to a 24" pipe in concrete;
- 14. 61' 46" 47.74 Feet along Land Court Application 1982 to a splice in face of seawall;
- 15. 61' 30" 200.00 Feet along face of seawall along highwater mark of Land Court Application into the point of beginning and containing an area of 2.722 acres.

666-1746

Excepting an easement, however, all littoral rights of whatsoever nature or kind which are or may be thereunto appurtenant.

Together with a perpetual easement over and across courses numbered 2 to 7, inclusive, of the above description of said parcel and any beach abutting upon said courses, for access to the beach hereby mentioned; provided, however, that such easement of access shall not include the right to erect or maintain any structure over or upon or to make any excavation in said courses or said beach.

And also an easement over and across the westerly (westerly) boundaries of the following parcels of land for access to Crescent Beach, hereinafter mentioned, and the same:

Lot 3, area 22,475 square feet, shown on Map 2 filed in the Office of the Assistant Registrar of the Land Court of the Territory of Hawaii with Land Court Application 624, being a portion of the land described in Transfer Certificate of Title No. 61,325;

The land registered in Land Court Application 624, area 79,998 square feet, shown on Map 2 of said Application filed in said office, being a portion of the land described in Transfer Certificate of Title No. 61,350; and

The land registered in Land Court Application No. 1000, area 20,000 square feet, shown on Map 1, filed in said office, being a portion of the land described in Transfer Certificate of Title No. 81,100.

Provided, however, that said easement for access shall not include the right to erect or maintain any structure over or upon or to make any excavation in said Crescent Beach of the sea.

To HAVE AND TO HOLD the same together with all of the rights, easements, privileges and appurtenances thereunto belonging or appertaining or now and enjoyed therewith unto the Grantee, its successors and assigns forever.

GRANTOR and GRANTEE hereby covenant and agree as follows:

A. That registered Map No. 4070 dated September 21, 1939, filed in the Office of the Surveyor of the Territory of Hawaii, copies of which map have been furnished to the Grantee, has been prepared as an aid to the interpretation of the following covenants and depicts the improvements, intended by the parties that are referred to in the following covenants. In the event that changes are hereinafter made in the following covenants by mutual agreement of the grantor and the grantee, said changes, insofar as it is possible so to do, shall be depicted on said map and revised copies thereof shall be furnished to the Grantee.

B. Grantor, for itself, its successors and assigns, hereby covenants and agrees with Grantee as follows:

1. Grantor shall subject to the availability of funds construct Crescent Beach, the approximate location and configuration of which beach is shown on Registered Map No. 4070, and bordered thereon in yellow. Said beach, shall be

approximately 150 feet in width, shall be located on the seaward side of the shore line in front of and between Land Court Application 1033 and 1034, shown on the map and the seaward (southern) shore line, hereby set forth and shown on Registered Map No. 4070. The area shall permanently contain a beach 150 feet wide, located in the same location and configuration shown on Registered Map No. 4070, to the extent that it is able to withstand the

action of natural forces thereupon, and the adjacent swimming area extending to seaward (southern) side, which swimming area is shown on Registered Map No. 4070 crosshatched in green, as a public beach and swimming area so long as and to the extent that appropriations are and may from time to time be available therefor. Grantor shall within six (6) months after completion of performance by Grantee under covenants 1 and 2 hereof, construct that part of the said Crescent Beach as is shown on Registered Map No. 4070 crosshatched in black and adjacent swimming area.

2. Grantor shall, subject to the availability of funds fill the area, marked "Recreation Area" and bordered in pink on Registered Map No. 4070, lying between the above-mentioned Crescent Beach and the southerly side of the Ala Moana Beach Harbor, with the exception of the lagoon abutments hereinafter described, within the recreation area, to an elevation not exceeding 7.0 feet above mean lower low water, (77.0 M.L.L.W.). Except for the portion thereof marked "Proposed Highway" and shown on Registered Map No. 4070, said filled area shall be used as and for a recreation area, subject to the covenants hereinbefore mentioned.

3. Grantor shall not construct or erect nor permit the construction or erection of any building or structure



... level of mean lower low water ... in that portion of the recreation area marked "Building Area" and crosshatched with cross lines on registered map No. 4470, lying westerly of a line across said recreation area parallel to and 1500 feet westerly from course numbered 4 of the description of Parcel 2 hereinafter, which line is marked "Division Line" and shown on Registered Map No. 4070, and any building or structures erected thereon shall be restricted to yacht clubs, swimming clubs, bath houses, and food restaurants and outbuildings incidental thereto and such buildings and structures of a like nature as will contribute to the use of said area as a recreation area. No hotels or apartment houses shall be built nor be permitted to be built thereon.

4. Grantor shall not construct or erect nor permit the construction or erection of any building on that portion of said recreation area, marked "No Building Area" on registered map No. 4070, lying between the Division line referred to in the preceding paragraph, the lagoon hereinafter described, "Lagoon Area", and the easterly side of Ala Moana Yacht Harbor, nor in the area covered by said lagoon, whether or not the same may be filled at some subsequent date.

5. Grantor shall construct, within sixty (60) days of the commencement of the drainage of the construction of the lagoon and lagoon outfalls hereinafter mentioned, and maintain a culvert connecting the sea and the lagoon hereinafter described, with not less than two separate outlets from said culvert in the lagoon, and one or more culverts connecting either or both of these portions of the Ala Moana Yacht Harbor marked "Water Area A" and "Water Area B" and crosshatched in orange on registered map No. 4070 and the lagoon hereinafter

described, with not less than two separated inlets to said lagoon or lagoons in the lagoon, for the purpose of permitting adequate water circulation through said lagoon.

6. Grantor shall permit Grantee to maintain said lagoon and culverts and any beach within and around the perimeter of said lagoon to the extent that the same are located upon land owned by the Grantor.

7. Grantor shall, within three (3) months after the completion by the Grantee of the lagoon and lagoon abutments hereinafter mentioned, construct a sand beach not less than 25 feet in width along where the same abuts the Proposed Roadway shown on said Registered Map No. 4070 in which segment said beach may be narrower, contiguous to and around the exterior of the perimeter of the lagoon hereinafter described in approximately the manner shown for said beach, marked "Lagoon beach" and color in blue on said Registered Map No. 4070, and shall cover the floor of said lagoon with sand for a width of not less than 25 feet contiguous to and around the interior of the perimeter of said lagoon.

8. Grantor shall, within two (2) weeks of the date hereof or the execution of a similar instrument and deed by the owner of Lot B, Lane Grant Application No. 1549 (whichever date is later), furnish the Grantee final engineering plans and specifications for the dredging and construction of the lagoon and lagoon abutments to be dredged and constructed by the Grantee, hereinafter mentioned.

9. Grantor shall permit Grantee to install and maintain electric power lines under lands of the Grantor in the vicinity of said lagoon in locations to be mutually agreed upon for the purpose of supplying electric power for the pumps to be maintained by Grantee, as hereinafter provided.

