FINAL PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

Waikīkī Beach Improvement and Maintenance Program

October 2024

Prepared for:
Hawai'i Department of Land and Natural Resources
Office of Conservation and Coastal Lands
1151 Punchbowl Street, Suite 131
Honolulu, Hawai'i 96813

Partnered with:
Waikīkī Beach Special Improvement District Association
2250 Kalākaua Ave. Suite 315
Honolulu, Hawai'i 96815

Prepared by:
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VOLUME II

Appendices A through H

Waikīkī Beach Improvement and Maintenance Program

Prepared By: Sea Engineering, Inc.

LIST OF APPENDICES

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APPENDIX A

Waikīkī Beach Community Advisory Committee

Prepared By: Sea Engineering, Inc.

WAIKĪKĪ BEACH COMMUNITY ADVISORY COMMITTEE EXECUTIVE SUMMARY

BACKGROUND

Waikīkī Beach is a globally recognized icon of Hawai‘i and is the state’s largest tourist destination. Waikīkī Beach also has tremendous cultural significance and is the birthplace of the sport and culture of surfing. The beaches, reef ecosystems, and myriad world-renowned surf breaks are valuable natural resources that support the culture and lifestyle of Hawai‘i, and the idyllic image of Waikīkī.

Waikīkī Beach is a highly engineered urban shoreline with the modern configuration largely the result of past management efforts (e.g., groins, seawall, and sand fill) intended to widen the beach.

Many sections of Waikīkī Beach are substantially narrowed or completely lost due to chronic beach erosion, lack of coordinated management, and insufficient capital investment. Beach loss results in a variety of negative economic, social, cultural, and environmental impacts. Therefore, it is important to fully understand the cumulative effects of shoreline development, recreational activities, and coastal processes (natural and human-induced) that control the movement of sand within the littoral system.

The Waikīkī Beach Community Advisory Committee will help to address the complex issues associated with beach sustainability by building consensus and identifying and resolving conflicts relating to Waikīkī Beach management. The committee will provide important guidance for planning and prioritizing future beach management projects at Waikīkī.

The State Department of Land and Natural Resources (DLNR) and the Waikīkī Beach Special Improvement District Association (WBSIDA), in partnership with the University of Hawai‘i Sea Grant College Program (UH Sea Grant), seek to assemble a small group key stakeholders to advise the State and County on future beach management and maintenance projects in Waikīkī. For the purposes of this project, we define Waikīkī Beach as the beaches and nearshore coastal zone extending from Kaimana Beach (Natatorium) to Fort DeRussy Beach (Hilton Hawaiian Village). The primary purpose of the advisory committee is to identify and prioritize beach management projects in Waikīkī and to help inform these projects.

Waikīkī Beach Advisory Committee Goals

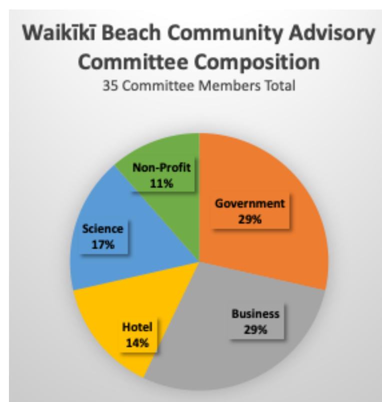
1. Advise the WBSIDA, the DLNR and UH Sea Grant on the development and implementation of a Waikīkī Beach Management Plan.
2. Ensure that future beach management projects address the issues and concerns of the Waikīkī community and local stakeholders.
3. Advise the State, County and stakeholders on beach management projects in Waikīkī.
4. Provide community coordination, education, and outreach efforts about beach management issues and projects in Waikīkī.
5. Provide diverse perspectives and guidance for future beach management and planning activities in Waikīkī.
6. Identify and evaluate alternatives for beach management and maintenance in Waikīkī.

Specific Committee Activities

1. **Meet** semi-annually for updates or more frequently as needed during projects.
2. **Serve as a sounding board** for proposed projects in Waikīkī Beach.
3. **Provide local knowledge and expertise** about important social, cultural, economic and environmental issues related to Waikīkī Beach.
4. **Provide strategic insights** on Waikīkī Beach management and ideas to overcome obstacles, capitalize on opportunities, and support long-term planning.
5. **Facilitate partnerships** with relevant agencies, organizations and individuals.
6. **Serve as community representatives** for specific beach management issues and concerns.

Committee Benefits

Members of the Waikīkī Beach Advisory Committee will benefit from hearing about and collaborating on state-of-the-art research and other project plans being conducted by university researchers and government agencies. Members will also benefit from being part of a network of partners with diverse knowledge and perspectives. All stakeholders will benefit from the external perspectives and strategic thinking provided by diverse individuals. The success of the Advisory Committee would be of mutual benefit to Advisory Committee members by serving as an example of effective early coordination and education for all members and facilitate the early identification of project concerns.



Coordinator Contact Info:

Dolan Eversole
University of Hawaiʻi Sea Grant College Program
Waikiki Beach Management Coordinator
808-956-9780 eversole@hawaii.edu

Waikīkī Beach Community Advisory Committee (April, 2020)
https://www.wbsida.org/waikiki-beach-community-advisory-committee

The Waikīkī Beach Advisory Committee is composed of approximately 35 people from a cross-section of local government, community groups and businesses.

Name	Organization/Business
Agencies & Organizations	
Lauren Blickley	Surfrider Foundation- Regional Manager
Keone Downing	Save our Surf
Rick Egged	Waikīkī Beach Special Improvement District Association
Dolan Eversole	UH Sea Grant (WBSIDA)
Bob Finley	Waikīkī Neighborhood Board
Chip Fletcher	University of Hawaii
Jim Fulton	Duke's Oceanfest/WBSIDA
Shellie Habel	University of Hawaiʻi Sea Grant/DLNR
Jim Howe	C&C Dept of Emergency Services
Kalani Kaanaana	Hawaiʻi Tourism Authority
Guy H. Kaulukukui	C&C of Honolulu Department of Enterprise Services
Sam Lemmo	Department of Land and Natural Resources-OCCL
Michelle Nekota	C&C Parks Department
Rob Porro	University of Hawaiʻi/ NDPTC
Josh Stanbro	C&C Office of Climate Change, Sustainability & Resiliency
Meghan Statts	Oahu District Manager, DLNR/DOBOR
John Tichen	C&C Ocean Safety- Chief
Ed Underwood	Department of Land and Natural Resources-DOBOR
Individuals & Operators	
Brian Benton	Dive and Surf O'ahu
Ted Bush	Waikiki Beach Services
John Clark	Ocean and Beach Expert/Historian
Bob Hampton	Waikīkī Beach Activities
George Kam	HTA/Quiksilver
Mike Kelley	Aqualani Beach and Ocean Recreation
Rus Murakami	Waikiki Beachside Bistro
George Parsons	Maitai Catamaran
Didi Robello	Aloha Beach Services
Soo/Richard Stover	Holokai Catamaran
John Savio	Na Hoku and Manu Kai Catamarans
Hotels	
Connie Deguair	Hilton Hotels
Kelly Hoen	Outrigger Hotels
Corbett Kalama	Weinberg Foundation
Lee Nakahara	Kyo-ya
Fred Orr	Sheraton Hotels
Patty Tam (Neal Sklodowski)	Halekulani

WAIKĪKĪ BEACH COMMUNITY ADVISORY COMMITTEE

Tuesday, November 7, 2017 4:00pm to 5:30pm
Sheraton Princess Kaiulani

Meeting Summary

1. **Meeting Called to Order- Rick Egged (4:07)**

2. **Introductions- Rick Egged (4:10)**
   - Committee structure, framework and geographic extent of the projects.
   - Ground rules and meeting expectations
   - Geographic scope for Waikīkī Beach Improvement projects.

3. **Community Advisory Committee- Dolan Eversole (4:15)**
   - Project Outreach Plan and Composition
   - Public Informational meeting Dec 5^{th} 5pm.
   - Website development

4. **Waikīkī Beach Management Plan- Dolan Eversole (4:20)**
   - Project Background, Goals and Scope
   - Focus is on the "Why" for Waikīkī, the "What" and "How" will come later.
   - Phases of Waikīkī beach Management Plan
   - Goals and scope of the Waikīkī ESI/FS.

5. **Waikīkī EIS & Feasibility Study- Sam Lemmo (4:30)**
   - Project Background- COP 21 Climate Accord meeting in Bonn, Germany
   - Hawaiʻi Climate Change Commission conducting Risk and Vulnerability Assessment for Sea-Level Rise using 3.2 ft of sea-level.
   - Next generation mapping using Sea-Level Rise Exposure area.
   - Mapping indicates beach erosion will accelerate in the future.
   - Waikīkī requires engineering to mitigate the effects of Sea-level rise.
   - Project partnerships are very important to legislative funding requests.
   - Sea Engineering on contract with the State DLNR for the Waikīkī Technical feasibility study/ EIS.
   - WBSIDA is handling the Waikīkī beach Management Plan and public outreach for this project.

6. **Group Discussion top priority for beach issues. (4:40)**
   (See Summary Table and Chart below)

7. **6:10 Meeting Adjourned**

8. **Next Meeting planned for February, 2018.**

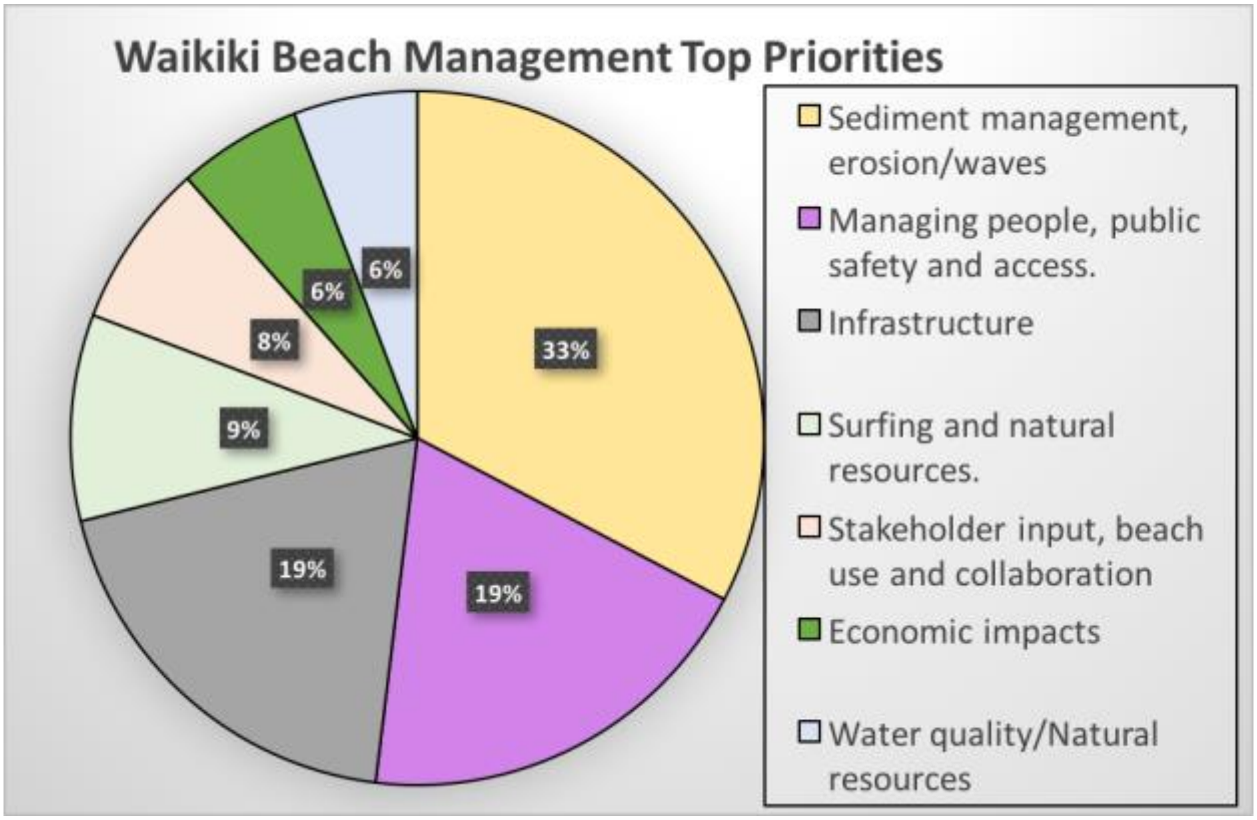
Summary of Priority Issue/Projects

Name	Comments	1st Priority	2nd Priority
Bob Finley *(Waikīkī Neighborhood Board)*	Would like to see more input on projects, interested to see who is using the beaches and how homeless are dealt with.	Stakeholder input, beach use and collaboration	Managing people and experience, public safety and access.
Michelle Nekota *(C&C Parks)*	Excited to collaborate, City needs technical support on beach projects. Beach erosion a major problem, ADA access is a problem in Waikīkī.	Sediment management, erosion/waves	Managing people and experience, public safety and access.
Chip Fletcher *(University of Hawai'i, SOEST)*	Would like to see the productive exchange of information to support the shared management of the beach resources. Waikīkī is a man-made beach. Offered idea to back-pass sand from the Royal Hawaiian side seasonally. Need to avoid fracturing the sand grains during hydraulic pumping.	Sediment management, erosion/waves	Stakeholder input, beach use and collaboration
Soo Stover *(Holokai Catamaran)*	Top issue is beach loss and wave run up affecting their catamaran operations. High tides make loading/unloading unsafe. Outrigger Reef had to close main beach access during king tides.	Sediment management, erosion/waves	Infrastructure and access
Brett Greenberg *(Aqualani Beach and Ocean Recreation)*	King Tides causing beach flooding. Even moderate tides causing flooding now. Beach loss is hurting business. Importance of surfing to Waikīkī.	Sediment management, erosion/waves	Economic impacts
George Parsons *(Maitai Catamaran)*	King Tides causing beach flooding. Beach loss is hurting business. Had to temporarily relocate during high tides. Historical beach at Sheraton, public access stairs need to reopen.	Sediment management, erosion/waves	Managing people, public safety and access.
George Kam *(HTA/Save Our Surf)*	Protection of surf sites and local access. The host culture of surfing needs to be protected and preserved. Public infrastructure is lacking and needs to be upgraded and maintained.	Surfing and natural resources.	Infrastructure and access
Keone Downing *(Save Our Surf)*	Sand volume limitations "how much sand is too much?" Concern over technical study with only one engineering firm. Would like to see distribution of tasks in the EIS.	Surfing and natural resources.	Sediment management, erosion/waves

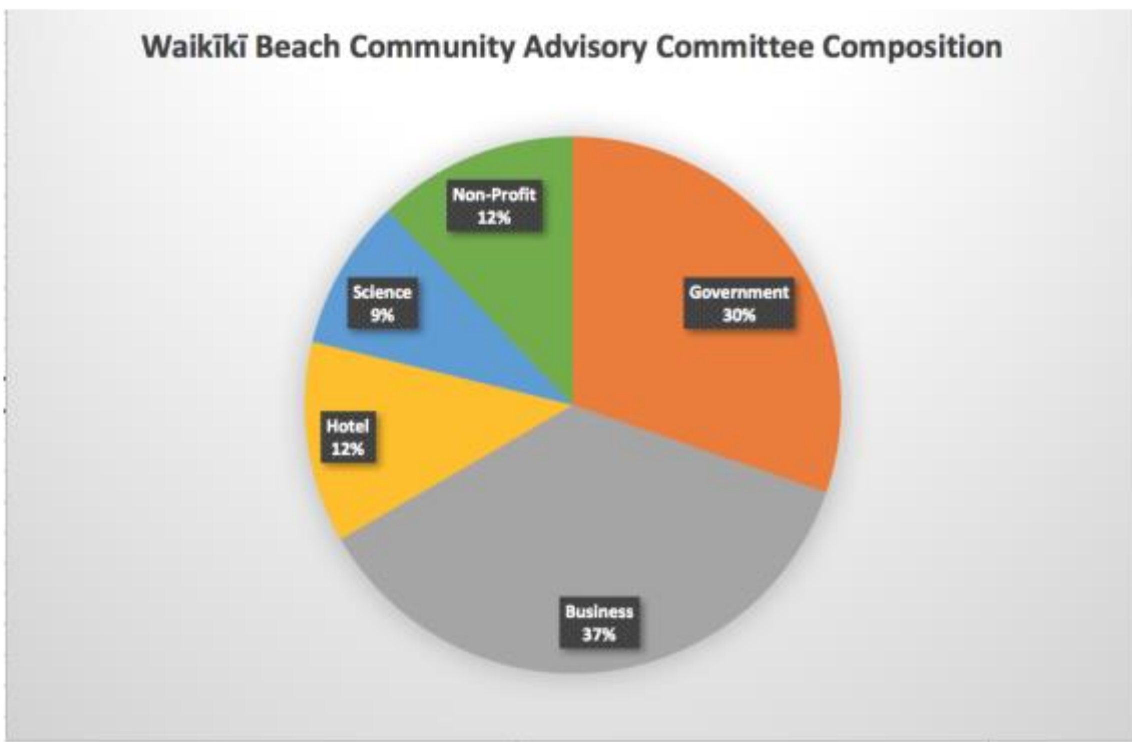
Name	**Comments**	**Primary Focus**	**Additional Focus**
Dolan Eversole *(UH Sea Grant/WBSIDA)*	Water quality, beach access alongshore, Reef health, Infrastructure maintenance. Economic studies will help justify maintenance projects in Waikīkī.	Water quality/Natural Resources	Infrastructure and access
Rus Murikami *(Waikīkī Beachside Bistro)*	Better balance between visitors and locals. Should strive for better experience and excellence. Improved experience/infrastructure	Managing people, public safety and access.	Infrastructure and access
Sam Lemmo *(DLNR-OCCL)*	Maintain modest nature of Waikīkī Beach. Recycle sand don't add more. Committee input important for the management approach.	Sediment management, erosion/waves	Stakeholder input, beach use and collaboration
Kevin Allen *(C&C Ocean Safety)*	Public safety as it pertains to staffing needs for beach changes. Public safety, risk management	Managing people, public safety and access.	Infrastructure
Bob Hampton *(Waikīkī Beach Activities)*	Value of Waikīkī Beach. Water quality and stigma of unknown water quality. PR issues long after the event has past.	Water quality/Natural resources	Economic impacts
Ted Bush *(Waikīkī Beach Services)*	Storm Mitigation benefits, erosion leading to seawall failure. General condition of Waikīkī is terrible.	Sediment management, erosion/waves	Infrastructure
Rick Egged *(WIA/WBSIDA)*	Storm mitigation benefits of beaches, climate change impacts	Sediment management, erosion/waves	Infrastructure
Fred Orr *(WBSIDA/Sheraton PK)*	Public access for Halekulani and Sheraton seawall. Kuhio Beach foundation erosion, Need to stabilize beach, Water quality	Sediment management, erosion/waves	Managing people, public safety and access.
John Clark *(Waikīkī Beach Expert and Historian)*	Need to plan for a high-quality beach. Protect "canoes" surf, surfing as a prime resource	Surfing and natural resources.	Sediment management, erosion/waves
Jim Howe *(C&C DES)*	Risk Management is multi-disciplinary. Need to better understand/manage people to mitigate risk. Act 170 will change the way the City operates relative to liability and risk. Public safety, risk management 6-point risk management approach. 1.Legal risk, 2.Financial risk, 3.Environmental risk, 4.Cultural, 5. Social 6. Physical	Managing people, public safety and access.	Infrastructure
Hubert Chang *(Hawaiian Oceans*	Happy for the WBSIDA and management planning is showing	Sediment management,	Stakeholder input, beach

Waikiki)	progress. Look to the past for examples of what worked.	erosion/waves	use and collaboration
Aaron Rutledge *(Star Beachboys)*	Beach erosion, bringing more sand needs to be thought out. Urgent need to erosion control now.	Sediment management, erosion/waves	Managing people, Public safety and access.
Jim Fulton *(Dukes Oceanfest/WBSIDA)*	Legacy of Duke, tradition and safe beach conditions.	Managing people, Public safety and access.	Sediment management, erosion/waves
Didi Robello *(Aloha Beach Services)*	Waikīkī canoe rides a unique opportunity. Sand loss due to Hurricanes Iniki and Ewa, removal of Kuhio groins accelerated erosion, sand has migrated to Baby Royals channel, need to stabilize the cell, suggestion to have marine special events help fund beach projects, need action now, waiting too long for management to catch up with erosion. Suggest move sand seaward to lower elevation of beach to mitigate wave run up.	Sediment management, erosion/waves	Surfing and natural resources.
Megan Statts *(DLNR-DOBOR)*	Public access to and along the shoreline.	Managing people, public safety and access.	Sediment management, erosion/waves
Brad Romine *(UH Sea Grant/DLNR)*	Support for efforts underway and happy to offer assistance	Sediment management, erosion/waves	Surfing and natural resources.
Matt Gonser *(C&C OCCSR)*	Concern about impacts to City facilities, need to preserve economic activities in Waikīkī.	Infrastructure	Economic impacts
Marvin Heskett *(Surfrider Foundation)*	Water quality impacts, SLR and septic tanks due to ground water table, storm water run off	Water quality/Natural resources	Infrastructure

	Sediment management, erosion/waves
	Water quality/Natural resources
	Managing people, public safety and access.
	Stakeholder input, beach use and collaboration
	Economic impacts
	Surfing and natural resources.
	Infrastructure



Summary of Waikīkī Beach Community Advisory Committee Meeting November 7, 2017



Summary of Waikīkī Beach Community Advisory Committee Composition by Sector

WAIKĪKĪ BEACH COMMUNITY ADVISORY COMMITTEE

HO'OMAU 'O WAIKĪKĪ KAHAKAI

"WAIKĪKĪ BEACH RENEWS ITSELF"

March 20, 2018 Meeting Summary

MEETING AGENDA

Date:	**March 20, 2018 1:00pm to 4:00pm**
Location:	Waikiki Beach Marriott Resort & Spa *Kaimuki 1 Rm* (2nd floor of the Kealohilani Tower) 2552 Kalakaua Ave, Honolulu, HI 96815, USA
Host:	Waikīkī Beach Special Improvement District Association (WBSIDA)
Organizer:	Dolan Eversole, University of Hawai'i Sea Grant/WBSIDA Cell (808) 282-2273 email: eversole@hawaii.edu

MEETING AGENDA

1. **Introductions- Facilitator** (10 mins)
   - Project Background, Goals and Scope
   - Ground Rules, Committee structure, framework and role.

2. **Community Advisory Committee Updates** (10 mins)
   a. First meeting and public meeting summary
   b. Advisory Committee Composition (New Members)
   c. WBSIDA Website Updates

3. **Waikīkī Beach Problem Mapping and Response Exercise** (90 mins)
   Goal: Identify highest priority beach management issues and list potential solutions.
   Group Exercise- Maps of Waikīkī
   Identify top beach management priority and potential solutions
   Group Discussion: Waikīkī Beach mapping overview and outcome

4. **Kuhio Beach Sandbag Groin Project** (Concept engineering design feedback) (60 mins)
   Goal: Assess designs for Kuhio groin. Provide feedback on design elements.
   - Project Background, Goals and Scope
   - Design: Design rational and approach and various design alternatives.
   - Group Discussion: Summary and outcome

Pau Hana Social gathering and talk story- Moana Terrace Bar

3-20-2018 Meeting Summary

Committee composition, past meeting summaries and information can be accessed online at: **https://www.wbsida.org/waikiki-beach-community-advisory-committee/**

Background Information

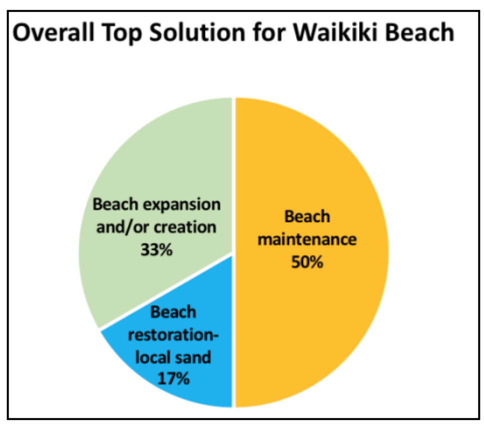
The Waikīkī Beach Community Advisory Committee (WBCAC) is intended to help to identify and address Waikīkī Beach management issues. The committee provides important guidance for planning and prioritizing future beach management projects in Waikīkī.

