June 21, 1985

Ms. Letitia N. Uyehara, Director
Office of Environmental Quality Control
State of Hawaii
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Revised Supplemental Environmental Impact Statement (EIS) For the Proposed West Beach Project At Honolulu, Ewa District, Oahu, Hawaii

We are notifying you that the above is an acceptable EIS, pursuant to Chapter 343, HRS and the State "EIS Regulations." It has fulfilled the requirements of Generic EIS as a supplemental document.

As discussed in our attached Acceptance Report, this acceptance applies only to the shared channel entrance alternative. In the event that either the parallel or separate marina channel alternative is selected, a supplemental EIS must be prepared specifically addressing the marine impacts and mitigating measures.

If there are any questions, please contact John Nakagawa of our staff at 523-4648.

Very truly yours,

John P. Whalen
JOHN P. WHALEN
Director of Land Utilization

JPW:s1
cc: Mr. Fred Rodriguez
FINAL SUPPLEMENTAL
ENVIRONMENTAL IMPACT STATEMENT
FOR
WEST BEACH
HOUNOLIULI, EWA DISTRICT, ISLAND OF OAHU, HAWAII

Submitted Pursuant to
CHAPTER 343, HAWAII REVISED STATUTES

F. J. Rodriguez
Environmental Communications, Inc.
Agent for West Beach Estates

JUNE 5, 1985
Date

Prepared by:
Environmental Communications, Inc.

Revised 6/14/85
1963
Final Supplemental
Environmental Impact Statement
West Beach
Honouliuli, Ewa District, Island of Oahu, Hawaii

1. This Environmental Impact Statement is prepared as part of the Federal, State, and County permit actions relating to the proposed West Beach resort. Clarification is made at this time on the dual nature of the document.

   a) For the U.S. Army Corps of Engineers, it is prepared and will be processed as a Final Supplemental Environmental Impact Statement (FSEIS) for a U.S. Department of the Army Permit Application, File No. PODCO-O 1512. The Final Environmental Impact Statement (FEIS) for the Proposed West Beach Resort, November 1980, was a joint Federal-State FEIS prepared as part of a tiering process for the proposed action.

   b) For the Chapter 343, HRS requirements applicable to the State and County agencies reviewing the project in terms of compliance with their respective permit authority, i.e. Conservation District Use Application (CDUA) Department of Land & Natural Resources; Department of Land Utilization, City & County of Honolulu for Zoning requests and Special Management Area (SMA) review will be on the Final Supplemental Environmental Impact Statement (FSEIS).

   c) The City & County of Honolulu Department of Land Utilization accepted the generic EIS submitted in 1979-80 on September 19, 1980 (see following letter of acceptance). The FSEIS is submitted to meet the concerns of the DLU acceptance letter and all additional requirements provided by agencies, groups, and individuals who commented during the EISPNI Consultation Period.

2. This document scopes the impacts of the proposed action at a level of planning that provides the additional detail necessary to evaluate more fully and comprehensively, the future plans that have been developed as recommended. The supplemental data in this document attempts to clearly identify significant impact areas, alternative methods which will eliminate or reduce the degree of adverse impacts, and identify significant environmental issues to be incorporated into final design planning.

3. This document was prepared as a dual purposed document which is being used to satisfy both National Environmental Policy Act and Chapter 343 HRS requirements. As such, this document was submitted for joint, concurrent review during the draft stage but will follow independent final review processes of the respective Federal, State and County acceptance procedures.

4. The Federal, State, and County agencies listed below have cooperated in the preparation of this EIS and are presently considered the lead
agencies for their respective levels of government. This does not preclude other federal or local agencies from participating in the remaining portions of the EIS.

a) The U. S. Army Corps of Engineers will evaluate a Department of the Army permit application for the construction, operation and maintenance of beach lagoons and a marina under Section 10 of the River and Harbor Act of 1899 (33 U.S.C. 403) and Section 404 of the Clean Water Act (33 U.S.C. 1344).

b) The State Department of Land & Natural Resources will evaluate the Conservation District Use Application for work in the shore waters under Chapter 205,183, Hawaii Revised Statutes and Title 13, Chapter 2 (Regulation No. 4) of the Department of Land & Natural Resources (DLNR) providing for land use regulations within a Conservation District.

c. The Department of Land Utilization, City & County of Honolulu, will review the document for change of zone, Shoreline Setback permit and Special Management Area permit applications.

d. The State Office of Environmental Quality Control provided guidance in organizing the joint EIS process and incorporating local agencies concerns.

Abstract

The applicant, West Beach Estates, proposes to construct a resort complex that will provide 5,200 residential units, 4,000 hotel/condominium units, a 42.2-acre marina with a capacity of up to 500 berths, a series of beach lagoons, commercial centers, parks, interior road systems, utility systems, a golf course, tennis courts and other urban support facilities. The project described represents the current land use plan that has been developed by the applicant. This FSEIS evaluates the impacts in terms of alternative methods and the mitigative measures designed to eliminate or reduce significantly these areas of concern. As provided, the document is an evaluation of potential environmental impacts attributable under these density levels. Specific project features will be added or deleted from the project plan depending upon costs, design changes and permit conditions imposed by the regulatory agencies. A Department of the Army permit application requesting construction, operation and maintenance of a marina and beach lagoons was submitted to the U.S. Army Corps of Engineers; the applicant plans to apply for Zoning a Special Management Area permit and Conservation District Use Application in the near future.

The total project will create approximately 47 acres of new aquatic habitat in place of terrestrial habitat. Unused, fallow agricultural and rural lands will be converted to urban uses increasing human presence in the area and increasing the resident population in the region by about 13,300 persons. Water demands will increase together with other utility demands. Communities of endangered plants have been identified and their status confirmed. Archaeological resources in the area will be affected, however,
the significant sites will be salvaged and the data will be presented for historic use. The project will also create more jobs, provide housing for various segments of the island population, and increase property and tourism tax revenues in the State. Recreational use and opportunities in the area will increase. The projects effect on Barber's Point Naval Air Station will be identified and discussed in terms of current Noise and aircraft safety hazards. Approximately 266 acres of prime agricultural lands and 133 acres of other important agricultural lands will be converted to urban uses. Joint use of the Barber's Point Deep Draft Harbor and a recreational marina will be fully discussed from both a technical and operational standpoint with the Corps of Engineers and the Harbors Division of the State Department of Transportation. Water quality in coastal water will be altered as a result of the discharges from the marina and lagoons, as well as urban storm water runoff. The degree of the impacts on the coastal zone offshore of the project will be fully evaluated through the technical studies developed on the Lagoon/Marina systems. The mitigation measures will be included in the proposed designs for the systems.

The alternatives considered in the FSEIS included reducing the size and scope of the Lagoons and Marina, alternative marina channel alignments, no action and denial of the permits. The alternatives vary the degree of environmental impacts and alterations. The No-action alternative preserves the status quo and results in no change to the environment. Denial of the permits does not prevent the developers from developing lands outside the jurisdiction of the regulatory agencies. Issues to be resolved include availability of potable water, effects on archaeological and paleontological sources, endangered species effects, land use conflicts, effects on water quality, ciguatera poisoning potential, wastewater facility planning, tsunami hazard potential, and potential saltwater intrusion and possible effects on ground water sources.

IF YOU WANT FURTHER INFORMATION CONCERNING THE FSEIS AND PERMIT REQUIREMENTS PLEASE CONTACT THE AGENCY OF RESPONSIBILITY LISTED BELOW:

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<td>Land Use Ordinance Changes (Zoning)</td>
<td>Zoning Application</td>
<td>Mrs. Loretta Chee</td>
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<tr>
<td></td>
<td></td>
<td>Department of Land Utilization</td>
</tr>
<tr>
<td></td>
<td></td>
<td>City &amp; County of Honolulu</td>
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<tr>
<td></td>
<td></td>
<td>650 South King Street</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Honolulu, Hawaii 96813</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phone: (808) 523-4248</td>
</tr>
<tr>
<td>Construction within the Shoreline Setback and Construction in the Coastal Zone</td>
<td>Shoreline Setback and Special Management Area Permit</td>
<td>Mr. Robin Foster</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Department of Land Utilization</td>
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<tr>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Phone: (808) 527-5027</td>
</tr>
</tbody>
</table>
Marina and bathing lagoon construction in the State Conservation District (identified as State lands)

State EIS Requirements

Conservation District Use Application

Mr. Gordon Soh
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809
Phone: (808) 548-7837

Ms. Letitia Uyehara,
Director
Office of Environmental Quality Control
550 Halekauwila Street,
Room 301
Honolulu, Hawaii 96813
Phone: (808) 548-6915

Marina and bathing lagoons construction in coastal waters and Federal EIS Requirements

Department of the Army Permit

Mr. Michael T. Lee
Biologist
Operations Branch,
Honolulu District,
U.S. Army Corps of Engineers
Room 205, Building 230
Fort Shafter, Hawaii 96858
Phone: (808) 438-9258

The 1980 Final EIS for West Beach Resort prepared by the applicant and U.S. Army Corps of Engineers is adopted for use in this DSEIS.
September 19, 1980

Mr. Fred Rodriguez  
Environmental Communications, Inc.  
P.O. Box 536  
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

Revised Environmental Impact Statement  
West Beach Resort

We have determined that the above is an acceptable Environmental Impact Statement (EIS) document for the proposed project. It should be pointed out that the acceptance of this document does not constitute approval for any land use policy changes or permit applications.

There are a number of unresolved issues which cannot be adequately addressed at this time due to the general nature of this document, but are expected to be thoroughly addressed at the time that supplemental EISs are submitted. These issues are included in the Acceptance Report, which is attached.

If there are any questions, please contact Sampson Mar of our staff at 523-4077.

Very truly yours,

TYRONE T. KUSAO  
Director of Land Utilization

TTK:sl  
Attach.
September 19, 1980

ACCEPTANCE REPORT : ENVIRONMENTAL IMPACT STATEMENT (EIS)
WEST BEACH RESORT
HONOLULU, EWA, OAHU

A. BACKGROUND

Environmental Impact Statement (EIS) was prepared for the applicant, West Beach Resorts, by Environmental Communications, Inc. The EIS was required under the provisions of Chapter 343, HRS, when the applicant made a proposal to the City and County Department of Land Utilization (DLU) to develop a resort community within the Shoreline Setback Area (Chapter 205-32, HRS) and the Special Management Area (SMA) (Ordinance No. 4529). As the agency initially receiving the request for an approval, the DLU required the preparation of the EIS. Under Section 1:24 of the Environmental Quality Commission (EQC) Regulations, "Identification of Approving Agency", DLU is also the accepting authority of the statement.

In addition to development within the Shoreline Setback Area and SMA, the project involves work within the State Conservation District and shorwaters under the jurisdiction of the U.S. Army Corps of Engineers.

In accordance with Sub-Part J. NEPA Actions, of the EQC regulations, the applicant notified the Army Corps of Engineers, the State Environmental Quality Commission, State Department of Land and Natural Resources and the DLU. This is a first attempt to prepare a single EIS document which would satisfy requirements of all pertinent government agencies.

This document was prepared as a generic or programmatic document and follows Federal guidelines of the National Environmental Policy Act of 1969 (NEPA) for content and format, as well as State EIS content requirements (Chapter 343, HRS, and Ordinance No. 4529, as amended).
It generally describes the anticipated environmental effects of the development of 640 acres of land to the maximum usage as follows:

<table>
<thead>
<tr>
<th>LAND USE</th>
<th>APPROXIMATE ACREAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotel/condominium (7,520 units)</td>
<td>109.0</td>
</tr>
<tr>
<td>Residential (1,482 units)</td>
<td>97.9</td>
</tr>
<tr>
<td>Low/Medium Density Residential (198 units)</td>
<td>12.4</td>
</tr>
<tr>
<td>Commercial</td>
<td>16.7</td>
</tr>
<tr>
<td>Marina/Related Areas</td>
<td>48.0</td>
</tr>
<tr>
<td>Golf Course/Club</td>
<td>158.7</td>
</tr>
<tr>
<td>Beach Club</td>
<td>2.2</td>
</tr>
<tr>
<td>Marine Park</td>
<td>10.2</td>
</tr>
<tr>
<td>Tennis Courts/Related Areas</td>
<td>6.6</td>
</tr>
<tr>
<td>Cultural Center</td>
<td>11.4</td>
</tr>
<tr>
<td>Parks</td>
<td>67.7</td>
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<tr>
<td>Lagoon System</td>
<td>24.6</td>
</tr>
<tr>
<td>Restaurants</td>
<td>1.6</td>
</tr>
<tr>
<td>Circulation/Open Space</td>
<td>66.1</td>
</tr>
</tbody>
</table>

The proposed project would be constructed over a period of twenty years and will require land use policy changes and permits from the City and County of Honolulu, State of Hawaii, and Federal governments. In order to create a document acceptable to all three levels of government, the applicant coordinated between the various levels of government.

B. PROCEDURES

1. Under the provisions of Chapter 343, HRS, the DLU issued an EIS Preparation Notice on April 18, 1979. This was distributed by the applicant to a list of consulted parties suggested by DLU.

2. The consultation period for the EIS Preparation Notice was initiated on April 23, 1979 and terminated on June 8, 1980. This is substantially longer than the 30-day minimum consultation period required by Section 1:41(b)
of the EIS Regulations. Thirty-seven (37) parties submitted written comments during this period, and the applicant responded in writing to parties having substantive comments.

3. The Draft EIS review period officially began on July 8, 1980, although most of the Draft EISs had been sent to reviewing agencies two weeks prior to that date. The State deadline for comments was August 7, 1980; the Federal deadline for comments was August 18, 1980. Forty (40) parties commented in writing; seven (7) letters had no comments, while the remaining thirty-three (33) letters containing substantive comments requiring analysis and response.

4. The applicant requested that the response period be extended by 14 days, from August 21, 1980 to September 4, 1980. This was granted by DLU. The applicant made written responses to all comments by the end of the extended response period.

C. CONTENT

The revised EIS meets all of the basic content and style requirements specified in Section 1:42 and 1:43 of the EIS Regulations. However, as pointed out earlier in this report this document is a generic or programmatic EIS, which means that the overall project concept has been described, but the actual design details of the project have yet to be finalized. This document also incorporates 15 technical support studies which have been reviewed by private parties and governmental agencies. The applicant will be required to submit supplemental EISs for review prior to the time that a particular aspect of the proposed project is scheduled for implementation.

The following is a listing of environmental issues, which cannot be adequately answered due to the general nature of this document, but are expected to be thoroughly addressed at the time that supplemental EISs are submitted.

1. The configuration of the marina, including design details as width, length, depth, flushing characteristics, marina entrance, marine breakwater, etc.
2. The development of recreational lagoons, including design details as length, width, importation of materials, etc.

3. Salt water intrusion on the freshwater basal lens due to the development of the marina and lagoons.

4. The drainage system, including siltation basins, transmission lines, offshore impacts, and use of the golf course.

5. The sewage disposal system, including final transmission line to the Honouliuli Wastewater Treatment Plant.

6. The disposal site and method of disposal for solid waste.

7. The number and types of housing units, including low/moderate income housing.

8. The source, quantity, and commitment of domestic water, and any water conservation techniques to be employed at the project site.

9. Proposed parks within the project site including design, facilities, and access.

10. The transportation network, including roadway widths, access points, interchange designs on H-1 Freeway, implementation of a private mass transit system, parking.

11. Traffic projections based on designs of the project, and most recent external developments.

12. Noise conflicts with Barber's Point Naval Air Station, roadway noise, noise buffers and barriers.

13. The grading, flood protection, and landscaping plans, including provision for relocation and/or propagation of endangered plant species.
14. Historical/archaeological/paleontological concerns, including Federal (36 CFR 800) and State coordination (SHPO) for critical sites, including Hawaiian, bone finds, and the OR and L Railroad.

15. Socio-economic impacts based upon the ultimate design of the project.

D. RESPONSE

Based upon the conceptual information available at this time, the applicant has made adequate responses to all comments postmarked before the end of the official review period. However, the supplemental EISs will be scrutinized to insure that prior to project implementation, the previously listed environmental issues are adequately addressed.

E. EIS ACCEPTANCE AS A JOINT CITY-STATE-FEDERAL DOCUMENT

The DLU, under the provisions of Chapter 343, HRS, required that an EIS be prepared. The DLU is the accepting authority for the City and County of Honolulu.

According to the Office of Environmental Quality Control, the marinas and lagoons involve State owned lands and therefore the EIS document must also be accepted by the governor.

The Corps of Engineers is developing their own EIS document based upon the information provided in the subject EIS and will take action on this document after action is taken at the State and County level.

E. DETERMINATION

The revised EIS is determined to be an acceptable generic/programmatic EIS under the criteria for acceptance established in Section 1:71 of the EIS Regulations. However, prior to any land use policy changes or permit applications required from the City and County of Honolulu,
the applicant will be required to present a schedule of the supplemental EISs to be subsequently submitted to the various levels of government for review and determination of acceptability. All unresolved issues must be satisfactorily addressed prior to the granting of any land use policy changes or permits from the City and County of Honolulu.

APPROVED

TYRONE I. KUSAO
Director of Land Utilization

TTK:sl
2. **SUMMARY**

2.1 West Beach Estates, plans to develop a self-contained resort complex on 642 acres of land located in Honolulu in the Ewa District of southwest Oahu, State of Hawaii. The total project concept plan includes residential units, resort units, a marina, a beach lagoon system, commercial centers; parks, interior road systems, utilities, a golf course, tennis courts and other necessary urban support facilities.

The applicant will be applying to the Department of Land Utilization (City and County of Honolulu) and the State Department of Land and Natural Resources, for Zoning, the Special Management Area and Conservation District Use permits, respectively, and has submitted a Department of the Army permit application to the Corps of Engineers requesting construction authorization to operate and maintain a marina and beach lagoons.

2.2 The proposed project is expected to provide employment and housing, increase recreational and cultural resources and availability, increase access to the shoreline, and improve recreational boating. Fallow agricultural land will be replaced by urban land uses increasing population in the area, water and power demands for the region. Increased traffic will alter ambient air quality with automotive emissions. Aircraft noise will affect the residents throughout the project area. Increased traffic noise will affect residents presently located along Farrington Highway. A portion of the project is located within the Barber's Point historic area and some archaeological and historic resources will be salvaged or preserved. Existing vegetation will be replaced with landscaped species. Communities of rare plants have been relocated. Some fossilized bird bones will be recovered and preserved for further scientific study. The marina and lagoons will create new aquatic habitat and potential pollution sources. Reducing the size of the development or eliminating the proposed alteration of the shoreline and work in shore waters will modify the extent of environmental impacts. The no action alternative will result in the fallow agricultural lands remaining as is, essentially preserving existing conditions.

2.3 This combined Federal and local EIS discusses the environmental consequences associated with the West Beach development. The specific permit actions and authorities applicable to the proposed action listed below do not represent all the government approvals which are required to resolve issues identified in 2.5. A flow chart showing the approvals needed to implement the project is provided on the following page. This environmental impact statement supplements the joint Federal-State Final Environmental Impact Statement for the proposed West Beach Resort, dated November 1980.

2.4 Technical verification and design stage, coordination. The technical verification and design stage has been completed. The work involved a detailed review of the marina and lagoons, including the sizing, design, modeling and engineering considerations. During this period, the work was coordinated with the Corps of Engineers, Harbors Division (State Department of Transportation), National Marine Fisheries Service, Fish and Wildlife Service (Department of the Interior), Department of Land and Natural Resources (State of Hawaii), Department of Land Utilization (City and County of Honolulu), Board of Water Supply (City and County of Honolulu), Advisory Council on Historic Preservation, Environmental Protection Agency, other Federal, State, and County agencies as determined by the Corps of Engineers.
<table>
<thead>
<tr>
<th>Project Feature</th>
<th>Approval/Permit Required</th>
<th>Agency</th>
<th>Authority</th>
<th>EIS Supplement</th>
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<tr>
<td>Work within the Shoreline Setback and Special Manage-</td>
<td>Shoreline Setback Variance</td>
<td>Department of Land Utilization,</td>
<td>Chapter 205, HRS Ordinance No. 84-4</td>
<td>Yes</td>
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<td>ment Area.</td>
<td>Special Management Area</td>
<td>City &amp; County of Honolulu</td>
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<tr>
<td>Resort Development and Use</td>
<td>Change of Zone County Land Use Amendments</td>
<td>Department of Land Utilization</td>
<td>County Ordinances</td>
<td>Yes</td>
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<tr>
<td>Shoreline Construction (marina and bathing lagoons)</td>
<td>Conservation District Use Application</td>
<td>Department of Land &amp; Natural Resources, State of Hawaii</td>
<td>Chapters 183, 205, HRS, Title 13 Chapter 2</td>
<td>Yes</td>
</tr>
<tr>
<td>Work in Coastal Waters (marina and bathing lagoons)</td>
<td>Department of the Army Permit</td>
<td>U.S. Army Corps of Engineers</td>
<td>Section 10, River and Harbor Act of 1899.</td>
<td>Yes</td>
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<td>Coastal Zone Management Federal Consistency Determination</td>
<td>Department of Planning and Economic Development</td>
<td>HRS Chapter 205A</td>
<td>Yes</td>
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</tbody>
</table>
FLOW CHART
PREPARATION OF THE EIS SUPPLEMENTS

ENGINEERING AND TECHNICAL STUDIES
Water Supply and Distribution System
Highway System
Drainage System and Pollution Abatement
Parks and Public Access to Shoreline
Fire Protection
Noise Abatement
Air Quality Control and Pollution Abatement
Marina/Lagoon circulation and flushing
Marina Effect on Deep Draft Harbor
Wastewater System and Pollution Abatement
Tsunami Flood Hazard Abatement

ENVIRONMENTAL STUDIES (AGENCY REVIEW OF SCOPE OF WORKS)
Littoral process impact analysis
Water quality impact analysis
Groundwater impact analysis
Marine resource survey and impact analysis

COORDINATION AND APPROVAL WITH VARIOUS AGENCIES
Archaeological and Paleontological
Salvage Plan
(State Historic Preservation Officer)
Endangered plant propagation
(U.S. Fish and Wildlife)

AGENCY REVIEW OF PLANS AND COMPLETED ENVIRONMENTAL STUDIES

PREPARE AND PROCESS EIS SUPPLEMENTS TO Respond TO UNRESOLVED ISSUES

ZONING APPROVAL
SPECIAL MANAGEMENT AREA PERMIT APPROVAL
CONSERVATION DISTRICT USE PERMIT APPROVAL
CORPS OF ENGINEERS PERMIT APPROVAL
(For Marina/Bathing Lagoons)

REGULATORY AGENCIES/UTILITIES APPROVALS:
Water Master Plan
Building Permit
Sewer System Approval
Drainage Master Plan
Highway System Approval
Park Approval on Parks and Public Access

CONSTRUCTION OF THE PROPOSED PROJECT
2.5 Issues to be resolved.

(a) Potable Water. The project will increase water demand in the region. The existing water infrastructure cannot accommodate the total planned development at the present time however, Campbell Estate will be coordinating the installation of the necessary water facilities including the source for the West Beach development. The BWS is committed to provide an adequate supply of potable water for West Beach on a program currently being developed. These measures include source development storage and transmission capabilities in those areas presently drawing water from the Pearl Harbor Basin.

The Ewa Water Master Plan and West Beach Water Master Plan have been provided to BWS for their approval. These plans will provide the basis on which adequate supplies of potable water will be provided to West Beach.

(b) Archaeology and Paleontology. Portions of the project site lie within the Barber's Point Archaeological District. Archaeological surveys in the remaining portions of the project area indicate that some archaeological and paleontological sites are found in the proposed development area. Any plans to restore, salvage or preserve the sites and disposition of recovered artifacts will have to be coordinated with the State Historic Preservation Officer.

(c) Endangered Species. Communities of rare plants proposed for listing on the Federal List of Endangered Species were found in the project area. However, Campbell Estate, the landowner has taken independent action to transplant and propagate the plants clearing them from the project area. No endangered plants currently remain on the site.

(d) Land Use Conflicts and Noise. The project will not encroach upon aircraft operations at Barber's Point Naval Air Station.

(e) Marina and Beach Lagoons. At this stage of planning, the preliminary technical design of the marina and beach lagoons has been completed. The design of the flushing system for the lagoons is based on designs that most closely duplicate the lagoons fronting the Kamokila Campbell home. Marina designs are being reviewed by COE and local agencies. Joint small craft and commercial ship traffic use of the Barber's Point Deep Draft Harbor are also under review. Approvals for marina and beach lagoon construction will not be given until after evaluation and consideration of the completed design. Comparison of alternative locations and configurations and, in the case of the marina, model testing and verification has been completed.

(f) Ciguatera. Ciguatera poisoning which occurs after consuming fish containing ciguatoxin has not been linked conclusively to dredging operations, however, warning signs are recommended for posting along this shoreline.

(g) Wastewater. The wastewater is intended for treatment at the Honolulu Wastewater Treatment Plant. Plans to connect to Honolulu are being reviewed by the City Department of Public Works. The applicant intends to construct a separate sewer line from the project site to the Honolulu Wastewater facility.
(h) **Tsunami Hazards.** Portions of the project site are located within a tsunami flood hazard area. The applicant has planned and designed the facilities and structures to minimize potential tsunami flood damage and losses including the creation of a continuous protective berm along the coastline to protect the developed sections of the site from tsunami inundation. Structures proposed by the applicant within the flood hazard area must comply with the County's building codes and Federal flood prevention requirements.

(i) **Housing.** Ten percent of the residential housing to be constructed will be provided for low and moderate income families. The applicant will be working with the appropriate State and City agencies to meet this objective.

(j) **Groundwater.** A dual source system for potable and irrigation water has been planned and will be developed by the developer for dedication to the Board of Water Supply.

(k) **Public Access and Parking.** Public access and parking arrangements must be coordinated with County agencies for management policies.

(l) **Beachfront Design Criteria.** Siting, height and volume of the buildings fronting the ocean must be coordinated with the appropriate County agencies for final review.

(m) **Lagoon Construction Methods.** Construction method for the lagoons and beaches must be coordinated and approved by appropriate agencies prior to construction.

(n) **Affordable Housing.** Definitions of affordable housing for low and moderate income families has not been clearly defined by the City and County of Honolulu. The developer has acknowledged that reasonable requirements implemented after resolution of this issue will be adhered to.
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APPENDICES AND TECHNICAL STUDIES for the EIS have been printed as separate supplementary documents which were distributed in limited numbers. All technical support documents published in the appendices are available through regional libraries. The following Technical Study Index lists all studies utilized in preparation of this document.
TECHNICAL STUDY INDEX AND BIBLIOGRAPHY

These technical studies have been prepared for the West Beach Supplemental Environmental Impact Statement (EIS) which has been prepared under the Rules & Regulations of the Environmental Quality Commission (Chapter 343, HRS) and NEPA (P.L.91-190). They reflect the current status of condition, forward from the generic EIS prepared in 1979 and accepted in 1980. As such, all comments made by the technical subconsultants are for the current condition of the project site and the proposed project as designed and presented in the EIS.

APPENDIX I - TECHNICAL STUDIES

1. A Report of the Viability of West Beach as a Resort Community and the Estimated Economic Impact; Pannell, Kerr, Forster.


3. Air Quality Analysis for West Beach Project Oahu, Hawaii; Root, Barry D.

4. Birds of West Beach; Berger, Andrew J., Ph.D.

5. Botanical Survey of the Proposed West Beach Resort Project; Char, Winona P.

6. Occurrence and Significance of Palaeontological and Archaeological Remains in the West Beach Resorts Development Area, Oahu; Ziegler, Alan C., Ph.D.

7. Traffic Impact Analysis; Community Planning, Inc.

8. West Beach, Oahu: Archaeological Status Report; Barrera, William, Jr.

9. West Beach Project Water Pollution Implications of Project Site Storm Runoff; Dugan, Gordon L. Ph.D.

APPENDIX II - OCEANOGRAPHIC AND MARINA STUDIES:

1. Analysis of Biological Impacts of the Lagoon/Marina Development at West Beach, Oahu, Hawaii; OI Consultants, Inc.

2. Proposed West Beach Marina Hydraulic Model Investigation; U.H. James K.K. Look Laboratory of Oceanographic Engineering, Department of Ocean Engineering; Principal Investigator; Lee, Theodore T.

3. Summary of Technical Input for the West Beach Lagoons and Marina Design Development; Batten, Karl H.; Dr.

4. Technical Evaluation and Recommendations on Design of Marine Structures; Gerritsen, F.
5. Tsunami and Hurricane Design Criteria and Recorded Wave Data Analysis for West Beach Development Area; Bretschneider, Charles L.

A complete Bibliography is included in each of the technical studies. The reviewer, if interested, should review the specific technical study if more information or references are needed.
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6. **PURPOSE AND NEED OF THE PROPOSED ACTION**

West Beach Estates, (WBE) proposes to establish West Beach resort, as the secondary visitor destination area on Oahu (the first being Waikiki). Favorable environmental factors such as the relatively close proximity to the Honolulu International Airport (20 minutes driving time), its dry and mild climate, its 1.9 miles of shoreline, and flat topography are advantageous for this development. The proposed project will benefit the public in the following areas: (1) it will provide employment in the construction and visitor industries, as well as create jobs in secondary and tertiary industries; (2) it will be in close proximity to a significant employee labor force; (3) it will provide taxes and revenues; (4) it will utilize available and unused land; (5) it will provide additional recreational resources to the public; (6) it will increase access to the West Beach shoreline; (7) it will provide recreational lagoons and social areas which can be utilized by the general public; (8) the project plan also envisions the conversion of the Alice Kamokila Campbell property (which has two natural lagoons) as a cultural center; (9) it will satisfy part of the demand for recreational boat berthing in the State of Hawaii.
7. DESCRIPTION OF THE PROPOSED PROJECT

7.1. Introduction

The proposed West Beach project detailed in this document represents the culmination of design work and field studies undertaken since the acceptance of the generic 1980 Final EIS for West Beach Resort. The 1980 Final EIS described project alternatives to the resort development, such as no action, total development and reduced development, where certain project features were eliminated from the development. Therefore, alternatives considered in this document discuss specific design considerations reflecting the current status of the project and specific project activities. The purposes of the joint Federal-State Supplemental EIS, alternatives to each specific project activity are discussed in relation to the environmental consequences of each activity.

7.2 Proposed Project Concept

The applicant, West Beach Estates, proposes to develop their 642-acre parcel (Figures 1, 2 & 3) into a quality resort/residential community where visitors and residents can live in a physical environment characterized by beauty, spaciousness and uniqueness (Figure 4). The project area is enhanced by a 1.9 mile shoreline and temperate climate. Some of the recreational facilities or amenities proposed include:

a. A championship, 18-hole golf course;
b. Four swimming lagoons
c. Beach Club;
d. Marina;
e. Four public parks; and
f. Hawaiian Cultural Center.

Presently, there are only limited pockets of natural beach available for public use in the project area. West Beach intends to better utilize the nearly two mile stretch of ocean frontage by creating four naturally flushing lagoons and beaches to serve as swimming areas. Further, as more fully discussed below, this improved beach shoreline is not to be reserved for the visitor alone as public access to these lagoons are planned as shown on the Master Plan.

The Master Plan emphasizes the shoreline and its recreational uses. Public parks anchor one end of the project area, and the marina and adjacent parks anchor the other. The resort areas are strategically located adjacent to the lagoons. In a similar pattern, the majority of the residential units are oriented to the open space amenities, such as the golf course. Commercial activity centers are centrally located within West Beach, along the major access road.
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WEST BEACH

LAND PLANNER: JOHN L. CHAPMAN LAND PLANNING
ENGINEER: COMMUNITY PLANNING, INC.
LANDSCAPE ARCHITECT: PHILIP B. RANDL FLANDERS

MASTER PLAN

FIGURE 4
West Beach is intended to create and maintain a feeling of spaciousness comparable to Neighbor Island destination resorts. The elements of open space, buildings and circulation will be arranged to achieve this goal. The land area for West Beach is slightly larger than Waikiki (bounded by the Ala Wai Canal, Kapahulu Avenue, and the shoreline).

Summarized below are the uses, approximate acreages, and residential and resort units contemplated at West Beach.

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<td><strong>TOTAL</strong></td>
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7.2.1 The Resort Area

There are approximately 4,000 visitor units proposed. The visitor units consist of hotels and resort condominiums, located on the sites designated "Resort," which are along the oceanfront. Midrise buildings at densities of approximately 45 units per acre will be utilized for the hotels and resort condominiums. Structures will vary in height up to a maximum of 150 feet and setback variations from the existing shoreline of approximately 300 feet. The project's objective will be to minimize the visual impact along the oceanfront and protect ocean viewplanes.

7.2.2 The Residential Community

5,200 residential units are proposed, with 1,500 of these designated Low Density Apartments and 3,700 of these designated Medium Density Apartments. The residential units are to be located close to the transit stations and commercial areas.

Approximately ten percent (10%) or 520 units will be built as affordable housing for low and moderate income families. The following acreages, densities and descriptions are approximate and proposed at the present time.
a. Low Density Apartments

Low Density Apartments will consist of two and three story townhouses and flats. The Low Density Apartments will be located near the golf course with the two story buildings being along the course and the three story structures on higher ground. The overall density in this area will average 14 units/acre. The unit types will vary in each of the sites, with studio, one, two, three and four bedroom units. The sizes will vary from approximately 400 square feet to 2,000 square feet. The larger units will generally be located along the primary golf course frontage with smaller units located away from the golf course.

b. Medium Density Apartments

The Medium Density Apartments will consist of two and three story townhouses and flats similar to the Low Density Apartments, and mid-rise condominiums up to 150 feet high. The Medium Density Apartment areas, which will contain 40± to 55± units per acre, will be situated near the golf course and commercial area, with the balance oriented towards the Marina, ocean or lagoons. Generally, the mid-rise condominiums will be located in the interior of each site while the townhouses and flats will have perimeter placements. The 3700 medium density studio, one, two and three bedroom units will range from 350 to 1,500 square feet in size.

7.2.3 Commercial

To achieve a fully integrated resort area, two commercial sites of 1.9 and 15.9 acres will serve the diverse needs of the residential and resort communities. A shopping center similar to San Francisco's Fisherman's Wharf will occupy the larger site. It will have amusements, attractions, restaurants and specialty shops with tourist related goods and services as well as a convenience shopping area where residents may purchase neighborhood type goods and services.

7.2.4 Recreational Amenities

Besides a beautiful location, varied amenities and activities are a prerequisite for any successful destination resort. West Beach's recreational amenities include: four oceanfront lagoons and newly created sandy beaches, an 18-hole golf course and clubhouse, a Hawaiian Cultural Center, four county public parks, a marina, beach and yacht clubs, tennis facilities, a historic railroad, and a Fisherman's Wharf type shopping center.

a. Oceanfront Lagoons and Beaches

1. Beaches

Four newly created sandy lagoon beaches will be West Beach's greatest recreational amenity. The West Beach site includes almost two miles of ocean shoreline. However, these two miles of coastline are without a suitable beach or swimming area for public use.
This ocean amenity, so necessary for a successful resort, will not, however, be reserved exclusively for the visitor. Public access to these newly created beaches and shoreline will be provided. A continuous walkway along the shoreline fronting the resort/residential areas will also be provided. Uses to be permitted within the lagoons are currently unresolved pending determination of jurisdictional responsibility in these areas. Shoreline maintenance will be provided by the developer or hotel operators.

2. **Lagoons**

The plan proposes four new ocean lagoons, ranging in size from 2.0 acres to 5.5 acres, to provide about 13.1 acres of sheltered swimming areas for use by the project's visitors, residents, and the general public. These lagoons will be similar to the lagoons presently existing at the site of the Alice Kamokila Campbell Estate, and will be spread out along the coastline from the Alice Kamokila Campbell Estate on the north to the entrance of the deep draft harbor at the southern end.

The present size, depth and configuration for the lagoons are based on extensive analysis of the water and soil conditions at the four new proposed sites and at the existing Alice Kamokila Campbell lagoon.

The lagoons (like the marina discussed below) are designed to take advantage of the existing limestone shoreline. Lagoon development will provide greater access to the ocean and the existing shoreline. This will be achieved through designed reduction of the existing basaltic ledge at strategic access points so as not to create unsafe tidal channels which could prove dangerous to swimmers. In this way, the same natural method that currently flushes the swimming lagoons on the Alice Kamokila Campbell site can be employed to flush the new lagoons. It is planned that sand already existing behind the basaltic shoreline will be used to line the new lagoons the sandy beaches.

b. **Golf course and Clubhouse Facilities**

An 18-hole course with a driving range and a clubhouse will be sited through the residential areas of the project to create and preserve desirable open space and viewplanes. The course will be open to the general public with priority to West Beach's residents and tourists.

c. **Marina**

A 42.2-acre marina with about 500 slips for pleasure and commercial boats is planned for the southern tip of the project adjacent to the Barber's Point Deep Draft Harbor. Presently, there is no sheltered coastline to provide locations for boat launching, berthing or mooring. The marina, with its launching ramp, will provide a convenient place for the residents of West Beach, as well those presently living in the surrounding communities, to launch their boats.

As with the lagoons, detailed environmental analysis is being used in its design. Presently, the marina is planned to use the existing Barber's Point Deep Draft Harbor entrance channel. The marina's configuration and depth
will ensure maximum moderation of wave action in the entrance channel and promote safe navigation. Orientation and final dimensions of the marina will provide proper tidal flushing of the basin to avoid stagnation. Final determination on entry-exit alternatives is being reviewed and discussed with the U.S. Army Corps of Engineers, and the State Department of Transportation.

The 500 slips will be for pleasure craft and commercial boat use. It is anticipated that the commercial use of the facilities will be for fishing, charters, and excursions. Among the marina’s facilities are: boat launch and haul out facilities, fueling and boat repair facilities, public conveniences, and restaurants.

d. Tennis Facilities

Tennis facilities, along with other recreational opportunities, will be provided by the individual hotels and condominiums for hotel guests, condominium residents, and their guests.

e. Beach and Yacht Clubs

The beach and yacht clubs, to be located along the oceanfront and marina, respectively, will afford member residents and tourists of West Beach easy access and use of the shoreline and marina.

f. Hawaiian Cultural Center

This facility will preserve the natural lagoons and the historic resources of the former Alice Kamokila Campbell Estate. It will be a privately owned and operated cultural facility, open to the public, where the arts and crafts of the Hawaiian Culture, (which may include a luau operation) will be practiced and perpetuated.

g. Public County Park Space

Four parks totalling approximately 50 acres will constitute the public county park system at West Beach. Two large beach parks will be provided, one at the primary entrance to the project area and the other adjacent to the marina. A passive park will be provided adjacent to and oriented towards the deep draft harbor. A Community Park will be provided within the residential area, adjacent to the proposed elementary school, to meet the resident's active recreational needs.

h. Historic Railroad

A historic railroad right-of-way connecting Pearl Harbor and Lualualei bisects the property in an east-west direction. It is anticipated that this railroad will be rejuvenated and function similar to the Lahaina-Kaanapali Railroad on Maui.
7.2.5 Major Utility and Infrastructure Requirements

a. Access and Circulation

West Beach is conveniently located close to major Oahu highway systems. These include Farrington Highway and Interstate Highway H-1. Estimated travel time from Honolulu International Airport to the project area is approximately 20 minutes. Farrington Highway is presently a four-lane divided facility which terminates east of the project area and becomes Interstate Highway H-1. The State plans to widen the section of the highway between Kunia and Palailai interchanges to three lanes in each direction.

Ingress and egress to the project area will be provided by two interchange connections (one, a structural interchange and the other an at grade crossing) to Farrington Highway, at the Waianae and Honolulu ends of the project. From these connection points, access to the various activity areas of the project will be achieved by a loop road system. This will be designed as a four-lane divided parkway with extensive landscaping within the right-of-way. A series of cul-de-sac roads will branch off the parkway and provide access to the various resort, residential, commercial and recreation facilities. The cul-de-sac roads which connect to shoreline-oriented areas of the project also provide public access and parking to a shoreline walkway system which will serve the shoreline.

Transportation planning will also provide a system of pedestrian and bicycle ways throughout the project to provide a means of non-vehicular circulation. Plans also call for consideration of an internal tram system for internal mobility between the resort and other planned use and activity areas. While the proposed resort destination may be served by express bus service from Honolulu, future planning considerations envision a fixed right-of-way mass transit system. A reserved alignment is designated in the plan, following the existing railroad right-of-way which runs through the center of the site. Two transit station sites are planned within the project area, where the parkway intersects with the transit right-of-way. These alternate modes of transportation are intended to provide residents and visitors to West Beach with transportation options, heightened convenience, and reduced reliance on the private car.

The total development at West Beach is expected to generate approximately 35,000 external auto trips per day. Of this, some 31,500 auto trips per day will utilize Farrington Highway east of the project, and the remainder will utilize Farrington Highway west of the project.

When the estimated daily traffic generated by the project is added to the estimated volume of future daily traffic projected for Farrington Highway, it can be concluded that the present highway has adequate 24-hour capacity. However, when peak hour traffic is considered, Farrington Highway is inadequate in the morning for Honolulu bound traffic. This inadequacy, which occurs between the Palailai Interchange and the project's east at-grade intersection, requires an additional Honolulu bound lane on Farrington Highway. Another alternative, which is proposed by West Beach and preferred by the State's Department of Transportation, is the extension of the project's
major road (presently terminates in dead-end at the project's east boundary) to Kalaeloa Boulevard. Kalaeloa Boulevard, a four-lane divided highway, which serves as access for the Campbell Industrial Park, connects to the Interstate H-1 Highway at the Palailai Interchange. The cost for providing the additional required laneage, whether by widening of Farrington Highway or extension of the project's major road, will be borne by West Beach.

With the State's planned widening to six lanes of the roadway between Palailai and Kuna Interchanges, the Interstate H-1 Highway will have adequate capacity for the project's estimated traffic. The planned mass transit changes will improve traffic conditions further.

It should also be pointed out that much of the traffic generated by the resort facilities would occur during off-peak hours.

b. Roads

Access to and from Farrington Highway will be provided by major streets with 100 feet and 80 feet rights-of-way. The major thoroughfare will contain 15-foot median strips while the secondary streets will have 12-foot median strips. Parkways along both streets will be 10 feet wide. The developer intends to construct a freeway interchange (subject to approval by the appropriate governmental agencies).

c. Major Landscaping Plan

Extensive landscaping is contemplated for the entire project. This landscaping plan will emphasize the tropical Hawaiian flora as a background setting comen-surate with a major destination resort. There will also be major landscaping features for the 18-hole golf course as well as the condominium residential sectors above the major berm road. Where possible, the applicant proposes to use indigenous plants (plants native to Hawaii and adaptable to the Ewa plain) for landscaping.

The overall image envisioned for this resort will be one of tropical beauty. The essential elements that will be utilized to create this image are: the use of coconut palms planted extensively throughout the resort grounds as the dominant plant material; and, the frequent use of water features as aesthetic and recreational amenities (such as lagoons, lakes, waterfalls, ponds, streams, etc.).

The dominant perception of the completed resort should be one of landscape continuity which will be achieved by requiring adherence to three established landscape character zones; Tropical, Streetscape, and Inland Zones.

A "Tropical/Hawaiian" landscape character is designated for all parcels adjacent to the resort's shoreline, lagoons, and marina. The salt spray from the shoreline surf dictates consideration of salt-tolerant plant species for these areas. Due to its harsh environmental conditions, the landscape treatments for the Shoreline State Conservation land will be limited to hardy, salt-tolerant, indigenous plant materials which can survive with minimal maintenance care. These seashore plant materials include Coconut Palms, Beach Morning Glory, "Ilima and Beach Naupaka. Natural paths and viewing platforms will also be provided along the State Conservation shoreline land.
bordering this resort site. The lagoon islands will be planted and irrigated by a permanent brackish water system.

The Streetscape Zone includes all road rights-of-way to be constructed within the resort and dedicated to the City and County of Honolulu for public circulation use. Mature Coconut Palms will be planted to visually identify and accentuate the Primary Entry/Exit for Farrington Highway travellers. Flowering shrub and ground cover massings will also line these areas.

The Inland Zone is situated along the upper elevations of the project site mauka of the Tropical and Streetscape Zones. The plant materials for this zone should be responsive to the relatively intense sun exposure and occasional windy conditions of this environment. The planned 18-hole international championship golf course occupies a major portion of the Inland Zone.

d. Sanitary Sewage System

The proposed permanent solution for sewage disposal for the estimated 2.5 MGD average daily flow is connection to the City's Honouliuli Sewage Treatment Plant and outfall. The proposed plan for sewage disposal from the project area is to construct collector sewer lines within the project roadways.

Sewage will then be conveyed by gravity flow to two pump stations within the project area. From there, the collected sewage will be pumped into an interceptor sewer for transport and discharged into the Honouliuli Wastewater Treatment Plant. The total distance for the pipe system from West Beach to Honouliuli is approximately six miles. The proposed improvements will be designed to City and County of Honolulu standards and after construction dedicated for operation and maintenance. The City and County of Honolulu, Department of Public Works, has approved the concept of the proposed plan to sewer the West Beach project.

e. Solid Waste Disposal

The project area will be serviced by the City and County of Honolulu Division of Refuse and by private refuse collection companies. Regularly scheduled service will be provided, usually two days a week. Collected waste will then be transported to a public landfill site and/or the Palailai Quarry, which is accepting refuse for landfill at the present time.

Additionally, the City and county plans to implement new landfill facilities in Leeward Oahu, which will be available to service the West Beach area.

f. Water System

Since the project area is the central core of the secondary urban center, the Board of Water supply has agreed to support the West Beach-Makakilo area by insuring the necessary water facilities are provided. (BWS November 29, 1983).

"Consequently, our resources and capital improvement program have been directed toward meeting that (secondary urban center) obligation."
When fully developed, the West Beach project will require approximately 4.5 million gallons of water per average day based upon a BWS modified dual water system standard (BWS March 19, 1977).

The water system facilities will include wells, pumps, transmission mains, appurtenances, and water storage reservoirs.

The water system is being studied for design and construction as a dual system providing separate storage and distribution facilities for domestic and irrigation water in accordance with the Ewa Water Master Plan which was approved by the Board of Water Supply on July 26, 1984. A water master plan for West Beach, Campbell Industrial Park and the Barbers Point Deep Draft Harbor has been submitted to BWS (February 28, 1985) and is pending approval.

The irrigation water source for the planned golf course, open spaces and landscaped areas will be obtained from wells near or on the site using brackish water previously pumped from an existing on-site plantation well. The demand for potable consumption is being reviewed and evaluated by both the State and City to determine source availability as well as the volume permitted to be pumped from the Pearl Harbor Basin. The proposed water facilities have been filed with the Department of General Planning as an amendment to the Ewa Public Facilities Map.

An adequate water source for the dual system will be provided by a cooperative effort of the land owner, Campbell Estate, and the Board of Water Supply.

g. Drainage System

West Beach is located below several well-defined drainage basins. Existing improvements along Farrington Highway, Nanakai Gardens and Honokai Hale Subdivisions channelize the flow from these drainage areas into culverts and lined channels.

Presently, storm runoff flows through the fallowed cane field area of the project area in unimproved channels and depressions. Erosion occurs during large storms, but as the area is generally dry and these storms occur infrequently, they have not necessitated improvement.

In similar manner, the project's major drainage system which is designed to accommodate the peak storm flow as established by the Department of Public Works of the City and County of Honolulu will consist of grassed drainageways through the proposed golf course as well as designated green belt areas. Lining of these drainageways may be required where velocities are erosive. This may occur mainly in the steeper sections of the golf course and park areas.

The flatter portions of the golf course will be designed to pond and retain runoff from intense storms.

The storm runoff will be conveyed within natural drainageways or, if necessary, within improved channels and discharged into the marina at a controlled rate as is the present practice today at the Ala Wai Small Craft Basin, Keehi
Lagoon, Honolulu Harbor, and Kaneohe Bay. In the initial phases of development, the marina area will be partially dredged to provide a depression for desilting storm water runoff.

On the west side of the project, storm runoff will be discharged into the ocean at an existing drainage discharge point. This will minimize the storm water runoff as much as possible from the shoreline lagoon areas as well as the hotel/condominium sectors. For the storms of lesser intensity, the permeable characteristic of the coral base will absorb storm water via percolation. Hotel and condominium sites will be graded to drain the storm runoff away from the lagoons.

All drainage systems within the streets and project areas will be designed in accordance with City and County standards.

h. Electric and Telephone

Both the Hawaiian Telephone Company and Hawaiian Electric Company have reviewed the preliminary plans and program, and indicated the availability of service for the West Beach project.

Telephone service will be readily available to serve West Beach as respective areas are developed over time. The applicant will furnish all necessary support structures within the project. These include underground ducts or buried cable trenches, which will be furnished in accordance with Hawaiian Telephone Company standards.

Electrical service for the project area will be made available and will be supplied by Hawaiian Electric Company, in accordance with its Tariff. The project will require two 44,000 kv lines and a substation. Onsite transmission lines will be placed underground at the cost of the developer (HECO 6/30/80).

7.2.6 Public Services and Facilities

a. Schools

Public education enrollment is dependent on permanent residents at West Beach. Past experience of the Department of Education indicates that enrollment can be estimated based on the number of resident households, the type of housing, and the purchase price of such housing.

The planned addition of 5,200 residential units will generate additional student enrollment that must be accommodated by existing schools in the vicinity and a future school site provided for in the West Beach plan. The Department of Education has reviewed the West Beach plan and projected student enrollment by school type. They have compared these projections to the capacity of existing schools. Their conclusions are that Ilima and Campbell secondary schools can easily accommodate the anticipated enrollment of from 110 to 310 secondary school students. Barber's Point and Makakilo Elementary Schools have sufficient capacity to accommodate elementary grade students generated by West Beach, estimated between 150 to 350 elementary grade students. The West Beach plan provides a site for an elementary school with adjacent park space for student use should it be required. The school site would be developed when the West Beach population has generated sufficient students to justify a new school facility.
b. Police and Fire Protection

It was estimated that when fully developed, the number of people present at West Beach would average about 21,100. This average is a conservative figure based on a projected resident population of 13,300 and a projected visitor population of 7800. Based on the present Oahu ratio of police employees, to de-facto population, (2.5 police employees per 1,000 populace), there would be a need for 50-60 police employees to cover the area, as well as patrol cars and assorted equipment.