1. Grantee, for itself, its successors and assigns, hereby covenants and agrees with Grantor as follows, these covenants to run with the land described as Parcel 2, hereinafter:

1. Grantee consents to the construction of said Crescent Beach, recreation area, lagoon and lagoon beach, hereinafter as hereinafter mentioned. Grantee also consents to the demolition and removal of the pier shown and marked "Pier" on Registered Map No. 4070, in the filling and construction of said Crescent Beach.

2. Grantee shall within six (6) months after the Grantor has furnished it with final engineering plans and specifications therefor create and construct a lagoon and lagoon attachments in accordance with said plans and specifications. The lagoon shall be dredged to a depth of not less than 7.7 feet (-1.7 M.S.L.W.) and not more than 12 feet (-12.0 M.S.L.W.), and shall be in the approximate location and configuration shown on the attached map as "Lagoon" and colored in green thereon. Said lagoon shall be of a maximum length, in an easterly-westerly direction, of 650 feet and a maximum width, in a northeasterly-southeasterly direction, of 410 feet. The perimeter of said lagoon, as shown on said Registered Map No. 4070 except along the northwesterly segment of the same, the proposed roadway, represents the mean low water line of the lagoon. The distances around the exterior perimeter of said lagoon to be constructed by the Grantee shall be at least 10 feet from the perimeter of said lagoon to the mean low water line, along shore 5 feet above mean lower low water (-9.0 M.S.L.W.) and at least 75 feet from said perimeter of said lagoon to the proposed roadway where the same is less than 75 feet to said

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... and ... at the same level ... an additional ... distance of 20 feet ... the extent that the full ... distance of 20 feet ... within the ... impeded by the ... of the proposed roadway ... through 15, of the ...

... Grant ... within the period mentioned next ... the area described in ... 2 hereinafter to the ... adjacent to the ... on the ... and ... sides of the same, ... within the ... area thereof to be covered by a portion of the lagoon beach, ... where the grade shall ... to mean low water mark of the lagoon. Any material ... in constructing said lagoon in excess of that necessary ... the lagoon abutments may be used ... for the purpose of filling ... 2 and for the purpose of filling ... 1 if permitted by the owners thereof.

4. The Grantee, within one (1) month after completion of performance by contractor under covenants B 5 and B 7 hereof, shall install and thereafter, subject only to the provisions of paragraph B 1, hereinafter, shall personally operate and maintain necessary pumps and valves, to be situated on the property of the Grantee at locations mutually agreed upon, to provide circulation of water in said lagoon adequate to keep the same clean and sanitary at all times.

5. It is mutually understood and agreed by the Grantor and Grantee, that:

1. In the event that satisfactory maintenance of the lagoon proves to be physically impracticable by reason of excessive costs or inability to maintain proper sanitary conditions therein the foregoing covenants numbered B 5, B 6, and B 7 shall be terminated and the Grantor and Grantee

shall have no further obligation with respect thereto.

In such event, the Grantor shall, however,

- (a) Fill the lagoon and lagoon beach to the grade of the surrounding properties. The lagoon shall then become a part of the "No Buildings" portion of the recreation area, and the easement hereinabove granted for access to the lagoon shall become an easement for access to said recreation area.
- (b) Convey to the Grantee, its successors and assigns a non-exclusive easement for foot passage 20 feet wide from the junction of courses numbered 7 and 8 of the description of Parcel 2, hereinabove described, along, contiguous to and on the westerly side of courses numbered 1 to 7, inclusive, of said description of Parcel 2, hereinabove described, for access to Crescent Beach and the sea; provided, however, that said easement shall not include the right to erect or maintain any structure over or upon or to make any excavation in the area covered by said easement.

2. That certain agreements known as the Waikiki Agreement entered into on October 19, 1920, between Grantor and various property owners, including Grantee's predecessors in title, said agreement being recorded in the Bureau of Conveyances of the Territory of Hawaii in Book 1047, Pages 170-202, and noted on Transfer Certificates of Title Nos. 83110 and 81306 issued to the Grantor, is hereby and herewith terminated as between the Grantor and Grantee.

3. Grantor's obligation to perform these covenants under 2, above, as to which a time limit for performance is stated shall be subject to its ability to perform the same.

with funds currently available therefor, to wit, the sum of
the Hundred Party Transfer Certificate (No. 40,000.00).

And in consideration of the foregoing conveyance by
and covenants of the Grantor, the Grantee hereby gives, grants,
conveys, sells, conveys, releases and relinquishes unto
the Grantee any and all lesser interests appurtenant to the follow-
ing shoreline property, to wit, of Tract No. 33, bordering on the land
described as Parcel No. 10, and upon a portion of Crescent Beach:

1. Any and all lesser interests appurtenant to
Tract No. 33, of 10,000 square feet, as shown on Map 3
of the Office of the Assistant Registrar of
the Territory of Hawaii with Land
Court Application No. 514 of John Fna Estate Trustees,
relating to the land described in Transfer Certificate
of Title No. 20,110 issued to the Grantee.

2. Any and all lesser interests appurtenant to
Tract No. 33, of 10,000 square feet, as shown on Map 3
of the Office of the Assistant Registrar of the
Land Court of the Territory of Hawaii with Land Court
Application No. 514 of Frances Germania Richardson,
being a portion of the land described in Transfer Cer-
tificate of Title No. 21,000 issued to the Grantee.

3. Any and all lesser interests appurtenant to
Tract No. 33, of 10,000 square feet, all of the land
described in Land Court Application No. 524 of Sophie
Tract No. 33, of 71,000 square feet, as shown on Map 3
of the Office of the Assistant Registrar of the
Territory of Hawaii with said Land
Court Application No. 524, a portion of the land de-
scribed in Transfer Certificate of Title No. 21,356,

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4. Any and all littoral rights appurtenant to that certain parcel of land being all of the land registered in Land Court Application No. 1683 of Associated Hotels (Hawaii) Limited, area 85,309 square feet, as shown on [redacted] filed in the Office of the Assistant [redacted] the Land Court of the Territory of Hawaii [redacted] Land Court Application, being a part of [redacted] and described in Transfer Certificate No. 61,595 issued to the Grantee.

Notwithstanding and reserving, however, from the conveyance of the above littoral rights under items 2, 3 and 4 above, a [redacted] easement for access across the makai (westerly) boundaries of the lands described therein for access to Crescent Beach and the sea; but without including as part of said easement the right to erect or maintain any structure over or upon or to make any excavation in said Crescent Beach abutting said makai boundaries of the sea; said easement being the same as [redacted] hereinabove granted by the Grantor to the Grantee.

TO HAVE AND TO HOLD the same together with all rights and privileges belonging or appertaining thereto unto the Grantor, its successors and assigns, forever.

