Environmental Assessment/
Environmental Impact Statement Preparation Notice

GRAY'S BEACH RESTORATION PROJECT
WAIKĪKĪ, O'AHU, HAWAI'I

PREPARED FOR:

Kyoya Hotels & Resorts, LP

PREPARED BY:

PLANNING SOLUTIONS

Sea Engineering, Inc.

AUGUST 2008

PROJECT SUMMARY

Project:	Gray's Beach Restoration Project
Applicant	Kyo-ya Hotels & Resorts, LP 2255 Kalakaua Ave., Honolulu, HI Contact: Ernest Nishizaki Phone: (808) 931-8699
Approving Agencies	Office of Conservation & Coastal Lands Department of Land & Natural Resources State of Hawai'i 1151 Punchbowl Street, Room 131 Honolulu, Hawai'i 96813 Contact: Sam Lemmo Phone: (808) 587-0381 Department of the Army Corps of Engineers Regulatory Branch Building 230 Fort Shafter, HI 96858-5440 Contact: Peter Galloway Phone: (808) 438-8416
Location	Waikīkī Beach, O'ahu, HI
Tax Map Keys	None (seaward of shoreline)
State Land Use District	Conservation.
County Zoning	None.
Proposed Action	The applicant proposes to replenish the beach fronting the Sheraton Waikiki Hotel. Offshore sand will be recovered and emplaced along the beach, and three partially covered rock groins will be constructed to stabilize the newly created beach and prevent erosion and loss of sand.
Associated Actions Requiring Environmental Assessment	Work within the Conservation District and within navigable waters of the United States.
Required Permits & Approvals	Conservation District Use Permit, Department of the Army Permit, Water Quality Certification, Coastal Zone Management Act Consistency Determination
Anticipated Determination	Completion of an Environmental Impact Statement
Consultant	Planning Solutions, Inc. 210 Ward Ave, Suite 330 Honolulu, HI 96814 Contact: Perry White (808) 550-4483 And Sea Engineering, Inc.

SUMMARY

Kyo-ya Hotels and Resorts LP (Kyo-ya) is proposing to restore and stabilize a sand beach fronting its Sheraton Waikiki Hotel property. If the required land use approvals and environmental permits are granted, Kyo-ya will:

- Construct three rock T-head groins along the shoreline fronting the Sheraton Waikiki Hotel, with the eastern-most groin replacing the existing Royal Hawaiian groin. The groins would be spaced 230 feet and 270 feet apart from east to west. The stems would extend 160 feet from the existing seawall (all groin dimensions are measured along the crest), with the east and west groins originating at the seawall and the middle groin beginning 30 feet seaward of the seawall.
- Emplace sand fill between the groins to create a beach with a minimum horizontal crest width of 30-feet at the +5.2 foot elevation extending from the seawall, and a 1V:10H slope from the crest to the sea bottom. Approximately two-thirds of the groin stem would be covered by sand, with the groins gradually emerging from the beach slope. Sand fill would also be placed on the west side of the groins to transition into the adjacent shoreline. Sand fill is expected to be obtained by recovery of offshore sand from the Halekūlani Channel, seaward of the 20-foot depth contour. The total dry beach width, i.e. above the high tide line, would be approximately 75 feet, and the total dry beach area would be about 45,000 square feet (1 acre). Assuming 75 square feet per person the beach would accommodate 600 persons.

The project is intended to enhance recreational and aesthetic enjoyment of the area and provide protection for the backshore area. The restored beach will facilitate lateral access along the shoreline and enhance recreational opportunities. The proposed improvements are designed to minimize adverse effects on the shoreline and nearshore environment. Modeling and analyses of nearshore conditions conducted in the project area indicate that the project will not alter wave patterns in a manner that will disrupt existing surf breaks. Rather, it will decrease wave reflection by replacing the existing vertical seawall with more energy dissipating beach sand and groins. It will also enhance on and offshore recreational opportunities by facilitating access to the shoreline.

This Environmental Assessment/Environmental Impact Statement Preparation Notice (EA/EISPN) describes the proposed project and alternatives in detail and orients the reader to the project area and the <u>kinds</u> of impacts expected to result from the project. The Draft Environmental Impact Statement (DEIS) for the project will present detailed analysis of potential impacts and propose measures to minimize or mitigate unavoidable impacts.

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1.0 PURPOSE AND NEED

1.1 INTRODUCTION

The Sheraton Waikiki Hotel (Sheraton) is located in the middle of Waikīkī Beach, along the shoreline of Māmala Bay on the south shore of O'ahu, Hawai'i. Waikīkī Beach is recognized as the State's primary tourist destination, attracting millions of visitors yearly. With approximately 44% of its hotel rooms, Waikīkī is the State's largest visitor destination area; with 1,700 rooms the Sheraton Waikiki is its largest single hotel building. The fast land on which the hotel is located is protected by a seawall that has been in place since the 1920s. Despite its size, the Sheraton Waikiki has less sandy beach area fronting it than any other shoreline hotel. The absence of a beach makes the area one of the most constrained in all of Waikīkī with respect to public long-shore (i.e., lateral) access.

Kyo-ya Hotels & Resorts, LP is proposing to restore and stabilize a sand beach fronting the Sheraton Waikiki hotel to enhance recreational and aesthetic enjoyment of the area and provide protection for the backshore area. The restored beach will facilitate lateral access along the shoreline and enhance recreational opportunities. A complete description of its objectives is presented in Section 1.3.

The project includes the following components, which are the subject of this environmental assessment/environmental impact statement preparation notice (EA/EISPN):

- The construction and maintenance of three 160-foot long stone groin features spanning 500 feet of shoreline.
- The removal of approximately 15,000 cubic yards of sand from the Halekūlani Channel for use in the beach restoration.
- The placement of the sand removed from the channel between the groins to create a beach. The total beach width above the high tide line would be approximately 75 feet, and the total dry beach area would be about 45,000 square feet (1 acre). Assuming 75 square feet per person the beach would accommodate nearly 600 persons.
- The placement of sand fill on the western side of the westernmost groin to transition into the adjacent shoreline.

1.2 PURPOSE AND NEED FOR THE PROJECT

1.2.1 THE NEED FOR BEACH RESTORATION IN WAIKĪKĪ: GENERAL

Until the late 1800s Waikīkī Beach was a narrow barrier beach in front of a low-lying swampy backshore. In 1877 Kapi'olani Park was opened, and a seawall was constructed in 1890 to protect the road leading to it. Development of beachfront hotels began in 1901, and seawalls were constructed to protect them. By 1910 seawalls had become associated with beach loss, and in 1917 additional seawall construction was prohibited. This prohibition was generally ignored and by 1920 seawalls spanned the majority of the Waikīkī shoreline. In the 1930s the Board of Harbor Commissioners began attempts to restore the beach, and these attempts continue today.

Sand has been imported, and structures such as groins and crib walls have been constructed in attempts to retain the sand. Construction of the Royal Hawaiian Hotel was finished in 1927, complete with a new seawall, and between 1926 and 1929 eight groins were constructed between the Royal Hawaiian and Fort DeRussy. Unfortunately, most attempts to stabilize the beach have failed, and 98% of the sand imported to nourish the beach cannot be accounted for today. At present, Waikīkī Beach is entirely man-made, and there is no natural shoreline between Honolulu Harbor and Diamond Head. While Waikīkī Beach remains a symbol of Hawai'i for many and is still the State's largest tourist destination, visitor surveys indicate that 12% of tourists who say they will not return to Waikīkī cite the limited beach area and the resulting crowding as a reason for their decision.

1.2.2 THE NEED FOR THE PROPOSED GRAY'S BEACH RESTORATION PROJECT

The shoreline fronting the Sheraton Waikiki Hotel is one of the worst segments along the shoreline with respect to the amount of usable beach and lateral access along the shore. Gray's Beach, which once extended along most or all of this segment of shoreline, has shrunk to a small remnant beach fronting the Halekūlani Hotel and the extreme western end of the Sheraton property. While a small amount of sand is present adjacent to the seawall, it is typically underwater at high tide and waves breaking against the seawall create splash that discourages people from using the pedestrian walkway that runs along the seawall top. The predominant direction of sand transport in the vicinity of the Sheraton Waikiki is from east to west; however this can vary based on normal changes in the wave climate. Large surf events can result in significant loss of sand, to the extent the beach disappears completely for a while. The Royal Hawaiian groin blocks sand from moving toward the Sheraton, and the reflective Sheraton seawall exacerbates erosion and greatly reduces the chance for sand accumulation in front of it. In 2006, wave energy from high surf undermined the base of the Royal Hawaiian groin near the east end of the Sheraton property. This created a sinkhole which is currently demarcated by security tape (Clark 2007). The proposed beach nourishment will reduce the potential for further damage to the groin and Sheraton property.

1.3 OBJECTIVES OF THE PROPOSED ACTION

Kyo-ya has adopted the following objectives for the proposed action:

(1) Restore and stabilize the beach fronting the Sheraton Waikiki to provide for recreational and aesthetic enjoyment of its guests and the general public.

(2) Maintain and enhance protection for the backshore area.

(3) Facilitate lateral access along the shore.

(4) Increase the variety of/access to water-oriented recreational activities along the beach fronting the hotel.

(5) Protect the Sheraton Waikiki Hotel from property damage that could occur as a result of further undermining of the Royal Hawaiian groin.

(6) Minimize the potential for environmental harm and risks to public health and safety during construction and operation.

(7) Minimize or eliminate potential adverse impacts on coastal processes.

1.4 REQUIRED FEDERAL AND STATE APPROVALS

1.4.1 FEDERAL APPROVALS

In a July 1, 2008, letter (File POH-2007-92), the Regulatory Branch of the Honolulu District of the U.S. Army Corps of Engineers (COE) wrote to the engineer for the Gray's Beach Project as follows:

> *We have reviewed the project information you provided with respect to the Corps' authority to issue Department of the Army (DA) permits pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403) and Section 404 of the Clean Water Act (33 USC 1344). All work or structures in or affecting the course, condition, location or capacity of navigable waters, including tidal wetlands, require DA authorization pursuant to Section 10. In addition, activities involving the discharge of dredged or fill material into waters of the United States, including adjacent wetlands, require a DA permit pursuant to Section 404.*

> *Based on our review of the information you provided, we have determined that the proposed project would be constructed in navigable waters of the United States and will require an individual (standard) DA permit issued pursuant to Section 10 and Section 404.*

Having addressed the need for a Department of the Army Permit, the COE's July 1, 2008, letter went on to address the extent to which the proposed action would be subject to the National Environmental Policy Act (NEPA), stating:

> *Based on our review of the draft EISPN and other information available to this office, it is apparent that the proposed project will significantly affect the quality of the human environment. We conclude that a Federal EIS will be needed for processing of the required DA permit application and that it should be a joint Federal and State document to avoid duplication as specified in NEPA implementing regulations (40 CFR 15062).*

In accordance with this determination, the COE and the State of Hawai'i Department of Land and Natural Resources will prepare a joint Federal and State EIS that fulfills the requirements of both Chapter 343, Hawai'i Revised Statues and the National Environmental Policy Act (NEPA). The findings included in the Final EIS will inform the COE's decision to issue (or deny) a Department of the Army permit.

1.4.2 STATE OF HAWAI'I APPROVALS

If the Federal/State EIS is for the Gray's Beach Restoration Project is approved by the Chair of the Board of Land and Natural Resources (who is the Governor's authorized representative to act as "accepting authority" for Chapter 343 environmental impact statements that involve the commitment of State-owned land), the Final EIS will serve as the basis for several State actions. These include:

- Issuance of the Conservation District Use Permit that is needed for the use of lands within the State Conservation District.
- Commitment (by lease, easement, or other arrangement) of the State-owned land on which the proposed groins and beach would be constructed.
- Granting the applicant the right to transfer sand from the seafloor in the Halekūlani Channel to the area between groins in order to form new beaches.

As with the Federal approvals, the findings of the Final EIS will inform the State agencies' decisions on whether to issue the required approvals.

1.5 APPLICABLE LEGAL & REGULATORY REQUIREMENTS

1.5.1 APPLICABLE FEDERAL EXECUTIVE ORDERS, LAWS, AND REGULATIONS

The Federal Executive Orders, Laws and Regulations that govern the proposed action are described below.

1.5.1.1 NEPA of 1969, as amended (42 USC §4321 et seq.)

NEPA requires Federal agencies to prepare an EA or EIS for Federal actions that have the potential to significantly affect the quality of the human environment, including both natural and cultural resources. The Act establishes Federal agency procedures for preserving important aspects of the national heritage and enhancing the quality of renewable resources. This document has been prepared in compliance with NEPA and the implementing Council on Environmental Quality (CEQ) regulations (40 CFR §§1500-1508).

1.5.1.2 Clean Water Act (CWA) of 1977, as amended (33 USC §§1251-1387)

The Clean Water Act (CWA) is the key legislation governing surface water quality protection in the United States. Sections 401, 402, and 404 of the Act require permits for actions that involve wastewater discharges or discharge of dredged or fill material into waters of the United States. The discharge of the stone that would make up the groins and the sand that would form the beaches between the proposed groins constitute fill as defined in the CWA and are both subject to regulations implementing the CWA. In Hawaiʻi, the U.S. Environmental Protection Agency has delegated responsibility for implementing the Act to the State. The State regulations that carry out this responsibility are discussed below in Section NNN.

1.5.1.3 Rivers and Harbors Act (33 USC §403)

Section 10 of the Rivers and Harbors Act, 33 USC §403, requires a Department of the Army (DA) permit for any activity that obstructs or alters navigable waters of the U.S., or the course, location, condition, or capacity of any port, harbor, refuge, or enclosure within the limits of any breakwater, or of the channel of any navigable water. The proposed groins represent an obstruction/alteration of navigable waters as defined in the statute. Hence, their construction requires a Section 10 per it from the COE.

1.5.1.4 Coastal Zone Management Act (CZMA) of 1972 (16 USC §§1451-1465 *et seq*.)

The CZMA requires that Federal actions affecting any land/water use or coastal zone natural resources must be consistent with the enforceable policies of an approved state coastal zone management program to the maximum extent practicable. The CZMA requires a "consistency determination" from the State of Hawaiʻi Department of Business, Economic Development, and Tourism (DBEDT) for actions within the coastal zone, as defined by Hawaiʻi Revised Statutes (HRS) §205A-1. Hence, a CZM Consistency Certification will be needed for the proposed project.

1.5.1.5 Endangered Species Act (ESA) of 1973 (16 USC §§1531-1544 et seq.)

The ESA requires Federal agencies to assure that their actions are not likely to jeopardize the continued existence of any threatened or endangered species, or result in destruction or adverse modifications of habitat critical to those species. Accordingly, the COE will consult with the USFWS and NMFS and seek their concurrence that the proposed project is not likely to affect threatened and endangered species under their jurisdictions adversely.

1.5.1.6 Fish and Wildlife Coordination Act (FWCA) of 1934, as amended (16 USC §§661-666[c] et seq.)

The FWCA provides for consultation with the USFWS and other relevant Federal and State agencies when a Federal action proposes to modify or control U.S. waters for any purpose. The applicant has already initiated this consultation and both it and the COE will continue to seek advice as it continues the environmental impact and permitting processes. The reports and recommendations of the State of Hawaiʻi Department of Land and Natural Resources will be made an integral part of the EIS and Record of Decision.

1.5.1.7 Magnuson-Stevens Fishery Conservation and Management Act (16 USC §1801 et seq.)

The Magnuson-Stevens Act (16 USC §1801 et seq.), as amended by the Sustainable Fisheries Act, PL 104-297, calls for action to stop or reverse the loss of marine fish habitat. The waters out to 200 miles (mi) around the Hawaiian Islands are under the jurisdiction of the Western Pacific Regional Fishery Management Council (WPRFMC). The WPRFMC has approved a Fisheries Management Plans (FMP) for Hawaiʻi that designates all the ocean waters surrounding Oʻahu, from the shore to depths of over 100 feet, including the area that would be affected by the proposed Gray's Beach Restoration Project as "Essential Fish Habitat" (EFH).

The WPRFMC has also identified "Habitat Areas of Particular Concern" (HAPC). As defined in the 1996 amendments to the Act, these habitats are a subset of EFH that are "rare, particularly susceptible to human-induced degradation, especially ecologically important, or located in an environmentally stressed area." The area that would be affected by the proposed Gray's Beach Restoration Project is not within a HAPC.

1.5.1.8 Marine Mammal Protection Act (MMPA) of 1972, as amended (16 USC §§1361-1421(h) et seq.)

Reauthorized in 1994, the MMPA establishes a moratorium, with certain exceptions, on the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas and on importing of marine mammals and marine mammal products into the U.S. The applicant's preliminary consultation for the Gray's Beach project indicates that it will comply with the MMPA. The COE will carry out formal consultation during the preparation of the NEPA documentation, and the results will be reported in the FEIS and COE's Record of Decision.

1.5.1.9 Migratory Bird Treaty Act (META) of 1918, as amended (16 USC §§703 712 et seq.)

The MBTA is a bilateral migratory bird treaty with Canada, Mexico, Japan, and Russia. Sections 703 to 712 of the Act prohibit the taking of migratory birds in the absence of a permit. The actions involved in constructing and maintaining the groins and beach do not appear to have the potential to affect migratory birds. Written confirmation of this will be obtained during the NEPA process.

1.5.1.10 National Historic Preservation Act (NHPA) of 1966 (16 USC §470 et seq.)

Section 106 of the NHPA of 1966, 16 USC §470(f), as amended, requires Federal agencies having direct or indirect jurisdiction over a Federal undertaking to take into account effects on any district, site, building, structure, or object that is included or is eligible for inclusion in the National Register of Historic Places (NRHP) prior to the approval of expenditure of any funds or issuance of any license or permit. The applicant's informal consultation with the Historic Preservation Division of the State of Hawai'i Department of Land and Natural Resources indicates that the proposed project will not adversely affect historic properties. The COE will conduct formal consultation with the Hawai'i State Historic Preservation Officer (SHPO) to confirm this.

1.5.1.11 Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 (25 USC §3001)

NAGPRA provides for the protection and repatriation of Native American and Native Hawaiian human remains and cultural items discovered on Federal lands. The Proposed Action does not involve the use of Federal land and is not, therefore, subject to the Act.

1.5.1.12 EO 13089, Coral Reef Protection (63 FR 32701)

EO 13089, dated June 11, 1998, directs all Federal agencies whose actions may affect U.S. coral reef ecosystems to:

- Identify their actions that may affect U.S. coral reef ecosystems;
- Utilize programs and authorities to protect and enhance the condition of such ecosystems; and
- Ensure that any actions they authorize, fund, or carry out will not degrade the conditions of such ecosystems.

Marine biological consultants are inventorying the coral resources in and around the areas that could be affected by the proposed project. The results of these surveys will be used to confirm the extent to which the proposed action is likely to affect coral reefs and to identify measures that will be undertaken to mitigate these unavoidable effects.

1.5.1.13 EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds (16 USC §§ 703-711) (66 FR 3853)

Under EO 13186, dated January 10, 2001, all Federal agencies taking actions that have, or are likely to have, a measurable negative impact on migratory bird populations are directed to develop and implement a Memorandum of Understanding (MOU) with USFWS that promotes the conservation of migratory bird populations. The applicant's preliminary assessment indicates that the Gray's Beach Restoration project would not affect habitat used by migratory bird populations. The USFWS will be consulted to confirm this determination.

1.5.1.14 EO 12898, Environmental Justice

Under EO 12898, dated February 11, 1994, Federal agencies are required to address the potential for disproportionately high and adverse environmental effects of their actions on minority and low-income populations. Agencies are required to ensure that their programs and activities that affect human health or the environment do not directly or indirectly use criteria, methods, or practices that discriminate on the basis of race, color, or national origin. NEPA documents are specifically required to analyze effects of Federal actions on minority and low-income populations and, whenever feasible, to develop mitigation measures to address significant and adverse effects on such communities. The EO states that the public, including minority and low-income communities, should have adequate access to public information relating to human health or environmental planning, regulation, and enforcement.

The proposed project would expand the amount of sandy beach available to the general public in Waikīkī, including members of low-income and minority groups. Unless information to the contrary arises out of the environmental review process, there does not appear to be any mechanism through which the proposed project could impose disproportionately high adverse effects on minority or low-income populations.

1.5.1.15 EO 13045, Protection of Children from Environmental Health Risks and Safety Risks

Under EO 13045, dated April 21, 1997, Federal agencies are required to address the potential for disproportionately high and adverse environmental effects of their actions on children. Agencies are required to identify and, if necessary, mitigate health and safety risks with the potential to disproportionately affect children. The BO requires that agencies ensure that their policies, programs, activities, and standards address such risks.

Preliminary review of the proposed action indicates that it lacks any elements with the potential to affect children adversely. This topic will be explored further during the environmental assessment process and the results will be reported in the *Draft EIS*.

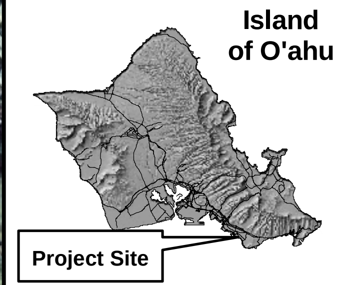
1.5.1.16 EO 13123, Greening the Government through Efficient Energy Management (65 FR 24595)

E0 13123, Part 2, Section 204, dated April 21, 2000, states "each agency shall strive to expand the use of renewable energy within its facilities and in its activities by implementing renewable energy projects and by purchasing electricity from renewable energy sources." Construction and maintenance of the proposed beach improvements does not involve the ongoing use of electricity. The applicant's general policy is to promote energy efficiency throughout its operations, and it will include a statement to that effect in its construction contract for the proposed beach restoration.

1.6 REPORT ORGANIZATION

The remainder of this document is organized as follows:

- Chapter 2 describes the specific tasks that comprise the proposed action. It also describes the other alternate actions that were considered and explains why they were rejected.
- Chapter 3 provides an overview of the existing environment that could be affected by the project.
- Chapter 4 identifies the kinds of environmental impacts that could result from the proposed action and that will be discussed in detail in the EIS for the project.
- Chapter 5 presents the determination that the project will require preparation of a joint NEPA/Chapter 343 Environmental Impact Statement (EIS).
- Chapter 6 lists the parties that have been consulted during preparation of this report and includes the preliminary report distribution list.
- Chapter 7 lists the references used during the preparation of this report.



Prepared For:

Kyo-ya Hotels & Resorts, LP

Prepared By:

PLANNING SOLUTIONS

Sources:

City & County of Honolulu GIS

Figure 1.1:

Location Map

Gray's Beach Restoration Project

Figure 1-1 Location Map 2007-09-10.mxd

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2.0 ALTERNATIVES CONSIDERED

2.1 INTRODUCTION

As described in Chapter 1 of this notice, Kyo-ya plans to restore and stabilize the sand beach fronting its Sheraton Waikiki property. This chapter provides detailed information about the design and construction of its preferred alternative (i.e., the proposed project). It also describes and discusses possible alternatives. That discussion is divided into two parts. The first covers alternative approaches which Kyo-ya believes might achieve some or all of the same objectives, albeit less satisfactorily and/or at higher cost or with greater adverse environmental effects. The second describes alternatives that were considered briefly but discarded after it was concluded that they could not achieve the project objectives. The description is divided into 3 major parts.

- Section 2.2 describes the design of the shoreline improvements that Kyo-ya has proposed and the data and analyses on which their design is based. Sections 2.2.1 and 2.2.2 present a detailed discussion of the environmental factors on which the proposed design is based: Section 2.2.3 describes the major design features, and Section 2.2.4 outlines the construction methodology that would be used. It includes conceptual site plans for the proposed beach restoration and nourishment. Finally, Section 2.2.5 discusses the anticipated schedule for construction of the project and Section 2.2.6 provides preliminary cost estimates for each of the major components.
- Section 2.3 discusses the alternatives to the proposed action. It begins by outlining the framework within which alternatives were formulated and analyzed (Section 2.3.1). This is followed by a description of the action alternatives (including the proposed action) that the environmental impact statement will assess in detail (Section 2.3.2). This is followed by a brief review of the alternatives that Kyo-ya considered but eliminated from detailed consideration (Section 2.3.3).
- Finally, Section 2.4 discusses the alternative of taking "No Action".

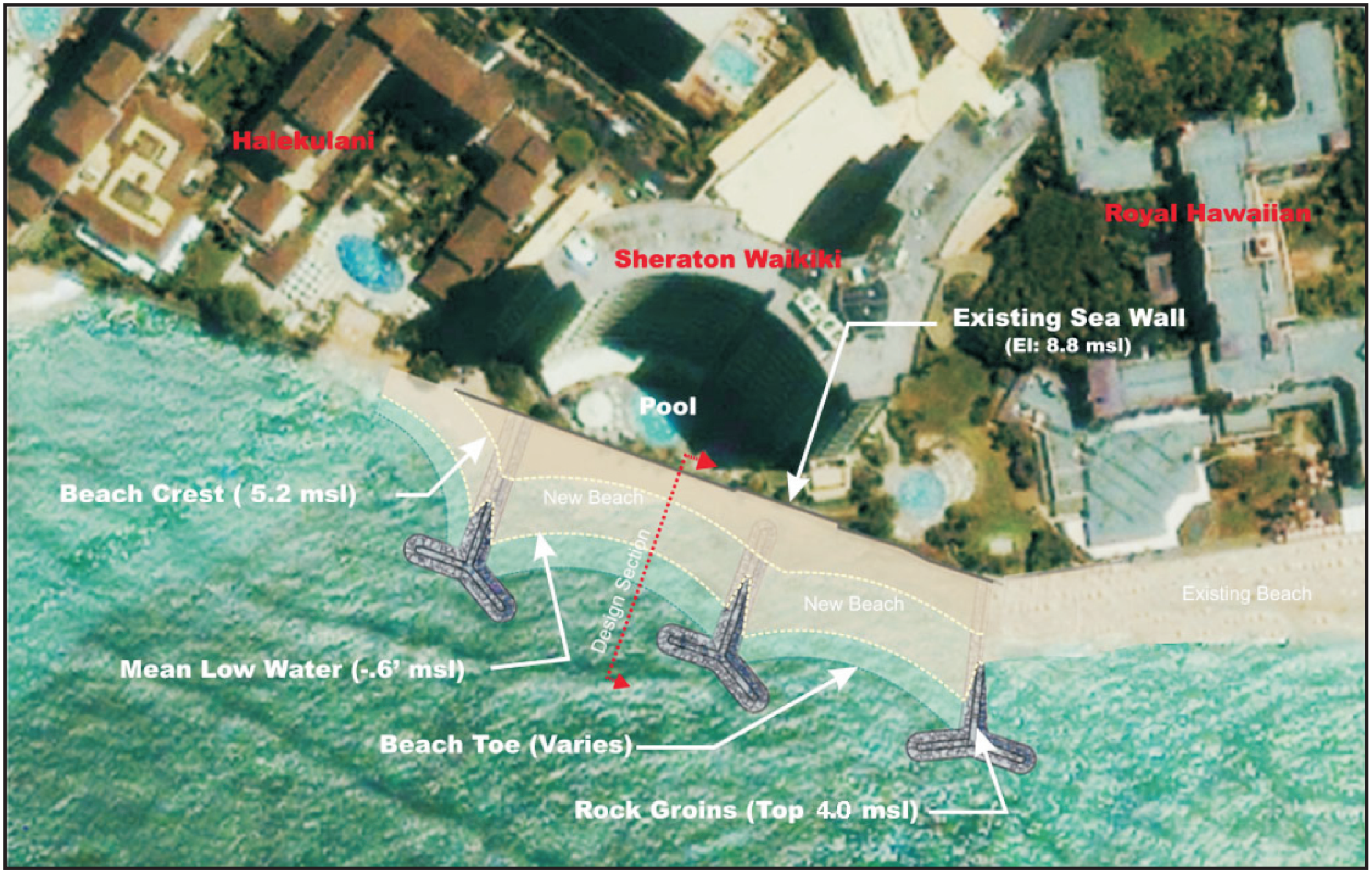
2.2 DESCRIPTION OF THE PROPOSED ACTION

Kyo-ya's proposal for re-establishing and maintaining a sandy beach in front of the Sheraton Waikiki requires: (1) constructing structures (in this case three T-head groins) to stabilize the sand beach fill and prevent its loss due to wave action and currents; (2) restoring a sandy beach using sand that has been carried offshore and is now lying on the bottom of the nearby Halekūlani Channel; and (3) maintaining the beach as necessary by periodically nourishing it with additional sand from the same source. Figure 2.1 contains an aerial photograph on which the conceptual restoration plan is depicted; Figure 2.2 shows a typical cross-section of the completed beach; and Figure 2.3 contains a photo-rendering showing the way the shoreline would look with the proposed project. The following sections describe the design of the proposed project in detail, including the data and modeling that informed the design considerations.