Waikīkī Beach Advisory Committee Goals

1. Advise the WBSIDA, the DLNR, the City and County of Honolulu and UH Sea Grant on the development and implementation of a Waikīkī Beach Management Plan.
2. Ensure that future beach management projects address the issues and concerns of the Waikīkī community and local stakeholders.
3. Advise/recommend on specific beach management projects in Waikīkī.
4. Provide community coordination, education, and outreach efforts about beach management issues and projects in Waikīkī.
5. Identify and evaluate alternatives for beach management and maintenance in Waikīkī.

General Summary:

- 19 of the 31-member committee (61%) were present for the 3-20-18 meeting.
- The meeting consisted of 3 group exercises designed to obtain feedback on priorities for future beach management plans.



PRIORITY AREAS

- The Royal Hawaiian Cell was considered the #1 choice for beach management planning and maintenance (50%), followed by Kuhio Beach (25%) and Halekulani (19%)

PRIORITY ASSET

- The top asset identified for Waikīkī included the economic value of the beach but it is recognized how closely connected and inter-related each value is to each other.

PRIORITY PROBLEM

- The top problem identified for Waikīkī varied greatly by cell but tended included Erosion/wave run-up and Structural Damage.

PRIORITY SOLUTION

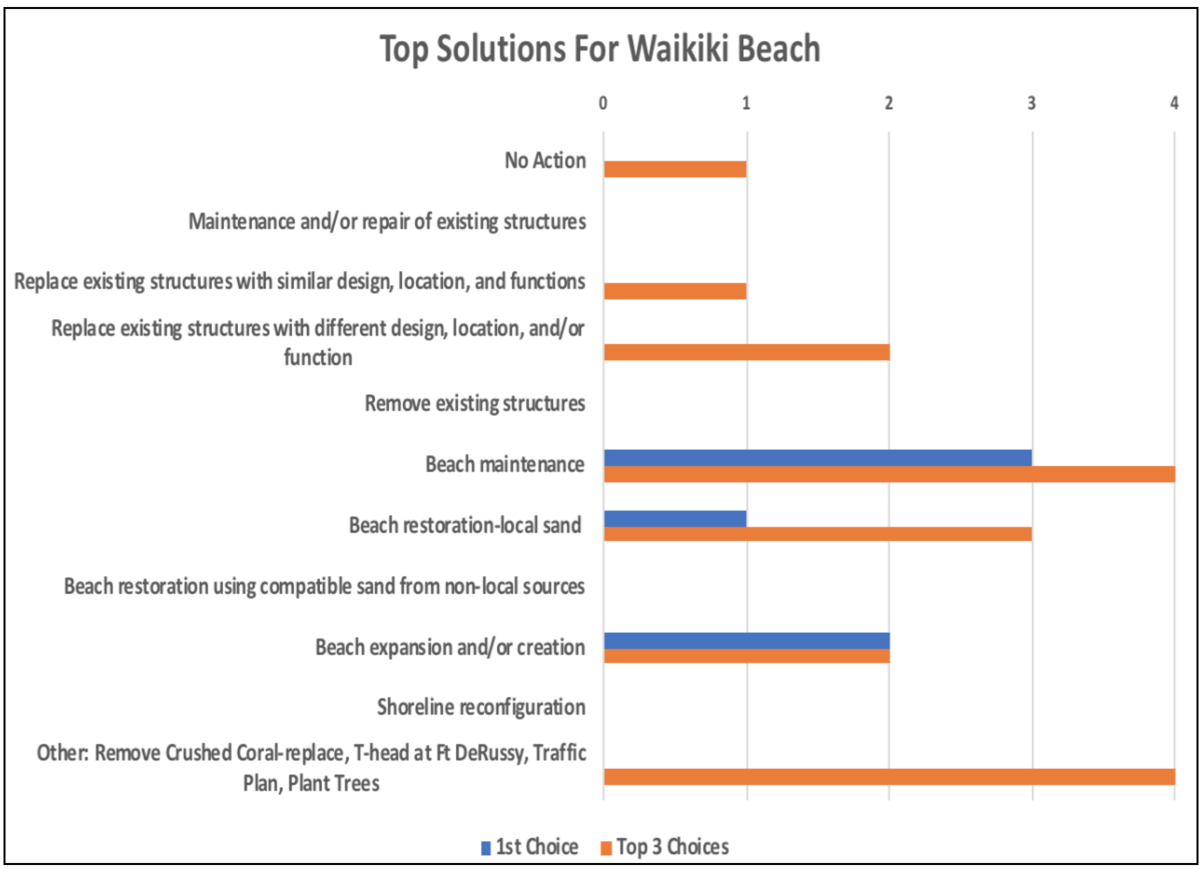
- The top solution identified for Waikīkī varied by cell but included beach maintenance and beach restoration using local sand sources with specific "other" options.

Exercise #1
Waikīkī Beach Problem Mapping and Response Exercise (60 mins)
Goal: Identify highest priority beach management issues and rank potential solutions.

This exercise started with each committee member being assigned to a group and a rotation sequence for 6 separate breakouts by geographic beach area. Each breakout asked the participants to rank the top 3 assets, problems and potential solutions. The results for each cell are summarized in Appendix A and more generally below.

General Summary: Overall the results suggest the following:

1. Preferred solutions vary by each beach cell but tend to generally favor the softer maintenance-oriented solutions.
2. Looking just at the 1st choice solutions, we see that beach maintenance is favored followed by beach expansion and beach restoration.
3. Generally, the *most favored overall* solutions included beach maintenance and beach restoration using local sand sources with specific "other" options that vary by cell.
4. While there are exceptions in some beach cells, the *least favored* solutions included; shoreline reconfiguration, beach restoration using non-local sand sources, removal of existing structures and maintenance and repair of existing structures.



Exercise #2- Kuhio Beach Sandbag Groin Project

This portion of the meeting consisted of a general introduction of the problem area at Kuhio Beach fronting the Duke Kahanamoku Statue and recent erosion responses from the City. This was followed by a briefing from Sam Lemmo of the DLNR on potential mitigation strategies and the DLNR's progress on developing a response to the erosion. There was general discussion and questions from the Committee regarding various options to address the erosion here.

General Summary:

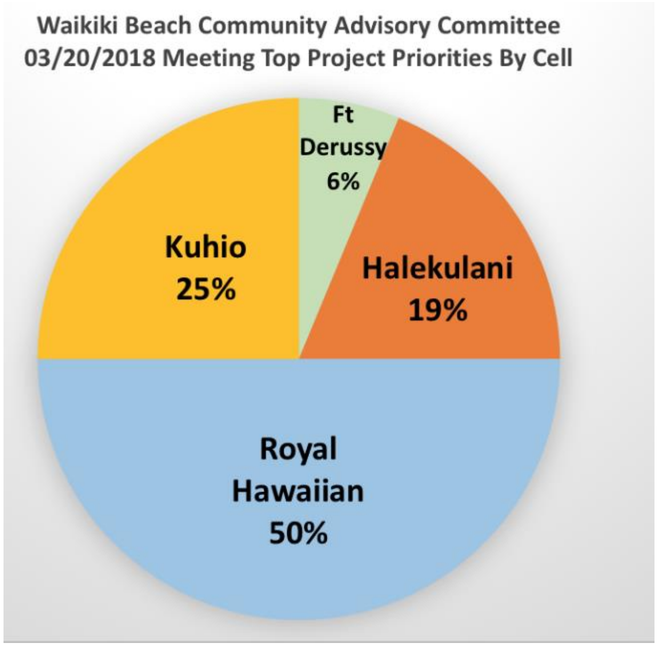
1. Committee members are supportive of a rapid response to the erosion problem here. A possible solution of sandbag groin(s) possibly 2 or 3 was discussed and seemed to be agreeable to the Committee. Although no vote was taken, there were no objections to the project moving forward into a design phase.
2. Sand sources for a project in this area are estimated at ~1000 cubic yards and are recognized as important component of this project. Concern was raised about public safety if the Kuhio swim basin is significantly deepened.

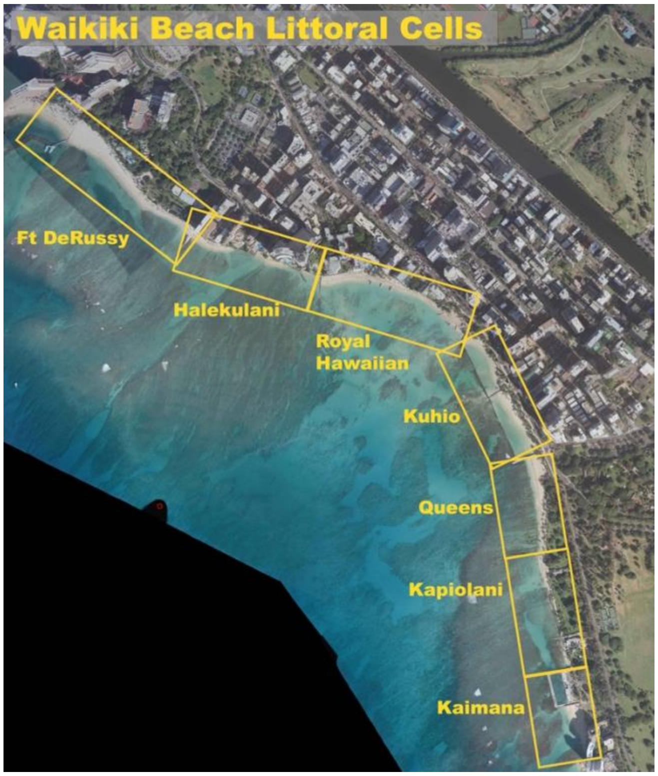
Discussion:

1. Sam Lemmo introduced the DLNR's plan to address the erosion at Kuhio in part based on the Committee's input and prior stakeholder meetings on this subject.
2. The project design goal is to stabilize the area with something that can be permitted and built quickly, possibly as a temporary structure.
3. A potential design may include a short sandbag groin to replicate the effect of the older concrete groins that were removed in 2012.
4. Dolan Eversole described a potential sand source of 1000 cy for this project from the Diamond Head basin of Kuhio Beach as part of a beach maintenance project to reshape the beach profile and utilize excess sand remaining from the 2012 beach maintenance project. This would be in partnership with the City and County Parks Department.
5. Funding sources are not confirmed but the estimated cost of $400,000 would likely be a cost share between the State and the Waikīkī Beach Special Improvement District.
6. Permitting can be complex for this type of project. Sam and Dolan met with the Army Corps of Engineers in September, 2017 about this project to see if it could be considered under the existing 2012 Beach Maintenance project. The initial response was negative from the Army Corps.
7. Permitting could take 1 year or more but there is strong interest in finding a faster expedited (possibly emergency) permitting route.
8. Concern was raised about deepening the Kuhio swim basin water depth as part of the sand bypassing and beach maintenance project.
9. Question if the beach slope is steepened will it erode if the sand is removed from the basin? This was addressed by several staff that the slope will not be steep enough to create an erosion problem in the basin.
10. The City and County used to do this type of beach maintenance annually with long-arm excavators and back hoes to re-shape the beach here but has stopped in recent years.
11. Will the concrete foundation be removed? Dolan Eversole responded that the project goal for now is to stabilize the area with structures and sand and bury the foundation. Removal would be very intrusive and may expose even more dirt fill.

Exercise #3- Beach Project Priority Exercise

This exercise included a simple vote for what beach areas are the highest priority for each committee member. Each committee member was given two votes and allowed to vote by show of hands for which beach cell has the highest priority for developing plans for beach management, maintenance and/or improvements. The Royal Hawaiian Beach cell was the favored beach area for priority by the Committee followed by Kuhio Beach and Halekulani.





Appendix A: Summary of Priority Solutions by Beach Cell

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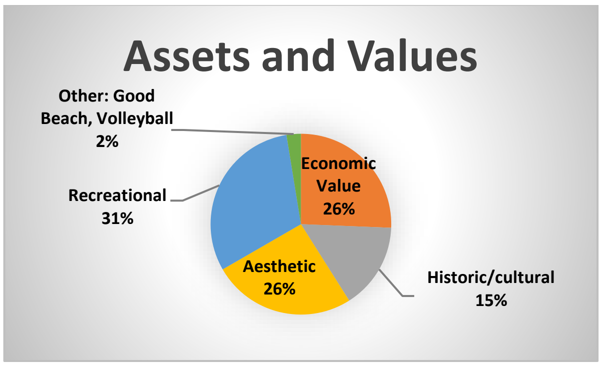
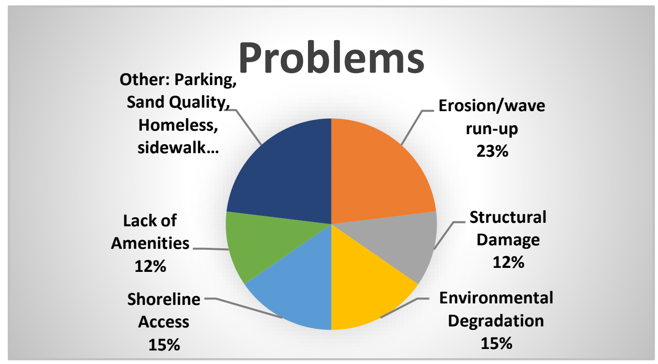
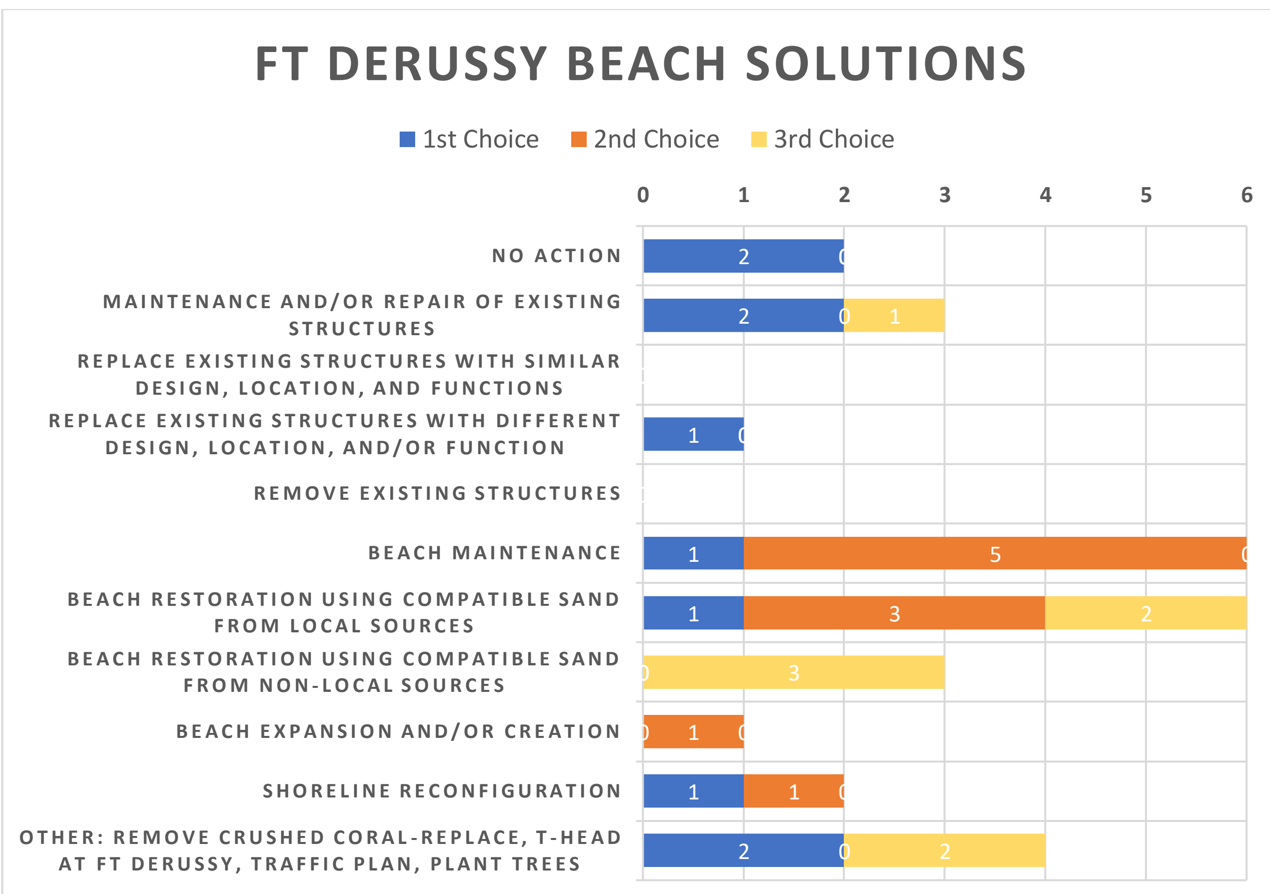
FT. DERUSSY BEACH, WAIKIKI