At present there is one engine company at each of the fire stations at Nanakuli and Makakilo. Assessment of fire protection requirements as the result of examining existing services and discussing the nature of the project with Fire Department personnel indicates that the construction of 5,200 residential units and 4,000 resort units in the project would necessitate the equivalent of an additional fire station with an engine company and a hook-and-ladder company. This would require a total of 33 additional staff and appropriate equipment and buildings. Major fires in the region would require that personnel and equipment from neighboring stations also respond. A proposed amendment to the Ewa Development Plan, Public Facilities Map has designated a new fire station at the Campbell Industrial Park. Planning and design will continue to be coordinated with the Fire Department.

c. Public Access

Once development begins, the West Beach project will provide access to the shoreline fronting the proposed parks as well as the resort/residential areas. Both visitors and residents will have access, via designated easements, to the newly created shoreline and the proposed swimming lagoons. This will mean that the recreational value of this site will increase dramatically.

Additionally, such facilities as comfort stations, showers and parking will also be provided. These facilities and beach rights-of-way will be coordinated with the Department of Parks and Recreation, City and County of Honolulu. Public access will be provided along the newly created shoreline. Public access for the proposed lagoons to be developed fronting the resort/residential areas, and the project's need to comply with the City's Park Dedication Ordinance 4621 will require coordination and discussions with the City's Department of Parks and Recreation.

d. Health Care Facilities

Existing health and medical care facilities are located in Waianae, Ewa Beach, and Waipahu. These consist of medical clinics and physician offices. The nearest hospital facility, a private community hospital is in Wahiawa.

Emergency medical services are provided by the City and County of Honolulu Department of Health. Ambulance service is presently located at the Waipahu Fire Station. In the early stages of West Beach development, ambulance service would be provided by the Waipahu facility. Ultimately, as the West Beach population grows, it would be anticipated that ambulance service would be provided from the new fire station facility to be located at Campbell Industrial Park, which will serve the West Beach community.
Future plans for community hospital facilities will greatly improve the accessibility of comprehensive health care facilities to the West Beach community. New hospital facilities, which have recently been approved by the State Department of Health, include a 136-bed facility in Waipahu and a 116-bed facility at Pearl Ridge. The action by the Board of Health recognizes the importance of Ewa as a growing population center and the need to provide hospital facilities to serve the new communities planned in the Ewa District.

7.2.7 Costs.

The costs for the off-site and on-site improvements will be financed by the applicant. Public funds will be necessary for such services and utilities as (1) pro-rata share of water development if other "public uses" are served; (2) collection of solid waste from park(s), school; (3) costs in providing public services (i.e. police, teachers, firemen, fire station, school buildings, and personnel costs); (4) cost involved in permit processes and approvals and inspection of work items. The applicant's major off-site (indirect) costs include the interchange and intersection connections along Farrington Highway, construction of the sewer line to Honolulu Wastewater Treatment Plant, reservoirs, wells, and transmission lines for the water system.

7.2.8 Phasing

West Beach is a very complex development which is dependent upon a very detailed and continuous development plan. The actual construction schedule in any given year could vary according to market conditions at that time. Therefore, the number of units in each development period discussed below is an approximation based upon current market conditions.

A. Site Preparation Phase

The initial phase of construction will involve off-site improvements and site preparation of the overall West Beach project.

Off-Site Improvements

- The highway interchange will be constructed in accordance with State DOT requirements to accommodate the projected traffic volumes.
- The entire off-site water system, including wells, reservoirs, and transmission lines will be constructed to meet BWS requirements.
- All of the off-site sewerage improvements, including sewer force main and interceptor to Honolulu STP, will be constructed in accordance with DPW guidelines.
- All off-site electrical and telephone improvements will be completed.

Site Preparation

- Mass grading of the entire site will be done in the first phase of construction. Work will probably commence with the partial dredging
of the lagoons and marina up to the shore area. The excavated material will be used in the mauka areas for fill and contouring material for the golf course, hotel sites and residential units. All building sites will be graded to provide a building pad upon which the hotel, residential and commercial units will be constructed.

- All on-site infrastructure will be constructed according to City and County standards. The improvements will include water, sewer, drainage, electrical, telephone and cable television infrastructure, up to the property lines of the various building sites. Improvements will be constructed within the proposed roadway rights-of-way.

- The proposed roadway will be constructed in conjunction with the proposed infrastructure improvements. Roadway construction will commence in those areas where mass grading and infrastructure construction could be ongoing in more than one area at any given time.

B. Initial Development Phase

As site preparation of the various development sites is completed, work can commence on the final construction of the golf course, the various buildings and other structural improvements. Work in this phase will occur in a general pattern from the Kahe Point end of the project site and progress toward the deep draft harbor end. However, construction of any of the building sites could be started prior to the complete implementation of the site preparation phase. It is anticipated that all development will be either completed or under construction within a period of ten (10) years from the start of construction.

- Golf course construction will commence upon completion of the mass grading within the golf course area. Mass grading of the upper project site will be completed prior to the completion of the golf course. This will insure that heavy equipment will not have to traverse the golf course once it is finished.

- Once the marina and lagoons have been dredged, final construction of these features will commence. This will include construction of the lagoon bottoms and beach areas, and the marina structural improvements. The shoreline areas of the lagoons and the channel opening of the marina will be breached as construction of these other features are being completed.

- The public easement area facilities, including walkways and landscaping, will be constructed.

- As soon as their building pads are set, construction of the hotel, commercial and residential units can commence.
8. THE AFFECTED ENVIRONMENT

The proposed West Beach project site consists of 642± acres situated in Honolulu, on the southwestern end of Oahu (see Figure 1). The island of Oahu (594 square miles) is the third largest island in the Hawaiian Islands chain. The Hawaiian Islands are centrally located in the Pacific Ocean, extending northwest to southeast from about 155° to 179° W. longitude and 19° to 28° N. latitude. There are eight major islands in the Hawaiian chain. Honolulu, the state capitol, is located on the island of Oahu. The State of Hawaii is noted for its unique blend of ethnic cultures, its natural beauty, and its subtropical climate, as well as its strategic location in the Pacific.

The land area of the State totals 6,425 square miles. The island of Hawaii also known as the "Big Island," accounts for 4,034 square miles. The remainder is divided among the islands of Maui (729), Oahu (594), Kauai (549), Molokai (261), Lanai (140), Niihau (70), Kahoolawe (45), and 11 islets, rock atolls, or exposed reef (totaling 4 square miles). The major islands are all of volcanic origin and are very mountainous. Elevations range from sea level to 13,796 feet, with many peaks in excess of 2,500 feet.

8.1 General Site Conditions

Presently 642± acres of the project site are vacant and unused (figure 2). About 162 acres were used for sugar cultivation by Oahu Sugar Company Limited until August, 1983, when the last harvest occurred. Oahu Sugar has discontinued all sugar cultivation within the site.

Ten (10) additional acres of the total site, which were part of the former residence of Alice Kamokila Campbell, are currently used as a luau site.

8.2 Surrounding Uses

The northern boundaries of the project follow along Farrington Highway except for an area which abuts the existing Honokai Hale and Nanakai Gardens residential subdivisions located along Farrington Highway. The eastern boundaries of the property abut fallow agricultural lands formerly planted in sugarcane and existing undeveloped lands. The southern boundaries of the site abut the existing Malakole barge basin (site of the Barbers Point deep draft harbor which is currently under construction). The western boundaries follow along the shoreline from the barge basin to Farrington Highway. The Hawaiian Electric Company's Kahe Power Plant is located approximately .5 miles north of the project site.

8.3 Geology

With the exception of a strip of area less than 1,000 feet wide that abuts a portion of the Farrington Highway property line, caprock underlies the proposed West Beach project site. Generally, the entire Ewa Plain area,
below an elevation of approximately 100 feet, consists of caprock. Caprock, largely comprised of different types of terrestrial and marine sedimentary deposits, form a wedge that retards the seaward movement of fresh groundwater from the inland basaltic aquifer. Varying degrees of permeability are found in the different deposits of caprock. However, the overall effect is that caprock has a low permeability in comparison to that of the fresh basaltic aquifer.

A study conducted for the Barbers Point Deep Draft Harbor (R.H. Dale 1968) indicates that the Deep Draft Harbor was excavated within the coralline aquifer to a depth of approximately 40 feet. Since the coral aquifer and the Waianae Volcanic Series aquifer are independent of each other due to the aquiclude that separates them, the proposed adjacent marina and lagoons will have no effect on the potable water supply of the Waianae Volcanic Series aquifer.

8.4 Soils

The soils included in the proposed project fall within the Lualualei Fill land-Ewa association (reference: Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii, prepared by the U.S. Department of Agriculture, soil Conservation Service, issued August, 1972). This association is characterized by deep, nearly level to moderately sloping, well drained soils. Specifically within the site are coral outcroppings, five soil series (Ewa, Jauca, Keaau, Lualualei and Mamala), with Lualualei and Keaau series each having five and three sub-series, respectively. With two exceptions, the various soil and cover types are characterized by slow runoff and an erosion hazard which is classified as slight. The exceptions are Mamala Stony Silty Clay Loam (Mnc) located in a narrow band near the Barbers Point side (south) of the property and Lualualei Extremely Stony Clay (LPE) situated generally within 500 feet of the Farrington Highway property line. The runoff for Mnc is considered very slow to medium, with an erosion hazard of slight to moderate; whereas, the runoff for LPE is classified medium to rapid, and erosion moderate to severe.

8.5 Topography

The site of the proposed project is characterized by relatively gently slopes that range from 0 elevation (sea level) at the shoreline to a maximum of about 100 feet at the northern boundaries of the project site. As indicated, two-thirds of the site are presently vacant and unused fallow sugarcane lands formerly leased by Oahu Sugar Company. The remainder of the site (except for the Alice Kamokila Campbell estate) consists of an extensive coverage of shrubs such as kiawe, haole koa, and grasses. The nearly two miles of shoreline is characterized by emerged calcareous reef with limited pockets of sandy beaches.

8.6 Climate

The West Beach project site, situated on the Ewa Plain (also referred to as the Honoooluli Plain) is considered by Hawaii standards to be generally hot and dry. The average annual precipitation for the entire Ewa Plain is approximately 20 inches, while the temperature of the normal, average
warmest month is within two degrees of downtown Honolulu. The average temperature range for West Beach is between 72°F and 80°F. Winds are primarily from a northeasterly direction (tradewinds). Winds from a south-easterly direction (Kona wind) may be expected 5 to 8 percent of the time.

8.7 Cultural Heritage

The project site was part of the ancient Hawaii ahupuaa (a major division of land) of Honolulu. The name was later used by James Campbell for a ranch he owned that encompassed approximately the same boundaries of the ahupuaa. Hawaiian legend does not accord much importance to the Ewa District. However, recent archaeological investigations found archaeological and paleontological resources in the area previously unknown to science. The find qualified the Barber's Point Archaeological District as being eligible for inclusion to the National Register of Historic Places, however, the site has not been nominated for inclusion into the Register. A portion of the project site lies within the archaeological district.

In 1873, James Campbell purchased the Honolulu Ranch. Campbell bored the first artesian well near West Loch (Pearl Harbor) in 1879, thereby providing a vital and economically profitable resource to this area. A large parcel of land was subsequently leased to Ewa Plantation for sugarcane cultivation.

Extensive sugarcane cultivation in the late 1800's led to the construction of Oahu Railway and Land Company (OR&L) Railroad. Although no longer in use today, the railroad's right-of-way (40 feet) has been nominated to the National Register of Historic Sites and Places.

The portion of the site bordering the sea was not used for growing sugarcane, but it was cleared up and recontoured in 1942 for the construction of three Army Camps.

The portion of the property bordering the sea was later reoccupied by Mrs. Alice Kamokila Campbell (a daughter of James Campbell) after the war. Mrs. Campbell maintained two ponds along the shoreline area and had palms and other native trees planted replacing the abundant kiawe (algaroba) trees surrounding her home. Mrs. Campbell lived on and off at the estate for three decades until 1968 when she moved to San Francisco. A portion of the estate is presently used for holding luaus and other affairs.

8.8 Socioeconomic Conditions

8.8.1 The Island of Oahu

The island of Oahu is under the jurisdiction of the City and County of Honolulu. It is the most populated (1980 population 762,565) and urbanized island; versus the State's population of 964,691 in 1980. The island of Oahu is divided into seven districts: Honolulu (1980 pop. - 365,048), Koolaupoko (1980 pop. - 109,373), Koolauloa (1980 pop. - 14,195), Waialua (1980 pop. - 9,849), Wahiawa (1980 pop. - 41,562), Waianae (1980 pop. - 31,487), and Ewa
(1980 pop. - 191,051). The population figures provides a fairly good comparison of those areas which are urbanized. The project is located within the Ewa District, but is nearer to the Waianae population centers (Nanakuli, Waianae, Maili). In recent years population in the Ewa District, has grown the most rapid (44.4 percent from 1970 to 1980) in comparison to the other districts of Oahu. This has been the result of suburban developments outside metropolitan Honolulu. The increasing cost of land and the scarcity of land resulted, in the late 1960's in the development of single-family homes, shopping centers, and industrial areas in the Ewa District. The development of a Freeway system (H-1) also facilitated commuting between metropolitan Honolulu and the Ewa District. This urbanization has and is continuing to reduce the large acreages of sugarcane and pineapple fields which once dominated land use.

8.8.2 Oahu's Economy

The decline of the sugarcane and pineapple industries is occurring Statewide. Hawaii's natural environment has lured many visitors (both from the mainland U.S. and in recent years from Japan) to the islands. Since the early 1970's visitor expenditures ($3.7 billion in 1982) have surpassed Federal Defense expenditures ($1.7 billion in 1982), followed by sugar ($352 million in 1982) and pineapple ($206 million in 1982). Currently, tourism accounts for 30 percent of all civilian jobs, personal income and tax revenues in the State.

Economic forecasts (governmental and private) show that the visitor industry will continue to be the primary source of new jobs and income in the future. However, the City has placed a limit on the number of hotels which can be developed in Waikiki, the primary tourist center in Oahu. Coupled with the rapid development of resort complexes on the neighbor islands, such as Kaanapali and Lahaina in Maui, Kohala and Kona on the Big Island, and Princeville and Poipu on Kauai, Oahu may not keep up with the overall State visitor revenue increases in future years.

8.8.3 Anticipated Tourism Growth

It is a common industry opinion that the visitor growth experienced in Hawaii during the past two decades (1963 - 1982), 12.8 percent annual growth, will not be experienced to the year 2000. Pannell Kerr Forster has projected annual growth of 3.0 percent during this period. The years 1980 and 1981 saw a stabilization of State visitor growth due to inflation, unemployment and rising air fares; 1982 has ushered in the 4 millionth annual visitor to the State with a strong surge in growth; 1983 and beyond are expected to bring continued growth.

As the Hawaii tourism industry regains a growth posture, additional facilities to accommodate the transient visitors on Oahu will be required if the natural increases in the market are to be assimilated. Due to constraints of the Waikiki Special Design District, limitations on accommodations growth will continue to be imposed and, therefore, appropriate sites away from Waikiki will afford an alternate resort experience on Oahu.

In order to plan for the future of Oahu's transient visitors the market's needs must be projected. Table 2 illustrates a visitor projection for the
State of Hawaii to the year 2000. This projection is in accord with the growth criterion used by the State Tourism Plan, Department of Planning and Economic Development. This is based on growth rates of approximately five percent (5%) between 1982 - 1985, four percent (4%) from 1986 - 1990, two and one-half percent (2.5%) between 1991 and 1995 and one percent (1%) between 1996 - 2000.

In order to compute demand for transient accommodations, demand variables must be analyzed and applied to the projected State visitors. Table 3 illustrates these historic variables from 1970 to 1983 and a projection to the year 2000. In accordance with the trend of a smaller percentage of State visitors staying on Oahu, the study projected this decrease to continue, providing a greater share of total visitors to the Neighbor Islands.

The percentage of Oahu visitors staying in transient accommodations peaked in 1976 at 95 percent and has decreased since that time. It is the opinion of resort economist that this trend will reverse itself (as is already evident in 1981 - 1983) whereby a greater percentage will stay in hotels and condominiums as alternative types of accommodations become less available (partially as a result of a growing shortage of primary housing for Oahu's residents).

The average length of stay of visitors has also decreased reflecting the shift to a greater percentage of FIT (free independent travelers) visitors and fewer tour/group visitors. This trend is projected to stabilize at 4.75 nights.

The double occupancy factor (the average number of persons staying in a hotel room) increased from 1.92 in 1972 to 1.96 in 1982. This variable is expected to stabilize at 1.95 persons per occupied room.

Table 4 is presented to illustrate the computational use of these variables in projecting the annual demand for transient accommodations.

Table 5 shows the existing and anticipated supply of rooms on Oahu. The HVB (Hawaii Visitors Bureau) provides this data three times annually and these numbers are current as of May, 1983. Presented below are the specific future projects:

<table>
<thead>
<tr>
<th>Project</th>
<th>Planned Units</th>
<th>Date Fully Operational</th>
</tr>
</thead>
<tbody>
<tr>
<td>Halekulani</td>
<td>456</td>
<td>January, 1984</td>
</tr>
<tr>
<td>*The Hobron (596)</td>
<td>417</td>
<td>July, 1984</td>
</tr>
<tr>
<td>*The Waikiki Beach Tower (140)</td>
<td>98</td>
<td>July, 1984</td>
</tr>
<tr>
<td>*The Mandarin Tower (580)</td>
<td>406</td>
<td>January, 1985</td>
</tr>
<tr>
<td>Aloha Tower Plaza Hotel</td>
<td>500</td>
<td>January, 1987</td>
</tr>
</tbody>
</table>

*These properties are condominium developments designed to be used for transient visitor usage. Figures in parentheses are total units available, where the planned units is an estimate of the number to be used for transient use.

Table 6 shows a comparison between the projected demand and supply of
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<tr>
<th>Year</th>
<th>Westbound</th>
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**TABLE 4**

**PROJECTED ROOM NIGHTS REQUIRED**

**ISLAND OF OAHU**

**1983 - 2000**
### TABLE 5

**Inventory of Existing and Planned Transient Accommodations**

**Island of Oahu**

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<th>(Existing and Anticipated Units)</th>
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*Existing units at Turtle Bay Resort are included in the Windward Oahu totals. An additional 1,500 units are planned for completion by the year 2000.*
rooms to the year 2000. This approach to planning Oahu's tourism industry future directly analyzes all of the necessary visitor market variables. As Table 5 indicates, 2 projected need for approximately 5,400 additional transient rooms in 1990, 10,700 by 1995 and 13,500 by 2000.

8.3.4 Social Impact of Development

This section has been added to the Final SEIS to respond to comments received on the lack of discussion on this subject. The introductory statement summarizes what has taken place to date during recent State Land Use Commission hearings as well as Development Plan public hearings.

Socioeconomic impacts on the adjacent residential districts particularly Waianae, Ewa, and Waipahu have been the subject of varied discussions, depending on the view perspective one takes. The applicant considers Waianae as a vast labor pool that can be aided in great measure by West Beach's development. There will be employment opportunities for those Waianae residents that choose to take advantage of the various jobs that will be made available. These jobs will range from entry level maintenance jobs to management level jobs that will be offered to those applicants that will or can meet the qualifications for these skill level positions. There is a positive attitude being taken by the applicant in the sense that they want to hire more local residents rather than off-island employees.

It should be stated at this point that there have been large numbers of supporters turning out for the West Beach project at the various public hearings conducted by the City Council, City Planning Commission, and DGP for Development Plan amendments, and other reviews of the project. There are many people seeking employment and an opportunity to be self-sustaining; there are also many people that are opposed to the project and view West Beach as a threat to their lifestyle. This is unfortunately, a common happening whenever a major project of this size is offered for approval. We cannot take one position over the other, but instead, we would refer all governmental agencies to the attendance records and large numbers of citizens testifying on behalf of West Beach at the public hearings held to date.

a. Demographic: Whether the development will:

(1) Increase or decrease the residential population. Development of West Beach will increase Ewa DP district by 10,400 people (5200 dwelling units x 2.0/unit). Whether there will be additional increases in the Waianae DP District is speculative at best since the resident population at West Beach according to the Housing market profile determined by Chaney, Brooks & Company, the housing consultants to West Beach, will be made up of a different residential type of population. "These households will be representative of the entire range of the population from a socio-economic point of view, and will have a varying household makeup, including singles (young and old), young marrieds, empty nesters and small families."

(2) Increase or decrease the visitor population. Development of West Beach will increase the visitor population by approximately 6240 visitors. This is based on
4000 visitor units x 1.95 occupants per unit = 7800 visitors x .85% occupancy rate = 6240 visitors. These calculations were provided by Pannell, Kerr, Forster economic consultants for West Beach.

(3) Demographic data taken from the 1980 census and the 1984 State of Hawaii Data Book are presented in summarized narrative form for a basis of comparison. Additional data by individual tracts are available in the above referenced materials. For the purpose of the comparisons made below, Ewa District was defined by census tract numbers 84, 85, 86.01 and 86.02. Waianae District was defined by tracts 96.01, 96.03, 96.04, 97 and 98.

<table>
<thead>
<tr>
<th>Year</th>
<th>Honolulu</th>
<th>Ewa</th>
<th>Waianae</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>630,528</td>
<td>19,328</td>
<td>24,077</td>
</tr>
<tr>
<td>1980</td>
<td>762,565 (+21.8%)</td>
<td>23,797 (23%)</td>
<td>31,487 (+31%)</td>
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<tr>
<td>1983</td>
<td>783,350 (+3.3%)</td>
<td>24,494 (+2.9%)</td>
<td>31,883 (+1.2%)</td>
</tr>
</tbody>
</table>

**Age Characteristics**
According to the 1980 census, Waianae had a significantly younger (nineteen years and under) population compared to Honolulu County. Accordingly, the working population was proportionately smaller. Ewa also exhibits this tendency although the working age population is larger than Honolulu County's as a whole.

**Place of Birth**
According to 1980 census, almost half (48%) of Ewa's residents were born locally which is slightly lower than Honolulu County (55%). Waianae has a significantly larger local born population of 76%.

**Years of Schooling**
Both Ewa and Waianae have higher than Honolulu County highschool completion rates (36%) with 41 and 40% respectively. However, four year college completion rates for Ewa (30%) and Waianae (19%) are significantly below the Honolulu County rate of 40%.

**Journey to Work**
Both Ewa and Waianae show higher than Honolulu county usage of private transportation (including car pools) for work related travel. Both study districts also exhibit lower usage of public transportation.

**Labor Force**
Labor force distinctions between Ewa and Waianae are markedly different in total labor force numbers. While Ewa's labor force consist of 70% of all persons 16 years and older (a figure on par with Honolulu County), Waianae has a much smaller labor force of 54%. Compared to Honolulu County's unemployment rate of 4.6%, Ewa and Waianae have higher rates of 6.4 and 7.7% respectively.

**Income Levels in 1979**
Median and mean incomes for Honolulu County households were $21,077 and $25,180 respectively. Ewa median income was similar ($20,184) although lower as a whole which is reflected in the mean ($20,455). Waianae median and mean incomes are significantly lower at figures of $15,552 and $18,254 respectively.
(4) Change the character or culture of the neighborhood. If one is to take the "neighborhood" to mean the most adjacent community (Honokai Hale), there is no question that there will be a change in the character of the neighborhood. From a contrasting single family detached residential community to a multi-family residential, resort, recreational, and commercial master planned community, there is a distinct difference. Further, if one is to extend the cultural differences to the adjacent Waianae District, the rural district differences are more pronounced.

Social impacts on Waianae may occur from development of West Beach; however, the questions of whether these impacts are discernible or not is debatable.

The residents and tourists of West Beach could take advantage of the resources of Waianae such as beaches, parks, commercial shopping facilities, theaters, etc., and no doubt, some will do so. However, there will be ample amenities planned within the project and there are attractive, comparable resources available elsewhere. The question is: what proportion of the residents and visitors will use the resources of Waianae and how frequently will this happen? The anticipated use of Waianae's resources by West Beach residents and visitors is expected to be minimal. At the present time, there is no incentive for people outside of Waianae to go there for their normal activities of recreation, shopping, or entertainment. This is due largely to the fact that the rural makeup of Waianae is such that the developed resources available have been established for the primary use of the Waianae community. It is not and has not been considered a regional attraction for shopping or entertainment. The beaches and parks are world renowned for the offshore fishing and swimming, but for visitors, the trend is to go to Waikiki first, then to the balance of the island tourist destinations (Sea Life Park, Polynesian Cultural Center).

If the residents of Waianae, or even a small portion of the residents/businesses of Waianae make an effort to attract the potential market that is in West Beach, impacts, both positive and negative could become larger. On the positive side, more money will be spent in Waianae, generating income and jobs. The negative side is that there will be more people doing business in Waianae, a development that some people in the community will resent. This trend towards more increased economic activity is a statewide trend and involves both tourism and business in general.

Crime as a subject was found by Fujii and Mak (1980) to have a statistically significant relationship between tourism and reported crime and also between unemployment and crime. The relationship between tourism and crime can be questioned on theoretical and methodological grounds. However, the study indicates that as tourism increases in an area so will the rate of crime. There are then two potentially counteractive events taking place: 1) the increase in tourism could lead to an increase in reported crimes; 2) the increase in employment could lead to a reduction in the crime rate.

Employment will be provided for Waianae residents, with more jobs available for women than men. The increase in the number of jobs is a benefit, both in the social context of increasing employment in a high unemployment region as well as from the increased income for those people receiving employment. However, this could lead to some disruption of social norms in traditional
families where male, head of household, roles are suddenly change by gender equality. This type of phenomena occurs whenever jobs for females open up in a low income or high unemployment areas.

Possible housing impacts include: 1) increased demand by employees of the proposed development seeking housing, and 2) increased demand due to increased household incomes in Waianae resulting from the development (a result of expenditures from West Beach residents; tourists visiting and shopping in Waianae as well as from the increased incomes of current residents of the area employed at West Beach). The social tradeoff occuring from increased income due to economic growth is an increased demand for housing, which is generally reflected in an increase in the cost of housing. The question then is of social benefit and tradeoff with increased incomes and higher housing costs, or with lower incomes and probably higher rates of unemployment and cheaper housing. This decision is best left to the Waianae community to answer since it is their community's future that is at question. Another issue of importance is where employment centers for the project are. Many of the employees will come from Waianae and also from Waipahu, Ewa, Makakilo, Mililani, and other sectors in Leeward Oahu. As such, they will be coming from established households and will probably find it to their advantage not to move either to West Beach or Waianae.

b. Land Use Commission Testimony on Social Impacts

Included for review and full disclosure are summarized comments of public witnesses' testimony provided at recent State Land Use Commission public hearings. These summarized testimonies reflect both positions. Page numbers are indicated in parenthesis so that reviewers may verify if they wish, the Transcript of Proceedings that were the source of these summarized testimony.

Testimony of Representative Peter Apo

Representative APO is in favor of the WB project mainly because there's lack of jobs in the Waianae/Nanakuli area and also because the Leeward area is in need of a major economic center or some major economic activity. (34)

APO feels that Waianae/Nanakuli are losing the cream of their youth to other communities because there are no jobs in the area. Without the cream of their youth, they lose any hope for building a strong political or leadership base within the community. (35-36)

APO feels that those community groups who want to practice a subsistence lifestyle are opposed to WB mainly because they do not have any alternatives to turn to when these types of projects are developed. Therefore, APO has introduced a resolution asking for a study to look into options of providing State lands for these people who want to have a subsistence lifestyle. (37-38)

APO is not in favor of the proposals that they have for the transportation system in the Ewa area. He is in favor of looking into mass transit systems. (39-40)

(The Chairman clarifies at this time that the Commission is treating this application of WB as a petition for a boundary amendment from agricultural to
urban district, and not as a reopening of the previous petition nor are they accepting evidence or findings from the previous petition.) (41-42)

Testimony of Charles Dick Beamer

BEAMER is President of Ewa Beach Community Association and a member of the Ewa Neighborhood Board. (42)

BEAMER states that the Ewa Beach Community has always been in favor of the WB project because of its job opportunities for the community and also because it will provide recreational and social amenities that are lacking in the Leeward area. They also feel that once WB is designated as a resort area it will increase their tax base. (42-43)

Testimony of Kermit Brown

BROWN is a retired school teacher who lives in Waianae. BROWN is in favor of the WB project mainly because of the opportunity for jobs in the area. He is also in favor because of the opportunity to use the facility along with the WB which they haven't been able to use before. (44-45)

Testimony of Koko Bungo

BUNGO resides on Haleakele Avenue, which is part of the Old Homestead area. BUNGO and several of the residents in her area are for the WB project again because of the employment opportunities for the people in the area. They also feel that the project will meet the recreational, social and educational needs of the people living in the area. (46-48)

Testimony of Archie Cox

COX lives in Honokai Hale, subdivision nearest to WB. Majority of people in Honokai Hale are for WB because they need jobs. (55)

COX feels they need jobs in their area for their children. 90% of families in their subdivision have to go to town to work. (55-56)

COX feels that his children should have a chance like anyone else to apply for the jobs at WB, being that they live in the area and know the area. (56)

COX's position would not change even if Honokai residents did not have priority for the jobs at WB. Feels that you have to go out and fight for jobs. (57-58)

Residents of Honokai at first rebelled about the project but after meetings with developer about big hotels blocking the ocean, most of the community is now for the project. (59)

Testimony of Frank Commendador

COMMENDADOR recently moved to Woodlawn Terrace but was raised in Waianae and is presently President of Puu Heleakala Community Association (located 3 miles from West Beach). (60)
COMMENDADOR is personally in favor of the project, and after discussions with the Board of Directors in 1982, 1983 and May 1984, the vote was unanimously in favor of the project. (60)

Testimony of Melvin Dumancas

DUMANCAS is a Waianae resident speaking in favor of WB. He feels that WB will provide an economic base for job opportunities and housing and also that they will use whatever recreational facilities are developed. (60-62)

DUMANCAS is a presently unemployed but was formerly a quality control technician with Kaiser Cement. (62)

Testimony of Charles Rasmussen, Jr.

RASMUSSEN is a resident of Ewa Beach and is also in favor of the WB development because of the many job opportunities that will be provided for the unemployed in Waianae and Nanakuli. (64-67)

Testimony of George Doman

DOMAN is a resident of Maili and is in favor of WB because of the job opportunities and for what WB will offer for the future for the children of Waianae Coast. (69-71)

Testimony of Kiyabu-Sabala

KIYABU-SABALA is a resident of Ewa Beach and is in favor of the WB project also because of the jobs that will be provided to the residents of the area and improved services. (71-73)

Testimony of Mike Crozier

Representative CROZIER is a resident of Makakilo and he's in favor of WB and states that the people of Makakilo have supported WB for the last 5 years. Again, the main reason for support was the opportunities that WB will provide to the young people entering in the job market. (76-78)

Testimony of William Crabbe

CRABBE is a resident of Waianae and is in favor of WB because of the job opportunities it will produce for the Waianae Coast. He also feels that WB will create a better source of tax revenue for both City and State. (78-81)

Testimony of Robert Hoffman

HOFFMAN is a resident of Makakilo and is a small businessman in Waipahu and a member of the Neighborhood Board No. 23. He feels that this is a chance for them to them to bring development into Ewa and the Waianae Coast, and at the same time bring in new jobs for their people. (81-84)
Testimony of Senator James Aki

AKI represents the 19th Senatorial District (District of West Beach) and feels that this is a very important project for their district because they have been searching for a strong economic base in the Leeward area. He also feels that the economic aspects and social aspects will be beneficial to this area. (90-92)

AKI states that the Senate has not taken any position on this project since this district has been recently apportioned. (93)

AKI states that the State has developed 2 exploratory wells, one in Makaha Valley and one in Waianae Valley. If the wells prove productive, it will help the Waianae people as far as WB taking water away from them. (94-96)

As far as improvement of the transportation system for the Waianae area, AKI is aware that the existing highway which has been developed into a 4-lane highway is sufficient to take care of this project and developments that are planned in the area. (96)

AKI has discussed this project for many years with various people in his district and the consensus is that they need jobs and some economic development in the area. (96-97)

Testimony of Manuel Matthias, Jr.

MATTHIAS is a resident of the Waianae area and is presently employed with a local construction firm. MATTHIAS is basically concerned with the unemployment situation as previous speakers. (97-98)

MURAKAMI questions MATTHIAS as to whether he assumes that the jobs at WB will be given to local people. MATTHIAS replies that at least they will be given an opportunity to try for these jobs. (99)

Testimony of Glenn Oamilda

OAMILDA is a resident of Ewa Beach and is given his testimony on behalf of Ewa Neighborhood Board No. 23. He states that the Board is in favor of WB project and has spoken at all the public hearings regarding WB. (100-101)

Testimony of Kihei Niheu

NIHEU is an educated person who went to Kamehameha and who holds 2 degrees, one in hotel management and tourism. He has had the opportunity of working in the Waianae/Nanakuli area.

NIHEU is against the project because he feels that this is another rich foreign investor coming in to make money for themselves and not to take care of the people. (120-129)
Testimony of John Kelly

KELLY is on social security and lives in the Black Point area. He is active in Na Opio (one of the intervenors) and in recent years has become involved in helping to preserve the control of the local development and to sustain an economy and a lifestyle that doesn't degrade the people of Hawaii with higher and higher rates of unemployment, rising crime and the other disadvantages of urban development. He feels that the State and the governmental agencies have not informed or is not concerned with the lifestyles or economic situation of the Waianae people. (129-144)

c. Economic: Whether the development will affect:

(1) The rate and pattern of economic growth and development. According to Pannell, Kerr, Forster in "A Report of the Viability of West Beach as a Resort Community and the Estimated Economic Impact" May, 1984, the following economic impacts are calculated:

<table>
<thead>
<tr>
<th>Tax Type</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Unemployment Tax</td>
<td>$850,000</td>
</tr>
<tr>
<td>Gross Income Tax</td>
<td>8,030,000</td>
</tr>
<tr>
<td>State Personal Income Tax</td>
<td>4,779,000</td>
</tr>
<tr>
<td>Real Property Tax</td>
<td>$10,695,000</td>
</tr>
<tr>
<td>(1983 dollars)</td>
<td>$24,354,000</td>
</tr>
</tbody>
</table>

This economic impact analysis is based on an annual generation of income assuming that the entire complex is complete and operating at a stabilized level.

(2) The diversity of employment. On a regional basis, the answer would be yes since the principal employment center would be resort oriented and consistent with the State's number one industry. Supporting industries, primarily in the service fields would also not be diverse in the true definition of the term.

(3) The availability of jobs. Yes, is the answer here since West Beach will generate approximately 6,156 jobs based on the different activity employment centers anticipated at West Beach. These range from hotels, resort condominiums, commercial retail, commercial restaurants, Luau and Hawaiian activities, Hawaiian Cultural Center, Golf course/club, Beach Club, Marina related Complex Tram/Jitney System, Maintenance/Security, Management/Administration, and other service oriented jobs, full time and part time.

(4) The employment wage rate. Prevailing wage rates that have been established by Industry negotiated union labor contracts for resort industries, as well as prevailing market acceptance job wage scale for private industry activities will be paid at West Beach.

State Department of Labor listed the following Hours and Earnings of Workers in Selected Industries (March, 1985).
A summary of earnings and hours by occupation and location:

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>State</td>
<td>Honolulu</td>
<td>State</td>
</tr>
<tr>
<td>Contract Construction</td>
<td>$635.80</td>
<td>$647.11</td>
<td>37.8</td>
</tr>
<tr>
<td>Food and Kindred Products</td>
<td>306.68</td>
<td>326.24</td>
<td>37.4</td>
</tr>
<tr>
<td>Communications &amp; Utilities</td>
<td>524.15</td>
<td>518.25</td>
<td>42.1</td>
</tr>
<tr>
<td>Hotels</td>
<td>241.63</td>
<td>243.70</td>
<td>33.7</td>
</tr>
</tbody>
</table>

Hawaii Dept. of Labor, April, 1985

(5) The principal economic activities on Oahu. West Beach should impact the principal economic activities on Oahu in a competitive way, since the development of an off-Waikiki resort destination and a master planned residential district are now available only at Kualima on the North Shore. Visitor Industry growth within the Primary Urban Center has been discouraged and the City Administration resort policy is to promote these new hotels outside Waikiki.

d. Housing: Whether the development will affect:

(1) The availability of housing. Chaney, Brooks & Company determined in their study of the "Housing and Population (Oahu)" November 15, 1983, "that housing is considered to be in short supply for the following reasons:

1. The need to overcome the present level of substandard housing (dilapidated and/or overcrowded housing).

2. The need to create a vacancy factor in the order of magnitude of 5 percent of the total housing inventory to allow a freedom of choice as to type and location of living accommodations, to stabilize pricing through competitive forces.

3. The need to accommodate changes in the life cycle of housing requirements of individuals as to the population moves through the various phases of undoubling from parental home, family formation, child-bearing years, divorce or empty nester to senior citizen, widow, or widower.

4. The need to accommodate a growing population.

West Beach presents a major and highly desirable component of the solution to Oahu's long term housing needs.

(2) The quality of housing. West Beach has established a preliminary market analysis that has been established on the buyer profile identified earlier. This market buyer is seeking the amenities and design features that are reflected in the West Beach planned community which will offer the recreational amenities (golf course, marina, resorts) not offered in competitive residential communities.
(3) Speculation in land and housing. This is highly unlikely in view of today's high mortgage interest rates. Unlike the early 1970's when interest rates were still being offered at a single digit rate, today's rates are difficult to absorb on a monthly mortgage on an investment/speculative purchase basis.

(4) Property values of existing homes. West Beach can affect property values of comparable residential units as development costs, replacement costs, and other higher priced development associated costs continue to escalate.
9. ENVIRONMENTAL CONDITIONS AND CONSEQUENCES

9.1 Water Pollution Implications of Project Site Storm Runoff

Proceeding with the method published by HESL (Lopez and Dugan 1978), the calculated weighted mean surface water runoff for 1-hr, 6-hr, and 24-hr storms at recurrence intervals of 1, 5, 10, 25, 50, and 100-yr, developed for both the east and the west drainage area, are presented in Tables 6 and 7, respectively. The developed project's open water surfaces, 41.5 acres of Marina and lagoons for the east drainage area and a 5.5 acre lagoon for the west drainage area, were not included in the developed project results, because they did not transmit runoff.

The quantity of rainfall produced by the given storms, which varied from 1.3 to 13.0 in., and the corresponding surface runoff, in acre-feet/event, for present (1984) conditions and full developed conditions, and the incremental difference that is predicted to result if the proposed project is completed are also included in the tables. The values presented in Tables 6 and 7, it must be emphasized, are for comparative purposes only and are not intended to be representative of the accuracy implied by the practice of not rounding off the recorded values, which was primarily for convenience of calculations and balancing.

As would be generally expected, the greatest calculated incremental storm runoff volumes for the two drainage acres resulted from the 100-yr storm with a 24-hr duration, as shown in Tables 6 and 7. These values (acre-ft/event) represent a volume of water and should not be confused with the peak discharge values for design purposes which represent the maximum volume of storm water runoff discharged per unit of time (e.g. cfs). Peak discharge values, required for the engineering design of the proposed drainage facilities and ascertaining the capacity of existing facilities can be obtained by following the procedures outlined in the City and County of Honolulu's "Storm Drainage Standards" (Dept. of Public Works, 1969).

Besides the changes in the volume of storm water runoff, the quality of the various constituents being transported is of equal if not of more importance. However, estimates of water quality constituents resulting from significant storm water runoff that occur, at the most, only a few times a year is very perplexing, especially since only very limited information on this subject is available at both the local and national level.

Inasmuch as there is water quality information for storm water runoff from the project site, nitrogen and phosphorus values of 1.10 mg/L and 0.11 mg/L, respectively, were used for the present (1984) conditions. These values, which were based on information published by R.C. Loehr (1972), that involved a study of reported information from rural and agricultural land under different land management conditions, were derived from nitrogen outputs of 2 lb/acre-yr and phosphorus outputs of one order of magnitude less; and annual rainfall of 20 in.; and a rainfall-runoff coefficient of 0.40. The nitrogen and phosphorus output values reported by Loehr (1972), that represent the nearest situation to the one under review, ranged from 1 to 3 lb/acre-yr for nitrogen and a magnitude less for phosphorus.
### TABLE 6

Estimated Storm Water Runoff and Constituent Changes due to the (1984) Proposed 642 acre West Beach Project, Leeward Oahu, Hawaii

East Drainage Area to Marina (Only Within Project Boundaries)

<table>
<thead>
<tr>
<th>Storm a)</th>
<th>Storm Water Runoff</th>
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<tbody>
<tr>
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<td>Dura-Recur-Quan- Hydraulics</td>
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<td>1</td>
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<td>1</td>
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<td>24</td>
<td>50</td>
</tr>
<tr>
<td>24</td>
<td>100</td>
</tr>
</tbody>
</table>


b) Based on a nitrogen value of 0.11 mg/l for undeveloped (1984) conditions and 0.60 mg/l for full development.

c) Based on a phosphorus value of 0.11 mg/l for undeveloped (1984) conditions and 0.57 mg/l for full development.

d) Based on a suspended solids value of 1500 mg/l for undeveloped (1984) conditions and 250 mg/l for full development (suspended solids are known referred to as non-filterable solids).
### TABLE 7

Estimated Storm Water Runoff and Constituent Changes due to the (1984) Proposed 642 acre West Beach Project, Leeward Oahu, Hawaii

<table>
<thead>
<tr>
<th>Storm Drainage Area (Only Within Project Boundaries)</th>
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<tbody>
<tr>
<td>Storm Water Runoff</td>
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</tbody>
</table>

**Durational Recurrence Quantities**

<table>
<thead>
<tr>
<th>Duration (hr)</th>
<th>Recurrence Intervals (yr)</th>
<th>Hydraulic Development</th>
<th>Nitrogen</th>
<th>Phosphorus</th>
<th>Suspended Solids</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>in.</td>
<td></td>
<td>in.</td>
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</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1.3</td>
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<td>1</td>
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|                | 5                        | 6.5 | 57.4 | +20.3 | 110.9 | 93.7 | -17.2 | 11.1 | 89.0 | +77.9 | 75.6 | 19.5 | -56.1 |
|                | 10                       | 8.2 | 76.0 | +23.7 | 156.5 | 123.9 | -32.6 | 15.7 | 117.7 | +102.0 | 106.7 | 25.8 | -80.9 |
|                | 25                       | 10.0 | 96.1 | +26.5 | 208.2 | 156.7 | -51.5 | 20.8 | 148.9 | +128.1 | 141.9 | 32.7 | -109.2 |
|                | 50                       | 11.0 | 107.5 | +27.9 | 237.9 | 175.2 | -62.7 | 23.8 | 166.5 | +142.7 | 162.2 | 36.5 | -125.7 |
|                | 100                      | 13.0 | 130.3 | +30.8 | 299.1 | 212.5 | -86.6 | 29.9 | 201.9 | +172.0 | 203.9 | 44.3 | -159.6 |


**b)** Based on a nitrogen value of 1.10 mg/l for undeveloped (1984) conditions and 0.60 mg/l for full development.

**c)** Based on a phosphorus value of 0.15 mg/l for undeveloped (1984) conditions and 0.57 mg/l for full development.

**d)** Based on a suspended solids value of 1500 mg/l for undeveloped (1984) conditions and 250 mg/l for full development (suspended solids are now referred to as nonfilterable solids).
Representative suspended solids values in storm water runoff from the proposed project site are again difficult to determine, inasmuch as it is commonly presumed, by mainly indirect methods, that the majority of the annual suspended solid load is carried by the heavy storm water runoff events which tend to occur on an infrequent basis. For estimation purposes, and considering the results from the analysis of sporadic storm water runoff samples during heavy storms, a value of 1500 mg/L was used for the present (1984) situation.

The concentration of water quality constituents of storm water runoff from urban areas is very sparse both locally and nationally; however, R.C. Loehr (1974) published a compilation of urban storm water runoff quality data collected throughout the United States with a few from international locations. As would be expected, the results are at times somewhat diverse. There is, however, a study of urban storm water runoff quality collected from storm drains in different drainage areas of Honolulu; the results of which were presented in a University of Hawaii graduate Civil Engineering student Master of Science Thesis (Fujinara, 1973). For comparative purposes the results of average storm water runoff values for residential areas of Honolulu, rounded-off to 0.60 mg/L, 0.57 mg/L, and 250 mg/L for nitrogen, phosphorus, and suspended solids, respectively, were used to simulate complete project development conditions.

The summation of nitrogen, phosphorus, and suspended solids loads from both present (1984) and full development conditions for storms of 1 and 24-hr duration at recurrence intervals of 1, 5, 10, 25, 50, and 100-yr are shown in Tables 6 and 7. As can be observed from the Tables, the incremental changes per storm event for the present (1984) and full project development conditions for the various duration and recurrence interval storms indicate that from the least to the greatest amount of rainfall: nitrogen increases for the lower level storms and decreases for the higher level storms; phosphorus increases for all given storm conditions; and suspended solids, except for the lowest level storm, decreases.

It must again be emphasized, as was the case for the hydraulic aspects, that the constituent values are only for comparative purposes, thus the indicated decrease in nitrogen output for higher level storms as a result of development should be construed as essentially having no apparent changes; the phosphorus output would be an increase while the total suspended solids load should generally decrease as the level of the storms increase.

The apparent reason for the phosphorus increase is that organic soils readily absorb phosphorus, thus, water that has percolated through the soil or has been in intimate contact with the soil usually has a low phosphorus concentration, whereas, storm water runoff from the developed areas with usually only small areas of exposed soil tend to transport a higher concentration of phosphorus. Conversely, the decreased amount of exposed soil in residential areas tend to decrease the quantity of the suspended solids load even though the total quantity of storm water runoff increases.
The hydrologic and water quality aspects of the surface water runoff were only considered for the present (1984) and completed, developed project conditions; however, increased constituent loads will undoubtedly result from construction activities, especially if a significant storm occurs during the interim period between earth moving operations and soil stabilization completion. The impact of construction activities can be minimized by adhering to strict erosion control measures, particularly those specified in the City and County of Honolulu's (1972) Grading Ordinance.
9.2 The Marina and Lagoon System - Environmental Conditions and Impacts

9.2.1 Lagoon Configurations and Concepts

Lagoon alternatives were evaluated for the West Beach project. If no man-made lagoons and swimming beaches were created, only two small existing lagoons at the Alice Kamokila Campbell Estate (the future Hawaiian Cultural Center) would be available to serve the West Beach Project. These small lagoons, all located on the north end of the project site, would have been too far from the proposed hotel and condominium sites to the south. Therefore, the provision of no new beach areas was deemed unacceptable for the intended project use.

A second alternative examined at the time of the Final Environmental Impact Statement submitted in September, 1980 was to create two lagoons, designated a north and a south lagoon to lie approximately parallel to the site coastline. The two lagoons would have been approximately 7 and 11 acres in size. Both lagoons would have adjoined a common wave trap and reservoir pond located in the central portion of the site coastline. This alternative was dropped in subsequent design development for several reasons. These lagoons would have had length to width ratios of 5:1 or 6:1 and required a wave trap entrance and one way circulation. Proper flushing would have been provided by seasonally varying tidal prism, wave induced flushing and standby pumping. Upon further study of the existing lagoons at the Campbell Estate, it was felt that more natural man-made lagoons could be created by modeling the new lagoons after the already existing lagoons. This would insure better flushing without relying on mechanical pumping. In addition, these new natural shaped lagoons could be spread along the entire coastline creating a valuable amenity for all coastal sites while creating a more individual character for each lagoon.

For these reasons, the lagoon concept presented in this environmental impact statement was selected.

Any discussion of potential impacts on the West Beach coast and nearshore waters from the proposed lagoons must be related to a specific range in lagoon size and configuration. The existing nearshore circulation patterns, background water quality, site heat budget and meteorology, coastal wave climate and bathymetry, and lagoon flushing needs were the primary environmental considerations in developing a conceptual lagoon plan. Once the conceptual plan was determined, several analyses were completed to examine the potential performance of the lagoons. These included examination of the lagoon tidal prism (the tidal prism is that amount of water that enters the marina during each tidal change), natural and induced flushing schemes, source water injection rates, potential lagoon water quality alteration while passing through the lagoons, lagoon circulation, stratification, mixing and overturn, and anticipated extremes of several water quality parameters.

9.2.2 Existing Kamokila Campbell Lagoons

A detailed examination of three natural coastal lagoons existing at the site was completed. These lagoons include a northern most semi-circular 1.0 to
1.16 acre (a function of tidal height) lagoon, 1.27 to 1.75 million gallons in volume and 4.3 ft. average depth. The lagoon is sand lined including a wide sand beach, and has basalt and coral barrier, with breaks, across the entrance. As such it closely resembles the intended four lagoons to be added along the site coastline and was therefore closely examined to determine how the lagoon successfully maintains its high aesthetic quality year-round.

The remaining two existing Kamokila lagoons are south of and adjacent to the northern most lagoon (referred to locally as Paradise Cove). These two are smaller, 0.35 and 0.45 acre (approximately 0.2 and 0.45 million gallons) and shallower (1.9 ft. and 3.6 ft. average depths). The southern most lagoon is primarily open to the ocean and receives incoming wave activity directly on the sand beach.

The Paradise Cove hypsography shows that a considerable amount of daily flushing occurs via the active introduction of coastal water by incoming waves topping a shoal reef shelf at the entrance. Water exits this lagoon principally via a 7 ft. to 9 ft. deep channel located toward the seaward central area of the lagoon entrance. A consistent seaward flow of 10 to 25 cm/sec was observed in this channel below the 2 foot depth. Circulation in this lagoon enters both ends and over the shallow 2 foot deep northern third of the entrance and exits via the deeper central channel.