And Grantee for itself, its successors and assigns do hereby remise, release and forever discharge Grantor, its successors and assigns of and from any and all manner of action or actions, cause and causes of action, suits, controversies and trespasses, damages, claims and demands of whatever kind or nature to, against or in connection with [redacted] of Grantee, hereinabove described, the littoral rights of action are hereinabove conveyed by the Grantee to [redacted] herebefore claimed or existing, in law or equity, [redacted] [redacted] had any by reason of any matter, cause or

thing whatsoever having been done or omitted to be done by the Grantor.

IN WITNESS WHEREOF, the TERRITORY OF HAWAII has caused these presents to be duly executed by Harriet M. Ashford, its Commissioner of Public Lands, and countersigned by Samuel Wilder King, Governor of Hawaii, A. D. Gust, Chairman, Board of Public Lands of the Territory of Hawaii, and Ben E. Mutter, Chairman, Board of Harbor Commissioners, pursuant to the authority so to do in them vested by the aforesaid Public Law 199, dated August 1, 1958, Chapter 44, 85th Congress, First Session, and all other laws enabling them so to do, and KAISEN COMMUNITY HOMES has caused these presents to be executed and its corporate seal to be hereunto affixed by its proper officer in that behalf duly authorized, on the day and year first above written.

TERRITORY OF HAWAII

By Harriet M. Ashford
Commissioner of Public Lands

Grantor

KAISEN COMMUNITY HOMES

By Samuel Wilder King
Governor of Hawaii

Samuel Wilder King
Governor, Territory of Hawaii

A. D. Gust
Chairman, Board of Public Lands

Ben E. Mutter
Chairman, Board of Harbor Commissioners

APPROVED:
Cent. R. Adair

1958
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TERRITORY OF HAWAII)
CITY AND COUNTY OF HONOLULU) SS:

On this 17th day of August, 1955, before me personally appeared MARGUERITE A. ASH GORD, COMMISSIONER OF PUBLIC LANDS, to me known to be the person who executed the foregoing instrument and acknowledged to me that she executed the same as her free act and deed as COMMISSIONER OF PUBLIC LANDS of the Territory of Hawaii and that she executed the same on behalf of the Territory of Hawaii.

George K. H. ...
Notary Public, First Judicial
Circuit, Territory of Hawaii.

My commission expires 11-15-57

TERRITORY OF HAWAII)
CITY AND COUNTY OF HONOLULU) SS:

On this 22nd day of September, 1955, before me appeared HENRY J. KAISER to me personally known, who, being by me duly sworn, did say that he is the Chairman of the Board of KAISER COMMUNITY HOMES and that the seal affixed to the foregoing instrument is the corporate seal of said corporation and that said instrument was signed and sealed in behalf of said corporation by authority of its Board of Directors, and said HENRY J. KAISER acknowledged said instrument to be the free act and deed of said corporation.

George K. H. ...
Notary Public, First Judicial
Circuit, Territory of Hawaii.

My commission expires 8/1/57

Filed of Record OCT 18 1955 at 10:00 A.M.
Honolulu, Hawaiian Territory of Hawaii.
by ... Clerk

(FIRST ORIGINAL)

INDENTURE AND DEED

1955-3024 Part 235

THIS INDENTURE executed this 26th day of September, 1955, by and between the TERRITORY OF HAWAII, hereinafter called the "Grantor" and ANNIE AULANI PAOA CLARK, wife of Herman Kahikiena Clark, whose residence and post office address is 347 Keaniani Street, Lanikai, Oahu, Territory of Hawaii, VIOLET LEILANI PAOA COOK, unmarried, whose residence and post office address is 1537-3-2 Wilder Avenue, Honolulu, City and County of Honolulu, said Territory, KELIHOALANI PAOA, unmarried, whose residence and post office address is 1341 Ala Moana Road, Honolulu, City and County of Honolulu, said Territory, FREDERICK HCOLAE PAOA, husband of Madelyn Eleanor Barte Paoa, whose residence and post office address is 828 North Judd Street, said Honolulu, MELVIN EDWARD LEIHALANI PAOA, husband of Lillian Kamakana Paoa, whose residence and post office address is 45-451 Makalani Street, Kaneohe, Oahu, said Territory, MALCOLM HULI-LAUXEA PAOA, also known as Clarence Allan Paoa, husband of Juanita Ellen Clarke Paoa, whose residence and post office address is 1341 Ala Moana Road, said Honolulu, GILBERT HOOHIE PAOA, husband of Edna Alden Paoa, whose residence and post office address is 1259 Center Street, said Honolulu, HENRY KALAEONE PAOA, husband of Helen Maile Zaller Paoa, whose residence and post office address is 601 9th Avenue, said Honolulu, MARY ELLEN KEALOHAPAOOLE PAOA CLARKE, wife of John Mason Clark, whose residence and post office address is 858 Oneawa Street, said Lanikai, LEON KAPUAHZLANI STERLING, Junior, unmarried, whose residence and post office address is 2937 Kala-kaua Avenue, said Honolulu, WAYNE STACEY PAOA STERLING, husband of Helen Zooser Sterling, whose residence and post office address

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is 409 Keolu Street, said Lacikai, and LEON KAPUAHELANI STERLING, Senior, unmarried, whose residence and post office address is 1419 Ernest Street, said Honolulu, hereinafter called the "Grantees",

W I T N E S S E T H :

WHEREAS, Grantor has expended considerable sums of money in the development of Waikiki Beach and desires to expend further public funds in said development by constructing an artificial beach and groin in the area seaward of the land hereinafter described; and

WHEREAS, the construction of said public beach and groin would interfere with the littoral rights appurtenant to the land of Grantees abutting said area; and

WHEREAS, Grantor is willing to convey to Grantees that certain area, hereinafter described, provided that Grantees will waive and relinquish all claims for compensation or damages against Grantor heretofore made in connection with Grantees' said property, that Grantees will grant, convey, release and relinquish to Grantor all littoral rights appurtenant to or connected with their said land, that Grantees will agree to the construction of said public beach and groin, and that the owners of other shorelands abutting said area will do all of the same; and

WHEREAS, by Public Law 199, dated August 1, 1955, Chapter 441, 84th Congress, First Session, the Commissioner of Public Lands of the Territory of Hawaii, with the concurrence of the Board of Harbor Commissioners and the approval of two-thirds of the Board of Public Lands and of the Governor of the Territory of Hawaii, is authorized and empowered to convey to the owners of certain shorelands, of whom each Grantee is

one, all or a certain portion of a certain tidelands area described in said Public Law, which tidelands area includes the land hereinafter described as Parcel 1, upon the fulfillment of certain conditions; and

WHEREAS, the Board of Harbor Commissioners, at its meeting held September 21, 1955, has concurred in, and two-thirds of the Board of Public Lands of the Territory of Hawaii, at its meetings held September 2 and 9, 1955, and the Governor of the Territory of Hawaii, have approved the conveyance of said land, and the conditions referred to have been or are fulfilled by this indenture and by one or more indentures of like tenor made by and between the Grantor and the owners of other shorelands abutting on the tidelands area described in said Public Law;

NOW, THEREFORE, for and in consideration of the release and covenants of and the conveyances by the Grantees, hereinafter set forth, the Grantor does hereby give, grant, bargain and sell unto the Grantees, their respective heirs, executors, administrators and assigns, as tenants in common, forever and in fee simple, the following property:

PARCEL 1

Being the area lying westerly of and adjacent to Lot B of Land Court Application 1549.