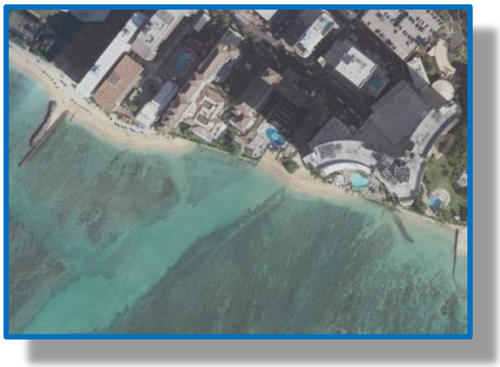
ASSETS & VALUES



ISSUES & PROBLEMS

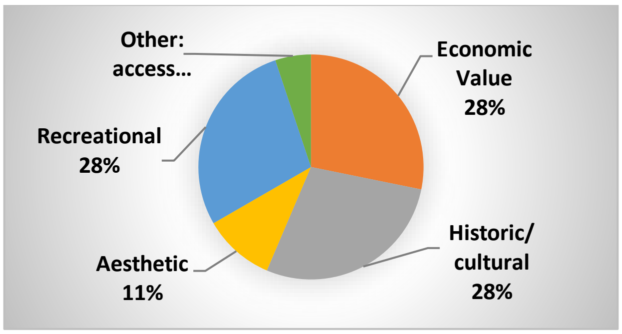




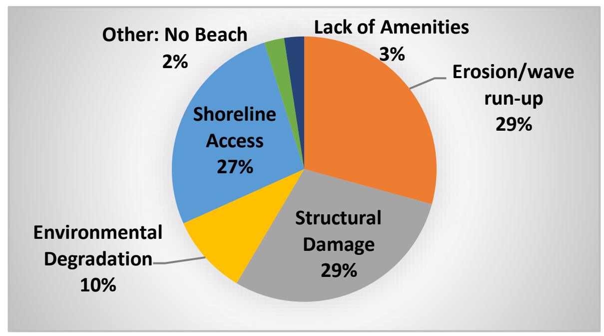


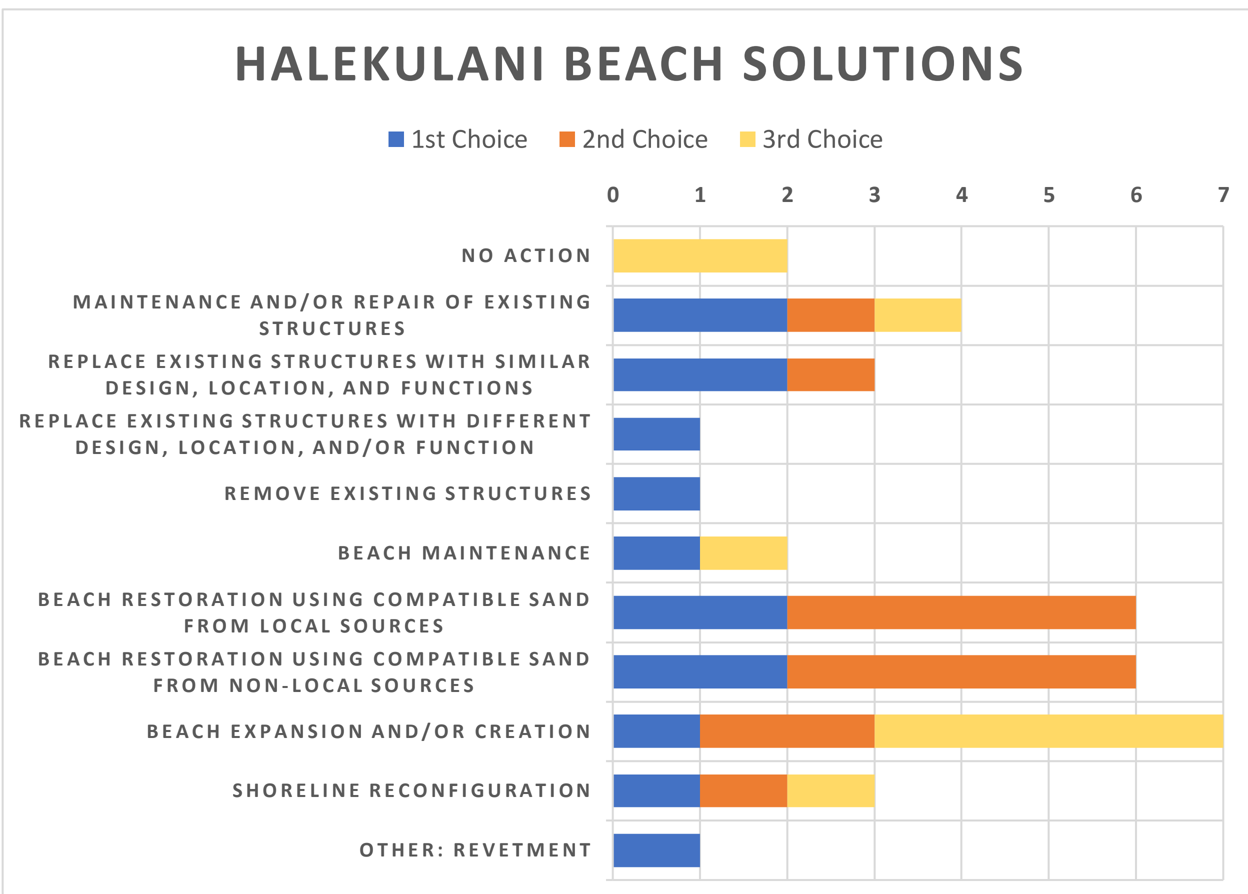
HALEKULANI BEACH, WAIKIKI

ASSETS & VALUES



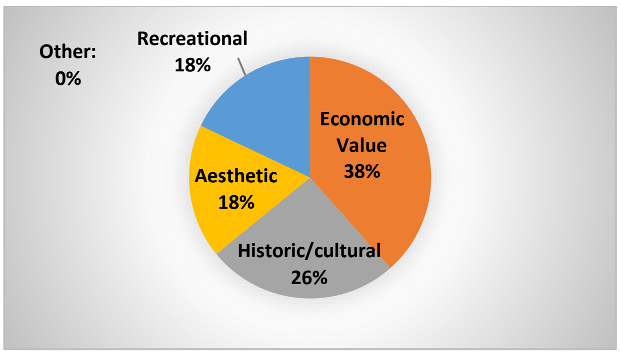
ISSUES & PROBLEMS



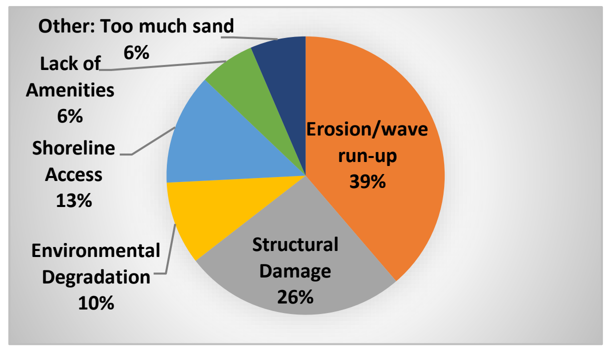


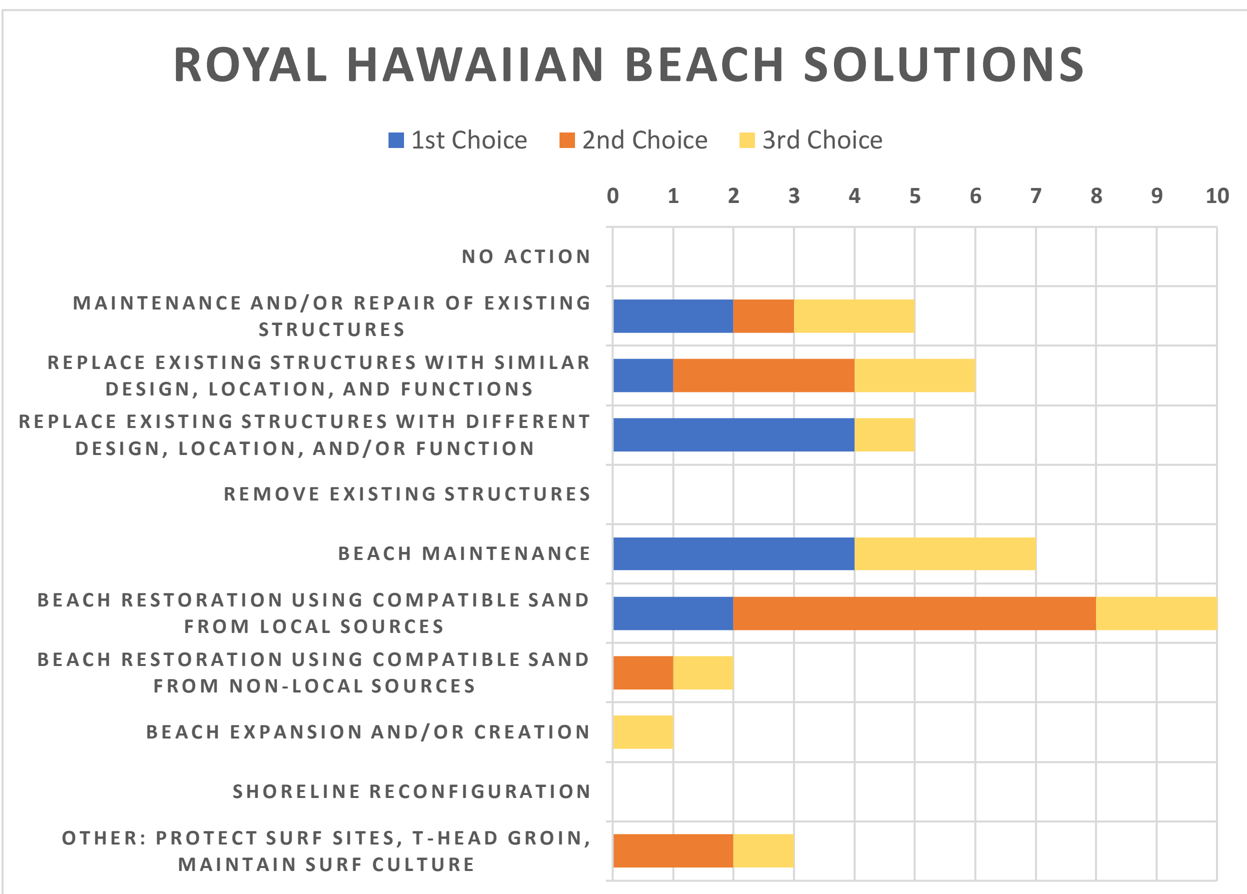
ROYAL HAWAIIAN BEACH, WAIKIKI

ASSETS & VALUES



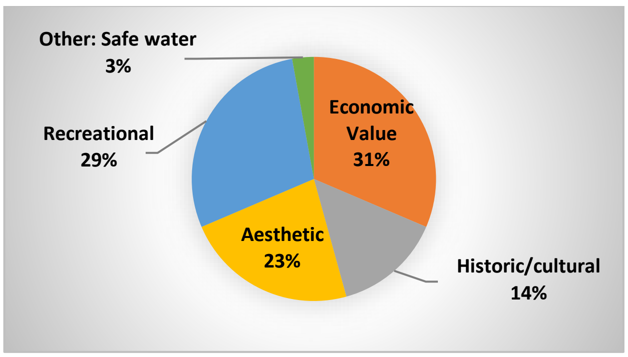
ISSUES & PROBLEMS



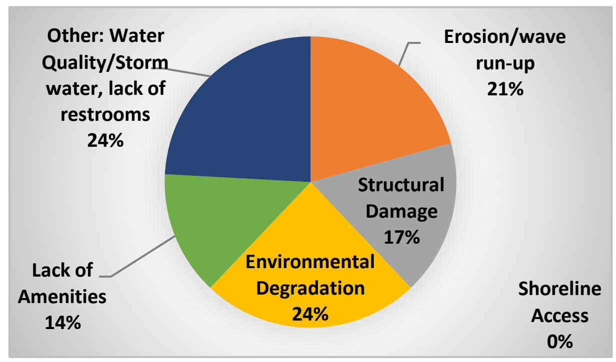


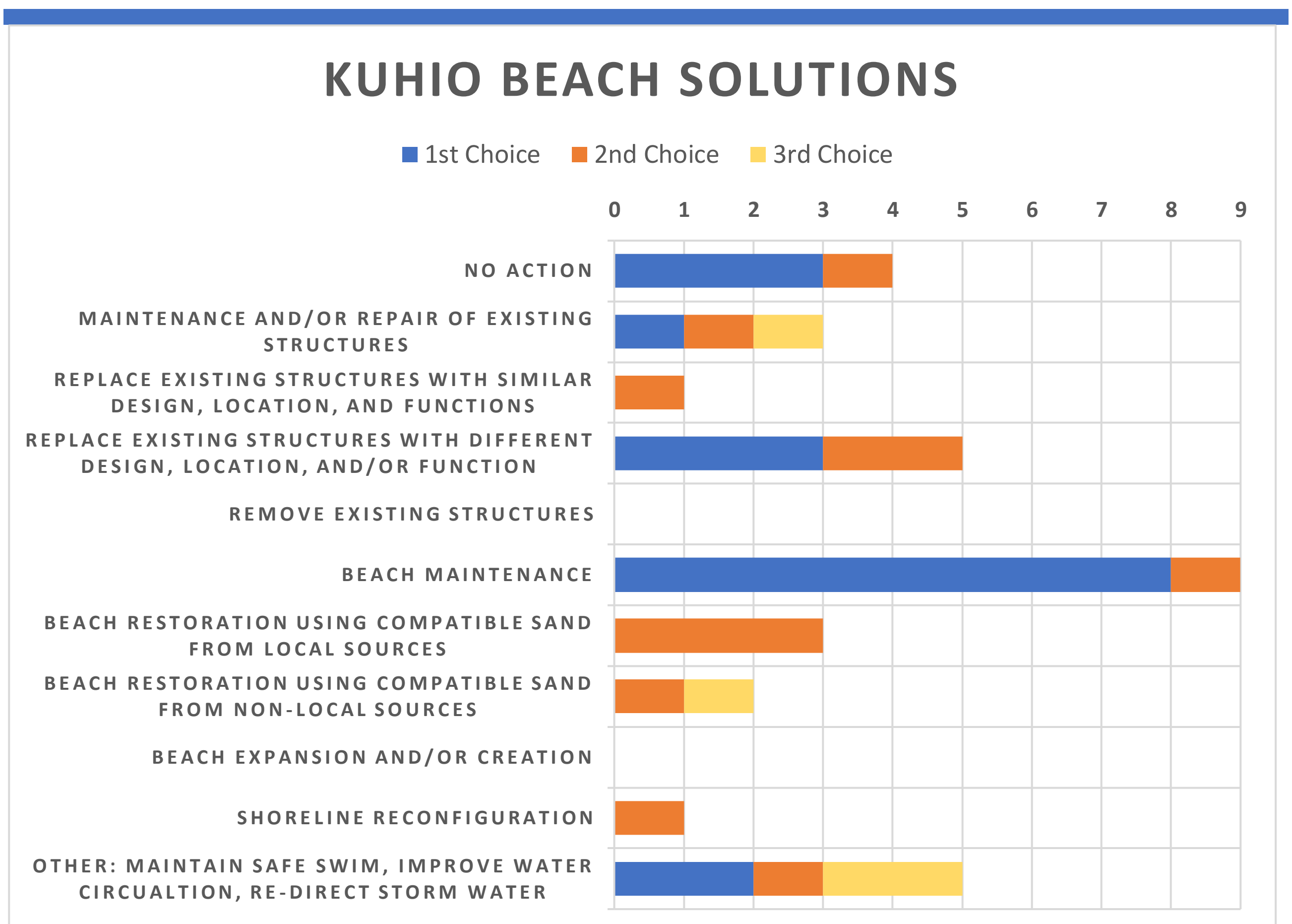
KUHIO BEACH WAIKIKI

ASSETS & VALUES



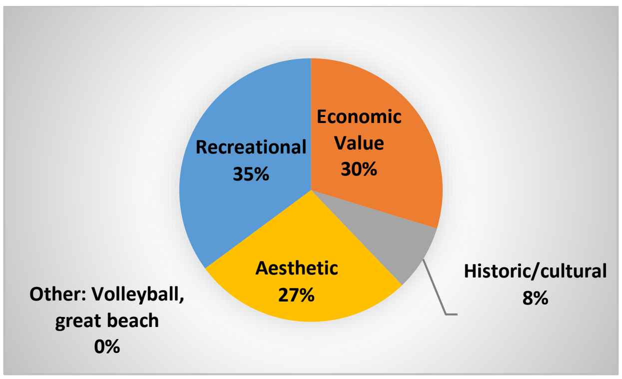
ISSUES & PROBLEMS



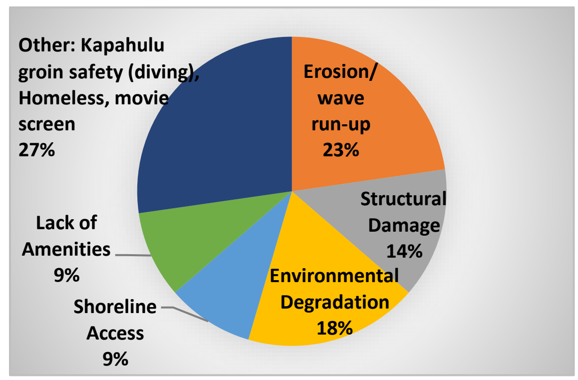


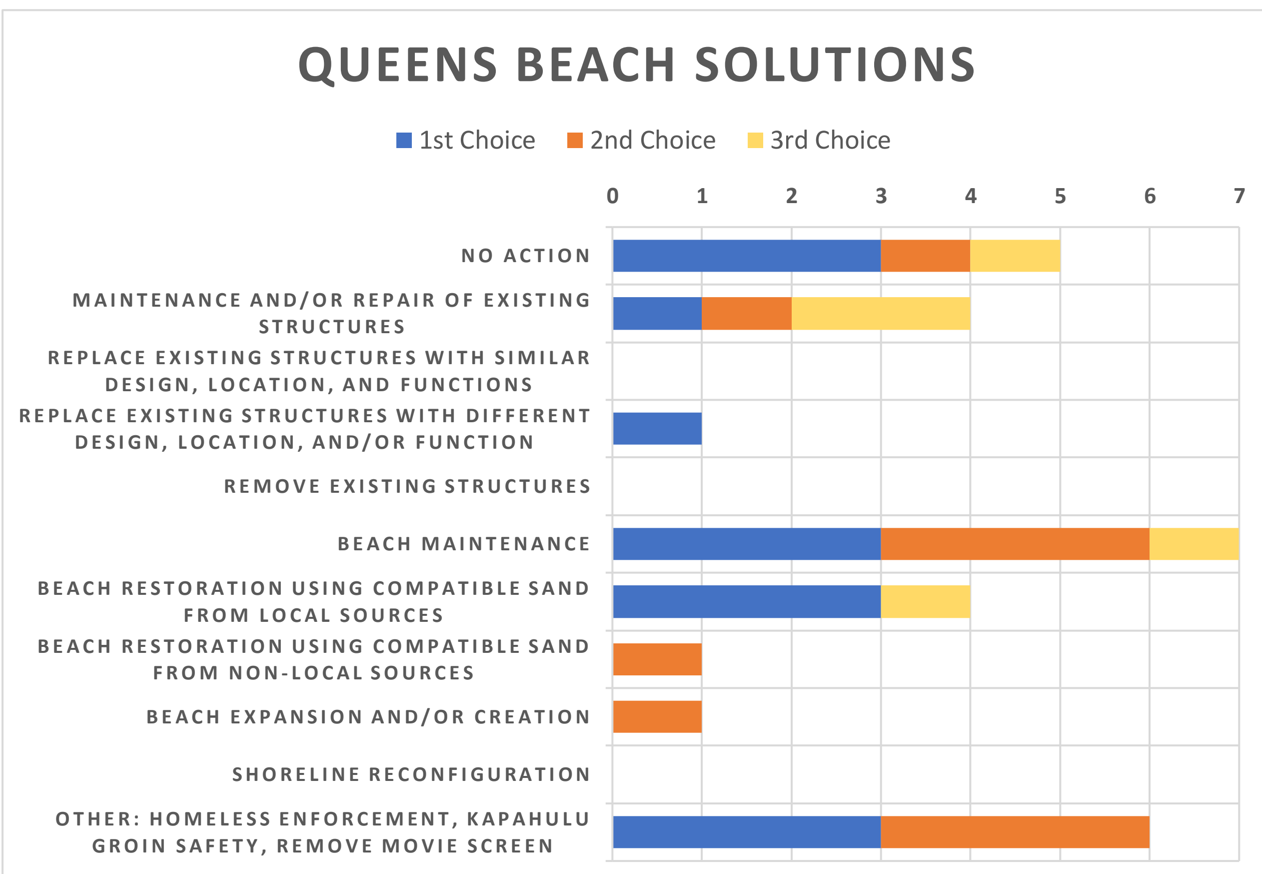
QUEENS BEACH WAIKIKI

ASSETS & VALUES



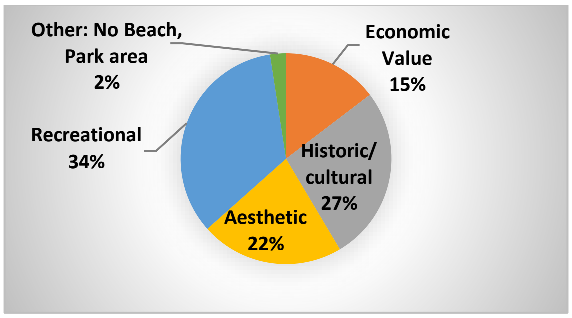
ISSUES & PROBLEMS





KAPIOLANI BEACH
WAIKIKI

ASSETS & VALUES



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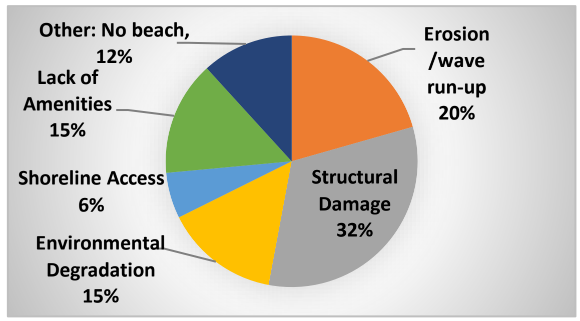

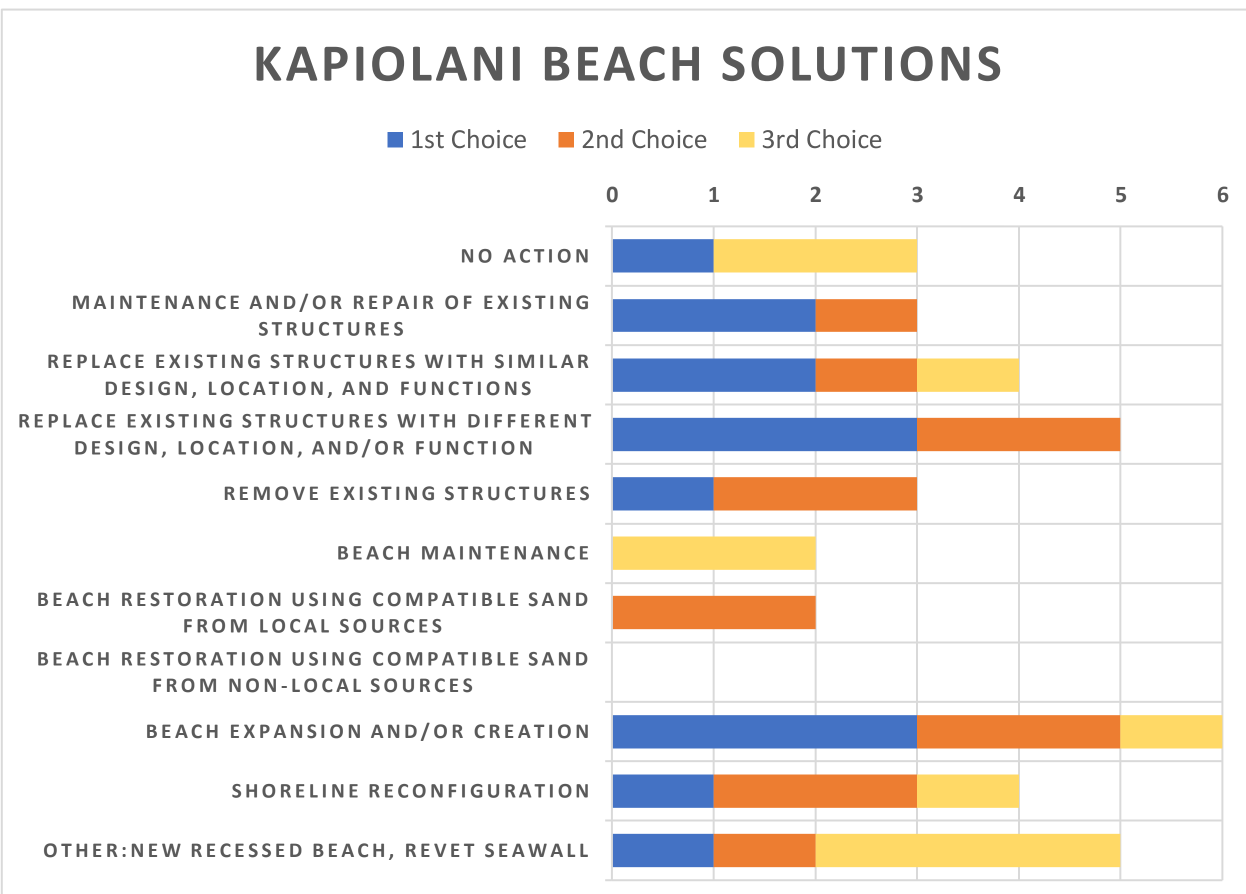

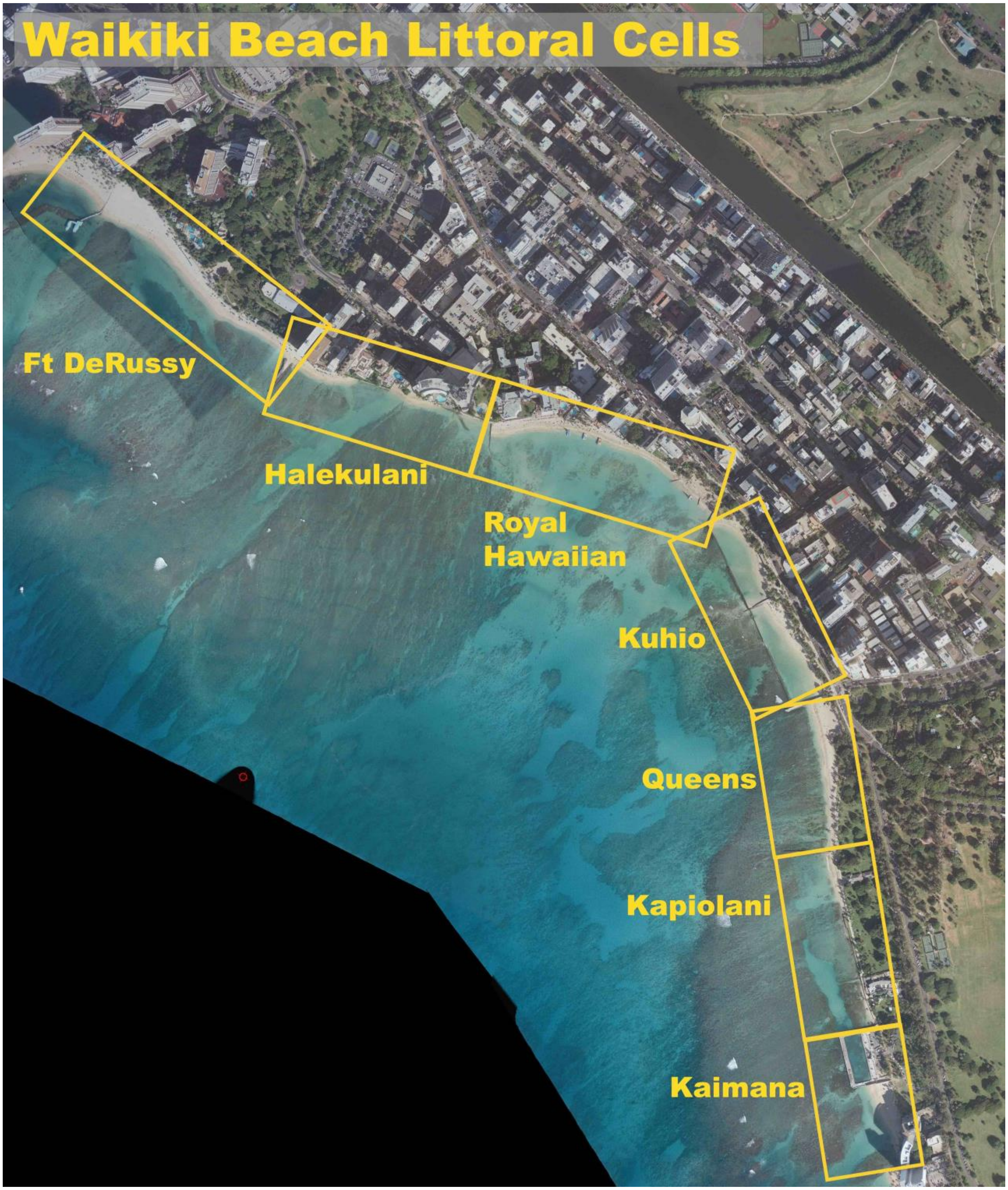

Waikiki Beach Littoral Cells
Ft DeRussy
Halekulani
Royal Hawaiian
Kuhio
Queens
Kapiolani
Kaimana

WAIKĪKĪ BEACH COMMUNITY ADVISORY COMMITTEE

HO'OMAU 'O WAIKĪKĪ KAHAKAI

"WAIKĪKĪ BEACH RENEWS ITSELF"

MEETING AGENDA

Date: **September 27, 2018* 1:30pm to 4:00pm**
**Rescheduled August 23, 2018 meeting due to Hurricane Lane*

Location: Royal Hawaiian Hotel
Regency I Room
2559 Kalakaua Ave, Honolulu, HI 96815

Host: Waikīkī Beach Special Improvement District Association (WBSIDA)
Contact: Dolan Eversole, University of Hawaiʻi Sea Grant/WBSIDA
Cell (808) 282-2273 email: eversole@hawaii.edu

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1. **Waikīkī Beach Community Advisory Committee Updates** (15 mins)
   a. Advisory Committee composition. (New members)
   b. March meeting issue mapping summary. (Handout)

2. **Royal Hawaiian Groin Design Update (**15 mins) (Handout)
   a) sea-level rise (SLR) consideration and new "L-spur" design.
   b) Timing and application status.