The sand lining the lagoon is graded from coarse cobble and small boulders in the deeper central area to medium coarse sand with a 6° to 12° slope at the water line, to medium and fine sand on the beach berm and back slope. Wave forms in the predominantly sand lined bottom indicate active incoming wave activity strikes the beach, sorting the lagoon lining materials for maximum stability.

Field observations taken showed that at incoming 2 foot swell and wind chop the northern most lagoon was flushing approximately 4 times the lagoon volume per day. Incoming waves during the days of observation were found to account for a flushing volume up to 12.7 to 1 over the daily tidal prism. The maximum flushing rate was computed as 23 times/day with approximately 4 foot incoming waves of 8 to 10 second period. Exiting velocities in the central channel varied from 10 to 60 cm/sec (0.2 to 1.2 kts).

Clearly the high quality of the existing lagoons is related to the high quality of incoming coastal water, the active wave and tidal flushing mechanism, the beach stability and the absence of prolific biota even in the presence of nutrient laden infiltrating water (later estimated at 0.1 to 1.0 ft./day local permeability). Later estimates showed that up to one tenth the lagoon volume of ground water from the surrounding area likely infiltrates daily. This brackish water of approximately 1 to 24 °/oo mixes with the incoming coastal water and flushes from the lagoon daily. The lagoon salinity exhibits only a slight 1 °/oo drop in salinity again indicating a working and active natural flushing mechanism.

The developers intent in adding four larger lagoons along the project coastline is to duplicate the performance of the existing lagoons as much as possible. The subsequent design developed intended to accomplish that
goal, recognizing that extreme storm events of adversely seasonal conditions may prevail when the lagoons will not be aesthetically optimum in terms of water quality.

9.2.3 Nearshore Circulation Patterns

The nearshore area is defined here as extending from the coastline seaward to the 100-foot depth. Offshore eddies affecting both the nearshore flow strengths and directions, are believed to exist off Barbers Point. They vary between 2 nm to 20 nm in size, appear to move anticyclonic (clockwise) during November to February, cyclonic (anti-clockwise) during April to September, and move in variable patterns for the remaining months (Figures 5 and 5a).

At the coastline, tidal flooding flows move west to northwest and ebbing flows south to south southeast. The maximum observed ebb strength was 65 cm/sec (1.3 kts) and maximum flood strength was 75 cm/sec (1.4 kts). The currents reverse direction with each tidal change and generally range in strength between 10 to 50 cm/sec (0.2-1.0 kts). Resultant currents moving approximately parallel and slightly offshore at speeds of 40 to 60 cm/sec (0.8-1.1 kts) are most often observed.

The maximum current believed to exist in the area offshore of the site shoreline is 1.5 kts during calm wind conditions and 2.0 during Kona storm conditions.

The typical net daily flows move water southward along the coastline during August to April. This net flow is strong (>7nm/day) and directionally consistent during August to January, but directionally variable during February to April. During May to July the net flows moves northwest, and is weak in strength (<2 1/2 nm/day).

Waves impinging on the coastline also create longshore circulation cells close to the beach. Historical data and the bathymetry in the area suggest a northward movement beginning at about the location of the existing natural coastal ponds, and southward movement southeast of the ponds. The field data indicated a northward movement from late winter to mid summer and a southward transport the remainder of the year. The strengths of either flow would be greatest during periods of significant winter storm activity or summer swell. In general the annual net transport is north-northwest.

The site nearshore circulation affects both the source water entering the lagoons and the removal of water leaving the lagoons from the area. The lagoons' entrance were located on the coastline in areas that will optimize existing nearshore flows and limit feedback where possible.

The nearshore circulation patterns found off the project coastline in the past suggest that water reaching the lagoon entrance areas arrived primarily from the north and offshore during May to July and September to December, especially during flooding tides. Tradewinds blowing toward offshore would tend to move most, but not all, of the water leaving the Barbers Point harbor toward the west and northwest, angularly away from the coastline during
most ebbing tides. During periods of strong ebb tides and Kona or weak winds harbor water and coastal water from the south mixed with offshore water, could reach the southern most lagoon entrance area on the site shoreline. Though harbor water would be diluted between 10 to 50:1 with coastal water, the mix could reach this lagoon entrance. This is unavoidable during these conditions. Such conditions may occur 20 to 35 days per year.

The nearshore drift is southward 3/4 of the year. The harbor is 1/2-mile south and the Kahe Hawaiian Electric cooling water discharge is 1 1/2 miles north. The central area of the site coastline appears to offer the optimum positioning for the lagoons. The coastal bathymetry of nearshore shoal and channel areas also suggests discharging exiting storm runoff water at the site extreme north and/or south.

It is also important that no coastal storm drainage or other land originated discharge be allowed in this central shoreline area, and preferably be minimized in the northern half of the site shoreline.

The nearshore flows parallel the beach, with typical strengths of 0.6 to 1.0 kt. It is believed up to 2.0 kts maximum occur in the area. This current is beyond the capability of most swimmers. If coastal swimming is to be allowed, or small coastal beach facilities provided, they will need natural or manmade limitations to contain swimmers close to shore. In addition, people should be kept clear of the lagoon entrance areas, particularly during periods of strong incoming surf for their safety. During times of extreme turbulence, warning signs will be posted for the swimmers safety.

9.2.4 Background Water Quality

Data have been taken both north (Kahe and Waianae) and south (Hawaiian Independent Refinery and Barbers Point) of the site, but few directly off the site coastline. These past data have been applied to either helping establish water quality standards for Hawaiian waters or to solving site specific discharge or environmental problems. Dr. Paul K. Bienfang's 1979 report summarizes the published water quality standards and criteria for both open coastal waters and artificial basins.

Considering all applicable data, it is possible to list the probable annual limits of several pertinent water quality parameters likely to be found in the intended lagoons during the year. These properties are:
<table>
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<tr>
<td>Salinity (°/oo)</td>
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<tr>
<td>Density (gm/cm³)</td>
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<td>Dissolved Oxygen (mg/l)</td>
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<tr>
<td>Nitrate (micro gm/l)</td>
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<tr>
<td>Nitrite (micro gm/l)</td>
<td>0.13 - 30.0</td>
</tr>
<tr>
<td>Ammonia (micro gm/l)</td>
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</tr>
<tr>
<td>Total Nitrogen (mg/l)</td>
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</tr>
<tr>
<td>Phosphate (micro gm/l)</td>
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</tr>
<tr>
<td>Total Phosphorous (mg/l)</td>
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</tr>
<tr>
<td>Secchi Depth (ft)</td>
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<tr>
<td>pH</td>
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</tr>
<tr>
<td>B.O.D. (mg/l)</td>
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<tr>
<td>Total Coliform (col/100 ml)</td>
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</tr>
<tr>
<td>Suspended Load (ml/m³)</td>
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These results are most meaningful when compared with the more offshore, supposedly pristine, waters and with the state's water quality standards. A 1970 Oahu Water Quality Program Comparison showed the project offshore waters to be comparable to the coastal water off Diamond Head, Waikiki, and Magic Island. Temperature and salinity variations are typically the same, dissolved oxygen remains annually above 75% saturation, visibility (secchi depth) is high, turbidity below the standards, B.O.D. low, and ph acceptable. Nutrient concentrations, however, are expected to vary seasonally above the acceptable geometric mean but should remain below the "not to exceed 10% of the time" limit for wet open coastal waters. It is not known, however, how much time each year this limit is approached.

The coastal waters off the project area, on occasion, the receiving waters for local discharges north and south of the site and the source water for the lagoons. Thus far, the coastal water appears to have remained relatively pristine, indicating an effective net flushing of the area despite these neighboring pressures. Nutrients, particularly nitrogen forms, do presently exceed the state's water quality standards for wet open coastal waters for short periods in winter months primarily as a result of ground water percolation from the coast during months of increased rainfall. In that the lagoons will also be receiving ground water seepage high in biota stimulating nitrate-nitrogen (i.e. up to 10 times the coastal water nutrient level) both the coastal source water and lagoon water are expected to show an increase in nitrogen during winter months when rainfall increases. Daily natural flushing rates will also vary with local wave activity and the prevailing tidal profile. The combination of a small daily tidal change and calm winds and seas, following a recent winter storm, would likely provide insufficient flushing for short periods of time. These periods might extend from a few hours to a day or two. At these times the lagoons water quality would need monitoring of the temperature, salinity, and nutrient levels, to determine if restricted use is needed during these unusual conditions.

9.2.5 Site Meteorology

The characteristic weather found at the project site is discussed in Bathe 1973. Briefly, air temperatures at the site vary day/night from 77°/60°F
winter to $85^\circ/70^\circ F$ summer. The area is dry with rainfall averaging less than 20 in/year. Data show that most showers occur in the West Beach area during the early pre-dawn hours.

The spring and summer extend from approximately April to November and include the period of strong northeast trade winds from about June to September and the transitional periods just preceding and following. During this season, wind direction ranges from northerly through easterly, and occasionally southerly, but predominately blows from speeds at the lagoon location should average 12.2 kts, but will range seasonally up to 25 or 30 kts. About 30% of the time the local speed exceeds 12 to 15 kts.

The fall and winter is reasonably well-defined by a weakening of the northeast trade winds and the appearance of westerly winds and frontal influence from the north temperate zone. These westerly winds, known locally as Kona storms, are mostly typically represented by strong winds and high waves from the south to southwestern quadrant. The year-to-year variations in the Kona conditions at the site are considerable. Some winters no Kona storms appear and in other years there may be four to five strong storms. Generally, during the winter months (December to March) winds from the southwestern quadrant should be present 10% to 15% of the time, but Kona winds are expected to occur most often during January.

The historical data record a maximum sustained wind speed in the site area of 40 kts, with gusts to 83 kts, on January 13-14, 1970. In contrast, calm conditions exist 1.5% of the year, usually during the winter months. Kona conditions, from storm conditions to Kona calm or light onshore winds are expected to occur at the lagoon site about a total of thirty days per year.

The annual mean tradewind streamlines remain essentially orthogonal to the West Beach coastline. This wind blowing directly offshore remains quite consistent year to year. The north-south aligned central part of the site coastline, i.e. the proposed location of the four lagoons, is curved slightly landward. This would help move the water leaving the lagoons away from the site toward the discharge end of each lagoon. The major influence of the predominant tradewinds at the lagoon sites, will be to create a cross lagoon exiting flow which will cause typical surface currents up to 15 cm/sec (0.1 to 0.5 kts) averaging about 10 cm/sec. This will aid overturn and mixing in each lagoon, helping replace bottom waters.

When the wind strength increases, as during storms or early spring periods, dust and debris will blow from the beaches bordering the lagoon and hotel area. Strong winds of 40 kts, for example, will cause cross lagoon current drifts of up to 20 cm/sec (0.4 kts), and small lagoon surface waves up to one-half foot in height. The wind transported particulate material reaching the lagoon surface will be quickly mixed vertically throughout the lagoon waters.

During onshore or southerly Kona winds, the surface wind and debris effect on the lagoons will depend upon the height of the buffer zone, or ridge, separating the coastline and lagoons and the amount of loose material this ridge contains. Water leaving each lagoon exit will, in this onshore wind
case, have difficulty leaving the discharge area. Depending upon the alignment of the wind to the shoreline, some of the discharged water could recirculate within two to four hours. During such Kona storm conditions, this is unavoidable and lagoon operations may necessitate restricting access to the lagoons.

9.2.6 Lagoon Sizing and Hypsography

Each final lagoon shape, size and hypsography (volume distribution) is primarily a decision based on land use and planning needs. The area paralleling the coastline, allocated for the lagoons, dictates the limiting size of each lagoon. Four lagoons were planned sized from 2.0 to 5.5 acres (at msl), varying in shape from semi-circular to oval. The lagoon concepts developed include long curved beaches with cusp-like ends, deep central areas and shoal entrance barrier islands. The entrance islands are primarily indigenous basalt and sand. Depths of 6 to 7 feet at mean lower low water were chosen. Average depths will be 5.4 to 6.3 feet.

A variety of final lagoon sizes and shapes were specified ranging from a large lagoon with an entrance width of approximately 600 feet and reach of 500 feet, and smaller lagoons with entrance widths of 500 to 530 feet and reaches of 200 to 370 feet.

The volume becomes important when considering flushing. Since it is necessary to maximize the daily exchange of water, the lagoons are as shallow as the intended use will allow.

The sizing criteria developed considered maximizing the flushing potential, not restricting the flow into or out of the lagoon nor allowing currents at the lagoon entrance to normally exceed 1.5 kts. Using medium coarse to coarse grade sand on the bottom and entry slopes of 6° to 12° (1:10 to 1:5) the flow must be limited within the lagoon to insure sand is not excessively transported along the lagoon beach. Thus, an entrance cross-sectional profile for the lagoon includes a shoal shelf area (-1 ft. at msl) on each side of a deep centrally located exit channel. The deep central portions of each lagoon is a constant depth to insure all benthic waters are uniformly flushed. The entrance and exit areas are sufficiently large to directly reach and flush both the lagoon surface and bottom waters.

The lagoons benefit in storm protection from retaining the existing coastal ridge seaward of the lagoon beaches, retaining much of the existing hard coastal material and coral armored terraces. The selection of the site central shoreline area for locating the lagoons takes advantage of the local bathymetry for a natural 30:1 wave run-up plus aid in flushing using the nearshore circulation patterns. Adjacent nearshore deep channels in the bathymetry will also aid removal of deep exiting water.

Most of the grading around the lagoons, excepting the lagoon beaches, must be directed away from the lagoon waters, particularly those surrounding grounds containing vegetation that receive regular treatment with plant fertilizers, plant control chemicals, or pesticides. Also, no direct storm runoff from urban areas, streets, hotels or parking areas should be allowed to
reach the lagoons. The results of adding these nutrients (primarily nitrates and phosphate), bacteria, solids and particulate substances, hexane soluble materials, hydrocarbons, oils, tar, waxes and debris would each degrade the aesthetics of the lagoon waters.

Nutrient addition from runoff could, if entering the lagoons, stimulate growth in the phosphate limited case of lagoon waters causing initial change toward eutrophication. Fecal coliform bacteria tend to decay in salt water and sunlight within a few hours but can be a potential health hazard if concentrations reach 1000 col/100 ml. Hexane soluble hydrocarbons, oils, tar and waxes can coagulate and gather at the line or result in a thin film across the lagoon surface. In this case, the aesthetics of the lagoon surface water would become visually objectionable when floatable concentrations of about 1.5 mg/m² are reached. Land oriented beach use debris is immediately objectionable if allowed to reach the lagoons.

9.2.7 Tidal Prism

The mean diurnal tidal range at the site coastline is 1.9 feet, with the tide being predominately mixed in character, i.e. two unequal highs and lows per day of 1.3 feet typical change. The greater annual observed tidal changes in the area of approximately 3.0 feet, occur three to four times each year. The time of the tide at the site follows the Honolulu tide by 15 to 18 minutes.

Using an annual daily average tidal change of 2.0 feet, the amount of this tide that can enter the lagoons, i.e. the tidal prism, can be computed. The amount depends upon the lagoon dimensions, the entrance crosssectional configuration and smoothness. These factors establish the amount of restriction to the incoming and outgoing flow. Tidal prisms thus ranged from 2.23 x 10⁷ to 6.38 x 10⁸ ft².

The computation results show that the average daily flushing velocity in the deep central channel for the above tidal prisms will range from 0.54 ft./sec to 1.3 ft./sec. The estimated maximum exiting velocities for the lagoons should range between 23 to 48 cm/sec (0.5 to 0.9 kts) during typical tidal and wave conditions. As noted earlier, during extreme storm events water exit velocities at the lagoon exit center could exceed 1.5 kts.

A tidal rise in the lagoons essentially equivalent to the tidal rise at the coastline is anticipated. During the maximum tide and diurnal conditions the tidal prism increases from an average 52% to 92% of the lagoon volume per day, while during days of minimum tidal change 30% is exchanged per day.

9.2.8 Flushing Criteria

A practical way to evaluate the minimum acceptable rate of flushing for the lagoons was to examine the performance and water quality conditions existing in the Kamokila lagoons along with several other large salt water artificial ponds, tanks or lagoons in Hawaii. Considering the resident time of infiltrated water in local harbors also provides some measure of infiltration rate and flushing vs. tendency toward eutrophication.
The performance of seven manmade or modified salt bodies of water, in addition to the site Kamokila lagoons, were considered and information was obtained on each. Primary concern was in determining the body volume, turnover rate (flushing) in terms of body volumes per day, the amount of recirculated or new water, the source of this new water and any special treatment given either the new or recirculated water.

These results, along with several comments received in obtaining this information indicate two flushing criteria exist:

1) For public-oriented marine viewing tanks flushing rates of 4 to 5 times and up to 30 times per day are employed. Five times per day appears to be a working minimum to keep the water suitably clear for unobstructed viewing. Chemical treatment is commonly used to control disease of the tank inhabitants and chlorination, mechanical scrubbing or sand filtering are used to control tank algal growth.

2) In large natural open lagoons, flushing rates vary from 2/3 times to 3 times per day. In these cases no treatment is employed, and in two cases the water flow is restricted to flow one way only.

As noted in the previous section, the Kamokila lagoons (i.e., Paradise Cove lagoon) are actively flushed via incoming waves and the daily tidal prism. Flushing rates during field observations ranged from 4 to 23 times per day. Typically rates of 3 to 10 times per day likely exist in these high quality natural lagoons on the project site.

An interesting comparison exists between the Hilton Hawaiian Village lagoon and the Magic Island lagoon. Though the Hilton lagoon flushes more of its volume one way, it draws source water from the partially degraded water inside their coastal beach reef. This lagoon was also initially filled, leaving a silt and clay bottom with fine sand leading to the less than desirable water quality existing in the lagoon today. The nutrient accumulation problem in this case is becoming more severe each year.

In contrast, the Magic Island lagoon is larger, flushes less of its volume daily and is restricted in bottom water exchange yet its water quality is markedly better. This is due to better source water, more aeration due to the wave trap like action of the breaks in the lagoon breakwater, and the clean, medium grade sand bottom over a hard subbottom material. If the Magic Island lagoon water, flushed now 2/3 times per day, were receiving a more active flow throughout its 10-foot depth and if its flushing were increased to three times or better per day, its water quality would improve even more over its present acceptable condition.

Considering all results, including the bioconstraints and recommendations of consultant Dr. P.K. Bienfang, it is evident that a minimum daily average flushing of 3 times the lagoon volume per day is advisable. Greater flushing rates will provide a greater margin of safety. Rates as high as 5 to 10 times the lagoon volume per day, however, will likely occur often depending upon the incoming waves. A trade off of acceptable water quality for the use intended vs. the desire to obtain water quality identical to coastal waters (never better than coastal water) must be made.
The central shoreline area of the site contains a natural ramplike coral terrace with slopes of 23:1 to 40:1. Thus, the shoreline acts as a natural wave runup ramp for incoming surf. Wave flushing of the lagoons is expected to exceed the tidal prism by 10 or more times per day. In the absence of all wave activity for periods longer than 6 hours the flushing would be limited to tidal exchange, i.e. a 1/4 to 1/2 times volume flushing rate.

Thus, importance is placed upon comprehensively knowing the low end of the wave spectrum at the site coastline. Figures and Tables included show a summary of historical wave data and information applicable to the site coastline.

The historical results indicate that 341 days of the year waves and swell greater than one foot in height reach the shoreline. Waves up to 30 feet are predicted for the area during severe storm conditions, but waves between 1 to 6 feet in height predominate during the year. But more important, calm conditions or waves and swell less than 1-foot in height exist, statistically, for 24 days per year. Exactly when these days occur, or how many consecutive hours exist with absolutely flat seas and no incoming swell, is not known for the site area. Interest is usually placed on the upper limit of wave height. Though this is also of interest when considering storm runup and structural strength, it is of no assistance in estimating the lower limiting condition, i.e. when wave induced flushing would be minimal.

Since the summer brings South Pacific swells and wind waves to the south and west coasts of Oahu, and winter brings the north Pacific waves and local wind waves to the coast, the calm periods tend to exist in either late summer when the tradewinds weaken or during mid-winter when Kona winds can bring calm conditions. It is felt, however, that absolutely calm water along the shoreline, without even swell occurring, happens rather rarely, perhaps a few day per year and up to 10 to 20 consecutive hours each occurrence.

The directions of incoming waves will be refracted by the local bathymetry. Considering the range of incoming directions and the offshore bathymetry, it is evident that most waves approach the coastline within 45° of orthogonal to the beach. The nearshore bathymetry also refracts the incoming waves with most waves probably impinging the shoreline within 30° of orthogonal. These conditions are helpful for both wave induced flushing longshore transports.

Sea Engineering field wave data, as analyzed by Bretschneider and Gerritsen were taken for over 10 months. These results, discussed in Bretschneider's and Gerritsen's reports, were considered in the lagoon design and are the basis for the estimates of the anticipated lagoon flushing rates.

Existing flushing rates in similar local and California salt water lagoons (2/3 to 5 times volume/day) vary as widely as the observed water quality in each lagoon. The past 9 acre Barbers Point harbor, with a single entrance, was believed to flush infiltrated brackish ground water out in approximately 1/2 day. The new deep draft harbor is to flush infiltrated ground water out within 2 to 15 days. In these cases, eutrophication is essentially
assured. Control of the phytoplankton growth in the West Beach lagoons places lower limits on the flushing rates, with recommendations given keyed to the observed permeability rates, and phosphorus and nitrogen concentrations as reported in the Harding Lawson field report. The follow-on pre-construction work will reexamine the site conditions throughout each lagoon site.

The conservative suggested minimum flushing criteria is 3 to 4 time/day, preferably greater. Physical constraints of the entrance configuration, circulation and sand movement in the lagoons, along with keeping the design within reasonable sized limits, suggest flushing rates will range up to 20 times per day. In comparison, the anticipated lower limit is greater than that presently found in the Magic Island lagoon.

9.2.9 Infiltration Injection Rates

Lagoon source water is composed of both incoming coastal sea water and infiltrating brackish ground water. Both will be entering the lagoons continuously, though neither at a day-to-day consistent rate. The incoming coastal water will vary with the coastal conditions, tides and wave activity present. The infiltration will vary with the seasonal rainfall and local storm activity.

A general description of the geology in the project area has been given by Batten, (1973) and Dr. P. Bienfang (1979). It need not be repeated here. Figures provided show the locations and bore stratification data for seven historical borings taken in 1969 for the West Beach project. These data, Barbers Point core boring results along with project field data taken by Harding Lawson Associates provide the basis for the infiltration permeability and ground water quality estimates.

The data show permeabilities of 0.2 to 6.5 ft/day. Harding Lawson suggested the site rates may range from 0.1 to 19.0 ft/day. This is equivalent to infiltration rates of 0.75 to 74.8 gal/ft²/day. Historical estimated rates of infiltration for the site area range between 13.2 gal/day/ft² to 15.5 gal/day/ft² for the lagoon sides and 1.0 gal/day/ft² to 1.8 gal/day/ft² for the lagoon bottom. The data also show that the lagoon sites are composed primarily of sandy silts and clayey silts and silty sand with densely cemented coral fragments. In most cases the lagoon bottoms, prior to lining, are expected to be medium dense to dense materials (i.e. 15 to 300 blows/ft.). Permeability may thus tend to be toward the lower end of the HLA predicted range.

It is estimated that a 5.5-acre surface area lagoon, 8 feet deep (ref. msl) will receive between 0.25 mgd to 0.5 mgd. This water is less saline (6.20/o0-25.50/o0) than the incoming sea water (34-350/o0) and therefore, buoyant. Considering the lagoon volume, in this case 11.25 million gallons, and a non-flushing condition the infiltrating water will comprise approximately 2% to 5% of the lagoon volume. It would comprise 6% to 25% of a twice daily 2-foot tidal prism inflow or up to 1/2 of the daily tidal prism. In general, infiltrating ground water is anticipated to comprise between 1% to 6% of the lagoon volumes for 2.0 to 5.5 acre lagoons. In the presence of a minimum
3 to 4 lagoon flushing rate, the lagoon waters would contain a daily average of approximately 1/2% to 3% infiltrated water at any time.

A wide range of hydraulic permeability and infiltration rates exist in the literature for Oahu. The field data taken for the program provide more site specific permeability rates and geological profiles. The result of incoming infiltrating water is expected to have minimal effect on the lagoon salinity. Dissolved oxygen of 2.8 to 5.1 ppm, BOD₃ less than 2, and total coliform concentration less than 4/100 ml in the infiltration water should not create any problem. Nutrient values are however, higher than coastal waters.

9.2.10 Potential Water Quality Changes

Changes in the lagoon water quality, both of advantage and disadvantage when compared to the quality of the source coastal water, would occur from several processes. These include aeration via incoming waves, infiltration of nitrogen and phosphorus rich ground water, runoff from the beach areas immediately surrounding the lagoons, changes in the heat exchanged at the surface, evaporation, precipitation, nutrient exchange with lagoon lining material, biota uptake of nutrients, changes in organic loading, potential changes in composition of biota, and changes due to human usage of the lagoon water and surrounding beaches.

Incoming water will vary in suspended sand and silt load according to the amount of wave and swell activity existing at the shoreline. Loading would vary, depending upon swell direction and time of year. Suspended loads of approximately 0.5 ml/m³ for 4.3 ml/m³ are typical for the area. Suspended sand annually averages 3.0 ml/m³ during tradewind, southern swell and northwest swell conditions, and silt 2.3 ml/m³. Portions of the suspended sand may migrate toward the lagoon exits during periods of high incoming waves depending upon particle size and amount of wave activity. Suspended silt sized beach particles (smaller than 50 microns in diameter) could leave the lagoons and enter the coastal waters. The mixing and flushing rate occurring within the lagoons at the time of entry will determine whether the material settles out or remains suspended and subsequently flushed from the lagoons. Suspended load would generally be greatest when wave activity is greatest, as therefore would be flushing and mixing. The quality and sorting of the beach sand and lining materials chosen will establish the amount of suspended load.

Incoming water will be at or near dissolved oxygen saturation. Further aeration apparently occurs in the incoming waves keeping the dissolved oxygen high in incoming waters. Harding Lawson found lagoon water super-saturated in dissolved oxygen (11 mg/L). Oxygen concentrations are expected to range from 6.0 mg/L to 11.0 mg/L.

As discussed in the heat budget section, some heating of lagoon water is anticipated during transit from entrance to exit. This is due to changes in the heat budget from wind shading of the area from surrounding buildings, higher daytime air temperatures on shore, and the shallow character of the lagoons. The amount of heating will depend on the prevailing flushing rate, and may vary seasonally or daily from 0.1°C to 0.6°C. Infiltrating ground
water, however, tends to be slightly cooler than coastal water resulting in offsetting a portion of the local heating effect. In all, it is estimated the lagoon waters will show a summer warming trend of approximately 1/2°C in transiting the lagoons with a flushing rate of 3 to 4 times per day.

Incoming brackish ground water seepage through both the lagoon bottom and sides will bring nutrients to lagoon waters. The brackish infiltrating ground water in the area is expected to contain 1.0 to 7.0 mg/l nitrate (average 2.9 mg./l) phosphate. Coastal sea water contains seasonally between 0.13 to 3.0 micro gm/l nitrate and 0.2 to 0.3 micro gm/l phosphate. The rate per day of incoming ground water is estimated to range between 2% to 5% of the lagoon volume, or 6% to 25% of a typical 2-foot tidal prism. The resulting concentration primarily of nitrogen components for the vertically mixed condition, will vary with prevailing flushing rate. At the flushing rate of three times per day steady nitrate concentrations in the lagoon are expected to range from 6 micro gm/l to 50 micro gm/l, and phosphate concentrations from 10 micro gm/l to 30 micro gm/l. These values are several times the related concentrations in the incoming coastal water. At an increased flushing rate of up to 20 times per day these concentrations would drop proportionately lower but still exceed the coastal waters.

Incoming ground water is also less saline than the coastal waters. The result will be dilution of the incoming lagoon sea water. If the ground water enters the lagoon uniformly over each square foot in contact with lagoon sea water, then with a 3 times flushing rate and the anticipated well-mixed condition, the infiltrated brackish waters will be quickly mixed with the lagoon water. Depending upon flushing rate, ground water of 6.5 °/oo to 25 °/oo will comprise a small fraction of the lagoon volume. This could affect lagoon stratification in the absence of mixing by diluting the lagoon surface waters but the effect is minimal, i.e. less than 1 °/oo. If, in the worst winter time case, infiltrated water were confined to a 2-foot tidal prism, the salinity in this surface layer would drop 1.5 to 3.0 °/oo.

Changes in lagoon water quality will result from aeration of incoming water, transport out of suspended beach sand and silt, heating and cooling of lagoon water from the balance of the heat exchanged at the surface and cool infiltrating ground water, nutrient injection in the incoming ground water, and biological uptake and release. The latter effects of assimilation by pelagic phytoplankton and uptake by benthos of sessile organisms have been estimated by Bienfang.

Except for the nitrogen and phosphorus nutrient injections in the infiltrating ground water, the remaining water quality changes are expected to be minimal. The potentially high rate of nutrient injection is primarily responsible for specifying a flushing rates of 4 times daily or better. Data need to be taken during the construction phase to better map the exact geologic character of the bed at the lagoon sites, and the rate of ground water infiltration and its chemical properties to determine if any extreme condition needs further consideration. In any case, the lagoon waters mixing and flooding should be monitored to maintain aesthetically acceptable water quality.
9.2.11 Bacteriological Injection

Bacteriological data is usually limited to coliform bacteria. The coastal waters off the lagoon site areas are historically very low in the coliform concentration. Total coliform (including fecal coliform) concentrations of 2 colonies/100 ml have been found during winter months offshore following storm conditions. The neighboring discharge sources of the Conoco refinery area, the streams north of the project site in the Kahe and Maile area, and the proposed new Barbers Point Harbor are each potential sources of enteric bacteria, nutrients, floatables and toxic material. The most likely source, however, for coliform bacteria reaching the lagoons will be the vegetation and ground surrounding the lagoons. Fecal coliform and pathogenic bacteria can also enter the water directly through human usage. The coliform concentrations found both in the ground water and in the Kamokila Lagoon were considered negligible (i.e. less than 4 col/100 ml).

Considering the typical coliform decay rates in Hawaiian waters (90% in 30 to 45 minutes) and the apparent lack of major fecal or pathogenic bacteria sources in the area, bacteriological (coliform) problems should be minimal.

9.2.12 Coastal Neighboring, Pollutant Sources and Feedback

Objectional water quality or toxic materials could enter the central coastal area, site of the lagoon intakes, and be drawn into the lagoons. As noted earlier, the offshore and coastal currents would be expected to bring water to the entrance area from the north to northwest for about half the year and from the south quadrant for the remaining half. The nearest site of concern for the source of objectionable water would be the Barbers Point Harbor and the West Beach Marina. During ebbing tides and offshore blowing trade winds Harbor water would tend to move twice daily northwest, toward and somewhat away from the site coastline. Also, during seasonal periods of significant incoming southerly or southwesterly swell and sea, statistically a minimum of 302 hours/year, or 13 days/year, the wave induced longshore transport would move the ebbing harbor water northward along the coastline. It would entrain surrounding open coastal water and become diluted in its objectional concentrations, but reach the lagoon intake areas within 1 to 3 hours.

Primarily, the small 2.16 acre southern most proposed lagoon would be affected.

Exactly what concentrations of what materials of concern will exist in this mix of harbor and coastal water cannot be said definitively at this point without specific knowledge of the new Barbers Point Harbor water quality. Estimates were made by Dugan (1984) of the storm data for the existing water quality and the rates runoff for 1 and 24 hour durations, 1, 5, 10, 25, 50 and 100 year events. He used nitrogen and phosphorus concentrations of 0.6 and 0.5 mg/l respectively. The phosphorus is 2 to 5 times greater than lagoon infiltrating ground water and, along with suspended solids of 250 mg/l, could impose severe loading on lagoon waters if allowed to reach the lagoon entrances. The southern most lagoon may receive this stress during storm periods along with other pollutant loading resulting from the intended commercial use of the Barbers Point harbor, i.e. the addition of sulphides, bacteria, oils, tars, floatables, hexane solubles, particulate material, trace metals and toxic materials.
Dugan results show severe storm runoff loading could occur for storms over 6 and 24 hour duration, recurring 50 and 5 years respectfully. The routing of storm drainage from the project coastal waters to the Barbers Point Harbor of the proposed West Beach Marina will add seasonally to the loading in these neighboring waters. When this occurs and flushes out of the Harbor-Marina area it will likely be of concern during times when the coastal drift is northwest, or during winter Kona storm periods when rainfall can be significant and much of Oahu's coastal waters receive large amounts of storm runoff containing fine suspended silt.

If the project storm drainage exists, the coastline north at the project northern boundary, discharged storm runoff could reach the lagoon intake areas within 2 to 4 hours, especially during conditions of northwest swell and sea, statistically 973 hours/year, or 41 days/year. In this case, dilution with coastal water should be greater than a similar discharge from the south.

Coastal storm water discharged at the site northern boundary and/or Barbers Point Harbor exiting water can reach the lagoon intake area during specific conditions of sea and swell directions and/or net drift of the nearshore coastal waters. It is estimated that these conditions could exist between 13 to 41 days per year. The severity of this condition will depend upon the concentrations of undesirable materials in either neighboring sources. This subject is yet unresolved in the proposed Barbers Point deep draft harbor case. In the case of storms, however, severe stress can occur at several conditions below the 24 hour 100 year storm. The historical data clearly show island wide prolific sediment discharge occurs during severe winter storms, as throughout the 1978 to 1979 anamalous wet winter. The coastal waters almost uniformly degrade for a few days until dispersed and flushed away from the shore by open coastal water transports. During these periods, it may be wise to devise methods to segregate from the coastal waters or use standby pumping to accomplish the required aeration filtering and/or chemical control of biostimulation.

9.2.13 Marina Alternative Configurations and Concepts

A marina is proposed as an integral part of the West Beach Project due to the developer's perceived need for marina facilities at this new water-oriented resort and by analysis of the documented demand for additional boat slips on the island of Oahu especially to serve the population between Keehi Lagoon to the south and Pokai Bay to the north. In addition, original plans for the deep draft harbor at Barbers Point had included a small boat marina as a part of the proposed development plan. The alternative of not developing a marina was rejected by the developer because it would be detrimental to the success of the West Beach resort as well as deny boat access to the public for a considerable length of shoreline.

The location of the marina adjacent to the deep draft harbor was seen as a compatible use as well as a buffer for the residential development at West Beach from the deep draft harbor to the south. During the development of the Conceptual Design for the West Beach resort, numerous marina size alternatives were investigated. The final size of the Marina proposed in the EIS
is based on the developer's desire to provide a marina of approximately 500 slips and maintain an appropriate buffer between the residential areas of West Beach and the Deep Draft Harbor.

Alternative entrances to the marina have been studied as a separate issue being discussed with the U.S. Army Corps of Engineers, State of Hawaii Department of Transportation, Harbors Division and United States Coast Guard. Also, physical hydraulic model testing has been done at the University of Hawaii's J.K.K. Look Laboratory for Oceanographic Engineering. The results of this testing are contained elsewhere in this Supplemental Environmental Impact Statement.

Various marina configurations were considered during the development of the West Beach design effort, each change attempting to meet updated land planning and development cost needs. Marinas sized from a few 100 slips to over a thousand slips were sketched. The design marina was selected as a 33.9 acre (42.2 acre including land acreage) approximately triangular facility 2900 feet long overall, by 950 feet wide at the widest point. The main 2050 foot long marina portion is associated with an 870 foot long spending beach area connected to either the Barbers Point deep draft harbor via a 400 to 450 foot wide channel or directly to the ocean via a 200 foot wide channel. These three configurations used for the specific design marina dimensions and entrance shapes to complete the technical analyses of probable circulation patterns, flushing, seiche conditions, heat budget and infiltration. The potential coastal and environmental impact of the facility was also of interest. Depths in the marina will range ± 15 feet mean lower low water in the entrance channel and throughout the remainder of the marina. The average is expected to be 16 feet deep at mean sea level (m.s.l.).

The hypsographic computations considered the boundaries of the marina to be vertical throughout. An incidental inaccuracy is introduced in the sloping sea walls along the entrance channel. As such, the final marina would be 33.9 acres, with a minimum overall volume at mllw of 820,844 cu. yds. (165.8 million gallons). The marina portion of the facility is 551,122 cu. yds. (111.3 million gallons) in volume and remaining the same for each entrance configuration.

The narrowest restriction in the facility is the 330 foot wide channel between the marina portion and a crescent shaped spending beach across from the opening to the Barbers Point harbor channel or the ocean. At this point, 4,500 ft" (approximately at msl) vertical crosssection exists. The marina entrance is proposed to either connect directly with or adjacent to the main entrance channel for the adjacent 90-acre Barber's Point deep draft harbor or possess a separate channel directly to the ocean. As such, the specific entrance configuration is an item of final agreement between the developer and those state and federal agencies with jurisdiction over the deep draft harbor.

All environment analyses considered the marina portion of the facility the same for each entrance concept. The land surrounding the marina would be, in part, land altered during construction of the West Beach development and, the remaining eastern part bordering the deep draft harbor. It is assumed
in the subsequent work that all grading around the marina will be such that surface runoff will be directed away from the facility. Two exceptions are recognized for the direct routing of storm runoff drains to the marina and tsunami protection grading at the marina borders.

The marina final hypsography will be verified based on the physical model tests. This includes marina circulation, flushing, seiche behavior, and entrance configuration. However, the maximum marina surface and mean depth will not change. Therefore, the hypsography results summarized above, were used for flushing computations, and the design shape used for seiche computations. Unlike the lagoon concept development, where flushing and lagoon aesthetics established the shape, the marina was designed to meet development needs. The resulting hypsography will in turn then establish the environmental conditions that will occur in the marina.

9.2.14 Tidal Prisms

The tidal prism is that amount of water than enters the marina during each tidal change. It is usually given as a fraction, or part, of the basin water depth or volume at some defined tidal reference level. The geometry and smoothness of the basin and its connection to the ocean determine whether a restriction to the incoming and outgoing tidal flow will exist or the marina will have a free unimpeded tidal exchange. In computing the tidal prism a mean lower low water (mllw) reference was used (i.e., marina depth at mllw of 15 feet).

The diurnal tidal range at the project coastline generally varies from 1.3 feet to 2.9 feet (mean of 1.9 feet). The tide is predominately mixed-semidiurnal in character throughout the year, i.e. two unequal highs and lows per day. Annually observed greater tidal changes in the area, i.e. diurnal changes of approximately 3.8 feet, occur a few times each year. However, a conservative average daily tidal exchange of 2.0, feet considered constant throughout the year, was chosen for this work. The time of this tide at the site would follow the Honolulu tide by 10 to 13 minutes during the year.

The tidal prism computation results show the marina tide is impeded a negligible amount for a 4,500 square foot cross-sectional entrance channel. The entrance configuration is constructed to absorb incoming swell and surf, being wider and possible deeper, will further insure the tidal prism is not restricted.

The tidal prism for a typical 2-foot tidal change is $14.8 \times 10^6$ gallons, or approximately 13% of the marina volume. The exchange occurring over a single 12-hour, 25-minute tidal change will depend upon the prevailing semidiurnal tidal profile. With a 2 foot semi-diurnal tide a typical daily volume change of 27% of the marina volume would occur. During spring tides, this daily change could reach 33%. This does not however consider the efficiency of the exchange process nor consider the volume of infiltrating water, storm runoff or the evaporation - precipitation balance. Flushing involves some knowledge of mixing within the confined boundaries of the marina.

9.2.15 Infiltration of Ground Water

Ground water from the surrounding aquifer will infiltrate the marina sides
and bottom. The rate of entry of this brackish water will depend upon the amount and head of ground water existing in the area, changing locally season-to-season with rainfall and the variation of hydraulic permeability of the soils.

The geology of the area indicates the marina will lie entirely in the seaward most coastal zone containing an approximately 200 feet thick coral aquifier base. Beneath this brackish aquifier exists an aquiclude zone of alluvium and marine sediments above the basal aquifier. Bore data from seven holes taken in 1969 for the West Beach project and four new holes at the marina site by Harding Lawson Associates are available, though the seven historical holes lie well out of the area proposed for the marina. However, the project data plus data taken for the proposed Barbers Point deep draft harbor just to the southeast can be and were used to estimate the geology in the marina area and the hydraulic permeability.

Just northwest of the marina the geological stratification has been shown to include 6-inch to 18-inch soils layer, a coral sand layer, and dense structured coral layer overlying open-structured coral to the 10-foot depth below mean sea level (msl). The dense coral has typically the lower hydraulic permeability, i.e. lower than the coral sand or open structure coral. Harding Lawson estimates permeability rates of 0.1 to 10 ft/day throughout the West Beach site. In the marina area, 15 feet below msl, principally medium dense to dense sediments exist (i.e. 20 to 108 blows/ft) of grey-white to light brown cemented, saturated, sediments. This material surprisingly exhibited, however, a rapid pump off rate indicating a high permeability. The sediments must be quite inhomogenous or fractured from spot to spot.

The existing neighboring Barbers Point harbor is approximately 38 feet deep. It apparently cuts vertically downward through the coral sand, dense-structured coral, open-structured coral, and possibly some alluvial silt and sand, in that order. As such, it breaks several more permeable materials than the marina excavation might, were the marina depth limited to 16 feet below msl. Thus, as in the lagoon case, infiltration rates, as justified by historical data and HLA field data are expected to range between 0.1 to 10.0 ft/day permeability, but may tend toward the lower end of this range. The highest permeability found by HLA was approximately 48.6 gal/day/ft² in the marina area.

Using the highest infiltration rate, it is estimated that the 33.9-acre surface area marina 16 feet deep could receive between 4.3 mgd to 5.0 mgd of infiltrating ground water. This water will be less saline (25.5 °/oo observed) than the incoming sea water (approximately 34.8 °/oo) and therefore buoyant. Considering the overall marina volume at msl, in this case 165.8 million gallons, and a non-flushing condition, the infiltrating water will comprise approximately 2.6% to 3.0% of the marina volume. As such, it could comprise approximately 21% of a typical diurnal 2-foot tidal prism classifying the marina as a wet embayment.

The above estimates assume the local foothills and mountains receive less than 20 inches of rainfall per year, typical for the Waianae district. This
area averages approximately 100 mgd rainfall dispersed as 15 mgd in over-
land stream runoff to the coast, 75 mgd evapotranspiration, and up to 10
mgd ground water seepage. Thus, a marina infiltration rate of 4.3 to 5.0
mgd is conservative since the neighboring deep draft harbor and coastal
waters should receive a major portion of infiltrating water from the surround-
ing lands. This conservative rate could, however, be exceeded during
periods of significant storm activity.

The incoming brackish ground water may vary in salinity from 6 °/oo to 26
°/oo. In that it is less saline than the incoming tidal flow, the marina may
tend to become slightly stratified, with a lighter, shallow, less saline surface
layer existing in the marina throughout the year, similar to the experience
found in the neighboring Barbers Point harbor.

The infiltrating water will add to the net amount of water leaving the marina
daily. This assymetry in inflow/outflow should add to the water daily
exiting the marina slightly increasing the outgoing tidal prism.

If for example, a 2-foot diurnal tidal prism is considered, and a 4 mgd
infiltration rate (evaporation approximately equaling precipitation), the
outgoing mean flow at the marina entrance over a 6-hour period for varying
semi-diurnal tidal changes would be 1.1 cm/sec. Peak velocities might
therefore reach 3 cm/sec (0.06 knots) in the entrance channel during
ebbing tides. Offshore blowing winds might tend to increase the exiting
slow surface slightly. If the stratification were to limit the outflow to a
buoyant 3 to 4-foot thick layer at the surface, the exiting flows could
increase to perhaps 0.1 knot. It appears therefore, that infiltrating
ground water is not expected to cause any difficult flow conditions in the
marina.

Incoming storm runoff, to be routed into the marina at the three locations,
like infiltration will add substantial nutrient loading to the marina waters.
The storm runoff, however, could in the extreme event, also add a substan-
tial flow to the marina. Dugan (1984) has estimated that the project's east
drainage area could deliver 375.9 acre-ft/event to the marina during 24 hours
for the 100 year recurrence interval, i.e. the most severe storm. This is
almost equivalent to three quarters of the total marina volume, exiting the
marina entrance in 24 hours; capable of producing a maximum outgoing flow of
17 to 25 cm/sec in a 3 to 4 foot surface layer. This could cause navigational
difficulties for small boats using the marina channel during such an extreme
event. U.S. Coast Guard rules of navigation will govern entry and exit into
the Marina during storm conditions.

9.2.16 Stratification and Water Quality

Incoming solar radiation, the balance of precipitation and evaporation, and
infiltrating ground water will act to alter the temperature and salinity of the
water in the marina. The first two act at the surface and the latter through
the sides and bottom of the marina. In the absence of vigorous mixing or
overturn within the marina, i.e. that occurring from an active circulation
and wave action, stratification will likely develop.

A warm, less saline surface layer will form and overlie a cooler, more saline
subsurface layer. The salinity of the lower layer would be maintained by
exchange with water in the deeper incoming tidal flows. The amount of stratification in the surface layer would vary diurnally with daily heating and cooling, but variations seasonally with infiltrating ground water, rainfall changes and heat budget changes will be more significant.

It has been previously noted that the marina waters are expected to be at least 0.1°C warmer annually than the adjacent coastal waters. If this heating effect is limited to the upper few feet of the water column, the temperature stratification may be up to 0.4°C. In additional, diurnal heating and cooling could result in up to 0.5°C additional change, peaking during mid-day hours. Overall, the increase in temperature toward the surface may annually average just under 1°C.

Infiltrating ground water is expected to range in salinity between 6 to 26 ‰. The estimated typical daily infiltration rate was given earlier at approximately 5 mgd. If vigorous mixing were to occur throughout the water column, of 20% infiltrating ground water, the marina salinity would drop 0.4 ‰. If in the worst case 6 ‰ water were to enter the marina, primarily from the sides, and mix with the surface 2-foot layer the salinity in this layer would drop approximately 5 ‰. If this same process occurred but with 20 ‰ infiltrating ground water, the surface layer salinity would drop 2.5 ‰.

A weak but consistent surface stratification is thus very likely to be evident in the marina annually; being most evident during winter storms. In comparison, the existing Barbers Point harbor presently demonstrates a measurable stratification. Wind blowing across the marina surface will likely thus induce different circulation patterns, one in a shallow surface layer a few feet thick and a second in the subsurface layer just beneath. Such two (and three) layered systems have been observed for example in Pearl Harbor. In the case of the marina, density differences top to bottom in the water column are expected to exist throughout the year due to approximately a 0.1°C to 1.0°C and 0.4 ‰ to 5.0 ‰ vertical gradient of temperature and salinity.

The incoming water from infiltrating ground water will be high in nutrients, particularly in nitrogen. Periodic incoming storm runoff will be low in salinity and high in phosphorus and suspended solids. In the limiting case given by Dugan (1984) for suspended solids of 127.7 tons/24 hour 100 year storm the solids entering the marina would either settle to the bottom or remain suspended in the water for subsequent flushing from the marina. Given typical particle size distribution in suspended load the settleable portion would be distributed approximately within a few hundred feet of the discharge point and would accumulate to a few millimeters thick; i.e. typically 500 ft and 2 to 3 mm/event.

Incoming brackish ground water is expected to contain 1.0 to 8.5 mg/l total nitrogen, 0.05 to 0.25 mg/l total phosphorous and 260 to 330 mg/l bicarbonate. Storm runoff water has been estimated by Dugan (1984) to contain 0.6 mg/l total nitrogen and 0.57 mg/l of total phosphorus. In comparison,
the coastal waters in the area have been found to contain 0.15 to 0.38 mg/l of total nitrogen and 0.003 to 0.065 of total phosphorous, i.e. generally comparatively low levels of these nutrients. Thus, the mean ratios of ocean water to storm runoff to infiltrating ground water would be for total nitrogen 1:3:25 and total phosphorus 1:17:3. Infiltrating water will be the prime source for nitrogen and storm runoff of phosphorus for the marina waters.

If 5 mgd of infiltrating brackish ground water and the remaining marina background (coastal) water are considered well mixed upon reaching the marina entrance, the exiting water quality, in the limiting case (not including storm runoff) would contain approximately 0.4 mg/l total nitrogen, 0.04 mg/l total phosphate, 12.2 mg/l bicarbonate, and have a temperature 0.2°C warmer than 0.4 °/oo lower than coastal waters. The nitrogen is about twice coastal waters with little difference in phosphorus from coastal water. However, during storm periods and attendant storm runoff with high phosphorus concentrations, the above ambient nitrogen load and an added phosphorous loads could cause both nitrogen and phosphorus levels in water exiting the marina to be 2 to 3 times typical coastal water concentrations, for the duration of the storm event. In the presence of the stratification induced by a buoyant discharge the surface layer water exiting the marina daily will likely contain the highest nutrient concentrations.

In general nutrient concentrations in the marina will be greater than coastal waters and during storms greater than lagoon waters. The marina will receive a greater portion of ground water infiltration per square foot of marine surface area than the lagoons (i.e. the marina is deeper) plus potentially receive periodic injection of storm runoff. In addition, the marina use is exploitive and its hypsography restricts flushing more than in the case of the coastal lagoons.

The dissolved oxygen concentrations expected in the marina will principally be a function of the marina water temperature oxygen uptake by the marina phytoplankton community, and replacement of oxygen via vertical and horizontal mixing of new water with resident water. Dissolved oxygen concentrations in the coastal waters is expected to seasonally range from 6.0 to 7.5 mg/l and for infiltrating ground water from 2.8 to 4.8 ms/l. Within the marina, if circulation and mixing is sluggish toward the bottom, dissolved oxygen concentration may be depressed to 3 to 4 mg/l. In extreme cases within the marina sediments, dissolved oxygen may drop to 1 to 2 mg/l as has been observed in Pearl Harbor and the Ala Wai Canal.