Situate at Kalia, Waikiki, Honolulu, Oahu, T.H.

Being a portion of the area transferred to the Territory of Hawaii by Presidential Executive Order 1856 dated October 27, 1928.

Being also a portion of the area described in Public Law 199, 84th Congress and approved August 1, 1955.

Beginning at the east corner of this parcel of land, being also the southwest corner of Lot B of Land Court Application 1549, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUNCH-ECWL" being 10393.91 feet South and 3718.15 feet East, as

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shown on Government Survey Registered Map 4070, and running by azimuths measured clockwise from True South:

1. 63° 24' 30" 310.99 feet along Parcel 2;
2. Thence on a curve to the left with a radius of 35.00 feet, the chord azimuth and distance being: 121° 54' 38.99 feet;
3. Still on a curve to the left with a radius of 300.00 feet, the chord azimuth and distance being: 76° 54' 116.03 feet;
4. 157° 41' 10.00 feet;
5. 239° 58' 406.00 feet to the west corner of Lot B of Land Court Application 1549;

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Thence along highwater mark of Lot B of Land Court Application 1549 for the next five (5) courses, the direct azimuths and distances between points of the said highwater mark being:

6. 320° 22' 18.48 feet;
7. 291° 45' 15.75 feet;
8. 297° 01' 22.75 feet;
9. 318° 42' 32.70 feet;
10. 326° 46' 15.03 feet to the point of beginning and containing an Area of 29,374 Square Feet.

Excepting and reserving, however, all littoral rights of whatsoever nature or kind which are or may be thereunto appertaining.

Excepting and reserving therefrom, further, an easement twenty (20) feet wide for the installation underground and below the level of mean lower low water, operation, maintenance, replacement and repair of a culvert connecting the lagoon and Water Area "A" of the Ala Moana Yacht Harbor, both of which are hereinafter mentioned; said easement to be centered on a straight line connecting and crossing courses numbered 3 and 5, not more than 56 feet easterly of course numbered 4, of the above description of Parcel 1, in a location to be later more precisely established by the Grantor.

Together with a perpetual easement over and across courses numbered 2 and 3 of the above description of said parcel and any beach abutting upon said courses, for access to the lagoon hereinafter mentioned; provided, however, that such easement for access shall not include the right to erect or maintain any structure over or upon or to make any excavation in said courses or said beach.

Together, further, with a non-exclusive easement for foot passage, 20 feet wide, save at and near the end thereof commencing at course numbered 4 of the above description of Parcel 1, where it shall be a minimum of 10 feet wide, from said course along, contiguous to and on

the westerly side of the owa-makai (westerly) segment of the perimeter of the lagoon to the southerly boundary of the recreation area and thence across the lagoon beach to Crescent Beach, all of which are hereinafter mentioned, for access to said Crescent Beach and the sea; provided, however, that such easement shall not include the right to erect or maintain any structure over or upon or to make any excavation in the area covered by such easement.

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TO HAVE AND TO HOLD the same together with all of the rights, easements, privileges and appurtenances thereunto belonging or appertaining or held and enjoyed therewith with the exceptions and reservations aforesaid, unto the Grantees, their respective heirs, executors, administrators and assigns, as tenants in common, forever.

Grantor and Grantees hereby covenant and agree as follows:

A. That Registered Map No. 4070, dated September 21, 1955, filed in the office of the Surveyor of the Territory of Hawaii, copies of which map have been furnished to the Grantees, has been prepared as an aid to the interpretation of the following covenants and depicts the improvements intended by the parties that are referred to in the following covenants. In the event that changes are hereinafter made in the following covenants by mutual agreement of the Grantor and the Grantees, said changes, in so far as it is possible so to do, shall be depicted on said map and revised copies thereof shall be furnished to the Grantees.

B. Grantor, for itself, its successors and assigns, hereby covenants and agrees with Grantees as follows:

1. Grantor shall, subject to the availability of funds, construct Crescent Beach, the approximate location and configuration of which beach is shown on Registered Map No. 4070, and bordered thereon in yellow. Said beach shall be approximately 150 feet in width, shall be located on the seaward side of the shoreline lying in front of and between Land Court Application 1653 and Dewey Way, shown on said map, and

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seaward (westerly) from said shoreline, as nearly as practicable as shown on Registered Map No. 4070. The Grantor shall permanently maintain said beach, after its construction, in the general location and configuration shown on Registered Map No. 4070 to the extent that it is able to control the action of natural forces thereupon, and the adjacent swimming area abutting its seaward (southerly) side, which swimming area is shown on Registered Map No. 4070 crosshatched in green, as a public beach and swimming area, so long as and to the extent that appropriations are and may from time to time be available therefor. Grantor shall, within thirteen (13) months of the date hereof, construct that part of Crescent Beach which is shown on Registered Map No. 4070 crosshatched in black and the swimming area adjacent thereto.

2. Grantor shall, subject to the availability of funds, fill the area, marked "Recreation Area" and bordered in pink on Registered Map No. 4070, lying between the above-mentioned Crescent Beach and the southerly side of the Ala Moana Yacht Harbor, with the exception of the lagoon area hereinafter described, to an elevation not exceeding 7.0 feet above mean lower low water (+7.0 M.L.L.W.), save within that portion thereof to be covered by a portion of the lagoon beach, hereafter mentioned, where the grade shall slope to mean low water mark of the lagoon. Except for the portion thereof marked "Proposed Roadway" and shown on Registered Map No. 4070, said filled area shall be used as and for a recreation area, subject to the covenants hereinbelow mentioned.

3. Grantor shall not construct or erect nor permit the construction or erection of any building or structure exceeding elevation 29 feet above the level of mean lower low water (+29.0 M.L.L.W.) on that portion of the recreation area marked

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water circulation through said lagoon. Grantor shall within three (3) months thereafter install, operate and maintain, or be responsible to the Grantees for the installation, operation and maintenance of, necessary pumps and valves to provide circulation of water through said lagoon adequate to keep the same clean and sanitary at all times.

6. Grantor shall construct within seven (7) months hereafter and shall maintain a suitable chain link fence along such portion of course numbered 5 of the above description of Parcel 1 as Grantees shall designate upon request of Grantor.