3. **Kuhio Beach Sandbag Groin Project** (30 mins) (Handout)
   - Final sandbag groin design update.
   - Design rationale and construction plan.
   - Access plan, timing and application status.
   - Group discussion, questions and comments.

4. **Waikīkī Conceptual Designs - Halekulani, Royal and Kuhio** (90 mins) (Handout)
   a) DLNR Waikīkī EIS project background, goals and scope.
   b) Review conceptual designs for Kuhio, Royal and Halekulani cells.
   c) Pedestrian access, SLR, public safety and aesthetic considerations for designs.
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4pm Pau

9-27-2018 Meeting Summary

Committee composition, past meeting summaries and information can be accessed online at:
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Background Information

The 32-member Waikīkī Beach Community Advisory Committee (WBCAC) is intended to help to identify and address Waikīkī Beach management issues. The committee provides important guidance for planning and prioritizing future beach management projects in Waikīkī.

Waikīkī Beach Advisory Committee Goals

1. Advise the WBSIDA, the DLNR, the City and County of Honolulu and UH Sea Grant on the development and implementation of a Waikīkī Beach Management Plan.
2. Ensure that future beach management projects address the issues and concerns of the Waikīkī community and local stakeholders.
3. Advise/recommend on specific beach management projects in Waikīkī.
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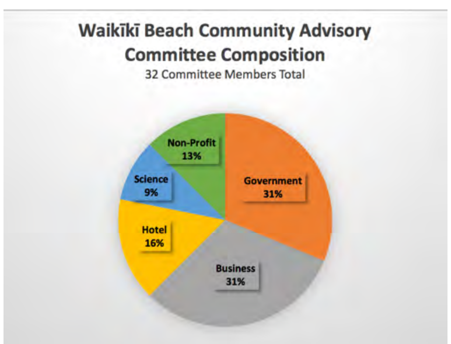
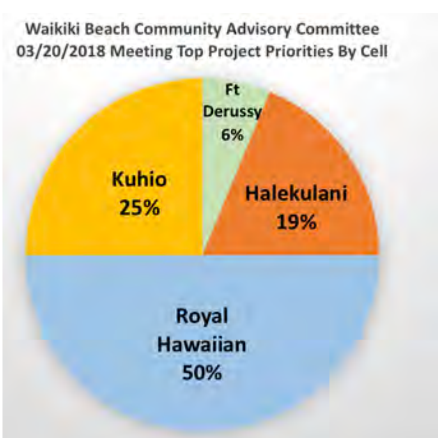
5. Identify and evaluate alternatives for beach management and maintenance in Waikīkī.





General Meeting Summary:

- 21 of the 32-member committee (66%) were present for the 9-27-18 meeting.
- The meeting consisted of several project updates and a ranking sheet exercise for six different conceptual engineering designs for the three priority beach cells (Royal, Kuhio and Halekulani).
- Follow up discussion with several committee members and stakeholders on the overall outreach and communication strategy for the conceptual designs has resulted in the development of an overall project goals, objectives and strategies.
- Based on the above input, the WBSIDA is in the process of developing specific criteria for the identification of the desired recreational use, design rational and outcome objectives for each design cell. This is thought to assist in the committee assessment and ranking of various conceptual designs.

Project Updates

- Royal Hawaiian Groin (RHG)- A project update was provided to the committee on the various design changes planned for the RHG including the change in the shoreward portion to "L-head" and an overall increase in the overall crest elevation by 1.5ft to account for future projections of sea-level rise.
- Discussion of the RHG centered on public safety measures that can be built into the design to prevent and/or mitigate public access along the top of the groin.
- A suggestion of possibly adding a lifeguard station to the base of the RGH was brought up. There was acknowledgement this may serve to improve observational coverage and emergency response time from the RHG to the Ft. DeRussy groin which is currently unguarded.
- Kuhio Beach Groin (KBG)- A project update was provided to the committee on the various design changes planned for the KBG.
- Discussion included the KBG function, dimensions, orientation, sand source and installation methodology.
- Concern raised by several committee members about the use of the proposed sand barrow area in the Diamond head basin for the beach fill next to the KBG as it may increase the slope of the beach and cause a deepening of the shallow wading area leading to a safety concern. Other safety concerns were raised regarding slip/fall hazards on the groin as well as novice surfers hitting the groin.
- A suggestion was made for the planned KBH be oriented similar to the pre-existing groin in order to orient the groin into the prevailing waves, as opposed to shore-perpendicular.

Conceptual Design Ranking Exercise (60 mins)
Goal: Evaluate and rank potential conceptual designs.

This exercise started with a presentation and discussion on six different conceptual designs for the three priority beach cells. Committee members were asked to rank the various designs on a 1-5 scale (1= no support, 5 = full support) (Appendix A). The ranking sheet was also emailed out to all committee members as part of a briefing packet before the meeting and a form-fillable version was sent after the meeting. The results for this exercise are summarized below.

a.

b.

c.

d.

e.

f.

General Summary: Considering the limited sample size[1], the overall the results suggest:

1. Preferred designs vary by each beach cell but tend to favor Options E and F (Halekulani T-heads and T-heads + SLR) as the top ranking for the first choice (Figure 1).
2. Similar ranking is observed if we look at the 1st choice PLUS the 2nd choice with Option F Halekulani T-heads + SLR as the overall preferred design (Figure 2).
3. Option C (Royal Hawaiian Beach) was an equal 2nd to Option E when considering the 1st choice PLUS the 2nd choice (Figure 2).
4. While there are exceptions in some beach cells, the *least favored* designs include Option B (Kuhio w/ breakwaters and C Royal Hawaiian.
5. Note Option C ranked an equal 3rd with 3 other designs when looking at 1st choices only an equal 2nd when looking at 1st Plus 2nd choices and an equal least preferred for the 5th choice. This seems to indicate a bi-modal distribution of ranking results or in other words the committee is largely split on this option with the same number of results as the 5th choice as there are for 1st plus 2nd (Figure 3). This might indicate more information and discussion is needed in order resolve this difference of opinion with this option if there is an interest in pursuing this option.

[1] A larger sample size will result in more statistically relevant and representative results. This could be done as an online survey to a wider stakeholder group and/or as public survey. Ideally future surveys will evaluate and rank various options for each cell rather than rank overall for all cells.

Conceptual Design Ranking Exercise – Results

Figure 1.

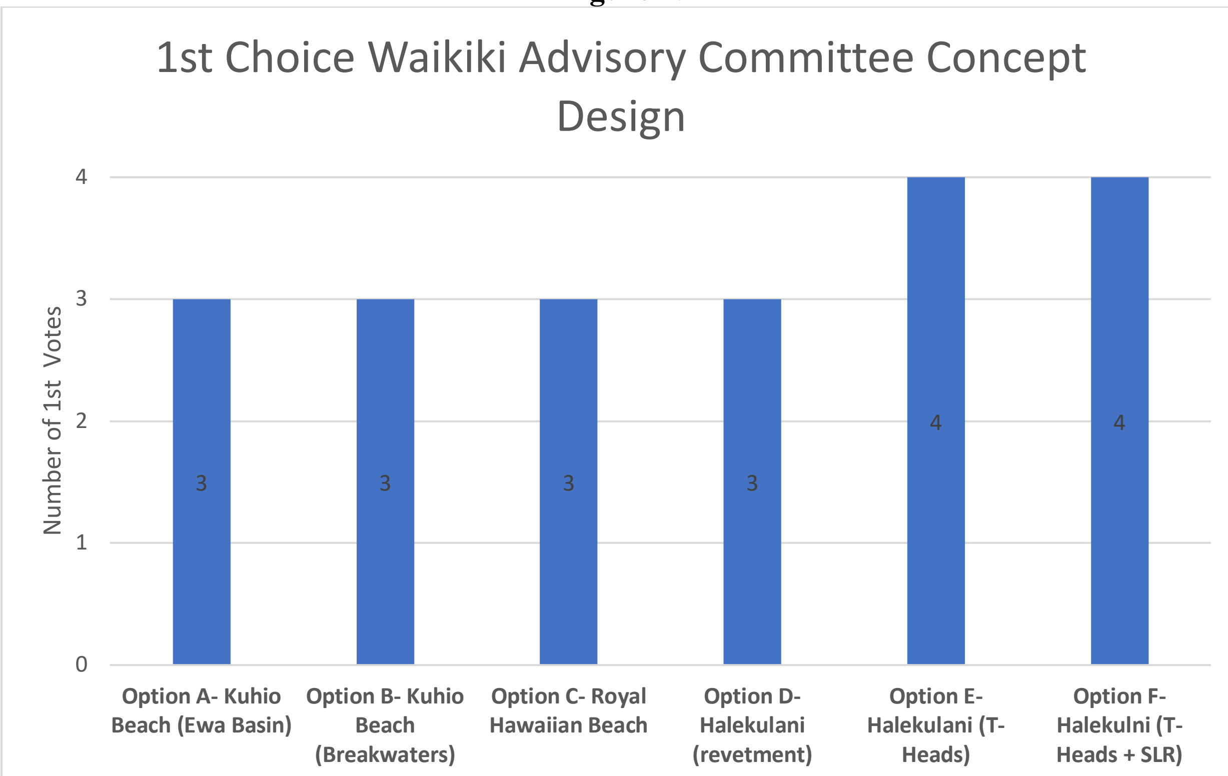


Figure 2.

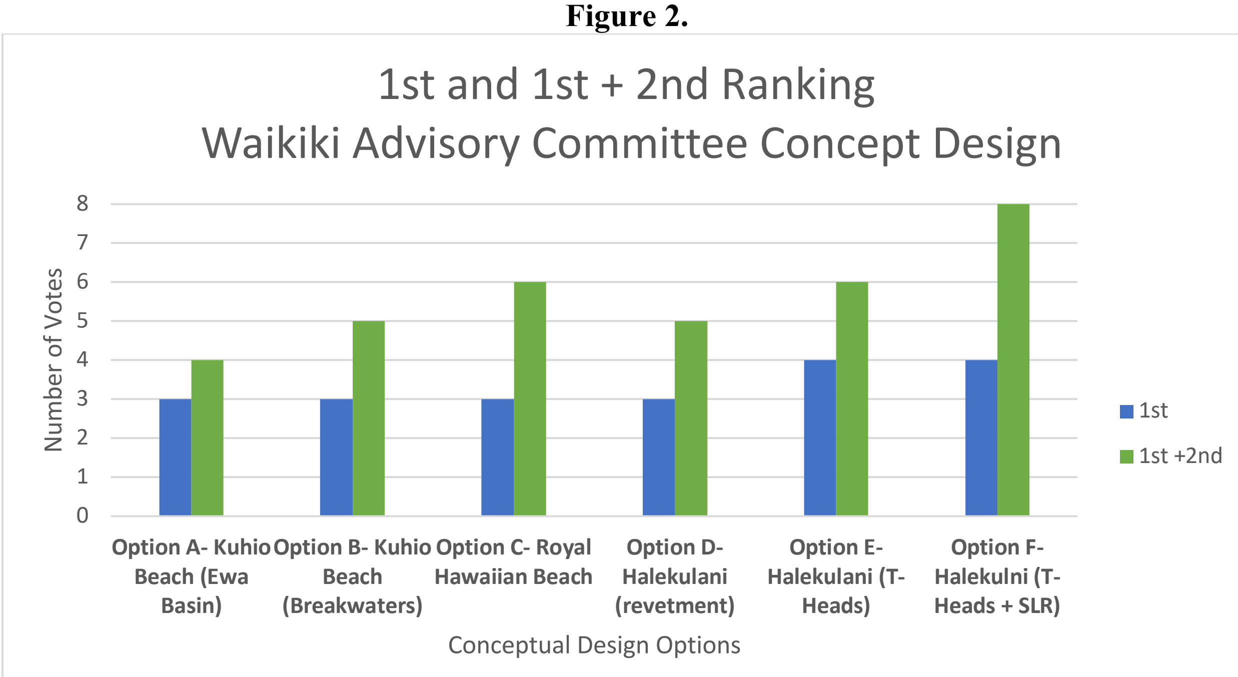
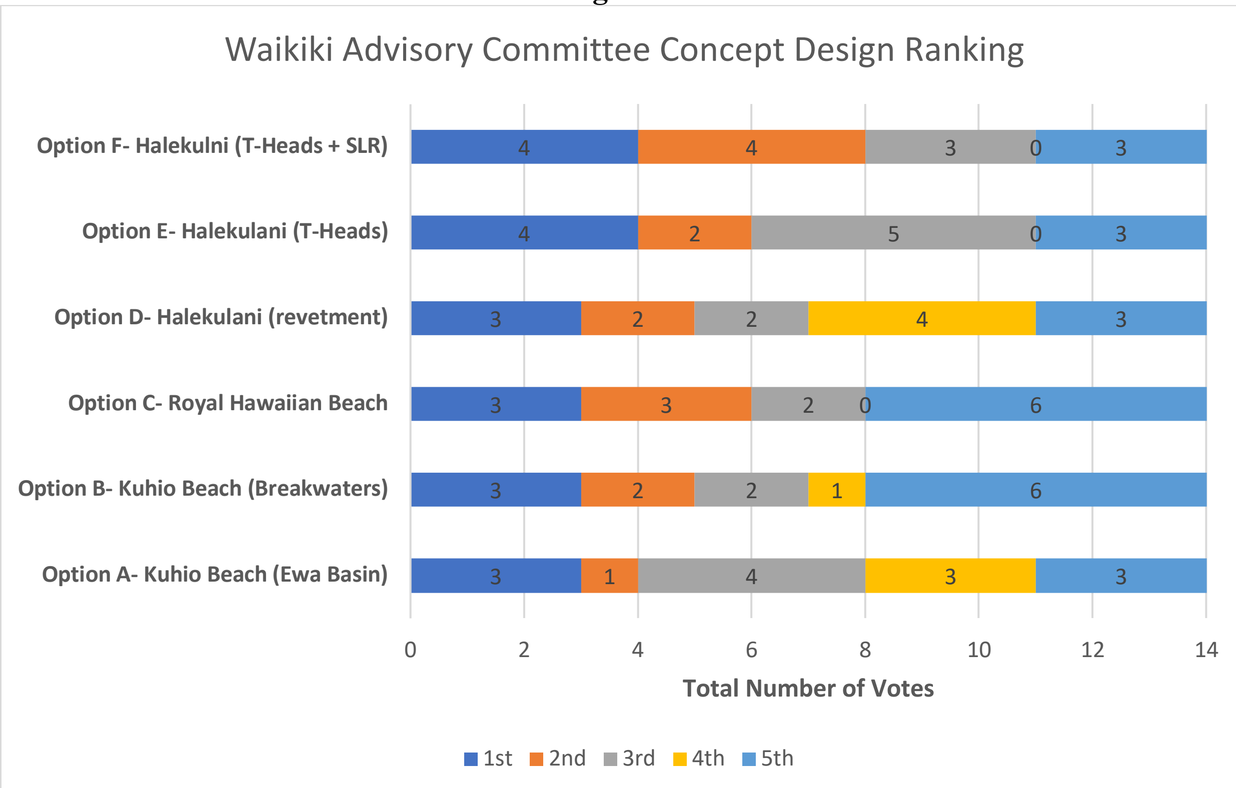
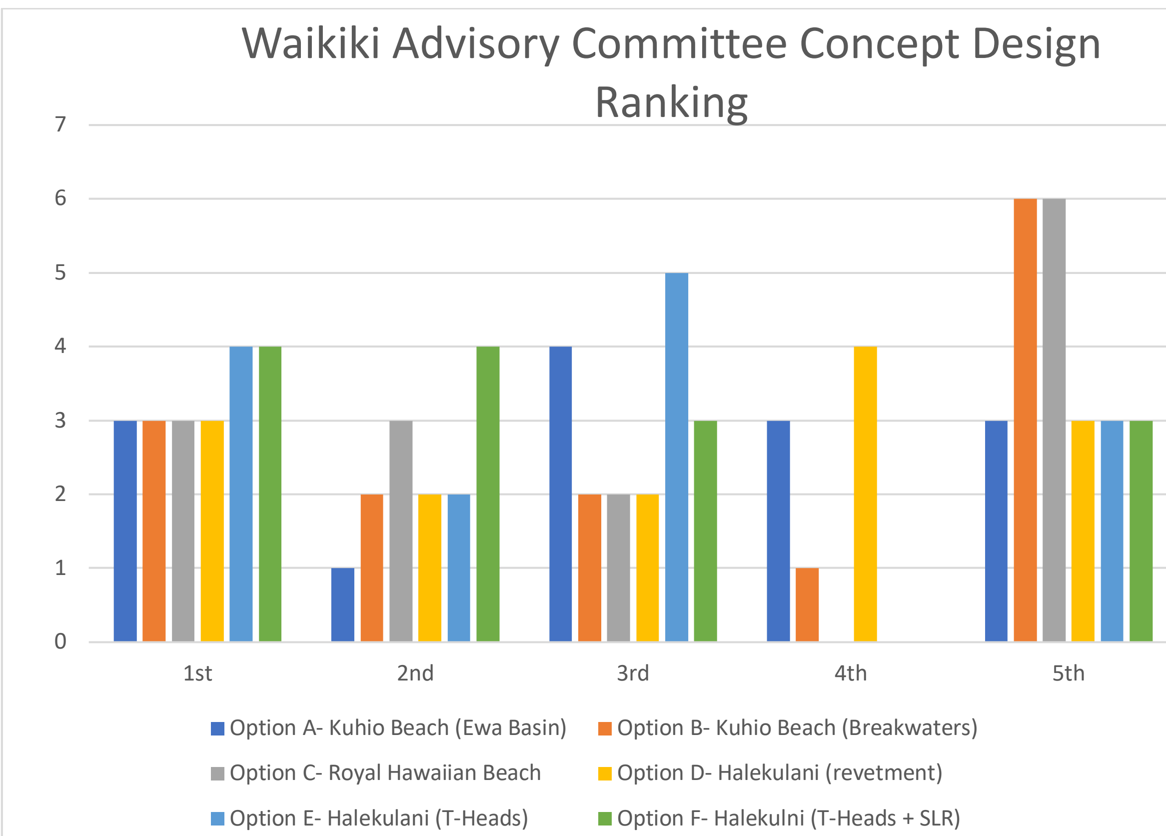


Figure 3.



Waikiki Advisory Committee Concept Design Ranking
Option F- Halekulni (T-Heads + SLR)
Option E- Halekulani (T-Heads)
Option D- Halekulani (revetment)
Option C- Royal Hawaiian Beach
Option B- Kuhio Beach (Breakwaters)
Option A- Kuhio Beach (Ewa Basin)
4 4 3 0 3
4 2 5 0 3
3 2 2 4 3
3 3 2 0 6
3 2 2 1 6
3 1 4 3 3
0 2 4 6 8 10 12 14
Total Number of Votes
1st 2nd 3rd 4th 5th



Waikiki Advisory Committee Concept Design Ranking
0 1 2 3 4 5 6 7
1st 2nd 3rd 4th 5th
Option A- Kuhio Beach (Ewa Basin)
Option B- Kuhio Beach (Breakwaters)
Option C- Royal Hawaiian Beach
Option D- Halekulani (revetment)
Option E- Halekulani (T-Heads)
Option F- Halekulni (T-Heads + SLR)

Conceptual Design Ranking Exercise –
Additional Committee Written Comments Received
(In no particular order)

1. No T-Heads
2. Safety critical for locals and visitors
3. Surf and recreation important
4. In favor of T-Heads but not the groins leading from shore to the heads.
5. Favor Breakwaters over groins
6. All structures are temporary, plan accordingly
7. Fully support T-Groins just need more details
8. Option A is good but B is better but need 3 more groins towards Kapahulu groin
9. Option C is good but need to take out T-Groin inshore of Canoes
10. Option E is good but need to move western most groin out of Halekulani channel
11. Option B- need to add replacement for Slippery Wall (Kuhio Breakwall)
12. Consider Multi-modal groins for safety, designed for safe access.
13. Design safe water entry areas and signage
14. Allow more mauka room for a beach to form and elevate beach
15. Design multi-use recreational access (stairs) rather than restrict access.
16. Safety concern for eddie formation and current flows (Koolina lagoon example)
17. Possible impacts of sand movement Ewa side of T-head

Appendix A: Sample of Conceptual Design Ranking Sheet

NAME: ____

Waikīkī Beach Conceptual Designs- Comment Sheet
1= no support, 5 = fully support

What is your level of your support for the following conceptual designs?

	1-5 Scale
a) Kuhio Beach Option A (Ewa Basin only)	__________
b) Kuhio Beach Option B (A +Breakwaters)	__________
c) Royal Hawaiian Beach (L-spur and T-head)	__________
d) Halekulani Option A (Revetments)	__________
e) Halekulani Option B (T-Heads)	__________
f) Halekulani Option A (T-Heads + SLR)	__________

a.

b.

c.

d.

e.

f.

Other comments you want to add?

____

____

____

____

____

WAIKĪKĪ BEACH COMMUNITY ADVISORY COMMITTEE

HO'OMAU 'O WAIKĪKĪ KAHAKAI

"WAIKĪKĪ BEACH RENEWS ITSELF"

MEETING AGENDA

Date: **Wednesday, February 13, 2019 2:00pm to 4:00pm**

Location: **Queen Kapiolani Hotel-** ***Leahi Room*** **3rd floor**
150 Kapahulu Ave. Honolulu, HI 96815
(Parking located across Kapahulu at the Zoo parking lot)

Host: Waikīkī Beach Special Improvement District Association (WBSIDA)

Contact: Dolan Eversole, University of Hawai'i Sea Grant/WBSIDA
Cell (808) 282-2273 email: eversole@hawaii.edu

MEETING AGENDA

1. **Waikīkī Beach Community Advisory Committee Updates** (10 mins)
    a) Advisory committee composition. (Introduce new members)

2. **Waikīkī Priority Project Areas – DLNR EIS Project Scope** (60 mins) (Handout)
    a) DLNR Waikīkī EIS project background, goals and scope.
    b) September 27, 2018 meeting conceptual designs ranking summary. (Handout)
    c) Review beach maintenance techniques for Waikīkī.
        i. Ft DeRussy sand back-passing
        ii. Waikīkī Beach maintenance (Royal Hawaiian Cell)
        iii. Small-scale dredging systems
        iv. Kuhio Beach basin improvements
    d) Group discussion, questions and comments.