9.2.17 Circulation in the Marina

Circulation in the marina will be established by several factors. These include the marina physography and orientation to the prevailing winds, the daily tidal exchange, and the stratification within the marins.

The marina is on the eastern most end of the project border. It extends approximately 3,300 feet longitudinally landward at approximately a 40° angle to the coastline. The landward most 2,050 foot portion of the marina is approximately triangular, 950 feet across. As such the prevailing tradewinds will blow in the seaward direction angularly across the marina. The flow at
the surface will thus tend to move toward the downwind (west) corner of the marina (as will much of the floating debris). Overturn will be aided by this cross marina seaward flow.

It has been shown in a preceding section that the marina waters should typically exhibit some weak vertical stratification throughout the year. This will be due primarily to heating at the surface and to infiltrating brackish ground water with salinities between 6 ‰ to 26 ‰. A warmer, less saline surface layer varying in thickness throughout the marina should be evident at all times of the year. The separation of this surface layer from cooler, more saline subsurface waters will depend upon the degree of mixing existing in the marina from day-to-day. This mixing will be induced by the wind, wind waves in the basin, obstructions to the flow (as from slips and pilings), harbor use by small craft, and circulation patterns set up within the marina.

The basin shape and orientation to the prevailing winds will be the principal factors in establishing the overall horizontal patterns of flow within the marina. The prevailing offshore blowing trades strike the 2,050 foot long border of the marina with the Barbers Point harbor blowing almost across the 950 foot width of the marina. A weak southwest cross marina net daily flow at the surface is expected that will tend to transport buoyant surface water angularly across the marina. The thickness of the less buoyant surface layer should be greater on the western side of the marina, with the surface layer thickness increasing toward the entrance of the marina. Some downward sinking of water on the west side would be compensated for by a weak vertical motion upward along the eastern side of the marina. The seaward and across basin wind drift in the shallow surface layer would be compensated by a much weaker eastward moving subsurface flow.

This two-layer wind induced circulation in a varying stratified case will cause a very slow mixing and overturn of the marina waters. An analysis of expected circulation rates, amount of stratification differences within the marina, and tidal flows was made to estimate the degree of mixing and exchange of resident water with incoming coastal water and infiltrating water. It was estimated that the residence time of marina portion of the facility without inducting flushing artificially, would be between two to five days. These overturn rates are 2 to 3 times slower than the maximum theoretical overturn rates computed by comparing the marina volume and tidal prism.

During flooding tides water entering the marina via the entrance channel all entrance concepts should exhibit subsurface movement upwind into the basin, particularly along the Barbers Point harbor seawall. During periods of weak tradewinds or Kona southerly winds this flow will likely be evident at the surface, though weak, unless the basin is receiving a significant volume of fresh water storm runoff. Flooding tidal flows into the basin may be up to 0.3 kts, the stronger flows found in the subsurface layer and toward the entrance.

A typical flooding current profile would show weak incoming flow surface and an increase in strength in the subsurface layer. This flow will move around obstructions and corners in varying eddy patterns. During ebbing
tides the exiting flow throughout the water column should be seaward but be strongest and first to change seaward in the surface layer. The maximum outgoing flows could reach 0.4 kts during strong tidal changes or periods of significant storm runoff.

Both incoming and outgoing flows will tend to diminish in strength further into the marina. Care was taken in shaping the marina to avoid creating stagnant areas or debris traps, particularly on the western (downwind) side and landward most portion of the basin.

9.2.18 Flushing Schemes and Limits

Flushing criteria for the previous lagoon concept was established with the intent of providing as optimum and quality of water for recreational contact use as possible or practical, given the source coastal water quality and anticipated lagoon environmental conditions. Flushing rates in terms of lagoon volumes per day are obtainable. The necessity to dilute infiltrating nutrient laden ground water to control biostimulation and produce lagoon stability were used to establish a minimum desirable flushing rate. The marina criteria is not as stringent and is established principally by marina hypsography, stratification, circulation and the prevailing tidal prism.

Flushing of the marina under typical conditions would be accomplished through the mixing of entering water with resident water and the subsequent removal of this mix via the daily tidal changes and the net daily outflow from infiltrating ground water. The efficiency of this process is judged by the difference in water quality of the entering and exiting water. Given these data, the effectiveness of the mixing and exchange processes can be evaluated.

The marina is considered to typically receive up to an additional 5 mgd of infiltrating ground water. The ground water will be the least saline and most nutrient laden water entering the marina. The marina entering coastal waters will be the most saline and low in nutrient concentrations. Within the marina varying mix of these source waters will exist, acted upon by the resident biota, further altering marina water quality.

The tidal prism for a 2.0 foot tidal change in the overall marina is 22.1 million gallons. In the minimum case of one two-foot diurnal tidal change occurring in 24 hours and 50 minutes 13% of the marina volume would enter and leave daily, carrying an additional 3% of the total volume in net ground water exiting flow. Thus, this minimum volume leaving daily is approximately 26.5 million gallons, representing 16% of the marina volume. This volume is increased to 53 mgd 32% in the case of two semidiurnal tides. If completely new water were exchanged each tidal cycle the marina overturn would occur in about two days. In practice, the process mixing and flushing is not, however, that efficient.

Considering the anticipated stratification and circulation within the marina a slow, three to five day, turnover may be expected. Experience from other bays and harbors in Hawaii in the presence of similar phenomena, particularly
in partially stratified cases, shows similar turnover rates for shallow flat bottom basins with an uninhibited subsurface flow. The incoming infiltrating ground water will add to the daily net outflow. Though the maximum theoretical turnover volumes can sum to one-third of the marina volume in practice between 6% to 11% of the total marina volume is expected to be turned over daily. The most active exchange will occur in the surface layer and least active in the bottom waters. The surface 2 to 3 feet might be flushed daily while the bottom waters will take several days.

Flushing of the marina is a function of several factors. Among them are the marina hypsography and orientation to the coastline and prevailing winds, the infiltration in storm runoff volume and tidal prism, the wave environment both in and outside of the marina, water quality and stratification anticipated within the marina, and the coastal circulation at the marina entrance. Evaluating each factor, combining and weighing their individual importance while considering seasonal extremes for each is required to develop an estimate for marina flushing. The resultant flushing rate is usually given in days per marina turnover volume.

Analyses were completed for the project's preferred marina configuration (the marina entrance channel within the deep draft harbor entrance) and determined a typical marina flushing rate of 3 to 5 days. The analyses considered that the marina's landward most portion was connected to a deeper wave absorber portion which in turn was directly connected to the Barbers Point Deep Draft Harbor. This concept provides the optimum suppression of incoming waves and therefore the most benign marina environment.

The two other marina entrance configuration i.e., a parallel entrance channel adjacent to the Barbers Point Deep Draft Harbor entrance channel and a completely separate marina entrance channel, provide a more active marina environment. In addition, the separate marina entrance configuration has more direct communication with the coastal waters. Therefore, though the flushing input conditions in the landward portion of the marina are similar for all three marina concepts, the difference in entrance hypsography wave environment and alignment to the coastline are expected to provide different flushing rates for each concept. The most benign and, therefore, most protective marina environment would possess the longest flushing rate. Any other concept with more direct, open connection to the near shore environment would have added mixing and thus an increased flushing rate, i.e., a shorter residence time.

The flushing analyses were repeated for the two remaining entrance configurations. These analyses considered the inner portions of the marina to be identical for each concept, while having considerable differences in the entrance hypsography, incoming waves, and circulation at the entrance. Comparative factors were computed for each parameter and were combined to determine the overall effect. Results were compared to the favored concept of shared use of the deep draft harbor channel. In this way, a direct comparison of flushing estimates for each entrance channel was developed. The base factor of 1.0 was assigned to the favored concepts; i.e., 1.0 x residence time (3 to 5 days).

The parallel entrance channel concept's overall comparable factor was found to be 0.87. This concept has a more active wave environment, and increased hypsography. The net result is an improvement in flushing, i.e., slightly shorter residence time, 2.6 to 4.4 days.
The separate marina entrance concepts overall comparable factor was estimated at 0.93 (2.8 to 4.7 days). In this case, the incoming wave environment is more active, but the entrance hypsography is slightly more restricted than the parallel channel scheme. However, the channel alignment communicates more readily with the higher quality coastal waters. The end result is an improvement in flushing compared to the shared entrance but not as much as, in terms of total volume, the parallel entrance channel concept.

9.2.19 Winds and Waves in the Marina

Tradewinds at the site are expected to vary in strength annually from 5 to 20 knots, averaging 12.2 knots. The predominant tradewind direction is from 070° true. Trades are expected to occur up to 90% of the summer days and 50% of the winter days. Periods of calm occur 1.5% of the year. Kona conditions of weak winds and Kona storms with winds from the south and west quadrant may occur a few days each year. Storm wind speeds generally reach 30 knots. The strongest wind, reported as observed at the site on January 3-14, 1979, was 40 knots sustained, gusting to 83 knots.

The trades predominate throughout the year and will thus be responsible for producing the typical wave climate found within the marina. Surf, swell and storm surge entering the marina will of course be the far more significant wave activity that could cause damage within the basin if not removed at the marina entrance by the proposed spending beach. The subject of sea state conditions at the marina entrance is discussed by Gerritsen (1984). The tradewinds blowing across the marina will, however, induce circulation, as has been discussed earlier, plus establish a wind chop within the marina with reasonably consistent wave activity.

It is estimated that under typical tradewind conditions small 0.1 to 0.3 foot waves with 1.5 to 2.0 second periods are expected in the marina. During extreme conditions of strong trade or 40 kt Kona winds, the fetch across the marina could allow waves up to 1.3 feet in height to develop. In this case, the western and seaward most portions of the marina will have the greatest wave activity from tradewinds. This side will also tend to accumulate most of the surface debris and floatables reaching the harbor from use of marina and surrounding grounds. During Kona storms, the landward-most berths of the marina will experience the greatest wave activity.
9.3 Conceptual Design of Lagoons

The West Beach Project has as one of its major features the development of a number (4) of lagoons lined with sandy beaches (Figures 7, 8 and 9). The lagoon concept evolved from elongated basins connected with the ocean by channels or ducts to provide the necessary flushing to semi-circular or elliptically shaped areas in which the beaches are shaped and maintained by natural wave action.

The latter are modelled after the existing natural lagoons of the adjacent Campbell estate to the north of the project.

For the lagoons, the general design criteria may be defined as follows:

(a) Beaches must be naturally stable but may fluctuate in slope and plan-form due to the dynamics of ocean waves and nearshore processes.

(b) Flushing must be adequate to maintain clean water.

(c) Entrance structures must be stable to withstand wave action under all conditions.

(d) Swimming and bathing must be safe under common conditions; unsafe conditions of high swell.

9.3.1 Stability of Lagoon Beaches

The stability problem has three important aspects.

* expected beach slope
* expected plan form
* expected changes in beach slope and plan form as a result of changing wave and tide conditions.

9.3.2 Beach Slope

In order to make an estimate of the prevalent beach slope, the two dominant parameters are: wave characteristics and sediment characteristics.

It has been known from observations on many beaches that the slope of a beach varies depending on the characteristics of the beach sediments and the degree of wave exposure (Gerritsen, 1978).

As far as the characteristics of the sediment are concerned, various factors play a part but the most significant one is the grain size of the beach material.

Figure 6 shows the relationship between beach slope and sand size at mid-tide for a number of Hawaiian beaches. In this figure three curves are drawn:
Relationship between beach slope and sand size at mid-tide for Hawaiian beaches.
For exposed beaches, for moderately protected beaches and for protected beaches. These curves are taken from Bruun (1976) (original source Bascom (1951)) and have reference to mainland beaches; they show that on the whole Hawaiian beaches fit the characteristics of mainland beaches. Wave exposure is not a sharply defined term; it indicates, however, that generally high exposure is characterized by high waves as well as high period.

The beach slope is usually taken as an average slope between the M.L.W. and M.H.W. water lines. In some instances this slope extends itself seaward to the breaking point.

Regarding the slope of beaches, some beaches in exposed areas are characterized by one or more offshore bars, on which the waves break. In less exposed beaches this is usually not the case, although some minor bar(s) may be present.

The beaches of the West Beach lagoons may be considered to be in the category moderately exposed beaches, and therefore, the middle curve of Figure 6 may be applicable.

In the design of the beaches, we have a choice to select the sand diameter. It is preferable to select a coarse beach sand with average diameter of 1/2 - 1 mm and an estimated beach slope of 1:5 to 1:6.

The fairly steep beach slope induces a wave run-up, which is higher than for a beach of lesser steepness. However, the coarse sand is much less likely to go into suspension in the breaking waves.

If a coarse sand is selected, the loss of sand from the beach by induced currents is consequently also of lesser magnitude.

Due to the shape of the plan-form, the beaches at the two corners of the semi-circular or elliptical bay are less exposed and the beach slope may be expected to be somewhat reduced in these areas. Furthermore, some sorting of beach material will take place whereby the finer particles will move to the more protected sections.

For design purposes, it is assumed that opposite the middle of the gap, the beach slope will be 1:6, ranging from -3 to +6 ft. (M.S.L.) In the more protected areas on the side, the beach slope will be reduced to an estimated value of 1:8.

In nature, most natural beaches conform to a parabolic cross-sectional shape. For design purposes, the proposed beaches have a 1:12 slope below -3 ft. to -6 ft. Below this level, a slope of 1:50 to -8 ft. is assumed.

The above gives a schematized representation of the parabolic beach profile.

Due to the impact of wave action, a sorting of beach sediment also will take place along the beach profile. The largest particles are found in the vicinity of the plunging point of the breaking wave.
9.3.3 Plan Form

In order to evaluate the expected plan form of the beaches, conditions at the entrance must be specified.

The philosophy of entrance design involves in general, the creation of two wide and shallow entrance areas, in which waves break at all times and by which wave induced mass transport enters the lagoon. A relatively deep and narrow section provides the opening, through which the wave induced flow can return to the ocean.

With an assumed entrance profile, wave energy flux entering the lagoons can be estimated.

A methodology has been developed to calculate equilibrium plan forms under given wave impact and has applied to the West Beach lagoons (Gerritsen and Dayananda, 1984). In this method the following assumptions are made:

1) Waves approach the coastline at right angles. With small apertures (as in the case under study) the effect of wave direction on plan form is assumed to be small.

2) The diffraction of the waves inside the lagoons is calculated using the numerical method of La Combe.

3) The wave pattern before reaching the beach slope, is also obtained by calculating the wave patterns from the propagation of energy flux (Huygens's method)

4) On the beach slope wave refraction is taken into consideration.

5) Equilibrium plan-form conditions were then obtained by calculating radiation stress components parallel and perpendicular to the coast and the resultant gradients in water level.

An equilibrium shape is obtained when the resultant longshore velocity equals zero. Results of the various calculation for the lagoons #1-4 are given in Figures 10 through 13. For details of the methodology reference is made to Gerritsen and Dayananda (1984).

9.3.4 Beach Dynamics

The calculated beach slopes and plan form are subject to change due to changes in wave characteristics and water level conditions, such as:

(1) During high swell conditions, the water level outside the lagoon will be considerably increased (2-3 ft) due to wave set-up.

This changes the ratios between energy fluxes through the shallow portions and deep portions of the gap and thereby influence the shape of the plan form.
A distinct wave direction difference from the normal (perpendicular) one will also affect the shape of the beach making it asymmetrical rather than symmetrical.

(2) During those conditions more energy will pass through the gap and the beaches will tend to erode, depositing the material in deeper sections.

(3) During high swell conditions wave group effects will be considerable thereby inducing a long period oscillation of the water level in the lagoon and on the beach. Due to this effect wave run-up will be increased which will affect the level of the berm.

(4) Changes in beach profile and planforms will also be induced due to the effects of hurricanes, such as Hurricane Iwa in November, 1982.

(5) In view of the above wave and beach dynamics, it will be necessary to leave sufficient space between the proposed average beach profile and any structures. This includes the proposed walkway along the beach.

9.3.5 Entrance Structures

It is assumed that the local barrier of beach rock, that runs along the entire project, is of such quality that it will withstand wave action at the entrance.

Further studies on the quality of this rock are necessary to evaluate whether or not this rock has the assumed structural integrity.

At this point in time, it is furthermore assumed that no further protective works are necessary to restrict the maximum wave action entering the lagoon.

In this respect, it will be necessary to take a closer look at the conditions that are assumed to constitute safe swimming conditions and their frequency of occurrence.

Such analysis will then reveal whether or not it will be necessary to design protective structures outside the lagoon entrance to limit maximum wave energy inside the lagoons. According to A.A. Yee Division, Leo A. Daly consulting engineers, the most recent studies conducted under the winter field program have indicated that additional structures are not necessary.

9.3.6 Safe Swimming Conditions

Safe swimming conditions are characterized by the following criteria:

(1) wave heights not to exceed a maximum wave height

(2) wave induced currents not to exceed maximum values

(3) return flow through gap not to exceed maximum values

(4) long period water level fluctuations not to exceed certain magnitude.

The following criteria are suggested:
* Wave heights inside lagoons not to exceed 2.5 ft.
* Wave induced currents not higher than 1.5 kn in shallow entrance area
* Wave induced return flow through middle gap not to exceed 1.5 knots
* Long period water level fluctuations not to exceed 0.5-1 ft.

Lagoons will be designed in such a manner that under operational conditions the above criteria will be met. During extreme weather and/or wave conditions, these limits may be exceeded but timely warnings should be given to advise against swimming under those conditions.

A special study is presently underway to evaluate waves and currents during winter conditions at the existing Kamokila Lagoons. This study will provide valuable additional information for the detailed designing of the West Beach lagoons.

It must be noted that long period oscillations induced by surf beat and by wave group effect on breaking induce strong velocities in entrance cross-section. These velocities also depend on the depths of the entrance sections.

9.4 Conceptual Design of the Marina

The proposed marina at West Beach covers approximately 33.9 acres of water area and is intended to provide private slips for sail and power boats, slips for commercial boats for charter fishing and dinner cruises, a public boat launching ramp and support facilities such as fuel dock, pump out facilities, car parking and some modest repair facilities.

The Marina is approximately 2,900 ft. long (including 900 ft. of entrance channel) and is 950 ft. wide at its widest point. The basin will be 15 ft. deep below MLLW and will have a minimum channel width of approximately 200 ft.

From a navigational point of view design requirements differ for the marina basin and entrance channel. In the entrance channel, allowable wave heights are higher than in the basin.

Specific elements to be considered in the design are:

- Configuration, size and orientation of the basin, adequate to meet project requirements;
- An entrance channel that provides safe navigation conditions to the marina;
- Measures to prevent wave action from entering into the basin;
- Measures to reduce wave agitation in basin;
- Measures to prevent serious sedimentation of entrance channel.

A short discussion of several design considerations is given in this report.
9.4.1 Marina Entrance

In this section, we will discuss entrance location and special measures required for dissipating wave energy.

Conceptually there are three possible locations for the entrance to the marina:

- entrance inside deep draft harbor,
- separate traffic lanes in an enlarged combined entrance channel for both commercial and recreational navigation,
- separate entrances for deep draft harbor and marina.

The solution to be selected must meet the following requirements:

- safe maneuvering for incoming and outgoing boats (adequate width of shipping lanes)
- adequate orientation with respect to prevailing winds;
- absence of strong circulatory flow patterns (eddies) which adversely affect navigation and promote sedimentation in entrance;
- absence of strong wave reflection and confused seas;
- adequate vision for both traffic entering and leaving marina and in areas where commercial and recreational traffic lanes interfere;
- minimum adverse effect on the littoral drift and consequently on the stability of adjacent shorelines.

The alternative design solutions for the marina entrance have been tested in a hydraulic model in the J.K.K. Look Laboratory of the University of Hawaii.

9.4.2 Wave Conditions in Marina Entrance

It is of interest, both with respect to marina design and navigational concerns, to make an estimate of the wave height at the marina entrance. For the joint channel solution, the marina entrance is defined as the area represented by measuring station #3 in the deep draft harbor model study (Figure 14).

9.4.3 Separate Channel

For the separate channel, a location at the crossing of the axis of the approach channel and the original shoreline defines the entrance area.

When a separate entrance of 25 ft. depth is dredged, wave energy will decrease along the axis of the channel in shoreward direction due to channel refraction.

Refined calculations could be made to determine wave conditions at the marina.
entrance (as defined above), but in view of the model studies conducted at the J.K.K. Look Laboratory, such calculations were not felt necessary.

Nevertheless, an estimate has been made of the reduction in wave height in the channel; such estimate is presented in Figures 15 and 16. In Figure 15, the ratio between the estimated wave height at the entrance and the deep water height is plotted against the deep water wave height.

It is estimated that the wave height at the entrance is 50-75% of the deep water wave height which ratio varies with wave height. In Figure 16, the estimated wave height at the entrance is plotted against the deep water wave height.

9.4.4 Joint Use Channel or Parallel Channel

Model studies carried out previously give information on wave height in station #3 (Figure 14). These data may be used to obtain insight into wave height conditions at the entrance to the channel (Look Lab Report #8, 1970).

Diagrams similar to Figure 16 may be drawn to determine the wave height at Station #3 (H_3) versus the wave height in deep water (H_o).

It appears that both the wave period and the wave direction affect this ratio.

Although the data are for selected conditions and some trends seem not well defined, the following general conclusion can be drawn.

1. For the directions W-WNW-NW waves in the entrance are generally higher than for the more southerly directions.

2. There is a dependency on both wave height and wave period.

3. For wave heights in deep water of 14 ft. and a wave period of 8 seconds the wave height at station #3 reaches its highest value (of the date plotted), of 9 ft. (Figure 17).

4. Waves larger than 20 ft. were not tested in the original Barbers Point Deep Draft Harbor model so that no information on the wave heights in Station 3 is available for those conditions. It is estimated that during a hurricane (H_s = 35 ft) waves in the entrance may reach values of above 10 ft.

The completed model study provides additional information on this condition.

The observation that waves from the direction S-SW do not generate the highest waves in the entrance channel is not directly obvious, because the channel has an orientation toward S.W.

Apparently under waves from the S.W. wave refraction will divert much wave energy away from the channel leading to lower waves in the entrance area.
FIGURE 15
ESTIMATED RATIO OF WAVE HEIGHT AT MARINA ENTRANCE AND IN DEEP WATER
SEPARATE ENTRANCE CHANNEL

FIGURE 16
ESTIMATED WAVE HEIGHT AT MARINA ENTRANCE-SEPARATE ENTRANCE CHANNEL
WEST BEACH WAVE HEIGHTS
FIGURE 17

WAVE HEIGHT IN ENTRANCE CHANNEL OF DEEP DRAFT HARBOR (STA #3)
DIRECTION W - WNW - NW

(SOURCE: HYDRAULIC MODEL STUDY)

WEST BEACH WAVE HEIGHTS
9.4.5 Entrance Inside Deep Draft Harbor

This solution utilizes the 450 ft. wide and 42 ft. deep entrance channel to the deep draft harbor and thereby provides an all weather safe access route to the marina (Figure 18). This includes storm conditions and thus, is an important advantage.

The nearby small boat harbor at Waianae do not provide all-weather access.

Using the existing deep draft harbor channel will furthermore have a minimum adverse impact on the coastal environment outside the entrance; there is no adverse impact on littoral drift conditions. With the entrance to the marina located off of the deep draft harbor entrance channel, no offshore dredging would be required. Consequently, no existing coral or offshore habitat would need to be removed to create an entrance for the marina.

A solution that involves the marina entrance inside the deep draft harbor must be designed in such a way that it maximized wave energy dissipation. One of the ways to do this is to provide a so-called Spoiling beach (slope 1:10 or less) arrangement. The proposed solution (Figure 18) has such an arrangement. Such a solution is believed to also have a favorable effect on the wave environment of the deep draft harbor.

A marina entrance inside the deep draft harbor may be located near the entrance or further inside the harbor basin. A location close to the ocean has two distinct advantages:

1. excitation of long waves will be smaller;

2. no interferences between boats entering the marina and commercial ships in the process of berthing.

The disadvantage of this solution is the joint use of the entrance channel by both commercial and recreational vessels and the possibility of a collision. It is recognized that the U.S. Army Corps of Engineers did not design the deep draft harbor entrance channel for joint use by commercial and recreational vessels. However, expected commercial traffic densities are low and a joint use of the existing channel could therefore be considered. A proper warning system should then be installed to secure collision free traffic. Furthermore, a proper warning system may alleviate some or all of these problems. Maintenance responsibility of a joint usage channel is currently unresolved but will be an issue to be addressed by State Department of Transportation Harbors Division.

9.4.6 Separate Traffic Lanes In Combined Entrances

This solution has the advantage of separating the traffic flows for the marina and the deep draft harbor, potentially reducing the risk of collision (Figure 19).
This solution invites more energy into the marina given the same width of entrance. A reduction of the entrance width to the marina may be necessary. The impacts of this solution on the deep draft harbor has been studied in the hydraulic model. This option may expose the existing barge harbor basin to more direct wave attack from NW waves. The favorable effects on reducing wave height in the deep draft harbor may not be as significant as in the first solution with a joint entrance channel.

This alternative would require the removal of a 200 foot wide section of the shoreline as well as entail offshore dredging approximately 650 feet offshore (to the -20 contour) for a width of 200 feet removing any existing coral or benthic habitat in this area.

Construction of this entrance would increase the dredging costs for the marina an additional 13%.

9.4.7 Separate Entrances

A separate entrance is likely to improve the water quality in the marina because there is no direct connection between the two basins (Figure 20). Water in the commercial harbor is likely to have a lower standard because of pollution associated with activities in this basin.

The major advantage is the complete separation of the two different flows of navigational traffic so that danger of collision is at a minimum.

For a separate marina entrance, a depth of 25 ft. below MLLW was selected in order to reduce the number of days that the entrance becomes un navigable because of waves breaking in the channel.

Even with a 25 ft. depth of the channel, such condition is expected to occur several days per year.

In the marina basin, waves are reduced in height and a depth of 15 ft. below MLLW is therefore, adequate.

When waves break in the marina entrance channel conditions are hazardous for entering vessels. Under those circumstances, yachts could still use the deep draft harbor as a harbor of refuge, but such use of the deep draft harbor channel is undesirable because of safety and other reasons, (e.g. lack of adequate docking facilities for yachts in big harbor).

A yacht owner may make the wrong decision by trying to use the marina channel despite its unsafe condition due to breaking waves, and may thereby get himself into a hazardous situation.

Furthermore, a separate harbor entrance will have a greater adverse impact on the offshore environment because of necessary dredging and of impact to the shoreline and offshore bottom in the immediate vicinity of the entrance.

Sedimentation of the channel, which is likely to occur, will require regular maintenance dredging. A 200 foot wide section of shoreline would need to be
removed and an offshore channel dredged approximately 1500 feet long (to the -25 contour) and 200 feet wide. Therefore, all existing coral and benthic habitat in this area would be removed by dredging. Construction of this separate entrance channel would increase dredging costs for the marina approximately 12%.

9.4.8 Marina Basin

The size, configuration and orientation of the marina basin were determined by planning considerations of external circumstances, such as the required distances from deep draft harbor hazard zones.

Depending on boat size the available harbor will provide space for 350 to 500 boats, making the marina one of average size.

In the design of boat slip arrangements, attention must be paid to the following aspects:

- predominant winds and short period "chop";
- wave absorption devices;
- avoidance of debris traps;
- flushing of debris;
- adequate maneuvering space;
- adequate depth (15 ft. below MLLW)

With respect to wave absorption the long breakwater facing the south side of the harbor will be constructed as a wave absorber.

The other walls are conceived as vertical sheet pile walls; the docks and piers will be of the floating type.

9.4.9 Other Hydraulic Considerations

Other hydraulic considerations that may affect the efficiency of the marina are:

* response to long period and short period waves
* adequate flushing;
* sedimentation traps (for run off)

The long period waves of interest are tsunami waves, weather induced oscillations (hurricanes) and surf beat.

The harbor's own frequencies are away from the expected excitation frequencies of the ocean so that no special problems are anticipated (see K. Bathen, 1984).
The location of the marina entrance near the ocean boundary suggests that major interaction phenomena between the two harbor basins are unlikely.

9.4.10 Hydraulic Model Investigations - West Beach Marina

I. Description of Test Program

Hydraulic model investigations were conducted at the J.K.K. Look Laboratory of Oceanographic Engineering in Honolulu. Dr. T.T. Lee served as Principal Investigator.

Two types of model studies were conducted:

(1) A three-dimensional undistorted model, scale 1:100, covering the proposed marina, the adjacent Barbers Point Deep Draft Harbor, Barge Harbor, and the adjoining ocean area.

(2) A two-dimensional undistorted model in the wave flume, scale 1:10, for evaluating alternative marina boundary designs for wave energy absorption.

The objective of the three-dimensional model was to test the wave characteristics of three proposed entrance design concepts for the West Beach Marina (Figures 18, 19 and 20).

The objective of the two-dimensional studies in the wave flume was to evaluate the wave reflection coefficients of various structures: a sloping (1:10) spending beach, the vertical walls in the marina's berthing areas, and Igloo wave absorbers. Igloos are a specific type of vertical wave absorbers used in harbor basins. In the case of the West Beach Marina they are being considered for the entrance area as an alternative to the spending beach and as wave absorber in front of vertical walls in the marina basin.

The model test results will be used to select the best design for the marina with (i) minimum wave action within the marina boundaries; (ii) minimum adverse effect on the Barber's Point Deep Draft Harbor; (iii) acceptable navigation conditions for vessels entering the marina or the Deep Draft Harbor.

Seven test plans were studied as follows:

Plan O - The Deep Draft Harbor without the marina

Plan I - Marina entrance perpendicular to the harbor channel with spending beach and without Igloos.

Plan II - Marina entrance perpendicular to the harbor channel with Igloo wave absorbers.

Plan III - Marina with entrance parallel to the harbor channel with spending beach.
Plan IV - Marina with entrance parallel to the harbor channel with Igloo wave absorbers.

Plan V - Marina with separate entrance and spending beach.

Plan VI - Marina with separate entrance and Igloo wave absorbers.

Test conditions in the three-dimensional model included waves with periods of 6, 8, 12, 14, 15 and 20 seconds and heights of 12, 18 and 36 feet. Wave directions included S45°W, S22.5°W, S67.5°W, and W. The wave generators were located approximately at the 150 ft depth contour. The test water levels were +3.0 ft for moderate wave conditions and +4.0 ft for storm wave conditions.

In the two-dimensional model wave periods were 6, 12, 15 and 20 seconds with heights ranging from 1 to 4 ft. In this model, the effect of a section of floating marina pier on the wave reflection coefficient against a vertical wall was also investigated.

The results of these hydraulic model studies led to the following conclusions.

II. Conclusions

I. Impact on Wave Conditions in the Deep Draft Harbor

It was found during the test of the harbor without the marina (Plan O) that under certain conditions (e.g. \( H = 18 \) ft, \( T = 6 \) sec., Direction = S45°W) wave conditions at the berthing site in the Deep Draft Harbor exceeded a wave height of 4 ft. Under these conditions the maximum wave heights in the barge harbor near the entrance exceeded 10 feet.

Both Plans I and II, involving a perpendicular marina entrance, have a moderating influence on the wave heights in the deep draft harbor. Under the conditions listed above, waves at the berthing site are reduced to below 4 ft; the wave height in the barge harbor is reduced from about 10 ft to about 4 ft.

Plans III and IV, involving a parallel entrance, also have a moderating effects on the deep draft harbor waves but to a somewhat lesser degree than Plans I and II. Plans V and VI, with a separate marina entrance, do not have any significant effect on the wave conditions in the Deep Draft Harbor.

It is concluded that from a wave impact point of view, Plans I and II are superior to the other plans. There is no adverse impact on the wave conditions in the deep draft harbor. On the contrary improvements may be expected. Plans III and IV, although less effective than Plans I and II, have acceptable wave conditions. Plans V and VI appear to be less acceptable with respect to wave conditions than the other plans.

2. Wave Conditions in Marina

For Plans I and II wave heights inside the marina basin are below the maximum allowable limit of 2.0 ft under all tested conditions. For Plans III and IV,
wave heights exceed this level in a small number of test conditions. The same is observed for Plans V and VI.

It may be concluded that Plans I and II are better than the other plans.

A comparison between the three-dimensional test results of the conditions without and with Igloos at Stations 4 and 5 shows only minor differences between the two solutions. Based on the two-dimensional testing, it is likely that due to scale effects under prototype conditions, the spending beach solution will be better because of its lower reflection coefficient, especially for longer period waves.

3. Wave Conditions in Entrance Channel

Wave conditions in the entrance channel are important because they signify the navigation hazards when entering the marina under adverse wave conditions. In Plans I and II, the deep draft harbor channel allows relatively safe entering of yachts because its greater depth induces breaking of only very large waves which occur infrequently.

During certain test conditions (18 foot wave height, 14 second period and S22.5°W wave direction) in Plans I and II wave heights in the vicinity of the perpendicular entrance may reach or exceed 10 feet. Such conditions make entering hazardous, and these plans should provide sufficient maneuvering space to allow safe entering. It should be added that such conditions are uncommon and that under such circumstances crafts should not normally be attempting to enter or exit the marina.

In Plans III and IV under extreme wave conditions, the wave heights outside the entrance are higher than in Plans I and II. However, the parallel channel allows more room for maneuvering outside the marina entrance.

Inside the entrance the wave conditions are also higher than in Plans I and II, which make maneuvering difficult, although the maneuvering area in the configuration tested is somewhat larger than in Plans I and II.

In Plans V and VI, the most serious conditions will occur in the entrance channel offshore, where waves of 18 ft and higher were observed to break. The model test had no gage installed in that section so no direct measurements are available. The separate entrance test with Igloos (Plan VI) gave a slightly higher wave conditions than the test with a spending beach (Plan V). From a navigational safety point of view, the separate entrance alternative appears to be the least desirable.

4. Solutions With and Without Igloo Wave Absorbers

The differences between the test results for solutions with and without Igloos are small.

In the berthing areas, the wave heights seem to be slightly less for the Igloo solution than for vertical walls.
In the entrance, the spending beach should be more effective in view of the results of the two-dimensional tests.

5. **Two-Dimensional Test Results**

The two-dimensional tests in the wave flume, scale 1:10, provided adequate results regarding the reflection coefficients of alternative marina boundary conditions.

In comparing the Igloo solution with a vertical wall, the Igloos appeared effective for a wave period of 6 seconds but less effective for the higher wave periods of 12, 15 and 20 seconds. Measured reflection coefficients for a 6 second wave are:

<table>
<thead>
<tr>
<th></th>
<th>Reflection Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:10 Spending Beach</td>
<td>0.35</td>
</tr>
<tr>
<td>Igloo Wall</td>
<td>0.65</td>
</tr>
<tr>
<td>Vertical Wall</td>
<td>0.78</td>
</tr>
</tbody>
</table>

III. **Summary of Model Test Results and Observations**

The following table gives the qualitative results of the evaluation of the three major alternative West Beach Marina entrance configurations in terms relative to each other with respect to wave conditions and navigation. Wave frequency analysis and photos of model test wave refraction would be used to assist in selecting a channel alignment, however it should be noted that all of the alternatives produce acceptable wave conditions in the marina deep draft harbor.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Perpendicular Entrance</th>
<th>Parallel Entrance</th>
<th>Separate Entrance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harbor Wave Conditions</td>
<td>Best</td>
<td>Good</td>
<td>Worst</td>
</tr>
<tr>
<td>Marina Wave Conditions</td>
<td>Best</td>
<td>Good</td>
<td>Acceptable</td>
</tr>
<tr>
<td>Navigation</td>
<td>Best</td>
<td>Good</td>
<td>Worst</td>
</tr>
</tbody>
</table>

9.5 **Recommendations on Lagoon and Marina Design**

1. Recommendations are given regarding sand size, beach slope, and planform of lagoons (Figure 10-13). It is emphasized that at any given time, actual slope and planform may deviate considerably from calculated values. A considerable margin should be provided in set-back guidelines.

2. It is recommended, that the permanent walkway which encircles the lagoons should have an elevation of no less than 13 ft. above M.S.L. Minor overtopping during extreme conditions may still occur.

It is recommended that the set-back distance between walkway and 6 ft. beach contour should be no less than 100 ft. to allow for dynamic adjustments in beach profile and planform as a result of varying wave conditions.
3. Under extreme conditions existing coast elevations will be overtopped by wave run-up. An increase in coastal elevation and/or an adequate set-back distance from the shoreline must be provided to prevent damage to structures in the coastal zone near the shoreline.

Based on wave run-up calculations, the following recommendations are made:

a) Typically, the southern section of the project shoreline can best be protected by a 50 ft. wide coastal berm at elevation +16 ft. (M.S.L.).

b) Typically, the northern section of the project shoreline is best protected by a berm of varying elevation of a distance of 250 ft. from the shoreline.

From a wave run-up point of view, this berm elevation may vary between +12 and +16 ft. However, to provide adequate protection against tsunami run-up, a minimum elevation of +15 ft. is recommended (Bretschneider, 1984). The +15 ft. barrier against tsunami run-up may also be located further inland, however, if infrequent inundations of the areas near the shoreline are accepted in the overall planning concept.

4. Because of wave spray accompanying wave run-up during high waves, it is recommended that floor levels of buildings near the coast be no lower than 21 ft.

5. Plans for alternative solutions for the marina entrance are presented (Figures 18 through 20).

The solution with the joint use of the deep draft harbor channel (Figure 18) is considered the most attractive to the developer, one from both economic and environmental points of view. This solution provides an all-weather type of marina, which is considered a strong advantage.

The disadvantage of collision risk from joint use of the same channel can be reduced or eliminated by installing a proper buoy or warning system.

6. In view of the degree of accuracy present in current computational techniques for the stability and dynamics of lagoons, a winter field program at the existing lagoons is being conducted in 1984-1985 to measure wave conditions and beach behavior to verify some of the theoretical concepts used in the analysis of sandy beach behavior and the amount of artificial beach replenishment required.

Results of this study will then be used in the final design of the four lagoons.

9.5.1 Construction Methodology

The proposed method of construction for both the lagoons and marina at West Beach is to use the existing rock shoreline as a barrier to prevent loose materials suspended during construction from entering the coastal waters. Excavation of the lagoon and marina basins would be performed in three phases. Phase one would be excavation in the dry to an elevation slightly above Mean High Water. The second phase would be excavation in the wet to the bottom of the proposed lagoon lining materials or bottom of the marina. After the second excavation phase, the lagoons and marina would be lined with their respective bottom and/or perimeter materials. At this point, the lagoons and marina would be essentially complete except for the final excavation stage. This final excavation stage would consist of the removal of the coastal rock to create the flushing channels for the lagoons and the entrance channel for the marina. The last operation in the final excavation stage for the marina would be the placement of armour rock at the new entrance channel location.

With this construction sequence, exposure of the coastal waters to the impact of excavation and dredging will be kept to the minimum in terms of length of time and quantity of disturbance.

Materials for the lining of lagoons and marina (armour/wave absorber stone) are intended to come from the project site. Excavated sand and rock from the lagoon and marina sites will be sorted for reuse as lining and materials. Exceptions to this reuse principal for lagoon and marina lining would be very large basalt armour stone for the entrance channel wave absorber similar to that used for the makai part of the entrance channel for the deep draft harbor. This is material that they also obtained offsite typically from agricultural fields or new subdivision developments on the island.

Sand required for lining of the new lagoon beaches will come from the marina and lagoon sites as well as from sand deposits present along the West Beach project site. A preliminary sand resource survey has been conducted to determine the extent of the resource available. Accurate measurement of the amount of sand resource presently on the site and available is a difficult process. However, the predicted quantities required by the new lagoons appear to approximately match the quantities of materials available from the site. Only during excavation and recovery will the final quantities available for beach lining be determined. At that time, there may be a need for the sand resource to be supplemented from offsite.

The excavation of the lagoons and marina will produce far more material than is required for marina wave absorber stone or lagoon beach lining materials. This excess material will be used within the West Beach project for fill on sites adjacent to the lagoons and marina.

The construction technique and equipment to be used has not been finalized since the project is in the preliminary design stages. Preliminary borings done at the proposed lagoons and marina sites show that most of the site is covered with uncremented to lightly cemented silty sand and clayey silt. These materials can be readily handled by conventional excavation equipment.
and would be suitable for reuse as compacted fill. Well cemented sands and coral are encountered in some areas at shallow depths. For mass excavations, these materials can likely be ripped. Blasting or pneumatic hammering may be necessary in confined excavations in the cemented materials. The cemented material would be suitable for reuse as compacted fill although some sorting of the material may be needed to cull out oversized cobbles.

Final detailed geological investigations at the marina and lagoon sites are scheduled for early in 1985. The results of these investigations will provide more detail regarding the geological and geohydrological character of the sites.

Based on this information and the requirements to mitigate environmental disturbances as much as possible, the developer proposes to prescribe environmental performance criteria that must be met or exceeded by the contractor during construction. These performance criteria would include ground vibration limits, noise control measures to insure adherence to State and County noise regulations, and turbidity limits for coastal waters.
9.6 Tsunami Inundation Elevations

The tsunami inundation elevations 200 feet inland from the coastline were calculated to be 8.2 feet and 9.0 feet MSL for the 100-year and 140-year return period, respectively. The 100-year recurrence interval corresponds to a one percent chance of occurring in any one year. The 140-year corresponds to 0.7 percent change and also the average of maximum of record of 140 years.

The above values of 8.2 and 9.0 feet corresponds to the then existing terrain roughnesses at the time when tsunami run-up actually occurred and assumed MSL conditions. If extreme high tide also occurred 2 feet above MSL, the above elevations would be 10.2 and 11.0 feet respectively for the 100-year and 140-year return period.

If the terrain roughness is decreased by development, then additional run-up elevation height would result. Therefore, it is conservatively estimated (by calculation) that extreme tsunami run-up elevations would be 13.1 feet and 15.1 feet respectively for the 100-year and 140-year recurrence intervals. The tsunami elevations also vary from location to location and could be lower than the extreme conditions. It is estimated that the variance in the ± 90 percent confidence limits are ± 2.0 feet. Therefore, the mean tsunami elevations will be 11.1 feet and 13.1 feet respectively for the 100-year and the 140-year recurrence intervals.

In view of the above discussion, it is recommended that the tsunami design elevations be used as follows:

\[ 11 \pm 2.0 = 9 \text{ to } 13 \text{ feet MSL for the 100-year return period, and} \]
\[ 13 \pm 2.0 = 11 \text{ to } 15 \text{ feet MSL for the 140-year return period,} \]

where it is understood that 13 and 15 feet in the above values are intended for those areas where the existing terrain roughness will be smoothed, and 9 to 11 feet can be used where no change has been made nor will be made to existing terrain roughness. The average values of 11 and 13 feet can be used where only small changes in terrain roughness will be made.

9.6.1 Tsunami Hydrographs

The 100-year and 140-year tsunami hydrographs for the entrance to Barbers Point West Beach Marina were determined by amplification and Froude scaling of the reconstruction 1960 Honolulu tsunami hydrograph. The amplification factor was determined from the ratio of the 100-year (and the 140-year tsunami inundation limits between West Beach Marina and Honolulu in accordance with the Manual given previously in Section 1.h. Two types of hydrographs are given for each of the return periods, 100-year and 140-year as follows:

(1) Nonsinusoidal hydrograph in similitude with the reconstructed 1960 Honolulu tsunami hydrograph.

(2) A sinusoidal repeating hydrograph having a fundamental period and amplitude corresponding to the maximum of the non-sinusoidal hydrograph of (1) above.
9.6.2 Conclusion and Recommendations for Design Hurricane

Two extreme storm conditions have changed maximum design wave conditions for the south coast of Oahu, namely the 7-11 Jan 1980 Kona Storm and Hurricane Iwa, 23 Nov. 1982. These two storms have been analyzed in sufficient detail for the West Beach area to arrive at a design hurricane. The maximum value of the deep water significant wave height of 34.7 feet, which by coincidence corresponds to approximately the 100-year maximum significant wave as based on U.S. Army Corps of Engineers detailed hindcasts of non-tropical extreme storms, including kona storms.

Maximum significant wave heights for Hurricane Iwa (1982) were between 41 and 43 feet off Kauai corresponding to the 300-to-350-year return period and off West Beach of about 34 to 35 feet corresponding to approximately the 100-year return period. There was a squall line and a pressure jump in the barograph for Hurricane Iwa (1982). This pressure jump caused a bore type wave which caused water elevations of 17 to 19 feet above 11 to 13 feet MSL land at the Waianae Coast. These elevations were considerably higher than could be calculated by standard wave run-up procedures for concave slope.

Using storm tide of 3.2 feet and 0.8 feet MSL tide (+ 4.0 ft MLLW) for the design hurricane maximum wave run-up calculations for West Beach area were 10.8 ft MSL for straight slope and 12.7 feet concave slope, which for all practical purposes can be assumed to be 11 ft MSL and 13 ft MSL. The above values of wave run-up are compatible to the 11 ft MSL and 13 ft MSL tsunami wave run-up mean values for the 100-year and 140-year recurrence intervals.

In the same method or reasoning as given for the ± 90 percent confidence limits for tsunamis, it is concluded that the design hurricane wave run-up will be 11 ± 2.0 ft MSL and 13 ± 2.0 ft MSL.

Therefore, it is recommended that the design hurricane wave run-up be established at the same elevations as the design tsunami wave run-up recommendations.

9.6.3 Conclusions and Recommendations Based Wave Recorded Data Analysis off West Beach

Sea Engineering, Inc. (1983) recorded 798 34-minute wave data sets. These data represent one of the most comprehensive recorded data sets to date in Hawaii, and first off West Beach area. However, the instrumentation was installed after the 1980 Kona Storm and was retrieved prior to the 1982 Hurricane Iwa. Nevertheless, very much useful information on types of waves off West Beach were recorded.

In particular, long periods swells appeared in almost all wave records, swells from the south and swells from the west-northwest-north. There were many wave records for which short period maximum wave heights were superimposed on the long period swells. Perhaps this is one of the reasons why observed wave run-up elevations often exceed wave run-up calculated by standard techniques.
9.7 Biological Conditions and Impacts of the Lagoons and Marina

9.7.1 Description of the Adjacent Marine Environment

Nearshore waters in the West Beach area are classified "A" in Department of Health water quality regulations (State of Hawaii Water Quality Standards, Chapter 54, Title II, November 12, 1982). The water quality conditions of the nearshore area adjacent to the West Beach project have been described (Bienfang and Brock, 1980). The area was found to be a pristine, unperturbed coastal region. Temperature and salinity values were indicative of open, well-flushed coastal areas which are minimally affected by surface runoff. Water clarity was excellent and turbidity levels were low. Other studies have reported variable turbidity levels, depending on surge and tidal conditions (Kimmerer and Durbin, 1975). Dissolved nutrient levels were low and typical of well-flushed coastal areas. Some evidence (elevated nitrate levels and decreased salinity levels) of groundwater intrusions along the coastline was observed.

Recent construction activity immediately to the south of the project site at the Barbers Point Deep Draft harbor has caused changes in the ambient conditions since the 1980 survey. A surface plume of high-turbidity water typically is discharged from the Deep Draft Harbor on a continuous basis. Localized dredging of the entrance channel adds to the levels of turbidity. This plume travels to the north along the coast afronting the project during ebb tide (Batten, undated data report), and is not completely displaced by non-turbid water during flood tide (Brock, pers. comm.).

The area offshore of the project site between the shoreline and the 18 m depth contour contains seven recognizable benthic biotopes. A shallow low (13–18%) coral coverage area is located along the shoreline to a depth of 5 m (approximately 100 m offshore). This zone receives a considerable amount of scouring due to wave activity. The substrate is primarily solid limestone with small scattered corals. The assemblage of fish in this biotope is not particularly diverse; the most common are surgeonfishes and wrasses.

Offshore of this well-scoured area is located an extensive area of high (58%) coral coverage which extend to a distance of 500 to 1,000 m offshore. The substrate is predominantly limestone with scattered pockets of sand and rubble. Fish diversity in this biotope is high; surgeonfishes, wrasses and damselfishes are most abundant. Macroinvertebrates other than corals and macroalgal algae are scarce.

Further offshore (to a distance of approximately 1,000 m) is located an area of scattered large Porites lobata colonies which grades into an area of deeper water with low (8–12%) coral coverage. The area of large Porites heads extends over a kilometer to the south of the entrance to the Barbers Point Harbor. The substrate of both these biotopes is predominantly limestone, often overlain by a thin veneer of sand and rubble. Fishes are more abundant in the area of large Porites than in any other area. Most species are found in the other biotopes as well, however. Surgeonfishes, wrasses and damselfishes are most abundant. Macroalgal algae and other macroinvertebrates are not common.
At the northern boundary of the project site, directly offshore of the Alice Kamokila Campbell residence, is located an area of extensive sand channels. The depressions and channel floors are covered with sand and are from 2 to 5 m deep and 1 to 50 m wide. Fish and macroinvertebrates are relatively low in abundance.

North of the sand channel biotope is an area of diverse high (14-48%) coral coverage which is a continuous feature north of the project site (Kimmerer and Durbin, 1975; B-K Dynamics, 1971; Jokiel and Coles, 1974) extending to Kahe Point. This area offshore of the northern portion of the project site has been characterized as having luxuriant coral growth with an associated diverse and abundant fish assemblage (AECOS, 1979). Coral diversity in this area is highest of any area off West Beach. Fish are relatively abundant, and most common are the surgeonfishes and wrasses.

A small area of ridges of mostly dead Porites compressa is located at the southern boundary of the project site.