2.2.1 DESIGN CONSIDERATIONS FOR PROPOSED BEACH STABILIZATION

In developing plans for the proposed protective structure and beach, engineers adhered to the following general precepts:

- Utilize a well-demonstrated and generally conservative design methodology for the required stabilization structures. The use of three groins maximizes beach stability, while at the same time reducing the seaward extent of the groins.
- Design the groin structures to be stable under severe storm wave attack as demonstrated by detailed oceanographic analyses.



Prepared For:

Kyo-ya Hotels & Resorts, LP

Prepared By:

PLANNING SOLUTIONS

Source:

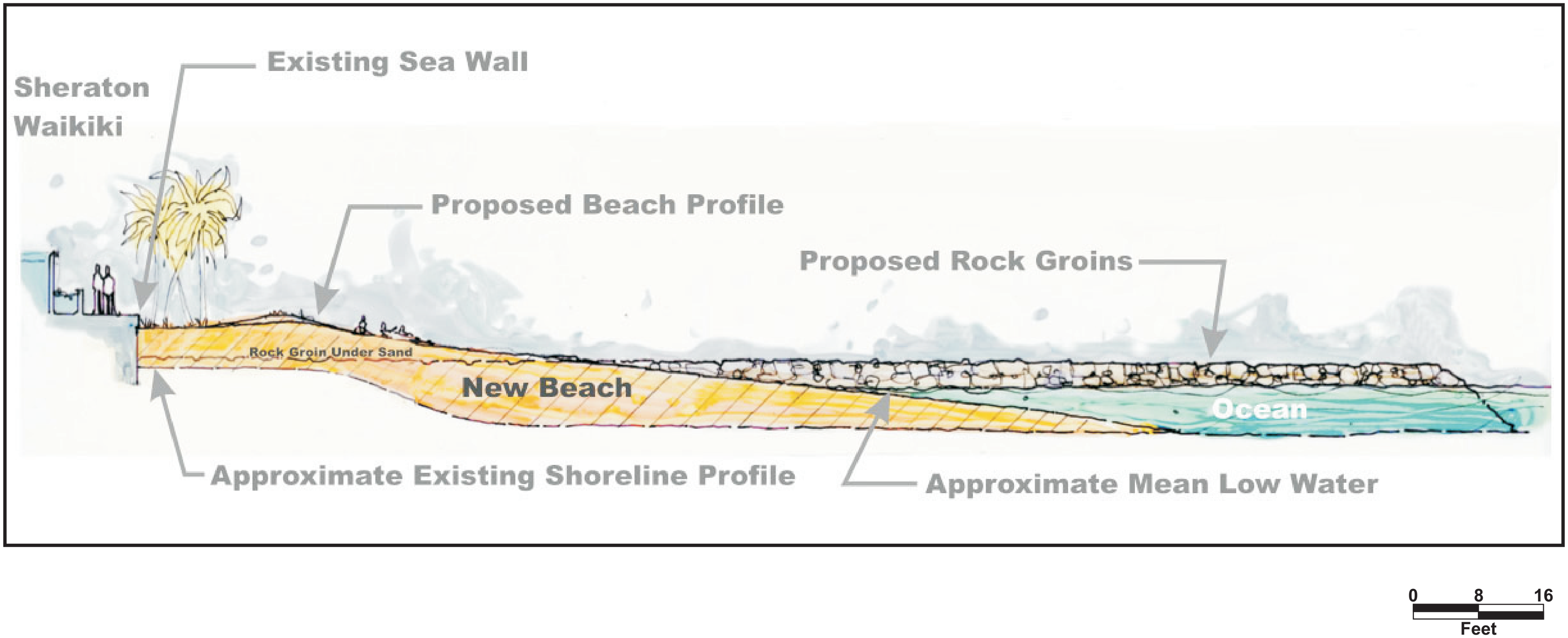
Sea Engineering, Inc.

Figure 2.1:

Conceptual Beach Restoration Plan

Gray's Beach Restoration Project

Figure 2-1 Conceptual Beach Restoration Plan 2007-09-19.cdr



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Source:

Sea Engineering, Inc.

Figure 2.2:

Typical Section of Beach Restoration Plan

Gray's Beach Restoration Project

Prepared For:

Kyo-ya Hotels & Resorts, LP

Prepared By:

PLANNING SOLUTIONS

Sources:

Sea Engineering, Inc.

Note: View is from Halekulani Hotel.

Figure 2.3:

Photo Rendering of Proposed Project

Gray's Beach Restoration Project

Figure 2-3 Aerial Rendering of Project Area 2008-07-22.cdr

- Maintain a minimum ratio of gap width between the groin heads to head length of 60:40 so that the groins do not appear to dominate the viewplane.
- Locate the western-most groin inboard from the property line in order to not block the existing public beach access way, to maintain a clear beach area fronting the water activities center, and to provide for sailing catamaran beaching.
- Design the restored beach with a minimum crest width of 30 feet (horizontal width from seawall to top of beach slope), and an elevation of +5.2 feet, to match the adjacent Royal Hawaiian beach elevation.
- Locate the groins so as to "bracket" the two swimming pool areas in order to reduce the impact on the seaward vista from the pool decks, restaurant and bar areas.

Sea Engineering, Inc. performed wave modeling and analyzed potential sand sources for the proposed beach restoration. The results of the modeling and a summary of the sand source investigation is presented in the following subsections.

2.2.2 BASIS OF DESIGN

Several sources of wave data are available for Waikīkī. The prevailing deepwater wave conditions for Waikīkī beaches are reported by Edward K. Noda and Associates, Inc. (1992). Recorded stillwater levels in Honolulu Harbor in the vicinity of the project site are available for both prevailing and storm conditions through the Center for Operational Oceanographic Product and Services, National Ocean Service, NOAA. The hindcast stillwater levels during storm conditions along the south coast of the Island of O'ahu are also reported by Bretschneider and Noda (1985). The storms were defined as the scenario hurricanes for the Hawaiian Islands (Haraguchi, 1984).

2.2.2.1 Prevailing Wave Conditions Used for the Design

The deepwater wave conditions offshore of Waikīkī used for the design are based on wave measurements that Edward K. Noda & Associates made off Waikīkī from July 1990 to October 1991 (see Table 2.1 for summer [May to October] and Table 2.2 for winter [November to April] seasons, respectively) The wave gage was located about one mile from the shore in a water depth of 50 feet. The wave measurements determined the significant wave height, significant wave period, and direction. The measured significant waves were then converted to their corresponding deepwater wave conditions based on a wave refraction analysis.

2.2.2.1.1 Deepwater Wave Characteristics Used for the Design

As shown in Table 2.1and Table 2.2, the project site is exposed to waves from the southeast to west-southwest. During the summer, nearly two-thirds of waves approach from the south, while during the winter this diminishes to 40%. In the winter, waves approaching from the south-southwest and southwest increase in frequency. Waves from the west-southwest and southwest occur only 0.5% of the time during the summer and 12% of the time during the winter. Engineers used the data summarized in the tables to select five representative deepwater wave conditions for the project based on the frequency of occurrences in each wave direction (see Table 2.3).

Table 2.1. Deepwater Waves offshore Waikīkī in Summer, % Frequency: Significant wave height (ft) vs. Significant period (sec.)

		Summer Months (may - October)								
Dir (°TN)	Hs\Ts	<6	6-8	8-10	10-12	12-14	14-16	16-18	>=18	Total%
SE	<1	0	0	0	0.1	0.2	0	0	0	0.3
123.75 -	1-2	0.2	0.1	0.1	0.3	0.2	0	0	0	1.0
146.25	2-3	0.4	0.6	0	0.1	0	0	0	0	1.2
	3-4	0	0.4	0	0.1	0	0	0	0	0.6
	4-5	0	0	0	0	0	0	0	0	0
	5-6	0	0	0	0	0	0	0	0	0
	6-7	0	0	0	0	0	0	0	0	0
	7-8	0	0	0	0	0	0	0	0	0
	8-9	0	0	0	0	0	0	0	0	0
	Total%	0.7	1.2	0.1	0.6	0.5	0	0	0	3.0
SSE	<1	0	0.1	0	0	0	0.4	0	0	0.4
146.25 -	1-2	0.8	1.8	1	0.4	0	1	0.3	0	5.3
168.75	2-3	2.1	5.6	1.1	0.4	0	0.5	0.3	0	10.0
	3-4	0.9	2.4	1	0.1	0	0.1	0.2	0	4.7
	4-5	0.1	0.5	0.2	0	0	0	0	0	0.8
	5-6	0.1	0.2	0	0	0	0	0.1	0	0.3
	6-7	0.1	0.1	0	0	0	0	0	0	0.1
	7-8	0	0	0	0	0	0	0	0	0
	8-9	0	0	0	0	0	0	0	0	0
	9-10	0	0	0	0	0	0	0	0	0
	Total%	4	10.6	3.3	1	0	2	0.9	0	21.7
S	<1	0	0.2	0.1	0.5	0.4	0	0	0	1.1
168.75 -	1-2	0.8	1.9	1.7	5.9	2.7	1.6	0.4	0	15.1
191.25	2-3	3.1	3.4	4	8.8	6.4	3.8	1	0	30.4
	3-4	1.4	2.3	1.7	2.7	3.7	3.3	0.2	0	15.4
	4-5	0.6	0.2	0.1	0.2	0.1	0.6	0	0	1.8
	5-6	0.1	0.1	0	0	0	0.1	0	0	0.2
	6-7	0.1	0	0	0	0	0	0	0	0.1
	7-8	0	0.1	0	0	0	0	0	0	0.1
	8-9	0	0	0	0	0	0	0	0	0
	Total%	5.9	8.2	7.5	18.1	13.3	9.4	1.7		64.1
SSW	<1	0	0	0	0	0.2	0	0	0	0.2
191.25 -	1-2	0.1	0.1	0.7	0.9	1.2	0.5	0.2	0	3.6
213.75	2-3	0.3	0.1	0.7	1.9	1.3	0.4	0.1	0	4.8
	3-4	0.4	0.2	0.1	0.2	0.4	0.2	0.1	0	1.5
	4-5	0	0.1	0	0	0	0	0	0	0.1
	5-6	0.1	0	0	0	0	0	0	0	0.1
	Total%	0.8	0.4	1.4	3	3	1	0.4	0	10.1
SW	<1	0	0	0	0	0	0	0	0	0
213.75 -	1-2	0	0	0	0	0.2	0.1	0	0	0.4
236.25	2-3	0.1	0	0	0.1	0	0	0	0	0.1
	3-4	0	0	0	0	0	0	0	0	0
	4-5	0	0	0	0	0	0	0	0	0
	5-6	0	0	0	0	0	0	0	0	0
	6-7	0	0	0	0	0	0	0	0	0
	7-8	0	0	0	0	0	0	0	0	0
	8-9	0	0	0	0	0	0	0	0	0
	Total%	0.1	0	0	0.1	0.2	0.1	0	0	0.5
WSW	<1	0	0	0	0	0	0	0	0	0
236.25 -	1-2	0	0	0	0	0	0	0	0	0
258.75	2-3	0	0	0	0	0	0	0	0	0
	3-4	0	0	0	0	0	0	0	0	0
	4-5	0	0	0	0	0	0	0	0	0
	5-6	0	0	0	0	0	0	0	0	0
	Total%	0	0	0	0	0	0	0	0	0
All	Total%	11.5	20.4	12.3	23.1	17.3	12.5	2.9	0	100.0

Source: Edward K. Noda & Associates (1992) in Sea Engineering (2007), Table 3-1.

Table 2.2. Deepwater Waves Offshore Waikīkī in Winter Months, % Frequency: Significant wave height (ft) vs. Significant period (sec)

		Winter Months (November - April)								
Dir (°TN)	Hs\Ts	<6	6-8	8-10	10-12	12-14	14-16	16-18	>=18	Total%
SE	<1	0.2	0	0	0	0	0	0	0	0.2
123.75 -	1-2	0.2	0.1	0	0	0	0	0	0	0.3
146.25	2-3	0.4	0.6	0	0.3	0	0	0	0	1.3
	3-4	0.3	0.5	0	0	0	0	0	0	0.8
	4-5	0	0.7	0	0.2	0	0	0	0	0.9
	5-6	0	0.4	0	0	0	0	0	0	0.4
	6-7	0	0	0	0	0	0	0	0	0
	7-8	0	0.1	0	0	0	0	0	0	0.1
	8-9	0	0.4	0	0	0	0	0	0	0.4
	Total%	1.1	2.8	0	0.5	0	0	0	0	4.3
SSE	<1	0.8	0.6	0.1	0	0	0	0	0.1	1.6
146.25 -	1-2	2.1	2.4	0.5	0	0	0	0.1	0.1	5.2
168.75	2-3	3.7	5.2	1.9	0.6	0	0	0	0	11.4
	3-4	3.3	3.5	0.6	0	0	0	0	0	7.4
	4-5	0.9	1.7	0.4	0	0	0	0	0	3.0
	5-6	0.6	0.5	0	0	0	0	0	0	1.1
	6-7	0.2	0.1	0	0	0	0	0	0	0.3
	7-8	0	0.1	0	0	0	0	0	0	0.1
	8-9	0	0.2	0	0	0	0	0	0	0.2
	9-10	0	0.1	0	0	0	0	0	0	0.1
	Total%	11.6	14.3	3.4	0.6	0	0	0.1	0.2	30.2
S	<1	0.6	0.5	0.6	0.6	0	0	0	0	2.2
168.75 -	1-2	1.5	2.3	1.4	2.6	0.5	0.4	0.3	0	8.9
191.25	2-3	2.8	3.5	3.3	4.7	1.3	0.6	0.3	0	16.5
	3-4	1.6	1.7	1.5	1.9	0.8	0.5	0	0	7.9
	4-5	0.3	1.2	1.3	0.3	0	0	0.1	0	3.1
	5-6	0.1	0.2	0	0	0	0	0	0	0.3
	6-7	0.2	0.3	0	0	0	0	0	0	0.5
	7-8	0.1	0.1	0	0	0	0	0	0	0.2
	8-9	0.1	0	0	0	0	0	0	0	0.1
	Total%	7.2	9.7	8	10.1	2.6	1.5	0.6	0	39.7
SSW	<1	0	0	0.3	0.9	0.1	0.2	0	0	1.5
191.25 -	1-2	0.5	0.5	1	2.7	0.6	0.4	0.4	0.1	6.1
213.75	2-3	0.5	0.6	0.4	0.6	1.2	0.4	0	0	3.6
	3-4	0	0.4	0	0.1	0.6	0.5	0	0	1.6
	4-5	0	0	0.1	0	0.2	0	0	0	0.3
	5-6	0	0	0	0	0	0	0	0	0
	Total%	0.9	1.4	1.8	4.3	2.8	1.4	0.4	0.1	13.0
SW	<1	0.1	0	0.4	0.5	0.3	0	0	0	1.2
213.75 -	1-2	0.8	0.2	0.1	0.7	0.5	0.2	0	0.1	2.6
236.25	2-3	0.6	0.1	0.2	0.7	0.9	0.1	0	0	2.6
	3-4	0.2	0	0.2	0.5	0.5	0	0.1	0	1.4
	4-5	0.2	0	0	0	0	0	0	0	0.2
	5-6	0.1	0	0	0	0	0	0	0	0.1
	6-7	0	0.2	0	0	0	0	0	0	0.2
	7-8	0	0	0	0	0	0	0	0	0
	8-9	0.1	0	0	0	0	0	0	0	0.1
	Total%	2	0.5	0.8	2.4	2.1	0.3	0.1	0.1	8.3
WSW	<1	0.8	0.4	0.1	0.1	0	0	0	0	1.4
236.25 -	1-2	0.9	0.3	0	0	0	0	0	0.1	1.3
258.75	2-3	0.4	0.3	0.1	0	0.1	0.1	0	0	0.9
	3-4	0.1	0	0	0	0.1	0	0	0	0.2
	4-5	0	0	0	0.1	0	0	0	0	0.1
	5-6	0	0.1	0	0	0	0	0	0	0.1
	Total%	2.2	1	0.2	0.2	0.2	0.1	0	0.1	4.0
All	Total%	25.4	29.6	14.2	18.1	7.7	3.2	1.3	0.5	100.0

Source: Edward K. Noda & Associates (1992) in Sea Engineering (2007), Table 3-2.

Table 2.3. Selected Typical Deepwater Wave Conditions

Wave Direction	Wave Period (sec.)	Wave Height (ft.)
SSE	7	2.5
South	12	2.5
South	16	4.0
SW	6	2.0
SW	12	3.0
Source: Edward K. Noda & Associates (1992) in Sea Engineering, Inc. (2007).		

2.2.2.1.2 Deepwater to Shallow Water Wave Transformation

As waves approach the shore they slow in speed and increase in height and steepness as the water depth decreases. Waves break when the wave shape becomes too steep to be maintained, and this dissipates their energy. Wave energy is also dissipated due to sea bottom friction. Wave refraction is caused by differential wave speed along a wave crest due to varying water depths, and this causes wave crests to converge or diverge and may locally increase or decrease wave heights. Wave diffraction is the lateral transmission of wave energy along the wave crest, and causes the spreading of waves in a shadow zone, such as an area behind a breakwater or other barrier.

The selected deepwater waves shown in Table 2.3 were entered into the numerical wave refraction-diffraction model REF/DIF1, version 2.5, (Kirby and Dalrymple, 1994) to simulate the wave transformation as the waves propagate shoreward.[1] In the modeling, a high tide of 1.6 feet above MSL was used to determine conservative wave heights at the project site. The computed wave heights at a distance 200 feet from the project shoreline are shown in Table 2.4. Wave heights are presented for three nearshore sections along the project site shoreline, west side, middle, and east side sections. These wave heights are also the basis for a wave reflection analysis.

Table 2.4. Wave Heights Along Project Site (200 Feet from Shoreline)

Wave Dir./ Period (in sec)	Wave Height at West (in feet)	Wave Height at Middle (in feet)	Wave Height at East (in feet)
SSE / 7	2.0	2.4	2.9
South / 12	2.9	3.2	1,0
South / 16	2.4	3.2	1.9
SW / 6	2.4	3.1	0.9
SW / 12	2.9	0.9	1.2
Source: Sea Engineering (2007), Table 3-4.			

2.2.2.1.3 Design Waves and Water Levels

The design wave height and water level used in designing the protective structures (T-Head groins) are based on <u>extreme</u> wave and water level conditions rather than the typically prevailing conditions described above. Since the nearshore area of the project site is a wide reef flat, the largest wave height in the project area is a depth-limited wave, defined as 0.6 times the water depth. The wave is superimposed on the rise in stillwater level along the shore that also occurs during such conditions. That component of the rise is the sum of the astronomical tide, storm surge due to reduced

[1] The model is nonlinear, and the waves are transformed by the processes of wave shoaling, refraction, diffraction, and energy dissipation due to bottom friction and wave breaking. The large waves initially break some distance offshore. The waves then typically reform and continue shoreward as smaller waves, which may break again and reform several times before finally reaching the shoreline.

atmospheric pressure and wind stress, and wave setup. The extreme stillwater level rises were determined for Hurricanes ʻIwa and ʻIniki, the most recent hurricanes to pass through the Hawaiian Islands, and for two model scenario hurricanes.[2] These values are considered to be the water level rise due to storm surge and wave setup. These values were added to the astronomical high tide level of 1.6 feet above a mean sea level (MSL), which includes 0.5 feet due to the oceanic large scale eddies.

The total computed stillwater level rises for Hurricanes ʻIwa and ʻIniki are 4.0 feet and 3.2 feet above MSL, respectively. The stillwater level rises for the model scenario hurricanes are reported in *Hurricane Vulnerability Study for Honolulu, Hawaiʻi, and Vicinity* (Bretschneider and EKNA Inc. 1985). This study assumes direct hurricane approach to the south shore of Oʻahu. The storm surge and the wave setup at the project site are 1.3 feet and 3.5 feet for the SE-model hurricane and 1.0 and 3.7 feet for the SW-model Hurricane. The total stillwater level rises are then 6.4 feet for the SE-model hurricane and 6.3 feet for the SW-model hurricane. The stillwater level rises are given in Table 2.5.

Considering the maximum wave height equals 0.6 times the water depth, the design wave height is 6.2 feet based on the maximum water depth of 10.4 feet during the SE model hurricane. The total water depth includes 6.4 feet of the stillwater level rise and the reef elevation of -4.0 feet MSL at a distance 200 feet offshore.

Table 2.5. Stillwater Level Rises in Selected Storms at Project Site.

<table>
<tr><th></th><th>Hurricane ʻIniki</th><th>Hurricane ʻIwa</th><th>SE-Model Hurricane</th><th>SW-Model Hurricane</th></tr>
<tr><td>Astronomical Tide (ft)</td><td>1.6</td><td>1.6</td><td>1.6</td><td>1.6</td></tr>
<tr><td>Storm Surge (ft)</td><td rowspan="2">2.4</td><td rowspan="2">1.6</td><td>1.3</td><td>1.0</td></tr>
<tr><td>Wave Setup (ft)</td><td>3.5</td><td>3.7</td></tr>
<tr><td>Total SWL Rise (ft)</td><td>4.0</td><td>3.2</td><td>6.4</td><td>6.3</td></tr>
<tr><td colspan="5">Notes:
• Astronomical tide = large scale eddy + MHHW = 0.5 + 1.1 (ft above MSL)
• Storm Surge = wind setup + pressure setup
• The total stillwater level rise for Hurricane ʻIniki and ʻIwa are with the super astronomical tide 1.6 feet MSL.</td></tr>
</table>

Source: Sea Engineering, Inc. (2007), Table 3-5.

2.2.2.2 Beach Nourishment Sand: Regulatory Requirements

A key factor in any project of the sort that is proposed is the availability of suitable beach sand. The State Department of Land and Natural Resources (DLNR) beach nourishment guidelines specify that fill sand used to nourish a beach must meet several specific requirements:

- It may not contain more than six (6) percent silt material (sand grain size smaller than 0.074mm).
- It may not contain more than ten percent coarse material (sand grain size greater than 4.76mm).
- Its grain size distribution must fall within 20% of the existing beach grain size distribution.
- The overfill ratio[3] of the fill sand to existing sand may not exceed 1.5.

[2] The model scenario hurricanes are defined in the report *Hurricanes in Hawaiʻi* (Haraguchi 1984), prepared for the U.S. Army Corps of Engineers. They present hypothetical model hurricanes for the Hawaiian Islands. The model hurricanes are defined as the probable hurricanes that will strike the Hawaiian Islands in the future, based on the characteristics of the hurricanes that have previously struck the islands. The water levels recorded in Honolulu Harbor during Hurricanes ʻIwa and ʻIniki are available from the Center for Operational Oceanographic Product and Services, National Ocean Service, NOAA. The largest recorded differences between the recorded water level and the predicted tide in Honolulu were 2.4 feet during Hurricane ʻIwa and 1.6 feet during Hurricane ʻIniki.

[3] The overfill ratio is the volume of actual borrow material required to produce a unit volume of usable fill. The renourishment factor is germane to the long-term maintenance of a project, and addresses the basic question of how often

- The sand must be free of contaminants such as silt, clay, sludge, organic matter, turbidity, grease, pollutants, and others.
- The sand must be composed primarily of naturally occurring carbonate beach or dune sand.

The majority of these fill sand requirements are related to grain size, but color and abrasion resistance are also important characteristics of replenishment sand. For example, while natural calcareous beaches range in color from light brown to white, sand in offshore deposits usually turns a gray color as a result of anaerobic conditions that can arise due to a lack of wave action and associated mixing. Hence, even when an offshore sand source is suitable in terms of grain-size characteristics, it may have a gray color that makes it less desirable.

2.2.2.3 Characteristics of Existing Waikīkī Beach Sand

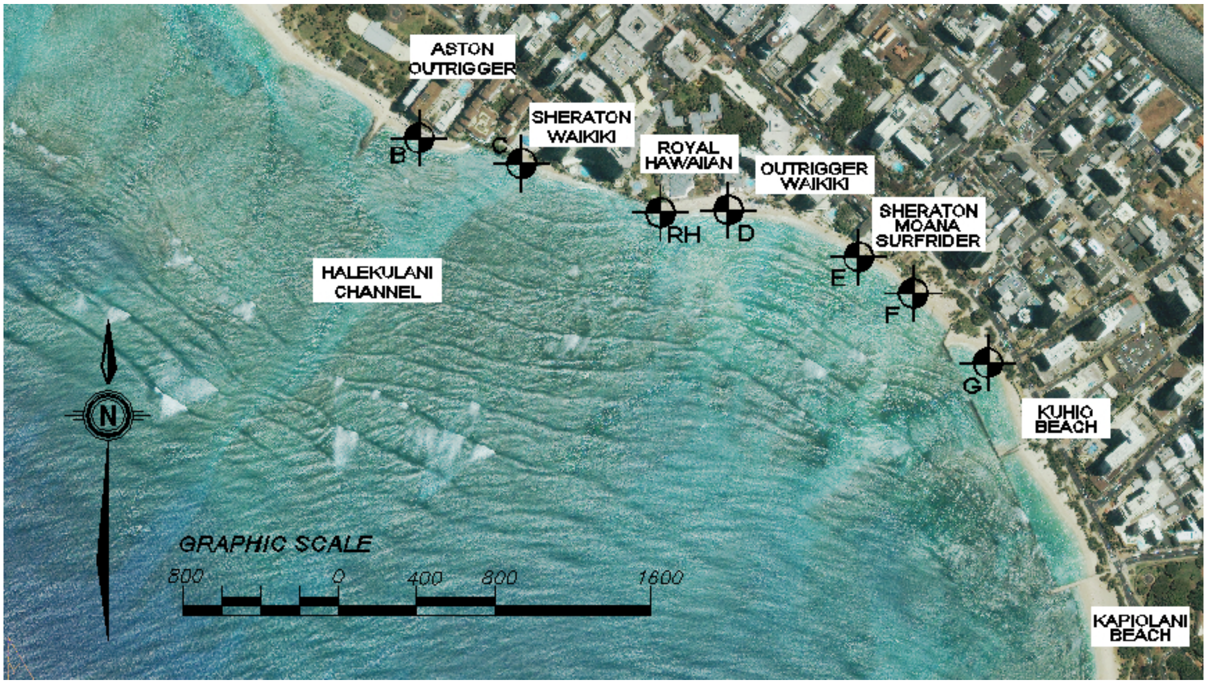
As Sea Engineering's design report for the proposed Gray's Beach Restoration Project documents, there is presently very little, if any, "native" beach sand on Waikīkī Beach. As a result, sand characteristics vary widely along the shoreline, primarily the result of the differing sand sources that have been used in the numerous nourishment projects that have been carried out there since the early 1900's. For example, in 1929, sand was pumped from a "reef flat" through the Halekūlani Channel for beach fill at the Halekūlani Hotel, while in 1938, 7,000 cubic yards of fill was placed on Kūhiō Beach from "another part of Oʻahu". In 1960, pulverized coral was placed on the beach at Fort DeRussy. The resulting fill was described as "more like an airfield than a beach" (Wiegel 2005). Table 2.6 summarizes the grain size characteristics of sand samples collected from beaches in the vicinity of the Sheraton Waikiki; Figure 2.4 depicts the locations where samples were collected. Median grain size (D50 in the table) ranges from 0.81 mm at the Aston Outrigger, 0.76 to 0.53mm at Hilton Hawaiian Village, and 0.37 to 0.29mm at the Royal Hawaiian Beach. Sand samples from the backshore area between the Halekūlani and Sheraton hotels (Noda 1991) had a median grain diameter of 0.54mm and was moderately to poorly sorted (i.e., a wide range of grain sizes).

Table 2.6. Sand Samples in Sheraton Waikiki Vicinity.

Map ID	*Sample Location*	D_{50}	σ	*Source*	*Date*
A	Hilton Hawaiian Village	0.76	0.50	Noda	1991
A	Hilton Hawaiian Village	0.53	~0.75	SEI	2004
B	Aston Outrigger	0.81	0.75	Noda	1991
C	Sheraton Waikiki	0.54	1.05	Noda	1991
D	Royal Hawaiian	0.29	0.55	Noda	1991
E	Kūhio Beach	0.30	0.65	Noda	1991
F	Moana Surfrider	0.71	0.43	DLNR	2004
G	ʻEwa Basin	0.39	0.40	DLNR	2004
RH	Royal Hawaiian	0.37	0.46	SEI	2007
Source: Sea Engineering, Inc. (2007), Table 5-2.					

renourishment will be required if a particular borrow source is selected that is texturally different from the native beach sand.

Figure 2.4. Sand Sample Locations.



Source: Sea Engineering, Inc. (2007).

2.2.2.4 Beach Nourishment Sand Sources

The majority of Hawai'i beaches are comprised of calcareous (calcium carbonate) sand made up of skeletal fragments of marine organisms such as corals, coralline algae, mollusks, echinoids, and forams. The density of calcium carbonate is more than 2.7g/cm^3, but the presence of microscopic pores and hollow grains make the effective density somewhat lower. The composition of sand is determined by the relative abundance of each species and therefore varies with location. Calcareous sand is the only type of sand that the State of Hawai'i allows for beach nourishment.