3. **Waikīkī Beach Improvement Project Status Update (**30 mins)
    a) Royal Hawaiian groin.
    b) Kuhio Beach sandbag groin.
    c) Repair of Kuhio Sand-filled Mattress
    d) Post-storm assessment

4pm Pau

WAIKĪKĪ BEACH COMMUNITY ADVISORY COMMITTEE

Tuesday, February 13, 2019 2:00pm to 4:00pm

SIGN IN SHEET

	Name	Organization	Email
1	Robert Finley	WNB #9	bob2222@hoaxov.ss.com
2	Debi Bishop	Hilton	debi.bishop@hilton.com
3	Connie DeGuair	Hilton/WBCA	connie.deguair@hilton.com
4	~~John Clark~~	FWB	jclark@hawaii.rr.com
5	DAVID SMITH	SEA ENGINEERING	DSMITH@SEAENGINEERING.COM
6	ANDY BOHLANDER	SEA ENGINEERING	abohlander@seaengineering.com
7	JASON WOLL	DPR - C+C of Hon	jwoll@honolulu.gov
8	Katie Guyu	DIVE OAHU	katie@diveoahu.com
9	Revell Newton	Outrigger Waikiki	revell.newton@outrigger.com
10	BRETT GREENBERG	AQUALANI BEACH + OCEAN REC.	bgreenberg@aqualani.com
11	[illegible]	Quiksilver	[illegible]
12	JIM FULTON	WBSIDA	jimfulton1010@gmail.com
13	Chip Fletcher	UH	fletcher@soest.hawaii.edu
14	Melissa Agbayani	DLNR ENG	melissa.m.agbayani@hawaii.gov
15	JOHN DATILES	DLNR ENG	JOHN.M.DATILES@HAWAII.GOV
16	Dolan Eversole	UH Sea Grant	

PRIORITY PROJECT AREAS

WAIKĪKĪ BEACH COMMUNITY ADVISORY COMMITTEE MEETING MINUTES

Date: Wednesday, February 13, 2019 2:00pm to 4:00pm
Location: Queen Kapiolani Hotel- Leahi Room 3rd floor
150 Kapahulu Ave. Honolulu, HI 96815
Contact: Dolan Eversole, University of Hawaiʻi Sea Grant/WBSIDA
email: eversole@hawaii.edu

MEETING SUMMARY

I. Waikīkī Beach Community Advisory Committee Updates

a) Advisory committee composition. (Introduce new members)
b) September 27, 2018 meeting conceptual designs ranking summary. (Handout)

II. Waikīkī Priority Project Areas – DLNR EIS Project Scope (Handout)

a) DLNR Waikīkī EIS project background, goals and scope.

- Presenter: Dolan Eversole (Hawaii Sea Grant / WBSIDA)
- Introductions (# of attendees = 18)

Review of last WBCAC meeting

- Review summary results of 9/27/2018 WBCAC meeting (Eversole)
- Primary goal of WBCAC is to obtain feedback from key stakeholders to inform conceptual planning for beach improvement projects.
- Review of past WBCAC assessments and how this information is being used to direct the next design phase of the EIS project.
- WBCAC identified priority project cells (Kuhio, Royal Hawaiian, Halekulani)
- WBCAC ranked conceptual project designs for each cell.
    - Halekulani beach cell groin field
    - Royal Hawaiian beach maintenance
    - Kuhio swim basins improvements
- WBCAC informed selection of engineering design criteria for each cell. Feedback included assets & values, issues & problems, and potential solutions.
- WBCAC preferred solutions for priority cells:
    - *Kuhio* – beach maintenance (concerns re: ocean safety and water quality)
    - *Royal Hawaiian* – beach restoration/maintenance using locally sourced sand, no new structures
    - *Halekulani* – beach expansion or creation
- Offered Committee the opportunity to share comments or concerns as a critical juncture in the EIS process.
- *Questions and discussion.*

Project-Specific updates

- Presenter: David Smith, PhD (Sea Engineering, Inc.)
- Sand is a critical component of any beach restoration project.
- Concerns re: sand, color, odor, fines (turbidity), coarse material (cobble), fracturing.
- Sand recovery methods:
  - Pneumatic sand conveyance system (unsuccessful in 2012).
  - Hydraulic dredge & pump from offshore sand deposits (successful in 2006, 2012).
  - Clamshell dredge & barge from offshore sand deposits.
  - "Eddy Pump" small-scale diver-operated dredge.
- Sand conveyance methods:
  - Pumping and back-passing
  - Conveyor belts can transport sand from barge to truck and truck to beach.
- Group discussion, questions and comments.
  - Committee discussion on the merits of sand quality and how to sort or filter undesirable components.
  - Discussion regarding small-scale pumping systems and the possibility of utilizing a system in Waikīkī.

Questions and discussion.

III. Waikīkī Beach Improvement Project Status Update

a) Royal Hawaiian Groin Replacement

- Presenter: Dolan Eversole (Hawaii Sea Grant / WBSIDA)
- Nearing the end of the regulatory permitting process.
- Anticipate construction commencing Winter 2019 to Spring 2020.
- Project duration 2-3 months.
- Project will require partial beach closure (likely in the mornings) during construction.
- Staging and construction area at the Royal Hawaiian beach fronting the Royal Hawaiian hotel likely to be significant and ongoing during construction.

b) Kuhio Beach Sandbag Groin

- Presenter: Dolan Eversole (Hawaii Sea Grant / WBSIDA)
- Short-term project (5-10yrs) to allow us to develop/implement a long-term solution.
- All permit applications have been submitted and are under review.
- Anticipate construction commencing Fall, 2019 (Sep-Nov).
- Project duration 2-3 weeks and will require partial beach closure at Kuhio Beach park.

c) Post-storm assessment (Feb 10 high wind/surf event)

- Presenter: Dolan Eversole (Hawaii Sea Grant / WBSIDA)
- Kona Low event transported a substantial volume of sand to the Diamond Head end of Royal Hawaiian Beach, adjacent to the Kuhio swim basin.
- Overall the event was beneficial to Waikīkī by increasing beach sand volumes.
- Sand-filled mattress was damaged in summer of 2018 and repairs are being planned.
- Diamond Head side of Royal Hawaiian Groin experienced seasonal erosion.
- No other storm impacts were observed or discussed.

WAIKĪKĪ BEACH COMMUNITY ADVISORY COMMITTEE

HO'OMAU 'O WAIKĪKĪ KAHAKAI

"WAIKĪKĪ BEACH RENEWS ITSELF"

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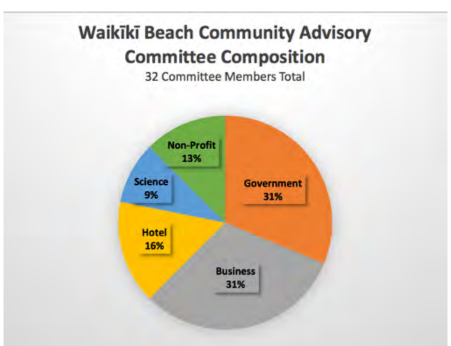

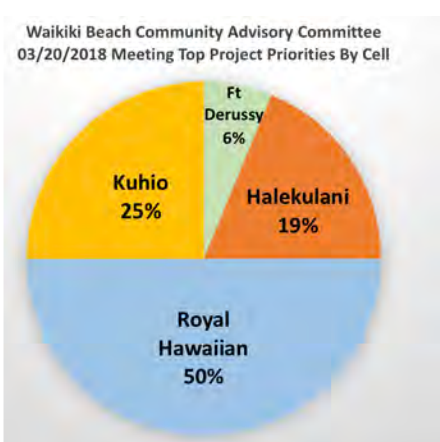

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a.

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f.

General Summary: Considering the limited sample size[1], the overall the results suggest:

1. Preferred designs vary by each beach cell but tend to favor Options E and F (Halekulani T-heads and T-heads + SLR) as the top ranking for the first choice (Figure 1).
2. Similar ranking is observed if we look at the 1st choice PLUS the 2nd choice with Option F Halekulani T-heads + SLR as the overall preferred design (Figure 2).
3. Option C (Royal Hawaiian Beach) was an equal 2nd to Option E when considering the 1st choice PLUS the 2nd choice (Figure 2).
4. While there are exceptions in some beach cells, the *least favored* designs include Option B (Kuhio w/ breakwaters and C Royal Hawaiian.
5. Note Option C ranked an equal 3rd with 3 other designs when looking at 1st choices only an equal 2nd when looking at 1st Plus 2nd choices and an equal least preferred for the 5th choice. This seems to indicate a bi-modal distribution of ranking results or in other words the committee is largely split on this option with the same number of results as the 5th choice as there are for 1st plus 2nd (Figure 3). This might indicate more information and discussion is needed in order resolve this difference of opinion with this option if there is an interest in pursuing this option.

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[1] A larger sample size will result in more statistically relevant and representative results. This could be done as an online survey to a wider stakeholder group and/or as public survey. Ideally future surveys will evaluate and rank various options for each cell rather than rank overall for all cells.

Conceptual Design Ranking Exercise – Results

Figure 1.

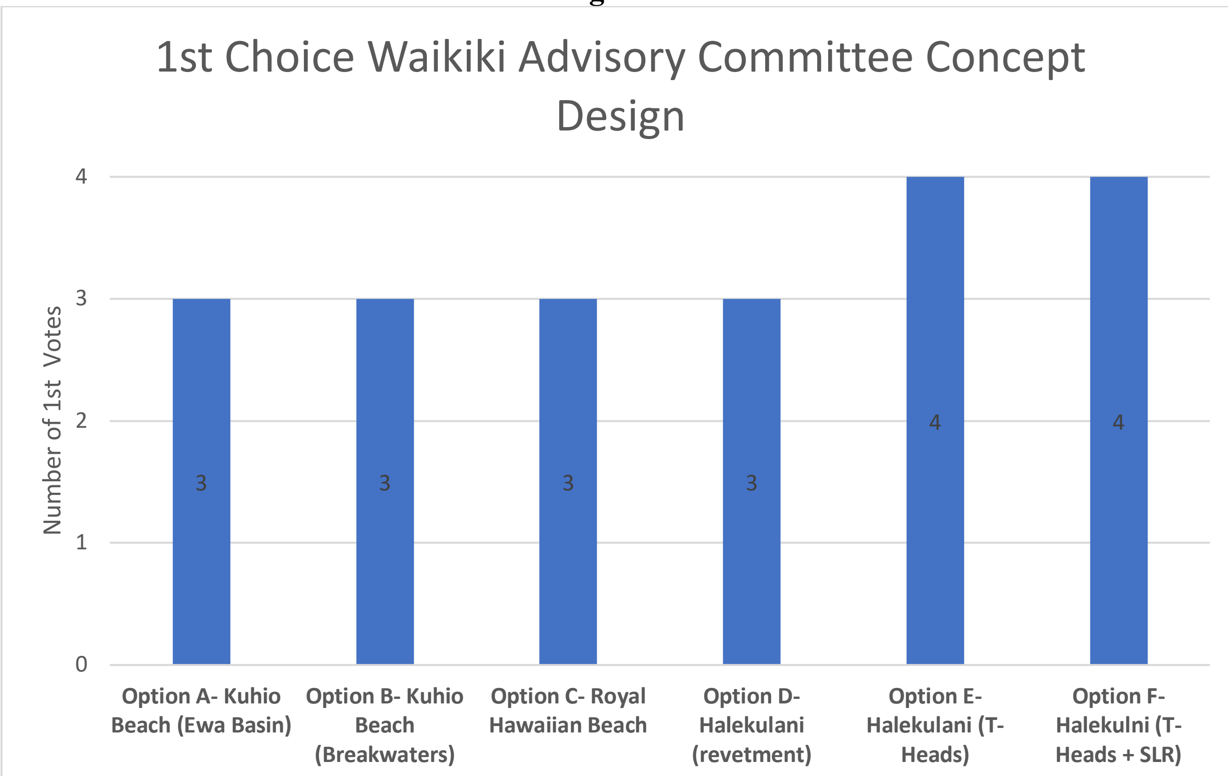


Figure 2.

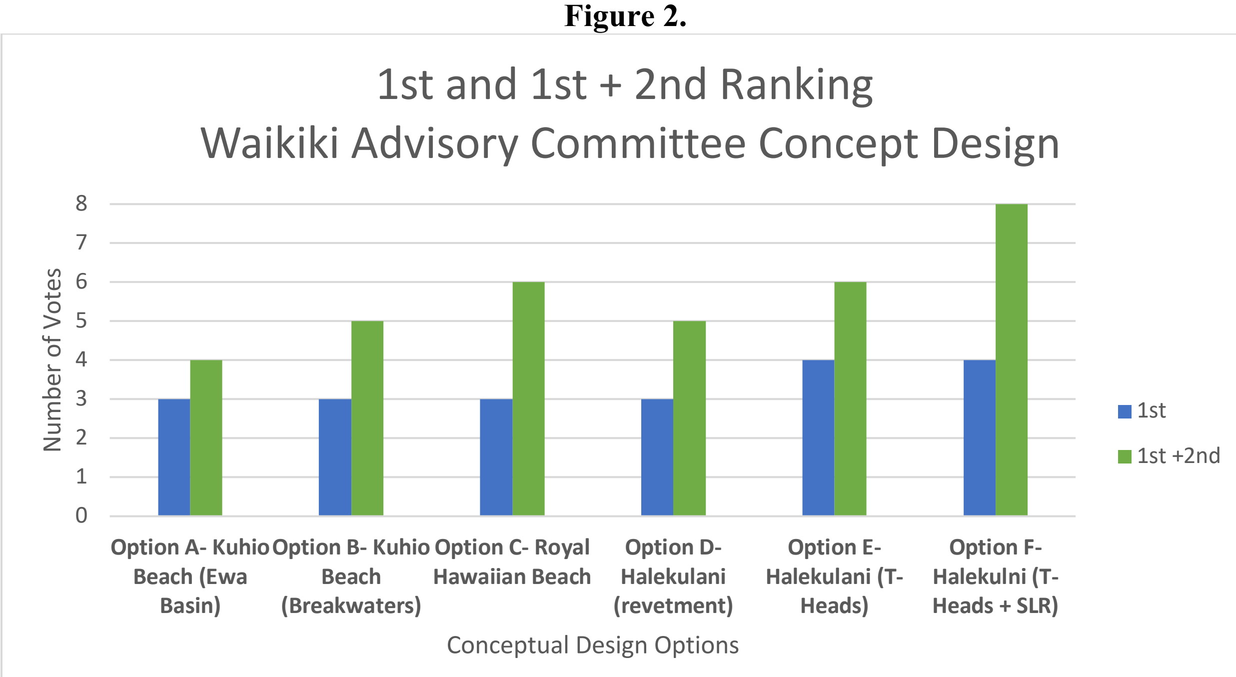
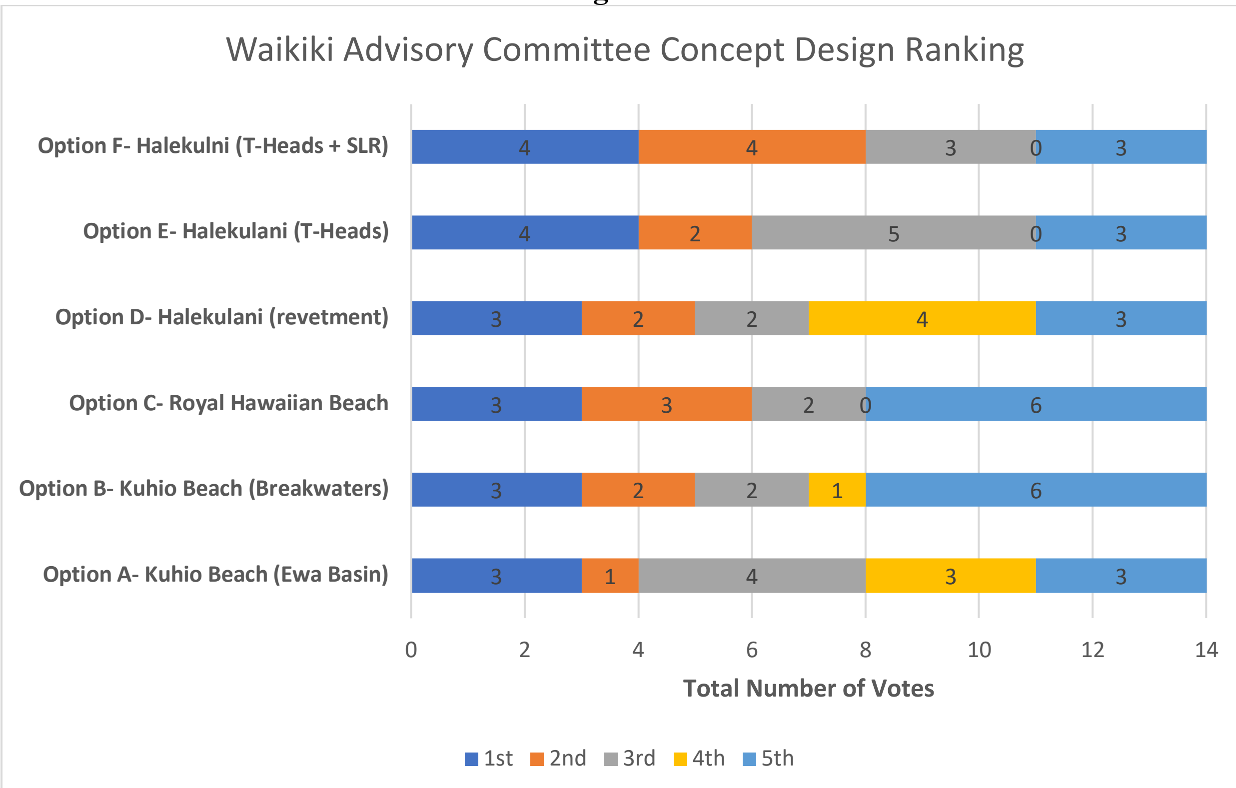
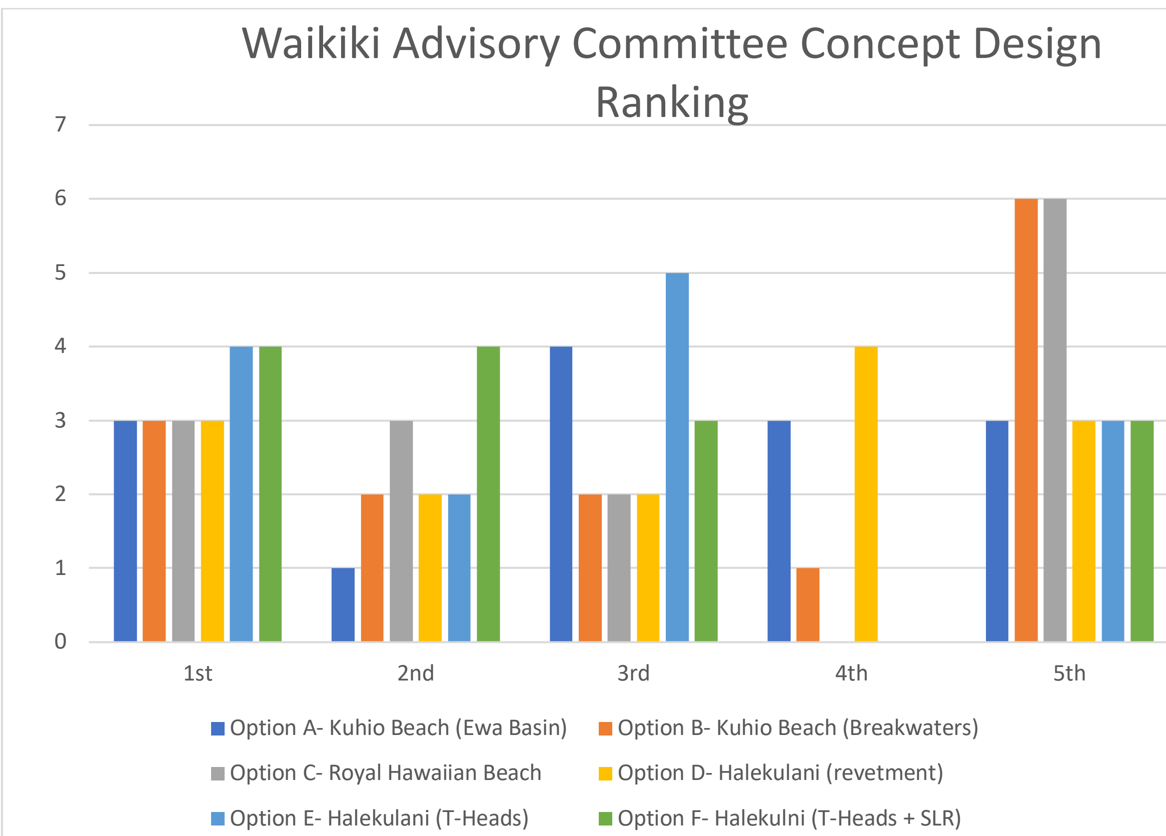


Figure 3.


Waikiki Advisory Committee Concept Design Ranking
Option F- Halekulni (T-Heads + SLR)
4 4 3 0 3
Option E- Halekulani (T-Heads)
4 2 5 0 3
Option D- Halekulani (revetment)
3 2 2 4 3
Option C- Royal Hawaiian Beach
3 3 2 0 6
Option B- Kuhio Beach (Breakwaters)
3 2 2 1 6
Option A- Kuhio Beach (Ewa Basin)
3 1 4 3 3
0 2 4 6 8 10 12 14
Total Number of Votes
1st 2nd 3rd 4th 5th


Waikiki Advisory Committee Concept Design Ranking
0 1 2 3 4 5 6 7
1st 2nd 3rd 4th 5th
Option A- Kuhio Beach (Ewa Basin)
Option B- Kuhio Beach (Breakwaters)
Option C- Royal Hawaiian Beach
Option D- Halekulani (revetment)
Option E- Halekulani (T-Heads)
Option F- Halekulni (T-Heads + SLR)

Conceptual Design Ranking Exercise –
Additional Committee Written Comments Received
(In no particular order)

1. No T-Heads
2. Safety critical for locals and visitors
3. Surf and recreation important
4. In favor of T-Heads but not the groins leading from shore to the heads.
5. Favor Breakwaters over groins
6. All structures are temporary, plan accordingly
7. Fully support T-Groins just need more details
8. Option A is good but B is better but need 3 more groins towards Kapahulu groin
9. Option C is good but need to take out T-Groin inshore of Canoes
10. Option E is good but need to move western most groin out of Halekulani channel
11. Option B- need to add replacement for Slippery Wall (Kuhio Breakwall)
12. Consider Multi-modal groins for safety, designed for safe access.
13. Design safe water entry areas and signage
14. Allow more mauka room for a beach to form and elevate beach
15. Design multi-use recreational access (stairs) rather than restrict access.
16. Safety concern for eddie formation and current flows (Koolina lagoon example)
17. Possible impacts of sand movement Ewa side of T-head

Appendix A: Sample of Conceptual Design Ranking Sheet

NAME: ________________________________

Waikīkī Beach Conceptual Designs- Comment Sheet
1= no support, 5 = fully support

What is your level of your support for the following conceptual designs?

	1-5 Scale
a) Kuhio Beach Option A (Ewa Basin only)	________
b) Kuhio Beach Option B (A +Breakwaters)	________
c) Royal Hawaiian Beach (L-spur and T-head)	________
d) Halekulani Option A (Revetments)	________
e) Halekulani Option B (T-Heads)	________
f) Halekulani Option A (T-Heads + SLR)	________

a.


b.


c.


d.


e.


f.


Other comments you want to add?