7. Grantor shall, within nine and one-half (9-1/2) months from the date hereof, construct a sand beach not less than seventy-five (75) feet in width (save where the same abuts the proposed roadway shown on said Registered Map No. 4070 in which segment said beach may be narrower) contiguous to and around the exterior of the perimeter of the lagoon hereinafter described in approximately the manner shown for said beach, marked "Lagoon Beach" and colored in blue on said Registered Map No. 4070, and shall cover the floor of said lagoon with sand for a width of not less than seventy-five (75) feet contiguous to and around the interior of the perimeter of said lagoon. Upon request of the Grantees, made within the period mentioned above, the Grantor shall widen that portion of the lagoon beach abutting upon courses numbered 2 and 3 of the above description of Parcel 1 by extending the same across said courses into the lagoon to the distance requested by the Grantees, but not beyond the prolongation in a westerly direction across the lagoon of course numbered 1 of the above description of Parcel 1.

8. Grantor shall within six and one half (6-1/2)

months of the date hereof dredge and construct a lagoon with surrounding lagoon abutments, or be responsible to the Grantees for the dredging and construction of, said lagoon and lagoon abutments. The lagoon shall be dredged to a depth of not less than 7.7 feet (-7.7 M.L.L.W.) and not more than 12 feet (-12.0 M.L.L.W.), shall be in the approximate location and configuration shown on said Registered Map No. 4070 as "Lagoon" and colored in green thereon. Said lagoon shall be of a maximum length, in an easterly-westerly direction, of 650 feet and a maximum width, in a northwesterly-southeasterly direction, of 450 feet. The perimeter of said lagoon, as shown on said Registered Map No. 4070 except along the northwesterly segment of the same near the proposed roadway represents the mean low water mark of the same.

The abutments around the exterior perimeter of said lagoon shall be composed of fill evenly sloped from the perimeter of said lagoon to a level of not more than 6 feet above mean lower low water (+6.0 M.L.L.W.) at a distance of not more than 75 feet from said perimeter (or at the southerly line of the proposed roadway where the same is closer than 75 feet to said perimeter) and thence at the same level for an additional distance of 50 feet (except to the extent that the full additional distance of 50 feet cannot be obtained within the limits imposed by the southerly line of the proposed roadway and the southerly courses, numbered 13 through 15, of the description of Parcel 2, shown on Registered Map No. 4070 and conveyed to Kaiser Community Homes).

C. Grantees, jointly and severally, for themselves and their respective heirs, executors, administrators and assigns, hereby covenant and agree with Grantor as follows, these covenants to run with the land described as Parcel 1 hereinabove:

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1. Grantees consent to the construction of said Crescent Beach, recreation area, lagoon and lagoon beach hereinabove mentioned.

2. Grantees shall, on or before completion of the lagoon and lagoon abutments by the Grantor, fill or cause to be filled the area described in Parcel 1 hereinabove to the approximate grade of the Grantees' property adjoining it on the easterly side, save the area thereof to be covered by a portion of the lagoon abutments.

D. It is mutually covenanted and agreed, by the Grantor and Grantees, as above, that:

(1) In the event that satisfactory maintenance of the lagoon proves to be physically impracticable by reason of excessive costs or inability to maintain proper sanitary conditions therein, the foregoing covenant numbered B-5 shall be terminated and the Grantor shall have no further obligation with respect thereto.

In such event, the Grantor shall, however,

- (a) Fill the lagoon and lagoon beach to the grade of the surrounding properties. The lagoon shall then become a part of the "No Buildings" portion of the recreation area, and the easement hereinabove granted for access to the lagoon shall become an easement for access to said recreation area.
- (b) Convey to the Grantees, their respective heirs, executors, administrators or assigns a non-exclusive easement for foot passage, 20 feet wide, from courses numbered 2 and 3 of the above description of Parcel 1 to Crescent Beach, for access to said beach and the sea; provided, however, that said easement shall not

include the right to erect or maintain any structure over or upon or to make any excavation in the area covered by said easement. The mauka (easterly) boundary of said easement shall be a straight line connecting the junctions of courses numbered 1 and 2 of the above description of Parcel 1 and of courses numbered 1 and 2 of the description of Parcel 2, as shown on said Registered Map No. 4070, conveyed by the Grantor to Kaiser Community Homes and the projection of said line across the lagoon beach to Crescent Beach.

- (c) Convey to the Grantees, their respective heirs, executors, administrators or assigns, the easement hereinabove excepted and reserved by the Grantor, through Parcel 1, for underground culverts.

Upon conveyance of said new easement by the Grantor, mentioned in subparagraph D(1)(b) hereinabove, the Grantees will reconvey to the Grantor the 20-foot wide easement along the awa-makai (westerly) segment of the perimeter of the lagoon, hereinabove granted to them for access to Crescent Beach and the sea.

(2) That certain agreement known as the Waikiki Agreement, entered into on October 19, 1923, between Grantor and various property owners, including Grantees' predecessors in title, said agreement being recorded in the Bureau of Conveyances of the Territory of Hawaii in Book 1047, Pages 176-202, and noted on Transfer Certificate of Title No. 47,212 issued to the Grantees, is hereby and herewith terminated as between the Grantor and Grantees.

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(3) Grantor's obligation to perform those covenants under B above as to which a time limit for performance is stated shall be subject to its ability to perform the same with funds currently available therefor, to-wit, the sum of ONE-HUNDRED AND FORTY THOUSAND DOLLARS (\$140,000.00).

And in consideration of the foregoing conveyance by and covenants^{an} of the Grantor, the Grantees hereby give, grant, bargain, sell, convey, release and relinquish unto Grantor, its successors and assigns, any and all littoral rights appurtenant to the following shoreline property of the Grantees, bordering on the land described as Parcel 1 above:

Any and all littoral rights appurtenant to Lot B, area 45,105 square feet, as shown on Map 1 filed in the Office of the Assistant Registrar of the Land Court of the Territory of Hawaii with Land Court Application No. 1549, being a portion of the land described in Transfer Certificate of Title No. 47,212 issued to the Grantees.

TO HAVE AND TO HOLD the same together with all rights and privileges belonging or appertaining thereto unto the Grantor, its successors and assigns, forever.

And Grantees for themselves and their respective heirs, executors, administrators, and assigns do hereby remise, release and forever discharge Grantor, its successors and assigns of and from any and all manner of action or actions, cause and causes of action, suits, controversies and trespasses, damages, claims and demands of whatsoever kind or nature to, against or in connection with the property of Grantees, hereinabove described,

the littoral rights of which are hereinabove conveyed by the Grantees to the Grantor, heretofore claimed or existing, in law or equity, which the Grantees have had by reason of any matter, cause or thing whatsoever having been done or omitted to be done by the Grantor.