2.2.2.4.1 Potential On-Land Calcareous Sand Sources

In the past, sand for beach nourishment projects was often obtained from on-land deposits. While some of these were of excellent quality (e.g., Mokulē'ia Inland Beach Sand), Sea Engineering's 2007 analysis concluded that there are no presently existing commercially available on-land sources of suitable beach sand.

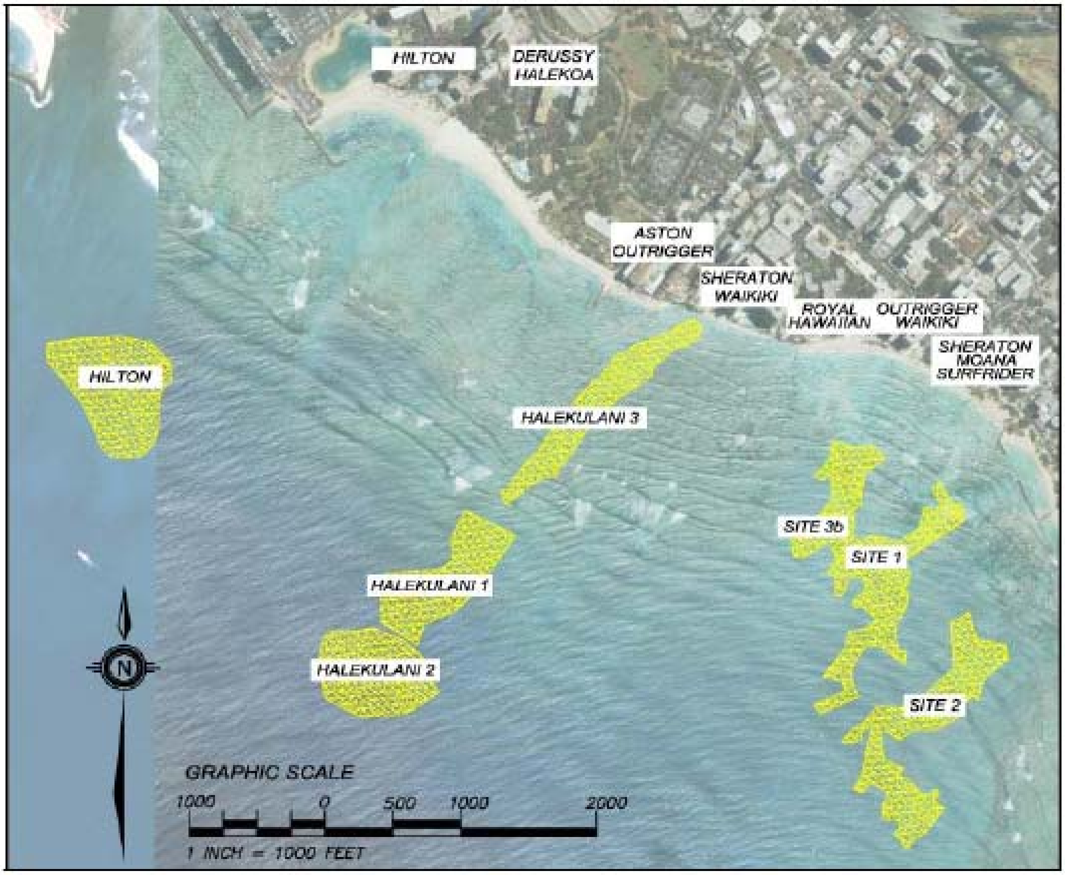
2.2.2.4.2 Potential Offshore Sand Sources

Offshore sand deposits can present a suitable cost-effective source of sand for beach fill and nourishment. Where present, offshore sand deposits occurring within the same littoral cell as the target beach can have grain size characteristics and composition that are very similar to that of sand on the beach itself.

A number of studies have characterized sand deposits in the Waikīkī Area. They include Noda (1991), Sea Engineering (2004), Hampton (2003), and DLNR (2004). Figure 2.5 shows the locations of those which have the 15,000 cubic yards needed for the proposed project.[4] Table 2.7 summarizes the characteristics of seven offshore deposits in the area, and brief descriptions of those deposits follow below.

[4] All beach restoration sand volumes used in this report include 10% overfill and 10% contingency.

Figure 2.5. Offshore Sand Source Locations



Source: Sea Engineering, Inc. (2007), Figure 5-2.

Table 2.7. Offshore Sand Source Summary

Location	D_{50} *(mm)*	*σ*	*Volume (CY)*	*Color*	*Source*	*Year*
Hilton	0.55	0.82	40,500	light grey	SEI	2004
Halekūlani 1	0.28–0.33	0.9–1.9	110,000	light olive to yellowish grey	USGS	2003
Halekūlani 2	0.40–0.55	0.9–1.2	130,000		USGS	2003
Halekūlani 3	0.70	0.55	-	yellowish grey	SEI	2007
Site 1	0.35	0.43–0.56	31,835	light grey	DLNR	2004
Site 2	0.40	0.36–0.51	27,119	light grey	DLNR	2004
Site 3b	0.36	0.42–0.53	27,119	light grey	DLNR	2004

Source: Sea Engineering, Inc. (2007), Table 5-3.

Hilton Area. This deposit is located approximately 2,600 feet southwest of the Hilton Hawaiian Village in water depths between 40 and 55 feet. The maximum thickness of the deposit is 5 feet with an average of 4 feet. The deposit covers approximately 12 acres and contains an estimated 40,500 cubic yards of sand (SEI 2004). The deposit is characterized by a gray color with visible shell fragments, giving the appearance of coarser, less sorted sand. The median grain size (D_{50}) is 0.55mm; the sand is moderately well-sorted.

<u>*Halekūlani Channel.*</u> The shoreward terminus of the Halekūlani Channel is located adjacent to the Sheraton Waikiki project area. The sand channel extends approximately 4,000 feet offshore where it widens into a broad sand field in approximately 120 feet of water. Noda (1991) estimated that it contains 500,000 cubic yards of sand between the 100-foot and 40-foot depth contours and 80,000 cubic yards shoreward of the 40-foot depth contour. They reported that median grain size in the deposit varies from 0.20mm to 0.39mm (with the coarser samples found in water depths of less than 10 feet); the reported average sorting parameter, (σ) was 1.1, indicating a moderately to poorly sorted sand. The samples exhibited a gray color.

Hampton et al (2003) collected numerous vibracore samples up to 6 meters long from the Halekūlani Channel from locations between 750 meters and 1,500 meters offshore, in water depths from 10 to 60 feet. Median grain sizes varied from 0.17mm to 0.57mm, and the sand ranged from moderately well-sorted to poorly sorted. The coarser samples (0.55>D50 >0.40) were generally obtained in water of depths from 40 to 60 feet, while finer samples (0.33>D50 >0.28) were found in water depths of 10 to 30 feet. Based on the vibracore results, at least 240,000 cubic yards of light olive to yellowish gray sand can probably be found in the channel between the 10 foot and 60 foot depths.

Finally, sand samples that Sea Engineering Inc. collected from the Halekūlani Channel from an estimated depth of 10 feet approximately 150 and 350 feet from shore have a median grain size of 0.70 and are moderately well-sorted (SEI 2007).

<u>*Kūhiō Beach Sources.*</u> In 2004, sand sources in the vicinity of Kūhiō Beach were considered for the Small-Scale Sand Pumping Project in Waikīkī. Sites 1, 2, and 3b, shown on Figure 5.2 were chosen for detailed investigation. The sand source sites are located in water depths of 8 to 20 feet. The estimated total quantity of sand for the three sites is 86,000 cubic yards. Median grain size of this well-sorted sand varies from 0.35 to 0.40mm. Approximately 10,000 cubic yards of source sand were pumped to the beach from the northwestern edge of Site 1 near its junction with Site 3b. The pumping project was completed in January of 2007 after a work period of one month. The sand was reportedly well-sorted with medium grain size and a light gray color.

2.2.2.4.3 Comparison of Existing Beach and Source Sand

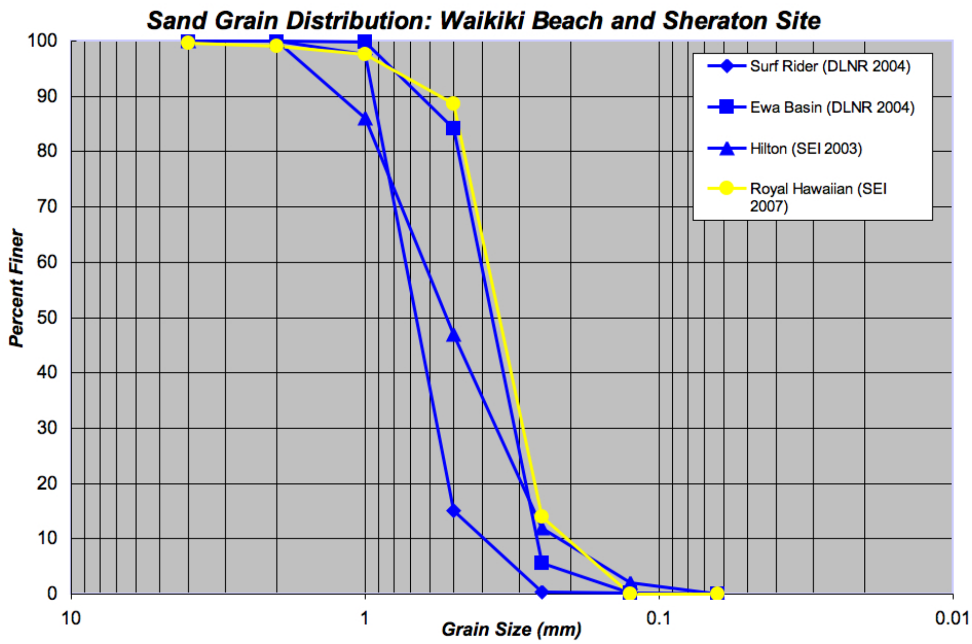
Figure 2.6 presents a graphical summary of grain size distribution for existing Waikīkī Beach sand at various locations. Blue lines represent samples taken at other Waikīkī Beach locations, while the yellow lines are those taken in the project vicinity (Royal Hawaiian Hotel). The finer sand at the Royal Hawaiian groin is indicative of a beach that has been stabilized by the groin itself. The Royal Hawaiian grain size is thus considered a reasonable "design" grain size for the proposed beach restoration project. Figure 2.7 compares the grain sizes of the existing sand at the Royal Hawaiian with the sand at potential sources of replenishment sand. Red lines indicate possible sources and the solid yellow line corresponds to sand at the Royal Hawaiian.

2.2.2.4.4 Source Sand Suitability Summary

Based on the available data from the current and previous investigations, it is probable that six of the seven locations presented above contain sand of sufficient quantity and quality to qualify as potential sources of nourishment sand for the Gray's Beach Restoration Project.

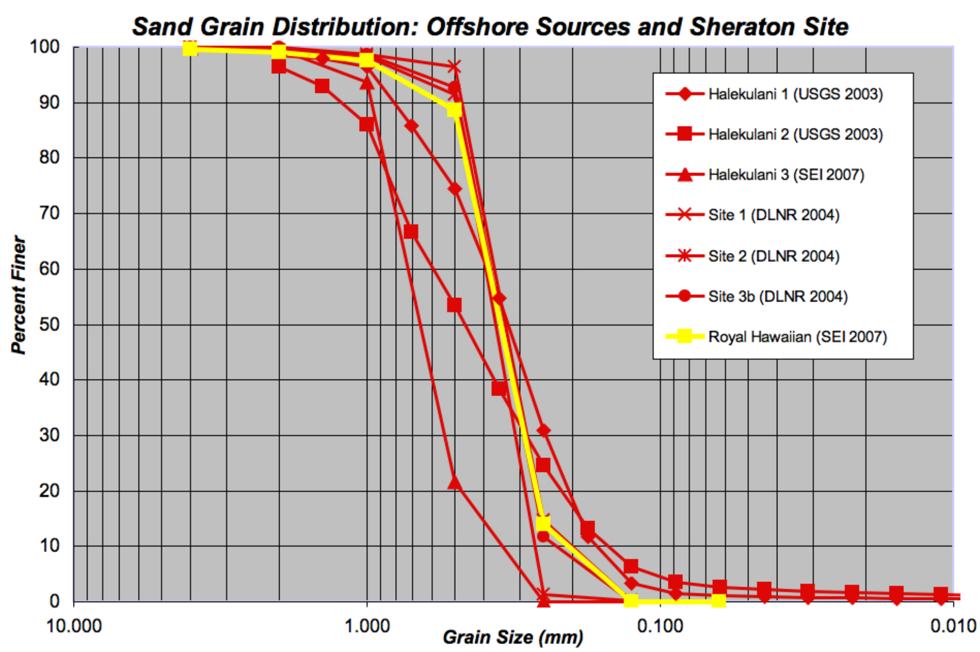
- The sources within the Halekūlani Channel are most appealing in terms of quantity and their proximity to the Sheraton Waikiki. A submerged pipeline carrying sand to the beach would be no more than 2/3 mile long. Of the three Halekūlani source areas, the one closest to shore, Halekūlani 3, contains the coarsest sand, but the quantity is unknown. In addition, Halekūlani 3 is landward of the surf zone and thus poses significant sand recovery operational difficulties, as well as the possibility of interfering with recreational surfing. The Halekūlani 2 area contains sand that is a little less coarse than Halekūlani 3; however, it is located the farthest offshore and in the deepest water where its recovery can pose the greatest operational difficulties. For this reason, the least coarse sand found in the Halekūlani 1 site may be the most attractive option of the three.

Figure 2.6. Sand Grain Size Distribution: Waikīkī Beach and Gray's Beach Site.



Source: Sea Engineering, Inc. (2007).

Figure 2.7. Sand Grain Size Distribution: Offshore Sources and Gray's Beach Site



Source: Sea Engineering, Inc. (2007).

- The sources in the vicinity of Kūhiō Beach have recently proven to be of suitable quality and quantity for nourishment projects, and the grain size distributions from those sources are similar to those at the Sheraton Waikiki. However, they are in relatively shallow water, where wave action poses sand recovery operational difficulties. In addition, they are situated well away from Gray's Beach, resulting in greater difficulty and probably greater impact for routing the submerged pipeline needed to transport nourishment sand from near Kūhiō Beach to the areas between the proposed groins where the new beach would be created.
- The Hilton source has the disadvantage of being both distant from Gray's Beach and located in relatively deep water. It appears to be the least suitable source of those investigated.

2.2.3 BEACH RESTORATION CONCEPT DESIGN

2.2.3.1 Introduction

The preceding discussion focused on the sand from which a beach could be formed. This section discusses the structures and beach shape needed to maintain the sand in place within the high energy coastal environment. Given the wave energy to which Gray's Beach is exposed and the presence of the hard, flat-surfaced protective seawall fronting the hotel, simply placing sand on the shoreline will not provide a stable beach. Instead, as demonstrated by the history of chronic beach loss, particularly fronting the Sheraton Waikiki, an unstabilized beach is not a viable option. Not only would the maintenance costs be excessive, the potential for sand swept from the beach to harm benthic biota would be great.

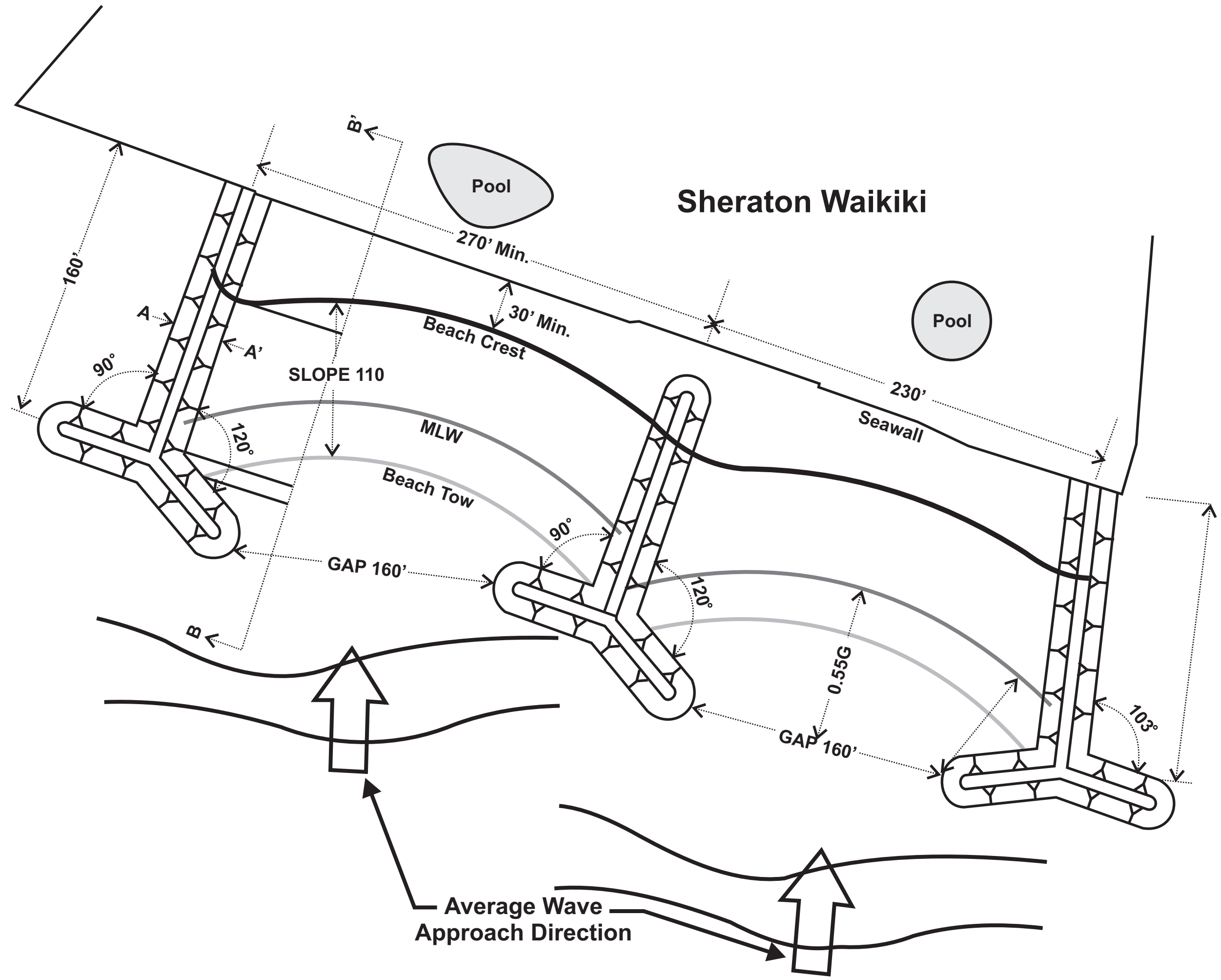
To avoid the problems that would result from beach nourishment alone, structural shoreline improvements are needed. The following subsections describe the improvements that Kyo-ya is proposing and its reasons for selecting the proposed design.

2.2.3.2 Groin Layout and Beach Shape Design

The proposed design calls for the use of what coastal engineers refer to as "emergent T-head rock groins". These would be constructed perpendicular to the shoreline to compartmentalize the beach and impound the sand. Figure 2.8 presents a schematic plan view of the groins, and Figure 2.9 shows their cross-section and profile. The crests of the proposed structures extend above the high water line and a spur or head is used at the seaward end of the groin to diffract waves and reduce rip current formation along the groin stem. This design has been used with considerable success in Florida, the Gulf coast, and the Caribbean to establish stable beaches along shorelines similar to that at Waikīkī. The design follows guidelines developed by Dr. Kevin Bodge, who serves as a design consultant for this project (see Bodge "Design Aspects of Groins and Jetties", *Advances in Coastal Structure Design* published by the American Society of Civil Engineers, 2003).

Key design parameters for T-head groins include (i) groin length, (ii) head width and orientation, (iii) the gap distance between the heads, and (iv) beach shape and width. Choices made for each of those with respect to the proposed Gray's Beach Restoration Project are summarized below.

- The use of three groins maximizes beach stability, while at the same time reducing the seaward extent of the groins. They span 500 feet of shoreline, with the eastern-most groin located just inside the property line and replacing the existing Royal Hawaiian groin.
- The groins are positioned so that they "bracket" the two swimming pool areas at the Sheraton Waikiki. This reduces their impact on the seaward vista from the pool decks, restaurant, and bar areas.
- The proposed groins are located within a seaward projection of the Sheraton property boundaries. The western-most groin is sited inboard from the property line in order to maintain the existing public beach access, to maintain a clear beach area fronting the water activities center, and to provide for sailing catamaran beaching.



Prepared For:

Kyo-ya Hotels & Resorts, LP

Prepared By:

PLANNING SOLUTIONS

Source:

Sea Engineering, Inc.

Note: See Figure 2.9 for cross-sections.

0 100 200

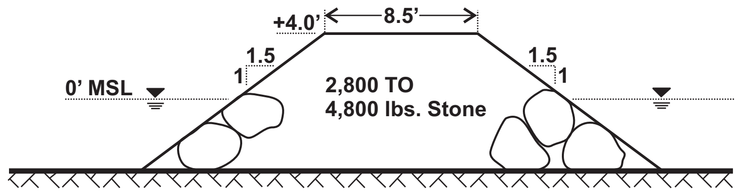
Feet

Figure 2.8:

Schematic Site Plan

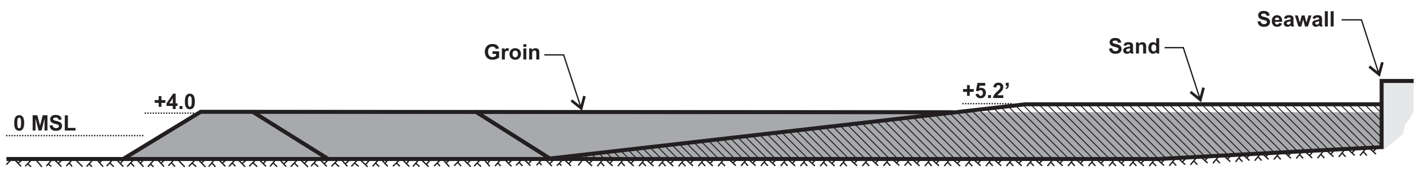
Gray's Beach Restoration Project

Figure 2-8 Schematic Site Plan 2008-07-22.cdr



Section A-A': Typical Groin Cross Section

10 0 5 10
Feet



Section B-B': Typical Profile Across the Beach

30 0 15 30
Feet

Prepared For:
Kyo-ya Hotels & Resorts, LP

Prepared By:
PLANNING SOLUTIONS

Source:
Sea Engineering, Inc.

Note: Section locations are depicted on Figure 2.8.

Figure 2.9:

Groin Cross-Section & Profile

Gray's Beach Restoration Project

Figure 2-9 Groin Cross Section & Profile 2008-07-24.cdr

- The proposed groins are spaced 230 feet and 270 feet apart (measured centerline to centerline) from east to west. The groin stems extend 160 feet along their crests from the existing seawall, with the east and west groins originating at the seawall and the middle groin beginning 30 feet seaward of the seawall. The maximum seaward extent of the groins would be about 200 feet from the seawall. The T-heads extend 53 feet to either side of the stem centerline, at angles ranging from 90º to 120º. The angles were selected to orient the gaps between heads so that they parallel the average wave approach.
- The groins would be constructed entirely of 2,800 to 4,800 pound stone; a two-stone thick layer is about 5.7 feet thick. The design calls for a crest width of 8 feet and side slopes of 1V:1.5H. The crest elevation of the east and west groins would be +4.0 feet; at +3.5 feet; the middle groin would be slightly lower. Approximately 3,770 cubic yards of stone will be required to construct the groins.
- The groin head length versus the space (gap) between the two groin heads ratio is about 40:60 so that the groins do not appear to dominate the viewscape.
- The groin layout and head angle are oriented such that the gap opening is as parallel as possible with the average prevailing wave crest approach. This "tuning" of the heads to minimize the angle between the prevailing wave approach and the gap opening helps ensure the predictability of the beach shape and yields potentially greater shoreline stability within each cell.
- The groin stem extends landward to the design beach crest to eliminate flanking and loss of sand from the cell around the back of the groin.
- The design uses a beach crest elevation of 5.2 feet above mean sea level, which is also the crest elevation of the adjacent existing beach fronting the Royal Hawaiian Hotel. This is about 3.5 feet above typical high water levels and is high enough to prevent significant wave run-up overtopping during typically prevailing (non-storm) water level and wave conditions.
- Sand fill would be placed between the groins to create a beach crest (the horizontal distance measured from the existing seawall to the point where the beach begins to slope downward to the water) with a minimum 30-foot width; this crest would be at an elevation of +5.2-feet. Beginning at the seaward side of this crest, the beach would slope gradually downward (1V:10H) to the sea bottom. This would yield a total dry beach width of about 75 feet above the average high tide line, and an area of about 45,000 square feet (about one acre). Assuming 75 square feet per person, the beach could accommodate up to 600 people. An estimated 15,000 cubic yards of sand would be required to create the beach.
- The groin crests are about 2 feet lower than the beach crest elevation; thus approximately half of the groin stem would be covered by sand, with the groins gradually emerging from the beach slope. Sand fill would also be placed on the western side of the westernmost groin to transition into the adjacent shorelines. This would not be done on the eastern side of the easternmost groin because sand has already accumulated there due to the presence of the Royal Hawaiian Groin.

2.2.3.3 Groin Design for Storm Wave Stability

While the beach and groin layout are primarily dependent on generally prevailing wave conditions, the rock groin structures themselves are designed to withstand severe storm wave conditions As discussed in Section 2.2.2. The model (typical) hurricane event approaching from the southeast is considered the appropriate storm condition for groin stability design. The required median groin armor stone weight for stability under the design wave height of 6.2 feet is 3,800 pounds. A size range of +/- 25% of the median weight will be used, or 2,800 to 4,800 pounds. The typical stone diameter will be 2.5 to 3 feet.

2.2.4 CONSTRUCTION METHODS & SEQUENCE

Project construction would consist of two primary tasks, construction of the rock T-head groins and offshore sand recovery to obtain the sand fill and place it between the groins to form usable beach area. The construction activities required for both of these are described in the following subsections.

2.2.4.1 Groin Construction

Construction of the rock rubblemound groins is a straightforward marine project. Relatively limited construction equipment would be required – primarily trucks and a moderate sized front-end loader and excavator. The greatest challenge is access – getting equipment and material to the site and establishing a work platform from which the work can be carried out. The shallow reef flat and wave action make ocean access difficult. Consequently, current plans call for the stone to be hauled by truck to the hotel property and moved to the shoreline across the hotel grounds. Approximately 290 truckloads will be required to transport the 3,770 cubic yards of stone required to construct the groins. This will be off-loaded in the construction staging area that the applicant expects to establish in the vacant area on the *mauka-'Ewa* corner of its property.

At present, the designers anticipate that the working platform needed to construct the groins will be provided by constructing a 20-foot wide stone berm along the ocean side of the seawall. A berm 550 feet long, 20 feet wide, and with a crest at +3 feet would require about 2,500 cubic yards of material. The groin stem and head sections would be overbuilt to approximately 15 feet in width to provide for equipment access, and the groins would be completed working from the head landward, removing excess stone as the work proceeds landward. Groin construction would proceed one at a time, with the stone berm being removed as work progresses.

2.2.4.2 Offshore Sand Recovery/Beach Construction

The beach fill would be obtained by dredging sand from the offshore sand deposits described in Section 2.2.2.4. Given the relatively small volume of sand required for the project (15,000 cubic yards), the most efficient and economical method for recovering the sand and transporting it to the shoreline would be to use a submersible sand pump working off a moored barge to suction dredge the sand and then pump it to shore through a submerged pipeline.[5] The sand will be dewatered behind a berm or other form of turbidity barrier during the beach fill operation. The exact dewatering methodology has not yet been determined. Depending on the size of the pump the daily production rate could vary from 250 to over 500 cubic yards. If the Halekūlani Channel source is used, most of the pipeline route will be along the sand channel bottom.

2.2.5 SCHEDULE

The coastal engineers estimate that it will take approximately 6 months to construct the T-head groins. Once they are in place, a further 4 to 8 weeks will be required to place the sand. Major schedule milestones for the proposed project are as follows:

- Complete EIS Process and obtain necessary permits/approvals - Spring 2010.
- Initiate Construction - Fall 2010.
- Project Completed - 2011.

[5] The recent Kūhiō Beach sand recovery project successfully utilized this methodology to pump approximately 10,000 cubic yards of offshore sand onto the shoreline in 30 days.

2.2.6 ANTICIPATED COSTS

The estimated construction cost of the project is approximately $4 million, as shown in Table 2.8.