____

____

____

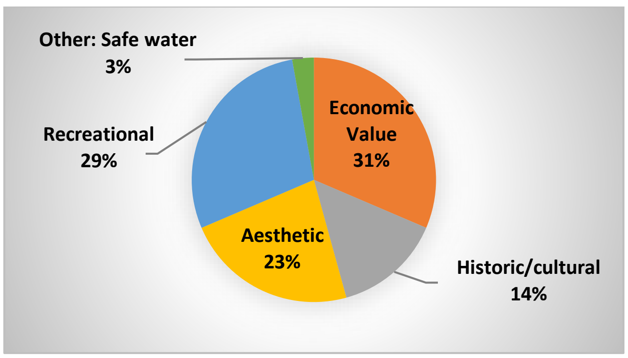
____

____

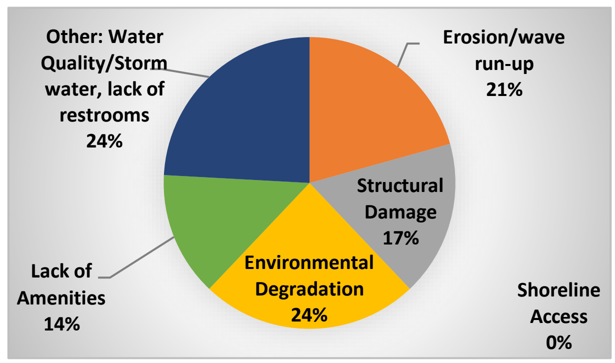
Waikīkī Beach Engineering Design Criteria

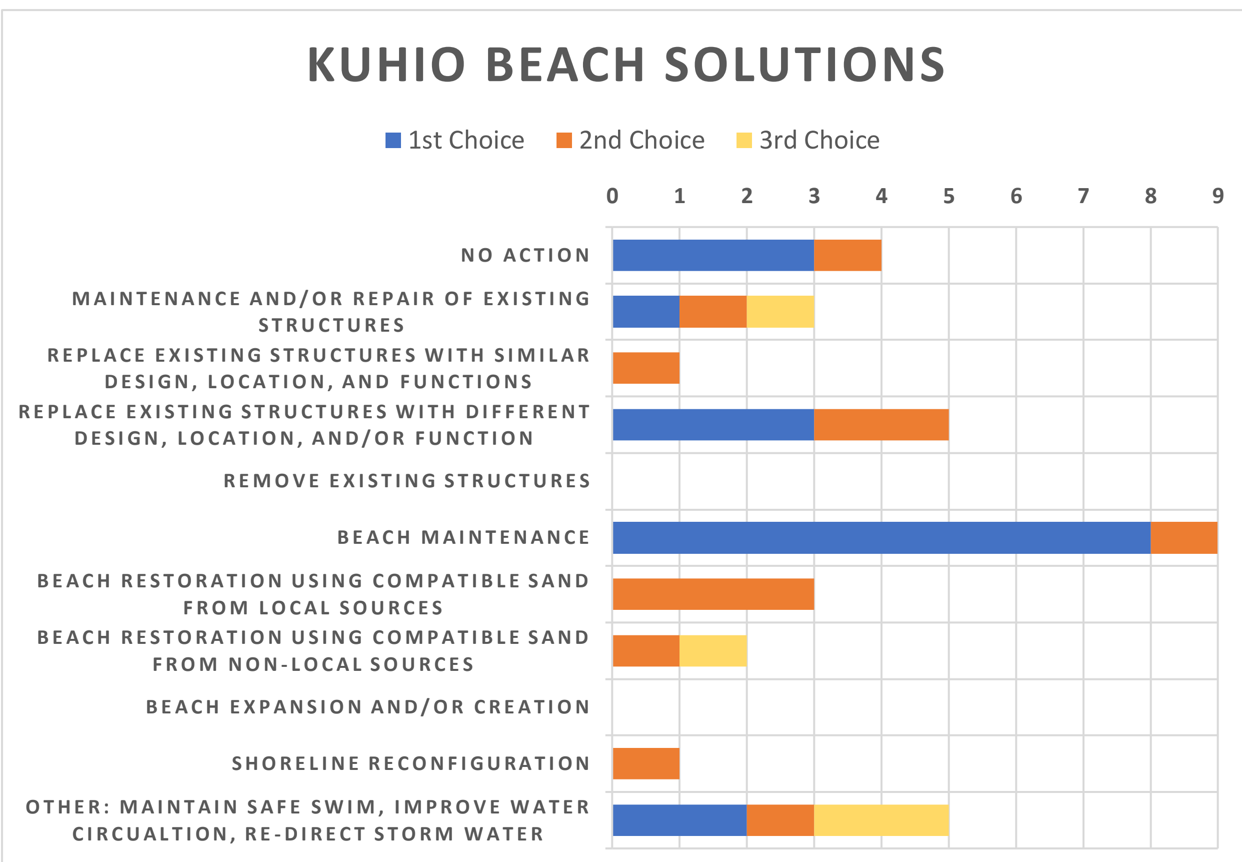
KUHIO BEACH WAIKIKI

ASSETS & VALUES



ISSUES & PROBLEMS





Waikīkī Beach Engineering Design Criteria

DESIRED ASSETS & USES

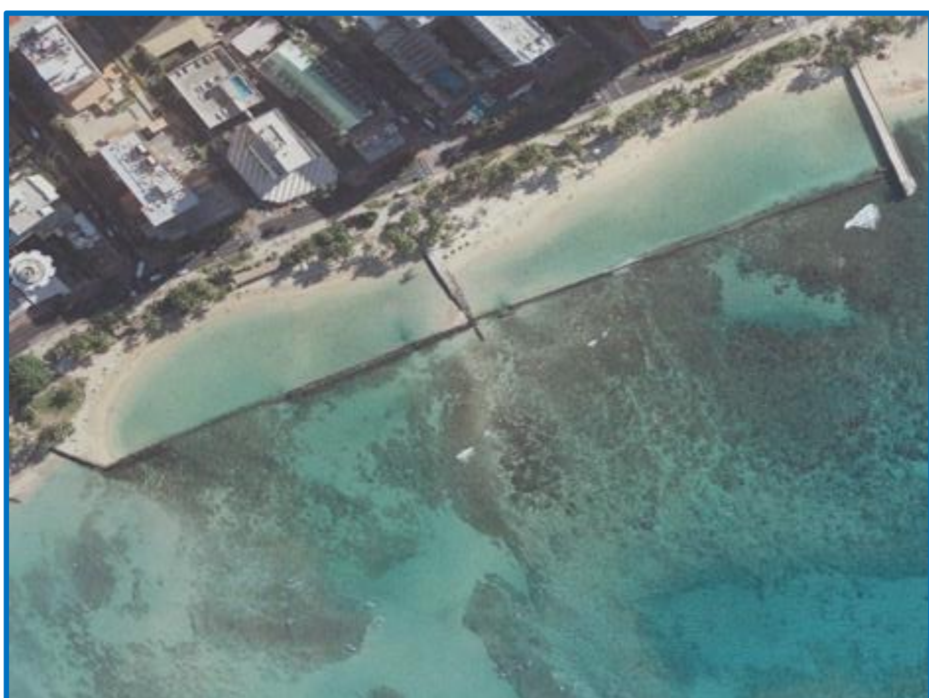
- Maintain calm and shallow water uses and beach-ocean interaction (swimming, bathing)
- Maintain ocean access at Ewa basin (Surfing access)
- Maintain existing commercial uses
- Maintain cultural/historical sense of place
- Maintain public access along Kapahulu groin and esplanade
- Preserve/protect surf sites (Walls, Queens, Baby Queens)

EXISTING ISSUES & PROBLEMS

- Beach Erosion and seaward slumping
- Water quality impacts
- Infrastructure and amenities lack of maintenance
- Seasonal beach erosion
- Public safety hazard on breakwater
- Beach loss at Diamond Head end of beach cell

DESIGN STRATEGIES & OPTIONS

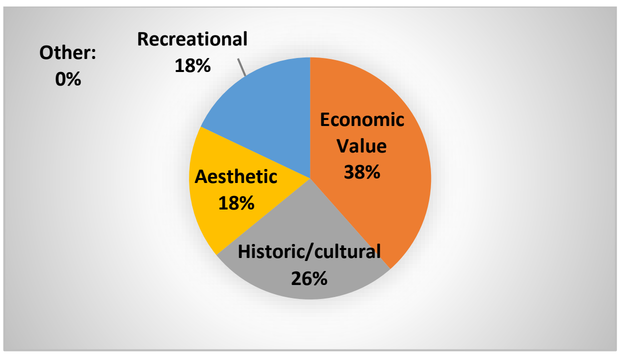
- Beach maintenance and restoration using locally sourced sand
- Small-scale beach maintenance (use existing basin sand for beach profile shaping)
- Replace existing structures with a different design function
- Improve water quality within basin (additional testing)
- Reduce sand loss through the breakwater channel
- Stabilize/manage seasonal beach dynamics



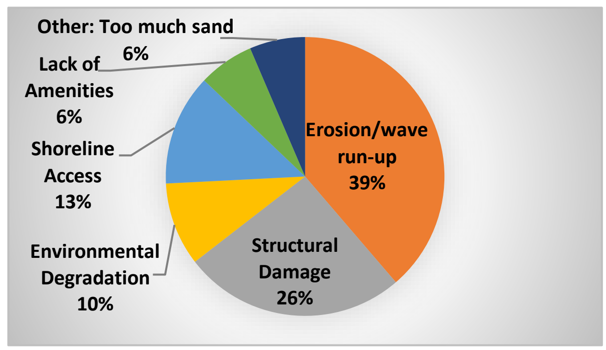
Waikīkī Beach Engineering Design Criteria

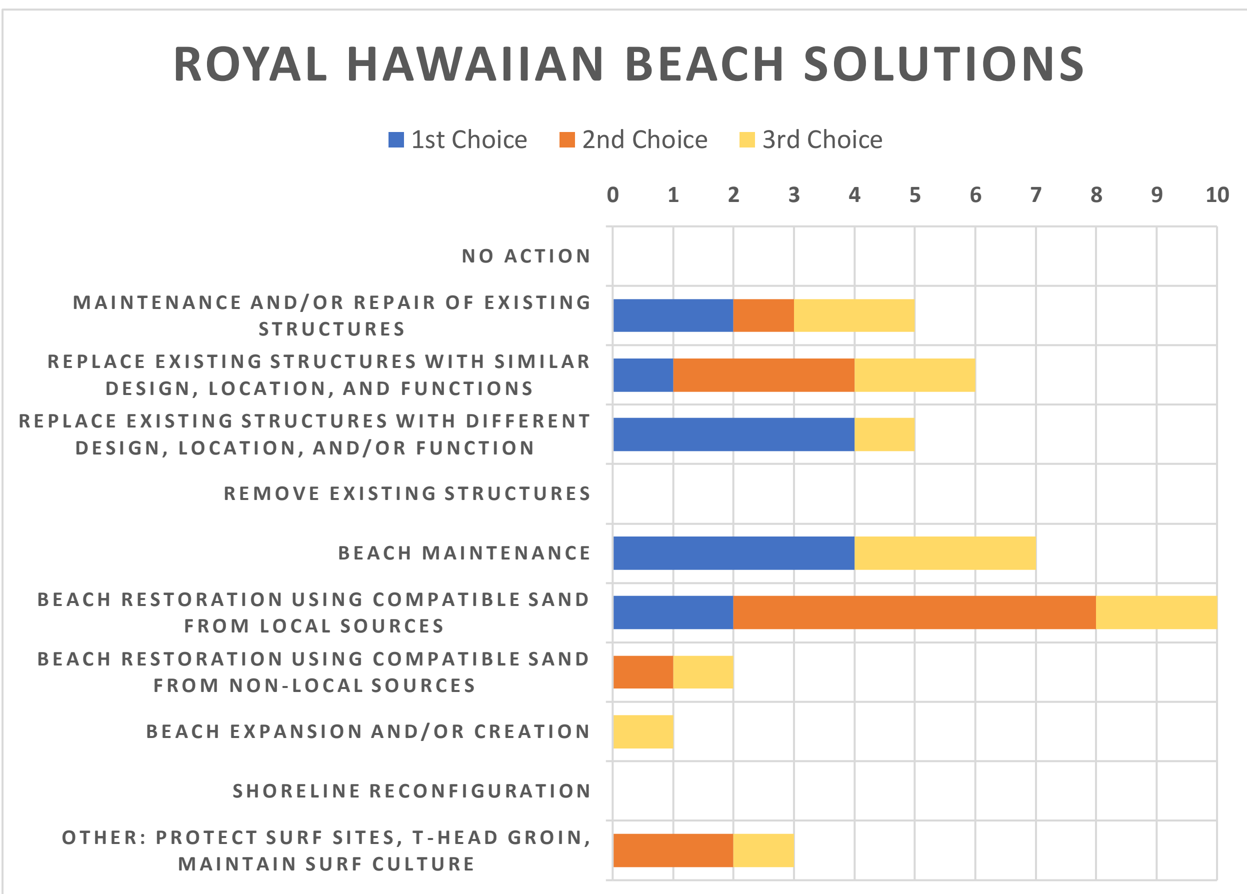
ROYAL HAWAIIAN BEACH, WAIKIKI

ASSETS & VALUES



ISSUES & PROBLEMS





Waikīkī Beach Engineering Design Criteria

DESIRED ASSETS & USES

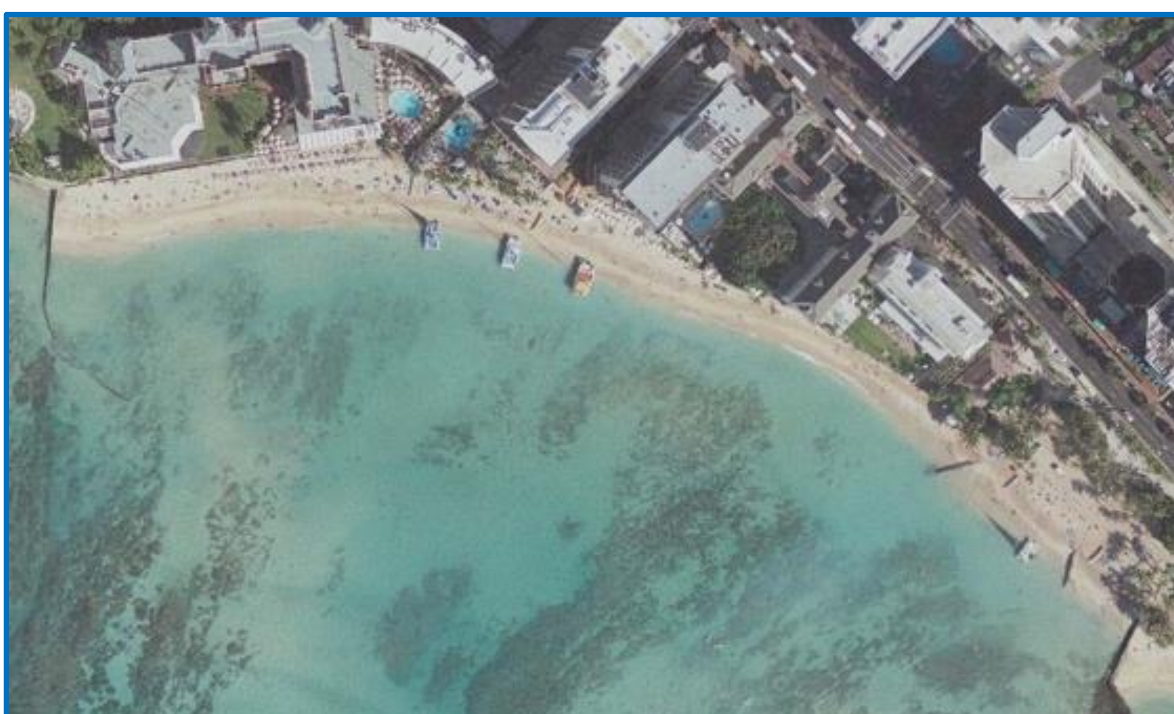
- Active uses and dynamic beach-ocean interaction
- Maintain mixed recreational use (swimming, surfing, bathing)
- Maintain economic/commercial use (catamarans, canoes, surf lessons/beach rentals)
- Maintain cultural/historical sense of place
- Maintain vessel ingress/egress through channel
- Preserve/protect surf sites (Canoes, Queens, Baby Queens)

EXISTING ISSUES & PROBLEMS

- Beach Erosion/Wave Run-up
- Seasonal beach erosion
- Structural failure of structures
- Limited seasonal lateral access
- Beach loss at Diamond Head end of beach cell

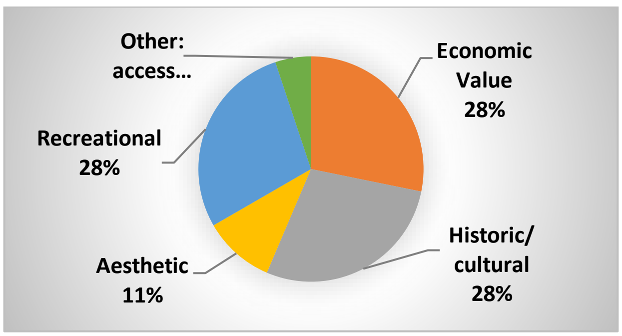
DESIGN STRATEGIES & OPTIONS

- Beach restoration using locally sourced sand
- Small-scale beach maintenance (use nearshore sandbar for sand back-passing)
- Replace existing structures with similar design
- Limited new shoreline structures-preserve open beach and view planes
- Improve lateral access alongshore (Pinch point at Moana)
- Reduce sand loss through the sand channel
- Stabilize/manage seasonal beach dynamics

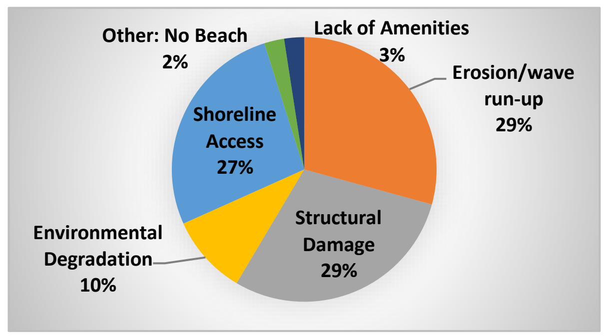


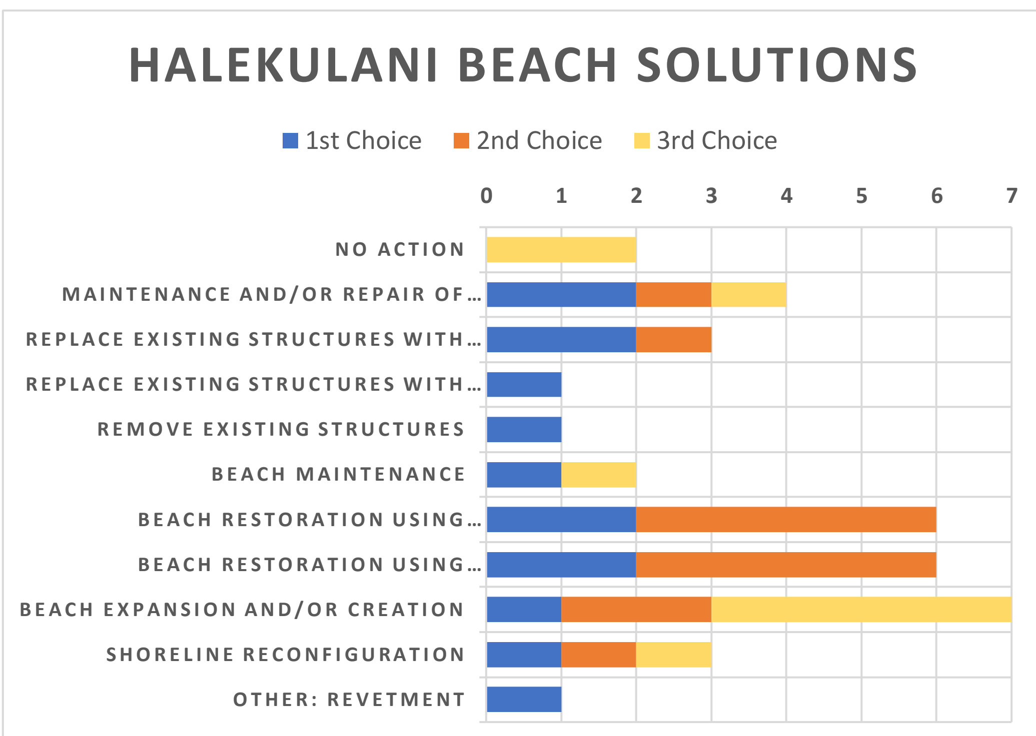
HALEKULANI BEACH, WAIKIKI

ASSETS & VALUES



ISSUES & PROBLEMS





Waikīkī Beach Engineering Design Criteria

DESIRED ASSETS & USES

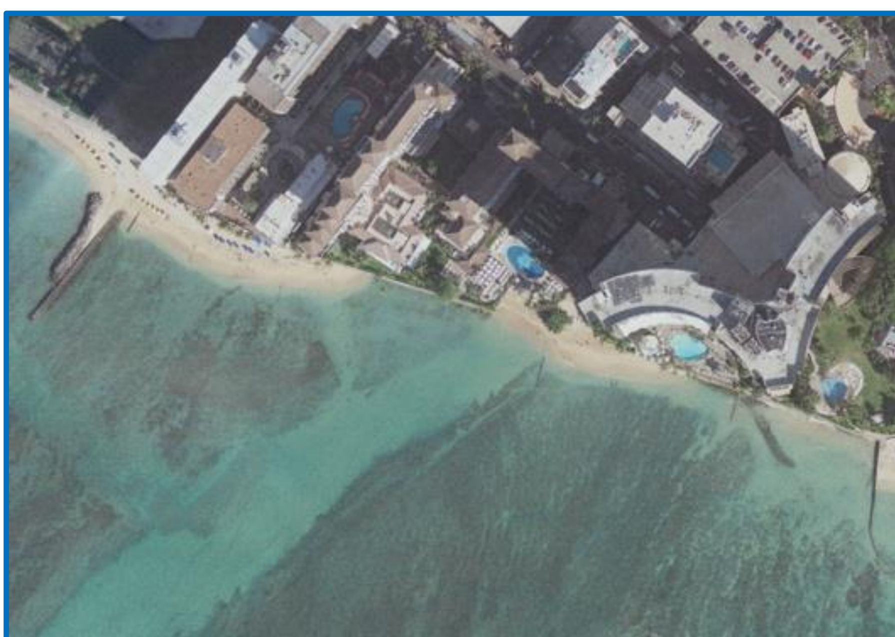
- Maintain mixed recreational use (swimming, surfing, bathing).
- Maintain high level of water quality
- Preserve submarine groundwater discharge at Halekulani Channel (Kawehewehe)
- Maintain vessel ingress/egress through Halekulani channel
- Preserve/protect surf sites (Populars, Threes, Fours)

EXISTING ISSUES & PROBLEMS

- Beach Erosion/Wave Run-up
- Overtopping of seawalls
- Structural failure of seawalls
- Limited lateral access
- Wave reflection off seawalls

DESIGN STRATEGIES & OPTIONS

- Beach Expansion and/or restoration
- Maintain and/or replace existing structures with similar design
- Improve lateral access alongshore (Boardwalk, walkway and/or beach)
- Reduce wave reflection off structures
- Reduce sand loss through the Halekulani sand channel
- Improve health and resilience of reef ecosystem



WAIKĪKĪ BEACH COMMUNITY ADVISORY COMMITTEE

HO'OMAU 'O WAIKĪKĪ KAHAKAI

"WAIKĪKĪ BEACH RENEWS ITSELF"

MEETING AGENDA

Date: **Wednesday, October 30th, 2019 2:00pm to 4:30pm**

Location: **Waikiki Beach Marriott Resort & Spa**
Kaimuki 1 Room 2nd floor Kealohilani tower (makai tower)
2552 Kalakaua Avenue (Parking is validated- Kealohilani tower)

Host: Waikīkī Beach Special Improvement District Association (WBSIDA)
Contact: Dolan Eversole, University of Hawai'i Sea Grant/WBSIDA
Cell (808) 282-2273 email: eversole@hawaii.edu

MEETING AGENDA

1. **Waikīkī Beach Community Advisory Committee** (10 mins)
   a) Introductions and advisory committee composition. (Introduce new members)
   b) Review of past meeting summaries and outcomes

2. **Waikīkī Beach Improvement Project Updates (**20 mins)
   a) Kuhio Beach sandbag groin.
   b) Royal Hawaiian groin.
   c) Waikīkī Beach Perception Surveys Update
   d) World Surfing Reserve Application

3. **Waikīkī Priority Project Areas – DLNR EIS Project Scope** (60 mins) (Handout)
   a) DLNR Waikīkī EIS project background, goals and scope.
   b) DLNR Sea-Level Rise R&V Assessment Update
   c) September 27, 2018 meeting conceptual designs ranking summary. (Handout)
   d) Review beach improvement conceptual designs for Waikīkī.
      i. Ft DeRussy sand back-passing
      ii. Halekulani cell concepts
      iii. Waikīkī Beach maintenance (Royal Hawaiian Cell)
      iv. Small-scale dredging systems
      v. Kuhio Beach basin concepts
   e) Group discussion, questions and comments. (60 mins)

4:30pm Pau Optional social 5-6pm at the pool bar.