AND, for the consideration aforesaid, HERMAN KAHIRIENA CLARK, husband of Annie Aulani Paoa Clark, MADELYN ELEANOR BARTO PAOA, wife of Frederick Hoolae Paoa, LILLIAN KAMAKANA PAOA, wife of Melvin Edward Lilikalani Paoa, JUANITA ELLEN CLARKE PAOA, wife of Malcolm Huiilaukea Paoa, EDNA ALDEN PAOA, wife of Gilbert Hoochie Paoa, HELEN MAILE ZALLER PAOA, wife of Henry Kalaeone Paoa, JOHN MASON CLARKE, husband of Mary Ellen Kealoha-pauole Paoa Clarke, and HELEN BOOZER STERLING, wife of Wayne Stacey Paoa Sterling, do hereby remise, release and quitclaim unto the Grantor all of their right, title and interest, by way of dower, curtesy, community property, or otherwise in and to any and all littoral rights appurtenant to Lot 3, area 45,105 square feet, as shown on Map 1 filed in the Office of the Assistant Registrar of the Land Court of the Territory of Hawaii with Land Court Application No. 1549, being a portion of the land described in Transfer Certificate of Title No. 47, 212.

IN WITNESS WHEREOF, the TERRITORY OF HAWAII has caused these presents to be duly executed by Marguerite K. Ashford, its Commissioner of Public Lands, and countersigned by Samuel Wilder King, Governor of Hawaii, A. D. Castro, Chairman, Board of Public Lands of the Territory of Hawaii, and Ben E. Mutter, Chairman, Board of Harbor Commissioners, pursuant to the authority so to do in them vested by the foresaid Public Law 199, dated August 1, 1955, Chapter 441, 84th Congress, First Session, and all other laws enabling them so to do, and ANNIE AULANI PAOA

RECORDED
MAR 21 1957

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CLARK, HERMAN KAHIKIENA CLARK, VIOLET LEILANI PAOA COOK,
KELIHOALANI PAOA, FREDERICK HOOLAS PAOA, MADELYN ELEANOR
BARTO PAOA, MELVIN EDWARD LILIKALANI PAOA, LILLIAN KAMAKANA
PAOA, MALCOLM HULILAUKEA PAOA, JUANITA ELLEN CLARKE PAOA,
GILBERT HOOHIE PAOA, EDNA ALDEN PAOA, HENRY KALAEONE PAOA,
HELEN MAILE ZALLER PAOA, MARY ELLEN KEALOHAPAUOLE PAOA
CLARKE, JOHN MASON CLARKE, LEON KAPUAHELANI STERLING, JUNIOR,
WAYNE STACY PAOA STERLING, HELEN BOOZER STERLING, and LEON
KAPUAHELANI STERLING, SENIOR, have hereunto set their hands
on the day and year first above written.

TERRITORY OF HAWAII

By *Lawrence K. Ashford*
Commissioner of Public Lands

COUNTERSIGNED:

Samuel Wilder King
Governor, Territory of Hawaii

[Signature]
Chairman, Board of Public Lands

Ben E. Hutter
Chairman, Board of Harbor
Commissioners

APPROVED TO FORM

[Signature]
Special Agent in Charge

Annie Aulani Paoa Clark
Annie Aulani Paoa Clark

Herman Kahikiena Clark
Herman Kahikiena Clark

Violet Leilani Paoa Cook
Violet Leilani Paoa Cook

Kelihoalani Paoa
Kelihoalani Paoa

I hereby certify that the letter "o" was deleted and the letter "l" inserted on line 45, page 4, and also the letters "an" was inserted on line 7, page 12 before execution and acknowledgment.



[Signature]
Notary Public

Frederick Hoolae Paoa
Frederick Hoolae Paoa

Madelyn Eleanor Barto Paoa
Madelyn Eleanor Barto Paoa

Melvin Edward Lilikalani Paoa
Melvin Edward Lilikalani Paoa

Lillian Kamakana Paoa
Lillian Kamakana Paoa

Malcolm Hulilaukea Paoa
Malcolm Hulilaukea Paoa

Juanita Ellen Clarke Paoa
Juanita Ellen Clarke Paoa

Gilbert Hoonie Paoa
Gilbert Hoonie Paoa

Edna Alden Paoa
Edna Alden Paoa

Henry Kalisone Paoa
Henry Kalisone Paoa

Helen Maile Galtier Paoa
Helen Maile Galtier Paoa

Mary Ellen Kealohapauole Paoa Clarke
Mary Ellen Kealohapauole Paoa Clarke

John Mason Clarke
John Mason Clarke

Leon Kapuanelani Sterling, Junior
Leon Kapuanelani Sterling, Junior

Wayne Stacey Paoa Sterling
Wayne Stacey Paoa Sterling

Helen Boozer Sterling
Helen Boozer Sterling

Leon Kapuanelani Sterling, Senior
Leon Kapuanelani Sterling, Senior

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TERRITORY OF HAWAII)
CITY AND COUNTY OF HONOLULU) SS.

On this 11th day of October, 1955, before me personally appeared MARGUERITE K. ASHFORD, COMMISSIONER OF PUBLIC LANDS, to me known to be the person who executed the foregoing instrument and acknowledged to me that she executed the same as her free act and deed as COMMISSIONER OF PUBLIC LANDS of the Territory of Hawaii and that she executed the same on behalf of the Territory of Hawaii.

Reginald R. Bruner
Notary Public, First Judicial Circuit, Territory of Hawaii.

My commission expires 12-15-58

TERRITORY OF HAWAII)
CITY AND COUNTY OF HONOLULU) SS.

On this 25th day of September, 1955, before me personally appeared ANNIE ADLANI PAOA CLARK and HERMAN KAHIKIENA CLARK, to me known to be the persons described in and who executed the foregoing instrument, and acknowledged that they executed the same as their free act and deed.

Walter J. Tinsley
Notary Public, First Judicial Circuit, Territory of Hawaii.

My commission expires MAR. 15, 1953

TERRITORY OF HAWAII)
CITY AND COUNTY OF HONOLULU) SS.

On this 25th day of September, 1955, before me personally appeared VIOLET LEILANI PAOA COOK, to me known to be the person described in and who executed the foregoing instrument, and acknowledged that she executed the same as her free act and deed.

Walter J. Tinsley
Notary Public, First Judicial Circuit, Territory of Hawaii.

My commission expires MAR. 15, 1953

I hereby certify that the letter "o" was deleted and the letter "l" inserted on line 43, page 4, and also the letters "an" was inserted on line 7, page 12 before execution and acknowledgment.

Reginald R. Bruner
Notary Public

TERRITORY OF HAWAII }
CITY AND COUNTY OF HONOLULU } SS.

On this 25th day of September, 1955, before me personally appeared KELIHOALANI PAOA, to me known to be the person described in and who executed the foregoing instrument, and acknowledged that she executed the same as her free act and deed.

Harold J. Dainoff
Notary Public, First Judicial
Circuit, Territory of Hawaii.

My commission expires MAR. 15, 1958

TERRITORY OF HAWAII }
CITY AND COUNTY OF HONOLULU } SS.

On this 25th day of September, 1955, before me personally appeared FREDERICK HOOLAS PAOA and ~~MARION ELEANOR PAOA~~ PAOA, to me known to be the persons described in and who executed the same as ^{his} their free act and deed.