Table 2.8. Anticipated Project Costs

Item	*Order-of Magnitude Costs*
Planning and Design	$ 300,000
Environmental Process and Permitting	$ 400,000
Construction:	
Mobilization and Site Preparation	$ 250,000
Groin Construction	$ 800,000
Sand Recovery and Placement	$ 1,500,000
Subtotal	$ 3,250,000
Contingency (20%)	650,000
TOTAL	$ 3,900,000
Source: Sea Engineering, Inc.	

2.3 ALTERNATIVES

2.3.1 FRAMEWORK FOR CONSIDERATION OF ALTERNATIVES

Both Federal and State laws and regulations governing the preparation of environmental impact statements provide for the consideration of alternatives to proposed actions. As discussed in the following subsections, in both cases the alternatives are limited to those aimed at meeting the objectives discussed above in Section 1.3.

2.3.1.1 National Environmental Policy Act Alternatives Requirements

The Council on Environmental Quality (CEQ) has adopted regulations that establish the general framework for implementing NEPA requirements (40 CFR Parts 1500 through 1508). Federal agencies such as the Department of the Army/U.S. Army Corps of Engineers, have developed their own rules for NEPA compliance that are consistent with the CEQ regulations while addressing the specific missions and program activities of each agency. CEQ regulations (40 CFR Part 1502) dictate the process that federal agencies must follow for all EISs, except where compliance with the regulations would be inconsistent with statutory requirements or where agency procedures allow for exceptions for national security reasons. §1502.2, which addresses the implementation of the requirements, contains several requirements that pertain to the consideration of alternatives:

(d) Environmental impact statements shall state how alternatives considered in it and decisions based on it will or will not achieve the requirements of sections 101 and 102(1) of the Act and other environmental laws and policies.

(e) The range of alternatives discussed in environmental impact statements shall encompass those to be considered by the ultimate agency decision-maker.

(f) Agencies shall not commit resources prejudicing selection of alternatives before making a final decision.

40 CFR §1502.14 advises that the alternatives discussion present the environmental impacts of the proposal and the alternatives in comparative form, "*...thus sharply defining the issues and providing a clear basis for choice among options by the decision-maker and the public.*" The guidance provides that agencies identify and define practical [emphasis added] alternatives for meeting objectives. Specifically, it requires environmental impact statements to:

(a) Rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated.

(b) Devote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits.

(c) Include reasonable alternatives not within the jurisdiction of the lead agency.

(d) Include the alternative of no action.

(e) Identify the agency's preferred alternative or alternatives, if one or more exists, in the draft statement and identify such alternative in the final statement unless another law prohibits the expression of such a preference.

(f) Include appropriate mitigation measures not already included in the proposed action or alternatives.

Because the alternatives that the COE considers must satisfy the Clean Water Act Section 404(b)(1) guidelines (published by the Environmental Protection Agency at 40 CFR Part 230 on December 24, 1980), that regulation also informs the identification of alternatives for the purposes of NEPA. These guidelines are the substantive environmental standards by which all Section 404 permit applications are evaluated. The COE guidance for these states:

> *The fundamental precept of the Guidelines is that discharges of dredged or fill material into waters of the United States, including wetlands, should not occur unless it can be demonstrated that such discharges, either individually or cumulatively, will not result in unacceptable adverse effects on the aquatic ecosystem. The Guidelines specifically require that "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences." [40 CFR 230.10(a)]. Based on this provision, the applicant is required in every case (irrespective of whether the discharge site is a special aquatic site or whether the activity associated with the discharge is water dependent) to evaluate opportunities for use of non- aquatic areas and other aquatic sites that would result in less adverse impact on the aquatic ecosystem. A permit cannot be issued, therefore, in circumstances where a less environmentally damaging practicable alternative for the proposed discharge exists (except as provided for under Section 404(b)(2)).*

The guidelines encourage the stringency of the alternatives review to be commensurate with both the level of impact (i.e., low alternatives analysis effort for activities with little potential for adverse effect and high effort for those with potentially large impacts).[6] Although sufficient information must be developed to determine whether the proposed activity is in fact the least damaging practicable alternative, if only minor differences between the environmental impacts of the proposed activity and potentially practicable alternatives are likely, the guidelines do not require an extensive analysis.

[6] Activities that generally have little potential to degrade the aquatic environment are those which include one, and frequently more, of the following characteristics: they are located in aquatic resources of limited natural function; they are small in size and cause little direct impact; they have little potential for secondary or cumulative impacts; or they cause only temporary impacts. The COE works with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and other appropriate state and Federal agencies in evaluating the likelihood that adverse impact would result from a particular proposal.

When it is determined that there is no identifiable or discernible difference in adverse impact on the environment between the applicant's proposed alternative and all other practicable alternatives, then the applicant's alternative is considered as satisfying the requirements of Section 230.10(a).[7]

The Guidelines provide the Corps and EPA with discretion for determining the necessary level of analysis to support a conclusion as to whether or not an alternative is "practicable". Practicable alternatives are those alternatives that are "*available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes*." [40 CFR 230.10(a)(2)]. The preamble to the Guidelines provides clarification on how cost is to be considered in the determination of practicability:

> *Our intent is to consider those alternatives which are reasonable in terms of the overall scope/cost of the proposed project. The term economic [for which the term "cost" was substituted in the final rule] might be construed to include consideration of the applicant's financial standing, or investment, or market share, a cumbersome inquiry which is not necessarily material to the objectives of the Guidelines. [Guidelines Preamble, "Alternatives", 45 Federal Register 85339 (December 24, 1980) (emphasis added)].*

The CEQ has provided guidance on the selection of alternatives in licensing and permitting situations such as that faced by the applicant for the Gray's Beach Restoration Project. It can be found at http://ceq.hss.doe.gov/NEPA/regs/1983/1983guid.htm. The guidance concluded that the emphasis in determining the scope of alternatives should be on what is "reasonable", defining them as those that are "*...practical or feasible from the technical and economic standpoint and using common sense rather than simply desirable from the standpoint of the applicant*." Subsequent rulings and court decisions have generally supported that in the case of applicant actions such as the proposed Gray's Beach Restoration Project, the choice of alternatives could be based on the primary objectives of the permit applicant. In the present case this means that the environmental analysis can focus on actions that provide the shoreline recreational amenities that Kyo-ya is seeking to provide in front of its hotel.

2.3.1.2 State of Hawaiʻi Chapter 343 Alternatives Requirements

The requirements for consideration of alternatives that is part of the State of Hawaiʻi's environmental impact assessment process (Chapter 343, Hawaiʻi Revised Statutes) and its implementing regulations generally parallels the NEPA requirements. Hawaiʻi Administrative Rules (HAR) §11-200-17 addresses the content requirements of draft and final environmental impact statements. Subsection §11-200-17(f) states:

> *(f) The draft EIS shall describe in a separate and distinct section alternatives which could attain the objectives of the action, regardless of cost, in sufficient detail to explain why they were rejected. The section shall include a rigorous exploration of the environmental impacts of all such alternative actions. Particular attention shall be given to alternatives that might enhance environmental quality or avoid, reduce, or minimize some or all of the adverse environmental effects, costs, or risks. Examples of alternatives include:*
>
> *(1) The alternative of no action;*
>
> *(2) Alternatives requiring actions of a significantly different nature which could provide similar benefits with different environmental impacts;*
>
> *(3) Alternatives related to different designs or details of the proposed action which would present different environmental impacts;*
>
> *(4) The alternative of postponing action pending further study; and*

[7] Note: Even where a practicable alternative exists that would have less adverse impact on the aquatic ecosystem, the Guidelines allow it to be rejected if it would have "other significant adverse environmental consequences." 40 CFR 230.10(a). This means that the alternatives analysis required by the Guidelines need not select an alternative where minor impacts on the aquatic environment are avoided at the cost of substantial impacts to other natural environmental values.

(5) Alternative locations for the proposed project.

In each case the analysis shall be sufficiently detailed to allow a comparative evaluation of the environmental benefits, costs, and risks of the proposed action and each reasonable alternative.

Kyo-ya used the State and Federal guidance above and the objectives listed in Section 1.3 to inform its selection of the alternatives to be considered in detail in the Draft EIS. These alternatives are described in the following section.

2.3.2 ACTION ALTERNATIVES TO BE EVALUATED IN THE EIS

2.3.2.1 Alternative 1: Proposed Gray's Beach Restoration Project

Alternative 1 consists of the proposed action as described above in Section 2.2. Implementation of this alternative would achieve all of the objectives listed in Section 1.3. In summary, this alternative involves:

- Constructing three stone T-head groins spanning 500 feet of shoreline. The maximum seaward extent of the groin heads would be 200 feet from the existing Sheraton Waikiki seawall.
- Placing approximately 15,000 cubic yards of sand fill between the groins to create a stable beach.[8] The total beach width above the high tide line would be approximately 75 feet, and the total dry beach area would be about 45,000 square feet (1 acre). Assuming 75 square feet per person the beach would accommodate nearly 600 persons. The sand would be obtained from the nearby Halekūlani channel.
- Placing sand fill on the western side of the westernmost groin to transition into the adjacent shoreline.

Kyo-ya believes this alternative best fulfills the project objectives outlined in Section 1.3 and as such it is the preferred course of action. An illustration of this alternative is presented in Figure 2.10 below for comparison purposes.

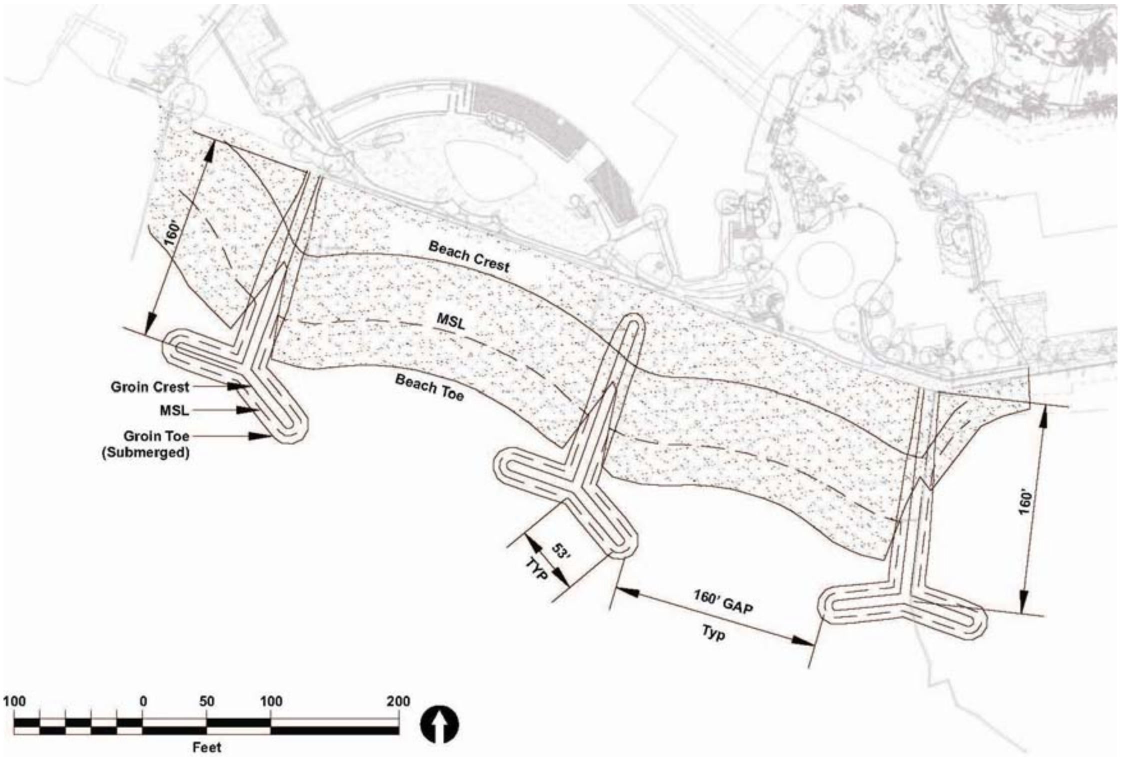
2.3.2.2 Alternative 2: Beach Nourishment + Two Groin Structures

Alternative 2 is similar in concept to Alternative 1, however as depicted in Figure 2.11, it consists of two groins rather than three. The two groins are necessarily larger (as required by the "Design Aspects of Groins and Jetties" described in Section 2.2 above) due to the increased spacing between the groin heads.

Each of the two T-head groins would be approximately 230 feet in length along its crest, with a maximum extension of 300 feet from the seawall. The slightly greater (than Alternative 1) seaward extent is needed in order to maintain the correct proportions between the gap width, T-head width, and overall groin length. Both groins in Alternative 2 would have a crest elevation of 4.0 feet and a crest width of 3 nominal stones, or approximately 8 feet. T-heads of approximately 100 feet in length extending on either side of the stem would result in a 270-foot gap between the structures. Construction of the groins would require the use of approximately 4,300 cubic yards of stone. The sides of the groin would slope uniformly at 1V: 1.5H.

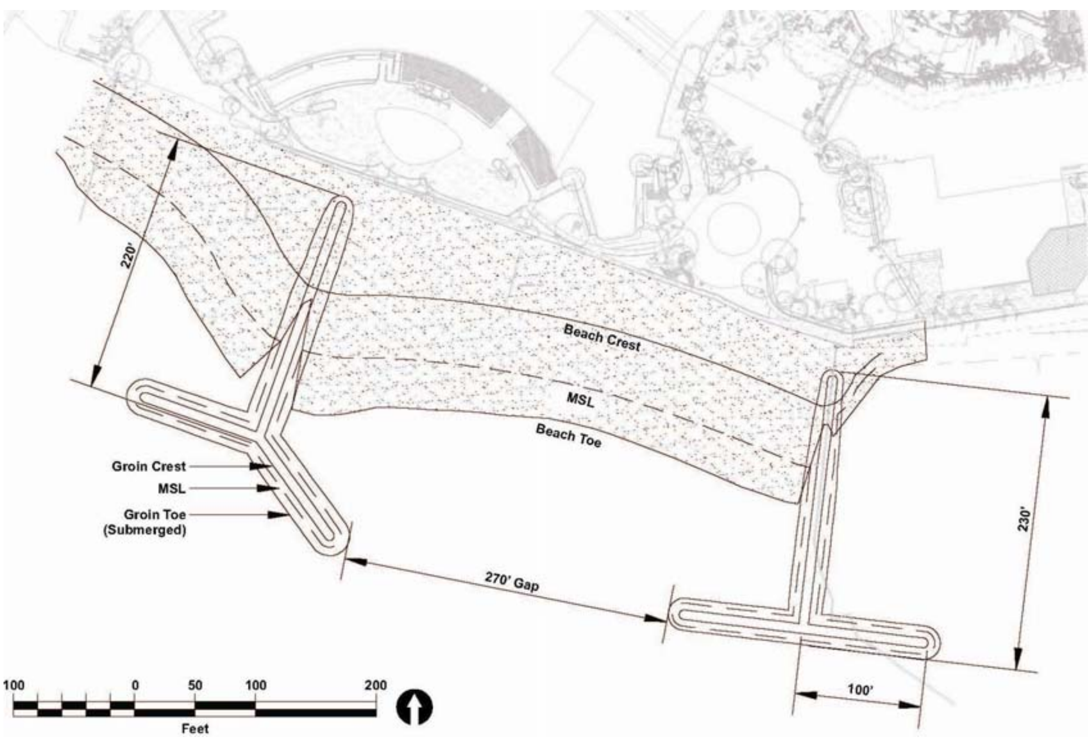
[8] This includes an assumed 10% overfill ratio and 10% contingency.

Figure 2.10. Schematic Plan of Alternative 1.



Source: Sea Engineering, Inc.

Figure 2.11 Schematic Plan of Alternative 2.



Source: Sea Engineering Inc.

Creation of a stable beach would require that nearly 20,000 cubic yards would be placed between the groins and along the western side in order to transition to the adjacent shoreline. The additional volume of sand is required to render the structures "transparent" to the littoral cell, meaning that they will neither contribute to nor reduce the amount of available sand in the cell.

The beach created by Alternative 2 would have a crest elevation of 5.2 feet and minimum crest width of 40 feet; both are slightly greater than the comparable numbers for Alternative 1. The beach would slope at 1V:10H to the submerged beach toe. Measured from the still water level at high tide, the dry beach width would be approximately 100 feet creating nearly 45,000 square feet (1 acre) of dry beach. The dry beach would cover nearly half of the length of the groin stems. This two-groin alternative would accommodate the same number of people as Alternative 1's three-groin design. Alternative 2 would require larger quantities of sand and rock, and the overall project would occupy a larger footprint without creating a larger amount of stable, dry beach than Alternative 1. Consequently, Kyo-ya believes this Alternative is less desirable than the proposed action from both an environmental and economic standpoint.

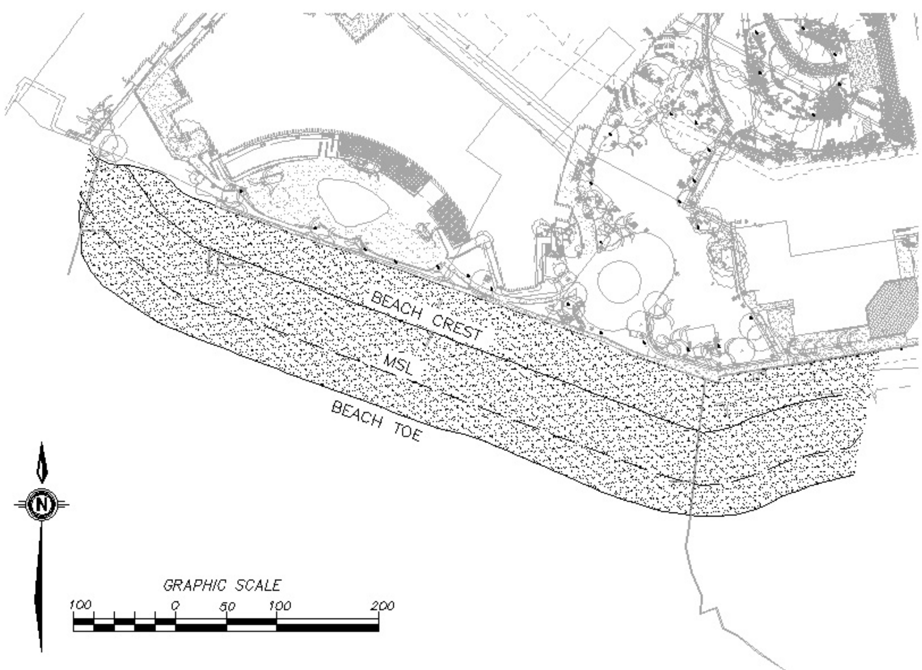
2.3.3 ALTERNATIVES ELIMINATED FROM DETAILED CONSIDERATION

Engineers considered several alternatives that involved less shoreline change than Alternatives 1 and 2. These included beach sand nourishment without the use of stabilizing structures, the construction of stabilizing structures without beach nourishment, and creation of a beach that is roughly half the size of the one that is proposed. These alternatives, and the reasons they have been eliminated from detailed consideration, are described below.

2.3.3.1 Beach Sand Replenishment with No Stabilization

This alternative, which entails filling the existing shoreline with sand and grading it to attain a natural beach plan and profile, is known as beach nourishment. In certain locations, beach nourishment without construction of stabilization structures can be a suitable alternative. This method is usually employed when source sand is plentiful and the project shoreline is either stable or exhibits very low erosion rates. An illustration of how this might be done at the project location is presented in Figure 2.12 below.

Figure 2.12. Illustration of Beach Nourishment Only



Source: Sea Engineering Inc.

Without construction of stabilizing features, there is little likelihood that a stable beach would be created by this alternative due to its wave and current exposure and history of chronic erosion at the project shoreline. For this reason, the dimensions and geometry of a nourished beach are nominal (i.e., as they would be if the work could be completed before the arrival of significant waves). In the following discussion, beach geometry that is equivalent to the preceding alternatives has been utilized for comparison purposes.

Beach nourishment along the 500-foot project shoreline assuming a crest elevation of 5.2 feet, minimum crest width of 40 feet, and beach slope of 1V:10H would require approximately 18,000 cubic yards of sand. The resultant dry beach above the average high tide line would be approximately 90 feet wide, occupy approximately 47,000 square feet (1.1 acre) and would accommodate over 600 people at 75 square feet per person.

Given the wave exposure of Waikīkī Beach, the history of chronic erosion and beach loss fronting the Sheraton, and the presence of a seawall fronting the hotel which inhibits beach stability and retention, this would not achieve the project's objectives and will not be discussed in detail in this report. The erosion rate for unstabilized beach fill would be so high that excessively frequent nourishment would be required to maintain the desired beach. There are very limited existing sources in Hawai'i for suitable beach fill sand, thus the resource is finite and the cost is high. The erosion of the beach sand and its transport onto nearby areas may also have undesirable impacts on the surrounding marine environment. The historic placing of sand on the shoreline in Waikīkī, and its subsequent transport offshore, has long been blamed for altering the sea bottom, affecting surf breaks, and filling in bottom relief which provides habitat for marine life. Thus, for this project, the use of shore-perpendicular rock groins to compartmentalize the beach and impound the sand is recommended.

2.3.3.2 Beach Stabilization Only

This alternative would involve construction of the stabilization features described in either Alternative 1 or 2 without the placement of sand between the rock groins. This approach can be successful in locations that currently have sand that is slowly eroding and that can be contained by structures. The feasibility of this alternative is further enhanced if sand within the littoral cell can be expected to accrete within and around the structures at a reasonable rate. The circumstances that make this approach practical are not present in the Gray's Beach area.

There is little or no sand presently in the Waikiki littoral zone, particularly in the vicinity of the project site which could be trapped by structures and accrete to form a beach. There has been virtually no sand accretion in the project vicinity for more than 30 years. In addition, the shoreline to the east in the vicinity of the Moana Surfrider Hotel, the direction from which the predominant sand transport can be expected to come from, is presently undergoing significant erosion and sand loss. Thus it is not reasonable to expect that the construction of stabilization structures alone would result in eventual beach formation by trapping sand. Since, this alternative would not meet any of the project objectives as discussed in Section1.3, it is not a practicable alternative.

2.3.3.3 Different Type of Stabilization Structure

Emergent T-head groins, with crests above the high water line and a spur or head at the seaward end of the groin to diffract waves and reduce rip current formation along the groin stem, have been used with considerable success in Florida, the Gulf coast and the Caribbean to construct stable beach restoration projects along shorelines similar to that at Waikīkī. Their proven success led to their selection for the proposed project.

Experience has proven that there is a certain minimum groin configuration necessary in order for them to have the proven effectiveness necessary for this project. Lower groin crests (i.e., a height less than the 4 feet that is proposed), for example, while visually less obtrusive, would not be sufficient to completely contain and prevent loss of the sand fill. Shorter groin stems or head length would not result in a desirable stable beach shape. Therefore, minor design variations to reduce the groin size or elevation from what is proposed are not considered viable alternatives and are no longer being considered. The groins could be constructed from materials other than stone, such as manmade concrete armor units. However, because this offers no engineering benefit and is less attractive than natural stone, it is not considered a viable alternative.

2.4 NO ACTION

Both NEPA Regulations and HAR, §11-200-17(f)(1) requires an evaluation of "no action". The EIS will evaluate the "no action" alternative. In the case of Kyo-ya's proposed Gray's Beach Restoration Project, "No Action" entails Kyo-ya Hotels & Resorts, LP leaving the shoreline fronting the Sheraton Waikiki Hotel in its present condition with a vertical concrete seawall and no sandy beach. This would not meet any of the objectives of the proposed action listed in Section 1.3 and would leave the existing Royal Hawaiian groin vulnerable to further deterioration. Consequently it will be evaluated only for the purposes of compliance with NEPA and HAR §11-200.

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3.0 OVERVIEW OF THE EXISTING ENVIRONMENT

This chapter briefly describes the existing environment of the areas that would be affected by the alternatives described above. The discussion is organized by topic (e.g., bathymetry, biota, sound levels, etc.). The information is intended primarily as a means of orienting readers to the general characteristics of the project area and to outline the kinds of resources that will be examined in the impact analysis. More detailed information will be provided in the Environmental Impact Statement (EIS) as needed to evaluate potential impacts.

3.1 BATHYMETRY & SEAFLOOR

Waikīkī is located on the south shore of Oʻahu, west of Diamond Head, along a pronounced embayment in the shoreline (Māmala Bay). This embayment is evident in the 18-foot depth contour, located approximately ½ mile offshore. Seaward of this, contours become straighter and bottom slope increases. A fringing fossil reef intersected by several relic stream channels extends approximately 1 mile offshore. Bottom slopes are generally mild inshore, consisting mainly of reefs and sand pockets. Bathymetry in the project area is presented in Figure 3.1.

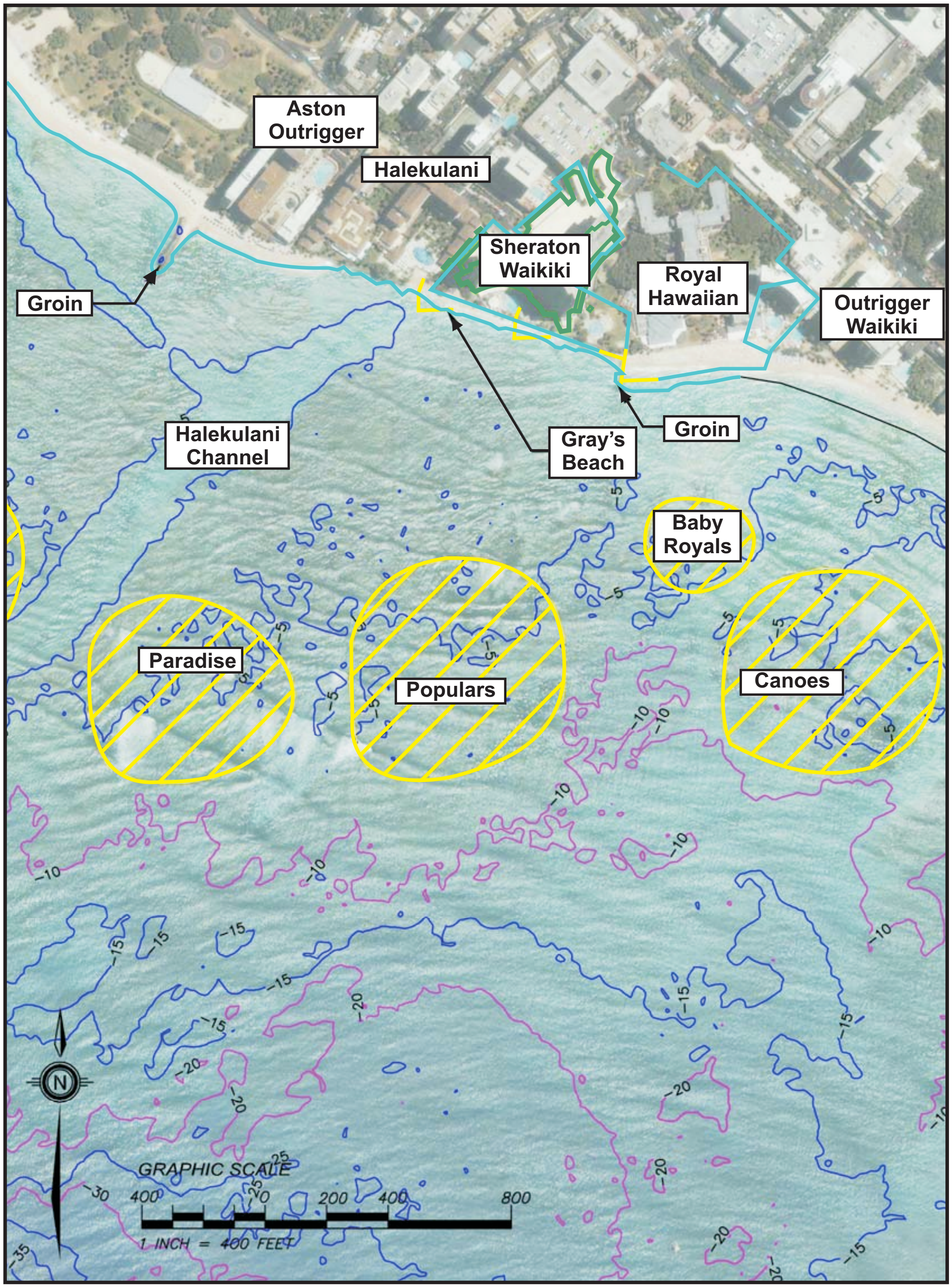
The shoreline at the Sheraton Waikiki is fronted by a shallow coral reef including channels and pockets filled with sand. This extends approximately 1,500 feet offshore through the "Baby Royals" and "Populars" surfing locations. Depths in this area are generally 5 feet or less. Seaward of "Populars", to a depth of 40 feet, the average bottom slope is 1V:100H. Between the 40 and 60-foot depth contours, bottom slopes increase to 1V:50H and further increases seaward of the 60-foot contour to 1V:15H.