WAIKIKI BEACH COMMUNITY ADVISORY COMMITTEE
Marriott Resort Waikiki Beach
October 30, 2019

Meeting Minutes

2:00pm Opening remarks and introductions (Rick Egged, WBSIDA)

2:15pm Review of past meeting outcomes (Dolan Eversole, Hawaii Sea Grant / WBSIDA)

2:25pm Waikiki Beach improvement project updates (Sam Lemmo, DLNR OCCL)

Kuhio Beach Sandbag Groin

Press release 10/30
Construction begins 11/04
Will be doing daily monitoring
K. Downing – is sand fill for bags compatible with the existing beach? Is it sand or crushed coral? What is plan when groin fails; how long will bags remain in place?
S. Lemmo – if it fails, we will adapt it or remove it; sand fill would be disposed of off-site; sandbags are larger than those used at Royal Hawaiian Groin;
C. Fletcher – what is failure and what is success? Will beach cell be more stable than what is currently there? Flanking will lead to proliferation of groins. Is the beach in this area an erosional or depositional feature?
S. Lemmo – failure is if sand does not remain stable in the beach cell or significant flanking occurs on the downdrift side;
K. Downing – does it make sense to spend money to repair this area temporarily or just focus on a larger, more permanent solution.

Royal Hawaiian Groin Replacement

Construction planned for Jan-Mar 2020
Construction duration will be approximately 3 months
Staging materials at Kuhio Beach
Structure is an L-head rubblemound groin with a concrete cap
Crest elevation was lowered to reduce the structural footprint
K. Downing – is a rubblemound groin stronger or weaker with the concrete spine;
D. Smith – ideally, we would have removed the existing groin; maintaining the existing groin was a condition of the permit; the armor layer is designed for the crown wall to be cast-in-place;
C. Fletcher – K. Downing raised a valid point; recommend further detailed analysis be conducted prior to final design and construction.

3:15pm Discussion of Waikiki as a *World Surfing Reserve* (Dolan Eversole)
K. Downing – what has this organization done to help any of the beaches that have been designated as world surfing reserves?
D. Eversole – one example where land was purchased to create a conservation easement.

3:30pm BREAK

3:40pm Waikiki EIS Update (Sam Lemmo) Strong emphasis on climate resilience

4:00pm Beach Improvement Conceptual Designs (David Smith)
S. Lemmo – does Kuhio design take into consideration the erosion hot spot at the Waikiki Tavern?
R. Porro – any adaptable features in the design so the structures can be modified for higher sea level?
D. Smith – designed to be equipment-accessible with the idea that future modifications will be necessary.
D. Eversole – are there other materials (other than rock), such as modular structures?
D. Smith – could use coral, concrete armor units, etc.; other options that would need to be evaluated.
C. Fletcher – Fort DeRussy sand in borrow v' placement areas is different; borrow area is crushed coral that is easily cemented; what is origin of sand in the placement area?
C. Fletcher – Royal Hawaiian Beach compaction, cementation, fracturing caused by trucking; also turbidity
R. Porro – projects seem to be discrete; are they are plans for recurring maintenance; if there is an approved maintenance plan, FEMA funding could be available after a disaster.

ADDITIONAL NOTES

- Questions are generally technical and focused on engineering challenges.
- Why are we encasing the existing RHG? Who made this requirement and why?
- Need to show model conditions on slides (wave height, direction, period).
- Need 3D renderings in addition to 2D plan views.
- For EIS, need to explain that shoreline has been consistently re-engineered over the past century (show examples of 3-4 photos showing evolution of each area); projects are relatively small in the context of the history of Waikiki.
- Investigate including a "maintenance program" to qualify for FEMA post-disaster funds.

WAIKĪKĪ BEACH COMMUNITY ADVISORY COMMITTEE

Wednesday, October 30, 2018 2:00pm to 4:30pm

9

SIGN IN SHEET

Name	Organization	Email
Dolan Eversole	WBSIDA	eversole@hawaii.edu
Ted Bush	"	tedb@waikikibeachservices.com
RUSMURAKAMI	SSA	RUSMURAKAMI@KMSSA.COM
Melissa Agbayani	DLNR ENG	melissa.m.agbayani@hawaii.gov
JOHN DATILES	" "	JOHN.M.DATILES@HAWAII.GOV
ANDY BOHLANDER	SGA ENGINEERING	abohlander@seaengineering.com
John Clark	FWB	jclark@hawaii.rr.com
BRETT GREENBERG	AQUALANI	Bgreenberg@AQUALANI.COM
Katie Gunge	Dive Oahu	katie@diveoahu.com
Neal Sklodowski	Halekulani	neal.sklodowski@halekulani.com
Bob Finley	WNA	
Rob Porro	UH NDPTC	rjporro@hawaii.edu
SAM LEMMO	DLNR	sam.j.lemmo@hawaii.gov
Chip Fletcher	UH	
Kristian McDonald		
Chryssaldo thomas	outrigger	chryssaldo.thomas@outrigger.com
JASON WOLL	C+C Hon DPR	jwoll@honolulu.gov
Jim Larson	WBSIDA	
Michele Nekota	DPR	
Revell Newton	Outrigger Waikiki	revell.newton@outrigger.com
JACOB VANDOR	DIVE OAHU	JACOBVANDOR@GMAIL.COM
DiDi Robello	ABS	

WAIKĪKĪ BEACH COMMUNITY ADVISORY COMMITTEE
HO'OMAU 'O WAIKĪKĪ KAHAKAI
"WAIKĪKĪ BEACH RENEWS ITSELF"

MEETING AGENDA

Date: **Tuesday, January 19th, 2020 2:00pm to 3:30pm**

Location: **Zoom Meeting**
https://us02web.zoom.us/j/82555500228?pwd=SzJWbTJycWtvUkFzeW5yN282Q243QT09
Meeting ID: 825 5550 0228 Passcode: 889179
One tap mobile +12532158782,,82555500228#,,,,*889179# US

Host: Waikīkī Beach Special Improvement District Association (WBSIDA)
Contact: Dolan Eversole, University of Hawai'i Sea Grant/WBSIDA
Cell (808) 282-2273 email: eversole@hawaii.edu

MEETING AGENDA

1. **Waikīkī Beach Community Advisory Committee** (10 mins)
   a) Welcoming, introductions and committee background.

2. **Waikīkī Beach Maintenance Project Updates (**20 mins)
   a) Royal Hawaiian groin
   b) Waikīkī Beach Maintenance Project

3. **Waikīkī Beach Improvements –EIS Project Scope** (30 mins) (Handout)
   a) Waikīkī EIS project background, goals and scope.
   b) Review beach improvement and maintenance conceptual designs for Waikīkī.
      i. Fort DeRussy Beach Sector – Beach Maintenance (sand back passing)
      ii. Halekūlani Beach Sector – Beach Construction with Stabilizing Groins
      iii. Royal Hawaiian Beach Sector - Beach Nourishment
      iv. Kūhiō Beach Sector ('Ewa Basin) – Beach Nourishment & Segmented Breakwater
      v. Kūhiō Beach Sector (Diamond Head Basin) – Beach Maintenance
   c) Group discussion, questions and comments. (30 mins)

3:30pm Pau

WAIKIKI BEACH COMMUNITY ADVISORY COMMITTEE
January 19, 2021
Meeting Minutes

2:00pm Opening remarks and introductions (Rick Egged, WBSIDA - Dolan Eversole, Hawaii Sea Grant/ WBSIDA)
Dolan added links to chat regarding the advisory committee and future beach maintenance project:
https://www.wbsida.org/waikiki-beach-community-advisory-committee
https://www.wbsida.org/waikiki-beach-maintenance

2:10pm Waikīkī Beach Community Advisory Committee (Dolan Eversole)
Review of last year's meeting minutes, review of criteria used in the Waikīkī master planning and how they were established. Review of executive summary regarding WBSIDA and goals. Review of documents attached in meeting invitation email. No questions asked.

2:20pm Waikīkī Beach Maintenance Project Updates (Dolan Eversole, Hawaii Sea Grant WBSIDA)
Waikīkī Beach Maintenance Project 2021
Provided brief intro regarding Royal Hawaiian Groin and Kūhiō Sandbag Groin. 2021 Waikīkī beach maintenance project similar in scope to 2012 maintenance project. Mobilization will begin in late January and expected to take 2 weeks. Sand recovery/dewatering/transport/placement to begin in February and expected to take 3-4 months. Expect to be demobilized sometime in May and completely finished by June. Outreach material provided to public including FAQ webpage.
Questions (asked via chat window):

- Mike Foley - Cost of the renourishment project?
  Answer: Between $3-4 million
- Chip Fletcher – How long from start to stop?
  Answer: Up to 4 months

2:40pm Waikīkī Beach Improvements –EISPN Project Scope
Waikīkī EIS project background, goals and scope (Sam Lemmo, DLNR OCCL)
Hope to be finished with EIS process by end of 2021.
Dolan shared the following project link:
https://dlnr.hawaii.gov/occl/waikiki/

Review beach improvement conceptual designs for Waikīkī (Andy Bohlander – SEI)
OEQC Process: Environmental Impact Statement Preparation Notice (EISPN)
EISPN published 12/23/20
Public scoping meeting 1/7/21
Draft PEIS expected to be published Spring 2021
Intro on early consultation process. Background – Economically important to state through tourism, beach is heavily engineered and in deteriorated state.

Offshore Sand Resources/Deposits – Reef Runway, Ala Moana, Hilton, Halekulani, Canoes/Queens, Diamond Head
Overview of Waikīkī beach sectors and erosion/flooding issues experienced in each
Reviewed concept designs for each of the four identified projects in the EISPN including:

1. Fort DeRussy Beach Sector
   • Proposed Action: Beach Maintenance (Sand Back passing)
   • Requires ~1,200 cubic yards of sand

2. Halekūlani Beach Sector
   • Proposed Action: Beach Construction with three Stabilizing Groins, potential for ADA access
   • Requires ~60,000 cubic yards of sand

3. Royal Hawaiian Beach Sector
   • Proposed Action: Beach Nourishment, no new structures proposed
   • Requires ~25,000 cubic yards of sand

4. Kūhiō Beach Sector
   • Proposed Action: Beach Nourishment, Segmented Breakwater (‘Ewa Basin)
   • Proposed Action: Beach Maintenance (Diamond Head Basin)
   • Requires ~28,500 cubic yards

3:35pm Group discussion, questions and comments.

- Mike Murray - (via chat box) - Dolan, Great presentation!! Trying to indoctrinate myself with the overall projects. The sites, you shared, past meeting minutes helped a lot! I do apologize as I need to leave the meeting just after 3! Mahalo, mm
- Chip Fletcher (via chat box) - Gotta leave for another meeting. Thanks Sam, Andy and Dolan!
- Dolan – Asked to expand on function and use of small scale dredge systems
  Answer (Andy B) – These are diver operated systems that transport sand from nearshore areas (~60 cubic yards of sand per hour, or 360 cubic yards per day.). Fort DeRussy, Hilton channel, Hilton lagoon, sandbar off of Royal Hawaiian, Kūhiō swim basins are potential candidates.
- Dolan (follow up) – How do these systems compare to truck hauling regarding production rate?
  Answer (Andy B) - Unclear but something they would love to test. Exploring options to conduct a demonstration project.
- Rob Porro – (via chat box) - Great presentation, Andy. Question regarding SLR - what SLR projection was used for the projects? Is there any modularity/flexibility built in to the designs if SLR is higher than expected?
  Answer (Andy B) – 50 year design life based on Sweet et. al. (2017) NOAA SLR projections.

(Dolan added) – Royal Hawaiian Groin modified the design to account for SLR.

Dolan shared website: https://dlnr.hawaii.gov/occl/files/2021/01/2020-12-23-OA-EISPN-Waikiki-Beach-Improvement-and-Maintenance-Program.pdf

- Darren Lerner – (via chat box) Thanks everyone. Gotta run!

3:45pm Pau

1-19-21-Waikiki Beach Community Advisory Committee Registration Report

First Name	Last Name	Registration Time	Approval Status	
Kalani	Kaanaana	2021-01-16 12:56:46	approved	
Scott	Sullivan	2021-01-07 14:52:33	approved	
Neal	Sklodowski	2021-01-07 12:04:47	approved	
Andy	Bohlander	2021-01-07 07:50:53	approved	
soostover		2021-01-11 10:43:23	approved	
Mike	Shaff	2021-01-07 05:08:27	approved	
Meghan	statts	2021-01-07 06:57:56	approved	
Shellie	Habel	2021-01-16 13:15:37	approved	
Doorae	Shin	2021-01-07 13:32:50	approved	
Roberto	Porro	2021-01-07 15:28:19	approved	
Lee	Nakahara	2021-01-07 08:32:44	approved	
Darren	Lerner	2021-01-19 11:57:35	approved	
Jason	Woll	2021-01-19 13:51:48	approved	
David	Smith	2021-01-12 13:44:41	approved	
George	Parsons	2021-01-07 09:53:25	approved	
Mindy	Sanford	2021-01-07 09:44:38	approved	
Bob	Hampton	2021-01-07 10:45:47	approved	
John	Clark	2021-01-16 11:28:10	approved	
harry	robello	2021-01-07 19:53:27	approved	
Ted	Bush	2021-01-08 09:33:21	approved	
rus	murakami	2021-01-19 10:01:40	approved	
Robert	Finley	2021-01-07 10:12:50	approved	
Richard	Stover	2021-01-11 10:34:32	approved	
Dolan	Eversole	2021-01-16 10:38:25	approved	
Jim	Fulton	2021-01-17 12:59:41	approved	
Rick	Egged	2021-01-19 11:08:45	approved	
Matthew	Gonser	2021-01-19 13:18:53	approved	
Mike	Foley	2021-01-19 13:58:48	approved	
brett greenberg		2021-01-07 10:48:07	approved	

sam	Iemmo	2021-01-19 11:20:12	approved	
Chip	Fletcher	2021-01-07 12:07:37	approved	
KEVIN	ALLEN	2021-01-19 14:14:56	approved	
Mike	Murray	2021-01-18 11:31:06	approved	
Giannicola	Tumino	2021-01-19 11:57:30	approved	

WAIKĪKĪ BEACH COMMUNITY ADVISORY COMMITTEE

HO'OMAU 'O WAIKĪKĪ KAHAKAI

"WAIKĪKĪ BEACH RENEWS ITSELF"

MEETING AGENDA

Tuesday, January 25th, 2022 2:00pm to 3:30pm

Zoom Meeting

https://us02web.zoom.us/j/87109477763?pwd=ZlQ2bW9DM3pIbjAwZHV4NTh3djZ0QT09

Meeting ID: 871 0947 7763

Passcode: 348780

AGENDA ITEM	
1. Waikīkī Beach Community Advisory Committee Briefing	**(10 mins)**
2. **Waikīkī Beach Improvement Projects Update**	**(10 mins)**
3. **Waikīkī Beach Improvements FEIS Update**	**(30 mins)**
a) DLNR Waikīkī EIS project background, goals and scope	
b) Update on Final EIS timeline and next steps	
4. Waikīkī Boardwalk Concept	**(10 mins)**
5. Group discussion, questions, comments.	**(30 mins)**
Next meeting July, 2022	
3:30pm Pau	

WAIKĪKĪ BEACH
COMMUNITY ADVISORY COMMITTEE

Meeting Agenda
Tuesday, November 1st, 2022 4:00pm to 5:00pm

Zoom Meeting
https://hawaii.zoom.us/j/93495859345
Meeting ID: 934 9585 9345
Passcode: 632543

MEETING AGENDA

1. Waikīkī Beach Community Advisory Committee
a) Welcome, introductions and committee updates
2. Waikīkī Beach Improvements EIS Update
a) Update on Final EIS timeline and next steps
b) Small-Scale Beach Restoration Pilot - Kawehewehe
3. **Waikīkī Projects Update**
a) Waikīkī Beach Maintenance Project- July, 2022 swell event
b) Royal Hawaiian Groin & Beach Overnight Closure
~~c) Ala Wai Harbor Vision Plan (DLNR)~~
d) Waikīkī Resilience Plan
4. **Save the Waves, World Surfing Reserve- Application Update**
5. Group discussion, questions, comments.
i. Next meeting June, 2023

For more information visit: https://www.wbsida.org/waikiki-beach-community-advisory-committee

WAIKIKI BEACH COMMUNITY ADVISORY COMMITTEE
November 1, 2022

Meeting Summary

4:00pm Opening remarks and introductions (Rick Egged, WBSIDA - Dolan Eversole, Hawaii Sea Grant/ WBSIDA)

4:10pm **Waikīkī Beach Improvements –Draft EIS Project Scope**
https://dlnr.hawaii.gov/occl/waikiki/

- Waikīkī EIS project background, goals and scope (Dolan Eversole)
- Draft EIS awaiting a Board of Land and Natural Resources hearing.
- Needs Board approval then Governor's signature, the document can then be used as an environmental reference for subsequent permits.
- Reviewed the Halekulani beach cell concept plan and Phase I of the plan as the first priority.
- Reviewed the small scale beach restoration pilot concept for the Kawehewehe area. Urgent need to mitigate erosion and wave run up that is impacting public walkway in the area.
- WBSIDA is supportive of the EIS plan and a cost-share partner.

4:25pm Questions- Waikīkī Beach Community Advisory Committee

- Several questions and general discussion around timelines and with the level of urgency why it is taking so long to get action to mitigate the erosion here.
- The permitting, while streamlined for a small-scale project without structures will still take time and contracts need to go through the State.
- Discussed the possibility of a delay in the state permitting beach restoration projects in the summer months could mean a delay if permits are ready in early summer but can't be initiated.
- Project needs to have permits developed and submitted to the State DLNR, no project costs for this yet.
- Earliest expected project start would be Spring, 2023, more likely summer-Fall 2023.

4:30pm **Waikīkī Beach Maintenance Project**s

Waikīkī Beach Maintenance Project 2021

- Briefing for Royal Hawaiian Groin and Kūhiō Sandbag Groin.
- 2021 Waikīkī beach maintenance project similar in scope to 2012 maintenance project.
- Beach monitoring reveals the beach has gained sediment since the beach nourishment was completed in May, 2021. This indicates the beach appears more stable than before, at least for now.
- The extortionary south swell of July, 2022 brought sand into the Royal Hawaiian beach which gained 3% area on the sub-aerial (above the water) portion of the total beach area.

Royal Hawaiian Groin and Beach Closure

- Royal Hawaiian Groin was completed in September, 2020.
- Beach appears to be much more stable since then. Stability is pronounced near the groin but the entire cell seems to be more stable now.
- *Beach Closure*- A new initiative to have nightly beach closure of the Royal Hawaiian Beach to address overnight sleeping and property storage.
- The WBSIDA is facilitating a process to allow the overnight beach closure to ensure a safe and clean environment.
- The overnight closure would be 2am to 5am which is consistent with the City and County beach park hours at Kuhio Beach.
- Transiting and access to the ocean would be allowed but no loitering, sitting or lying down between 2am and 5am.
- Action is pending a response from the DLNR.

Waikīkī Resilience Plan

- Update on the goals, objectives and status of the Waikīkī Resilience Plan.
- Two year effort through the State Office of Planning and Sustainable Development which has provided funding to the University of Hawaiʻi Community Design Center to develop a framework for a plan.

4:45pm **Waikīkī World Surfing Reserve**

- Update on the goals, objectives and status of the Waikīkī Surfing Reserve.
- Application process underway now and due in the Spring.
- Discussion centered around possible projects, stewardship committee composition and actions.
- General support for the idea and discussion about stakeholder and community outreach that is being planned for the application.

4:55pm Group discussion, questions and comments.

5:05pm Pau

FINAL PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

Waikīkī Beach Improvement and Maintenance Program

October 2024

Prepared for:
Hawai‘i Department of Land and Natural Resources
Office of Conservation and Coastal Lands
1151 Punchbowl Street, Suite 131
Honolulu, Hawai‘i 96813

Partnered with:
Waikīkī Beach Special Improvement District Association
2250 Kalākaua Ave. Suite 315
Honolulu, Hawai‘i 96815

Prepared by:
Sea Engineering, Inc.
Makai Research Pier
41-305 Kalaniana‘ole Hwy
Waimānalo, Hawai‘i 96795

APPENDIX B

Sand Source Investigation Report

Prepared By: Sea Engineering, Inc.

Sand Source Investigation Report
Waikiki Beach Improvement and Maintenance Program

Waikiki, Oahu, Hawaii

May 2024

Prepared for:
State of Hawaii
Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96813

Prepared by:
Sea Engineering, Inc.
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Job No. 25548

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1. INTRODUCTION

1.1 Background

The State of Hawaii Department of Land and Natural Resources (DLNR) has initiated the Waikiki Beach Restoration project, which consists of development of shoreline maintenance and improvement projects. The project area extends from the Natatorium west to the Hilton Hawaiian Village. Waikiki Beach is a highly modified urban shoreline, and the shoreline configuration today is largely the result of past efforts to widen and maintain the beach. Waikiki Beach is, at least in part, in a deteriorating state and requires regular maintenance and strategic improvements in order to continue to meet present and future beach needs to serve the growing Waikiki tourism economy. Many sections of Waikiki Beach are substantially narrowed or have been completely lost to erosion due to a long history shoreline modification, chronic and episodic sand loss, a lack of coordinated beach management, and minimal capital investment.

Sea Engineering, Inc. (SEI) has been contracted to accomplish three project objectives; 1) development of a Feasibility Study for beach maintenance/improvement, 2) preparation of an Environmental Impact Statement (EIS) for selected beach improvements, and 3) conceptual design and permitting for selected beach improvements. This work is being accomplished for the Department of Land and Natural Resources (DLNR), Office of Conservation and Coastal Lands (OCCL). Project coordination is also being assisted by the Waikiki Beach Special Improvement District Association (WBSIDA).

A primary objective of the Feasibility Study is to investigate potential sand sources. The potential sources of sand must be carefully evaluated in terms of quality, quantity, recovery cost, and general feasibility. Initial investigations for this project concluded that there was no readily available terrestrial source of suitable sand and that local offshore sand resources should be evaluated.

The following are objectives of this Sand Source Investigation:

1. Collect and review existing information regarding previous South Shore sand investigations
2. Delineate identified sand sources and estimate volumes
3. Delineate other potential sand sources
4. Investigate (map and sample) the potentially viable offshore deposits
5. Analyze the investigation data
6. Produce a report summarizing the findings and applicability of the sand for beach projects

1.2 Data sources in this report

Sea Engineering, Inc. (SEI) has performed offshore sand source investigations for several decades. SEI has worked in both lead and support roles, and company employees have performed sand investigations as employees of other organizations. SEI's knowledge base of offshore sand sources around Oahu is extensive. For the present study, one of the goals was to investigate both new and existing sand sources, in particular, those known to exist but that have not been well sampled. Sources of historical data included the U.S. Geological Survey (USGS) and the University of Hawaii Coastal Geology Group, as well as previous SEI projects. SEI collected historical data and performed sand source investigations on specific sites for the present project.

As this project was progressing, Sea Engineering undertook a project with the City and County of Honolulu to nourish the beach at Ala Moana Regional Park. Sand source investigations were performed as part of that study, and the results are included in this sand report. That project identified a sand source directly offshore of the park extending from 70 feet of water offshore to depths beyond 120 feet. That project also investigated a new deposit off Diamond Head Beach Park, as well as further investigation of certain sites around Waikiki.