Harold J. Dainoff
Notary Public, First Judicial
Circuit, Territory of Hawaii.

My commission expires MAR. 15, 1958

TERRITORY OF HAWAII }
CITY AND COUNTY OF HONOLULU } SS.

On this 25th day of September, 1955, before me personally appeared MELVIN EDWARD LILIKALANI PAOA and LILLIAN KAMAKANA PAOA, to me known to be the persons described in and who executed the foregoing instrument, and acknowledged that they executed the same as their free act and deed.

Harold J. Dainoff
Notary Public, First Judicial
Circuit, Territory of Hawaii

My commission expires MAR. 15, 1958

1955 SEP 25 11:30 AM

HEAR 3024 PAGE 252

TERRITORY OF HAWAII)
CITY AND COUNTY OF HONOLULU) SS.

On this 25th day of September, 1955, before me personally appeared MALCOLM HUILILAUKEA PAOA and JUANITA ELLEN CLARKE PAOA, to me known to be the persons described in and who executed the foregoing instrument, and acknowledged that they executed the same as their free act and deed.

Walter J. Tawala
Notary Public, First Judicial
Circuit, Territory of Hawaii.
My commission expires MAR. 15, 1958

TERRITORY OF HAWAII)
CITY AND COUNTY OF HONOLULU) SS.

On this 25th day of September, 1955, before me personally appeared ~~OLIVER WOODRUFF PAOA~~ and EDNA ALDEN PAOA, to me known to be the persons described in and who executed the foregoing instrument, and acknowledged that ^{she} ~~they~~ executed the same as ^{her} ~~their~~ free act and deed.

Walter J. Tawala
Notary Public, First Judicial
Circuit, Territory of Hawaii.
My commission expires MAR. 15, 1958

TERRITORY OF HAWAII)
CITY AND COUNTY OF HONOLULU) SS.

On this 25th day of September, 1955, before me personally appeared HENRY KALABONE PAOA and HELEN MAILE ZALLER PAOA, to me known to be the persons described in and who executed the foregoing instrument, and acknowledged that they executed the same as their free act and deed.

Walter J. Tawala
Notary Public, First Judicial
Circuit, Territory of Hawaii.
My commission expires MAR. 15, 1958

TERRITORY OF HAWAII }
CITY AND COUNTY OF HONOLULU } SS.

On this 25th day of September, 1955, before me personally appeared MARY ELLEN KEALOHAPAUOLE PAOA CLARKE and JOHN MASON CLARKE, to me known to be the persons described in and who executed the foregoing instrument, and acknowledged that they executed the same as their free act and deed.

Walter J. Duval
Notary Public, First Judicial
Circuit, Territory of Hawaii
My commission expires MAR. 15, 1958



LINE 3024 PAGE 253

TERRITORY OF HAWAII }
CITY AND COUNTY OF HONOLULU } SS.

On this 25th day of September, 1955, before me personally appeared LEON KAPUAHELANI STERLING, JUNIOR, to me known to be the person described in and who executed the foregoing instrument, and acknowledged that he executed the same as his free act and deed.

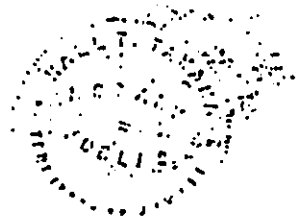
Walter J. Duval
Notary Public, First Judicial
Circuit, Territory of Hawaii
My commission expires MAR. 15, 1958



TERRITORY OF HAWAII }
CITY AND COUNTY OF HONOLULU } SS.

On this 25th day of September, 1955, before me personally appeared WAYNE STACEY PAOA STERLING and HELEN BOOZER STERLING, to me known to be the persons described in and who executed the foregoing instrument, and acknowledged that they executed the same as their free act and deed.

Walter J. Duval
Notary Public, First Judicial
Circuit, Territory of Hawaii.
My commission expires MAR. 15, 1958



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TERRITORY OF HAWAII
CITY AND COUNTY OF HONOLULU

SS.

On this 25th day of September, 1955,
before me personally appeared LEON KAPUAHELANI STERLING,
SENIOR, to me known to be the person described in and who
executed the foregoing instrument, and acknowledged that he
executed the same as his free act and deed.

Harold J. Marshall
Notary Public, First Judicial
Circuit, Territory of Hawaii.
MAR. 15, 1958

My commission expires _____

I hereby certify that the letter "o" was deleted
and the letter "l" inserted on line 45, page 4, and
also the letters "an" was inserted on line 7, page 12
before execution and acknowledgment.

TERRITORY OF HAWAII
CITY AND COUNTY OF HONOLULU

SS.

On this 26th day of September, 1955, before me
personally appeared GILBERT HUGHES PAGA, to me known to be the person described
in and who executed the foregoing instrument, and acknowledged that he executed
the same as his free act and deed.

Helen H. Darnell
Notary Public, First Judicial
Circuit, Territory of Hawaii.

My Commission expires Nov. 16, 1958

TERRITORY OF HAWAII
CITY AND COUNTY OF HONOLULU

SS.

On this 9th day of September, 1955, before me
personally appeared MADELYN ELEANOR BARTO PAGA, to me known to be the person
described in and who executed the foregoing instrument, and acknowledged that
she executed the same as her free act and deed.

Helen H. Darnell
Notary Public, First Judicial
Circuit, Territory of Hawaii.

My Commission expires Nov. 16, 1958.

Entered of Record
and compared.

OCT 19 1955

at 10:15 o'clock P.M.

Mark H. Wackstein Registrar of Conveyances.

By _____ Clerk

APPENDIX F

**Field Notes from a Brief Survey
Around the Breakwater at the
Southwest end of Kahanamoku Beach
Waikiki**

**Kahanamoku (Waikiki) Beach Breakwater
Field Survey**

December 9, 1994
R. Douglas / Y. Stender

AREA 1: Dredged area inside breakwater:

The area near the breakwater is one to two feet deep and mostly sand with some coral rubble. The number of fish found in this area is much less compared with the numbers observed seaward side of the breakwater (reef flat, AREA 3). Most of the fishes found here were those associated with calm protected reef or lagoonal areas. For example lizardfishes (*Saurida gracilis*), Apogonidae (*Foa brachygrama*), damselfishes (*Abudefduf* spp.), Scorpaenidae, and juvenile wrasses.

The algae found in this area were mostly in the very shallow water where depths were approximately 1 - 3 feet, growing on the coral rubble. Most common were *Enteromorpha* sp., *Ulva* sp., *Lyngbya majuscula*, *Hypnea* sp. and *Acanthophora spicifera*. In the deeper, sand area, 4 - 6 feet deep, algae were less common: sparse growths on a few scattered rocks. Typical were *Centroceras clavulatum* and *Spyridia filamentosa*.