Detailed nearshore bathymetry is available via the U.S. Army Corps of Engineers (USACE) Scanning Hydrographic Operational Airborne Lidar Survey (SHOALS) dataset. This bathymetry data was used to prepare a large scale, high resolution bathymetry map and was used as input to the numerical wave modeling discussed in Section 2.2.2.

Bottom composition of most of the nearshore marine habitat consists of a highly bio-eroded fossil reef platform bisected by shallow sand channels and pockets. Nearshore water depth in the project area is less than 5 feet. The western end of the study area is bounded by the Halekūlani sand channel, which is a sand-filled paleostream channel that extends from the shoreline through most of the reef platform. Existing concrete groins, as well as scattered concrete blocks and boulders, occur in the most shoreward submerged areas. Sediment in the numerous channels and pockets, as well as a thin layer covering the reef surface, varies from relatively fine-grained white sand (most of which was likely washed offshore after various episodes of beach nourishment) to coarse darker colored sand which is likely produced by erosion of the reef platform. In addition, some pocket depressions on the reef platform are filled with a layer of weathered rubble fragments. Figure 3.2 shows representative photographs of the sea bottom in the area.

3.2 CLIMATE AND AIR QUALITY

The Hawaiian Island chain is situated south of the large Eastern Pacific semi-permanent high-pressure cell, the dominant feature affecting air circulation in the region. Over the Hawaiian Islands, this high-pressure cell produces very persistent northeasterly winds called the trade winds. During the winter months, cold fronts sweep across the north central Pacific Ocean, bringing rain to the Hawaiian Islands and intermittently modifying the trade wind regime. Thunderstorms, which are rare but most frequent in the mountains, also contribute to annual precipitation.



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Prepared By:

PLANNING SOLUTIONS

Source:

Sea Engineering, Inc.

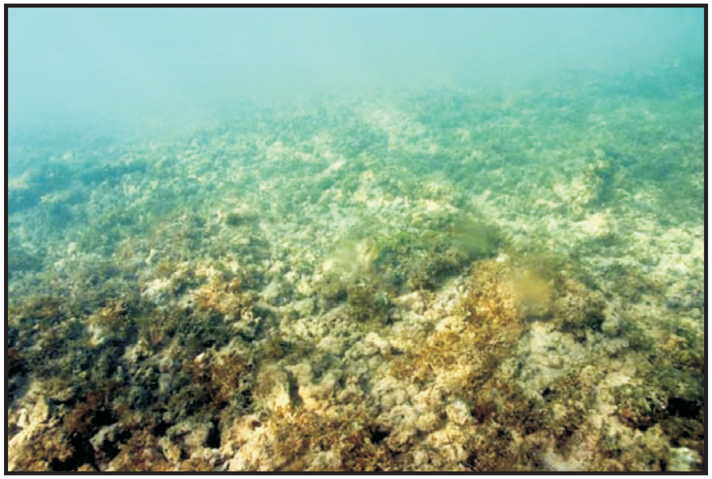
Note: Project area bathymetry contours are shown in feet.

Figure 3.1:

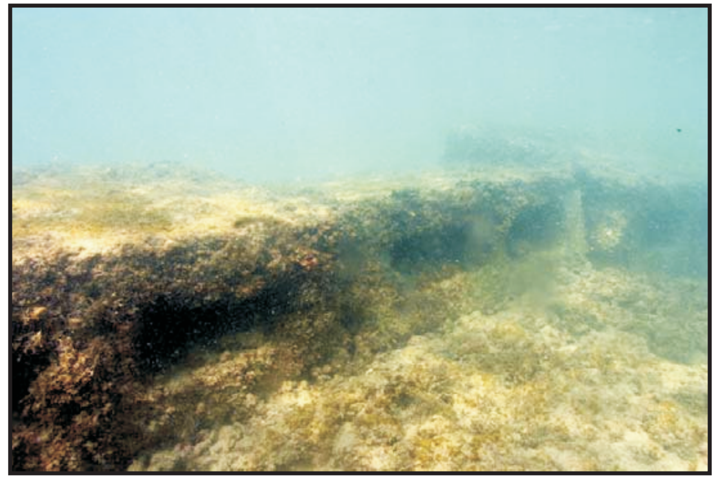
Bathymetry at Project Site

Gray's Beach Restoration Project

Figure 3-1 Bathymetry 2007-09-10.cdr

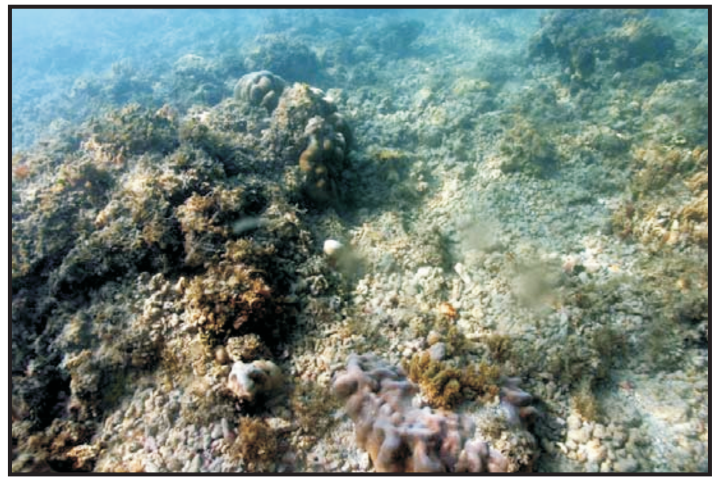


Fossil reef on the sea floor.



Concrete blocks offshore of Sheraton Waikiki.

Sand pockets.



Coral rubble typifying bottom conditions.

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Figure 3.2:

Photographs of the Sea Floor

Gray's Beach Restoration Project

Figure 3-3 Photographs of the Seafloor 2007-09-11.cdr

3.2.1 TEMPERATURE

Due to the tempering influence of the Pacific Ocean and their low-latitude location, the Hawaiian Islands experience extremely small diurnal and seasonal variations in ambient temperature. Average temperatures in the coolest and warmest months at Honolulu International Airport are 72.9° Fahrenheit (F) (January) and 81.4°F (July), respectively. These temperature variations are quite modest compared to those that occur at inland continental locations. Additional temperature data from Honolulu International Airport are summarized in Table 3.1.

Table 3.1. Average Monthly Temperature, Rainfall, and Humidity

	Normal Ambient Temperature, °Fahrenheit		*Average Monthly Rainfall (inches)*		
Month	***Daily Minimum***	***Daily Maximum***	***Monthly Minimum***	***Monthly Maximum***	***Average Relative Humidity (%)***
January	65.7	80.4	0.18	14.74	71
February	65.4	80.7	0.06	13.68	69
March	66.9	81.7	0.01	20.79	65
April	68.2	83.1	0.01	8.92	62.5
May	69.6	84.9	0.03	7.23	60.5
June	72.1	86.9	T	2.46	59
July	73.8	87.8	0.03	2.33	60
August	74.7	88.9	T	3.08	60
September	74.2	88.9	0.05	2.74	61.5
October	73.2	87.2	0.07	11.15	63.5
November	71.1	84.3	0.03	18.79	67
December	67.8	81.7	0.04	17.29	74.75
Note: "T" signifies a trace amount of rainfall (i.e., less than 0.01 inch).					
Source: State of Hawai'i Data Book 2003 (Data from Honolulu International Airport).					

3.2.2 RAINFALL AND HUMIDITY

Topography and the dominant northeast trade winds are the two primary factors that influence the amount of rainfall that falls on any given location on O'ahu. Near the top of the Ko'olau Range on the windward side of O'ahu that is fully exposed to the trade winds, rainfall averages nearly 250 inches per year. On the leeward side of the island, where the project is located, the rainfall is much lower (see Table 3.1); average annual rainfall in Waikīkī is less than 20 inches per year. Although the project area is on the leeward side of the island, the humidity is still moderately high, ranging from the mid-60 to the mid-70 percent.

3.2.3 WIND PATTERNS

The northeasterly trade winds predominate in the project area. Tradewinds are produced by the outflow of air from the Pacific Anticyclone, also known as the Pacific High. The center of this system is located well north and east of the Hawaiian chain and moves to the north and south seasonally. In the summer months the center moves to the north, causing the tradewinds to be at their strongest from May through September. Data from the Honolulu International Airport show that that during July, for example, winds from the northeast through east are present over 85 percent of the time and winds average 12.8 miles per hour. In the winter, the center moves to the south, resulting in decreasing tradewind frequency from October through April. During January, for example, winds from the northeast through east are present only 35 percent of the time and the average wind speed drops to 10.5 miles per hour. The island is also influenced by occasional Kona storms, which are intense low-pressure centers that pass near the island, bringing moderate to strong southerly winds and rain. When the trade winds or storms do not dominate the wind flows, the winds are typified by land/sea breezes and Kona winds. Figure 3.3 shows an annual wind rose based on data recorded at Honolulu International Airport between 1949 and 1995.

3.2.4 AIR QUALITY

3.2.4.1 Applicable Air Quality Standards

The U.S. Environmental Protection Agency has set national ambient air quality standards (NAAQS) for ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide, 2.5-micron and 10-micron particulate matter ($PM_{2.5}$ and PM_{10}), and airborne lead. These ambient air quality standards establish the maximum concentrations of pollution considered acceptable, with an adequate margin of safety, to protect the public health and welfare. The State of Hawai‘i has also adopted ambient air quality standards for some pollutants. In some cases, these are more stringent than the Federal standards. At present, the State has set standards for five of the six criteria pollutants (excluding $PM_{2.5}$) in addition to hydrogen sulfide (DOH 2003).

Both State and national air quality standards consist of two parts: an allowable concentration of a pollutant, and an averaging time over which the concentration is measured. The allowable concentrations are based on the results of studies of the effects of the pollutants on human health, crops, and vegetation, and, in some cases, damage to paint and other materials. The averaging times are based on whether the damage caused by the pollutant is more likely to occur during exposure to a high concentration for a short time (one hour, for instance), or to a lower average concentration over a longer period (8 hours, 24 hours, or one month). For some pollutants there is more than one air quality standard, reflecting both its short-term and long-term effects.

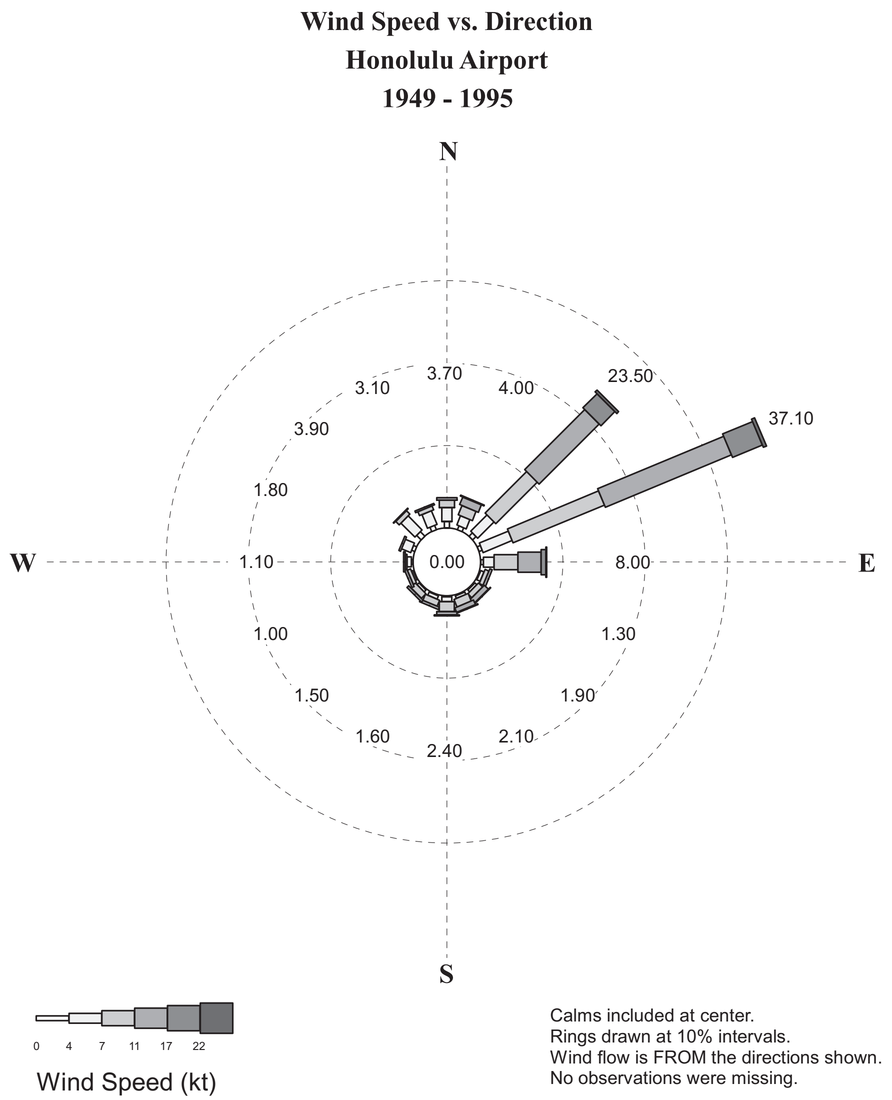
3.2.4.2 Existing Air Quality

Generally, air quality in the area is excellent. The State of Hawai‘i Department of Health monitors ambient air quality on O‘ahu using a system of 9 monitoring sites. The primary purpose of the monitoring network is to measure ambient air concentrations of the six criteria NAAQS pollutants. The air quality at the three air quality monitoring sites closest to the proposed project is summarized in Table 3.2. As shown by these data, air quality in the area during this year never exceeded the short-term or long-term State or National standards for the six pollutants measured [particulate matter ($PM_{2.5}$ and PM_{10}), nitrogen dioxide (NO_2) sulfur dioxide (SO_2), carbon monoxide, and hydrogen sulfide]. The Department of Health's only ozone monitoring station on O‘ahu is located on Sand Island. Existing ozone concentrations at that location also meet State and Federal ambient air quality standards.

3.3 SHORELINE CHARACTERISTICS

3.3.1 EXISTING SHORELINE

Waikīkī Beach consists of a relatively narrow band of calcareous sand approximately two miles long. Fletcher (2003) describes it as an "engineered" shoreline owing to the fact that its current configuration and condition is a result of many years of development both on and near the shoreline. While some may argue that this is a misnomer since the development along the shoreline has been piecemeal and without an overall design or coordinated management, it accurately conveys the sense that it is no longer a "natural" shoreline. As previously discussed, the shoreline near the Sheraton Waikiki consists of a narrow band of calcareous sand surrounded by man-made features. Moreover, it is likely that what sand is present migrated there from nourished beaches nearby. In the waters offshore, activities such as swimming, surfing, snorkeling, fishing, paddling, and sailing occur daily.



PERCENT OCCURRENCE: Wind Speed (kt)
LOWER BOUND OF CATEGORY

DIR	0	4	7	11	17	22
N	0.80	1.70	0.90	0.30	0.00	0.00
NNE	0.50	1.20	1.20	1.00	0.10	0.00
NE	0.60	2.80	7.10	10.30	2.40	0.30
ENE	0.40	3.80	12.00	16.60	3.90	0.40
E	0.30	1.30	2.90	2.80	0.60	0.10
ESE	0.10	0.40	0.50	0.30	0.00	0.00
SE	0.10	0.30	0.70	0.70	0.10	0.00
SSE	0.10	0.30	1.00	0.60	0.10	0.00

TOTAL OBS = 134736 MISSING OBS = 0

PERCENT OCCURRENCE: Wind Speed (kt)
LOWER BOUND OF CATEGORY

DIR	0	4	7	11	17	22
S	0.10	0.60	1.20	0.40	0.10	0.00
SSW	0.10	0.40	0.80	0.30	0.00	0.00
SW	0.10	0.30	0.80	0.30	0.00	0.00
WSW	0.10	0.20	0.40	0.30	0.00	0.00
W	0.20	0.50	0.20	0.20	0.00	0.00
WNW	0.40	1.20	0.20	0.00	0.00	0.00
NW	0.80	2.40	0.60	0.10	0.00	0.00
NNW	0.60	1.80	0.50	0.20	0.00	0.00

CALM OBS = 0 PERCENT CALM = 0.00

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Kyo-ya Hotels & Resorts, LP

Prepared By:

PLANNING SOLUTIONS

Source:

Sea Engineering, Inc.

Figure 3.3:

Wind Rose Diagram

Gray's Beach Restoration Project

Figure 3-3 Wind Rose 2007-09-11.cdr

Table 3.2. Air Quality at Nearby Locations: 2006.

Sampling Station	PM_{10}			$PM_{2.5}$		
	Highest Values		Annual Mean	Highest Values		Annual Mean
	Highest	2nd Highest		Highest	2nd Highest	
Honolulu	25	23	13	10	10	3
Sand Island				10	10	5
	1-Hour Carbon Monoxide			*8-Hour Carbon Monoxide*		
	Highest Values		Annual Mean	Highest Values		Annual Mean
	Highest	2nd Highest		Highest	2nd Highest	
Honolulu	2,850	1,938	501	1,226	1,211	501
Sand Island						
	3-Hour SO_2			*24-Hour SO_2*		
	Highest Values		Annual Mean	Highest Values		Annual Mean
	Highest	2nd Highest		Highest	2nd Highest	
Honolulu	43	36	1	13	5	1
Sand Island						

Note: PM_{10} samplers operated for 24 hours once every 6 days in accordance with EPA guidelines.
Note: $PM_{2.5}$ samplers operated for 24 hours once every 3 days in accordance with EPA guidelines.
Note: Based on 24-hour sampling, in micrograms per cubic meter
Note: As shown by these data, air quality in the area never exceeded the short-term or long-term State or National standards during the period of measurement for particulate matter (PM_{10}), sulfur dioxide (SO_2), and carbon monoxide.

Source: DOH (2006).

At present, the western shoreline fronting the Sheraton property consists of a small pocket beach known as Gray's Beach. This beach is shared with the Halekūlani Hotel across their common boundary. To the east of Gray's Beach, a narrow beach lies at the base of a seawall approximately 500 feet in length. Photographs of the project area are included in Figure 3.4. Beach widths and sand volume as measured by Fletcher (2003) are amongst the lowest in Waikīkī. This beach is emergent at low tide and is submerged at high tide. The eastern terminus of the seawall lies near the base of the Royal Hawaiian groin at the Sheraton property boundary. During periods of high surf, wave run-up reaches the base of the seawall and the reflected energy produces backwash. In 2006, wave energy from high surf undermined the base of the seawall near the east end of the property. This created a sinkhole which is currently demarcated by security tape (Clark 2007). A remnant wall at the west end of the Sheraton property becomes exposed during regular sand fluctuations. A portion of it is submerged and is not visible when water quality is poor.

The combination of limited beach area, high volume of beachgoers from adjacent hotels, and foot traffic through the area results in marked congestion. This situation is exacerbated during high tides and high surf when beachgoers become packed together and foot traffic becomes impeded. Lateral access along the shore is generally restricted to a narrow walkway on top of the seawall which waves often splash over.

3.3.2 SHORELINE HISTORY

Waikīkī was originally a wetland consisting of taro fields, fishponds, streams and narrow sand beaches. Until the late 1800's, the Waikīkī shoreline consisted of a narrow barrier beach in front of a swamp and lagoon. In the late 1800's, the first tourist attractions to the area included bathhouses that offered towels, swimsuits, changing rooms, and the use of the beach for a fee. Development of beachfront hotels such as the Sans Souci, Moana, and Honolulu Seaside soon followed, often necessitating construction of protective seawalls. In the early 1900's, the wetland areas were declared a hazard to public health, and the government decided to dredge a canal to drain the wetlands and use the dredge material to fill in the low lying areas (Fletcher 2003).

As early as 1910, seawalls became associated with beach loss. This resulted in the prohibition of additional seawall construction in 1917. This prohibition was generally ignored and by 1920, seawalls spanned the majority of the Waikīkī shorefront (USACE 1992). A 70-foot long concrete box culvert/groin was built northwest of the Halekūlani channel in 1917. In 1927, the Board of Harbor Commissioners was allowed to rebuild the eroded Waikīkī Beach and by 1930 they reported that eleven groins had been constructed including the Royal Hawaiian Groin which was built in 1927 and lengthened in 1930. Subsequently, the Waikīkī area has undergone a succession of projects relating to dredging, sand replenishment, construction of groins, jetties, harbors and swimming areas, as well as removal of a number of piers that were declared unsafe (Wiegel 2005).

"Beach Nourishment" as it is known today has probably been taking place since the early 1900's since it is likely that many if not all construction projects located near the beach included a component of sand relocation. Dredged material was commonly used as fill for adjacent projects or newly constructed beaches. Construction of groins often required grading of existing sand and addition of fill sand. An estimate, based on recorded volumes alone, indicates that nearly 400,000 cubic yards of sand has been placed on Waikīkī beaches since 1929 (Wiegel 2005). As a result of all this, there is very little, if any, "native" beach sand along Waikīkī Beach. Fletcher (2005) used historical photogrammetry in combination with a model that relates beach width change to volumetric change in estimating that Waikīkī beaches have gained less than 5,000 cubic yards since 1951 despite the fact that approximately 250,000 cubic yards of sand having been placed on it during that time. It can be deduced from this that at least 98% of the sand that government and private landowners have placed there has been lost.

3.3.3 SHORELINE PROCESSES

Waves and wave induced currents are primarily responsible for sediment suspension and transport along Waikīkī beaches. Wave energy levels near the Waikīkī shoreline are typically low since most waves break offshore along the fringing reef. Irregular bathymetry and wave characteristics result in variable wave patterns and direction of approach. For these reasons, longshore currents and sediment transport vary substantially between segments of shoreline.

Oceanographers commonly divide the Waikīkī nearshore area (i.e., the area extending seaward from the shoreline to just beyond the breaker zone) into seven littoral cells; the lateral boundaries of the cells are generally physical structures (Fletcher, 2003, Noda, 1991). These littoral cells, which are named according to the largest associated beach, include the Fort DeRussy, Halekūlani (including Gray's Beach), Royal Hawaiian, Kūhiō, Kapi'olani, Queens, and Kaimana Beach littoral cells. The project area is located within the Halekūlani littoral cell bounded on the west by the Fort DeRussy storm drain box culvert/groin and to the east by the existing Royal Hawaiian groin. The Fort DeRussy littoral cell is immediately to the west and the Royal Hawaiian littoral cell to the east. Using seven vertical aerial photos taken between 1951 and 2001, Miller and Fletcher (2003) concluded that two of the seven littoral cells, the Kaimana and Halekūlani Beach cells, are characterized by minor long term accretion while the others demonstrate long-term stability or minor to moderate erosion.

Looking west from the Royal Hawaiian Beach at Sheraton seawall.

Looking east from Gray's Beach at Sheraton seawall.

Looking east along the Sheraton seawall.

Wave reflection from the Sheraton sea wall.

Prepared For:

Kyo-ya Hotels & Resorts, LP

Prepared By:

PLANNING SOLUTIONS

Source:

Sea Engineering, Inc.

Figure 3.4:

Photographs of the Project Area

Gray's Beach Restoration Project

Figure 3-4 Photographs of the Project Area 2007-09-11.cdr

In the short term, the project area is subject to variable longshore transport. Fletcher (2003), Noda (1991), and Gerritsen (1978) all report that normal wave conditions, including south swells and east wind swells, generally result in northwesterly longshore currents and westerly transport of sand as evidenced by accumulation of sand on the southeastern side of the Royal Hawaiian groin. This was verified by sand tracer experiments performed in 1978 by Gerritsen. Variations in the wave climate can effect changes in transport patterns. During the summer, the beach fronting the Sheraton Waikiki is typically narrow due to northwest transport of sand. In the winter, potential accretion is highest due to southeast transport, but Kona storms that occur most frequently during this season can strip much of the sand away. The existence of the seawall fronting the Sheraton may exacerbate erosion. This occurs because the seawall reflects incoming waves, increasing turbulence and associated sediment suspension near the base of the wall. The sediment can then be transported by the prevailing longshore current.

While the Halekūlani Beach width has fluctuated over the years, the net result has been accretion at a rate between 0.1 and 0.3 meters per year, mostly occurring to the west of the Halekūlani Channel. Between the Royal Hawaiian groin and the Fort DeRussy drain/groin to the northwest of the Halekūlani Channel, there has historically been very little beach area despite the construction of minor beach structures. This has been attributed to impoundment of sand by the Royal Hawaiian groin and the seawall fronting the Sheraton Waikiki (Gerritsen, 1978). The small dry beach to the southeast of the Fort DeRussy drain/groin fronting the Aston Waikiki and Outrigger Reef is a persistent feature, however there is typically little if any dry beach fronting either the Halekūlani or Sheraton Waikiki hotels (Noda 1991).

There is typically a wide beach along the east side of the Royal Hawaiian groin. This indicates a net longshore transport to the west; however, this transport pattern sometimes reverses due to seasonal changes in the wave climate. Profile data has shown decreases in beach width on the east side of the Royal Hawaiian groin and corresponding increases in beach width approximately 500 feet to the east. This trend has been shown to reverse during the summer months. The Royal Hawaiian groin can produce a strong seaward flow of water during large surf events, which has been identified as the largest mechanism for beach loss along Waikīkī beach (Fletcher, 2003). Gerritsen (1978) measured velocities in this "rip current" of over 1.8 knots.

In summary, the predominant direction of sediment transport near the Sheraton Waikiki is from the southeast to the northwest, however this can vary during normal changes in the wave climate. There has been little or no beach fronting the Sheraton since the mid-1970s, and when beach occasionally accretes it is ephemeral and submerged at high tide. Large surf events can result in significant loss of sand. Adjacent man-made structures have probably contributed to this condition, both by limiting natural nourishment and exacerbating erosion.

3.4 WATER QUALITY

The State of Hawaiʻi Department of Health (DOH) has classified the marine waters in the project area as Class A Open Coastal Waters. DOH maintains several water quality monitoring stations in the nearshore and offshore waters near the project site. The nearshore sites include Station 159 (Gray's Beach), 158 (Fort DeRussy Beach) west of the project area, Station 155 (Kahanamoku Beach) west of Fort DeRussy Beach, Station 160 (Tavern Beach) east of Gray's Beach, and Station 161 (Kūhīo Beach) east of Tavern Beach. The DOH offshore sites include Station 411 (Threes) offshore of Gray's Beach, Station 413 (Populars) to the east of Threes, and Station 412 (Canoes) north-northeast of Populars. The DOH water quality data are available in US EPA's STORET database (www.epa.gov/STORET/). The data span 1973 to the present and include the following parameters: salinity, temperature, pH, dissolved oxygen, turbidity, nitrate+nitrite, Kjeldahl nitrogen, fecal coliform, Enterococcus bacteria, *Clostridium perfringens* bacteria, and ortho-phosphate.

In addition, the Clean Water Branch has just established a Marine recreational monitoring site (STORET No, 000413) at Populars, the surf site closest to Gray's Beach. Its plan calls for it to start testing water quality at this and other Waikīkī surf spots in September 2007 with a specially outfitted surfboard. Testing in the surf zone will provide surfers a more accurate sense of water quality in the zone where they spend the most time. Data gathered will be posted online and used in a study being done in cooperation with the University of Hawai'i's John A. Burns School of Medicine and the Surfrider Foundation O'ahu Chapter.

The State of Hawai'i Department of Health website also posts information on exceedance of single sample maximum water quality standards. The most recent reported exceedance near the project site occurred at Fort DeRussy Beach on August 2, 2007, when an *enterococcus* level of 158 was recorded (versus the 100 cfu/100 ml standard).[9] On that date *Clostridium* (which many consider to be a better indicator of bacterial contamination) was 1 cfu/100 ml, an acceptable level. At the time the sample was taken it was partly cloudy, the wind was light, the surf was small, the water was turbid, and toddler swimmers and beach walkers were present.

3.5 SUSCEPTIBILITY TO NATURAL HAZARDS

During severe storm events, storm waves combined with a "super elevation" of the water level at the shore can produce flooding along the shoreline. As shown on Figure 3.5, the areas inland of the proposed project are within Flood Hazard Zone A.

The project area is designated as Seismic Zone 1B. This is relatively low and does not affect the design of the proposed improvements.