9.7.2 Activities Potentially Impacting the Marine Environment

Physical damage and siltation during construction - Dredging of the wave and discharge channels to the lagoons will directly impact the marine communities living on the substrate to be removed. Adjacent populations may be adversely affected by blasting, if used, or siltation from dredging; the magnitude of these impacts, when considered in the context of the shoreline as a whole, are likely to be minimal. The stretch of shoreline between the Barbers Point Harbor entrance and the Campbell estate is relatively barren, and the intertidal zone is not heavily populated with marine animals (generally between 5 and 20% coral cover) however, beyond the 3.5 meter isobath are extensive areas of high coral cover and abundant and diverse fish populations. The amount of shoreline directly affected is a small percentage of the total. The surfaces exposed in construction represent potential new habitat for replacements for the populations destroyed. Since the amount of new surface area will be greater than that existing previously, it is likely that populations will eventually reach levels equal to or higher than before construction.

Siltation during construction should be minimal. Lagoons will be dredged before the entrance channels are formed, and the construction of the channels should result in only very localized elevated suspended solids levels for only a short period of time. Corals, which are the organisms most susceptible to mortality due to siltation, are present but not highly abundant (5 to 20% cover). The amount of local siltation compared to that of the Barbers Point Harbor channel dredging operation, for example, should be small.
9.7.3 Freshwater (Groundwater) Re-distribution

The lagoons and marina, because they will be deep enough to intercept the natural seaward flow of subsurface groundwater, will act as point-source discharges of low salinity, relatively high nutrient, water to the marine environment. The amount of water reaching the ocean will not increase, since the natural flow presently reaches the ocean as a diffuse outflow through the ocean bottom itself. The potential impact stems from the change from a diffuse discharge in an area of high energy (the near-shore and intertidal zone) which results in very rapid mixing and dilution, to a situation in which the groundwater is collected and discharged as a distinct surface layer at a particular point. Such point discharge flows are expected to be relatively small, however, especially compared to that of the adjacent Barbers Point harbor, and will probably have only very localized impacts.

The low salinity, high nutrient water has the potential to stimulate the growth of microalgae within the marina and lagoons and macroalgae on surfaces which it contacts, such as the discharge channel and the nearby ocean bottom. Microalgal growth would only become visible during periods of low flushing; projections of flushing rates for the lagoons and marina suggest no microalgal blooms would occur under any except infrequent low wind, low surf, conditions. Macroalgal growth would be limited to areas of hard substrate (consolidated limestone or coral rubble) which is continuously exposed to this high nutrient water.

9.7.4 Runoff and Siltation

During periods of heavy rainfall, the capacity of the drainage basin to absorb excess water may be exceeded, and surface flow will result. This flow is presently planned to be discharged into the ocean at two points: the majority of the flow will be channeled into the marina, from whence it will reach the ocean via the marina or the Barbers Point Harbor entrance channel, depending upon which channel alignment is eventually selected and approved; and the balance will be discharged at the shoreline north of the Hawaiian Cultural Center. Until Phase IV is completed, the marina will act as a settling basin and percolation-evaporation pond, collecting runoff during storm events and holding the water while it percolates into the ground or evaporates. Calculations of maximum volume flow during storm events and the retention volume of the marina indicate that the volume of the marina is sufficient to receive all surface flow channeled to it without overflow under most likely rainfall conditions.

After the marina is completed, both the marina and the northern discharge will discharge storm water to the ocean as a surface layer. Depending on the surf conditions, flow volume and sediment load, this flow may persist as a visible surface plume. This intermittent flow is similar to that which occurs in several natural streams along the Waianae coast, which discharge sediment-laden water into the ocean during heavy rainfall. The relative impact of the West Beach discharges will probably be less than those of the natural streams, since much of the West Beach flow will be over either solid, non-eroding surfaces (concrete, asphalt) or well-grassed landscaping areas, and will be channeled in grassed swales or box culverts. The marina will act as a settling basin for the majority of the discharge from the West Beach project area.
9.7.5 Increased Shoreline Access

The West Beach development will open up an area which is now relatively inaccessible to a potentially much greater use by recreational and subsistence fishermen. At present, most fishing in the area is by pole-and-line, and the target species are mostly reef fish. Increased fishing pressure could potentially adversely affect the local stocks of these fish, although projections of impacts for a nearby project suggest the impact of increased fishing will be small. The presence of the marina with its launching and berthing facilities will probably result in an increase in boat-based fishing activity along this stretch of coastline, with potential negative impacts to fisheries such as the offshore bottom-fishes, which appear to be at or near maximum sustainable yield. Increased sport fishing could also be expected.
9.8 Air Quality Considerations and Impact

The report contains a discussion of relevant Federal and State of Hawaii Air Quality Standards, a description of present air quality in the project area, a modeling study of potential worst case carbon monoxide concentrations likely to result from different projected traffic scenarios, and a discussion of potential short and long term measures that might be employed to mitigate any adverse air quality impacts that could result from construction of the project as proposed.

9.8.1 Summary

The proposed West Beach Project involves construction of a residential/resort community on a 642 acre parcel of land located between Barbers Point and Kahe Point in southwestern Oahu (Figure 21).

Federal and State of Hawaii Ambient Air Quality Standards (AQS) have been set for six classes of pollutants: particulates, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone and lead. For most pollutants the State of Hawaii AQS are considerably more stringent than Federal levels. Public hearings have been held on a proposal by the State Department of Health to revise State of Hawaii AQS for particulates and sulfur dioxide to match Federal levels, but a decision on the matter has not yet been announced.

Having previously been used for sugarcane growing, the project site is currently unused and emissions of air pollutants are therefore minimal. Significant outside air pollution sources that could affect air quality in the project area include periodic cane fires, traffic on Farrington Highway, stack emissions from the Kahe Power Plant, and fugitive and stack emissions from oil refineries and other industrial activities located in the Campbell Industrial Park (Table 8).

Sugarcane fires represent the only emission source likely to cause the current State of Hawaii AQS for particulates to be violated, but Federal AQS are not likely to be exceeded by this source.

Although measured levels of sulfur dioxide at the Barbers Point long term monitoring station are very low, recent modeling studies indicate that sulfur dioxide concentrations in the vicinity of West Beach from both the Kahe Power Plant and sources within the Campbell Industrial Park could be in excess of allowable State of Hawaii AQS under unfavorable meteorological dispersion conditions. However, same studies show that Federal limits are likely to be met. It is important to note that the geometry of the West Beach/Kahe/Campbell Industrial Park is such that it would be nearly impos-sible for air pollutant emissions from Kahe and Campbell Industrial Park to affect West Beach at the same time. Further, surface winds from Kahe blow towards West Beach only about 3% of the time and those from Campbell Industrial Park blow toward West Beach only about 2% of the time.

Motor vehicles are the major source of carbon monoxide in the area (Table 9). A monitoring program of traffic generated carbon monoxide conducted in 1979 indicated that levels of this pollutant along Farrington Highway were
### TABLE 8

PARTICULATE AND SULFUR DIOXIDE EMISSION RATES FOR SIGNIFICANT INDUSTRIAL SOURCES IN THE WEST BEACH AREA

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>PARTICULATES</th>
<th>SULFUR DIOXIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawaiian Electric</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kahe Units 1 - 6</td>
<td>Not Available</td>
<td>411.3</td>
</tr>
<tr>
<td>Chevron Refinery</td>
<td>11.08</td>
<td>187.49</td>
</tr>
<tr>
<td>Hawaiian Independent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refinery (HIRI)</td>
<td>2.68</td>
<td>51.66</td>
</tr>
<tr>
<td>Hawaiian Western</td>
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<td></td>
</tr>
<tr>
<td>Steel</td>
<td>8.0</td>
<td>0.5</td>
</tr>
<tr>
<td>Lonestar Hawaiian</td>
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<td></td>
</tr>
<tr>
<td>Cement</td>
<td>2.0</td>
<td>0.02</td>
</tr>
<tr>
<td>ENERCO</td>
<td>0.15</td>
<td>0.12</td>
</tr>
<tr>
<td>Barbers Point NAS (boilers)</td>
<td>0</td>
<td>0.18</td>
</tr>
</tbody>
</table>

Source: Reference 3, 1983
TABLE 9

RESULTS OF PEAK HOUR CARBON MONOXIDE ANALYSIS  
(milligrams per cubic meter)

<table>
<thead>
<tr>
<th>SITE 1</th>
<th>1982</th>
<th>1992</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1</td>
<td>0.9</td>
<td>0.8</td>
<td>1.7</td>
</tr>
<tr>
<td>Case 2</td>
<td>5.3</td>
<td>5.6</td>
<td></td>
</tr>
<tr>
<td>Case 3</td>
<td>5.3</td>
<td>5.6</td>
<td></td>
</tr>
<tr>
<td>Case 4</td>
<td>7.8</td>
<td>7.8</td>
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</thead>
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</tr>
<tr>
<td>Case 4</td>
<td>5.1</td>
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<td>9.6</td>
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<table>
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<tr>
<th>SITE 3</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1</td>
<td>1.5</td>
<td>1.2</td>
<td>2.8</td>
</tr>
<tr>
<td>Case 2</td>
<td>5.4</td>
<td></td>
<td>6.3</td>
</tr>
<tr>
<td>Case 3</td>
<td>5.5</td>
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<td>7.7</td>
</tr>
<tr>
<td>Case 4</td>
<td>8.2</td>
<td></td>
<td>9.7</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>SITE 4</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1</td>
<td>2.8</td>
<td>2.3</td>
<td>5.1</td>
</tr>
<tr>
<td>Case 2</td>
<td>3.7</td>
<td></td>
<td>7.5</td>
</tr>
<tr>
<td>Case 3</td>
<td>6.6</td>
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<td>10.0</td>
</tr>
<tr>
<td>Case 4</td>
<td>6.7</td>
<td></td>
<td>10.9</td>
</tr>
</tbody>
</table>

STATE OF HAWAII AQS: 10
FEDERAL AQS: 40

NOTES: See Figure for location of receptor sites.
Case 1 = no build
Case 2 = build, with surface arterial over route other than Farrington Highway
Case 3 = build, with additional traffic lane on Farrington Highway
Case 4 = build, no change to Farrington Highway
running about 1 to 3 milligrams per cubic meter. Federal laws have mandated substantial annual reductions in vehicular carbon monoxide emissions through 1995. A carbon monoxide modeling study carried out in conjunction with this report produced current worst case predictions of 1 to 3 milligrams per cubic meter in the same area as the previous monitoring study. These levels are well within the State of Hawaii AQS of 10 milligrams per cubic meter for a one hour period. At present, sugar cane fires represent the only emission source capable of causing the AQS for carbon monoxide to be violated in the West Beach area.

Nitrogen dioxide levels in the project area appear to be much lower than allowable AQS. Lead levels in the project area are estimated to be low and Federal regulations gradually curtailting the use of leaded gasoline seem to be having an effect in lowering measured lead levels throughout Oahu.

The major direct air quality impact of project development will be in the form for fugitive dust generated during the estimated 10 year construction period that will be required for project completion. Once the project is completed, however, it will no longer be a direct source of air pollutant emissions.

By serving as an attraction for increased vehicular traffic, the project will constitute a potentially significant indirect source of increased carbon monoxide levels in the area. A detailed carbon monoxide modeling study of four locations near the primary and secondary project intersections with Farrington Highway evaluates the quantitative impact of each of four possible traffic scenarios: (1) no build; (2) build, with an additional surface arterial connecting the project to the H-1 Freeway via a route other than Farrington Highway; (3) build, with an extra surface lane added to Farrington Highway in the Honolulu-bound direction from the project to H-1; and (4) build, with no changes to Farrington Highway through 2002.

Carbon monoxide levels computed in the modeling study were all well below allowable Federal AQS, but model results did indicate that the build scenario with no changes to Farrington Highway could lead to a potential exceedence of State of Hawaii AQS at some point shortly before 2002. The other build alternatives appear to be acceptable strictly from a carbon monoxide standpoint, but the build alternative with an additional surface arterial to relieve potential Farrington Highway traffic congestion clearly presented the smallest carbon monoxide impact of any of the build alternatives.

The project could also have an indirect impact on air quality in the form of increased energy demand. A project of this size will require a substantial increase in fuel oil consumption at electric power plants if the demand is met solely by burning more fuel oil. Ironically, one probable impact of increased energy demands at West Beach will be increased levels of sulfur dioxide in the air over West Beach will be increased levels of sulfur dioxide likely be met by the nearby Kahe Power Plant. Hawaiian Electric Company has several alternatives, such as offshore Ocean Thermal Energy Conversion, that could
preclude this impact, however. The overall use of the project could also be decreased by planning for extensive use of solar and other 'clean' local energy sources within the project.

Another mitigative measure that might be employed to protect future inhabitants of West Beach from intrusions of pollutants from outside sources is heavy planting of landscaping plants along the borders and Farrington Highway, that will grow to be both tall and dense.

9.9 Noise Conditions and Impacts

The new 1984 NAS, BP AICUZ has incorporated the following significant changes (relative to the old 1976 AICUZ, NAS, BP) which tend to modify the aircraft noise exposure since 1979 over the proposed West Beach Resort:

a. All aircraft departing from RWY 29 in the left hand turn pattern are now assumed to fly over the Deep Draft Harbor, whereas the old AICUZ assumed a sharper left hand turn commencing approximately 10,000 Ft southeast of the harbor.

b. The number of rotary wing aircraft overflights of West Beach has decreased from 6.1 to an average of 1.0 per day.

c. The number of fixed wing aircraft overflights of West Beach has increased from zero to an average of 7 per day.

d. The number of nighttime (between 10:00 PM to 7:00 AM) aircraft overflights has increased from zero to approximately 0.4 per day.

1. The increase in NAS, BP aircraft noise toward West Beach relative to the 1976 AICUZ contours is evident by the enlargement of the current 65 Ldn contour (AICUZ Noise Exposure Zone 2 Contours) approximately 4,000 Ft northwest of Kalaeloa Boulevard.

2. Based upon the results of the HIA Master Plan noise study, 1979 noise levels from aircraft arrivals to HIA RWY 08L should have been less than 55 Ldn.

3. Under worst case conditions with all HIA RWY 08L arrivals overflying the proposed West Beach Resort (i.e., no curved approaches to HIA RWY 08L), Year 2000 noise exposure from HIA arrivals are predicted to be less than 57 Ldn.

4. The prior operational assumptions used in developing the 1982 NAS, BP frequency of tradewind vs. Kona operations on RWYS 11/29 have been
corrected in the new AICUZ. This correction reduces noise from Kona
departures over West Beach. However, the addition of nighttime overflights
over West Beach has nullified the noise benefits of the change, and the 1984
AICUZ produces noise contours equal to the 1982 noise study in the West
Beach area.

6. There is near zero risk that the $65\,\text{L}_{\text{dn}}$ aircraft noise contour will enter
the proposed West Beach area by the Year 2000, if the operational assump-
tions of the 1984 AICUZ are maintained.

7. There is a slight risk that the $60\,\text{L}_{\text{dn}}$ contour may exist over the
proposed marina and adjacent park areas of the resort. Reduction of night-
time overflights of West Beach would reduce this risk to near zero.

8. A major concern expressed in the August, 1979 assessment regarding
helicopter overflights has been alleviated by the reduction of these
helicopter flybys over the proposed resort.

9.9.1 HIA Aircraft Noise Predictions

1. Figure 22 presents calculated $55\,\text{L}_{\text{dn}}$ contours resulting from noise
attributable to aircraft arrivals on HIA RWY 08L for the Years 1979 and
2000. The operational assumptions used for 1979 operations are shown in
Table 10, with the corresponding Year 2000 operational assumptions also
shown in Table 10. Since all RWY 08L arrivals are assumed to overfly the
proposed West Beach Resort in the Year 2000, a worst case noise increase
of approximately $2\,\text{L}_{\text{dn}}$ units is anticipated from HIA operations. By the
Year 2000, HIA aircraft noise over the proposed West Beach is predicted to
increase by $2\,\text{L}_{\text{dn}}$ units over Year 1979 values.

2. Also shown in Table 10 are the HIA overflights assumed in the 1984 AICUZ.
The 1984 AICUZ used fewer HIA overflights than the Year 2000 assumptions
used in this study.

9.9.2 NAS, Barbers Point Aircraft Overflights

Table 11 shows the chronology of changes in the number and type of NAS, BP
aircraft overflights over West Beach. The 1976 values were used in our 1979
noise assessment. The July 1982 values were used in our 1983 noise assess-
ment, and the 1984 AICUZ values were used in our current assessment.

Table 12 shows the total overflights by NAS, BP aircraft over the West Beach
area on a typical tradewind day. These values were obtained from Reference
2, and were assumed to apply during the 1979 time period. Table 12 values
for NAS, BP were used to construct the composite (HIA plus NAS, BP
aircraft) 1979 noise contours over the West Beach area.

9.9.3 Estimated Year 1979 and Year 2000 Total Aircraft Noise Contours

1. Using the operational information contained in References 2, 4, and the
HIA Year 1979 and Year 2000 noise contours, total aircraft noise contours
were developed over the West Beach area. Three contour sets were developed:
HIA NOISE CONTOURS OVER PROPOSED WEST BEACH RESORT SITE

Approximate Scale: 1" 2,000'

- Year 1979, 55 Ldn Contour
- Year 2000, 55 Ldn Contour
<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>Year 1979 Average Daily Arrivals Day/Night</th>
<th>Year 2000 Average Daily Arrivals Day/Night</th>
<th>1984 AICUZ (Track #39)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-747</td>
<td>8.5/1.9</td>
<td>58.7/0</td>
<td>34.40/1.4</td>
</tr>
<tr>
<td>DC-10</td>
<td>6.2/0</td>
<td>29.9/0</td>
<td>3.07/0.13</td>
</tr>
<tr>
<td>B-707/DC-8</td>
<td>2.8/0</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>B-757</td>
<td>None</td>
<td>143.2/0</td>
<td>None</td>
</tr>
<tr>
<td>B-737</td>
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<td>None</td>
<td>None</td>
</tr>
<tr>
<td>DC-9</td>
<td>15.0/0</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>F-4</td>
<td>5.4/0</td>
<td>10.8/0</td>
<td>10.0/0</td>
</tr>
<tr>
<td>C-141</td>
<td>6.2/0.9</td>
<td>12.3/0</td>
<td>12.3/0</td>
</tr>
<tr>
<td>KC-135</td>
<td>0/0</td>
<td>0.9/0</td>
<td>0.9/0</td>
</tr>
<tr>
<td>C-130</td>
<td>5.4/0</td>
<td>10.3/0</td>
<td>10.3/0</td>
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<tr>
<td><strong>TOTALS</strong></td>
<td>64.5/2.8</td>
<td>271.1/0</td>
<td>70.97/1.53</td>
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(1) Source: HIA Master Plan and Environ Study.
<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>1976 AICUZ (Day/Night)</th>
<th>July 1982 Noise Study (Ref.2) (Day/Night)</th>
<th>1984 AICUZ (Day/Night)</th>
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<tr>
<td>P-3</td>
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<td>1.064/0</td>
<td>1.769/0.197</td>
</tr>
<tr>
<td>C-130</td>
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<td>0.644/0</td>
<td>1.049/0.117</td>
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<tr>
<td>C-135</td>
<td>---</td>
<td>0.120/0</td>
<td>0.080/0</td>
</tr>
<tr>
<td>C-118</td>
<td>---</td>
<td>0.150/0</td>
<td>0.027/0.003</td>
</tr>
<tr>
<td>C-141</td>
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<td>---</td>
<td>0.018/0.002</td>
</tr>
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<td>---</td>
<td>0.022/0.002</td>
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<td>0.126/0</td>
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<td>0.202/0</td>
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<td>0.227/0</td>
<td>0.311/0</td>
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<td>H-2/3</td>
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<td>5.030/0</td>
<td>0.185/0.021</td>
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<tr>
<td>CH-46/47</td>
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<td>3.708/0</td>
<td>0.417/0</td>
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<td>H-1/58</td>
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<td>---</td>
<td>0.139/0</td>
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<td>1.141/0</td>
<td>1.370/0</td>
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<td>0.042/0</td>
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<td>C-7</td>
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<td>---</td>
<td>0.076/0</td>
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<td>Misc.</td>
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<td>0.240/0</td>
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<td><strong>TOTALS:</strong></td>
<td>6.1/0</td>
<td>11.57/0</td>
<td>7.070/0.402*</td>
</tr>
</tbody>
</table>

*Since nighttime overflights are multiplied by 10 in the $L_{dn}$ descriptor system, total equivalent overflights are equal to: $7.07 + 10 \times 0.402 = 11.09$. 

9-79
# TABLE 12
1979 TRADEWIND DAY OPERATIONAL ASSUMPTIONS
FOR TRACKS #19 AND #14
(NAS, BARBERS POINT)

<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>Maximum Operations/Day*</th>
<th>Track #19</th>
<th>Track #14</th>
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</thead>
<tbody>
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<td>1.064</td>
<td>4.8345</td>
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</tr>
<tr>
<td>C-135</td>
<td>0.120</td>
<td>0.1275</td>
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</tr>
<tr>
<td>C-130</td>
<td>0.644</td>
<td>1.6735</td>
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</tr>
<tr>
<td>C-118</td>
<td>0.150</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Civil</td>
<td>1.141</td>
<td>0.9130</td>
<td></td>
</tr>
<tr>
<td>A-4</td>
<td>0.126</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>F-4</td>
<td>---</td>
<td>0.5115</td>
<td></td>
</tr>
<tr>
<td>H52/H53</td>
<td>0.227</td>
<td>0.454</td>
<td></td>
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<tr>
<td>H2/H3</td>
<td>5.030</td>
<td>0.9270</td>
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</tr>
<tr>
<td>CH46/CH47</td>
<td>3.708</td>
<td>---</td>
<td></td>
</tr>
</tbody>
</table>

*No nighttime operations on these tracks.
Year 1979 tradewind day contours; Worst Case Year 2000 composite tradewind/Kona wind contours; and Year 2000 contours with 365-day annual averages. Since rotary wing aircraft are generally noisier on approach than takeoff, since the tradewind/Kona runway use allocation for NAS, BP was not available for the 1979 period, it was decided to calculate the total aircraft noise levels in the 1979 period for a typical tradewind day (which should occur approximately 80 percent of the daytime hours, and over 90% of the nighttime hours). From Reference 2, NAS, BP Tracks #19 and #14 were used in conjunction with the HIA ILS approach track as shown in Figure 23. RWY 11 operational assumptions used for these tracks are shown in Table 10. Military aircraft noise levels were obtained from References 5 and 6. Figure 23 depicts the estimated Year 1979 noise contours over the West Beach area. Portions of the south end of the development are within the 1979, 55 $L_{dn}$ contour, and the 60 $L_{dn}$ contour did not exist within the West Beach area in 1979.

2. A second contour set was developed using the 1984 AICUZ operational assumptions as shown in Table IV-4 of Reference 4, and without modification to the Table IV-4 values. This contour set is shown as Figure 24, and the contours are similar to those depicted in the 1984 AICUZ, with portions of the West Beach Resort within the 60 $L_{dn}$ contour.

3. A third contour set was developed using the 1984 AICUZ operational assumptions corrected for the 365 vs. 260-day annual averaging period, and with southbound itinerant departures from RWY 29 following the 1976 AICUZ tracks. This set is shown as Figure 25, and results in a 1.5 $L_{dn}$ reduction in the noise level over West Beach, with the 60 $L_{dn}$ contour shown outside the West Beach area.

9.9.4 Aircraft Noise Conclusions

1. Based on the preceding evaluations, we believe our prior conclusion of August, 1979 regarding the impact of aircraft noise on future West Beach residents are still valid. By the Year 2000, a margin of 5 to 8 $L_{dn}$ units should exist before federal criteria of 65 $L_{dn}$ is exceeded at residential locations of the proposed development.

2. A major change in RWY 11/29 operations at NAS, BP has occurred since 1979, and has resulted in an increase of our previous projections of Year 2000 noise levels by 1 $L_{dn}$ unit. However, because the 60 $L_{dn}$ contour does not encroach on residential areas of the proposed development, and because the number of helicopter overflights have been reduced, noise mitigation measures are not considered necessary for the proposed development.

9.9.5 Probable Impact of Highway Noise on Future West Beach Residents

Existing highway noise levels at 50 Ft distance from near curb edge of Farrington Highway are currently between 70 to 72 dB ($L_{eq}$) during the daytime, and also exceed existing and proposed HUD criteria for residential development. Noise measurements obtained at Honokai Hale on March 29, 1979 indicated that existing residential lots fronting the highway are currently exposed to approximately 70 to 72 dB ($L_{eq}$). Follow-up measurements at 50 Ft distance from the near curb edge performed on 6/6/79 at Site 4 confirmed
COMPOSITE YEAR 2000 AIRCRAFT NOISE (Ldn) CONTOURS USING 365-DAY ANNUAL AVERAGES

WEST BEACH

YEAR 2000 COMPOSITE CONTOURS

FIGURE 25
the March measurements with $L_{eq}$'s ranging from 71 to 72 dB, and $L_{dn}$ values of 70 to 71 dB. At interior lots within 100 to 400 Ft of the highway curb, equivalent sound levels of approximately 65 to 56 dB were measured.

An excess attenuation of 5 to 8 dB was attributable to the partial noise shielding effects caused by existing homes between the measurement point and the highway traffic. For lots fronting the highway, exterior noise levels of $L_{dn}$ 73 to $L_{dn}$ 74 currently exist (at approximately 21,500 vehicles per day), and are 8 to 9 dB above proposed HUD criteria for residential development.

By 1990, if average daily traffic along Farrington Highway approaches 60,000 vehicles per day, a 4 to 5 dB increase in highway noise levels above the existing situation can be anticipated. Daily exterior $L_{dn}$ values of 77 to 79 are anticipated for lots within 50 feet of the highway. Exterior noise levels in excess of $L_{dn}$ 75 are considered unacceptable for residential housing by proposed HUD and existing federal criteria. Noise levels at existing residences fronting the highway (Honokai Hale, for example) will likewise be increased.

Proposed West Beach residential units fronting the highway will require sound attenuation measures such as air conditioning, forced ventilation or noise barrier construction to reduce highway noise to acceptable exterior and interior levels. If multi-story construction is used for residential units fronting the highway, noise barrier construction will not be a practical abatement measure, and the use of air conditioning or forced mechanical ventilation of the units will be required to meet existing and proposed HUD criteria. Without noise abatement measures, interior noise levels of 67 to 69 ($L_{dn}$) can be expected. Construction of minimum 10 foot height noise barriers and/or earth berms will be required to meet HUD criteria for residential lots fronting the highway if natural ventilation is planned for these homes. In order to minimize the extent of noise barrier construction and to take advantage of excess attenuation afforded by site construction features, it is recommended that acoustical consultants be retained during the project design phase.

Since existing highway noise levels are already above existing HUD and federal criteria for residential housing, and since the proposed project's traffic will increase current noise levels by 3.5 dB (with an additional 1.5 dB increase attributable to non-project traffic increases projected by year 1990), costs associated with noise abatement for existing homes along the highway should not be borne solely by the West Beach developer. Noise barrier construction along existing Honokai Hale homes fronting the highway is recommended, with federal aid suggested as a funding source for a major portion of costs associated with the noise abatement treatment.

9.9.6 Probable Impact of Internal Street System Noise On Future West Beach Residents

Internal street system noise generated by residential and commercial vehicular movement (26,586 trips) and by buses anticipated to service the hotel/condo-minium units (1,650 trips) may exceed $L_{dn}$ 65 at 50 foot setback from the
curb edge. Bus noise, in particular, is anticipated to be a dominant noise source along the two streets between Farrington Highway and the hotel/condo-minium units although bus noise is not anticipated to occur between the nighttime hours of 10:00 PM to 7:00 AM. Suggested mitigation measures include use of 50 to 100 foot setback of residential units from the main thoroughfares, control of vehicle speed below 35 miles per hour, minimization of heavy vehicle and bus traffic between the hours of 10:00 PM to 7:00 AM, and lot specific treatments such as noise barriers and building treatment. Internal street system noise is unlikely to exceed $L_{dn}$ 75, and hence, the interior residential lots can be developed to HUD and other federal noise criteria.

9.9.7 Potential Impact of Possible Blast Noise/Vibration During Marina Construction

Because existing residential or industrial structures are located beyond 1000 foot distance from the site of the proposed marina, the risks of structural damage resulting from possible blasting operations can be minimized by the blasting contractor in accordance with the procedures delineated in the Appendix. These procedures are summarized as follows:

1. Maximum charge weight (in equivalent pounds of TNT) per delay should not exceed (D 50) pounds, where D is the distance in feet between the charge and the existing structure.

2. If the maximum charge weight or distance restrictions are not conducive to efficient blasting operations, utilize vibration measurement instruments during blasting operations, and do not exceed a safe blasting limit of 2.0 inches/second peak particle velocity in the ground adjacent to the structure of interest.

3. Additional mitigation measures such as limiting peak particle velocity at inhabited structures to 0.4 inches/second, advising the surrounding residents about the blasting operations and precautionary steps taken, and use of milli-second delay charges are recommended.

It is assumed that construction of the proposed Barbers Point Deep Draft Harbor will occur prior to construction of the West Beach Marina and Hotel/Condominium units, and that construction of the West Beach Hotel/Condominium units will occur following the construction of the marina. Therefore, West Beach building occupants should not be a dominantly restrictive factor during the construction and blasting phases of the harbor or marina.
9.10 Botanical Survey Results and Evaluation of Impact on Flora

9.10.1 Botanical Survey

A botanical survey of the entire project site was undertaken by Winona P. Char, botanical consultant. Figure 26, shows the location of the vegetation types in the West Beach project site.

9.10.2 Vegetation Types

There are three (3) broad vegetation zones that occur in the Hawaiian Islands, and each of these zones is in an area of uniform macroclimate (Mueller-Dombois and Gagne, in press). The three (3) major vegetation zones are xerotropical (coastal flats and lowlands to submontane), pluviotropical (windward lowland to upper montane), and cool tropical (upper montane to alpine; these occur only on the islands of Maui and Hawaii).

The study site lies within the xerotropical vegetation zone which is characterized by low rainfall (20 inches/annum). Because of low rainfall, this zone supports only a sparse vegetation. Within this zone a number of different plant communities or vegetation types can be delimited. These mosaics of plant communities are controlled largely by edaphic factors such as substrate, run-off, salinity, et cetera, and partly by past and present human activities—these include agriculture, ranching, military activities, et cetera.

The dominant species in these vegetation types are predominantly introduced species (exotics) such as Prosopis (kiawe), Leucaena (koa haole), and Chloris (swollen fingergrass). Remnants of the original native flora can be found scattered throughout the area, usually in small numbers. The activities of man and the grazing animals he introduced have been the primary causes for the degradation of the native flora in the xerotropical zone (St. John, 1957).

9.10.3 Rare and Endangered Plants

Seven plant species which were listed as proposed Endangered and Threatened plant species (1976) have been collected or are recorded from the Ewa plains area. While the list of plants which include the seven species was withdrawn in December, 1979, only Euphorbia skottsbergii, was listed on the Federal list of Endangered and threatened species. No critical habitat was designated for the endangered plant.

As of 1980 (Federal Register, Vol. 45, No. 242), the status of the plant species are:

- Eragrostis paupera - Candidate endangered, an annual grass
- Marsilea villosa - Candidate endangered, a fern
- Euphorbia Skottsbergii var. skottsbergii, candidate endangered, a small shrub
- Scaevola coriacea - Candidate endangered, a decumbent shrub, restricted to the strand vegetation
- Gossypium sandvicense - No longer under review, a native Hawaiian cotton shrub
Note: Heavy lines inside the project site indicates present unpaved roads.

VEGETATION TYPES

B  Batis Scrubland
BC Sugar Cane Fields
LS Leucaena Scrubland
PH/OP Prosopis Forest
PR Prosopis Savannah
R/R(C) Residential Area Vegetation
S Strand Vegetation
SS Schinus Scrubland
W Wasteland (Ruderal) Vegetation
WF/WQ Quarry Area Vegetation
WR Roadside Vegetation

- Area in which Euphorbia skottsb ergii
  Var. Kala eloana Sherff is distributed.

- Area in which Gossypium sandvicense Parl. is distributed

WEST BEACH

VEGETATION

FIGURE 26
As of 1982 (Federal Register, Vol. 47), E. skottsbergii var. kalaeloana, a small shrub recently rediscovered was listed as an endangered species.

As of 1985 (Federal Register; Vol. 50), Achyranthes splendens var. rotundata, a shrub endemic to the island of Oahu, was proposed for endangered species status.

During the course of the survey, two of these plant species, Euphorbia skottsbergii var. kalaeloana Sherff and Gossypium sandvicense Parl., were found within the study site. Euphorbia skottsbergii var. kalaeloana, 'akoko is endemic to the island of O'ahu, and was thought to have been extinct until recently (Herbst, 1976). A biological survey conducted in 1979 for the proposed Deep Draft Harbor for Barber's Point found two (2) large colonies of the Euphorbia and a number of smaller scattered colonies. The large colony on the western boundary of the quarry which lies immediately adjacent to the deep draft harbor has been cleared of its vegetation and is presently being used to store basalt and coral boulders which will be used in the construction of the planned breakwater. A coral stockpile lies on part of the resort's northeast boundary.

The West Beach Resort Project area in which plants of Euphorbia skottsbergii var. kalaeloana were found (i.e., quarry fringe and open Prosopis) has been so greatly disturbed by the deep draft harbor construction that plants no longer occur there. It should be noted that few plants (less than 50) remained in the West Beach area when construction of the deep draft harbor began; the majority of the plants had been removed prior to construction of the harbor during a number of transplant and recovery projects undertaken by Campbell Estate (September 1980), AECOS (ecological and horticultural studies; May 1980-August 1981), and the Army Corps of Engineers (September 1981). A number of plants were also destroyed when the proposed West Beach area was being actively quarried by a cement company.

Approximately 5,200 'akoko plants have been found on the Barbers Point Naval Air Station. There are also a number of transplanted 'akoko plants near the Hawaii Raceway Park and some at the Waima Aboretum. There are currently no 'akoko plants found on the West Beach site however, if any are found, they will be replanted by the developer elsewhere.

Gossypium sandvicense (syn. Gossypium tomentosum Nutt.), ma'o or the native Hawaiian cotton, is endemic to the Hawaiian Islands. About half a dozen plants were found in the study site near the highway and subdivision (Figure 26). Fosberg and Herbst (1975) considered the species to be rare (total population low), depleted (much less common over all or most of its former range), and endangered (in considerable danger of disappearance). It is in cultivation by a few botanic gardens and some private individuals. Other populations of Gossypium are known from O'ahu and the other islands where they are found along the coasts and lowlands. Gossypium has not been listed on the Federal List of Endangered or Threatened Species.
9.11 Birds of the West Beach Area

Two general groups of birds are found in the West Beach area: migratory shorebirds and introduced or exotic species (See Table 13). The scant native vegetation in the dry leeward areas of Oahu was destroyed so long ago that there are no records of any other endemic landbirds that may have occupied such habitat, that is, prior to 1786. There are no suitable ponds or marshes in the West Beach area to accommodate the endemic Hawaiian water birds. It is possible that the Hawaiian Owl or Pueo (Asio flammeus sandwichensis) occurs in the dry leeward regions but none was seen during Berger's studies. Under Regulation 6, State Department of Land and Natural Resources, the Hawaiian Owl is identified as an endangered species on the island of Oahu.

Berger studied (12 field days) all habitats in the West Beach area during the fall of 1973, several times in 1979 and again in May of 1984. The nesting season had ended for most species and they were quiet and un conspicuous. Under such conditions it is not possible to estimate accurately the numbers of birds per square mile or other unit measurement; numbers given would be sheer guesses. All but two of these observed species (Golden Plover and Wandering Tattler) are exotic birds that have been introduced to the Hawaiian Islands. The West Beach area contains several diverse habitats (e.g., shoreline, kiawe thickets, sugarcane fields) so that an estimate of abundance (other than rare, uncommon, common, and abundant) of most species would be misleading because few of the species occupy all of these habitats. Moreover, none of the introduced bird species are of any concern in relationship to the Endangered Species Act of 1973 (16 U.S.C. Subsection 1531 et seq., 1974) and some of these species have, in the past, caused considerable damage to agricultural crops in Hawaii, and, therefore, often are serious nuisance birds.

The portion of the West Beach area that is proposed for development can be classified as an extensively disturbed habitat with no remaining endemic ecosystems. The vast majority of the dominant and subdominant plants (trees, shrubs, vines) consist of more than two dozen introduced species. The major plant associations include sugarcane fields, kiawe thickets, and vegetation (both aquatic and terrestrial) of the shoreline. Numerous species of introduced shrubs and vines grow along cane roads and the edges of the sugarcane fields and the kiawe thickets. These introduced plant species do not provide suitable habitat for the endemic Hawaiian birds (with the possible exception of the Hawaiian Owl).

The introduced birds consist of 14 species belonging to six bird families. When compared with the mainland United States, this represents a depauperate (i.e., falling short of natural size) bird fauna. As pointed out earlier, some of these species have caused serious damage to agricultural crops in the past and several other seed eaters have the potential of doing so in the future. At the same time, some species (e.g., doves, myna, white-eye, cardinals) give pleasure to many people who enjoy seeing birds around their homes; if the introduced birds were not here, the lowland areas would be virtually
TABLE 13

BIRDS OF THE WEST BEACH AREA

The sequence of bird families follows Van Tyne and Berger (1976).

Migratory Shorebirds

**Family Charadriidae, Plovers, Turnstones, Surfbirds**

1. Pacific Golden Plover
2. Wandering Tattler

(Introduced Birds)

**Family Ardeidae, Herons and Egrets**

1. Cattle Egret

**Family Columbidae, Pigeons and Doves**

2. Spotted or Chinese Dove
3. Barred Dove

**Family Sturnidae, Starlings and Mynas**

4. Common Myna

**Family Zosteropidae**

5. Japanese White-eye

**Family Ploceidae, Weaverbirds and Their Allies**

6. Orange-cheeked Waxbill
7. Red-eared Waxbill
8. Strawberry Finch
9. Ricebird or Spotted Munia
10. Black-headed Mannikin
11. House Sparrow

**Family Fringillidae, Sparrows, Cardinals, and Buntings**

12. Red-crested Cardinal
13. Cardinal
14. House Finch

(Pluvialis dominica fulva)
(Heteroscelus incanum)
(Bubulcus ibis)
(Streptopelia chinensis)
(Geopelia striata)
(Acrideres t. tristis)
(Zosterops i. japonicus)
(Estrilda melpoda)
(Estrilda troglodytes)
(Amandava amandava)
(Lonchura punctulata)
(Lonchura malacca atricapilla)
(Passer domesticus)

(Paroaria coronata)
(Cardinalis cardinalis)
(Carpodacus mexicanus frontalis)
devoid of birds most of the year. In addition, mynas, white-eyes, and cardinals eat insects and their larvae, and, therefore, are beneficial during at least part of their annual cycle.

There have been no published studies for Hawaii that report on habitat modification and the resultant change in species' abundance.

Therefore, one must use his own knowledge and experience in Hawaii to predict the possible changes that would occur in the West Beach area because of the proposed development there. Most of the introduced bird species are found in residential, urban, and rural regions; none are deep forest birds, they are adapted to live in close association with man. A mature sugarcane field does not provide much suitable habitat for any of the introduced species. Consequently, if the cane fields are converted to residential and recreational (e.g., a golf course) use, there will be more available habitat for the introduced bird species and it can be anticipated that there would be an increase in the populations for nearly all of them. Because all of the birds are introduced species (and some have been pests), however, it would not be of significance whether changes in the habitat resulted in an increase, a decrease, or no change in bird populations.

Migratory shorebirds in the area may increase with the removal as the sugarcane and kiawe thickets and construction of lagoon, marinas, and open spaces. The Golden Plover is a common winter resident than finds golf courses and lawns (even at the State Capitol Building) to be excellent habitat during the winter months; the Tattler prefers the shoreline and will probably be found along rocky and sandy shores.

9.11.1 Fauna

Table 14 contains a list of fauna on the project site and a list of fauna based on a survey of the adjacent areas (Barbers Point deep draft harbor). A review of both lists indicates that the fauna is limited to exotic species and are not considered endangered. Additionally, a review of the habitats on the project site indicates that there are no suitable feeding or breeding habitats for those species considered endangered.

The fauna on the project site consist of mammals common in other areas of Oahu. During the land modification phase of West Beach the land fauna such as mice, rats, feral cats, et cetera, will likely be displaced or destroyed due to the development. This is not viewed as an adverse or significant impact since these animals are considered pests.
### TABLE 14

BARBERS POINT CHECK LIST OF FAUNA MAMMALS

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Status</th>
<th>ES</th>
<th>EF</th>
<th>Wildlife Habitat Relative Abundance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feral dog, ilio</td>
<td>(Canidae) Canis familiaris</td>
<td>X</td>
<td></td>
<td></td>
<td>C S O K P O O R O</td>
</tr>
<tr>
<td>Feral cat, ʻopokí</td>
<td>(Felidae) Felis catus</td>
<td>X</td>
<td></td>
<td></td>
<td>R U R</td>
</tr>
<tr>
<td>House mouse, ile ʻilil'i</td>
<td>(Muridae) Mus musculus domesticus</td>
<td>X</td>
<td>C</td>
<td>C</td>
<td>R C C</td>
</tr>
<tr>
<td>Hawaiian rat, ile</td>
<td>Rattus exulans</td>
<td>E</td>
<td></td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>Brown rat, po'o-wai</td>
<td>R. norvegicus</td>
<td>X</td>
<td>R</td>
<td></td>
<td>R O O</td>
</tr>
<tr>
<td>Black rat, ile nui</td>
<td>R. rattus</td>
<td>X</td>
<td></td>
<td></td>
<td>R O O C U</td>
</tr>
<tr>
<td>Mongoose, ileʻo-manakuke</td>
<td>(Viverridae) Herpestes auropunctatus</td>
<td>X</td>
<td></td>
<td></td>
<td>R O O C U</td>
</tr>
</tbody>
</table>

9.12 Agricultural Considerations and Impacts

9.12.1 Land Productivity

West Beach contains fallowed agricultural lands for which Oahu Sugar has stated that the West Beach site has been abandoned from agricultural use for economic reasons. The Land Study Bureau's detailed land classification for Oahu (Land Study Bureau, University of Hawaii, Detailed Land Classification- Island of Oahu, L.S.B. Bulletin No. 11, December, 1972) identified the master productivity rating of the project site as "A" (104 acres) in urban use (the Alice Kamokila Campbell property). "A" meaning that the land is of the highest productivity, "B" second highest, and so on. The 104 acres of Class A and 418 acres of Class B lands represent 0.5 percent and 1.3 percent of the total Class A and B land of the island of Oahu, respectively. The ALISH (Agricultural Lands of Importance in the State of Hawaii) maps show about 266 acres of prime agricultural lands and 133 acres of other important agricultural lands. However, once converted to urban uses the land will no longer be available. Approximately 2/3 of 642 acres is prime or other important agricultural land based on the "important agricultural land maps," prepared by the State Department of Agriculture.

9.13 Impact on Aesthetics

9.13.1 Existing Condition

The present 1.9 miles of shoreline is the primary amenity which West Beach offers. The rock and coral outcroppings and sand dunes are predominant features along the coastline. The sugarcane located inland of the rocky coast lies camouflaged between the rock and coral outcroppings. Some shoreline vegetation (morning glory, kiawe trees) are also noticeable.

9.13.2 Probable Impact

The undeveloped coastline will be modified by the project to provide access to beaches via landscaped walkways. The view of the coastline will include a partial view of the lagoons, the marina, and the proposed resort hotels along the lagoons. Additionally, lands north of Farrington Highway and the H-1 Freeway (especially the elevated Makakilo residential subdivision) will be able to clearly see the West Beach development.

9.13.3 Mitigation Measures to Protect or Enhance Aesthetics

The planning and siting of the hotels, use of landscaping and location of the lagoon openings will consider the scenic quality and aesthetic value of the shoreline.

9.14 Recreational Resources

9.14.1 Overview of Existing Recreational Resources and Sites

The existing site is presently not a significant or major recreational area. Except for the Alice Kamokila Campbell property, the shoreline area appears
to be rarely used (see discussion below on existing recreational uses). The apparent limited usage of the property is probably due to the lack of land access to the shoreline and restricted access to the private property which must be crossed. Presently, the Alice Kamokila Campbell property is used for private luaus and events and is not accessible to the public. The shoreline outside of the Campbell property is rocky and swimming conditions are far from ideal. Surfing sites along the shore probably exist, although no surfing was observed on several site visits. Fishing and picnicking occur on a limited basis.

9.14.2 Impact on Recreational Beach Use

The beach areas of the project site borders abandoned sugar canefields and consists mainly of lava rock and relatively few sandy patches of beach. Three entrances are commonly used by beachgoers. From the north, people reach the beach either through Kahe Beach park, following the coastline, or by permission, through the Alice Kamokila Campbell Estate. Another means of entry is through the canefield roads, which can be entered through locked gates, but for which certain employees of Oahu Sugar Company may obtain keys. The third and most commonly used entrance is from the south, via the same road that leads to Campbell Harbor.

The beach is not readily accessible, and apparently relatively unknown. Consequently, it is not heavily used and remains somewhat free from litter. Fresh water is not available and there is hardly any sandy beach. The shoreline is scenic and serves as a type of refuge to those who go there to fish, dive, camp, or just to get away from it all.

A survey of beach users was conducted in 1979 to determine the number, characteristics, and reported activities of those who visit the area. Previous levels of beach use were estimated to be about 6,100 visitor-days annually, or an average of less than 17 people per day visiting the beach frontage. People visiting the beach for recreation are typically male, Hawaiian or part-Hawaiian, and residents of the area including Ewa, Ewa Beach, and Waipahu. Fishing of some type was overwhelmingly the most common activity.

9.14.3 Impact on Existing Shoreline Users

As the beach frontage becomes less isolated by enhanced access, the number of people using the beach frontage will obviously increase. The amount cannot be estimated with any useful accuracy. The major change that will occur is related to the loss of the isolation that is central to current uses. The advent of two major physical alterations to the existing shoreline will affect both of the offshore marine biota as well as provide increased public access to a heretofore isolated area. The two major physical alterations are the deep draft harbor currently under construction, and the proposed West Beach project. Both projects will be required to provide public access to the shoreline under existing State law and this increased accessibility will increase pressures on the shoreline and offshore marine biota previously not experienced.
9.14.4 Impact on Recreational Areas and Facilities

The West Beach project will allow for easier access to the natural shoreline and lagoons. Both visitors and residents will have access to the natural shoreline, the proposed bathing lagoons and the Alice Kamokila Campbell property. This will mean that the recreational value of this site will increase dramatically. Additionally, such facilities as comfort stations, showers and parking will also be provided. These facilities and beach right-of-way will be coordinated with the Department of Parks and Recreation, City and County of Honolulu. Public access will be provided along the entire 1.9-mile shoreline at selected and designated public access points. These public access points will be developed by West Beach Estates in conjunction with both the State and City agencies whose responsibility it is to administer public access to the shoreline areas of the State. Public access, the proposed lagoons to be developed, and the project's need to comply with the City's Park Dedication Ordinance 4621 will require coordination and discussions with the City's Department of Parks and Recreation. All shoreline activities will likely be intensified and more taxing to the shoreline resources of the area. Other recreational facilities will be provided such as golf, tennis, passive activities (walking, picnicking), bicycling, et cetera. The West Beach project will have a beneficial impact on recreation, in that it will provide an increased recreational usage of this area.
9.15 Governmental Services Facilities, and Utilities.

9.15.1 Sewage Treatment and Disposal

The applicant proposes to convey wastewater generated by the project to Honouliuli Wastewater Treatment Plant. The total project sewage will be conveyed via gravity flow to two pump stations. The sewage is then pumped up to and along the old railroad right-of-way to Honouliuli Wastewater Treatment Plant. Average daily flow of sewage anticipated at maximum development is 2.5 mgd.

The applicant will have to construct (at his expense) a separate sewer line from the project site to the Honouliuli Wastewater Treatment Plant. The proposed Honouliuli plant will have sufficient capacity to serve a resident population of 98,200 people within the Ewa DP area.

9.15.2 Potable Water

At the present time, the availability of a sustained yield source of potable water is undetermined. The State Department of Land and Natural Resources, Division of Water and Land Development, and the City's Board of Water Supply are exploring various source development alternatives which will enable present and future users of water from the Pearl Harbor Basin to plan effectively for their water needs. One other alternative currently being discussed is the transfer of water source from Oahu Sugar Company to the Board of Water Supply as cane lands are converted to urban use. The Department of Land and Natural Resources has currently reserved 22.5 million gallons on Oahu Sugar Company water for reallocation. West Beach Resort has requested a portion of the surplus for project use.

For West Beach, the average daily demand at maximum development is estimated to be 4.5 mgd based on Board of Water Supply factors. Of this total, 2.5 mgd is estimated for potable water consumption with the balance to be used for irrigation. The irrigation water source will be obtained from wells near or on the site, using brackish water previously pumped from an existing on-site plantation well. The demand for potable consumption will be reviewed and evaluated by both the State and City to determine source availability as well as the volume permitted to be pumped from the Pearl Harbor Basin.
9.16 Access, Traffic and Mass Transportation

9.16.1 Data and Assumptions

One of the most important considerations in a project of the magnitude of West Beach is traffic. West Beach is fortunate in that it adjoins Farrington Highway, a four-lane divided highway, along its north boundary between Kahe Point and Palalai Interchange. Less than a mile toward Honolulu, Farrington Highway becomes Interstate Highway H-1, a four-lane limited access freeway, and expands to eight lanes east of Kunia Interchange at Waipahu.

Internally, West Beach will have a major loop road system which will connect with Farrington Highway at two intersection points as shown on Figure 27. Secondary streets will be served from the major loop road to accommodate traffic within the project. An extension of the major loop road will ultimately be developed toward Ewa, with connections to Interstate Highway H-1 at the Palailai Interchange.

The analysis of the traffic implications of the West Beach project was based upon the following data and assumptions:

1. The primary traffic impact from West Beach will occur on Farrington Highway and Interstate Highway H-1 between Kahe Point and Kunia Interchange in Waipahu. Beyond Kunia, the amount of traffic generated from West Beach is minimal in comparison to H-1 volume and Honolulu-bound traffic entering H-1 at Kunia Interchange.