AREA 2: Dredged area outside the breakwater:

On the Diamond Head side of the breakwater the depth is approximately 5 - 7 feet. An area of coral rubble extends for twenty to thirty feet to an area of mostly sand. The brown alga, *Sargassum polyphyllum*, grows in large thick patches covering areas up to two meters across. Other algal species found here and on the west side of the wall are those associated with higher wave energies: for example *Sargassum* spp., *Turbinaria omata*, *Acanthophora spicifera*, *Galaxaura* sp., *Codium* spp., *Microdictyon* sp., *Halimeda* sp., and *Porolithon* spp.

AREA 3: seaward side of the breakwater:

Depth along the west side of the breakwater ranges from 2 - 4 feet. *Chnoospora minima* grows high on the rock wall in the intertidal zone, with *Sargassum echinocarpum* growing commonly below it. *Sargassum polyphyllum* is also common here growing in large thick mats.

Most of the fishes found in the outside area are those species more common in higher wave energy environments and include wrasses, damselfish and surgeon fish.

AREA 4: Ala Wai Yacht Harbor

A quick look into the water at the back of the innermost slip basin revealed the following organisms present: surgeonfish (Acanthuridae: *Acanthurus triostegus*), large jellyfish (Scyphozoa: *Aurelia* cf. *labiata*), and fan-worm (Sabellidae: *Sabellastarte santijosephi*).

Species List
Kahanamoku (Waikiki) Beach Breakwater
Field Survey of December 9, 1994

Species	AREA 1 (inside)	AREA 2 (west)	AREA 3 (south)
ALGAE			
CYANOPHYTA			
<i>Lyngbya majuscula</i>	X		X
<i>Symploca hydroides</i>	X		
CHLOROPHYTA			
<i>Bomatella sphaerica</i>	X		
<i>Cladophoropsis luxurians</i>		X	X
<i>Codium arabicum</i>		X	X
<i>Codium edule</i>		X	X
<i>Dictyosphaeria versluyii</i>			X
<i>Enteromorpha</i> sp.	X		
<i>Halimeda discoidea</i>		X	X
<i>Microdictyon setchellianum</i>		X	X
<i>Neomeris annulatum</i>	X		
<i>Ulva fasciata</i>	?	?	?
<i>Ulva reticulata</i>	X		
<i>Valonia aegagropila</i>	X		X
PHAEOPHYTA			
<i>Chnoospora minima</i>		X	X
<i>Dictyopteris plagiogramma</i>		X	X
<i>Dictyota acutiloba</i>		X	X
<i>Dictyota sandvicensis</i>		X	X
<i>Padina australis</i>	X		
<i>Padina japonica</i>		X	X
<i>Sargassum echinocarpum</i>		X	X
<i>Sargassum polyphyllum</i>	X	X	X
<i>Styopodium hawaiiensis</i>			X
<i>Turbinaria ornata</i>		X	X
RHODOPHYTA			
<i>Acanthophora spicifera</i>	X	X	X
<i>Asparagopsis taxiformis</i>		X	
<i>Centroceras clavulatum</i>	X		
<i>Galaxaura filamentosa</i>	X		
<i>Galaxaura rugosa</i>		X	X

Species	AREA 1 (inside)	AREA 2 (west)	AREA 3 (south)
RHODOPHYTA (cont.)			
<i>Gracilaria bursapastoris</i>	X		
<i>Hypnea musciformis</i>	X		
<i>Jania</i> sp.	X		
<i>Liagora</i> sp.	X		
<i>Porolithon gardineri</i>			X
<i>Porolithon onkodes</i>			X
<i>Spyridia filamentosa</i>	X		
INVERTEBRATES			
POCILLOPORIDAE			
<i>Pocillopora damicornis</i>	X	X	X
<i>Pocillopora meandrina</i>		X	
PORITIDAE			
<i>Porites lobata</i>		X	
ZOANTHIDAE			
<i>Palythoa tuberculosa</i>			X
PORIFERA (sponges)			
	X	X	X
SABELLIDAE			
<i>Sabellastarte sanctijosephi</i>	X		
HOLOTHURIDAE			
<i>Holothuria nobilis</i>	X	X	X
OPHIOCOMIDAE			
<i>Ophiocoma erinaceus</i>	X		X
ECHINOIDEA			
<i>Echinometra mathei</i>		X	X
<i>Echinometra oblongata</i>		X	X
CONIDAE			
<i>Conus flavidus</i>			X
<i>Conus lividus</i>			X
CYPRÆDAE			
<i>Cypraea caputserpentis</i>			X
MURICIDAE			
<i>Drupa ricina</i>	X		
FISHES			
SYNODONTIDAE			
<i>Saurida gracilis</i>	X		

Species	AREA 1 (inside)	AREA 2 (west)	AREA 3 (south)
AULOSTOMIDAE			
<i>Aulostomus chinensis</i>	X	X	X
SCORPAENIDAE			
<i>Sebastapistes balieui</i>	X		
<i>Scorpaenopsis diabolus</i>	X		
APOGONIDAE			
<i>Foa brachygramma</i>	X		
MULLIDAE			
<i>Mulloides flavolineatus</i>	X	X	
<i>Mulloides vanicolensis</i>	X	X	
<i>Parupeneus multifaciatus</i>		X	
CHAETODONTIDAE			
<i>Chaetodon lunula</i>			X
POMACENTRIDAE			
<i>Abudefduf sordidus</i>	X	X	
<i>Abudefduf abdominalis</i>	X		
<i>Stegastes fasciolatus</i>		X	X
LABRIDAE			
<i>Coris venusta</i>		X	
<i>Cheilio inermis</i>		X	X
<i>Labroides phthirophagus</i>			X
<i>Thalassoma duperrey</i>		X	X
<i>Thalassoma trilobatum</i>			X
<i>Thalassoma purpureum</i>			X
<i>Stethojulis balteata</i>	X	X	X
BOTHIDAE			
<i>Bothus mancus</i>	X		
ZANCLIDAE			
<i>Zanclus cornutus</i>			X
ACANTHURIDAE			
<i>Acanthurus triostegus</i>			X
<i>Acanthurus leucopareius</i>		X	
<i>Acanthurus dussumieri</i>			X
<i>Acanthurus nigrofuscus</i>		X	
<i>Naso lituratus</i>		X	X
<i>Naso unicornis</i>		X	X
GOBIIDAE			
<i>Gnatholepis anjerensis</i>	X		
<i>Psilogobius mainlandi</i>	X		

Species	AREA 1 (inside)	AREA 2 (west)	AREA 3 (south)
BLENNIDAE			
<i>Cirripectes vanderbilti</i>			X
OSTRACIONTIDAE			
<i>Ostracion meleagris</i>		X	
TETRAODONTIDAE			
<i>Canthigastor amboiensis</i>		X	
<i>Canthigastor jactator</i>		X	
<i>Arothron hispidus</i>	X		X
CARANGIDAE			
<i>Caranx</i> sp.	X	X	

Survey Location Map