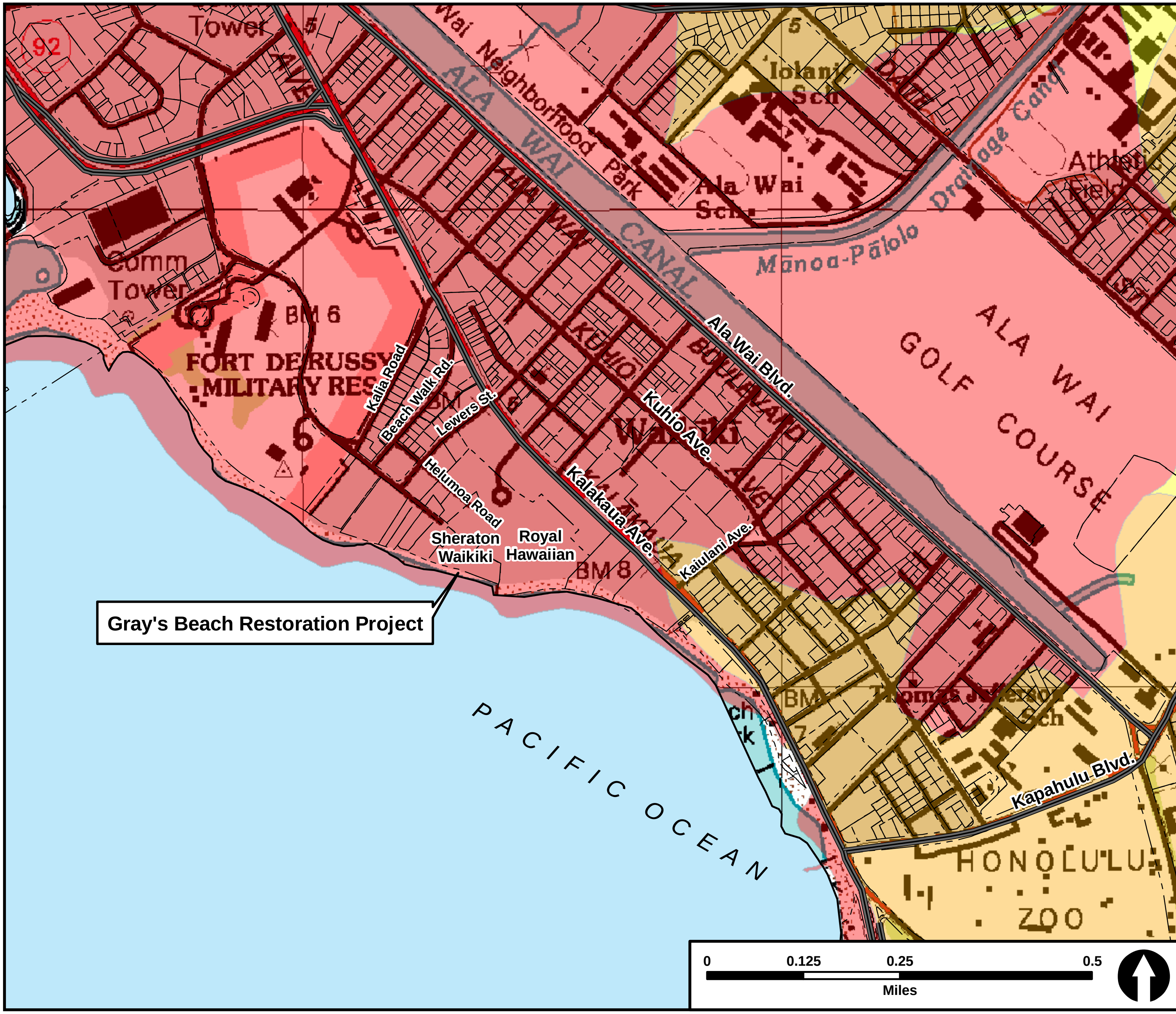
3.6 BIOTA

3.6.1 MARINE BIOTA

The nearshore area fronting the hotel is characterized by a shallow, highly bio-eroded fossil reef platform bisected by shallow sand channels and pockets. Coral cover is limited to less than 1% of the bottom area. Scour of the reef by sand suspended by wave action is the likely cause of the limited coral abundance. Reef fish are also relatively uncommon throughout the area.

A preliminary assessment of the marine biological characteristics of the shoreline fronting the Sheraton Waikiki (Marine Research Consultants, 2007 and AECOS, 2007) concluded that the most prominent biotic component of the marine community is a rich assemblage of macroalgae. The most common species by far is the invasive red alga *Gracilaria salicornia*. The occurrence of *G. salicornia* as a nuisance species in Waikīkī has been well documented (Smith *et al*. 2004), and maps showing estimates of abundance throughout the Waikīkī area reveal that the study site off of the Sheraton Waikiki is one of the regions where it is most abundant. Other common macroalgae inhabiting the reef platform include *Acanthophora specifera, Asparagopsis taxiformis, Trichoglea spp., Pterocladiella spp., Galaxaura spp., Dictyota spp., Sargassum spp. Turbinaria ornata* and *Padina spp*. Figure 3.6 shows representative photographs of the reef algae. The abundance of fleshy macroalgae decreases with increasing distance from shore, presumably in response to shearing from the greater wave stress.

The enterococcus limit in marine recreational waters within 1,000 feet of the shoreline, including natural public bathing or wading areas, is a geometric mean of seven per one hundred milliliters in not less than five samples. No single sample may exceed the single sample maximum of 100 CFU per 100 milliliters or the site-specific one-sided 75 per cent confidence limit. At locations where sampling is less frequent than five samples per twenty-five to thirty days, no single sample may exceed the single sample maximum and the geometric mean of these samples taken during the thirty-day period may not exceed 7 CFU per 100 milliliters.



Flood Hazard Designations:

- Zone A; an area inundated by 1% annual flood for which no BFEs have been determined.
- Zone X; an area that is determined to be outside the 1% and 0.2% annual chance floodplains.
- Zone X500; an area inundated by 0.2% annual chance flooding; an area inundated by 1% chance of flooding with average depths of less than a foot or with areas less than one square mile.

Prepared For:

Kyo-ya Hotels & Resorts, LP

Prepared By:

PLANNING SOLUTIONS

Sources:

-State of Hawai'i GIS
-City & County of Honolulu GIS

Figure 3.5:

Flood Hazard Map

Gray's Beach Restoration Project

Figure 3-5 Flood Hazard Map 2007-09-11.mxd

Coral cover in the portion of the nearshore area that would be affected by construction of the proposed groins is limited to less than 1% of the bottom, and is composed almost entirely of two species (*Porites lobata* and *Pocillopora meandrina*) (Figure 3.6). *P. lobata* occurs in a variety of growth forms, from flat encrustations flush with the reef surface to hemispherical lobed colonies that extend up to 2 feet in height. *Pocillopora meandrina* occurs as short branching hemispherical colonies. Wave-induced scour from resuspended sand on the reef flat is probably responsible for the observed limited coral abundance.

Other dominant species of macro-invertebrates include the boring sea urchins, *Echinometra matheai* and *Echinostrephus aciculatus*, which are responsible for much of the bioerosion and pitted nature of the reef platform that can be seen in the photographs reproduced in Figure 3.6. The long-spined sea urchins *Diadema paucispinum* and *Echinothrix diadema*, as well as the sea cucumber *Holothuria atra* were observed occasionally over the reef flat.

Reef fish were relatively uncommon throughout the area. The most common larger species observed were manini (*Acanthurus triostegus*) and humuhumu nukunuku apua‘a (*Rhinecanthus rectangulus*). Most other fish were small juveniles inhabiting the interstitial spaces in the reef framework.

The reef is well-known as a feeding site for green sea turtles (*Chelonia mydas*). They may be seen at all times of the day, often close to shore, feeding on seaweed that grows on the reef. The abundant algal standing crop throughout the Waikīkī reef platform provides excellent forage for the turtles. Green sea turtles, as well as other sea turtles in Hawai‘i, are fully protected under both the federal Endangered Species Act and under Hawai‘i state law. These laws prohibit hunting, injuring or harassing sea turtles or holding them in captivity without first obtaining a special permit for research or educational purposes.

3.6.2 TERRESTRIAL BIOTA

There is no terrestrial biota in the area on which the groins and sandy beach would be constructed. A few common coastal shrubs and small trees are present along the right-of-way that would be used to bring material to the site, but none of these are species of special concern.

3.7 NOISE

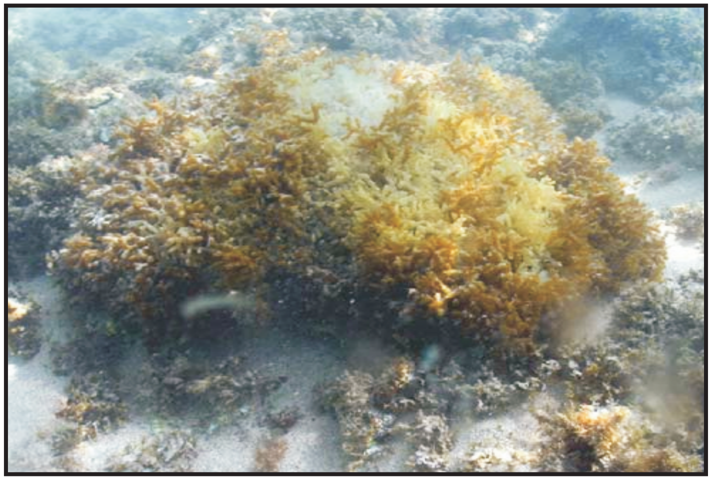
Existing ambient noise levels vary considerably within the project area both spatially (i.e., from place to place) and temporally (i.e., from one time to another). Wave action is the most significant natural noise source, and this is followed by the sound of wind in trees. Activities within the Sheraton complex are the largest existing source of artificial noise. Overall, the noise environment is relatively quiet.

3.8 HISTORIC, CULTURAL, AND ARCHAEOLOGICAL RESOURCES

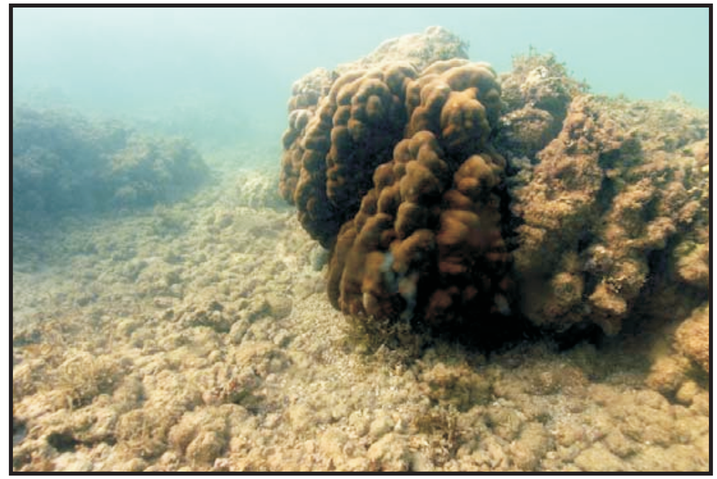
Cultural Surveys, Inc. is preparing an archaeological and cultural impact assessment for the proposed Gray's Beach Restoration project. An overview of the existing literature on historic and pre-historic use of the project area, as well as previous archaeological research, follows.

3.8.1 HISTORIC USES

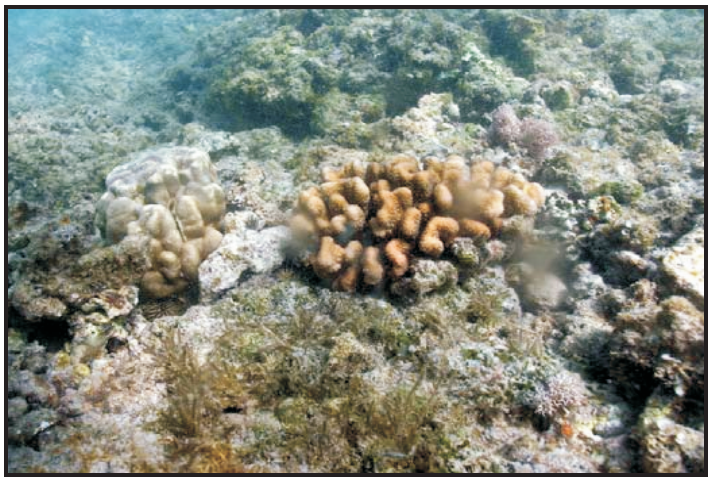
Gray's Beach fronts both the Sheraton Waikiki and the Halekūlani Hotel properties at their common boundary. Clark cites October 22, 1972 testimony from J. Atherton Gilman as saying there was coral on both sides of the beach and a natural sand-filled channel out through the reef that was called Gray's Channel. Gray's Beach was named for a boardinghouse, Gray's-by-the-Sea, which was located behind the beach. It was run by a woman named LaVancha Gray from 1912 to 1928. The boardinghouse was closed when Clifford Kimball bought the property to build the Halekūlani Hotel.



Dominant marine algae species, *Gracilaria salicornia*.



Dominant coral species, *Porites lobata*.



Branching coral *Pocillipora meandrina*.

Boring sea urchins occurring on the seafloor offshore of the Sheraton Waikiki.

Prepared For:

Kyo-ya Hotels & Resorts, LP

Prepared By:

PLANNING SOLUTIONS

Source:

Sea Engineering, Inc.

Figure 3.6:

Photographs of Coral & Algae

Gray's Beach Restoration Project

Figure 3.6 Photographs of Coral & Algae 2007-09-11.cdr

3.8.2 HAWAIIAN HABITATION AND TRADITIONAL LAND USES

Habitation. Waikīkī was a center of population and political power on Oʻahu beginning long before the arrival of Europeans in the Hawaiian Islands during the late eighteenth century. Kanahele (1995:134) notes that Waikīkī's ancient chiefs had located their residences there for hundreds of years and that Kamehameha V's residence was at Helumoa (where the proposed project is located). Kanahele (1995:134-1345) goes on to explain that: "Three features were common to royal locations in Waikīkī. They were situated 1) near the beach, 2) next to a stream or *ʻauwai* (canal) and 3) among a grove of coconut or *kou* trees." Chiefly residences, however, were only one element of a complex of features that characterized Waikīkī up to pre-contact times, as discussed below.

Agriculture. Beginning in the fifteenth century, a vast system of irrigated taro fields (*loʻi kalo*) was constructed, extending across the littoral plain from Waikīkī to lower Mānoa and Pālolo valleys. This field system – an impressive feat of engineering thought to have been designed by the chief Kalamakua – took advantage of streams descending from Makiki, Mānoa and Pālolo valleys, which also provided ample fresh water for the Hawaiians living in the ahupuaʻa. Water was also available from springs in nearby Mōʻiliʻili and Punahou. Closer to the Waikīkī shoreline, coconut groves and fishponds dotted the landscape. A sizeable population developed amidst this Hawaiian-engineered abundance. Land Commission Awards (summarized in Table 3.3) indicate a pattern of relatively dense, relatively high status habitation within the adjacent lands.

Aquaculture. The area known as Fort DeRussy (Kālia) contained ten Hawaiian fishponds used for aquaculture. Hawaiian aquaculture is especially notable as it was not practiced elsewhere in the Pacific in the same form. The majority of fishponds most likely were constructed in the sixteenth century. The prefix *loko* means "body of water" and the suffix describes the specific type. The four types of ponds are:

- *loko iʻa kalo* (fish and taro raised together in a pond),
- *loko wai* (inland freshwater fishpond),
- *loko puʻuone* (isolated shore fishpond formed by a barrier sand berm creating a single elongated ridge parallel to the coast), and
- *loko kuapā* (seawall on a reef with sluice gates).

Davis (1989, 1991) classified the ten fishponds at Fort DeRussy as *loko puʻuone* with salt-water lens intrusion and fresh water entering from upland *ʻauwai* (canals). Kāhāwai Piʻinaio was this type of stream. The 10 ponds are inland, swale-based ponds constructed between beach ridges that may have formed along the coast within the last millennium. Existing depressions in the sand were chosen to make the *loko puʻuone*, and brush was cleared out. During traditional times, the ponds were used to farm fish, usually for the Hawaiian *aliʻi* (royalty). The *ʻamaʻama* (mullet) and the *awa* (milkfish) were the two types of fish traditionally raised in the ponds.

Marine and Freshwater Resources Gathering Practices. Kālia was once renowned for the fragrant *limu līpoa*, as well as several other varieties of seaweed such as *manauea*, *wāwaeʻiole*, *ʻeleʻele*, *kala* and some *kohu*. The area between the Royal Hawaiian and the Halekūlani was the area where *limu līpoa* was traditionally gathered. Oral information passed down to Mr. Bob Paoa[10] confirmed the great fishing and the abundant *limu* in the Kālia area.

[10] Mr. Paoa is a community consultant who has participated in past cultural impact assessments by Cultural Surveys, Inc.

Table 3.3. Land Commission Awards in Project Area

LCA #	*Claimant*	*Traditional Names*	*General Location*	*Comments*
104 FL	Kekuanaoa	Kapuni	NW Sheraton	House site, also claimed 2 *lo'i*, 5 fish ponds and 1 *muliwai* elsewhere at Waikīkī.
228	Kalaiheana Kaleiheana	Helumoa	N Sheraton N Royal HH	Claims coconut grove at Helumoa with stream called Apukokohau adjacent, six with own houses living under claimant
822	Okuu	Helumoa	S end of Sheraton	House lot claim with an adobie fence and five houses; Kupanihi, Kini & Ku are house owners
1281	Kuluwailehua	References to Kamoku, Kamokuakahi & Kamoku elua [Kamoku 1 & 2] – variants of the more common "Keomuku"	Central Sheraton	Difficult to differentiate between 5 Waikīkī land claims
1379	Kapule II	Keaumoku [understood as a variant of "Keomuku"]	S Sheraton	House lot claim with a large house, a little house and a fence
1445	Kanemakua	Helamoa [sic. "Helumoa"]	Central Royal HH	House lot claim with 7 (variously 8) houses claimant owns 2 – seemingly other residents under the claimant are Kahanaumaikai, Kalaauli, Kaaia, Kahui & Ku
1385	Kaelemakule	Keomuku	S Sheraton	House lot claim
1463	Wahahe'e	Helumoa		House lot claim with 1 house & a fence
1508	Kaho'ouluulu	Pahupahuapua'a	SW Sheraton	House lot claim partly fenced
1511	Kanae	Keonuku [understood as a variant of "Keomuku"]	S Sheraton	House lot claim
1782	Kahope	Helumoa	SW Royal HH	House lot claim is bounded: *Mauka* by the coconuts of Helumoa, Kekaha by the *pāhale* belonging to Kanemakua, *Makai* by the sea shore, Honolulu by the *pāhale* of Okuu
2126	Keaho (Keoho)	Kuweluwelu, Keomukukai	S Sheraton	2 *puepue*, a *kula* and *pāhale* in one piece
8023	Aua	Keomuku	Central Sheraton	House lot claim bounded *mauka* by *loko* of Helumoa of 'Ī'ī and *mauka* by the *kula* nui of Helumoa.
Source: Cultural Surveys, Inc. (2007)				

The proposed project area is also a well-known foraging site for Green Sea Turtles or *honu*. Green Sea Turtles were once a food source for Native Hawaiians. The meat, viscera, and eggs supplemented the more common food sources like fish, birds, shellfish, coconuts, breadfruit and taro. Native Hawaiians valued the adult female turtle as a delicacy because of its high amount of green body fat (http://www.pacific.fws.gov/wesagrnturtindex.htm). *Honu* were also incorporated into religious and traditional ceremonies and were (and are) considered by some Native Hawaiian families to be a personal family deity or ʻ*aumakua*. The harvesting of turtles was often regulated according to *kapu* rules, reserved exclusively for the use of chiefs, priests or only men for special occasions such as a wedding, funeral, religious ceremony, building of a canoe, etc. (http://www.wpcouncil.org/protected/Documents/Kinan_Dalzel_Mast-2004.pdf). Native Hawaiians used the green fat for medicinal purposes to treat burns and other skin disorders (http://www.pacific.fws.gov/ wesagrnturtindex.htm).

Interviews from a prior cultural impact evaluation (Chiogioji *et al*. 2005) confirmed that the Waikīkī shoreline was abundant in many varieties of fish and limu, certain varieties of crab and lobster, as well as being good squid grounds. Talk-story with fishermen who presently use the Waikīkī coast confirms, for the most part, this is still true today. Where one chooses to fish depends on the crowds at the beach and time of day as well as the distribution of favored resources. In Waikīkī, especially due to the high volume of people on the beaches, many fishermen these days go fishing at night. The more favorable fishing grounds are in front of the old Niumalu Hotel (Hilton Hawaiian Village), the Royal Hawaiian and Halekūlani hotels, and the area fronting the Natatorium. Specifically, the area between Diamond Head and the Kapahulu Groin was considered better fishing grounds than the Outrigger Reef on the Beach/Fort DeRussy portion of the shoreline. Likewise, the squid grounds are located between the Kapahulu groin and Diamond Head.

<u>*Gathering of Plant Resources*</u>. Hawaiians utilized upland resources for a multitude of purposes. Forest resources were gathered not only for the basic needs of food and clothing, but for tools, weapons, canoe building, house construction, dyes, adornments, hula, medicinal, and religious purposes. The project area was valued for harvesting of *limu kala* in particular to make *lei* for offerings. McDonald notes that the "*lei limu kala* was and is still offered at the *kuʻula* [stone god used to attract fish] by fishermen or anyone who wishes to be favored by or is grateful to the sea" (1985:66).

<u>*Surfing and Other Sports*</u>. Surfing was and is one of the principal attractions of Waikīkī. In pre- and early post-contact Waikīkī, surfing was popular to both chiefs (*aliʻi*) and commoners (*makaʻāinana*). So important was surfing that there is a major *heiau* dedicated to the *nalu* or surf, and its riders. At the "surfing heiau" of Papaʻenaʻena, a terraced structure built at the foot of Diamond Head, is where surfers came to offer their sacrifices in order to obtain *mana* (supernatural and divine power) and knowledge of the surf. The site overlooked what surfers call today "First Break," the start of the Kalehuawehe surfing course which extended to Kawewehi (the deep, dark surf) at Kālia. Although everyone, including women and children, surfed, it was the chiefs who dominated the sport, and one of the best among Waikīkī's chiefs was Kalamakua. He came from a long ancestry of champion surfers whose knowledge, skill, and *mana* were handed down and passed on from generation to generation. The story of his romantic meeting with Keleanuinohoʻanaʻapiʻapi ("Great Kelea who flutters,") has been preserved as a reminder of the role that surfing played in the history of Waikīkī (Kanahele 1995:56-58). Kawehewehe, once the name of the surfing site off the project area, is called "Populars" today (John Clark, personal communication).

<u>*Wahi Pana* (Storied Places)</u>. The proposed project area, and the Waikīkī ahupuaʻa is a *wahi pana* (storied place), rich in *moʻolelo* (legends, myths), such as stories about *moʻo* (water spirits) associated with fishponds, springs and water resource areas that they guard and protect. Most noteworthy is Kawehewehe Pond, a place of spiritual healing. Kawehewehe is understood as the name of the beach on the ʻEwa side of the Royal Hawaiian Hotel (adjacent to Helumoa), just east of the Halekūlani Hotel, Waikīkī. The sick were bathed here as treatment. The patient might wear a seaweed (*limu kala*) lei and leave it in the water as a request that his sins be forgiven; hence the origin of the name

kala (Lit., the removal Pukui *et al*. 1974:99). As a treatment for illness and defilement, the sick were brought here to bathe in the healing waters of the ocean. As part of the healing ritual, many might wear a lei woven from the *limu kala*. After bathing in the ocean, the patient ducks under the water, releasing the lei from around his neck, letting the *lei kala* float out to sea. Upon turning around to return to shore, the custom is to never look back, symbolizing the ʻoki (to sever or end) and putting an end to the illness. Leaving the lei in the ocean also symbolizes forgiveness (*kala*) and the leaving of anything negative behind. Kawehewehe takes its meaning from the root word, "*wehe*" which mean "to remove" (Pukui et al. 1974:383). Thus, as the name implies, Kawehewehe was a traditional place where people went to be cured of all types of illnesses – both physical and spiritual. It is uncertain if the tradition of Kawehewehe as a healing place originated hundreds of years ago in Hawaiian history or whether it began after the introduction of foreign diseases and epidemics that decimated thousands of Hawaiians.

<u>Hawaiian Trails</u>. In *Fragments of Hawaiian History* John Papa ʻĪʻi described the "Honolulu trails of about 1810" (1959: 89), including the trail from Honolulu to Waikīkī. He said that:

> *"Kawaiahao which led to lower Waikiki went along Kaananiau, into the coconut grove at Pawaa, the coconut grove of Kuakuaka, then down to Piinaio; along the upper side of Kahanaumaikai's coconut grove, along the border of Kaihikapu pond, into Kawehewehe; then through the center of Helumoa of Puaaliilii, down to the mouth of the Apuakehau stream. (ʻĪʻi 1959: 92).*

Based on ʻĪʻi's description, the trail from Honolulu to Waikīkī in 1810 coursed through the *makai* side of the present Ft. DeRussy grounds and continued *makai* of the present project area in the vicinity of Kalia Road. It is likely that this trail was a long-established traditional route through Waikīkī.

<u>Burials.</u> The discovery of burials in the Waikīkī area during recent construction projects has been a cause of concern over the last few years. There are approximately 14,500 records associated with LCA claims during the Māhele of 1847-1853. Of these records, 432 are for claims both awarded and unawarded in Waikīkī. Among these 432 claims, there is only one mention of a graveyard or burial place, Claim 613 (to Kuluwailehua) which was not awarded (<u>www.waihona.com</u>). Although it is uncertain where the reported burial ground is located, based on the boundaries given in the testimony (Native Register, Vol. 2: 299-300 found in www.waihona.com), it is speculated that it might be adjacent to the former location of Waikīkī Church, near Kaʻiulani Avenue. It seems the circumstances of the burials discovered in the vicinity of the project area are more mundane than battle deaths or human sacrifices - namely that the vast majority of the deceased were the common people of Kālia. Withington (1953:16), probably referring to the *ʻokuʻu* (Lit., to squat on the haunches) or (possibly, cholera) plague (circa 1804), wrote:

> *"…a few years of peace settled over the Islands. Kamehameha and other warring chiefs took this opportunity to re-establish their forces, which had been greatly reduced through war and disease. A terrible epidemic of measles had attacked the people of the islands. It is claimed that more than three hundred bodies were carried out to sea from Waikīkī in one day." (Withington: 1953:16).*

It is possible that some of the Kālia burials discovered to date reflect such early depopulation by introduced diseases. Hawaiians placed significance on the *iwi* (bones), which were regarded as a lasting physical manifestation of the departed person and spirit. "The bones of the dead were guarded, respected, treasured, venerated, loved or even deified by relatives; coveted and despoiled by enemies" (Pukui et al., 1974:107).

3.8.3 ARCHAEOLOGICAL & CULTURAL RESOURCES IN THE PROJECT AREA

A preliminary literature review by Shideler (August 2007) identified several possible archaeological features that may be present in the project area and/or may increase the chances of encountering burials and artifacts during construction work. These are outlined below.

Helumoa Heiau. Pukui et al. (1974:44) translate "Helumoa", the common place name for this area, as "chicken scratch". They explain that "*Chickens scratched to find maggots in the victim's body*", with the "victims" being the remains of human sacrifices at the Helumoa Heiau. Thomas Thrum (1906:44) relates that it was a "place of sacrifice" going back at least as far as A.D. 1610. Thrum (1927:34) later notes: "This temple was long ago demolished, not a stone being left to mark the site, which was doubtlessly near, if not the [italics in original] actual spot now graced by the new Royal Hawaiian Hotel." Shideler noted that the Helumoa Heiau may have been located on the prominent point between the Royal Hawaiian and Sheraton Waikiki hotels.

Royal Residences of Kahekili and Kahahana. ʻĪʻī (1959:17) and Kanahele (1995:134) assert that the royal residence of the ruling chiefs Kahekili and Kahahana before him (and perhaps previous Oʻahu ruling chiefs as well) were located between the Royal Hawaiian Shopping Center and the Royal Hawaiian Hotel. This would place these residences and any archaeological remnants near the possible access corridor for the Gray's Beach Restoration project. In his supportive testimony for LCA 228 awarded to Kaleiheana in 1847, Īʻī declares that "Kamehameha himself lived on this land." ʻĪʻī comments in his supportive testimony for LCA 228 awarded to Kaleiheana in 1847 that relatively high status attendants of Kamehameha I continued to live on the property when Kamehameha I died (ʻĪʻī, Appendix A-2) indicating the prospect for finds in the general vicinity.

ʻĀpuakēhau. Fornander (1919 Volume VI, part 2; page 289) account of "The Story of Kahahana" provides the detail that (circa 1785) the massive invasion force of the Maui chief Kahekili was encamped at ʻĀpuakēhau, where they were organizing and preparing to march inland. He goes on to say that it was there at ʻĀpuakēhau that the Oʻahu forces first attacked "the Maui troops collected at the heiau" where "a fight commenced to which Hawaiian legends record no parallel". Shideler interprets this as confirming that the fighting referred to began in close proximity to Helumoa Heiau.