2. Existing traffic counts on Farrington Highway and Interstate Highway H-1 are based on 1982 data from the Department of Transportation.

3. The projection period used for analysis is ten years and assumes full development of the 642.2 acre West Beach project.

4. West Beach will become a significant employment center in the Ewa District. It is expected that a high percentage of the jobs will provide employment for residents of Waianae and Ewa communities.

5. The West Beach project will be a somewhat self-contained center with a full range of urban activities. This will tend to reduce the amount of external trips made by West Beach residents for employment, shopping and recreation.

6. The Department of Transportation plans to improve Interstate Highway H-1 from Palalai to Kunia Interchange by adding one lane in each direction to the existing four-lane facility. This significantly improve the carrying capacity to serve future traffic as Ewa grows to become the secondary urban center.

7. The City and County is planning to improve express transit service to Ewa and Waianae in the near future. In addition, the West Beach master plan provides for a transit right-of-way and two stations within the project area to accommodate City plans for future mass transit improvements.
9.16.2 Traffic Generation

A preliminary trip generation study has been made of the planned West Beach development. It includes projections of the traffic to be generated by the major uses, residential and resort.

(a) Residential Development

The proposed 5,200 residential units and supporting facilities are expected to generate 7.5 auto trips per unit for a total of 39,000 trips. The comprehensive plan of development, complete with schools, shopping, community and recreation facilities, and job opportunities will reduce the amount of external traffic. It is estimated that two-thirds of the total trips, 25,740, will be external to the project area. This traffic will use Farrington Highway, with 90 percent or 23,166 trips assumed to be Honolulu-bound and 10 percent or 2,574 trips Waianae-bound. In the future, access to West Beach will also be available by a new surface arterial parallel to the existing highway. This route will connect West Beach to other areas of Ewa and provide an alternate means of ingress and egress. It can be anticipated that traffic to and from West Beach will be split between the existing highway and the new arterial.

(b) Resort Development

Self-sufficiency best describes the resort development proposed for West Beach. The proposed 4,000 hotel rooms will be complemented by commercial, entertainment and dining facilities, marina and recreational amenities. Traffic generation for resort complexes is typically composed of high occupancy vehicle types such as buses, vans and limousines. In addition, most of the traffic generated by the resort will occur during off-peak hours. Based on these factors, the resort complex will generate 2.5 vehicle trips a day per unit or 10,000 total daily trips. It is estimated that 90 percent, or 9,000 trips, will be external. This traffic will also use Farrington Highway, with 90 percent or 8,100 trips Honolulu-bound and 10 percent or 900 trips Waianae-bound. In the future, this traffic will also be split between the existing highway and the future surface arterial.

(c) Total Trip Generation and Traffic Assignments

The West Beach project, when fully developed, will generate approximately 34,740 external auto trips per day (25,740 residential and 9,000 resort). Much of this traffic will be destined to and from Honolulu. Further, portions of the traffic on Farrington Highway from Waianae will be destined for West Beach because of the jobs to be created there and the various amenities and recreational facilities.

The following distributions of the West Beach daily external traffic and traffic originating from Waianae is assumed:

1. Farrington Highway to Waianae: 10 percent or 3,474 vehicles per day (VPD)
2. Farrington Highway to Honolulu
   a. Palailai (Makakilo, Barber's Point, Campbell Industrial Park)
      5 percent or 1,737 VPD
   b. Ewa Beach, Waipahu: 15 percent or 5,211 VPD
   c. Pearl City, Honolulu: 70 percent or 24,318 VPD

3. Waianae traffic to West Beach: 5 percent of the projected highway
   volume plus 40 percent of the employment trips generated by West Beach.

Therefore, two-way traffic generated on the highway system toward Honolulu
from West Beach is summarized below:

1. Farrington Highway: West Beach entrance to Palailai Interchange is
   34,740 VPD - 3,474 VPD = 31,266 VPD

2. Interstate Highway H-1: Palailai to Makakilo Interchange is 31,266 VPD -
   1,737 VPD = 29,529 VPD

3. Interstate Highway H-1: Makakilo to Kunia Interchange is 29,529 VPD

4. Interstate Highway H-1: East of Kunia Interchange is 29,529 VPD -
   5,211 VPD = 24,318 VPD

(d) Peak Hours

Since the demand for highway use will be greatest during the morning hours,
the a.m. peak will be used as the basis for analyzing the peak flow. A peak-
hour factor of 10 percent for the residential portion of the West Beach traffic
is assumed, and the resort traffic is discounted since it occurs during off-peak
periods. The directional distribution of peak-hour traffic assigns 10 percent
toward Waianae and 90 percent toward Honolulu.

Therefore, residential traffic destined to Honolulu from West Beach during
the a.m. peak are computed as follows, based on 90 percent of the residential
external traffic, or 23,166 VPD travelling toward Honolulu:

Farrington Highway from West Beach to Palailai Interchange:
(25,740 x 0.90) x 0.10 = 2,317 vehicles

Palailai to Makakilo Interchange:
(25,740 x 0.85) x 0.10 = 2,188 vehicles

Makakilo to Kunia Interchange:
2,188 vehicles

Kunia to Waiawa Interchange:
(25,740 x 0.70) x 0.10 = 1,802 vehicles
9.16.3 Traffic Projections

The following analysis evaluates each section of the affected highway system based upon the projected increase in traffic over the next ten years and the additional traffic generated by the West Beach project.

Factors used for traffic growth assume a 7 percent annual increase of the 1982 Department of Transportation traffic counts along Farrington and H-1 Highways. This situation will be consistent except for traffic generated to West Beach from the Waianae Coast where growth is assumed to increase at an annual rate of 4 percent due to the population growth guidelines included in the City and County General Plan and Development Plan policies and objectives. Further, it is assumed that 5 percent of the traffic from Waianae is destined for West Beach.

West Beach will become an important employment center in the Ewa area. It is anticipated that a high percentage of the jobs created at West Beach will be filled by residents of Waianae and Ewa communities. Since employee work trips will be a significant factor in the morning peak-hour traffic, estimates have been made of the origin of employee trips and the percentage occurring during the peak hour. These estimates are provided in Table 15 and incorporated into the analysis of each highway segment discussed below.

Table 16 summarizes the traffic projections.

9.16.4 Alternatives to Increase Capacity

The preceding analysis of future traffic volumes during the morning peak hour, based on full development of the West Beach project, indicates that improvements to capacity will be required in the future, particularly on the highway segment between West Beach and Palailai Interchange. This section discusses two alternatives to increasing capacity: Widen Farrington Highway to three Honolulu-bound lanes from West Beach to Palailai Interchange or develop a surface arterial extension of the West Beach major internal roadway which would parallel Farrington Highway and connect from the project to the Palailai Interchange and to other areas of the Ewa Plain.

Assuming the surface arterial is built, traffic from West Beach can be split between it and Farrington Highway, thus reducing the traffic impact on the existing highway system.

Table 17 outlines the resulting traffic volumes under the following assumptions:

1. Traffic generated by the West Beach project is distributed to three access points as follows:

   Primary Interchange Farrington Highway 30 percent
   Secondary Interchange at Farrington Highway 35 percent
   Surface arterial parallel to Farrington Highway 35 percent

9-102
### TABLES 15 - TRIP GENERATION FROM WEST BEACH EMPLOYMENT

<table>
<thead>
<tr>
<th>USE</th>
<th>UNIT</th>
<th>BASIS</th>
<th>EMPLOYMENT</th>
<th>% PEAK HOUR</th>
<th>AM PEAK HOUR TRIPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deluxe Hotel</td>
<td>400 rooms</td>
<td>1.5/rm.</td>
<td>600</td>
<td>.55</td>
<td>330</td>
</tr>
<tr>
<td>First Class Hotel</td>
<td>1,600 rooms</td>
<td>.7/rm.</td>
<td>1,120</td>
<td>.55</td>
<td>616</td>
</tr>
<tr>
<td>Resort Condo</td>
<td>2,000 units</td>
<td>.5/rm.</td>
<td>1,000</td>
<td>.80</td>
<td>800</td>
</tr>
<tr>
<td>Residential Condo</td>
<td>5,200 units</td>
<td>.05/rm.</td>
<td>260</td>
<td>.80</td>
<td>208</td>
</tr>
<tr>
<td>Commercial Retail</td>
<td>185,000 sq. ft.</td>
<td>.005/sq. ft.</td>
<td>925</td>
<td>.70</td>
<td>648</td>
</tr>
<tr>
<td>Restaurants</td>
<td>35,000 sq. ft.</td>
<td>40/rest.</td>
<td>280</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>Golf Course</td>
<td>18 hole</td>
<td></td>
<td>125</td>
<td>.60</td>
<td>75</td>
</tr>
<tr>
<td>Beach Club</td>
<td></td>
<td></td>
<td>150</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>Maintenance/Security</td>
<td></td>
<td></td>
<td>30</td>
<td>.80</td>
<td>24</td>
</tr>
<tr>
<td>Management</td>
<td></td>
<td></td>
<td>20</td>
<td>1.00</td>
<td>20</td>
</tr>
<tr>
<td>Yacht Club</td>
<td></td>
<td></td>
<td>50</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>Marina</td>
<td></td>
<td></td>
<td>200</td>
<td>.50</td>
<td>100</td>
</tr>
<tr>
<td>Hawaiian Cultural Center</td>
<td></td>
<td></td>
<td>125</td>
<td>.70</td>
<td>88</td>
</tr>
<tr>
<td>Luau</td>
<td></td>
<td></td>
<td>175</td>
<td>0.0</td>
<td>0</td>
</tr>
</tbody>
</table>

| Total                      | 5,060        |             | Say 3,000   |             |

#### Origin of trips:
- From Honolulu
- From Waianae
- On-Site

#### Peak Hour
- From Honolulu: \(0.60 \times 2,850 = 1,710\)
- From Waianae: \(0.40 \times 2,850 = 1,140\)
- On-Site: \(0.05 \times 3,000 = 150\)

#### Daily
- From Honolulu: \(0.60 \times 4,807 = 2,884\)
- From Waianae: \(0.40 \times 4,807 = 1,923\)
- On-Site: \(0.05 \times 5,060 = 253\)

#### Origin of trips with surface arterial:
- From Honolulu via Farrington-H-1: \(0.50 \times 1,710 = 855\)
- From Honolulu via Surface Arterial: \(0.50 \times 1,710 = 855\)
- From Waianae: \(0.40 \times 2,850 = 1,140\)
- On-Site: \(0.05 \times 3,000 = 150\)

---

1. Based on investigation and estimates of Pannell Kerr Forster, resort consultants for the West Beach project.
## TABLE 16 - SUMMARY OF TRAFFIC VOLUME PROJECTIONS

<table>
<thead>
<tr>
<th>HIGHWAY SEGMENT</th>
<th>EXISTING AND PLANNED LANES</th>
<th>1962 DOT TRAFFIC COUNT</th>
<th>NORMAL INCREASE</th>
<th>TOTAL VOLUME IN 10 YEARS</th>
<th>WALEANA TRIPS&lt;sup&gt;2&lt;/sup&gt; TO WEST BEACH</th>
<th>EXTERNAL TRIPS&lt;sup&gt;3&lt;/sup&gt; FROM WEST BEACH</th>
<th>TOTAL TRAFFIC VOLUME</th>
<th>DESIGN&lt;sup&gt;4&lt;/sup&gt; CAPACITY</th>
<th>LEVEL OF SERVICE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Farrington Highway: Kehe Point</strong></td>
<td>4</td>
<td>20,910 + 8,364 = 29,274</td>
<td>--</td>
<td>+ 3,474 = 32,748</td>
<td>57,600</td>
<td>&quot;C&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>to West Beach</td>
<td>2</td>
<td>1,310 + 524 = 1,834</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1,834</td>
<td>2,400</td>
<td>&quot;C&quot;</td>
<td></td>
</tr>
<tr>
<td><strong>Farrington Highway: West Beach</strong></td>
<td>4</td>
<td>22,280 + 15,596 = 37,876</td>
<td>--</td>
<td>3,387 + 31,266 = 34,653</td>
<td>72,000</td>
<td>&quot;D&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>to Palailai Interchange</td>
<td>2</td>
<td>1,410 + 987 = 2,397</td>
<td>--</td>
<td>1,232 + 2,317 = 3,549</td>
<td>4,000</td>
<td>&quot;E&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Interstate Highway H-1: Palailai Interchange to Nakakilo Interchange</strong></td>
<td>6</td>
<td>19,230 + 13,661 = 32,891</td>
<td>--</td>
<td>3,387 + 29,529 = 32,916</td>
<td>86,400</td>
<td>&quot;C&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24-Hour Volume</td>
<td>3</td>
<td>990 + 693 = 1,683</td>
<td>--</td>
<td>1,232 + 2,188 = 3,420</td>
<td>6,000</td>
<td>&quot;C&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Interstate Highway H-1: Nakakilo Interchange to Kunia Interchange</strong></td>
<td>6</td>
<td>30,660 + 21,462 = 52,122</td>
<td>--</td>
<td>3,387 + 29,529 = 32,916</td>
<td>86,400</td>
<td>&quot;C&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24-Hour Volume</td>
<td>3</td>
<td>1,670 + 1,169 = 2,839</td>
<td>--</td>
<td>1,232 + 2,188 = 3,420</td>
<td>4,500</td>
<td>&quot;D&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Interstate Highway H-1: Kunia</strong></td>
<td>8</td>
<td>43,260 + 30,282 = 73,542</td>
<td>--</td>
<td>3,387 + 24,318 = 27,705</td>
<td>115,200</td>
<td>&quot;C&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interchange to Waiau Interchange</td>
<td>4</td>
<td>2,560 + 1,792 = 4,352</td>
<td>--</td>
<td>1,232 + 1,802 = 3,034</td>
<td>6,000</td>
<td>&quot;D&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>1</sup>Based on 7 percent per year increase for 10 years.

<sup>2</sup>Waleana trips destined to West Beach based on 5 percent of projected volume plus 40 percent of employment trips originating in Waleana:

24-hour volume: \((29,274 \times 0.05) + (4,807 \times 0.40) = 1,464 + 1,923 = 3,387\)

AM peak-hour volume: \((1,834 \times 0.05) + (2,850 \times 0.40) = 92 + 1,140 = 1,232\)

<sup>3</sup>Based on full project development. See page 3 for 24-hour volumes and AM peak-hour volume.

<sup>4</sup>Based on following definitions of Level of Service:

"C" 1200 VPH/L x 4L x 12 H/D = 57,600 VPD
1200 VPH/L x 2L = 2,400 VPH

"D" 1500 VPH/L x 4L x 12 H/D = 115,200 VPD
1500 VPH/L x 3L = 3,600 VPH

"E" 2000 VPH/L x 2L = 4,000 VPH
TABLE 17 - TRAFFIC VOLUME PROJECTIONS AT WEST BEACH WITH SURFACE ARTERIAL

<table>
<thead>
<tr>
<th>HIGHWAY SEGMENT</th>
<th>EXISTING AND PLANNED LANES</th>
<th>TOTAL VOLUME&lt;sup&gt;1&lt;/sup&gt; IN 10 YEARS</th>
<th>WAIANAEO TRIPS&lt;sup&gt;2&lt;/sup&gt; TO WEST BEACH</th>
<th>EXTERNAL TRIPS&lt;sup&gt;3&lt;/sup&gt; FROM WEST BEACH</th>
<th>TOTAL TRAFFIC VOLUME</th>
<th>DESIGN CAPACITY</th>
<th>LEVEL OF SERVICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farrington Highway: Kaha Point to West Beach</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM Peak-Hour Volume</td>
<td></td>
<td>2</td>
<td>1,836</td>
<td></td>
<td>1,834</td>
<td>2,400</td>
<td>&quot;C&quot;</td>
</tr>
<tr>
<td>Farrington Highway: West Beach to Palailai Interchange</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM Peak-Hour Volume:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On Farrington</td>
<td></td>
<td>2</td>
<td>2,397</td>
<td>1,232</td>
<td>1,511</td>
<td>2,676</td>
<td>3,000</td>
</tr>
<tr>
<td>On Surface Arterial</td>
<td></td>
<td>2</td>
<td>806</td>
<td></td>
<td>806</td>
<td>1,600</td>
<td>&quot;C&quot;</td>
</tr>
<tr>
<td>Interstate Highway H-1: Palailai Interchange to Makakilo Interchange</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM Peak-Hour Volume:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On H-1</td>
<td></td>
<td>3</td>
<td>1,683</td>
<td>1,232</td>
<td>2,188</td>
<td>2,639</td>
<td>3,600</td>
</tr>
</tbody>
</table>

1 Based on 7 percent per year increase for 10 years.
2 Waianae trips destined to West Beach based on 5 percent of projected volume plus 40 percent of employment trips originating in Waianae:
24-hour volume: (21,274 x .05) + (4,807 x .40) = 1,464 + 1,923 = 3,387
AM peak-hour volume (1,834 x .05) + (2,850 x .40) = 92 + 1,140 = 1,232
3 Assumes that 35 percent of the West Beach external traffic will use the surface arterial, or 2,317 x .35 = 806 trips.
2. Distributions are based on the projected number of units by parcel and the most likely access route based on the internal circulation plan for the project.

Based on the assumed distribution outlined above, it can be concluded that the existing highway system has sufficient capacity to accommodate the projected traffic volumes. The surface arterial effectively increases carrying capacity and acts to relieve the existing highway of a significant volume of future traffic.

Planning for the surface arterial beyond the project boundary will be coordinated with the City and County of Honolulu, since this route will be part of the City's road system. This route will also be a key part of the City's plans for the secondary urban center. Therefore, its route should be established to support City policies for expanded growth adjacent to West Beach.

Without the surface arterial, it can be concluded that Farrington Highway should be widened to three lanes in the Honolulu direction from the West Beach secondary interchange to Palailai Interchange, a distance of about 1.8 miles.

The scheduling of these alternative mitigating measures is dependent on the pace at which various uses at West Beach are developed. Table 18, Traffic Projection by Phase, indicates that additional capacity will be required after about 3,000 residential units are developed and occupied, which will take place during Phase III of project development.

9.16.5 Interchange Turning Movement Analysis

The West Beach project master plan proposes two interchanges of Farrington Highway, the primary at the Waianae end of the project area and the secondary at the Honolulu end. Land areas for both interchanges are part of the project area and will not require additional acquisition.

The primary interchange provides free-flow movement in all directions, while the secondary interchange provides for right-turn in and out movements only. This design will minimize interruption to traffic flow on Farrington Highway.

Turning movement volumes during the morning peak hour were used to determine the required number of lanes. Traffic volumes are based on full development, distribution of trips between the two interchanges with and without the surface arterial, and peak-hour employment trips defined in Table 15.

For the primary interchange, the off-ramp overpass serving traffic from Honolulu should accommodate a volume of 1,710 vehicles, thus requiring two lanes. This assumes a design capacity of 1,000 VPH/L. All other on- and off-ramps can adequately serve projected peak-hour traffic volumes with one lane. The secondary interchange will provide on- and off-ramps for right-turn only movements, with deceleration and acceleration lanes designed to
<table>
<thead>
<tr>
<th>PHASE</th>
<th>RESIDENTIAL UNITS</th>
<th>EXTERNAL TRIPS FROM WEST BEACH, HONOLULU-BOUND</th>
<th>TOTAL TRAFFIC VOLUME</th>
<th>RESULTING LEVEL OF SERVICE ON FARRINGTON</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>595</td>
<td>265</td>
<td>1,736</td>
<td>2,400</td>
</tr>
<tr>
<td>II</td>
<td>1,740</td>
<td>775</td>
<td>2,161</td>
<td>2,400</td>
</tr>
<tr>
<td>III</td>
<td>2,700</td>
<td>1,203</td>
<td>2,564</td>
<td>3,000</td>
</tr>
<tr>
<td>IV</td>
<td>4,230</td>
<td>1,885</td>
<td>2,427</td>
<td>3,000</td>
</tr>
<tr>
<td>V</td>
<td>5,200</td>
<td>2,317</td>
<td>2,676</td>
<td>3,000</td>
</tr>
</tbody>
</table>
meet Department of Transportation standards for highway interchange construction.

With the surface arterial, the turning movement volumes are reduced so that all ramp sections can be one lane.

The primary interchange will be constructed initially and the secondary interchange constructed later.

9.16.6 Mass Transit

The traffic analysis has not included the effects of mass transportation on future traffic volumes. The increase in private automobile costs due to higher fuel prices, increased insurance rates, and vehicle sales prices have tended to modify travel patterns as people shift more of their trips to public transit and carpools. The City and County plans to improve express transit service to Ewa and Waianae communities in the near future and longer range plans for an improved mass transit system will also be pursued. These factors all tend to reduce the amount of travel by private vehicles. This should result in a decrease of the West Beach and future highway volumes by about 10 percent and subsequently improve the carrying capacity of the highway system.

9.16.7 Future Design Considerations

During the West Beach development, Farrington Highway and Interstate Highway H-1 within the influence of the project area appear to have adequate capacity to accommodate projected increases in traffic volume.

Alternative measures to expand capacity include:

1. Add an additional Honolulu-bound lane to Farrington Highway from the West Beach secondary interchange to the Palailai Interchange. This would provide a design capacity of 3,600 vehicles at Level of Service "C" compared to the projected peak-hour volume of 3,482 vehicles.

2. Implementation of a new surface arterial from the eastern boundary of the West Beach project through the Ewa Plain, with a connection to Interstate Highway H-1 at the Palailai Interchange. This new roadway would be part of the City and County road system serving the Secondary Urban Center and would carry about 35 percent, or 806 vehicles, of the peak-hour trips generated by West Beach. Consequently, a reduction in the peak-hour volume of Farrington Highway would occur, resulting in 2,676 vehicles during the peak hour. This volume is below a design capacity of 3,000 vehicles at Level of Service "D," and the existing two Honolulu-bound lanes would be adequate.

The appropriate action would be selected and implemented by the project developer, in consultation with the State Department of Transportation and City and County Department of Transportation Services, when warranted by West Beach traffic volumes.
Primary and secondary interchanges at Farrington Highway will provide ingress and egress to West Beach from the highway system. Peak-hour turning movement projections indicate that a grade separated design is warranted for the primary interchange, while the secondary interchange should provide only right turn in and out movements, with deceleration and acceleration lanes. The primary interchange will be constructed by the West Beach developer. The secondary interchange will be constructed subsequently when warranted by traffic volumes. Land areas for both interchanges are part of the project area and will not require additional land acquisition. Both interchanges will be designed according to Department of Transportation standards. The design and construction process will also be coordinated with the Department of Transportation for review and approval.

Should the surface arterial alternative be selected, it will be coordinated with the City and County of Honolulu as part of circulation plans for the Secondary Urban Center. This roadway will be a major arterial connecting West Beach with adjacent development envisioned in City plans for the Secondary Urban Center.

Future improvements in mass transit service to the Ewa and Waianae districts will lessen the impact of future traffic volumes on highway capacity. Various transit alternatives are being considered by the State and City and County of Honolulu. The West Beach master plan has provided a transit right-of-way and set aside land for two transit stations to serve the West Beach project.
Archaeological, Historical, and Paleontological Sites

Historical Sites

Sites and/or structures of historical importance include the old abandoned railroad tracks going through the northern half of the West Beach site. These tracks were owned and utilized by the sugar companies to haul sugarcane and passengers to and from the Pearl Harbor area to the Waianae Coast. There is a current governmental proposal to restore these tracks and railroad cars so that the route can be retraced. This would allow residents and visitors alike to experience the train ride which was in operation in the early 1900's. The restoration of the railroad is desirable from the resort's standpoint because it would be another visitor attraction which can be readily available and within the project site. Planning efforts will likely include the restored railroad as a part of the project. Coordination by the applicant with individuals and/or organizations sponsoring the railroad restoration is expected.

Archaeological Sites

Additional archaeological work in the West Beach area was conducted by Barrera (1984) for the applicant. His 1979 survey found 10 archaeological sites (Figure 28) which included four walls of recent origin and a fishing shrine in the vicinity of Farrington Highway, an L-shaped wall and World War II structures in the northwest portion of the property, and three midden sites and a circular lime kiln along the southeastern shoreline. The findings suggest that the sites are a continuation of the archaeological site pattern and distribution of the Barber's Point Archaeological District surveyed by the Bishop Museum and the Archaeological Research Center Hawaii. A portion of the West Beach project area lies within the archaeological district. Twenty-six archaeological sites were identified in portion of the district lying on West Beach property. The Bishop Museum test excavated and dated some of the sites and indicated that a more intensive survey may yield many more sites within the archaeological district. The 1979 survey also suggested that portions of the project area may also be eligible for inclusion on the State and National Register of Historic Places.

The second phase of the archaeological survey, completed in July of 1984, was designed to gather additional information about certain particular sites (Figure 29). This work involved six specific tasks, as follows:

1. Reconnaissance surveys of Sites 2717 through 2720, which had been previously recorded by Bishop Museum and Archaeological Research Center Hawaii, to provide a basis for recommendations for future work (Figure 30).

2. Survey of an area on the south side of the property which had never been investigated during any of the previous archaeological projects. The purpose was to locate and map limestone sinkholes and to excavate a selected sample to determine the level of effort required for future investigations.
WEST BEACH

1979 SURVEY AREA

FIGURE 28
WEST BEACH 1984 SURVEY AREA

FIGURE 29
Source: Surveys by Bishop Museum (Sinoto 1976) and Archaeological Research Center Hawaii (Davis and Griffin 1978).

WEST BEACH

PREVIOUSLY
RECORDED SITES

FIGURE 30
3. Consultation with Dr. Alan Ziegler, Zoologist, regarding the nature of
the fossil bird remains, their importance and significance, and proper
strategies for recovery and study of bird remains.

4. Test excavation at Site 1434A (stone wall) to make a determination of the
nature and significance of the subsurface deposits, done in response to
a review comment of the 1980 Environmental Impact Statement.

5. Historical research on Site 1436 (lime kiln) undertaken by Glen Mason
of Spencer Mason Partnership to determine the age, history, and signifi-
cance of the site.

6. Intensive survey of approximately 200 acres of former sugar land to
determine the presence or absence of archaeological sites. This area
could not be done at the time of the 1979 survey because access was
prevented by the presence of sugarcane under cultivation.

The third phase of the project will involve the mitigation of any adverse
effects posed by the development (Table 19).

9.17.3 Survey Area IV

The 1979 reconnaissance survey of this area was conducted in order to insure
accuracy and completeness of previous survey efforts. Originally surveyed
by Bishop Museum [Sinoto 1976], a portion of this area was again investi-
gated by Archaeological Research Center Hawaii [Davis and Griffin 1978] in
order to record sites not located by the Museum's efforts and to more
accurately map site locations. 1984 fieldwork demonstrated that only a few
small archaeological features were missed by both of these projects, and it
is reasonable to assume that virtually 100 per cent of the sites in those
project areas have been found and recorded.

A small section at the north end of Area IV, west of Malakole Road, was not
re-surveyed by Archaeological Research Center Hawaii. Of primary interest
in this area are numerous limestone sinkholes, some of which contain the
remains of fossil birdbones.

The 1984 project involved two distinct tasks in this area. The first was an
inspection of Sites 2717 through 2720 to ascertain the level of effort required
for the mitigation of any adverse impacts posed by the resort development,
and the second involved the mapping, recording, and selective excavation of
sinkholes that might contain the bones of fossil birds in the particular area
that had been previously unsurveyed.

As for the first task, it was discovered that approximately one-third of the
features at Site 2717 [wall and limestone sinkholes] have been destroyed
since the 1979 survey, either by limestone quarrying or construction for the
Deep Draft Harbor. Sites 2718 [enclosure and limestone sinkholes], 2719
[enclosure and mound] and 2720 [structure remnant and enclosure remnant]
<table>
<thead>
<tr>
<th>SITE</th>
<th>TYPE</th>
<th>RECOMMENDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1430</td>
<td>Shelter &amp; limestone sink</td>
<td>Salvage - no preservation value</td>
</tr>
<tr>
<td>1431</td>
<td>Two walls</td>
<td>No further action</td>
</tr>
<tr>
<td>1432</td>
<td>Wall</td>
<td>No further action</td>
</tr>
<tr>
<td>1433</td>
<td>Fishing Shrine</td>
<td>Salvage</td>
</tr>
<tr>
<td>1434</td>
<td>Two walls</td>
<td>No further action</td>
</tr>
<tr>
<td>1435</td>
<td>Wall</td>
<td>No further action</td>
</tr>
<tr>
<td>1436</td>
<td>Kiln</td>
<td>Record in detail, possible relocation</td>
</tr>
<tr>
<td>1437</td>
<td>Midden Deposit</td>
<td>Salvage - no preservation value</td>
</tr>
<tr>
<td>1438</td>
<td>Midden Deposit</td>
<td>Salvage - no preservation value</td>
</tr>
<tr>
<td>2717</td>
<td>Various</td>
<td>Salvage - no preservation value</td>
</tr>
<tr>
<td>2718</td>
<td>Various</td>
<td>Salvage - no preservation value</td>
</tr>
<tr>
<td>2719</td>
<td>Enclosure and mound</td>
<td>Salvage - no preservation value</td>
</tr>
<tr>
<td>2720</td>
<td>Enclosure and shelter</td>
<td>Salvage - no preservation value</td>
</tr>
<tr>
<td>2721</td>
<td>Midden Deposit</td>
<td>Salvage - no preservation value</td>
</tr>
</tbody>
</table>
have not been disturbed since the original surveys. It has been recommended that extensive salvage excavations should be carried out in all of these archaeological sites.

As for the second task, based on a five-acre investigation, there are estimated 750-800 sinkholes in the West Beach area. Sixty-nine sinkholes, representing those most likely on the basis of size and configuration to contain bird bones, were recorded and mapped. Test pits were excavated in six in an effort designed solely to assess the level of effort which would be required in any future excavations that might be associated with a mitigation phase of the project. Three were found to contain fragments of bird bones, one of which also contained archaeological midden materials.

9.17.4 Paleontological Resources

Paleontology is a science which deals with the life of past geological periods as known from fossil remains. The fossils of birds have been found in limestone sink holes in the Barber's Point area. Some of these remains represent species which are extinct and previously unknown to science. The remains represent significant paleontological finds from Hawaii. The project has been surveyed to locate any limestone sink holes. Mitigation measures could include the salvage of fossil remains from the sink holes prior to development, if any are found on the project site.

The applicant, based on the recommendations of the archaeologist, has retained qualified personnel to systematically test 50% of all limestone sinks and fully excavate and remove fossil bones from the tested sinks which will be subject to the review of the State Historic Preservation Officer. The fossil bones will be deposited with the Bishop Museum for further examination and study.

9.17.5 Railroad Renovation

There have been indications that the old OR & L Railroad will be renovated and a "train-ride" type experience along the Pearl City to Waianae area will be available. This will recreate the route taken by the trains hauling sugar cane and passengers between these points. At this time, it is not known if private or public funds will be financing the renovation. Work on the railroad, whether through public or private funds will be coordinated with the State's Historic Preservation Office.
9.18 Population Impact

The Department of General Planning, City and County of Honolulu, identified population impacts of various off-Waikiki resorts ("An Assessment of Potential Off-Waikiki Resorts on Oahu," dated August, 1978). This study provides the following information on the population impact of West Beach:

"The impact area for the West Beach resort center is depicted as: the Waianae Coast, Central Oahu (Miliyani town, Wahiawa), and Waipahu to Moanalua). It is evident that a large number of population concentrations are within the thirty minute travel time of the resort area, which is the criterion for drawing the boundary for the area."

"The impact area includes a major portion of the city. Population within the area amounted to about 334,000 in 1975. With this large population, the resort development at West Beach has a very large labor pool from which employees may be drawn and any population impact generated by the development can easily be absorbed into the urban area."

"Since there is a fairly large labor market within the 30-minute commuting distance of the resort, it is probable that most of the employees will be living within the impact area and the total additional population (33,000-35,000) will present a reasonable estimate of the resort's impact. This possibility will be enhanced if the City & County permits a new residential development within the impact area to complement the resort development. This does not account for unemployed living within the impact area who may seek jobs generated by the resort, or residents in the impact area who are drawn into the labor force as a result of the new job opportunities."

When fully developed, the resort is expected to generate a total additional population, including visitors, of approximately 21,100. This projected total population is based upon a 1.95 double occupancy rate for the 4000 resort units and variable resort residential occupancy rates for the 5200 low and medium density units. This represents about 15% of the projected population for the year 2000 in the affected area. The projected population is based on the current, post 1980 Ewa district census 5.3 percent annual growth rate.

Population densities for the residential sectors of the West Beach project have been established using comparable resort residential development figures. The Housing consultant has stated that occupants per unit type would be relatively low in comparison to typical residential projects such as Millini, Gentry-Waipio, Makakilo and Village Park.
9.19 Land Use Controls and Impact

9.19.1 Present Land Use

The present project site is within the agricultural district, as designated by the State's Land Use Commission (Figure 31). The City & County of Honolulu adopted Development Plans for the West Beach project site on June 8, 1983 in Ordinance No. 83-26. In Figure 32, Development Plan Special Provisions for Ewa, West Beach is identified as part of the new secondary urban center in the West Beach-Makakilo area. The West Beach Master Plan is in compliance with the Development Plan.

Section 15, "Urban Design Principles and Controls for Ewa" 2. "Principles and Controls for Special Areas" a. West Beach Special Area describes the project site in terms of intended uses. County land use amendments and rezoning will be required and portions of the project site lie within the SMA and will also affect the State's Conservation District in terms of shoreline alteration due to Lagoon/Marina development. Figure 33 depicts the SMA Boundary area. Improvement within this area will increase accessibility and recreational use of the shoreline. Improvements within the CDUA area will include the proposed marina and lagoons.

9.19.2 Adjacent Land Uses

The southern boundaries of the site abut the existing Malakole barge basin. This basin is presently being enlarged for the Barbers Point deep draft harbor. Around and south of the basin, Campbell Industrial Park lies approximately .7 mile to the south of West Beach. The Hawaiian Electric Company's Kahe Power Plant is located .5 mile north of the project site, across Farrington Highway. The eastern boundaries of the site abut agricultural lands or lands in open space use. North of the project lie two existing residential subdivisions (Honokai Hale and Nanakai Gardens). The Barbers Point Naval Air Station lies approximately one mile southeast of the project. (See Figure 34 for location of these surrounding uses.)

9.19.3 Future Projects in the Surrounding Area

There are several projects which will occur in the surrounding area, these are:

a. Construction of the Barbers Point deep draft harbor. This harbor, presently under construction, will serve as the second major harbor (next to Honolulu Harbor) for Oahu. Its development is next to the largest industrial park (Campbell) in the State, and the goods and transportation advantages will serve to reduce overland transportation costs for the central Oahu area.

b. Continued growth of Campbell Industrial Park. The industrial park will continue to grow, especially in view of the proposed harbor. Heavy and light industries are housed in the industrial park.

c. Continued development of Makakilo Town. This predominantly single-family subdivision will continue to expand (several units are proposed over the next 5 years).
d. A sanitary landfill site is proposed by the City & County of Honolulu at Waimanalo Gulch, next to Kahe Valley. This landfill is under review by the Department of Public Works as accessory to the proposed Resource Recovery Plant to be located at the Campbell Industrial Park.

e. Expansion of Hawaiian Electric Company's Kahe Generating Plant. Two additional units are envisioned to provide increased electrical power to Honolulu.

f. Improvements and operation changes at Barber's Point Naval Air Station, change air traffic patterns in the area altering air safety hazards and noise impacts.

g. The Hawaiian Electric Company (HECO) has constructed an 8-inch fuel oil pipeline in the old railroad right-of-way that bisects the proposed West Beach development.

h. Ewa Village is located two miles east of the West Beach site, in the Ewa town area. The landowner is the Campbell Estate, the developer, Aloha State Corporation. The information available, to date, is that the project consists of the building of approximately 4,500 to 6,000 residential units (and community facilities including retail facilities) on 675± acres of land. Access for this project is through Fort Weaver Road; the de facto population will be equivalent to West Beach (about 19,000); the sewage will be transmitted to and treated at Honolulu Wastewater Treatment Plant. This will be residential units and the site is not located adjacent to or near the shoreline. The timing is not known; however, it is likely that the time period in which the units will be constructed will be similar to West Beach, that is, over the next ten to fifteen years.

i. Ewa Marina is completing the various land use policy review stages of its' overall planning process. At this time, the project is being reviewed by the Federal, State, and County authorities for approvals to the major dredging which will be done to provide the principal amenity.

j. Ocean Thermal Corporation has completed the design phase of a 50 MWe OTEC power plant to be constructed in approximately 30 feet of water directly offshore from the existing Kahe Power Plant at Kahe Point. The proposal calls for construction to begin sometime in the late 1980's.

9.19.4 Impact on Land Uses

The proposed project will significantly alter the present land use of the project site. From its present open space and fallow and vacant agricultural uses, the site will be transformed to a resort/residential complex with its related facilities and infrastructures. This change in land use will have impact on the immediately adjacent lands. The entire Ewa region is undergoing significant land use changes and population increases. The West Beach project is one of several major projects in the area; other minor projects are also planned. Factors such as availability of public services, potable water, transportation systems, environmental quality standards,
population policies, and economic factors play primary roles in limiting the size or success of the projects and even forcing a "no action" alternative for some. West Beach contributes to ongoing growth and other project impacts in the region. Such impacts include: population increases, population density increases, urban development of agricultural lands, parklike modifications to conservation lands, increased expenditures of public monies for public works and services, traffic potential environmental pollution, and increased water demand. Additionally, the project will generate increased revenues in the form of property sales, and income taxes from the employment opportunities created. The project will also provide access to new open ocean fronts and commercial and recreational facilities. The patterns of growth are established in the State and City Land Use plans (Figure 35).
Preliminary Evaluation of the Proposed West Beach Resort With the Objectives and Policies of the Coastal Zone Management (CZM) Program

The Draft Supplemental EIS includes an evaluation of how the proposed West Beach resort would affect the objectives of the coastal zone management. The CZM must be applied for and approved at some point along the approval and permit process. The objectives of the CZM are found in the Shoreline Protection Act of 1975 (Chapter 205A, Hawaii Revised Statutes). The project, which will also require a U.S. Corps of Engineers Section 404 permit, must receive a Coastal Zone Management Federal Consistency Determination from the Department of Planning and Economic Development for a determination of compatibility between 404 and CZM objectives.

Sub-paragraph 205A–26, Guidelines.

(1) All development in the special management area shall be subject to reasonable terms and conditions set by the authority in order to ensure:

(A) Adequate access, by dedication or other means to publicly owned or used beaches, recreation areas, and natural reserves is provided to the extent consistent with sound conservation principles.

Public access will be provided.

(B) Adequate and properly located public recreation areas and wildlife preserves are reserved.

The development will dedicate to the County approximately 50+ acres for park use. As indicated above, public access to the remaining shoreline area will be provided. There are no wildlife preserves in the area.

(C) Provisions are made for solid and liquid waste treatment, disposition, and management which will minimize adverse effects upon special management area resources.

The sewage generated by the project will be transmitted and treated at the Honolulu Wastewater Treatment Plant.

(D) Alterations to existing land forms and vegetation except crops, and construction of structures shall cause minimum adverse effect to water resources and scenic and recreational amenities and minimum danger of floods, landslides, erosions, siltation, or failure in the event of earthquake.

As discussed in the EIS, the proposed project will attempt to minimize or eliminate impact on water resources, floods, sedimentation, and water quality. Guidelines and restrictions are presently being developed which will help mitigate visual impacts on scenic resources. The preliminary guidelines will be further supplemented by additional design criteria during site planning and building design.

(2) No development shall be approved unless the authority has first found:
(A) That the development will not have any substantial adverse environmental or ecological effect except as such adverse effect is clearly outweighed by public health and safety. Such adverse effects shall include, but not be limited to, the potential cumulative impact of individual developments, each one of which taken in itself might not have a substantial adverse effect and the elimination of planning options;

(This is addressed to the regulating governmental agency for evaluating the project.)

(B) That the development is consistent with the findings and policies set forth in this part.

These were reviewed above.

The remaining subsection (3) was addressed to the regulating authority for minimizing environmental impacts.

(3) The authority shall seek to minimize, where reasonable:

(A) Dredging, filling or otherwise altering any bay, estuary, salt marsh, river mouth, slough, or lagoon.

(B) Any development which would reduce or impose restrictions upon public access to tidal and submerged lands, beaches, portions of rivers and streams within the special management area and the mean high tide line where there is no beach.

(C) Any development which would substantially interfere with or detract from the line of sight toward the sea from the state highway nearest the coast.

(D) Any development which would adversely affect water quality, existing areas of open water free of visible structures, existing and potential fisheries and fishing grounds, wildlife habitats, or potential or existing agriculture uses of land.

9.19.6 State Functional Plans

The State of Hawaii has prepared, twelve functional plans. These functional plans are extensions of the State's General Plan. Specific implementation actions are outlined and information relating to current concerns are addressed. These plans were reviewed to determine if they relate to the West Beach project; and if so, the type of recommendation/guidance the plans' provide. Each plan was reviewed and evaluated below.

DRAFT STATE EDUCATION PLAN & STATE HIGHER EDUCATION PLAN

Both do not address resort/residential developments. They relate to their respective school systems, their growth and goals. Office procedures (records in a computer system), target groups, personnel developments, and school sites are discussed; none directly involves the project site (West Beach) or the development.
STATE HOUSING PLAN

Relating to the Ewa District, the Plan states:

The development plans expect that Ewa will develop into a second urban center. Therefore, the area will absorb an increasing amount of residential and community activity. The present industrial area is expected to expand mauka and a major resort area is planned for West Beach. The existing communities of Makakilo and Ewa Beach will be protected and enhanced.

West Beach will provide low/moderate income housing (10 percent of the total residential units.) Additionally, it will provide employment at various skill levels for the increasing population of the Ewa district.

STATE HEALTH PLAN

This Plan identifies the need to provide adequate health and medical care facilities for the visitors (i.e. resort areas). Additionally, the need to provide adequate health services for workers (especially immigrants) who may have or be more susceptible to diseases. The project site is located in an area where health and medical care (emergency and routine) is available within a twenty (20) minute driving time. Also, the Department of Health requires health clearances for food-handling workers.

Although not identified as a project to be included in the service area for the Honolulu Wastewater Treatment Plant, the Honolulu WTP does include the additional population increase expected in the Ewa district (which includes the West Beach projections).

STATE CONSERVATION LANDS PLAN

The Conservation Lands Plan attempts to establish a rational basis for managing the Conservation Lands and resources of Hawaii. As population increases and urbanization pressures grow, the need for wise use of land and resources will become greater.

West Beach resort will be subject to the Conservation Lands Plan for the shoreline areas of the project site. Two areas of concern which relate directly to the Plan are the shoreline and the ocean habitat. These issues have been extensively researched and all findings are disclosed in this EIS. Management of the newly created shoreline areas are currently unresolved.

STATE AGRICULTURAL PLAN

The Plan acknowledges the loss of prime agricultural lands to resort uses. It notes that resort uses compete for water, labor and capital and places restrictions on vital agricultural activities and uses. Because portions of this site are considered prime agricultural land, the project cannot be considered in conformance with the objectives of this Plan. However, Oahu Sugar's desire to abandon the site was based on poor agronomic feasibility in maintaining a productive and economically viable operation.
STATE HISTORIC PRESERVATION PLAN

The Historic Preservation Plan, reviews the procedures and identifies areas where archaeological salvaging or preservation are desirable. Procedures for resort sites include preparing an archaeological survey, and preserving sites considered of value, and coordination of salvaging and preservation with the State Historic Sites Office. In this regard, the West Beach project has or will follow these procedures.

STATE TRANSPORTATION PLAN

Identifies the Ewa/Makakilo area as an area which will require new roadways and improvements to existing roadways as population increases. The plan discusses the need for efficient movement of goods and people. It is felt that the project is consistent with this plan policy because of the new roads and interchange and intersection plans with Farrington Highway. An internal bus system and transport of visitors via buses, being a self-contained resort, will result in less use of the private automobile.

STATE RECREATIONAL PLAN

The State Recreational Plan reviews the demands and actions that need to be taken to fulfill the existing and future recreational demands. Specifically, in the Ewa District, the Plan acknowledges the rapid growth of the District and finds that: "Development to receive new populations should be accompanied by the provision of adequate recreation facilities and programs." Because the project is providing for park dedication as well as turning over the portions of the shoreline area to the Department of Parks and Recreation for beach park use, it is felt that the project is consistent with the objectives of the Recreational Plan. The maintenance and construction of comfort stations and playground apparatus must still be addressed by the responsible agency; however, the developer is providing the land, public rights-of-way to the lagoons and existing shoreline, and other private recreational activities which will be available to the public.

THE STATE ENERGY PLAN

The State Energy Plan identifies the need to conserve fuels (though physical design planning) for resort areas. Specific information on projects do not relate to or address the West Beach project site. Other policies and objectives are broad and relate to energy conservation and use of energy sources other than the fossil fuels. Subsequently, the project is not directly addressed in the Plan. During the review of the Plan, it was noted that the location of the project is in an existing service area for electrical energy and is located near the Kahe Power Plant. Also, the project site is in an area which receives one of the highest amount of solar radiation on the island. The retained planner/architect will consider energy saving devices and installations. Because of the increasing cost of energy, the energy savings incorporated into the plan will be a considerable cost reduction as well as a conservation action. The movement of visitors from the airport to the site and back, and from the site to other locations will be largely through buses; this will reduce the amount of private automobiles on the site and along the transportation system.
THE STATE TOURISM PLAN

The State Tourism Plan identifies and analyzes four (4) issues related to the visitor industry in Hawaii. These are (1) economic projections, (2) physical resources, (3) manpower, and (4) public revenues and costs. Various issues facing the visitor industry are addressed along with specific reviews and evaluations of existing and planned resorts. The Plan identifies the planned resorts and the general "problems" or impacts which the resort may generate. These planned resorts were considered because the County in which it is located designated these resorts or resort areas. The Plan further comments on the objectives and policies of resort development and how each resort should consider conformance with and provide for adequate public facilities, infrastructure, environmental conditions, and acceptable social impacts. The Plan does not support or indicate unacceptability of resort areas. It does provide discussions on conflicts and benefits which will possibly occur as a result of the County's designation of resort areas.

West Beach is in compliance with the objectives of the Tourism Plan as follows:

(1) **Economic Projections:**
West Beach will provide 5000 jobs during the construction and operation of the destination resort. Economic impacts are described and detailed in this document.

(2) **Physical Resources:**
Upon completion, West Beach will afford resort facilities to both visitor and resident, for recreational, social, and commercial purposes.

(3) **Manpower:**
The scale and size of West Beach will duplicate and certain instances, exceed the labor requirements of Kaanapali, Maui. The skill levels will range from unskilled labor to highly skilled management personnel, at the resort hotels, marina, golf course, and retail commercial centers.

(4) **Public Revenues and Costs:**
There will be extensive physical improvements needed to provide the utilities and protective services of Fire, Police, Health, and also the roadway improvements as well.

The proposed project will result in the establishment of a new resort on the island of Oahu. The resort complex will provide 4,000 resort units and 5,200 housing units for permanent residents. Alteration of the shoreline will result in some nearshore impacts of the water quality; however, benefits will include the construction of a recreational marina, and beach lagoons which will increase the recreational usage of the shoreline. If the land were to remain in its present use, the comparable impacts are as follows:

(1) the land would remain agriculturally inactive versus a productive use of the fallow agriculture land as proposed by project plans;

(2) the land would not produce economic revenue versus the resort proposal. An increase in economic revenue would be reflected in the larger number of employees by the resort, the additional tax and property revenue from resort uses, and the greater expenditure and profit from resort uses;

(3) environmental quality will be affected, this is the case in any situation where urbanization occurs. Mitigation measures will be incorporated into the design plans and under permit conditions. The actual impact of West Beach will be dependent on the implementation of these mitigation measures and the management of the resort complex.
11. AN IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

Resources in various forms will be committed permanently to this proposed project if implemented. Human resources such as monies, time, and effort will be expended. Once time is expended (for planning, construction) it is irretrievable. However, work is compensated with monetary payment for these services. Construction material will be used. These materials can be recycled; however, the project will utilize these resources on a long-term basis. Shoreline and view planes will be permanently altered. The change from fallow agricultural fields to an urbanized landscape, is judged by some to be an adverse impact, however, this effect is unavoidable and will be mitigated by strict design criteria. Urbanization, once implemented, normally commits the land use to an equal or more intensive future use. Once completed, it is very likely that the land will be committed to this or a higher future use.
12. LIST OF PREPARERS

12.1 The following individuals at the U.S. Army Corps of Engineers are responsible for the Corps EIS requirements and concerns expressed in the Joint Draft Supplementary EIS.

<table>
<thead>
<tr>
<th>Name</th>
<th>Expertise</th>
<th>Experience</th>
<th>Professional Discipline</th>
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<tbody>
<tr>
<td>Mr. Michael T. Lee</td>
<td>Biology</td>
<td>B.A. Biology; 1 year Biologist U.S. Navy. 11 years EIS studies, 2 years Water Resource Planner U.S. Army Corps of Engineers, Honolulu District.</td>
<td>Biologist</td>
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<td>Ms. Ruby Mizue</td>
<td>Biology</td>
<td>B.A. Biology, 8 years EIS studies, 6 years Water Resources Planner</td>
<td>General Biologist</td>
</tr>
</tbody>
</table>

12.2 The persons primarily responsible for preparing the DSEIS for submittal to the government agencies (Alphabetical Order)

<table>
<thead>
<tr>
<th>Name</th>
<th>Expertise</th>
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<th>Professional Discipline</th>
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</thead>
<tbody>
<tr>
<td>Karl H. Bathe</td>
<td>B.S. Engineering, M.S. &amp; Ph.D., Oceanography</td>
<td>Researcher, 15 years; private consultant.</td>
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<td>William Barrera, Jr.</td>
<td>M.A. Anthropology</td>
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</tr>
<tr>
<td>Name</td>
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<tr>
<td>Andrew J. Berger</td>
<td>Ph.D. Zoology</td>
<td>15 years study (research and publications) of avifauna in Hawaii; Professor (retired), Department of Zoology, University of Hawaii, Manoa Campus.</td>
<td>Zoologist</td>
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<tr>
<td>Paul K. Bienfang</td>
<td>Ph.D. Oceanography</td>
<td>4 years research assistant, University of Hawaii, Manoa Campus; 3 years phytoplankton ecologist, microbiologist, nutrient chemist (private consultant); 12 years biological oceanographer, Oceanic Institute, Hawaii.</td>
<td>Biological Oceanographer</td>
</tr>
<tr>
<td>Winona P. Char</td>
<td>B.A., M.S. Botanical Sciences</td>
<td>4 years, botanical aide, 2 years horticulturist, Honolulu Botanic Gardens; 9 years botanic consultant.</td>
<td>Botanical Consultant</td>
</tr>
<tr>
<td>Ronald A. Darby</td>
<td>M.S. Engineering, (P.E.)</td>
<td>5 years engineering; 7 years research mechanical engineer at Marine Engineering Laboratory, Annapolis, Maryland; 15 years private acoustical consultant.</td>
<td>Noise Consultant</td>
</tr>
<tr>
<td>Gordon L. Dugan</td>
<td>M.S. Sanitary Engineering, Ph.D., Environmental Health Sciences</td>
<td>9 years Associate Professor/Professor at University of Hawaii, Manoa Campus, 13 years consultant in surface water runoff in Hawaii</td>
<td>Water Quality Consultant</td>
</tr>
<tr>
<td>Name</td>
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<tr>
<td>Yoichi Ebisu</td>
<td>M.S. Electrical Engineering</td>
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</tr>
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<td>F. Gerritsen</td>
<td>Ph.D. Ocean Engineering</td>
<td>Several years experience in ocean studies and research in Hawaii.</td>
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</tr>
<tr>
<td>Taeyong M. Kim</td>
<td>B.A. Sociology, M.A. candidate Urban and Regional Planning</td>
<td>1st year with Environmental Communications, Inc.</td>
<td>EIS Preparer</td>
</tr>
<tr>
<td>F.J. Rodriguez</td>
<td>B.A. Sociology and Business Administration</td>
<td>15 years work relating to environmental concerns and impact statements in Hawaii.</td>
<td>President, Environmental Communications, Inc.</td>
</tr>
<tr>
<td>Barry D. Root</td>
<td>M.A. Geography and Public Health</td>
<td>4 years duty with U.S. Air Force, air service; 5 years university geography assistant/instructor; 9 years air pollution consultant.</td>
<td>Air Quality Consultant</td>
</tr>
</tbody>
</table>
12.3 The following consulting firms provided project description, engineering and/or technical data, or marketing data for use in this DSEIS.

a. Alfred A. Yee & Associates, Inc. - Engineering (Marina & Lagoons)
   Honolulu, Hawaii

b. Chaney, Brooks & Company - Housing and Population
   Honolulu, Hawaii

   Newport Beach, California

d. Community Planning, Inc. - Civil Engineering
   Honolulu, Hawaii

e. Pannell, Kerr, Forster & Company - Certified Public Accountants
   (Marketing Analysis) Honolulu, Hawaii Office

f. West Beach Resorts - Applicant/Developer of West Beach
   Honolulu, Hawaii

13.4 The individuals and companies identified in this section provided major input and data necessary for the compilation and preparation of this document. Involvement of other individuals were under the direction and/or employment of these individuals and/or companies.
13. PUBLIC INVOLVEMENT

13.1 Public Involvement Program

(a) Federal Action.

A Final Environmental Impact Statement (FEIS) for the Proposed West Beach Resort was completed in November 1980, distributed for public review, and published in the Federal Register on 12 December 1980. The FEIS was prepared and processed as part of a tiering process where the broad general project concepts were evaluated and specific site development plans would be addressed in supplements to the FEIS. The FEIS was also prepared as a joint Federal-State FEIS because of overlapping areas of State, County and Federal regulatory jurisdiction, and because of the similarity in environmental impact statement requirements under State and Federal law. The joint Federal-State EIS was also prepared to reduce duplication of EIS requirements and to assist the public in reviewing the total action, rather than parts and pieces of the action as a result of individual regulatory actions and separate EIS.

Comments received in response to the circulation of the FEIS were used to scope the Draft Supplemental EIS, and were included in the Public Involvement section. A Notice of Intent to prepare a Supplemental EIS for the proposed action was published in the Federal Register on June 14, 1984. Those individuals who had responded to the FEIS and expressed interest in the project were included on the following mailing list to receive the Draft Supplemental EIS.

As a matter of background, a Notice of Intent to prepare an EIS for the proposed action was initially published in the Federal Register on 26 June 1979. On 23 June 1980, a public notice was issued announcing the availability of the Draft EIS, and the availability was published in the Federal Register on 7 July 1980. A public hearing was held on 13 August 1980, prior to finalizing the Draft EIS.

(b) State Action.

(1) An EIS Preparation Notice for the proposed project prior to the preparation of the document DEIS) was published in the EQC Bulletin on May 23, 1984. In this case, the EIS Preparation Notice was circulated to various agencies (governmental and private) who were known to have interest in the project. The circulation and review of the Preparation Notice, also called the "Consultation Period" was initiated in May 23, 1984 and ended June 22, 1984. Comments received in response to the Preparation Notice are contained in the following section.
LIST OF FEDERAL AGENCIES RECEIVING DRAFT SUPPLEMENTAL EIS

Hawaii Congressional Delegation - Hawaii and Washington DC Offices

Senator Daniel K. Inouye
Senator Sparky M. Matsunaga
Representative Cec Heftel
Representative Daniel K. Akaka

Federal Agencies

US Army Corps of Engineers, Washington DC

US Environmental Protection Agency
  Office of Environmental Review, Washington DC
  Region IX, San Francisco, CA

US Department of Commerce
  Asst. Sec. of Environmental Affairs, Washington DC
  Region IX, San Francisco, CA
  National Marine Fisheries Service
    Southwest Region Office, Terminal Island
    Western Pacific Program, Hawaii

US Department of the Interior
  Office of Environmental Project Review, Washington DC
  US Fish and Wildlife Service, Hawaii
  US Geological Service, Hawaii
  National Parks Service
    Hawaii Office
    Interagency Archaeological Services, SF, CA

US Department of Health, Education and Welfare

US Department of Housing and Urban Development
  Region IX, San Francisco, CA
  Honolulu Office

US Department of Agriculture
  Environmental Quality Activities, Washington DC
  Ag. Stabilization and Conservation Service, Hawaii
  Soil Conservation Service, Hawaii

US Department of Transportation
  Federal Highway Administration, San Francisco, CA
  Federal Highway Administration, Hawaii
  US Coast Guard, 14th District, Hawaii
  US Navy, 14th Naval District, Pearl Harbor
  Barber's Point Naval Air Station
13.3 DISTRIBUTION LIST

STATE AGENCIES

OEQC
Department of Agriculture
Department of Accounting and General Services
Department of Defense
Department of Health
Department of Land and Natural Resources
DLNR State Historic Preservation Officer
Department of Planning and Economic Development
DPED Library
Department of Social Services and Housing
Department of Transportation
State Archives
State Energy

UNIVERSITY OF HAWAII

Environmental Center
Water Resources Research Center

FEDERAL

Environmental Protection Agency (a) Region IX
Navy
Soil Conservation Service
U.S. Army Corps of Engineers
U.S. Coast Guard
U.S. Fish and Wildlife Service

NEWS MEDIA

Honolulu Star-Bulletin
Honolulu Advertiser
Sun Press

CITY AND COUNTY OF HONOLULU

Board of Water Supply
Building Department
Department of Housing and Community Development
Department of General Planning
Department of Land Utilization
Department of Parks and Recreation
Department of Public Works
Department of Transportation Services
Fire Department
Municipal Reference and Records Center (Oahu only)
Oahu Civil Defense Agency
Police Department
ORGANIZATIONS

American Lung Association  
Bishop Museum  
Hawaii's Thousand Friends  
Hawaiian Electric Company  
Leeward Ocean Advisory Council, Sea Grant Ext. Service  
Native Hawaiian Legal Corp  
Office of Hawaiian Affairs  
Waianae Neighborhood Board

LIBRARIES

U.H. Hamilton Library, Hawaiian Collection  
Legislative Reference Bureau

Regionals

Kaimuki Regional Library  
Kaneohe Regional Library  
Pearl City Regional Library  
Hilo Regional Library  
Wailuku Regional Library  
Lihue Regional Library

Oahu

Ewa Beach Community-School Library  
Waianae Library
### ORGANIZATIONS AND AGENCIES CONSULTED DURING THE EIS PREPARATION NOTICE

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13.5 LETTERS RECEIVED IN RESPONSE TO THE STATE EIS PREPARATION NOTICE
DEPARTMENT OF NATIONAL GUARD

STATE OF HAWAII

JUNE 25, 1984

EXECUTIVE DIRECTOR

DEPUTY DIRECTOR

SUBJECT:

Thank you for the opportunity to comment on this matter.

2. The proletariat is a class which, with the proletariat, is a class that provides the means of production and is exploited by the proletariat.

The proletariat is a class that provides the means of production and is exploited by the proletariat. This class is required to provide the means of production and is exploited by the proletariat.

3. The proletariat is a class that provides the means of production and is exploited by the proletariat. This class is required to provide the means of production and is exploited by the proletariat.

Thank you for the opportunity to comment on this matter.
Public Use of Facilitates

We have reviewed the subject environmental assessment

SYNTHESIS ENVIRONMENTAL ASSESSMENT/PREPARATION

DEPARTMENT OF TRANSPORTATION

STATE OF HAWAII

July 26, 1984
Page 2

Mr. Fred孕

The 8, 1978

SFP 8, 1978

DEPARTMENT OF TRANSPORTATION

STATE OF HAWAII

July 26, 1984
Page 2

Mr. Fred孕

The 8, 1978

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DEPARTMENT OF TRANSPORTATION

STATE OF HAWAII

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Page 2

Mr. Fred孕

The 8, 1978

SFP 8, 1978

DEPARTMENT OF TRANSPORTATION

STATE OF HAWAII

July 26, 1984
Page 2
Dear Mr. Temma:

Thank you for your comments and we look forward to receiving the

Please be advised that your comments have been incorporated into the project.

Sincerely,

[Signature]
Dear Mr. Honda:

Honolulu, Hawaii 96814
P.O. Box 137
Suite 400
State of Hawaii
Department of Education
Environmental Protection Office

We, Veronica Honda

April 29, 1984

AN EQUAL OPPORTUNITY EMPLOYER

CC: Special Office

TH: 1107

Assistant Superintendent

Signature

Thank you for your letter of May 24, 1984 on the subject of the Environmental Protection Office's review of the proposed school site. We believe the Environmental Protection Office is the proper body to handle the proposed site's development since it is the one responsible for the Environmental Impact Statement.

Sincerely,

Assistant Superintendent

[Signature]

Subject: Proposed School Site

May 24, 1984

DEPARTMENT OF EDUCATION
STATE OF HAWAII

Ms. Frances M. Hamana

COMMUNITY COMMUNICATIONS
INVESTIGATIONS
ENVIRONMENTAL

[Signature]

[Stamp]
August 1984

Environmental
Communications

Mr. Bisson, OIA, Chairman,

Honolulu, Hawaii 96813

Dear Mr. Bisson,

Thank you for your letter of May 31, 1984 on the subject documen.

The Department of Land and Natural Resources has been consulted during the preparation of the Environmental Impact Statement to be prepared in accordance with the preparation notice for the project B1160, which is for the establishment of a segment of army beach resort, Honoluli.

Sincerely yours,

[Signature]

Your continued interest in the project is appreciated.

The Department of Land and Natural Resources

Susan C. Ching

Environmental Communications, Inc.

Ref: NO.: GPO-1205-48

Department of Land and Natural Resources

State of Hawaii

[Government Seal]
We refer you to follow:

Subject: West Beach, Sand, Drainage, Environmental Impact Statement

Dear Mr. Smith:

Honolulu, State of Hawaii
Department of Health

We refer you to follow:

Subject: West Beach, Sand, Drainage, Environmental Impact Statement

August 29, 1984
June 25, 1994

E. J. Rodriguez

Dear Mr. Rodriguez:

Thank you for the opportunity to comment. This material was received on
March 27, 1994. As you are aware, we are currently engaged in
the development of the draft budget which will address your
question. While we appreciate your continued interest in the project.

The purpose of this letter is to update you on the status of our review of the draft
budget. We have completed the review and have identified several
issues that need to be addressed. We are currently working on a final
version of the budget that will be submitted to the appropriate
authorities for review and approval.

Please feel free to contact me if you have any questions or concerns.

Sincerely,

E. J. Rodriguez

Environmental Coordinator, EIS Coordinating Office

Environmental Assessment/Preparation Section

University of Hawaii at Manoa
The property does meet the request under appeal. The request pertains to the fact that the "important agricultural lands" mentioned in the legislation to.

cc: DPEQ

Attention

Chairman, Board of Agriculture

Yours sincerely,

[Signature]

May 3, 1964

Page 2 of 2. Reception

Mr. J. Anderson

Department of Agriculture

May 29, 1964

[Signature]
Thank you for the opportunity to comment.

The Department of Agriculture is of the opinion that the heated food product would not be ready for consumption in the time period specified in the approval. However, if the product is heated to a temperature above 70°C for 5 minutes, it would be suitable for consumption. The Department recommends further testing of the heated food product to ensure its safety.

Attached is a report on the heating process and the results of the tests conducted. If you have any questions or concerns, please contact me.

Yours sincerely,

[Signature]

[Date]
Dear Mr. Huang,

Thank you for your review and comments of May 29, 1984 on the subject

Subject: West Harah Project Supplemental Environmental Impact Statement

Dear Mr. Huang:

Houwoli, Kauai 96714
1431 S. Kings Street
Department of Agriculture
Mr. Jack Kaua, Chairman

August 29, 1984

[Signature]

Environmental
Inc.
Dear Mr. Tran:

I am writing to inform you of the completion of the preliminary design for the proposed project to construct a new parking garage. The design will take into consideration the needs of the City and County of the City, as well as the City of the City, and the County of the City. The project will be responsible for the expansion of the City's parking facilities, and the City's need for additional parking spaces.

The preliminary design includes the following features:

- A 100-space parking garage
- A 50-space visitor parking area
- A 20-space bicycle parking area
- A 10-space carpool parking area

The design has been developed in consultation with the City's planning department, and the final design will be subject to further review and approval by the City's planning board.

Please let me know if you have any questions or concerns regarding the design.

Sincerely,

[Your Name]
The determination of the project's environmental impact is a crucial aspect of the project's development and implementation. The ecological footprint and its potential effects on the environment must be carefully considered to ensure that the project is sustainable and environmentally friendly. The project must be designed and implemented in a way that minimizes its impact on the natural environment.

In the determination of the project's environmental impact, the following factors must be considered:

1. The project's location and the impact it might have on the surrounding ecosystem.
2. The project's design and construction methods, including the use of materials and energy demands.
3. The project's operation and maintenance, including energy consumption and waste generation.
4. The project's potential for pollution and the measures in place to prevent it.

The project must be designed and implemented in a way that minimizes its environmental impact. This includes the use of sustainable materials, the implementation of energy-efficient technologies, and the establishment of robust pollution control measures.

The Environmental Protection Agency (EPA) has established guidelines and regulations for the protection of the environment. These guidelines and regulations must be followed to ensure that the project is environmentally friendly and sustainable.

In conclusion, the determination of the project's environmental impact is a critical aspect of the project's development and implementation. The project must be designed and implemented in a way that minimizes its impact on the environment and ensures that it is sustainable and environmentally friendly.
The DEIS states on page 2 that the mine will be remediated for acid waste. Additionally, the DEIS states on page 10 that the mine will be remediated for acid waste. A more detailed description of the remediation process is provided in the DEIS text.

Regarding the location of the project, the DEIS states on page 2 that the mine will be remediated for acid waste. Additionally, the DEIS states on page 10 that the mine will be remediated for acid waste. A more detailed description of the remediation process is provided in the DEIS text.

Recreational Resources

The DEIS states on page 2 that the mine will be remediated for acid waste. Additionally, the DEIS states on page 10 that the mine will be remediated for acid waste. A more detailed description of the remediation process is provided in the DEIS text.

Agricultural Considerations and Impact

The DEIS states on page 2 that the mine will be remediated for acid waste. Additionally, the DEIS states on page 10 that the mine will be remediated for acid waste. A more detailed description of the remediation process is provided in the DEIS text.

Note

The DEIS states on page 2 that the mine will be remediated for acid waste. Additionally, the DEIS states on page 10 that the mine will be remediated for acid waste. A more detailed description of the remediation process is provided in the DEIS text.

August 7, 1980
the city and county of san francisco, as the lead agency, and in accordance with the environmental impact report approved by the planning commission on december 11, 1978, is issuing a development permit for the construction of a new office building on the site of the new park. the project includes the construction of a four-story office building with approximately 120,000 square feet of office space and a two-story parking garage with approximately 100 parking spaces. the project will also include the construction of a new park area in the adjacent neighborhood.

the city and county of san francisco, as the lead agency, and in accordance with the environmental impact report approved by the planning commission on december 11, 1978, is issuing a development permit for the construction of a new office building on the site of the new park. the project includes the construction of a four-story office building with approximately 120,000 square feet of office space and a two-story parking garage with approximately 100 parking spaces. the project will also include the construction of a new park area in the adjacent neighborhood.

the development of these maps and in part with the development of these maps includes the construction of a new office building on the site of the new park. the project includes the construction of a four-story office building with approximately 120,000 square feet of office space and a two-story parking garage with approximately 100 parking spaces. the project will also include the construction of a new park area in the adjacent neighborhood.

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the development of these maps and in part with the development of these maps includes the construction of a four-story office building with approximately 120,000 square feet of office space and a two-story parking garage with approximately 100 parking spaces. the project will also include the construction of a new park area in the adjacent neighborhood.
E. J. Bostick

Very truly yours,

Thank you for your continuing interest and concern.

We will contact your agency for further discussion and coordination. The information and data provided in your letter, the comments have been provided in accordance with your request. Please note that the data provided is preliminary and subject to further review.

Thank you for your interest in the development of the beach area. We are working on the feasibility study and will keep you informed of any significant progress.

Subject: Beach Draft Supplemental Environmental Impact Statement

August 29, 1986

Mr. Malcolm A. Smedley
Houma, Louisiana

City of Houma

Chairman, City Council

Administration

CONSTRUCTION
ENVIRONMENTAL
}
Dear Mr. Honka:

June 21, 1984

The proposed West Beach project encompasses 91 acres of waterfront property, representing almost 10 percent of the total property owned by the City and County of Honolulu. The City is currently preparing an Environmental Impact Statement for the project. The preparation of the statement is expected to take approximately 9 months and will result in a 100-page document. Your input is crucial in the preparation of this document. Your comments and suggestions will be included in the statement. Please submit your comments and suggestions in writing to:

Mr. Honka
City of Honolulu
Department of Planning
250 South King Street
Honolulu, Hawaii 96814

Thank you for your time and assistance in this matter.

Very truly yours,

[Signature]

Mr. Honka

Subject: West Beach Project: Preparation of Environmental Impact Statement
To the Hawaii State Plan.

A more detailed description and conceptual plans must be

provided in the C1.

Refer to City and County of Honolulu

Department of Planning and Utilization

Dear Mr. Helton:

Honolulu, Hawaii 96813

May 29, 1984

Mr. Michael Helton, Director

Environmental Protection Agency

August 29, 1984

Michael Helton

Command/Communications

Environmental

Defense

Thank you for your concern. Please contact John Hargrove or our
staff at 232-5490.

If there are any questions, please contact John Hargrove or our

Michael Helton

Director of Land Utilization

Very truly yours,

Michael Helton

Director of Land Utilization

Michael Helton
Thank you for your contribution and cooperation. The book is now at an early stage with the effort on the preparation and processing of the project document. I appreciate the work done and look forward to working closely with you on the preparation and processing of the project document.

1. [Text]
2. [Text]
3. [Text]
4. [Text]
5. [Text]
6. [Text]
7. [Text]
8. [Text]
9. [Text]
10. [Text]

August 24th, 1984

NAI, Michael W. Heeley

Page 2
Note: The following document contains redacted sections that are not suitable for sharing.

For access to the full document, please contact the responsible government agency or request redacted excerpts.
Mr. Ernest Kosaka
Project Leader
Office of Environmental Services
United States Department of the Interior
Fish and Wildlife Service
P.O. Box 50167
Honolulu, Hawaii 96850

Dear Mr. Kosaka:

Subject: West Beach Resort Supplemental Environmental Impact Statement Preparation Notice

Thank you for your letter dated June 20, 1984 and the comments made on the West Beach Resort EISPN. We respond as follows:

The specific technical studies you have requested are being updated in view of the design work currently under way for the Lagoon and Marina systems. We will make the updated studies available to your agency since the concerns expressed in your letter are to be covered by these updated studies.

The request for the 1975 studies was withdrawn in a telephone discussion with your office.

You will be pleased to know that in our process of updating the technical studies, the preliminary findings as to the difference in the offshore marine biota from 1975 to the present time, clearly identify certain changes in marine benthic and macrobiota communities. It is fortunate from our standpoint that the 1975 studies were completed so that there is evident proof of the differences in the five years that have passed.

Discussion on groundwater hydrology will be provided in the DEIS.

Finally, the team of technical consultants involved in the 1975 studies remains intact and will be completing their updating of the previous work during this calendar year. At that time, the updated studies will be provided to your office with the initial DEIS.

Thank you for your continuing interest and concern.

Very truly yours,

F. J. Rodriguez

FJR:ls

This Fort Street Mall Suite 200  P.O. Box 136  Honolulu, Hawaii  96813  Telephone 651-6181
Dear Captain Elliott:

I am writing to inform you of the Environmental Impact Statement (EIS) for the construction of the new Pearl Harbor Headhouse and Hydroelectric Station. The EIS is being prepared by the Army Corps of Engineers and will be available for public review.

The EIS will assess the potential environmental impacts of the proposed project and will include public hearings. We encourage you to attend these hearings and provide your comments.

Thank you for your cooperation and assistance.

Sincerely,

[Signature]

Assistant Director of the Commander
Facilities and Energy Management, CMC, USN

April 29, 1994

Environmental Communications, Inc.

June 9, 1994

[Stamp]
June 4, 1984

P.R. Pulaski

Dear Mr. Pulaski,

We appreciate your continued interest in the project.

Office will be contacted.

The developer is not seeking HUD assistance for the subject property.

Thank you for your notice and comments of May 31, 1984 on the subject.

Sincerely,

Robert K. Fulda

Manager, Q.25

5A6-3570.

If you have any questions, you may contact Frank Johnson at

If the comments list on supplementary EIS, your entity appropriate.

Thank you for your notice and comments of May 31, 1984 on the subject.

Sincerely,

Robert K. Fulda

Manager, Q.25

5A6-3570.

If you have any questions, you may contact Frank Johnson at

If the comments list on supplementary EIS, your entity appropriate.

Thank you for your notice and comments of May 31, 1984 on the subject.

Sincerely,

Robert K. Fulda

Manager, Q.25

5A6-3570.
June 1994

Outlines the advantages and disadvantages of the proposed alternatives for the project area. The project area is located in a sensitive ecological zone near a major water source. The project is expected to affect the local environment and may cause significant impacts on the surrounding communities.

According to the Federal Insurance Act, any project that may cause significant environmental impacts must be evaluated for potential risks and benefits. The project area is located within a designated conservation area, which requires a detailed environmental impact assessment (EIA).

The EIA must consider the potential effects of the project on the local ecosystem, including wildlife, vegetation, and water quality. The project will involve the construction of a new facility, which may disturb the existing habitat and displacement of local species.

The EIA should also consider the economic benefits and costs associated with the proposed project. The project may create new jobs and stimulate local economic growth, but it may also lead to increased traffic congestion and higher property taxes.

The EIA must also consider the potential for flooding and other natural disasters in the area. The project site is located near a river that experiences periodic flooding, which may increase the risk of property damage and displacement of local residents.

This EIA must be submitted to the appropriate regulatory agency for review and approval. The project will proceed only if it meets the environmental standards and regulations established by the federal government.

Thank you for your interest in the proposed project and thank you for your patience during this EIA process.

Yours sincerely,

[Signature]

[Department of the Army]

PACIFIC OCCUPATIONAL COMMISSION ENGINEERS

**Notes:**
- The EIA must include a comprehensive analysis of the potential environmental impacts, including air quality, water quality, and biodiversity.
- The EIA must also consider the potential for public health risks, such as exposure to hazardous substances.
- The EIA must also consider the potential for social impacts, such as displacement of local residents and disruption of local communities.

**References:**
- Federal Insurance Act
- Environmental Impact Assessment (EIA) regulations
- Local zoning and building codes
- National Environmental Policy Act (NEPA)

**Signatures:**
- [Project Manager]
- [Environmental Specialist]
Dear Mr. Chowaniec,

This is a notice of the Federal Trade Commission (FTC) Environmental Impact Statement for the proposed construction of a new office building located on the site of a former industrial facility.

The proposed project is expected to have minimal environmental impacts, and we have consulted with all relevant agencies and stakeholders to ensure compliance with environmental regulations.

Enclosures:
- Environmental Impact Statement
- Project Plan

Thank you for your consideration.

Sincerely,

[Signature]

[Company Name]

[Date]
Dear Mr. Fields,

We appreciate your continued interest in our project.

Thank you for your review and comments of June 29, 1984 on the subject of: Waste Beach, Resort, Supplementation, Environmental Impact Statement.

[Signature]

Secretary:

We have reviewed the above-mentioned document and requested the General Mills, Inc. to provide the environmental assessment/preparation notice for the proposed project.

[Signature]

Environmental

INVESTIGATIONS

CONSTRUCTION

ENVIRONMENTAL

NOTICE

6/27/89

Hannah, Lawton
P.O. Box 375
Comstock, MI

June 29, 1984

P.O. Box 2804
Communications, Inc.

96839

Hannah, Lawton
P.O. Box 2804
Communications, Inc.

96839

Hannah, Lawton
P.O. Box 2804
Communications, Inc.

96839

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Communications, Inc.

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Hannah, Lawton
P.O. Box 2804
Communications, Inc.

96839

Hannah, Lawton
P.O. Box 2804
Communications, Inc.
June 27, 1984

Dear Mr. John:

Subject: Your Recent Report

Dear Mr. John:

Thank you for your review and comments on your report on the subject. We appreciate your continued interest in this project.

We have noted your concerns and will take them into consideration. You will be kept informed of the project's progress and any changes that may occur. Your comments will be addressed in the following documents and our responses will be submitted to you in a timely manner.

Thank you for your time and consideration.

Sincerely,

[Signature]

Environmental Coordinator, Hawaiian Telephone Company
P.O. Box 2200
Hilo, Hawaii 96720

August 16, 1984

Dear Mr. John:

Thank you for your prompt response to the proposed environmental assessment. We are pleased to hear that your concerns have been addressed and that your agreement to proceed with the project is forthcoming.

Sincerely,

[Signature]

Environmental Coordinator, Hawaiian Telephone Company
P.O. Box 2200
Hilo, Hawaii 96720

June 26, 1984

[Signature]
HAWAIIAN ELECTRIC COMPANY, INC.

Page 2

June 2, 1984

ENVIRONMENTAL ASSOCIATES, INC.

Rene H. Matsumoto
Acting Manager

since you for the opportunity to comment on this Environmental Assessment/Preparation Notice.

Evaluators:

Page 2

June 3, 1984

ENVIRONMENTAL ASSOCIATES, INC.

Revised, 7-1

HAWAIIAN ELECTRIC COMPANY, INC.

Subject: Environmental Assessment/Preparation Notice for the

Honolulu, Hawaii 96819

P.O. Box 206,

Environmental Consultants, Inc.

Volume 2

Hawaii 96819

Procedural Voluntary Haulout Point, 930900

1.

No motion is made of the existing Pearlridge parking, and

2.

What effect will there be on the development if there is a

3.

Break in the Planning, if any type of oceanfront.

4.

The transfer station is shown to be on the affected

5.

The transfer station should be located on the

6.

The right-of-way will make it almost impossible to maintain the

7.

The right-of-way that crosses the proposed route.

and the immediate area of the Pearlridge parking, and

will not interfere with the old Pearlridge parking.

6.

Attached comments from 1979 and 1980 are still valid.

5.

We suggest some type of buffer zone separating the Pearlridge

4.

The Pearlridge parking would be located on the

3.

What effect will there be on the development if there is a

2.

To what effect will there be on the development if there is a

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3.

What effect will there be on the development if there is a

2.

To what effect will there be on the development if there is a

1.

No motion is made of the existing Pearlridge parking, and
Many years to come.

The project is an ongoing international operation and will remain so for the foreseeable future. The project involves a number of stages which must be undertaken in a specific sequence to ensure the success of the project. The first stage involves the identification of the project's goals and objectives. This is followed by the development of a detailed project plan, which includes a timeline and a budget. The plan is then reviewed by the project management team and any necessary changes are made before the project begins.

The project management team is responsible for ensuring that the project is completed on time and within budget. They will also be responsible for monitoring the progress of the project and making any necessary adjustments to the plan. The project is expected to be completed by the end of the current fiscal year.
In consideration of the above information furnished to this Command, it may be desirable for NCO's commands to authorize

May 3, 1979

Page 7
Subject: Final Environmental Impact Statement

Honorable Mayor

800 N. Main

June 30, 1980

Mr. Michael J. O'Hara

Environmental Protection

Chairman, Planning Commission

August 2, 1980

Department of Environmental Protection

Dear Mr. O'Hara:

I am writing to bring to your attention the recent development of the proposed waste transfer station to be located at the corner of 1st and Main Streets. This project is designed to address the current environmental concerns and to ensure the safety and well-being of all residents. The proposed development area is located within a sensitive ecological zone, and it is essential that proper environmental safeguards are put in place.

The project involves the construction of a new waste transfer station, which will include: storage facilities, a maintenance area, and associated support structures. The station is scheduled to be operational by the end of the year.

Attached is a detailed environmental impact statement that outlines the potential impacts of the project and the measures proposed to mitigate these impacts. Please review this document and provide your feedback as soon as possible.

Thank you for your attention to this important matter.

Sincerely,

Michael J. O'Hara
Chairman, Planning Commission
null
Dear Mr. Crozier:

Thank you for your continued interest in this project.

The FER Act requires that the EIR include a detailed and comprehensive analysis of all significant environmental impacts associated with the project. In the Draft EIR, a number of issues were identified that require further study. As you have suggested, we will be conducting additional analysis to address these issues.

Sincerely,

[Signature]

F.R. Jr. Bodner

Subject: Deer Beach Resort Support Project Environmental Impact Statement

August 29, 1992

Environmental Communications, Inc.
We appreciate your continued interest in the project.

The purpose of this letter is to provide you with an update on the status of the proposed project. As you may be aware, the project is currently under review and will be addressed in the near future.

If you have any questions or concerns regarding the project, please do not hesitate to contact me.

Thank you for your interest and support.

Sincerely,

[Signature]

June 21, 1984
Dear Mr. Diamond,

We appreciate your continued interest in this project.

You will be sent copies of the EIS to your new address as they are completed.

Thank you for your contribution to the changes in our regulations.

Sincerely,

[Signature]

Preparation Note:

Subject: Kent Beach Resort
Submitted: Environmental Impact Statement

August 24, 1984

June 12, 1984

The numbers are:

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.

N.E. Direction

University of Hawaii at Manoa

Communication

Environmental

Document Control

Page 2 of 4
3. The effects of increased traffic on H-1 both day and evening bound, and Diament Head bound. It is not realistic to assume all or even a large number of the residents of West Beach will be affected. The traffic flow in and out of the area is substantial and there is no indication of the ability of the residents to handle such traffic. The construction of the West Beach resort will have a significant impact on the residents of the area.

2. Secondary impacts of water supply: The secondary impacts of water supply include changes in the water supply network, changes in water use, and changes in the water quality. The proposed project will have a significant impact on the water supply network in the area. The effects of these changes on the water supply network will be discussed in detail in the environmental impact statement.

1. The effects of dredging and blasting on the reef and marine environment: The proposed project will involve the dredging and blasting of the reef and marine environment. The effects of these activities on the reef and marine environment will be discussed in detail in the environmental impact statement.

We wish to be consulted parties in the preparation of the environmental impact statement for the West Beach resort project. We are concerned about the following areas of impact:
The effects of increased traffic on H-1 both day and evening bound, and Diament Head bound. It is not realistic to assume all or even a large number of the residents of West Beach will be affected. The traffic flow in and out of the area is substantial and there is no indication of the ability of the residents to handle such traffic. The construction of the West Beach resort will have a significant impact on the residents of the area.

The secondary impacts of water supply include changes in the water supply network, changes in water use, and changes in the water quality. The proposed project will have a significant impact on the water supply network in the area. The effects of these changes on the water supply network will be discussed in detail in the environmental impact statement.

The proposed project will involve the dredging and blasting of the reef and marine environment. The effects of these activities on the reef and marine environment will be discussed in detail in the environmental impact statement.

We wish to be consulted parties in the preparation of the environmental impact statement for the West Beach resort project. We are concerned about the following areas of impact:

We are pleased to see that more units are being proposed for rental. We imply that changes of this nature will affect the residents of Central Oahu area. The construction of the new units is likely to cause some adverse affects on the residents. We believe the nature of the new units will be more suitable for the needs of the residents. We hope to see more units being proposed for the Central Oahu area.
F.R.I.A.

Dear [Name],

Subject: Your Real Estate Suplemental Environmental Impact Statement

The Supplemental Environmental Impact Statement (SEIS) has been submitted to the appropriate regulatory agencies. The SEIS is a comprehensive document that evaluates the potential environmental impacts of the proposed project and outlines measures to mitigate any adverse effects.

The project is located at [Address], and it includes [List of project components]. The SEIS assesses the project's potential impacts on [List of environmental factors] and proposes strategies to minimize [List of mitigation measures].

If you have any questions or concerns regarding the SEIS, please feel free to contact me at [Contact information].

Thank you for your interest in [Project Name].

Sincerely,

[Your Name]
[Title]
[Company Name]
Tae Yong Kim  
Environmental Communications, Inc.  
P.O. Box 536  
Honolulu, Hawaii 96809  

Re:  Supplemental EIS for West Beach Project  

June 5, 1984  

Dear Mr. Kim:  

On behalf of my clients, Eric Enos, Angel Pilago, Lewi Kaawa, David Cullen, the Waianae Land Use Concerns Committee and Na Opio Aloha Aina, I request that you send me your notice of preparation for the Supplemental Environmental Impact Statement related to the West Beach Development.  

Please place me on your mailing list for comments and any subsequent mailings related to this process.  

Sincerely,  

ALAN T. MURAKAMI  
Staff Attorney  

cc: Eric Enos  
    Angel Pilago  
    Lewi Kaawa  
    David Cullen  

...
The following letters were received after distribution of the generic 1980 West Beach Resort FEIS.

### ORGANIZATIONS/AGENCIES

<table>
<thead>
<tr>
<th>Organization</th>
<th>Date of Comments</th>
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<tbody>
<tr>
<td><strong>Federal Agencies</strong></td>
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<tr>
<td>U.S. Environmental Protection Agency</td>
<td>01/09/81</td>
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<tr>
<td>U.S. Department of the Interior</td>
<td>02/03/81 &amp; 08/19/80</td>
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<tr>
<td>Federal Highway Administration</td>
<td>01/02/81</td>
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<tr>
<td>U.S. Coast Guard</td>
<td>12/31/80</td>
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<tr>
<td>Naval Base Pearl Harbor</td>
<td>12/31/80</td>
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<tr>
<td>Advisory Council on Historic Preservation</td>
<td>01/08/81</td>
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<td>National Marine Fisheries Services</td>
<td>01/09/81</td>
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<td>Fish and Wildlife Service</td>
<td>01/12/81</td>
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<td><strong>State of Hawaii</strong></td>
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<td>Department of Accounting &amp; General Services,</td>
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<tr>
<td>Division of Public Works</td>
<td>12/26/80</td>
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<td>Department of Education</td>
<td>12/19/80</td>
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<td>UOHB Water Resources Research Center</td>
<td>12/30/80</td>
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<td>Department of Planning and Economic Development</td>
<td>01/02/81</td>
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<td>Department of Transportation</td>
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<td>Department of Defense</td>
<td>01/22/81</td>
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<td>West Oahu Soil &amp; Water Conservation District</td>
<td>01/08/81</td>
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<tr>
<td><strong>City &amp; County of Honolulu</strong></td>
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<tr>
<td>Oahu Civil Defense</td>
<td>12/11/80</td>
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<td>Department of General Planning</td>
<td>12/23/80</td>
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<td>Department of Housing &amp; Community Development</td>
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<td>Department of Transportation Services</td>
<td>12/31/80</td>
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<td>Police Department</td>
<td>01/16/81 &amp; 12/16/80</td>
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<td>Board of Water Supply</td>
<td>01/14/81</td>
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<td>Fire Department</td>
<td>01/22/81 &amp; 12/16/80</td>
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<td><strong>Organizations</strong></td>
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<tr>
<td>Hawaiian Telephone Company</td>
<td>12/17/80 &amp; 02/20/81</td>
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<td>Hawaiian Electric Company</td>
<td>01/06/81</td>
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<tr>
<td>Waipahu Community Association</td>
<td>02/13/81</td>
</tr>
</tbody>
</table>
Potential adverse effects identified for the Barber's Point Archeological District may require the preparation of a Memorandum of Agreement (MOA) between the project sponsor, the Army Corps of Engineers, and the Advisory Council on Historic Preservation. The MOA establishing mitigation measures to preserve or protect this property should be included in the final environmental statement.

Specific measures to minimize harm to the paleontological resources at the project site should also be addressed in the final statement.

Provision of recreational resources in the proposed project will significantly improve recreational opportunities in the region. Consideration should be given to possible inclusion of hike-bikeways in the project, in addition to the other proposed recreational facilities.

The DEIS adequately addresses most of the expected general impacts on fish and wildlife resources resulting from the maximum density proposed project, however, the impact on the off-shore fishing area known as the "Barber's Point Banks" was not addressed. The only impact on fish indicated in the DEIS was due to increased shoreline accessibility. No mention was made of the role of the nearshore area as a nursery for species important in the offshore fishery or the project's impact thereon. This concern was previously pointed out in Fish & Wildlife Service comments on the reports entitled Proposed West Beach Project, Lagoons and Bays Studies, and Environmental Conditions Anticipated in Two Lagoons and A Harbor for Proposed West Beach Development.

Specific Comments

Page 33, Geology, and page 34, Soils. The discussion of geology relates primarily to water resources and that of soils to erosion. The statement should also evaluate the adequacy of the soils and rocks as foundation for the proposed structure. Sink holes, reported in the project area, could present a hazard for construction.

Summary

In view of a lack of a thorough evaluation of impacts on ground-water resources, and of site specific impacts related to the precise placement, orientation and size of various project components on fishery resources, the draft EIS does not appear to provide a sound basis for decisionmakers responsible for project approval. We recommend that these inadequacies be remedied before a final EIS is released.

Thank you for the opportunity to review this document.

Sincerely yours,

Patricia Anderson
Regional Environmental Officer

cc: Director, ODPB (w/copy incoming)
Director, Fish and Wildlife Service
Director, Heritage Conservation & Recreation Service
Director, National Park Service
Director, Geological Survey
Director, Bureau of Mines

Reg. Dir., FWS
Reg. Dir., HCWS
Reg. Dir., NPS
Reg. Dir., GS
Reg. Dir., BM
Thank you for this opportunity to review this subject that is being

...
2

The key component of the system is the "control system." This system is responsible for monitoring and controlling the environmental conditions within the facility. It is designed to ensure that the appropriate levels of air quality, water quality, and noise are maintained.

The control system consists of a network of sensors and actuators that collect data from various sources and adjust the environmental conditions accordingly. The data collected includes information on temperature, humidity, carbon dioxide levels, and noise levels.

The control system is also equipped with a series of algorithms that analyze the data and determine the appropriate actions to be taken. These algorithms take into account various factors, such as the current weather conditions, the number of people present in the facility, and the time of day.

The control system is designed to be highly flexible and can be adjusted to meet the specific needs of different facilities. It can also be integrated with other systems, such as lighting and heating systems, to optimize energy consumption.

In addition to monitoring and controlling the environmental conditions, the control system is also equipped with a series of alarms and alerts that notify the appropriate personnel in the event of any issues.

Overall, the control system is a critical component of the facility's overall design, and it plays a crucial role in ensuring the health and comfort of the occupants.
Dear Public Works Engineer,

Thank you for the opportunity to review and comment on the Water Beach Project. I am writing to express my concern about the potential environmental impact of this project.

Subject: Water Beach Project

Dear Public Works Director,

I am writing to express my concern about the potential environmental impact of the Water Beach Project. I believe that the proposed project will have significant environmental effects that need to be addressed.

I have attached a detailed report that outlines my concerns and suggestions for how to mitigate the environmental impact. I would appreciate the opportunity to discuss these issues with you at your convenience.

Thank you for your consideration.

Sincerely,

[Signature]

[Name]

Public Works Engineer

[Contact Information]
Dear Col. Thibodeau:

For Proposed West Beach Project, I'm pleased to present Environmental Impact Statement (EIS).

Best,

[Signature]

December 17, 1981

CITY AND COUNTY OF HONOLULU
FIRST DEPARTMENT
December 19, 1980

December 19, 1980

Department of Education

Hawaiian Electric Company, Inc.

January 6, 1981

Box 7701 / Honolulu / Hawaii / 96813

Dear Colleagues:

Thank you for the opportunity to review and comment on the final report.

The enclosure is the November 1980 Hawaii Department of Education Environmental Impact Statement. This report is required by Federal law.

Thank you for your consideration.

Sincerely,

[Signature]

Manager, Environmental Department

[Company Name]

[Address]

[Phone Number]

[Email Address]
Dear [Name],

I hope this message finds you well. I am writing to inform you of the latest developments in our project. As you know, we have been working on [Project Title] for the past several months, and we are making good progress.

The primary goal of our project is to [Project Goal]. To achieve this, we have identified [Key Milestones] as crucial steps in our plan. I am pleased to report that we have successfully completed the following milestones:

- [Milestone 1] - Completed on [Date]
- [Milestone 2] - Completed on [Date]

We are currently working on [Current Milestone] and expect to complete it by [Expected Date]. I believe we are on track to meet our deadline.

I would like to schedule a meeting with you to discuss the next steps in the project. Please let me know your availability so we can arrange a time that works for both of us.

Thank you for your continued support.

Sincerely,

[Your Name]

---

[Address]

[Phone Number]

[Email Address]

[Date]

---

This email was sent on behalf of [Your Name] with [Your Title]. Please contact [Your Name] at [Phone Number] or [Email Address] for further information. This email contains sensitive information and should not be forwarded or distributed without authorization.

University of Hawai'i at Manoa
some testing during the peak hours.

our performance, our other site conferences will also contribute

only the restaurant and not the dining room. One

development of additional sites, the R5K reflects

the first target mentioned by the proposed report.

monetary EIS.

issues around the target of the proposed report.

the above.

in the current target of the proposed report. In

to the general public. The comments that might

concern and not requiring the amount of Elgar

joint use of the proposed targets Point capital

We are specifically concerned about any completed

of the actions and those that have been determined.

supplemented to the EIS prepared once the site and
correction supplemented to the EIS prepared once the site and
to the report these changes will have on the proposal and

the report these changes will have on the proposal and

the report these changes will have on the proposal and

The report these changes will have on the proposal and

Thank you for the opportunity to review the subject.

September 1986

Dear Col. T. Reed,

4.5 After submitting reference

U.S. Army Engineers

Col. Elmer F. Reed (Ret.)

EFP, 6925

Ft. Sill, OK 73503

Deputy Commander

Strategic Plans

Dear Col. Reed,

The proposed joint regional report

strategic development concept of the corps of the HCNF

The HCNF to develop an environment to be adopted and at the

West Beach_Exhibit_Henry_Rodriguez.pdf

January 2, 1987

Page 2

AFL014764
Director of Transportation

Very truly yours,

[Signature]

[Address]

[Date: 2 Jan 1981]
Acting Chief Planning Officer

WE Felt that a detailed analysis plan is a matter yet to be

proceed.

Dear Sir:

January 23, 1989

December 22, 1986

DEAD TARGET, Harbor 96866

Port Authority, Harbor 96866

Building 200

150 Kapi'olani Boulevard

City and County of Honolulu

Department of General Planning

City and County of Honolulu

Department of General Planning
Thank you for providing the opportunity to review and comment on the EIS.

We have the following comments on the EIS:

Subject: Draft Report, Request for the Proposed Host Environmental Impact Statement

December 31, 1990

Dear Colonel Tidwell:

I am writing to comment on the draft host environmental impact statement. I would like to provide the following feedback:

1. In preparing a development plan for the area, we recommend that a comprehensive analysis of the potential impacts be conducted. This should include an assessment of the environmental, social, and economic effects.

2. Routes for access and egress should be considered to minimize traffic congestion.

3. An inte-connectional system is recommended for the project.

4. The report should include specific measures to reduce

5. Special consideration should be given to traffic and bay loading.

6. Attention should be given to traffic and bay loading.

Thank you for forwarding the EIS for our review and comment.

We have no further comment on the subject of environmental impact statement.

Sincerely,

[Signatures]

December 31, 1990
To ensure that adequate consideration is given to the
effects of this policy, all departments involved with
proposed developments or changes in the area and the
potential for traffic congestion must be consulted.

Dear Mr. Thompson,

I am in the process of preparing a report on the effects of this policy. To ensure
adequate consideration, we have consulted with all departments involved.

Sincerely,

[Signature]

Administrator Bureau
City and County of Honolulu

Carbon copy: Chief of Police

[Signature]

Chief of Police
City and County of Honolulu

If you have any questions, please contact the

[Contact Information]

[Signature]

[Department Name]
City and County of Honolulu

[Contact Information]

[Signature]

[Department Name]
City and County of Honolulu

December 16, 1980

[Stamp]

January 16, 1981

[Stamp]
Thank you for allowing us to review the PEIS for the Proposed Action.

The Environmental Impact Statement (EIS) should be submitted to the Environmental Protection Agency (EPA) and the National Council on Environmental Protection by the date specified in the Notice of Intent to Prepare an EIS. The public review period for the PEIS is from the date of publication of the Notice of Intent to Prepare an EIS to the date of certification by the EPA, unless the EPA issues a final rule regarding the notice.

The PEIS should be submitted to the EPA by the date specified in the Notice of Intent to Prepare an EIS. The public review period for the PEIS is from the date of publication of the Notice of Intent to Prepare an EIS to the date of certification by the EPA, unless the EPA issues a final rule regarding the notice.

We have the following comments on the PEIS:

1. We believe that our written comments are more comprehensive and cover a wider range of issues. The PEIS does not address the significant issues raised in our written comments.

2. Page 7 of the PEIS is not addressed.

3. Page 12 of the PEIS is not addressed.

4. The PEIS does not address the significant issues raised in our written comments.

5. We believe that our written comments are more comprehensive and cover a wider range of issues. The PEIS does not address the significant issues raised in our written comments.


Can you provide any written comments or suggestions for the PEIS?


For information, please call Lawence Moore at 945-2323.

Managing and Chief Engineer, Board of Water Supply.

Date: January 14, 1991.

Eileen Anthony, Mayor.

Eileen Anthony, Mayor.


No comments.

Eileen Anthony, Mayor.

Eileen Anthony, Mayor.
Manager, Environmental Department

Sincerely,

[Signature]

Please attach all test results to this memo. The final report for the radon test should be submitted to the Health Department within 15 days. If any actions are to be taken, they should be outlined in the report. All test results should be reviewed by the Department of Health. If any corrective actions are needed, they should be taken immediately. If any corrective actions are needed, they should be taken immediately.

Table 1: Results of Radon Tests

<table>
<thead>
<tr>
<th>Location</th>
<th>Test Results</th>
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<tbody>
<tr>
<td>Building 1</td>
<td>150 ppm</td>
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<tr>
<td>Building 2</td>
<td>200 ppm</td>
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<tr>
<td>Building 3</td>
<td>250 ppm</td>
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</table>

Please ensure all test results are provided to the Health Department for review. If any corrective actions are needed, they should be taken immediately.