There is much other documentary evidence that a great deal of royal activity and therefore potential burials and artifacts are present in the general area. Shideler cites the following:

- Kanahele (1995:99) writes of an "*ʻulu maika* course that was part of the royal sports complex of Kahuamokomoko in Helumoa" and states that: "When excavations for the Royal Hawaiian Hotel were made in the early 1920s many *ʻulu maika* discs were found."
- The Land Commission Awards indicate a pattern of relatively dense, relatively high status habitation within the adjacent lands.
- October 1923 records of the Bernice Pauahi Bishop Museum state that "…five individuals from Helumoa, Waikīkī, Oʻahu were collected by Kenneth P. Emory. Museum information indicates they were victims of the 1853 smallpox epidemic…" (*Federal Register* January 28, 1998 Volume 63, Number 18).
- Reference in the 1970 records of the Bernice Pauahi Bishop Museum that: "…eight individuals from Waikīkī…[donated] by the Sheraton Hawaiʻi Corporation…were recovered during excavations for tank construction…." This would appear to relate to the original work at the Sheraton Waikiki that was completed in 1971
- Several sets of remains were discovered during the prior re-development of the Royal Hawaiian Shopping Center (perhaps c. 1979) (personal communication from Ms. Lurline Salvadore formerly of the Kamehameha Schools' staff).

- Human remains were apparently discovered c. 1993 (personal communication from Mr. David Lee) during work on a sewer line in the basement of the accounting department of the Sheraton Waikiki adjacent to an area of proposed work.
- Human remains (that still remain in place; SIHP # 50-80-14-5937) were discovered in April 2001 during excavations associated with the construction of the Abhasa Spa at the Royal Hawaiian Hotel (Elmore et al. 2001). The Elmore et al. (2001:9) study relates an anecdotal account of additional remains "in a nearby location".[11]
- The substantial history of archaeological work in Waikīkī has indicated a relatively high density of burials within Beach sand and Jaucas sand deposits, which characterize the soils in the project area. Much of Waikīkī was formerly low-lying, at or close to the water table. Lands that were slightly higher, such as the present project area, were preferentially chosen for interment of the dead (though this would only apply to areas whose present elevation is not the result of relatively modern fill).

An archaeological inventory survey of the proposed access corridor and staging area(s) of the Gray's Beach Restoration Project is underway to identify specific features present, and the results will be presented in the *Draft EIS* for the project.

3.9 RECREATION

John Clark, a locally recognized expert on ocean recreation and cultural activities in Hawai'i, has completed a preliminary assessment of ocean recreation activities in the vicinity of the Sheraton Waikiki. His assessment, which is the basis of the following discussion, included observations of ocean activities and conditions, interviews with shoreline users, and identification of cultural practices in the project area. He identified a wide range of ocean-related activities occurring in the vicinity of the Sheraton Waikiki. These include sunbathing, snorkeling, skin diving, surfing, wave ski surfing, canoe surfing, kayaking, fishing, and catamaran rides. Figure 3.1 shows surf sites and other recreational locations in the project vicinity.

3.9.1 SUNBATHING

Sunbathing in the survey area is possible only in the hotel pools and at the small pocket of sand between the Sheraton Waikiki Hotel and the Halekūlani Hotel that is all that remains of Gray's Beach. The best time (some might say the only time) for sunbathing there is at low tide during periods of little or no surf. At high tide at least half of the beach is covered with water, and if an episode of high surf combines with a high tide, waves cross the entire beach and strike the retaining walls in the backshore. This situation precludes all opportunities for sunbathing. At low tide during periods of little or no surf, some sunbathing also occurs on the exposed beach at the west end of the vertical seawall fronting the Sheraton Waikiki. At high tide this area of the beach is completely submerged, precluding all sunbathing opportunities.

3.9.2 SWIMMING

Swimming in the survey area is also concentrated at Gray's Beach and in the Halekūlani Channel. Swimming sites in the ocean, especially those nearshore where swimmers are wading into the ocean from a beach, need to be sand-bottomed. The only place in the survey area where this occurs is at Gray's Beach where the sand-bottomed Halekūlani Channel intersects the beach. In comparison, the offshore bottom fronting the narrow sand beach at the base of the Sheraton Waikiki's vertical seawall is a shallow coral reef, a strong deterrent to wading and swimming. Almost no one swims in this area.

[11] As a generalization, there is a higher likelihood of additional burials in the vicinity of post-contact burials (as in the case of Site 50-80-14-5937) than in the vicinity of pre-contact burials.

The nearshore ocean bottom in the survey area also includes the remnants of several former seawalls, most of which are submerged. Some of these submerged remnants pose a danger to swimmers. During periods of high surf, visibility in the nearshore waters is poor due to wave agitation of the beach sand. During these conditions visitors unfamiliar with the locations of the remnants have dived into the ocean and struck them.

3.9.3 SNORKELING

The shallow reef fronting the Sheraton Waikiki is not known as a good site for snorkeling. The reef does not seem to attract the volume or variety of fish that other reefs do. In addition, during periods of high surf, visibility is poor due to suspended sand. For these reasons, snorkeling is an infrequent activity here. Beyond the Populars surf site (which is described in Section 3.9.4where the turtles rest, the ocean bottom is known to some boat operators as Sheraton Reef. Commercial boat tours bring snorkelers here and privately-owned pleasure boats anchor.

3.9.4 BOARD SURFING, WAVE SKI, CANOES, AND KAYAKS

"Populars" is the name of the surfing site located approximately 800 feet from the seawall fronting the Sheraton Waikiki (Figure 3.1). It was known to the Hawaiians as Kawehewehe, the same name they used for the Gray's Beach section of Waikīkī Beach. The name Populars replaced the name Kawehewehe in the early 1900s when the surf site became a "popular" spot with modern-day surfers. Today, Populars, or "Pops" as many surfers call it, is a heavily-used surf site. Its popularity is due to its long, rolling waves that can accommodate all levels of surfing ability from beginners to experts. Experts ride the largest waves that break the farthest out and beginners ride the smallest waves that break the closest to shore.

During the spring and summer months when big south swells occur, many expert surfers ride the waves at Populars. It is primarily a wave that breaks to the right of a surfer as he/she rides toward the shore, and offers a long ride before it finally ends. However, in addition to the seasonal spring/summer surf, Populars is surfed year around under a wide range of conditions.

Commercial surfing instructors bring their students to the inside sections of Populars. Most of these instructors are from the ocean activity desk at the Sheraton Waikiki and from other hotels to the west. Surfing instructors who operate east of the hotel usually take their students to Canoes, a surf break that is inshore of and to the east of Populars.

Wave skis are small kayaks approximately six feet long that are designed especially for riding waves. On occasion, wave skiers ride the smaller, inside waves at Populars, waves that reform from the larger waves breaking on the outside.

Outrigger canoe surfing takes place at Populars, usually on smaller, inside waves that reform from the larger waves breaking on the outside of the surf site. Commercial outrigger canoe rides are conducted in the inside sections of Populars. Canoe rides are offered to visitors through the Sheraton Waikiki beach services desk and from other hotel desks to the west of the hotel. Canoe ride operations east of the hotel usually take their students to Canoes.

Touring kayaks are not common in Waikīkī, but are available for rent from the ocean activity desk at Fort DeRussy. They are seen occasionally in the project area.

3.9.5 FISHING AND GATHERING

Two types of fishing occur in the project area, spear fishing and pole fishing, but both are infrequent. The reefs on both sides of the Halekūlani Channel were once noted octopus grounds, but do not have that reputation today. Nonetheless, some spear fishermen still try their luck in these areas. During the field trips that Clark has conducted as part of the investigations for this project, he observed only two divers looking for octopus.

The reef fronting the Sheraton Waikiki is not known as a productive fishing area, so pole fishing is an infrequent activity. However, at certain times of the year, schools of nehu, small anchovy-sized fish, may congregate near shore in the Halekūlani Channel fronting Gray's Beach. The nehu attract larger predators like papio, which are prized eating fish, which in turn attract pole fishermen. Pole fishermen whip for papio, which has the potential to create conflicts with swimmers. In addition, during periods when the nehu are schooling nearshore, pole fishermen whip not only from the beach, but from the vertical seawall fronting the Halekūlani property, where they are interacting with the pedestrian traffic on top of the wall.

Many areas of Waikīkī were once known as good places to gather edible seaweeds, or limu, but little if any edible seaweed seems to remain today. No gathering activities of seaweed, shellfish, or other marine species were observed during the field trips or noted by persons interviewed.

The Waikīkī Marine Managed Areas (MMA) consists of two parts: the Waikīkī Marine Life Conservation District (MLCD) and the Waikīkī-Diamond Head Fisheries Management Area (FMA). The project area is not included in the Waikīkī MMA.

3.9.6 CATAMARAN RIDES, BOATING AND BEACH CONCESSIONS

Catamaran rides are a popular activity on Waikīkī beach. The catamarans park on the beach, where they load and unload passengers. They motor in and out of the beach, then sail up and down the Waikīkī coast for specified periods of time.

At present, seven catamaran companies conduct ride operations on Waikīkī beach, and one of them, the *Maita'i*, parks on the east half of Gray's Beach, fronting the Sheraton Waikiki beach services desk. The *Mata'i* uses the Halekūlani Channel to access the beach. The catamarans and personal water crafts operated by the lifeguards are the only vessels under power that are permitted in the project area. Non-motorized boats such as surf skis (racing kayaks) and ocean kayaks (recreational kayaks) are permitted. In addition to the Maita'i, two other companies operate beach concessions in the project area, the Sheraton Waikiki beach services and the Hans Hedemann Surf School.

3.10 EXISTING LAND USE/SOCIOECONOMIC & CULTURAL ENVIRONMENT

3.10.1 LAND USE

As noted in the preceding section, Waikīkī Beach is famous for its diverse water recreation activities, including surfing, swimming, snorkeling, skin diving, fishing, canoe and sailing and catamaran rides. There are numerous "named" surf breaks along the Waikīkī shoreline, which is known for world-class surfing waves for beginners and experts alike. There are several surf breaks directly off the Sheraton. Spear and pole fishing are relatively infrequent activities, and the reef fronting the Sheraton is not known as a productive fishing area. Many areas of Waikīkī were once known as good places to gather edible seaweeds, or *limu*, but little if any edible limu seems to remain in Waikīkī today.

3.10.2 ECONOMIC AND CULTURAL SETTING

Waikīkī Beach is recognized as the State's primary tourist destination, attracting millions of visitors yearly. Waikīkī contains approximately 44% of the rooms/lodging units available in the State. The Sheraton Waikiki is the second-largest hotel in Waikīkī. Thus, the shoreline fronting the Sheraton Waikiki is visible to a large percentage of the tourists visiting the State. At present, there is no beach along most of the shoreline fronting of one of the largest hotels in Hawai'i's primary visitor destination.

Quantifying the economic implications of the degraded beach condition is difficult. However, the Waikīkī Beach Erosion Control Reevaluation Report prepared by the U.S. Army Corps of Engineers (2002) contains an extensive economic analysis of the costs and benefits of beach restoration and erosion control along all of Waikīkī beach. Some of the findings of this analysis include the following:

- Visitor surveys indicate that 12.6% of tourists who do not revisit cite crowding and congestion (considered to be of the beach) as reasons. This is equivalent to about 250,000 visitors, or 3.6% of the total visitors to the State in a year.
- These visitors, were they to come, would spend and estimated $181 million/year.
- Only four square feet of beach are estimated available per lodging unit in the vicinity of the Sheraton, the lowest in all of Waikīkī. Comparable numbers are 10 and 30 square feet per lodging unit at Kūhiō beach and Fort DeRussy beach, respectively.
- A benefit to cost ratio analysis was completed to determine Federal interest in restoring and improving Waikīkī Beach, with a ratio greater than one indicating that benefits exceeded costs. The benefit to cost ratio in the Sheraton beach vicinity was 15.5, the greatest in Waikīkī. The overall benefit to cost ratio for all of Waikīkī was about 6. The annual economic benefit for the Sheraton shoreline segment was estimated to be $6 million.

3.11 SCENIC AND AESTHETIC RESOURCES

The gentle curve of the Waikīkī shoreline, the wide expanse of water with multiple surf breaks, the changing colors resulting from the variable water depth, and the backdrop of Diamond Head make the seaward and long-shore views from the shoreline spectacular.

3.12 PUBLIC INFRASTRUCTURE & SERVICES

3.12.1 TRANSPORTATION

Vehicular and Pedestrian Access. There is no regular road access to the shoreline in this area. Pedestrian access is available from Kalia Road through the public right-of-way that runs from between the Sheraton Waikiki and the adjacent Halekūlani Hotel.

Harbors. The nearest harbor is the Ala Wai Harbor, which is owned and operated by the State of Hawaiʻi. Commercial cargo arrives and departs through Honolulu Harbor.

Airports. Honolulu International Airport is approximately six miles west of the project site.

3.12.2 WATER, SEWER, STORMWATER, & COMMUNICATION SYSTEMS

None of these services are present on the shoreline where the proposed beach restoration would occur. The closest potable water line is located on the Sheraton Waikiki property; it has the nearest restroom facilities as well. Kyo-ya has proposed construction of public restroom facilities near the shore at the existing public Right-of-way between the Sheraton and Halekūlani hotels, provided that necessary approvals and permits can be obtained.

3.12.3 POLICE, FIRE, EMERGENCY MEDICAL SERVICES

The Department of Land and Natural Resources Division of Conservation and Resources Enforcement (DOCARE) is responsible for enforcement activities in areas controlled by the Department of Land and Natural Resources, which includes the area seaward of the certified shoreline where the Gray's Beach Restoration Project would take place. In addition, Honolulu Police Department officers patrol accessible areas of the beach on all-terrain vehicles (ATVs). Presently, officers do not patrol beyond the Royal Hawaiian due to the limited shoreline access. The proposed project would allow police patrolling to continue further west along the beach fronting the Sheraton and Halekūlani Hotels.

The nearest police station is a satellite office on Kalākaua Boulevard. Police headquarters is located on Beretania Street near its intersection with Ward Avenue. The three nearest Fire Stations are on Makaloa Street, at the intersection of University and Date Street, and at the intersection of Kapahulu and Ala Wai Boulevard. The three hospitals nearest to the project site are Kapi'olani Women's and Children's on Punahou Street, Straub Hospital on King Street, and Queen's Hospital on Punchbowl Street. All three hospitals provide emergency medical services (EMS) to the area, as do the Fire Stations mentioned above.

4.0 POTENTIAL IMPACTS

This Chapter summarizes the kinds of adverse and beneficial effects that are likely to result from the proposed action. It was prepared using information concerning project alternatives presented in Chapter 2 and the preliminary information concerning the existing environment contained in Chapter 3. It is not intended to be an in-depth analysis. Instead, it briefly describes the issues that have been identified to date and outlines the kinds of analysis that Kyo-ya expects to include in the Environmental Impact Statement (EIS). By highlighting the kinds of analysis Kyo-ya believes are needed, it provides reviewers an opportunity to consider whether all issues that are important to them are likely to be addressed and, if not, to identify specific additional areas of concern that they believe should be included in the EIS.

4.1 BATHYMETRY AND SEAFLOOR IMPACTS

Construction of the proposed groins and beach will alter the bathymetry in the area they cover, the extent of which is discussed in Chapter 2. The EIS will characterize the effect on the source area. Other than the direct change in topography and impact to the existing seafloor in the immediate project area which would result from the groin construction and placement of beach fill, no other direct or indirect impacts to the nearshore seafloor are anticipated. The T-head groin beach stabilization structures will contain the sand fill and prevent its migration to other areas. No land-side work is envisioned.

4.2 CLIMATE & AIR QUALITY IMPACTS

Because most of the work that will take place will be in the water, the proposed project has a limited ability to affect air quality. The EIS will describe construction-related effects (e.g., emissions from internal combustion engines that power construction equipment) in qualitative terms. It will note that a few off-site activities, such as rock quarrying and transport, are involved that have the potential to temporarily decrease air quality in immediately adjacent areas, but a quantitative evaluation of those effects is not contemplated. The discussion will identify the mitigation measures that will be used to ensure that construction-related emissions are kept to the lowest level practicable. The groins and beach will not have any long-term air emissions.

4.3 IMPACTS TO SHORELINE CHARACTERISTICS & PROCESSES

The proposed groins and beaches are located in a discrete shoreline cell, bounded by the Royal Hawaiian groin to the east and the Fort DeRussy storm drain culvert/groin to the west. As discussed in Section 3.3, previous studies (including one prepared specifically for this project) indicate that there is very little interaction between this cell and the adjacent shorelines to either side.

To the east, the Royal Hawaiian beach's stability is a result of impoundment by the Royal Hawaiian groin. The proposed improvements to this groin, including the addition of a T-head, are expected to enhance the stability of the Royal Hawaiian beach.

At present, there is little sand in front of the Sheraton Waikiki. Normal southeast to northwest current patterns along the beach in the project area transport little sand, also due to sand impoundment at the Royal Hawaiian groin. Therefore it is unlikely that construction of the groins will starve the portion of Gray's beach to the west of the project area of any natural nourishment. Instead, the western groin is expected to result in an increase in beach width fronting the Halekūlani, particularly during winter months when westerly wave approach moves sand to the east where it will accrete adjacent to the groin. Sand fill will be placed on both sides of the two outside groins to nourish the shorelines adjacent to the project as well. The EIS will describe the anticipated changes in more detail.

4.4 WATER QUALITY IMPACTS

4.4.1 PROBABLE IMPACTS

Dredging for sand removal, dewatering, construction of the groins, and altered circulation patterns have the ability to have short-term or lasting impacts on water quality in the project area. Some increase in turbidity and suspended solids will occur during both the construction of the groins and the dredging/nourishment operations. Secondary water quality responses during this period could also include: (1) a decrease in dissolved oxygen concentrations as a result of sediment disturbance and/or the decrease in water clarity; (2) an increase in nitrogen and phosphorus levels in the project area from the sediment disturbance; and (3) possibility some slight changes in pH. Oil and grease discharge from the barge/dredging system could also occur. These water quality changes will be temporary, lasting only during the construction period. They will also be localized, occurring largely in water immediately adjacent to whatever construction activity is ongoing at the time.

Turbidity and suspended solids levels should show a marked improvement in the post implementation period. By their configuration, the groins will reduce wave action on the beach fronting the Sheraton and will also reduce longshore water (and hence sand) transport in that area. Water circulation within the newly created groined areas will be somewhat reduced compared with existing conditions. This will have the affect of increasing overall water residence time in these areas. If significant storm runoff into these areas does occur (which is not anticipated), any entrained pollutants would not flushed out into the open waters of Māmala Bay as quickly as they are now.

To characterize the water quality and establish baseline conditions in the project area, AECOS will establish five water quality stations and will collect samples during dry and rainy periods. Water quality samples will be collected from the surface. Salinity, dissolved oxygen, temperature, pH, turbidity, total suspended solids, chlorophyll α, nitrate+nitrite, ammonia, total nitrogen, and total phosphorus will be analyzed. The *Draft EIS* for the project will present the results of the baseline water quality analysis.

4.4.2 PROPOSED MONITORING & MITIGATION MEASURES

Sediment plumes from construction in shallow nearshore waters will be contained by the use of silt curtains. Sand will only be placed following construction of the T-head groins. This will minimize turbidity by reducing wave energy at the beach and allowing more effective containment with silt curtains. The temporary increases in turbidity and suspended sediments as a result of construction activities will cease once the project is complete. Water quality monitoring will be conducted during the construction period to confirm that construction-related activities do not lead to an exceedance of State water quality standards outside the construction area. If exceedances are detected, corrective action will be taken. The EIS will describe the mitigation measures that will be used and the water quality monitoring program that will be conducted during construction in more detail.

The contractor will employ Best Management Practices (BMPs) for construction in coastal waters. These practices, which will be detailed in the environmental impact statement, will include such things as daily inspection of equipment for conditions that could cause spills or leaks; cleaning of equipment prior to deployment near the water; proper location of storage, refueling, and servicing sites; implementation of adequate spill response, storm weather preparation plans, and the use of silt curtains to minimize potential impacts.

4.5 CHANGES IN SUSCEPTIBILITY TO HAZARDS

The proposed project will extend the shoreline seaward, increasing the space between the water and land-side development. This will increase the ability to tolerate storm waves without damage to structures, including the existing seawall. It will not have a significant effect on tsunami run-up.

Neither will the rock groins or sand beach be susceptible to damage in the event of an earthquake. The EIS will contain an expanded discussion of this point, but no separate analyses are planned.

4.6 BIOLOGICAL EFFECTS

4.6.1 EFFECTS ON MARINE BIOTA

Kyo-ya has retained AECOS, Inc. to conduct pre, during, and post-construction monitoring of marine biota to determine potential impacts and appropriate mitigation measures. The proposed monitoring program and preliminary mitigation measures based on current literature are outlined below, and the location of the proposed monitoring transects and stations are shown on Figure 4.1.

4.6.1.1 Benthos (Coral, other macroinvertebrates, algae)

AECOS will conduct preliminary surveys in the project area to characterize the benthos, with particular emphasis placed in and around the Halekūlani Channel, in the proposed dredging pipeline zone, and in the proposed "footprints" of the sand and groins. The extent of algae species in the project area that are preferred food of the green sea turtle will be determined. Quantitative surveys will be conducted in the proposed footprints of the sand and groins and the area of coral reef habitat, percent coverage of coral and algae, and the size distributions of coral colonies that will be lost to the development will be determined. The surveys will also locate any ecologically sensitive habitats that must be avoided during construction, such as dense coral aggregations and sea turtle feeding or resting areas. A species list of corals, other macroinvertebrates, and macroalgae in the area will be generated.

4.6.1.2 Turtles

As discussed in Section 3.6.1 above, the project area is a popular foraging area for Federally protected green sea turtles. Potential impacts to turtles from construction of the project could include disturbance of turtle congregation and resting areas and loss of macroalgae, which serves as a food source. Both of these impacts are expected to be temporary in nature. However, once in place, the replenished beach could attract a greater number of swimmers to the area, which may also impact the frequency and intensity of turtle usage of the area.

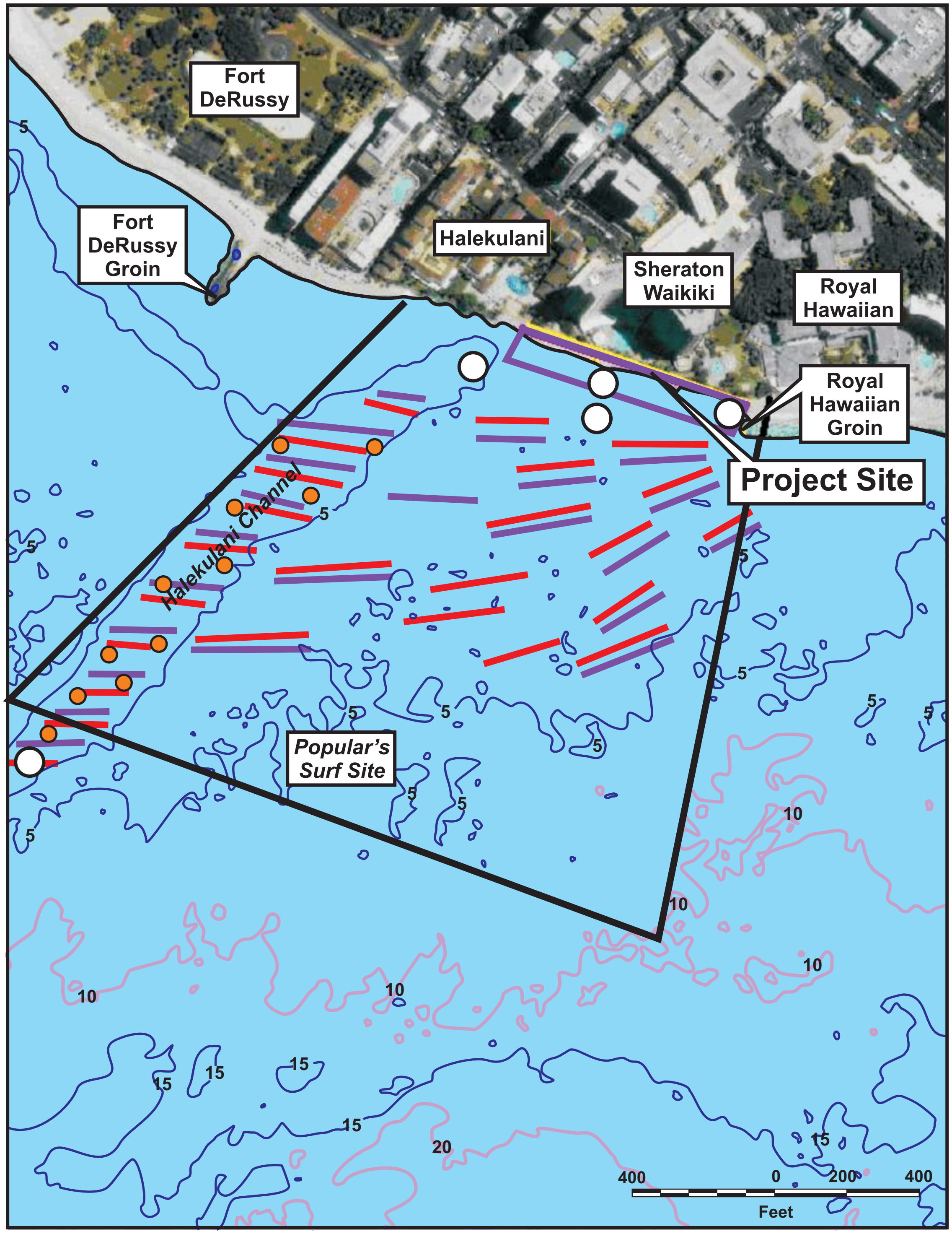
A survey of turtles in the area will be conducted before the project commences to determine turtle behavior and utilization of the reef. The survey will determine if there are turtle "congregation" areas or "sleeping holes" that could be impacted by construction.

The turtle surveys will be conducted over a period of three days in the early morning, at noon, and early in the evening (dusk). The observations will be made from a room in the Sheraton Waikiki Hotel several stories above the beach. The project area will be subdivided into five subsections and 15-minute counts will be made in each section. Turtles surfacing during a 15-minute count will be recorded by location on a map, and the data entered by zone. The turtle surveys will also record the number of swimmers in the water and their activity and note any human-turtle interactions. After each survey, swims will be made in the project area to identify resources or areas preferred by turtles.

4.6.1.3 Infauna

Benthic infauna live in sediment within soft substrate areas such as the Halekūlani Channel and other sand deposits offshore Waikīkī. Benthic infauna provide a significant food source for larger invertebrates and fish and this resource will be removed during dredging operations. Because of their low mobility, benthic animals take some time to recolonize an area, so monitoring the benthic community in the sand channel will indicate the extent recovery of an area.

Several samples will be collected from the Halekūlani Channel. Samples will be collected using an Elkman grab sampler and the sand will be floated through a 1.0 mm sieve to separate small benthic organism. The organisms will be enumerated and identified to the family level.



Prepared For:

Kyo-ya Hotels & Resorts, LP

Prepared By:

PLANNING SOLUTIONS

Source:

AECOS, Inc.
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Figure 4.1:

Biological Monitoring Stations

Gray's Beach Restoration Project

Figure 4-1 BiologicalMonitoring Stations for AECOS 2007-09-18.cdr

4.6.1.4 Fishes

The nearshore fish community of Waikīkī is fairly depauparate, although certain species are common and some recreational fishing does occur from the shore and existing groins. The nourishment project is not anticipated to have a large impact on the fish community although some habitat will be lost from dredging, some nearshore habitat will be converted to beach, and fishing pressure may be increased after the groins are constructed.

Fish populations will be quantified in the area using standard visual belt transects (Brock, 1954) and will record species, quantity, and total fish length. All fish will be identified to the lowest taxon possible. Trophic levels (piscivores, herbivores, detritivores, mobile and sessile invertebrate feeders, and zooplanktivores) will be assigned to the identified fish. The surveys will likely miss seasonal, cryptic, nocturnal, and burrow-inhabiting fishes.

Several fish transects will be conducted on the reef flat, in the Halekulani Channel because the sand channel may be important foraging and resting habitat for fishes such as juvenile goatfish (weke), and in the areas where the sand and groins will be placed.

4.6.2 EFFECTS ON TERRESTRIAL BIOTA

As indicated in Section 3.6.2, there is almost no terrestrial biota in the area that would be affected by the proposed action. The EIS will document this briefly, noting if any plantings will have to be relocated to provide construction equipment access and the kind of restoration that is planned when work is completed.

4.7 NOISE IMPACTS

Construction Period. Installation of the groins will involve truck transport of rock from the quarry to the work site. Most of this will be along public roadways and the vehicle movements associated with it will be a tiny fraction of the overall traffic volume. Material transport from Kalia Road to the shoreline will be more challenging, and the exact construction methods have not yet been settled. All of them involve the use of motorized equipment, however, and this equipment will produce noise. Similarly, large construction equipment will be needed to emplace the rock for the groins, and this equipment will operate close to public areas of the hotel, hotel rooms, and the public pedestrian right-of-way along the shoreline.

The EIS will identify the activities associated with construction and operation of the various facilities that have the potential to cause significant amounts of noise. It will characterize these potential noise events with respect to their loudness, location, and duration. It will outline measures that would be taken to minimize unnecessary noise from these activities, and it will discuss the extent to which construction activities can comply with applicable noise limits. The EIS will evaluate whether a noise variance is likely to be needed during construction.