Sincerely,

[Signature]
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<tr>
<th>ORGANIZATIONS/AGENCIES</th>
<th>Date of Comment Received</th>
<th>Date of Response</th>
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<tr>
<td><strong>City and County</strong></td>
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<td>Board of Water Supply</td>
<td>05/13/85</td>
<td>06/03/85</td>
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<tr>
<td>Building Department</td>
<td>04/25/85</td>
<td>NRN</td>
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<td>Department of General Planning</td>
<td>05/09/85</td>
<td>06/03/85</td>
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<td>Department of Housing &amp; Community Development</td>
<td>05/16/85</td>
<td>06/03/85</td>
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<td>Department of Land Utilization</td>
<td>05/23/85</td>
<td>06/03/85</td>
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<tr>
<td>Department of Parks &amp; Recreation</td>
<td>04/22/85</td>
<td>06/03/85</td>
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<td>Department of Public Works</td>
<td>04/23/85</td>
<td>06/03/85</td>
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<td>Department of Transportation Services</td>
<td>05/13/85</td>
<td>NRN</td>
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<tr>
<td>Fire Department</td>
<td>05/21/85</td>
<td>NRN</td>
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<tr>
<td>Police Department</td>
<td>04/12/85</td>
<td>06/03/85</td>
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<tr>
<td>Oahu Civil Defense Agency</td>
<td>04/11/85</td>
<td>NRN</td>
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<tr>
<td><strong>State</strong></td>
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<td>Department of Accounting and General Services</td>
<td>04/25/85</td>
<td>NRN</td>
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<tr>
<td>Department of Agriculture</td>
<td>05/22/85</td>
<td>06/03/85</td>
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<td>Department of Defense</td>
<td>05/02/85</td>
<td>NRN</td>
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<td>Department of Education</td>
<td>04/23/85</td>
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<td>Department of Health</td>
<td>05/23/85</td>
<td>06/03/85</td>
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<td>Department of Hawaiian Home Lands</td>
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<td>06/03/85</td>
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<td>Department of Land &amp; Natural Resources</td>
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<td>Department of Planning and Economic Development</td>
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<td>Department of Social Services and Housing</td>
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<td>Department of Transportation</td>
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<td>Office of Environmental Quality Control</td>
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<td>U.H.-Environmental Center</td>
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<td>U.H.-Water Resource Research Center</td>
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<td>U.H.-Botany Department</td>
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<td>06/03/85</td>
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<tr>
<td>U.H.-Archaeology Department</td>
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<td>Energy Division</td>
<td>05/15/85</td>
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**ORGANIZATIONS AND AGENCIES**

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<td><strong>Federal Agencies</strong></td>
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<td>Soil Conservation Services</td>
<td>05/08/85</td>
<td>NRN</td>
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<td>U.S. Agriculture, Conservation Service</td>
<td>04/08/85</td>
<td>NRN</td>
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<td>U.S. Army Corps of Engineers</td>
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<td>United States Environmental Protection Agency</td>
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<td>Department of Housing and Urban Development</td>
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<td>Coast Guard, Department of Transportation</td>
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<td>Federal Highway Administration</td>
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<td>National Oceanic &amp; Atmospheric Administration-National Marine Fisheries Services</td>
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<td>06/03/85</td>
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<td><strong>U.S. Department of the Interior</strong></td>
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<td>Office of the Secretary</td>
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<td>Department of Transportation</td>
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<td>Federal Aviation Administration Western-Pacific Administration</td>
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<td><strong>Private Agencies</strong></td>
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<td>Hawaiian Electric Company</td>
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<td>Life of the Land</td>
<td>05/21/85</td>
<td>06/03/85</td>
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<td>Bernice P. Bishop Museum</td>
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<td>Hawaii Thousand Friends</td>
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<td>Leeward Ocean Advisory Council</td>
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<td>Waianae Land Use Concerns Committee</td>
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<td>Waianae Neighborhood Board #24</td>
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<td>Native Hawaiian Legal Corporation</td>
<td>05/22/85</td>
<td>06/03/85</td>
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<tr>
<td>Mr. Bruce A. Carlson</td>
<td>05/23/85</td>
<td>06/03/85</td>
</tr>
</tbody>
</table>

**NRN - No Response Needed**
FRM:

F. J. Robinson

Very truly yours,

[Signature]

Thank you for your continuing interest and support of Great Beach Resort and
time will be considered in the Final EIS.

Item 2 will be considered in the Final EIS.

Item 1.4 will be revised accordingly in the Final EIS.

Dear Mr. Hyland:

Handshale, Hawaii 96719

The Hon. Robert F. Stafford
Board of Water Supply

Manager, Water Supply

We are in receipt of your department's comments dated May 13, 1985, on the

June 1, 1985

COMMENTS ON
ENVIRONMENTAL
REVIEW DOCUMENTS
Dear [Name],

Thank you for the opportunity to review the Supplemented LFS and have no

Subject: [Supplemental LFS - April Report]

Very truly yours,

[Signature]

APR 29 1985

[Stamp]
EXHIBIT A

THANK YOU FOR THE OPPORTUNITY TO OFFER OUR COMMENT.

Submit for the project's public hearing.}

Subject: Press Release Environmental Impact Statement

TO: Mayor F. Wingard, Director

City and County of Honolulu Department of General Planning

June 1, 1985

Dear Mr. Chair:

The Mayor's Office has requested that the Environmental Impact Statement be provided to the City Council for public hearing. The statement is attached for your review.

Sincerely,

[Signature]

City and County of Honolulu Department of General Planning

June 1, 1985
The project has been satisfactorily addressed.

Therefore, and finding that the transportation issues connected with the above mentioned project are not significant in the environmental impact.

April 4, 1985,

Transportation Control, State of Hawaii, dated

This is in reference to a letter sent to us by the Office of

Subject: Airfield Expansion

Department of Transportation

June 28, 1985

May 13, 1985
Dear Mr. Haddad,

We have received the following request via email:

**Proposed Project and Have an Estimate of the Construction Cost**

The estimated construction cost for the proposed project is $X.

**Subject:** Update Project Status - Parkppalani Estates

Best regards,

[Signature]

May 23, 1985

City and County of Honolulu

Fire Department
environmental impact statement.

Thank you for allowing us to comment on this draft supplemental development.

In determining the traffic safety impact of the proposal, it is essential to consider how traffic from the area's projected growth impact the traffic on the existing and planned arterial network. It is also important to consider the potential for future development in the area.

Thank you for considering our comments.

Sincerely,

[Signature]

April 12, 1985

Honolulu, Oahu, Hawaii
65 South Street
City and County of Honolulu

Subject: Draft supplemental environmental impact statement

Mr. John F. Whalen, Director

Environmental Impact Statement

Page 2
Dear Sirs,

Thank you for your prompt communication on the proposed "The Direct Planning Phase..." project. I appreciate your interest in the community impact of this major land development. It is my understanding that the nature and scale of the project are such that the public and surrounding areas will be affected significantly.

I believe it is crucial to address concerns early and engage the community in the decision-making process. As you know, the proposed development is located on the edge of the community, and its impact will be far-reaching. We are committed to ensuring that the project meets the needs and desires of the residents.

In conclusion, we are open to feedback and suggestions. If you have any concerns or ideas, please feel free to share them with us. We value the input of our community and are committed to working together to ensure a positive outcome.

Sincerely,
[Name]
[Position]

June 3, 1995

[Environmental Impact Statement]
Mr. Fred J. Rodriquez

We have reviewed the subject document and have no comments to offer.

Subject: Draft Supplemental Environmental Impact

Dear Colonel Jenkins:

Port Sherman, Fl 96698
Essex County Army Corps of Engineers

Dear Colonel Jenkins,

We have reviewed the subject document and have no comments to offer.

Subject: Draft Supplemental Environmental Impact

Dear Colonel Jenkins:

Port Sherman, Fl 96698
Essex County Army Corps of Engineers

Dear Colonel Jenkins,

We have reviewed the subject document and have no comments to offer.

Subject: Draft Supplemental Environmental Impact

Dear Colonel Jenkins:

Port Sherman, Fl 96698
Essex County Army Corps of Engineers

Dear Colonel Jenkins,
Dear Mr. Smith,

Thank you for the opportunity to comment.

[Signature]

[Date]

[City and County of General Planning Committee]
Thank you for your comments and continuing interest.

P. J. O'Brien

Very truly yours,

[Signature]

Additional thanks to all those who participated in the public hearing. Functional Plan and Conceptual Plan documents developed for the Municipal Planning Department. We request the Municipal Planning Department of Agriculture for your consideration of agricultural sections. Your department's decision to continue to use the Department of Agriculture's draft report is consistent with the direction that the Municipal Planning Department has provided for urban development. The draft report of the land which was reached in response to the hearings is Supplementary Environmental Impact Statement dated May 2, 1985.

We are in receipt of your department's comments on the draft report draft. Thank you.

[Signature]

June 3, 1985
E. J. Rodriguez

Very truly yours,

Thank you for a most comprehensive and detailed review of our Els document. We

tried to address the issues in your feedback on the Els draft protocol.

join forces. We do not appreciate any difficulties in completing the documentation

of the Els draft. We are appreciative of the effort of your staff in assisting this

end your department's opportunity to comment prior to the preparation of the

Finally, it is understood that this comment better of our draft Els is to pro-

Page 4
May 1, 1988

Mr. Steven Cho
MAY 23 1995

In support of the conservation and protection of wetlands, it is important that the wetland areas be located in the correct location and be managed properly. The selection of a wetland protection area must be based on the following criteria:

1. The location of the wetland area must be suitable for the intended use.
2. The area must be free from pollutants.
3. The area must be accessible for monitoring and maintenance.
4. The area must be contiguous with other protected areas.

In order to ensure the conservation and protection of wetlands, it is essential that these criteria be met.
There has been a recent change in the form of the application for scholarships and the form of the application for the RA. The new form requires applicants to provide a detailed explanation of their academic and extracurricular activities. The information provided will be reviewed by a committee of faculty members who will determine the final selection of recipients. Applicants are encouraged to submit their applications early to ensure consideration.

The application deadline is March 1, 2023. Please submit all required documentation, including transcripts and letters of recommendation, to the address below. Any questions or concerns regarding the application process should be directed to the Office of Student Affairs.

Thank you for your interest in our scholarships and RA programs. We look forward to reviewing your applications.

Sincerely,

[Signature]
Office of Student Affairs

[Address]

[Date]
we are transmitting your copy should the department decide to
3. Issue the 3-year or longer term contract, if known.

2. After the specialty issue of housing is provided
the county's median.

Your property income is defined as 80% - 120% of
income to median income for the county.
income to median income for the county.
income to median income for the county.
income to median income for the county.
income to median income for the county.

The determination of low and moderate income is
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income to median income, the offer to the housing communities.
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income to median income, the offer to the housing communities.
income to median income, the offer to the housing communities.

HOW TO ORDER:

Phone: Russell M. Parkcox, Executive Director

P.O. Box 9007
Honolulu, Hawaii 96813

CONTRACT:

Thank you for the opportunity to comment.

The Honorable President, F. E. Sumi, Director

Attachement

Russell M. Parkcox, Executive Director

April 21, 1985

STATE OF HAWAII

HAWAIIAN HOUSING AUTHORITY

DEPARTMENT OF COMMUNITY AND HUMAN SERVICES
Coordinating the Department of Transportation

The Department of Transportation is responsible for ensuring the smooth and efficient operation of the transportation system within the state. This includes planning, construction, and maintenance of roads, bridges, public transit systems, and other infrastructure. The Department also regulates trucking, airlines, and railroads to ensure they operate safely and efficiently.

The Department collaborates with state and local authorities to address transportation needs and issues. It works closely with the Federal Highway Administration and other federal agencies to secure funding and implement transportation projects.

The transportation system is vital to the state's economy, providing jobs, facilitating commerce, and connecting communities. The Department is committed to providing affordable and accessible transportation options for all residents.

The Department of Transportation is headquartered in Atlanta with regional offices in various parts of the state.

Contact Information:

Department of Transportation
1000 State Capitol, PO Box 897
Atlanta, GA 30339

Phone: 404-656-3600

Website: www.dot.ga.gov

Email: info@dot.ga.gov
Traffic Operations

P.R.I.M.

Dear Mr. Zane,

Thank you for your letter commenting on this project and adding your comments.

We appreciate your efforts and are glad to receive your comments and suggestions.

We believe that the project will be improved with your additional information.

Please find attached a more comprehensive report of the project.

We hope that this will be helpful.

Yours truly,

[Signature]

June 3, 1985

P.R.I.M.
before commencing construction.

6. The entire area within a project's footprint should be protected by a fence or other barrier to prevent unauthorized access during construction.

7. The project's footprint should be protected by a fence or other barrier to prevent unauthorized access during construction.

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100. The project's footprint should be protected by a fence or other barrier to prevent unauthorized access during construction.
Dear Mr. Ungar:

Honolulu, Hawaii 96813

Office of Environmental Quality Control

Ms. Linda L. Unaka, Director

May 22, 1993

We are in receipt of your office comments on the West Beach Project Draft EIS. We would like to respond to your concerns.

We have reviewed your comments and the traffic consultant will be reviewing the plans.

We appreciate the opportunity to review this document.

Sincerely,

[Signature]

May 22, 1993

Col. Michael M. Zemke

Environmental Coordinator

Office of Land Utilization
Please contact me at my office if you have any questions on this matter.

Very truly yours,

[Signature]

Attachment

Dear Commissioner,

Thank you for your timely comments on this project and also your continued support.

[Signature]

June 2, 1998

Ms. Linda N. Lyons
The importance of the optimal operation of the network for the proper functioning of the system cannot be overstated. It is crucial that the network design is optimized for efficiency and reliability, taking into account the interdependencies of the components. The network's performance is directly affected by the parameters such as traffic load, connectivity, and redundancy. Improper design can lead to disruptions in service and increase operational costs. Therefore, it is essential to have a well-thought-out network architecture that ensures seamless operation and meets the operational requirements.

In the context of the environmental factors, we are in need of the Environmental Impact Assessment (EIA) report to be conducted. The data collected from the study will be used to refine the network design and ensure compliance with environmental regulations. The EIA report will provide insights into the potential environmental impacts of the network, enabling us to make informed decisions that balance operational needs with environmental considerations.

To summarize, the optimization of the network operation is crucial for maintaining the system's performance and ensuring its reliability. The EIA report will play a vital role in the decision-making process, guiding us toward a sustainable and efficient network design.
For the purpose of391 identification of the states, this

could not be determined in the present litigation and

to the extent that the regulations conflict with

the Act, the provisions of the Act shall prevail. By

What is the primary question of the case?

The question is whether the defendant, a nonprofit corporation, is entitled to

be relieved from the application of the regulations because of the charitable

status of the corporation. The regulations provide that a nonprofit corporation

is entitled to the benefits of the Act if it is registered with the Attorney

General of the State of New York and if it is not subject to the rules and

regulations of any other State. The defendant, a nonprofit corporation, has

registered with the Attorney General of the State of New York and is not subject

to the rules and regulations of any other State. The defendant asserts that

it is entitled to the benefits of the Act because it is a charitable corporation

and that it is entitled to the benefits of the Act because it is a nonprofit

corporation.

The defendant is a nonprofit corporation and is entitled to the benefits of the

Act. The defendant is a charitable corporation and is entitled to the benefits of

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the Act. The defendant is a charitable corporation and is entitled to the benefits of

the Act.
President:

William Berryman, Jr.

Sincerely yours,

[Signature]

Page 3

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Thank you for your comments and continuing interest.

Larry

See you.
My inquiry is to move no particular day, and the text.

We are pleased to inform you that we have received your request for a quotation. Our team is currently working on preparing the details and will be in touch with you shortly.

Thank you for your patience and understanding.

Best regards,

[Company Name]
map. Stroyn during hacro construction is tooled correctly on the
Finally, I would point out that site 86-19, which was de-
portant because it appears to be eligible.
Rather, it is not necessary to-
sector is so broad as to make all strides. Even more troubling is the fact is, the eligibility criteria for the national key-

Each household makes one particular statement which is clearly
The proper experts. The proper experts would be more profitably addressed to

Firstly, once we are aware of the majority, not sociology,
Thank you for your library comment and continuing interest.

Please find below the revised version of the letter you submitted and the reason for my decision to return it.

Rev. J. Robert

Very truly yours,

[signature]

Thank you for your library comment and continuing interest.

Dear Mr. President,

I am forwarding the letter you submitted and the reason for my decision to return it.

Rev. J. Robert

Very truly yours,

[signature]
Dear [Name],

I hope this letter finds you well and that you are doing well. I wanted to follow up on our recent conversation regarding [topic]. I understand that you are facing some challenges with [specific issue], and I wanted to offer my support and assistance.

In our last conversation, you mentioned that [specific issue]. I understand that this can be stressful, and I wanted to share with you some strategies that may help you manage your workload more effectively. I have attached some resources that you might find helpful.

Please let me know if there is anything else I can do to assist you. I am available at any time to help you with [specific issue].

Thank you for your understanding and patience. I look forward to hearing back from you.

Sincerely,

[Your Name]

June 3, 1995

P.S. I hope to hear back from you soon.

[Your Address]

Cc: [CCs]

P.S. Please let me know if there is anything else I can do to help you.

[Your Signature]
REFERENCES


In conclusion, for all of the reasons I have raised above, we all have been led to believe that the environmental impact of the proposed development would be minimal. However, I am concerned that the consultant's report may reflect a bias in favor of the project and may not fully consider the potential environmental impacts. Therefore, I urge the committee to conduct a thorough review of the report and to address any concerns raised by the public.

I look forward to hearing your response and will be available to discuss any further details or questions you may have.

Sincerely yours,

[Signature]

[Name]

Environmental Consultant
President
William Reeser, Jr.

Sincerely yours,

[Signature]

[Handwritten note]

Finally, I would point out that site no. 179, which was developed in another area because it was found to be eligible, is no longer under consideration. A site is not necessarily eligible just because it is used for industrial purposes. The fact is, the eligibility criteria for the National Register are quite specific and the criteria for the National Register are not as broad as some have suggested. A mark off the address in the national register may be considered by the proper authorities.

Sincerely yours,

[Signature]

[Handwritten note]
MAY 10 1985

NO RESPONSE NEEDED

Hospitalityln 606
P.O. Box 490
Environmental Communications, Inc.

We read (with interest) the recent proposals for the reduction of the Missouri City and County of Houston Department of Landfill Disposal System. Should you have any further information?

Sincerely,

[Signature]

Hospitalityln 606

Thank you for the opportunity to review this document. We were pleased to be included in the recent discussion on the subject. If you have any further questions or comments, please feel free to contact us.

Subject: Landfill Disposal System for West Houston

Dear Colleagues,

Your proposal for the reduction of the Missouri City and County of Houston Department of Landfill Disposal System is quite interesting. I would like to discuss further.

Sincerely,

[Signature]

MAY 10 1985

Hospitalityln 606
P.O. Box 490
Please refer to the attached document.
May 20, 1995

EPA

Re: Proposed dry stack high-level waste storage at the top of the disposal shaft.

Mr. Robert M. Mahon, Director
Fluor-Danco

May 15, 1995

Dear Mr. Mahon,

Thank you for the opportunity to comment on this document. We have enclosed the proposed dry stack high-level waste storage facility at the top of the disposal shaft.

1. The proposed dry stack facility is located adjacent to the containment building. It is scheduled to be completed in 1995.

2. The facility will be designed to accommodate a maximum of 20 high-level waste canisters.

3. The facility will be constructed of concrete and steel, with a thickness of 2 feet.

4. The facility will be monitored to ensure that it remains safe and operational.

cc: John P. Mahon, Deputy Director

Sincerely,

[Signature]

May 15, 1995

EPA
Thank you for your comments and continuing interest in our project.

1. In order to protect our company's interests, we ask that you not reveal the confidentiality agreement.

2. Before proceeding with the development of our project, please ensure all necessary approvals are in place and that all legal concerns are addressed.

3. The decision to proceed with the project will be made based on the collective assessment of all stakeholders involved.

4. If you have any questions or concerns, please feel free to contact us at your earliest convenience.

Thank you for your understanding and cooperation.

[Signature]
June 1, 1998

Mr. Donald Hungate

ENVIROCONSTRUCTION

[Logo]
Be sure to obtain a copy of the current parking regulations and the civil penalties provided in the State of Hawaii


---

Dear Commissioner Brown,

Attorney General

City of

Honolulu

City Planning Committee

Re: Hawaii Parking Program (3)

Dear Commissioner Brown,

I have been informed by a recent change in the City Council that the parking regulations are being reviewed and updated. I am writing to express my support for these changes, as I believe they will have a positive impact on the community.

Firstly, I believe that the current parking regulations are outdated and do not adequately address the needs of the city. With the increasing number of vehicles on the road, it is crucial that we have a comprehensive parking plan in place.

Secondly, I am concerned about the impact that the current regulations have on businesses and residents. I believe that a more flexible approach to parking will be beneficial in attracting visitors and supporting local businesses.

Lastly, I would like to commend the City Council for taking the time to review and update the parking regulations. I believe that this will have a positive impact on the community and I look forward to seeing the updated regulations implemented.

Thank you for your time and consideration.

Sincerely,

Michael C. Parks

June 1, 1989
For the important cultural significance of the sites, they
were
listed as National Historic Landmarks in 1965.

The park is located in the mountains near the
Mississippi River.

As for the important cultural significance of the sites, they
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listed as National Historic Landmarks in 1965.

The park is located in the mountains near the
Mississippi River.
Thank you for your comments and continuing interest.

The authorities who are involved with the project authorization, predevelopment, and construction will be informed of the progress of the project and the decision to whether or not a program of offshore area construction is undertaken. The authorities are also informed about the marine environment have been studied and assessed.
In 1974, when Bertol Barra visited the site area to look at other sites in the larger portion of the prehistoric area which at that time was not known as being an area of possible historic significance, he was primarily interested in the site area at the Deep Harbor site near the City of Moxico, because of the many large resources, especially of Three Strikes. The site area is now known as a site of historic significance, based on the fact that the area has been expanded and incorporated into the City of Moxico.

When asked about the sufficiency of Barrera’s maps, David testified that he believed they were adequate, although he did not specify the level of detail or the accuracy of the maps. When asked about the availability of the maps, he testified that they were available at the time of his testimony.

David also testified that the site area at the Deep Harbor site was located near the City of Moxico, and that it was a site of historic significance due to the presence of the Three Strikes. He further testified that the site area was a part of the City of Moxico, and that he did not have any knowledge of the site area before his visit.
• Varied restaurants and cocktail lounges.
• Organized and unorganized sporting, recreational and cultural activities such as golf, swimming, tennis, fishing (both surf and deep sea), snorkeling, hiking, nature walks, hunting, surfing, crafts, hobbies, horseback riding, badminton, volleyball, archery and skeet and trap shooting.

The proposed resort development as planned at West Beach embodies these qualities and attributes.

THE ADVANTAGES OF A RESORT COMPLEX AT WEST BEACH

On the basis of our analysis of the visitor market of Oahu and the planned resort development at West Beach, it is our opinion that West Beach is well-suited to the development of a resort complex as envisaged by West Beach Estates for the following reasons:

• West Beach can provide the long-term job formation needs of Oahu which depend largely on the growth of tourism.

The 1970s have witnessed declines in the job-generating prospects of two major private sector industries other than tourism, sugar and pineapple. A number of other industries have attempted to grow and some of these have been successful while some have not. Those that were successful, however, provide little hope for major new job formation. Clearly, the future for new job formation on Oahu lies with tourism. If Oahu's economy is to continue to provide jobs for its present residents and their children, then tourism must play a major role in providing jobs.

Between 1970 and 1980 total employment in Hawaii grew by nearly 34 percent. By comparison pineapple and sugar industry employment was reduced by 24 percent and hotel employment rose 74.0 percent. In 1970 one out of every five jobs in the State were attributed to the tourism industry. By 1980 this ratio has grown to one in three jobs attributed to tourism. Presented on the following page is a tabulation showing the relative employment growth by industries:
<table>
<thead>
<tr>
<th>Industry</th>
<th>1970</th>
<th>1980</th>
<th>Percent Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (including government)</td>
<td>250,751</td>
<td>335,538</td>
<td>33.8</td>
</tr>
<tr>
<td>Total government</td>
<td>64,494</td>
<td>75,516</td>
<td>17.1</td>
</tr>
<tr>
<td>Total (excluding government)</td>
<td>186,257</td>
<td>260,022</td>
<td>39.6</td>
</tr>
<tr>
<td>Agriculture</td>
<td>3,309</td>
<td>3,797</td>
<td>14.8</td>
</tr>
<tr>
<td>Sugar and pineapple</td>
<td>2,266</td>
<td>1,730</td>
<td>(23.7)</td>
</tr>
<tr>
<td>Other</td>
<td>1,043</td>
<td>2,067</td>
<td>98.2</td>
</tr>
<tr>
<td>Mining and contract construction</td>
<td>22,741</td>
<td>19,517</td>
<td>(14.2)</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>18,597</td>
<td>17,521</td>
<td>(5.8)</td>
</tr>
<tr>
<td>Transportation</td>
<td>12,614</td>
<td>18,204</td>
<td>44.3</td>
</tr>
<tr>
<td>Communications</td>
<td>5,911</td>
<td>5,605</td>
<td>(5.2)</td>
</tr>
<tr>
<td>Utilities</td>
<td>1,874</td>
<td>1,862</td>
<td>(0.6)</td>
</tr>
<tr>
<td>Wholesale trade</td>
<td>14,287</td>
<td>16,423</td>
<td>15.0</td>
</tr>
<tr>
<td>Retail trade</td>
<td>45,101</td>
<td>71,342</td>
<td>58.2</td>
</tr>
<tr>
<td>Finance, Real Estate, Insurance</td>
<td>15,880</td>
<td>26,973</td>
<td>69.9</td>
</tr>
<tr>
<td>Services</td>
<td>45,906</td>
<td>78,686</td>
<td>71.4</td>
</tr>
<tr>
<td>Hotels</td>
<td>9,292</td>
<td>16,136</td>
<td>73.7</td>
</tr>
<tr>
<td>Nonclassified</td>
<td>5,867</td>
<td>92</td>
<td>(98.4)</td>
</tr>
</tbody>
</table>

In 1980 leeward Oahu's unemployment was 7.5% compared to 4.5% for the island of Oahu. July 1983 data for the island of Oahu is available and computes to 6.3%. Data is not available for the current period for leeward Oahu. If, however, the same relationship of Oahu to the leeward area in 1980 were applied to the current period, leeward Oahu would have an unemployment rate of 10.5%.

- The location of West Beach is in Oahu's Ewa area where population growth is accelerating.

Government and private studies have recognized the western shift in Oahu's population center and government has planned for this by undertaking highway improvements in the Ewa area, siting major public facilities such as Aloha Stadium Ewa of downtown, planning infrastructure improvements for the area, etc. Yet, employment centers (other than Campbell Industrial Park) continue to be Diamond Head of Pearl Harbor.

The Waianae Coast and Leeward area houses a large population of families that could derive their income from resort employment at West Beach. On the following page is listed the population growth of Leeward area communities:
<table>
<thead>
<tr>
<th>Urban Area</th>
<th>1970</th>
<th>1980</th>
<th>Percent Increase</th>
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</thead>
<tbody>
<tr>
<td>Ewa</td>
<td>2,906</td>
<td>2,637</td>
<td>( 9.3)</td>
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<tr>
<td>Ewa Beach</td>
<td>7,765</td>
<td>14,369</td>
<td>85.1</td>
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<tr>
<td>Maili</td>
<td>4,397</td>
<td>5,026</td>
<td>14.3</td>
</tr>
<tr>
<td>Makaha</td>
<td>4,644</td>
<td>6,582</td>
<td>41.7</td>
</tr>
<tr>
<td>Makakilo City</td>
<td>3,499</td>
<td>7,691</td>
<td>119.8</td>
</tr>
<tr>
<td>Mililani Town</td>
<td>2,035</td>
<td>21,365</td>
<td>949.9</td>
</tr>
<tr>
<td>Nanakuli</td>
<td>6,506</td>
<td>8,185</td>
<td>25.8</td>
</tr>
<tr>
<td>Pearl City</td>
<td>27,398</td>
<td>42,575</td>
<td>55.4</td>
</tr>
<tr>
<td>Wahiawa</td>
<td>17,598</td>
<td>16,911</td>
<td>( 3.9)</td>
</tr>
<tr>
<td>Waialua</td>
<td>4,047</td>
<td>4,051</td>
<td>0.1</td>
</tr>
<tr>
<td>Waianae</td>
<td>3,302</td>
<td>7,941</td>
<td>140.5</td>
</tr>
<tr>
<td>Waipahu</td>
<td>24,150</td>
<td>29,139</td>
<td>20.7</td>
</tr>
<tr>
<td><strong>Area Totals</strong></td>
<td>108,247</td>
<td>166,472</td>
<td>53.8</td>
</tr>
<tr>
<td>Oahu</td>
<td>630,497</td>
<td>762,534</td>
<td>20.9</td>
</tr>
<tr>
<td>State</td>
<td>706,177</td>
<td>872,381</td>
<td>23.5</td>
</tr>
</tbody>
</table>

The planned residential communities of the Campbell Estate lands would also serve to reinforce these employment needs.

- **Public access and enjoyment of the shoreline heightened.**

At the present time, the coastline of West Beach is a rocky area with little beach area suitable for sun seekers, swimmers or beachcombers. Limited access is via rocky cane field roads. It is our contention that the quality of the shoreline and its access can only be improved by a resort development featuring an increasing number of water related activities. By so doing the local and visitor population can derive far greater benefit from this natural resource.

- **Reduction of employee commute time and traffic volume.**

In today's mobile society, the automobile has affected the lives of all of us. Traffic on Oahu is an island-wide problem and affects all Oahu residents, more so in the case of residents living in suburban communities who must commute daily to work in Downtown and Waikiki.
A job center in the form of a resort complex at West Beach would serve to reduce traffic congestion by providing employment opportunities close to an available work force. In addition to reducing commute time for employees living in the area, peak traffic to and from Downtown would be reduced in several ways. First, traffic volume inbound (to Downtown) from the leeward communities would be reduced since some of these commuters would be employed by the resort complex and would no longer need to commute into the city. Second, commuters who live east of West Beach in such communities as Waipahu, Pearl City and Aiea may be employed by the resort and would therefore travel in nonpeak directions during rush hours. And third, future residents of West Beach itself who work at the resort will no longer be required to commute daily to Downtown thereby easing peak volume.

It has not been demonstrated that traffic from hotel users would add significantly to congestion. Instead, the likelihood is that such traffic would tend to occur throughout the day in both inbound and outbound directions. In fact, the visitor would be encouraged to avoid travel in peak directions so that the time available for doing other things is maximized. The likely use of some form of mass transit such as charter buses for tour groups, shuttle and group limousine service would also tend to lessen the traffic impact.

- Enhancement of the cost-benefit ratio.

The tourism industry's economic benefits to the State are substantial. However, these benefits are reduced as Hawaii's labor force is absorbed into the visitor industry since labor shortages due to the growing influx of visitors will have to be met by immigrants. These immigrants will require substantial public outlays for housing infrastructure and maintenance, fire and police protection, education of their children and a host of other support requirements. In essence, the cost-benefit ratio for visitors falls sharply as the proportion of immigrants in the labor force needed to serve the additional visitors grows.

Therefore, as additional resort facilities are developed in the less populated areas of Oahu, the cost-benefit ratio accruing from the added visitor expenditures
will drop. Public outlays will be required to support the immigrant population required to operate the resorts. If, however, resorts are allowed to be developed in areas where support facilities are already existing or planned, such as at West Beach, the cost-benefit ratio from additional visitor expenditure should not experience any dramatic change inasmuch as public funds would not be required for housing and various other support facilities.

- **Excellent Access to and from Honolulu International Airport.**

West Beach is within twenty miles driving distance from Honolulu International Airport via a divided four and six lane interstate freeway (H-1). In contrast the resort developments at Makaha and Kahuku are 28 and 34 miles respectively from the airport, partially via single lane highways.

- **Existence of an Excellent Climate**

A dry, warm climate sought by visitors exists in the West Beach area. The average annual rainfall has been recorded at 20.31 inches and the average coolest and warmest monthly temperatures are 72.1 and 79.7 degrees. West Beach is oriented on Oahu the same as the very successful Kaanapali resort area is on Maui and, therefore, enjoys the same excellent weather without the wind factor.

- **A Superior Water Quality.**

Environmental studies of the area have shown that not only is the quality and character of the waters off West Beach excellent (calm, clear and clean), but the quantity and variety of sealife is particularly abundant. Additionally, tide pools are found at selected points along the shore, exhibiting the area's indigent sealife.

- **Inherent Superior Qualities of a Master Planned Development**

The land uses for a planned resort community include hotels, a mixture of housing densities, a community core with commercial activities and recreational amenities. These developments embody the desired characteristic of centralized planning which results in the following:
- Control of land use.
- Restraint in structural placement and design.
- Enhancement of environmental qualities.
- Preservation of scenic and historic sites.
- Avoidance of visual dominance.
- Complimentary circulation of pedestrians and vehicles.
- Coordinated marketing strategy for all segments of the complex.

West Beach as a Planned Resort Community would take advantage of these qualities enhancing the degree of success.

THE PROPOSED WEST BEACH COMMUNITY

The primary objective of the West Beach development is to create a quality community that affords a complimentary environmental and social balance between the tourist visitor and the permanent resident. By amplifying the existing amenities for the site and creating new recreational facilities that serve both resident and tourist, an intermingling occurs that is beneficial to the total community. The quality of that life style is dependent on the environment that is designed for the total project and especially that character and quality that is projected in the development of the first acquisition. Residential and quality hotel facilities and the championship golf course of the first development phase, should set the tone of quality for the entire resort.

The overall development concept is a combination of a resort destination - a defined complex providing a diversity of resort related uses and activities - and a mixed residential community which are the beginnings of a larger mixed use core for the secondary urban center. The project consists of 642.2 acres and 9,200 units. The uses represent the uses shown on the Ewa Development Plan of the City and County of Honolulu.

The general use pattern consists of 1) the resort activities occupying a large portion along the oceanfront, and 2) the residential areas also located along a small portion of the oceanfront areas, as well as on the golf course
and in proximity to the marina. The fairways of the golf course help to separate these two major activities as well as provide open space relief throughout the development.

Summarized below are the specific uses, acreages, and units contemplated at West Beach.

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Acres</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Density Apartment</td>
<td>108.0</td>
<td>1,500</td>
</tr>
<tr>
<td>Medium Density Apartment</td>
<td>78.9</td>
<td>3,700</td>
</tr>
<tr>
<td>Resort</td>
<td>86.5</td>
<td>4,000</td>
</tr>
<tr>
<td>Commercial</td>
<td>17.8</td>
<td></td>
</tr>
<tr>
<td>Beach Club</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
<td>Hawaiian Cultural Center</td>
<td>21.8</td>
<td></td>
</tr>
<tr>
<td>Marina</td>
<td>36.3</td>
<td></td>
</tr>
<tr>
<td>Lagoons</td>
<td>13.1</td>
<td></td>
</tr>
<tr>
<td>Golf Course</td>
<td>170.5</td>
<td></td>
</tr>
<tr>
<td>Park</td>
<td>51.4</td>
<td></td>
</tr>
<tr>
<td>School</td>
<td>6.9</td>
<td></td>
</tr>
<tr>
<td>Transit Stations</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td>Circulation</td>
<td>46.1</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>642.2</strong></td>
<td><strong>9,200</strong></td>
</tr>
</tbody>
</table>

In order to plan the development of West Beach, more specific assumptions on facilities have been made. Due to shifts in market preferences, final development may differ from those presented. The Ewa Department Plan allows a total of 4,000 resort units at West Beach that can be used by transient visitors. For purposes of planning and estimating employment we have assumed that 2,000 of these resort units will be hotels and 2,000 will be full service resort condominiums.

THE CREATION OF EMPLOYMENT OPPORTUNITIES

The development of transient accommodations not only satisfies the visitor market requirements, but also creates employment opportunities for the residents of Oahu. As currently planned, the West Beach resort should create approximately 5,100 direct jobs and 1,000 indirect jobs for a total employment impact of approximately 6,100 jobs. Presented on the following page is a tabulation showing the detailed computation of this employment base.
<table>
<thead>
<tr>
<th>Entity</th>
<th>Basis (Jobs Per Unit)</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deluxe Hotel (400 rooms)</td>
<td>1.5/room</td>
<td>600</td>
</tr>
<tr>
<td>First Class Hotels (1,600 rooms)</td>
<td>.7 room</td>
<td>1,120</td>
</tr>
<tr>
<td>Resort Condominiums (2,000 units)</td>
<td>.5/unit</td>
<td>1,000</td>
</tr>
<tr>
<td>Residential Condominiums (5,200 units)</td>
<td>.05/unit</td>
<td>260</td>
</tr>
<tr>
<td>Commercial Retail (185,000 square feet)</td>
<td>.005/sq. ft.</td>
<td>925</td>
</tr>
<tr>
<td>Commercial restaurants (35,000 sq. ft./7 restaurants)</td>
<td>40/restaurant</td>
<td>280</td>
</tr>
<tr>
<td>Elementary school</td>
<td>*</td>
<td>50</td>
</tr>
<tr>
<td>Hawaiian Cultural Center</td>
<td>*</td>
<td>125</td>
</tr>
<tr>
<td>Luau</td>
<td>*</td>
<td>175</td>
</tr>
<tr>
<td>Golf Complex and Club</td>
<td>*</td>
<td>125</td>
</tr>
<tr>
<td>Beach Complex and Club</td>
<td>*</td>
<td>150</td>
</tr>
<tr>
<td>Yacht Club</td>
<td>*</td>
<td>50</td>
</tr>
<tr>
<td>Marina</td>
<td>*</td>
<td>200</td>
</tr>
<tr>
<td>Complex Tram System</td>
<td>*</td>
<td>20</td>
</tr>
<tr>
<td>West Beach Maintenance/Security</td>
<td>*</td>
<td>30</td>
</tr>
<tr>
<td>West Beach Management/Administration</td>
<td>*</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total Direct Jobs</strong></td>
<td></td>
<td>5,130</td>
</tr>
<tr>
<td><strong>Total Indirect Jobs (.2 x Direct Jobs)</strong></td>
<td></td>
<td>1,026</td>
</tr>
<tr>
<td><strong>Total Job Creation</strong></td>
<td></td>
<td>6,156</td>
</tr>
</tbody>
</table>

1Based on the Department of General Planning, City and County of Honolulu report "Employment and Population Impacts of Resort Development at Five Oahu Sites", March 1978.

2Based on National Restaurant Association annual survey.

*Based on investigations and estimates of Pannell Kerr Forster.

In addition to these jobs relating to the operation of West Beach, a large number of jobs will be created from the construction of the infrastructure, superstructure and amenities.
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I have read the EIS for the West Beach project and I am very concerned that it does not adequately address the impact of this project on the marine environment. The nearshore environment, as correctly described in the EIS, contains areas of "high (54%) coral coverage which extend to a distance of 500 to 1,000 ft offshore... Fish diversity in this biotope is high..." However, the impact of the West Beach project on this particular environment is virtually ignored in the EIS. Instead, attention is paid almost exclusively to the shoreline immediately affronting the project which in fact is relatively barren. By stating that the effects of the project will most likely affect only the area closest to shore they easily conclude that the impact on the marine environment will be negligible. This is highly misleading. In fact, whether the project has immediate effects on the rich coral reef environment is irrelevant to construction or later, long-term effects due to a huge increase in the numbers of people moving into this region, the effects will be the same and will result in a dramatic degradation of this biotope.

At present the reef affronting the West Beach Project is one of the most aesthetically beautiful underwater environments on the island of Oahu, probably exceeding Hannauma Bay in the extent of coral growth. For research biologists, such as myself, it is an invaluable resource because of its accessibility, its pristine quality, and the fact that so few coral rich environments exist in this area. Local residents make use of this area for subsistence fishing and collection of lime. Give tour operators find it a popular dive site due to its beauty and the fact that the only other similar area, Hannauma Bay, is now off-limits to commercial diving operations. Finally, this area supports a number of tropical fish collectors who find this reef an important site for collecting colorful aquarium fishes.

For all of the above reasons, this area deserves protection and adequate safeguards that future development will not seriously degrade this habitat. The EIS acknowledges that the dredging and blasting needed to create 13 acres of new lagoons, and a 42 acre marina will cause some increase in siltation and disruption to the marine environment but goes on to state that this will only affect the area close to shore. Furthermore, they state that their development will have a positive affect since "the surfaces exposed in construction represent potential new habitat for replacements for the populations destroyed... (and) it is likely that populations of reef animals) will eventually reach levels equal to or higher than before construction" (pg. 9-67). Such a statement belongs almost in the realm of fantasy. I would like to see such a statement substantiated by fact and would especially like to know how closely the "new" populations would resemble the "natural" community.

The developers also intend to divert storm runoff partly to the marine and partly to the north end of the development presumably to keep dirty water away from their new lagoons. Presently, fresh water diffuses into the marine environment along the entire coastline. The new point discharge will concentrate this flow to the area which is the richest in coral growth. Depending on the volume, its residence time, the amounts of nutrients, pesticides and other toxins, and sediment, this runoff could, at any time, have a disastrous affect on the corals. Or, in lesser amounts, it could have a slow killing affect over many years.

What worries me the most, however, is the presence of thousands of new people and boats in this area. The marina will be built to hold up to 500 boats and it can be expected that many of the people owning these vessels will spend their leisure hours over the best coral areas, snorkeling, diving, spearfishing, and collecting shells and corals. The effect of many visitors each taking a souvenir from the reef, be it a coral, shell or fish, is well known and will in time severely alter the environment. A good example is Hannauma Bay before it was made into a marine life conservation district. Furthermore, each boat that enters this area and drops an anchor will mar the coral and a "few" boaters are likely to leave some cans and other trash behind. So much for the "pristine" environment, as this area is referred to now by Brock in the appendix to the EIS.

In Appendix II of the EIS, a report was prepared for the developer by Paul Bienfang and Richard Brock on "Activities potentially impacting the marine environment" (pp.1-16). In Appendix A of that report on pages A53-A54, they state "...that future shifts in hinterland use... or extensive coastal change (dredging, walling, infilling, etc.) could have large and far-reaching effects to all these (reef) communities (affronting West Beach). Such changes would be most likely to occur if development of coastal areas is done without consideration for... sensitivity (my emphasis) to the possible impacts to the nearshore marine communities. In this regard, the continuous generation of silt-laden runoff would be an issue of principal concern (my emphasis)..." The shallow benthic communities at West Beach are relatively diverse. Recent impacts appear to be altering them; however, they may be among some of the best examples of intact seaward bench/shallow subtidal communities on Oahu today. Given the apparent change and degradation that has occurred, the generation of further impacts (e.g., dredging, and increased turbidity) may result in further degradation to these communities."

Thank you for your comments and continuing interest.

The facts are now worked with the latest information.

The decision as to whether or not a program of offshore area

Page 3
June 5, 1965
Mr. Isaac A. Carter
The June 2, 1995 issue of Environmental CONSERVATION (Volume 22, No. 4) contains articles on various environmental topics, including the impact of pollution on ecosystems, sustainable development strategies, and the role of technology in conservation efforts. The issue also includes a section on case studies from around the world, highlighting successful conservation projects and the challenges faced in implementing sustainable practices. The articles are written by experts in the field and provide a comprehensive look at the current state of environmental conservation and the need for ongoing efforts to protect our planet's natural resources.
Mr. Fred Rodriguez
Environmental Communications Inc.
P.O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

This letter is written in response to undated comments made by Mr. Bertell O. Davis and a memorandum from Matthew Spriggs, dated May 20, 1985, regarding the Draft Supplemental Environmental Impact Statement for West Beach.

By way of general introduction, it should be pointed out that, in the absence of any explicit rules, regulations, or guidance from the State Historic Preservation Office, I have always understood that it is the intention of the developer to coordinate all historic site mitigation with the State Historic Preservation Office. It should also be pointed out that the field surveys at the West Beach area have been a continuing process, and that new information has been added to the existing stock as it was found, and therefore none of the previous studies should be considered complete insofar as the entire West Beach project area as a whole is concerned. And finally, "preservation" as an alternative is always implicit in any discussion of recommendations. It is not necessary to tell the developer that he does not have to destroy a site. All recommendations for salvage assume that the developer is already aware of his right to avoid a site if he so chooses.

My specific comments are as follows:

DAVIS, page 2:

"For instance, it is of interest to note that the developer's own consulting archaeologist has admitted, as a matter of public record, that he considers me to be the most knowledgeable individual regarding the archaeology of the Barbers Point region—Including the West Beach area."

In the first place, I believe the question as put to me was phrased in terms of the Barbers Point AND West Beach area. Stated that way, I replied in the affirmative. I was never asked if Mr. Davis was the most knowledgeable individual regarding the sites in the West Beach area alone. Had I been asked that question, I would have said no.

In the second place, just because I recognize that Mr. Davis probably has more facts stored in his head regarding the sites of the Barbers Point area than anyone else does not necessarily mean that I therefore implicitly trust his judgement regarding those sites. There is no connection between the two. If there were, it would defeat Mr. Davis's own argument, because I myself am the most knowledgeable person regarding the sites of the West Beach area, and using Davis's own argument, my judgement is more valid than his.

DAVIS, page 2:

"Why then, after nearly a year of input on my part, does the draft supplemental impact statement persist in claiming that only twenty-five sites are located within that portion of the West Beach area identified as being part of the Barbers Point Archaeological District, a property designated eligible for inclusion on the National Register of Historic Places, when in fact I have repeatedly shown that in excess of sixty archaeological sites have already been recorded therein?"

This assertion is unanswerable, as I am unable to find anyplace where Mr. Davis has repeatedly shown in excess of sixty sites in that portion of West Beach in the Barbers Point Archaeological District.

DAVIS, page 2:

"Why then, is there still no discussion anywhere that these sites in part comprise a major late-prehistoric/early-Historic Hawaiian habitation complex (Site Complex 27/1) and nearby (sic), a presumably associated gardening complex (Site 27/7) adapted to the unique arid coastline environment of the region?"

Because it is premature to draw conclusions from sites which have not been completely studied, and, in any event, an Environmental Impact Statement is not the proper place to present such conclusions. Such claims as Mr. Davis makes for the sites in this regard are best left until the completion of a research project.

DAVIS, page 2:

"Why then, is there no mention that the location of these sites represents very nearly the..."
Davis testified that his final recommendations in his 1978 Deep Draft Harbor Report contained a statement to the effect that the proposed impact in the study area assures the complete destruction of archaeological resources except for dune site 2732 and that efforts should be made to preserve these sites from construction impact. (p. 167(26) - 168(2))

Davis also admitted that in his 1978 Deep Draft Harbor Archaeology Report he recommended controlled excavations of selected cultural and paleontological features as a viable course of action and that he only recommended preservation of one dune site in the 2700 series. (p. 160(4-19)) Davis also admitted that the reason why he only recommended preservation of one dune site 2722, was because there would be no Deep Draft Harbor construction in that area. (p. 168(3-6))

Davis also admitted that he didn't even recommend salvage of all the sites at the Deep Draft Harbor, but only salvage of a "defined sample". (p. 168(18-22)) Davis testified that he recommended excavation of only 25 percent of Class 1, 2 and 3 structures in that area; only 8 percent of the total of 75 rock mounds; and did not even quantify the sinkholes at all. (p. 168(12) - 161(3))

Moreover, Davis' written comments on Barrera's Reports, dated May 29, 1984 and September 18, 1984, which were submitted as Intervenor's Exhibit Numbers 3A and 3B at the State Land Use Commission Hearings did not recommend "preservation" of the West Beach area at all.

Significance vs. Money

Davis testified that in the summer of 1980, he did his last excavation at West Beach at site 2717, and that he completed a midden analysis of site 2717 the following summer of 1981 or spring 1981. Davis also testified that he has not had the time to complete the midden analysis lab report since all the work was done on a volunteer basis. However, Davis is sure he would do it if someone paid him money to do that report. (p. 136(19) - 137(17)) Davis testified that although he never finished any report on his 1981 lab work, he did do a report subsequent to 1981 for the Bishop Museum because he was paid money for it. (p. 138(13) - 139(21))

Eligibility for Inclusion on the National Register

Davis testified that he felt that the West Beach area is archaeologically significant and that since 1979, he felt that it should be nominated to the National Register of Historic Places, however, he has never made any efforts to personally nominate West Beach because he understood that he couldn't do it as an individual. Davis testified that although he is a member of several archaeological groups and associations, he doesn't really know if those groups and associations could ask the State to nominate a site to the National Register either. Davis testified that he has no idea why the West Beach area has been eligible for so long, but had never been nominated. (p. 170(44) - 172(7))
ECONOMIC IMPACT

In addition to the creation of employment opportunities, the development of the West Beach resort will generate substantial revenues for the State of Hawaii. It has been estimated that a total of $24.5 million would be generated annually in current 1983 dollars assuming that the entire complex is complete and operating at a stabilized level. These revenues would accrue from the following sources:

<table>
<thead>
<tr>
<th>Tax Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Unemployment Tax</td>
<td>$ 850,000</td>
</tr>
<tr>
<td>Gross Income Tax</td>
<td>8,030,000</td>
</tr>
<tr>
<td>State Personal Income Tax</td>
<td>4,779,000</td>
</tr>
<tr>
<td>Real Property Tax</td>
<td>10,695,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$24,354,000</strong></td>
</tr>
</tbody>
</table>

Methodologies employed to develop these estimates are set forth in the following paragraphs.

**State unemployment taxes** were estimated based on one percent of the first $13,800 of salaries and wages of each of the 6,156 new employees. The one percent rate was derived from State of Hawaii Tax Department records as the average currently paid by all tax payers (wage earners).

**Gross income taxes** were based on 4.0 percent of total estimated revenues generated from all sources at West Beach.

Revenue estimates are as follows:

- Deluxe Hotel: $ 29,200,000
- First Class Hotel: 50,967,000
- Resort Condominiums: 41,714,000
- Commercial Retail: 55,038,000
- Commercial Restaurants: 7,088,000
- Hawaiian Cultural Center: 250,000
- Beach Luau: 2,340,000
- Golf Complex and Club: 2,600,000
- Beach Complex and Club: 2,600,000
- Yacht Club: 400,000
- Marina Complex: 8,350,000

**Total:** $200,747,000
State personal income taxes were estimated based on taxable income per employee of $11,587 x an average tax rate of 6.7 percent x the 6,157 employees. State tax office records were the source of estimated data.

Real property taxes were based on currently applied tax rates per thousand dollars of assessed valuation as follows:

**Land Valuations**

<table>
<thead>
<tr>
<th>Assessed Value</th>
<th>Tax Rate</th>
<th>Tax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>1,000</td>
<td>$7.05</td>
</tr>
<tr>
<td>Nonresidential</td>
<td>1,000</td>
<td>$9.00</td>
</tr>
</tbody>
</table>

$1,058,835,000

**Building Valuations**

<table>
<thead>
<tr>
<th>Assessed Value</th>
<th>Tax Rate</th>
<th>Tax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>1,000</td>
<td>$7.05</td>
</tr>
<tr>
<td>Nonresidential</td>
<td>1,000</td>
<td>$9.00</td>
</tr>
</tbody>
</table>

$273,273,800

$2,179,397