Operational Period. Once construction is completed, the proposed improvements themselves will not be a source of noise. Hence, the only source of post-construction noise will be from the activities that take place on the beach. These are subject to regulation and will not differ measurably from noise from activities that take place elsewhere along the Waikīkī shoreline. The EIS will document this conclusion.

4.8 EFFECTS ON HISTORIC, CULTURAL, & ARCHAEOLOGICAL RESOURCES

Cultural Surveys Hawaiʻi (CSH) will conduct the Cultural Impact Assessment (CIA) for the Gray's Beach Restoration Project at the Sheraton Waikiki. The proposed cultural study and report will conform to the State Office of Environmental Quality Control (OEQC) guidelines for preparation of cultural impact studies. The scope for the cultural impact assessment is summarized as follows:

- CSH will research historical documents, maps and existing archaeological information pertaining to the sites in the vicinity of the project at the State Historic Preservation Division library and the Cultural Surveys Hawai'i library. Information on Land Commission Awards will be accessed through Waihona Aina Corporation's Māhele Data Base (www.waihona.com). The State Historic Preservation Division, Office of Hawaiian Affairs, O'ahu Island Burial Council, and members of other community organizations (e.g. surfing and fishing clubs, Waikīkī community associations and Neighborhood Board, etc.) will be contacted in order to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the study area and the surrounding vicinity. The names for potential community contacts will also be drawn from past CSH cultural studies in or near the project area.
- CSH staff will interview persons knowledgeable about the past and present cultural practices in the project area and its surrounding area. It anticipates both formal and informal interviews with community *kūpuna* (elders) and *kama'āina* (native-born) during its cultural assessment studies. The CSH cultural specialist/s conducting research on this assessment will employ snowball and judgment sampling methods, an informed consent process, and semi-structured interviews according to standard ethnographic methods.
- To assist in discussion of nearshore natural and cultural resources and cultural practices specific to the project area, CSH will initiate "talk-story" session questions from six broad categories. The categories include: Wahi Pana (storied places), Burials and Historic Properties, Recreational Activities (surfing, swimming, snorkeling, skin diving, canoeing, sailing, etc.), Plant Gathering, and Marine and Fresh Water Resources (limu-gathering, fishing). CSH will pay particular attention to cultural considerations pertaining to possible effects on *honu* (green sea turtle) feeding habitat and other secondary impacts from the proposed development.

4.9 LAND USE AND SOCIO-ECONOMIC EFFECTS

The proposed shoreline improvements will create a beach where none presently exists. Their construction and operation will not alter the existing land use pattern. As discussed further in Section 4.10 below, the presence of the beach is likely to attract many swimmers and sunbathers who do not presently use the area, however. This could affect the level of commercial activity on immediately neighboring properties, and the EIS will discuss the nature and extent of these changes.

The direct socio-economic effects of the proposed facilities are limited principally to construction employment and related business activity. The employment and business expenditures are not large enough to affect the larger socio-economic context of the area. Similarly, the presence and ongoing use of the beach would, if anything, have a positive effect on property values in the immediate or extended area. The EIS will note this, but it will not contain a quantitative analysis of this effect.

4.10 RECREATIONAL IMPACTS

The project is designed to restore a recreational beach to the shoreline in front of the Sheraton Waikiki, approximately 500 feet long and 75 feet wide above the high tide line. This will create approximately 45,000 square feet of usable beach, enough to accommodate about 600 beach goers. It will also greatly improve lateral access along the shore. The beach will be accessible via the existing public beach access right-of-way between the Sheraton and the Halekūlani, and the Sheraton has plans to provide a new public comfort station adjacent to the access.

4.10.1 IMPACTS ON SUNBATHING AND SWIMMING OPPORTUNITIES

This project is designed to restore a recreational beach to the shoreline in front of the Sheraton Waikiki. The project will restore a beach that is typically about 75 feet wide, depending on tide level and wave activity. This equates to a beach area of about 45,000 square feet (1 acre), sufficient to accommodate about 600 people. The project will therefore have a significant beneficial impact to primary recreational activities at Waikīkī – sunbathing and walking. This availability of permanently dry beach will dramatically ease congestion along the walkway fronting the Sheraton.

The proposed project will not create an extensive new swimming area, but it will provide a sandy bottom for wading up to the existing reef depth of –2 to –4 feet and the protection afforded by the groins may allow limited swimming within their confines. Beyond this, swimmers and waders will be walking on the existing, irregular shallow reef bottom, which will remain a strong deterrent to wading and swimming.

4.10.2 IMPACTS ON SURFING & OTHER OCEAN RECREATION

A major concern for groins and other shore protection features is the extent to which they may reflect waves, propagating them back seaward toward surf sites. To assess possible reflected wave impacts, a numerical wave analysis was completed, comparing calculated wave reflection from the existing vertical seawall to possible wave reflection from the groin structure T-heads.

Section 2.2.2.1 of this report describes prevailing wave characteristics in Waikīkī and at the project site. The most frequently occurring waves were from the south, occurring 60% of the time during the summer, and 40% of the time during the winter. Deepwater waves from the south, with periods of 12 seconds and 16 seconds were therefore selected for the wave reflection analysis. The numerical wave model REF/DIF1 was used to transform the deepwater waves and determine the nearshore wave heights at the groin T-heads. Table 2.4 presents the computed wave heights at the structures; wave heights range from 1 to 3.2 feet. Corresponding breaking wave heights at the surf site Populars are 4 to 6 feet.

Sea Engineering Inc. analyzed the reflected waves by determining the wave propagation paths and heights as they reflect off the structure T-heads using a methodology described in the Shore Protection Manual (1984) that accounts for the process of wave reflection, diffraction, and shoaling.[12] Wave refraction was not included because the reef area was represented as a generally flat bottom in the model. Wave energy dissipation due to wave breaking and bottom friction is not included because it is a minor consideration for reflected waves. The procedure is based on the following:

- The empirical wave reflection coefficients for a rubble-mound structure are graphically presented as a function of the surf similarity parameter, which depends on the structure slope, the deepwater wave length and the incident wave height at the structure.
- A side slope of 1V:1.5H was used for the groin T-heads. The surf similarity parameter was adjusted for the wave approach angle to the structure (an oblique angle) by reducing the structure slope.
- The lateral wave energy spreading along the wave crests of the reflected waves was approximated by using the diffraction diagrams for waves entering a harbor through a gap between two breakwaters. The diffraction coefficient depends on the incident wave direction, the lateral distance, and the gap width, which are scaled relative to the wave length. For this analysis, the groin head length was considered as a breakwater gap, and the gap was adjusted accordingly for the oblique wave angle approach to the structure. The relative gaps for the groin-heads ranges from 0.12 to 0.64. The diffraction coefficients are interpolated by using the diffraction diagrams for the gaps of 0.5 and 1.0.
- The shoaling effect exists when there is a water depth difference between the surf site and the groin head location. In this case, changes in water depth over the reef are small, and wave shoaling effects are minor.

[12] The beach stabilization structure system consists of three T-headed groins. The groin heads are each aligned in slightly different orientations. Thus, an approaching wave can be reflected from 6 surfaces (each of the 3 groins has 2 head segments that may be aligned slightly differently).

Table 4.1 presents the model calculated wave heights at the six T-head segments. Wave heights range from 1 to 3.2 feet. Table 4.2 and Table 4.3 present the wave shoaling and reflection coefficients used in the reflection analysis for the T-head groins.

A similar wave analysis was completed for waves reflecting off of the existing vertical seawall at the site. A wave height of 2.5 feet at the wall, corresponding to a water depth of 3.6 feet, was used for this analysis. Waves were assumed to reflect off the vertical surface without loss of energy. Table 4.4 shows wave parameters used for the vertical wall reflection.

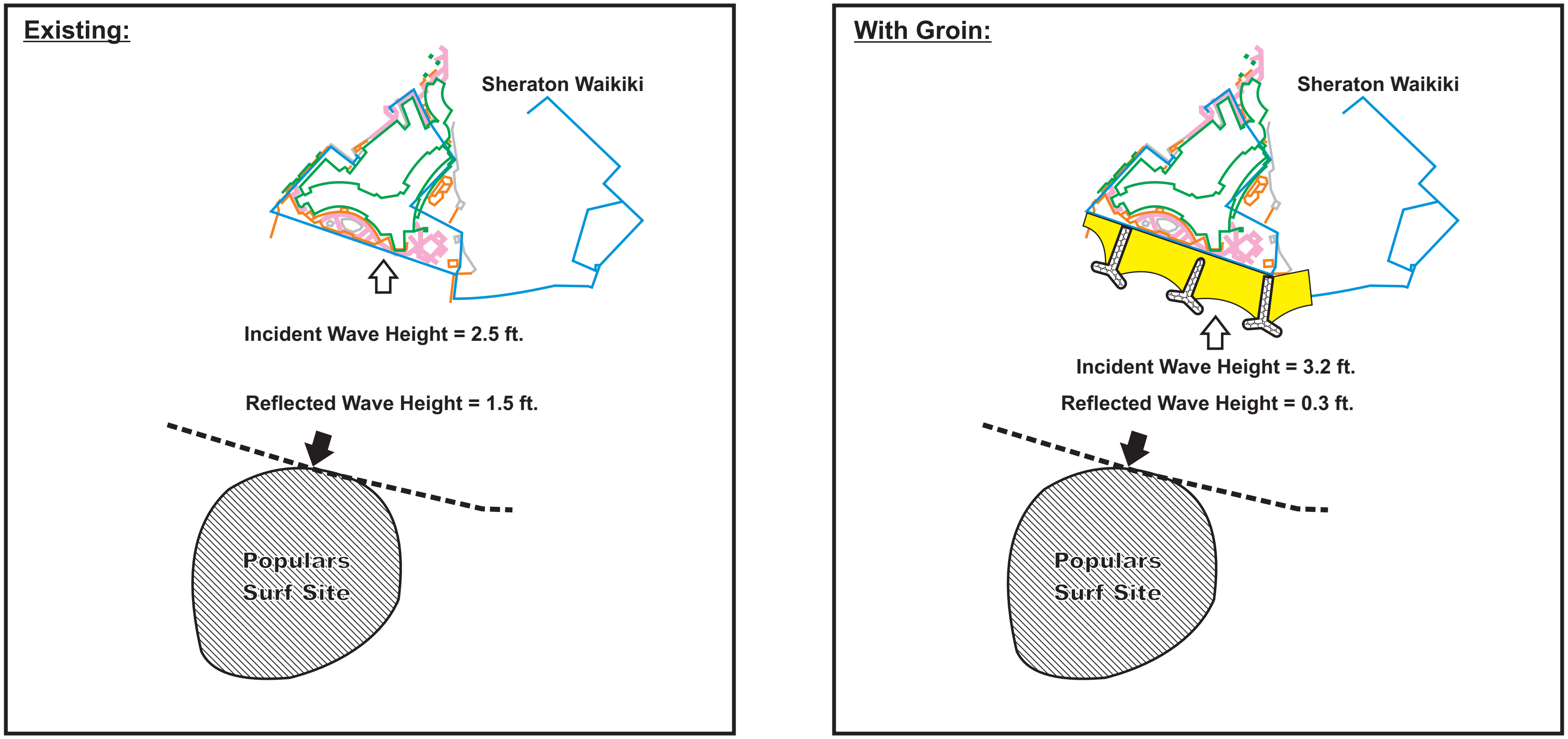
Table 4.5 and Figure 4.2 present the results of the reflection analysis. The table shows that the T-head groin reflected wave height in the vicinity of the surf break Populars is estimated to be 0.3 feet. By contrast, the reflected wave height for the present condition (vertical seawall) is estimated to be 1.5 feet. Thus, numerical analysis indicates that the proposed project should significantly reduce reflected wave energy in the vicinity of the surf break. This is intuitively expected because 520 feet of vertical seawall will be replaced by 320 feet of sand beach and 200 feet of T-head groins. Vertical seawalls offer a nearly perfect reflecting surface, while the sand beach will not reflect any significant amount of wave energy, and the T-head groins are designed to be sloping and porous to minimize wave reflection.

The typical landward-most extent of the surf site Populars is located approximately 800 feet seaward of the existing seawall fronting the Sheraton Waikiki, and would be about 600 feet from the proposed groin heads. The existing seawall results in significant wave reflection back toward the offshore area, particularly during high tide and periods of high surf. Replacing the seawall with a non-reflective beach and porous energy dissipating rock groins will reduce the wave reflection by an estimated 80%. The EIS will discuss this in detail and will document the coordination that Kyo-ya has carried out with representative surfing interest groups.

Other existing recreational activities such as snorkeling, canoeing, kayaking and wave ski riding should not be negatively impacted by the proposed project. Preliminary research indicates that these activities will likely benefit from the improved access to the water provided by the wide sand beach, and this topic will be discussed further in the EIS. This portion of the analysis will pay special attention to the sand dredging portion of the project because it will occur closest to surfing areas.

4.10.3 IMPACTS ON CATAMARAN RIDES, BOATING AND BEACH CONCESSIONS

The proposed project may affect the operations of the Maitaʻi catamaran, which accesses its loading space on the eastern half of Gray's Beach through the Halekūlani Channel. The extent of the effect will be determined by how far west the proposed beach extends and the location of the westernmost groin. The catamaran is 45 feet long and backs out in an easterly direction to depart the beach. Based on initial discussions regarding the catamaran's operations, the location of the westernmost groin has already been shifted to the east to provide additional room for the catamaran operations. Discussions with the catamaran operators are continuing, in an effort to minimize possible impacts and the EIS will describe the results of this mitigation effort.



Prepared For:

Kyo-ya Hotels & Resorts, LP

Prepared By:

PLANNING SOLUTIONS

Source:

Sea Engineering, Inc.

300 0 20 300 600

Feet

Figure 4.2:

Wave Reflection for Existing Conditions & Proposed Project

Gray's Beach Restoration Project

Figure 4-2 Wave Reflection for Existing Conditions & Proposed Project 2007-09-11.cdr

Table 4.1. Incident Wave Heights (feet) at Groin-Heads

Groin Head ID	*S-12*	*S-16*
LW	2.9	2.4
LM	3.2	3.2
LE	1.0	1.9
RW	2.9	2.4
RM	3.2	3.2
RE	1.0	1.9

Table Notes:
S-12: South deepwater wave with a period of 12 seconds;
S-16: South deepwater wave with a period of 16 seconds

Groin Head ID
LW: Left groin Head at the west groin
LM: Left groin Head at the middle groin
LE: Left groin Head at the east groin
RW: Right groin Head at the west groin
RM: Right groin Head at the middle groin
RE: Right groin Head at the east groin
(Note: Right or Left looking toward shore)

Source: Sea Engineering, Inc. (2007), Table 6-1.

Table 4.2. Wave Reflection Coefficients at Groin-Heads

Groin Head ID	*S-12*	*S-16*
LW	0.60	0.66
LM	0.59	0.64
LE	0.68	0.65
RW	0.56	0.62
RM	-	-
RE	0.70	0.69

Source: Sea Engineering, Inc. (2007), Table 6-2.

Table 4.3. Wave Shoaling Coefficients at Groin-Heads

Groin Head ID	*S-12*	*S-16*
LW	1.51	1.74
LM	1.55	1.79
LE	1.58	1.81
RW	1.51	1.74
RM	1.55	1.79
RE	1.58	1.81

Source: Sea Engineering, Inc. (2007), Table 6-3.

Table 4.4. Parameters of Waves Reflected on the Existing Vertical Wall

Parameters	*S-12*	*S-16*
Incident wave height at vertical wall (ft)	2.5	2.5
Reflection coefficient	1.0	1.0
Wave shoaling factor	0.89	0.89
Diffraction coefficient	0.63	0.70
Source: Sea Engineering, Inc. (2007), Table 6-4.		

Table 4.5. Maximum Reflected Wave Heights (feet) at Offshore Surf Site

Reflected from	S-12	S-16
Groins	0.3	0.3
Vertical wall	1.4	1.6
Source: Sea Engineering, Inc. (2007), Table 6-5.		

4.11 VISUAL IMPACTS

Construction of the groins and emplacement of the sand will involve the use of heavy construction equipment. This equipment will be present along the shoreline for several months and will detract from the beauty of the area. However, the beach restoration project will be accomplished concurrently with the construction of planned extensive renovation of the Sheraton Waikiki grounds and backshore area. The barge from which the sand dredging will be conducted will be present for up to 2 months and will be visible as well. It will be closest, and therefore most visible from, the Populars surf site; its distance from land will make it less intrusive to people walking along the shoreline. The EIS will briefly describe the nature of these temporary changes and the areas from which they would be visible. It will also characterize the duration of the change and place this within the perspective of other work that has taken place in the area.

Once construction is completed, the rock groins will be visible from beach and offshore areas, as well as higher buildings and vantage points. Figure 4.3 and Figure 4.4 include renderings depicting the appearance of the proposed groins and beach replenishment from aerial and ground-level vantage points. The EIS will describe the vantage points from which the project will be visible, and will discuss what impacts the proposed groins and beach replenishment will have on the scenic qualities of Waikīkī Beach.

4.12 IMPACTS ON PUBLIC INFRASTRUCTURE AND SERVICES

The proposed Gray's Beach Restoration Project has little potential to affect public infrastructure and services. It does not require water or electrical power. In and of itself, it does not generate a need for additional sanitary wastewater collection and treatment facilities and it would not affect stormwater runoff that might impact the City's stormwater system. Most users would likely come by foot rather than in vehicles, and the improvements are not expected to increase the resident or visitor population of the island.

The proposed project does not involve any activities that would permanently alter the need for, or ability to provide, emergency services. Police, Fire Department, and Emergency Medical Services will be informed of the project construction schedule and apprised of the emergency vehicle access routes to be used during construction. The contractor will be required to provide ample clearance to emergency vehicles at all times. The EIS will document this.

Existing View

Post-Construction Rendering

Prepared For:

Kyo-ya Hotels & Resorts, LP

Prepared By:

PLANNING SOLUTIONS

Sources:

Sea Engineering, Inc.

Figure 4.3:

Existing & Post-Construction Aerial Views

Gray's Beach Restoration Project

Figure 4-3 Pre- & post-Project Aerial Views 2008-07-22.cdr

Existing Beach View

Post-Construction Rendering

Prepared For:

Kyo-ya Hotels & Resorts, LP

Prepared By:

PLANNING SOLUTIONS

Sources:

Sea Engineering, Inc.

Figure 4.4:

Existing & Post-Construction Beach Level Views

Gray's Beach Restoration Project

Figure 4-4 Pre- & post-Project Beach Views 2008-07-22.cdr

POTENTIAL IMPACTS

The project would generate construction-vehicle traffic on Kalia Road. The volume would be no more than 10-20 vehicle-trips per day for most of the construction period. However, when the stone needed for the groins is being trucked in, the number of trips will increase substantially. The EIS will estimate the volume, describe the route, and discuss the measures that will be taken to control the trucks so as to minimize adverse effects on other users.

5.0 DETERMINATION

5.1 NEED FOR A STATE (CHAPTER 343) EIS

5.1.1 CHAPTER 343 DETERMINATION CRITERIA

Chapter 343, Hawai'i Revised Statutes (HRS), and Hawai'i Administrative Rules (HAR) §11-200 establish certain categories of action that require the agency processing an applicant's request for approval to prepare an environmental assessment. HAR §11-200-11.2 establishes procedures for determining if an environmental assessment (EA) is sufficient or if an environmental impact statement (EIS) should be prepared for actions that may have a significant effect on the environment. HAR §11-200-12 lists the following criteria to be used in making such a determination. An EIS is required if the proposed project:

- Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;
- Curtails the range of beneficial uses of the environment;
- Conflicts with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders;
- Substantially affects the economic or social welfare of the community or State;
- Substantially affects public health;
- Involves substantial secondary impacts, such as population changes or effects on public facilities;
- Involves a substantial degradation of environmental quality;
- Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions;
- Substantially affects a rare, threatened, or endangered species, or its habitat;
- Detrimentally affects air or water quality or ambient noise levels;
- Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters;
- Substantially affects scenic vistas and view planes identified in county or state plans or studies; or
- Requires substantial energy consumption.

5.1.2 CHAPTER 343 HRS DETERMINATION

In accordance with the potential impacts outlined in Chapter 4, the provisions of Chapter 343, Hawai'i Revised Statutes and the significance criteria described above, the Office of Conservation and Coastal Lands of the State of Hawai'i Department of Land and Natural Resources determined that the proposed action could have potentially significant impacts and that these should be evaluated and discussed by preparing an environmental impact statement in accordance with Chapter 343 and HAR 11-200.

5.2 NEED FOR A FEDERAL (NEPA) EIS

40 CFR §1502.3 establishes the statutory requirements for environmental impact statements at the Federal level. It provides that NEPA environmental impact statements (§1508.11) are to be included in every recommendation or report for proposals that involve legislation or other "major Federal actions" [§1508.18] significantly [§§1508.3, 1508.8] affecting the quality of the human environment.

§1508.18 defines a "major Federal action" as actions with effects that may be major and which are potentially subject to Federal control and responsibility. Major reinforces but does not have a meaning independent of significantly (§1508.27). Actions include "*...new and continuing activities, including projects…entirely or partly ...regulated, or approved by federal agencies….Projects include actions approved by permit or other regulatory decision….*"

After completing its review of the Department of the Army Permit application that the applicant submitted to it on July 23, 2008, the Honolulu District of the COE reaffirmed the decision originally provided in its July 1, 2008, letter to the project engineer that the proposed project has the potential to significantly affect the quality of the human environment and that a Federal EIS would, therefore, be needed for processing of the required DA permit application. That same letter advised that the document should be a joint Federal and State document to avoid duplication as specified in NEPA implementing regulations (40 CFR 1506.2) and indicated that it would initiate a formal scoping process in accordance with 40 CFR §1501.7.

6.0 CONSULTATION & DISTRIBUTION

6.1 CONSULTATION

The consultation activities and coordination with agencies, organizations and individuals that Kyo-ya has already undertaken is summarized in Table 6.1 below. The names of individuals and organizations invited to attend the scoping meetings who actually attended or sent representatives are indicated by asterisks.

6.2 EA/EISPN DISTRIBUTION

Kyo-ya will distribute this EISPN to the individuals and organizations listed in Table 6.2 and request their comments on the proposed scope of the analysis and on the completeness of the alternatives that Kyo-ya proposes to evaluate. It will provide a limited number of loan copies to libraries.

6.3 NOTICE OF INTENT

After formally receiving the applicant's permit application, the COE prepared a Notice of Intent for publication in the *Federal Register*. Publication of NOI will initiate a public scoping process that will run generally concurrently with the initial public review period that is part of the State of Hawai'i Chapter 343 EIS process.

Table 6.1. Agencies and Individuals Invited to Consult During EA/EISPN Preparation

Project Presentation Meetings with Local Stakeholders (July 23, 2007 and August 4, 2008)
Ala Wai Watershed Association (Karen Ah Mai)* Van Horn Diamond (Diamond Ohana) Hawaii Historic Foundation (Kirsten Faulkner) Hawaii Hotel & Lodging Association (Murray Towill)** H.E.R.E. Local 5 (Eric Gill*, Eric Emerson, Marsha Bruhn, Cade Watanabe*) Paulette & Jerry Kaleikini (Kaleikini Ohana)* Kui'walu (Lani Lapalio)* The Nature Conservancy of Hawaii (Suzanne Case) Office of Conservation & Coastal Lands, State DLNR (Sam Lemmo) Office of Hawaiian Affairs (Clyde Nāmu'o, Jason Jeremiah, Sterling Wong, Grant Arnold*, Jerome Yasuhara*) The Outdoor Circle (Mary Steiner) Outrigger Enterprises (Dr. Chuck Kelley)* Save Our Surf (George Downing) Sierra Club (Jeff Mikulina) (Sierra Club) Surfrider Foundation (Marvin Heskett, Scott Werny, Stuart Coleman)* U.H. Seagrant College Program (Dolan Eversole)* U.H. Seagrant Extension Agent for Waikīkī (Jennifer Barrett)* Waikīkī Improvement Association (Rick Egged)** Waikīkī Business Improvement District Association (Jan Yamane)** Waikīkī Neighborhood Board (Bob Finley)** Waikīkī Residents Association (Bob Kessler*, Michelle Matson) Waikīkī Aquarium (Andrew Rossiter) Emalia & Ka'imi Keohokālole (Keohokālole Ohana)* Clyde Aikau (Waikīkī concessionaire and surfer)* Didi Robello (Waikīkī beach boy and concessionaire)** Heidi Vasquez (Beach Activities of Maui/UV Rays)* Marsha Wienert (State Tourism Liaison) Alan Wolenski (Beach Activities of Maui)*
Note: Asterisks indicate those who attended the meetings – two asterisks indicates attendance at both meetings.

EIS Preparation Notice Agency Scoping Meeting (July 24, 2007)
Federal: • U.S. Army Corps of Engineers, Honolulu District, Regulatory Branch* • U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office • NOAA, National Marine Fisheries Service, Pacific Islands Regional Office* • Pacific Islands Environmental Coordinator • U.S. Geological Service, Water Resources Division • Department of Agriculture, Natural Resources Conservation Service • U.S. Environmental Protection Agency, Region IX, Honolulu Branch State: • Office of Environmental Quality Control • Department of Land and Natural Resources - Office of Conservation and Coastal Lands* - Aquatic Resources Division - Historic Preservation Division - Division of Boating and Ocean Recreation • Department of Health, Clean Water Branch* • DBEDT, Office of Planning, Coastal Zone Management Program • University of Hawai'i at Mānoa, Environmental Center • Office of Hawaiian Affairs City & County of Honolulu: • Department of Planning and Permitting • Department of Parks and Recreation • Emergency Services Department, Ocean Safety & Lifeguard Services
Other consultation:
City & County, Department of Planning and Permitting, Office of the Deputy Director State Department of Land and Natural Resources - Office of Conservation and Coastal Lands - Land Division - Division of Aquatic Resources - Division of Boating and Ocean Recreation NOAA, National Marine Fisheries Service, Pacific Islands Area Office Surfrider Foundation, Oahu Chapter, Executive Board meeting Ala Wai Watershed Association
Note: Asterisks indicate those who actually attended the meetings – two asterisks indicates attendance at both meetings.
Source: Sea Engineering, Inc. (2007)

Table 6.2. EA/EISPN Distribution List

City and County of Honolulu	**Libraries and Depositories**
Board of Water Supply	DBEDT Library
Department of Design and Construction	Waikīkī-Kapahulu Public Library
Department of Environmental Services	Hawai'i State Library Documents Center (2 copies)
Department of Facility Maintenance	Library, Honolulu Department of Customer Services
Department of Parks and Recreation	Legislative Reference Bureau
Department of Planning & Permitting (5 copies)	Kaimuki Regional Library
Department of Transportation Services	UH Hamilton Library
Fire Department	
Police Department	**Elected Officials**
Department of Emergency Services, Ocean Safety	US Representative Neil Abercrombie
	U.S. Senator Daniel K. Inouye
State Agencies	U.S. Senator Daniel Akaka
Commission on Water Resource Management	State Senator Les Ihara Jr.
Department of Defense	State Senator Gordon Trimble
Department of Hawaiian Homelands	State Representative Tom Brower
Office of Environmental Quality Control (4 copies)	State Representative Scott Nishimoto
Office of Hawaiian Affairs	County Councilmember Charles Djou
Department of Accounting and General Services	Waikīkī Neighborhood Board Chair Robert Finley
Dept of Business, Economic Development, & Tourism	
DBEDT Coastal Zone Management Program	**Other Parties**
Dept of Health, Env Planning Office (3 copies)	Surfrider Foundation, O'ahu Chapter
Department of Land and Natural Resources (5 copies)	O'ahu Island Burial Council
Department of Transportation	Ala Wai Watershed Association
DLNR Historic Preservation Division	Keohokālole Ohana
State Tourism Liaison	Diamond Ohana
UH Environmental Center	Kaleikini Ohana
UH Seagrant Program	H.E.R.E. Local 5
UH Marine Programs	Clyde Aikau (Waikīkī concessionaire and surfer)
	Aloha Beach Services
Federal Agencies	Beach Acitivities of Maui/UV Rays
Environmental Protection Agency (PICO)	Outrigger Enterprises
NOAA National Marine Fisheries Service	Hawaii Historic Foundation
US Fish and Wildlife Service, Pacific Islands Office	Save Our Surf
US Geological Service, Water Resources Division	Sierra Club
US Natural Resources Conservation Service	The Nature Conservancy of Hawaii
US Coast Guard	Waikīkī Improvement Association
US Navy	Waikīkī Business Improvement District Association
Pacific Islands Environmental Coordinator	Hawaii Hotel & Lodging Association
	Waikīkī Residents Association
	Waikīkī Aquarium
Local Utilities	The Outdoor Circle
Hawaiian Electric Company, Inc.	Honolulu Advertiser
	Honolulu Star-Bulletin
Source: Compiled by Planning Solutions, Inc.	

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