2. SAND SOURCE INVESTIGATIONS

2.1 Introduction

A key component to the success of the proposed actions is the availability of a suitable sand source for beach nourishment. The majority of Hawaiʻi beaches are composed of calcareous (calcium carbonate) sand, which is composed of skeletal fragments of marine organisms such as corals, coralline algae, mollusks, echinoids, forams, and minor fractions of terrigenous (i.e., volcanic) sediment. The composition of sand is determined by the relative abundance of each contributing species and varies with location. The density of calcium carbonate is more than 2.7 g/cm^3; however, microscopic pores and hollow grains make the effective density somewhat lower. The density and shape of the individual particles affects the transport characteristics when compared to silica beach sand that is derived from inland sources characteristic of most beaches on continental U.S. coastlines (Smith and Cheung, 2003).

In the past, sand for beach nourishment was typically obtained from other beaches on Oʻahu and Molokaʻi or from inland deposits of relict beach and dune sands that were commercially available. Mokulēʻia sand, mined by Hawaiian Cement, was a high-quality relict beach sand deposit found several hundred meters inland of the existing beach on the North Shore of Oʻahu. The Mokulēʻia sand is moderately sorted, and the median grain size (D_{50}) is 0.60 mm. This sand has reportedly been used for beach nourishment projects at the Hilton Hawaiian Village and Kūhiō Beach. However, this sand source is no longer commercially available.

Maui dune sand was previously mined by Hawaiian Cement and HC&D (formerly Ameron). It is a fine to medium grain sand with a median grain size (D_{50}) of 0.25 mm. The sand contains a relatively high percentage of fines, contains terrigenous sediment (dirt), and has a medium to dark brown color. It has not been used for beach nourishment projects on Oʻahu. In 2017, the County of Maui placed a moratorium on mining of inland dune sand, so this sand is no longer available.

Imported sand has been commercially available for many years to support various industries including but not limited to construction, landscaping, and golf courses. These sands are often composed of quartz minerals and can be ordered to desired sand composition, grain size, density, texture, angularity and color specifications. However, the use of imported sand from outside Hawaiʻi that is not composed of calcium carbonate does not align with State of Hawaiʻi standards and guidelines for beach nourishment.

Offshore marine deposits present an alternative source of sand. These deposits can and have been dredged and transported to shore to support various beach nourishment projects. Offshore sand deposits can provide a suitable source of sand for beach fill and nourishment, particularly when considering the limited availability of suitable, natural sand from inland sources. Offshore sand deposits occurring within the same littoral cell can have grain size characteristics and composition that are similar to the adjacent beach sand. Offshore sands were utilized in the 2006 Kūhiō Beach Nourishment project, and the Waikīkī Beach Maintenance I and II projects in 2012 and 2021, respectively.

2.2 Sand Characteristics and Quality

The State of Hawaiʻi Department of Land and Natural Resources (DLNR) established beach nourishment guidelines, which specify that fill sand used to nourish a beach must meet several specific requirements:

- Sand shall contain no more than 6% fine material (grain size smaller than 0.074 mm).
- Sand shall contain no more than 10% coarse material (grain size greater than 4.76 mm).
- The grain size distribution will fall within 20% of the existing beach sand.
- The overfill ratio of the fill sand to existing sand shall not exceed 1.5.
- Sand will be free of contaminants such as silt, clay, sludge, organic matter, turbidity, grease, pollutants, and others.
- Sand will be primarily composed of naturally occurring carbonate beach or dune sand.

The majority of the current fill sand requirements are related to grain size. In order to ascertain the grain size characteristics, a sieve analysis is performed, which is done by mechanically shaking a sand sample through a series of sieves of decreasing screen size. The material captured on each sieve is weighed, and this establishes the grain size distribution curves. The median diameter (grain diameter that is finer than 50% of the sample), or D_{50}, is often used by engineers to quantify the grain size of a sample. Similarly, D_{16} and D_{84} are obtained, and they are used to quantify the range of grain sizes present in a sample known as sorting, σ, defined by:

$$\sigma = \frac{\phi_{84} - \phi_{16}}{4} - \frac{\phi_{95} - \phi_{5}}{6.6}$$

where $\phi = -\log_2(D)$ where D is given in millimeters. Descriptive sorting values are presented in Table 1-1.

Table 1-1 Sorting value descriptions

Sorting Range (ϕ units)	Description
0.00 – 0.35	very well sorted
0.35 – 0.50	well sorted
0.50 – 0.71	moderately well sorted
0.71 – 1.00	moderately sorted
1.00 – 2.00	poorly sorted
2.00 – 4.00	very poorly sorted
4.00 – ∞	extremely poorly sorted

Color is also an important consideration when determining whether sand is suitable for beach nourishment. While natural calcareous beaches range in color from light brown to white, sand in offshore deposits is typically grayish in color as a result of anaerobic conditions produced by biologic activity and a lack of wave action and associated mixing. Even though an offshore sand source may be suitable in terms of grain size characteristics, as illustrated in several offshore dredging and beach restoration projects in Waikīkī, a persistent gray color can be undesirable. During the 2012 Waikīkī Beach Maintenance I project, the offshore sand was noticeably grayer than the existing beach sand after initial recovery and placement; however, after several weeks of prolonged exposure to subaerial conditions and ultraviolet radiation from the sun, the gray color faded and is no longer discernable from the existing beach sand.

2.3 Methodology

Sea Engineering conducts seafloor investigations from their boats *Huki Pau* and *Huki Pono* (Figure 1-1 and Figure 1-2). The *Huki Pau* is a 74-foot twin-screw workboat set up to support diving and marine construction operations. The vessel has a large open well-deck, knuckleboom crane, and built-in diving stations. The four-point mooring system allows for stable placement of the boat for vibracore operations.

The *Huki Pono* is a 43-foot twin screw workboat set up to support diving and marine survey operations in the Hawaiian islands. The vessel has three steering stations and a large, air-conditioned deckhouse ideal for use as a support center for survey or ROV operations.

Figure 1-1 Sea Engineering's work vessel *Huki Pau*

Figure 1-2 Sea Engineering's research vessel *Huki Pono*

Sea Engineering's offshore sand investigations typically employ the following: sub-bottom profiling, side scan sonar surveys, towed camera surveys, diver reconnaissance and sampling, jet probing, and vibracoring.

Geophysical sub-bottom profiling systems are essentially echo-sounders that use lower acoustic frequencies to penetrate into the substrate. Where common echo-sounders may use an acoustic frequency in the vicinity of 200 kHz, sub-bottom system frequencies are typically between 0.5 kHz and 20 kHz. The term sub-bottom refers to a generally hard layer of sediment or rock that underlies recent soft sediment deposition. The lower the acoustic frequency, the deeper into the bottom the system can penetrate.

Sea Engineering uses an EdgeTech 0512i "chirp" sub-bottom profiler with an EdgeTech 3200XS processing system. The chirp processors use signal processing to shape the acoustic wavelets used to image the substrate, providing significantly greater image resolution than traditional impulsive systems such as boomers and sparkers. Different wavelets are available with the system for use in different terrains. After on-site system deployment, trial survey lines are typically conducted using various pulse configurations. The optimal pulse for the substrate in Waikiki was found to be a 20 ms pulse with a frequency range of 0.5 kHz to 7 kHz. This relatively low frequency range is necessary for penetration into the coralline limestone sands and gravels found in Hawaii. The EdgeTech 0512i system is in fact a specialty system for use in coarse sand environments.

The sub-bottom data is reviewed with EdgeTech software, sub-bottom horizons are digitized for processing, and sand thicknesses are measured at discrete locations along the tracklines. Text files containing position and either bottom or sub-bottom elevations can be outputted for analysis and presentation. Surfaces representing the bottom and sub-bottom can be created and the difference is the volume of sand in the deposit.

Side-scan sonar transmits acoustic signals with wide vertical beam widths out to either side of the sonar towfish. A receiver then records the signals that are reflected back from the seafloor to the towfish. Hard bottom areas and features produce more intense reflections than sediments. The result is a plan view acoustic image of seafloor characteristics, allowing mapping of bottom type across a swath of seafloor.

Jet probing is conducted to determine the thickness of sediments overlying consolidated or hard bottom substrate, and is therefore an important means of testing and verifying sub-bottom profiling accomplished by remote sensing equipment. A jet probe consists of a length of pipe connected to a water pump by flexible hose. A diver jets the pipe and hose vertically into the sediment deposit until "refusal" is encountered. The refusal can be described as hard, crunchy, or soft; hard indicates a solid bottom, crunchy indicates a gravel layer, and soft indicates that the hole is collapsing and seizing the pipe or that there is insufficient hose to penetrate further.

Vibracoring is a method of pushing a thin-walled tube into the sand deposit and extracting a core of sediment up to about 8 ft long. The sand characteristics over the full core can be analyzed and the results interpolated and extrapolated to better characterize the deposit as a whole. Based on the findings, certain areas within the deposit can then be targeted or avoided, as necessary. Sea Engineering's vibracore is shown on the deck of the *Huki Pau* in Figure 1-3.

Figure 1-3 Vibracore on the deck of the *R/V Huki Pau*

2.4 Data Analysis Techniques

Sand cores obtained from the 2017 sand investigations were analyzed by coastal geologists by dividing the cores into representative layers and assessing overall appearance, including grain type, shell fragments, color, and grain size. Sand samples were obtained from the cores and processed for grain size distribution. These logs are presented in Appendix A of this report for the 2017 field work. The samples were also tested for turbidity. Grain size distribution and turbidity results for other projects are also included in this report.

2.5 Turbidity methodology

Laboratory turbidity tests were performed on numerous sand samples from offshore sites and beaches to evaluate the relative differences in turbidity generation between beach sand and offshore sand and assess possible impacts of turbidity along the beach. Turbidity was determined by measuring the scattering of the light through sample cells that contained distilled water and sand in suspension. A total of 28 offshore samples were analyzed for turbidity as follows:

- *Ala Moana* (7)
- *Halekulani* (6)
- *Hilton* (5)
- *RR—Inner 1a* (6)
- *RR—Inner 1b* (2)
- *Canoes/Queens* (2)

Turbidity was measured using a Hach 2100Q Portable Turbidimeter (Figure 1-4). The instrument has an optical laser configuration that measures the scattering of the light passing through the sample cell (Figure 1-5). Turbidity is measured in Nephelometric Turbidity Units (NTUs), a standard turbidity unit for United States environmental monitoring. The instrument was calibrated once before the first experiment using the manufacturer's 20, 100, and 800 NTU StablCal primary calibration standards and the 10 NTU primary verification standard. The cells used for the turbidity readings were glass Hach Lab Turbidimeter Sample Cells.

All sample bottles and sample cells were meticulously cleaned. The sample bottles were vigorously cleaned with tap water. The sample cells were cleaned with tap water and filled with distilled water, then left filled for a minimum of 24 hours. The sample cells remained filled with distilled water until use to avoid contamination from air. Before each turbidity test, the cells were emptied, cleaned with tap water, and filled once more with distilled water until overflowing. The outside walls were treated with a thin coating of Hach silicone oil to cover imperfections and scratches and to minimize stray light.

Test samples were prepared with one tablespoon of dry sand placed in a 120 mL Polystyrene sample bottle. The bottle was then filled with 100 mL of distilled water. Preceding each turbidity test run, the sample bottle was shaken vigorously to emulate turbulence. The suspension was immediately poured into a cleaned Hach cell, which was then inverted three times following the manufacturer's guidelines and placed in the machine. The turbidity runs began immediately upon cell insertion within the analyzer.

A reading was taken for each sample at the following time intervals:

- 30 seconds
- 1 minute
- 2 minutes
- 5 minutes
- 10 minutes
- 20 minutes
- 1 hour
- 2 hours
- 4 hours
- 6 hours
- 24 hours

Results were stored on the device's internal memory, then uploaded to a computer for further analysis.

Figure 1-4 2100Q Portable Turbidimeter

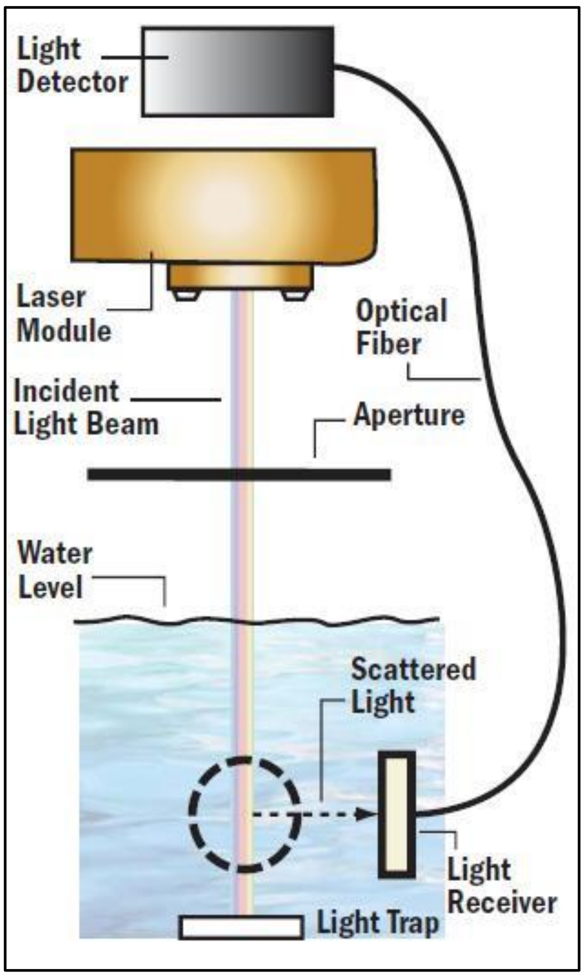

Figure 1-5 Laser Nephelometer Optical Configuration (Sadar, Cason, and Engelhardt; 2009)

2.6 Overfill Factor

A beach undergoes an adjustment period following nourishment. The beach equilibrium profile is achieved as sand moves cross shore and alongshore and there may be an accompanying decrease in beach volume. This loss of sand is compensated for through an overfill ratio, which describes the compatibility of the native beach and borrow sands and is dependent on the size distributions of the native and nourishment (borrow) sand.

The overfill ratio is determined based on the sand size characteristics of the two sands and represents the volume of fill necessary to yield the desired beach volumes calculated previously. Bodge (2004) compared overfill ratio methods and developed an expression that is believed to produce more accurate results than the previous methods.

The mean grain size, M, and sorting, σ, for the native and borrow sands are calculated as presented in the Coastal Engineering Manual (2006) as

$$M = \frac{(\phi_{16} + \phi_{50} + \phi_{84})}{3}$$

$$\sigma = \frac{(\phi_{84} - \phi_{16})}{4} + \frac{(\phi_{95} - \phi_{5})}{6}$$

where $\phi = -\log_2(D)$ where D is given in millimeters.

The dimensionless grain size difference is calculated as

$$M'_b - M'_n = \frac{M_b - M_n}{\sigma_b}$$

where subscripts n and b refer to the native (i.e., beach) and borrow (i.e., offshore) sand, and the overfill ratio is read from Figure 1-6.

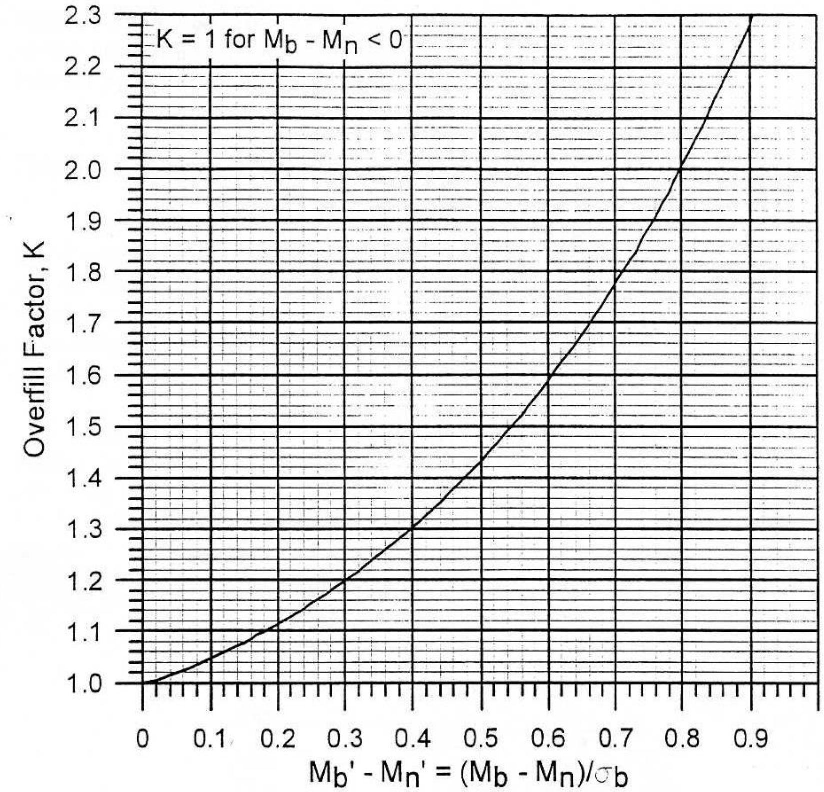

Figure 1-6 Dean's overfill ratio expressed as a single curve (Bodge, 2004).

3. POTENTIAL SAND SOURCES

Sand investigations around Oahu have been performed for several decades, including specific studies pertaining to the characterization and quantification of sand deposits along the south shore of Oahu. These studies have identified sand sources of varying quantities, including small patches or thin deposits. The following discussion presents findings from the previous studies as well as results of the investigations conducted for present projects.

3.1 *Canoes/Queens* Offshore Sand Deposit

3.1.1 Historical data

The University of Hawaii Coastal Geology Group (CGG) performed extensive jet probing of sand deposits offshore of Waikiki Beach in 2005. The 406 probe locations are shown in Figure 3-1 indicated by white markers. Sand thicknesses were measured to the depth where the probe encountered hard refusal or rubble. Sand thicknesses as great as 9 feet, though unusual, were measured. The probe data was used to produce estimates of sand volume for three sand deposits shown by the white lines in the figure. Based on the jet probe data, the CGG estimated these three sand deposits to contain 86,000 cubic yards of sand.

DLNR sponsored nourishment of Kuhio Beach Park during the winter of 2006-2007, utilizing these sand deposit findings of the CGG. Approximately 10,000 cu. yd. of sand was pumped to the beach from the site identified immediately offshore of the Canoes surf break. The project was completed in January of 2007 after a work period of one month. The sand reportedly was well-sorted with medium grain size of 0.35 mm to 0.40 mm. The sand exhibited a light grey color which became lighter upon exposure to sunlight and mixing with existing beach sand.

A field program was conducted by Sea Engineering in August and September of 2009 to verify the findings of the CGG data and estimate the amount of sand that is presently available in offshore deposits. Using aerial photography and a side-scan survey performed by the CGG as guides, geophysical investigations were performed on the offshore deposits using sub-bottom profiling and jet probes. The surveys were performed within practical limits for sand recovery, including water depth and proximity to shore.

For this survey, an EdgeTech 0512i “chirp” sub-bottom profiler was used with an EdgeTech 3200XS processing system. Sub-bottom tracklines from the August 2009 sub-bottom survey are shown as the white and red lines in Figure 3-2. More than 10 miles of sub-bottom tracklines were surveyed. The sub-bottom data was reviewed with EdgeTech software, sub-bottom horizons were digitized for processing, and sand thicknesses were measured at discrete locations along the tracklines. The red lines shown in the figure are portions of four tracklines where sand was identified. These are not the only locations where sand was found; rather, these are examples shown to illustrate findings of the sub-bottom profiling. The sand thicknesses along the four red tracks, referred to as W-1 through W-4, are shown in Figure 3-3. For ease of visual comparison, the figures have the same vertical scale. In August and September of 2009, Sea Engineering revisited the sites, jet probing in 46 locations to verify the sand thicknesses identified by the sub-bottom profiling. Those investigations, shown as red markers in Figure 3-2, found sand thicknesses as great as 7 ft. Sand thicknesses measured using jet probing along tracklines W-3 and W-4 were compared with the results of the sub-bottom profiling. Table 3-1 shows a comparison of the findings; the jet probe data is also shown in Figure 3-3 where the jet probes were coincident with the sub-bottom tracklines.

Figure 3-3 shows lines W-2, W-3, and W-4 to have consistent deposits of sand greater than three feet thick and more than 300 feet wide. Portions of profiles W-1 and W-3 show great variability along the line, indicating that there is an irregular limestone layer beneath the sand. The jet probes show good correlation with the results of the sub-bottom profiling.

Based on the geophysical investigations, "Site A" (immediately offshore of the Canoes and Queens surf sites) was estimated to contain 46,000 cu. yd. of sand. An 18-inch thick sand sample from this site, *WAIK-6*, had a median diameter of 0.31 mm and was classified as moderately well sorted. Approximately 24,000 cu. yd. of sand was dredged from "Site A" and the beach widening was performed from January to May 2012. Site A is also referred to as *Canoes/Queens* in this report.

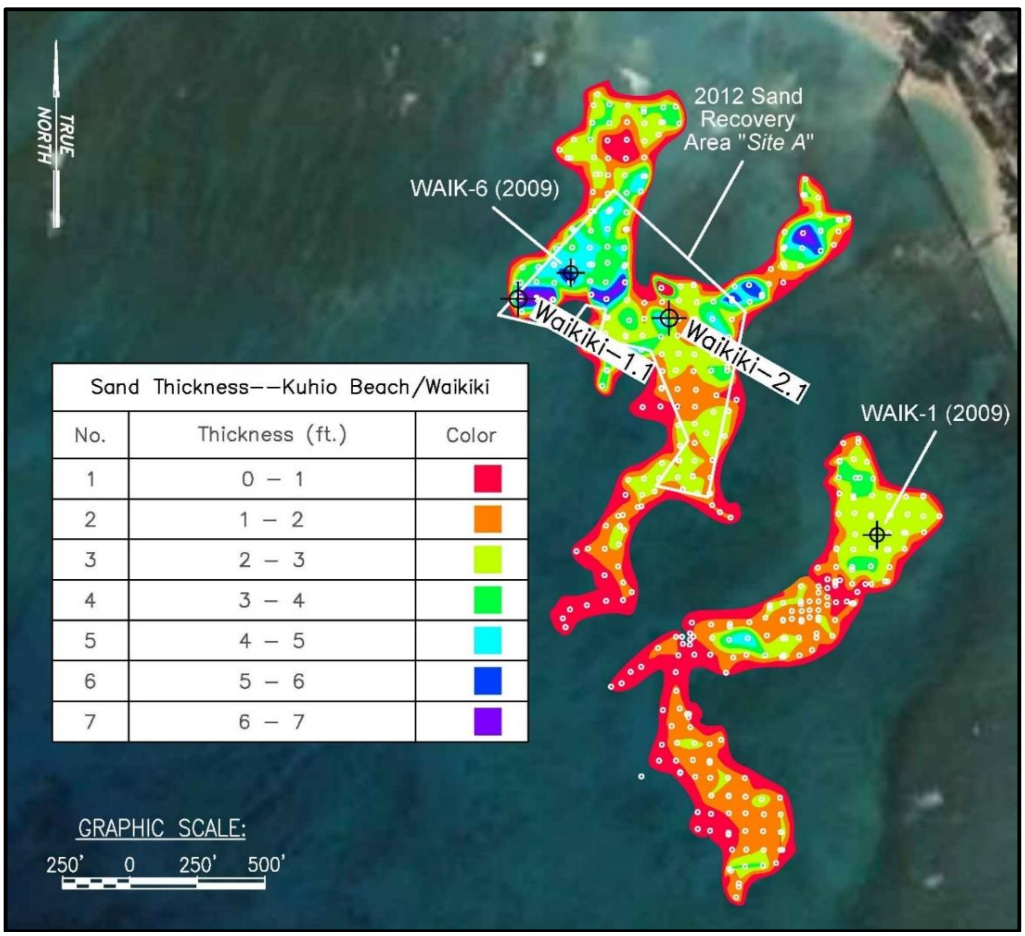

Figure 3-1 *Canoes/Queens* sand deposit thicknesses.

(Univ. of Hawaii Coastal Geology Group jet probe locations [white circles]
Sea Engineering core locations [black cross / circle])

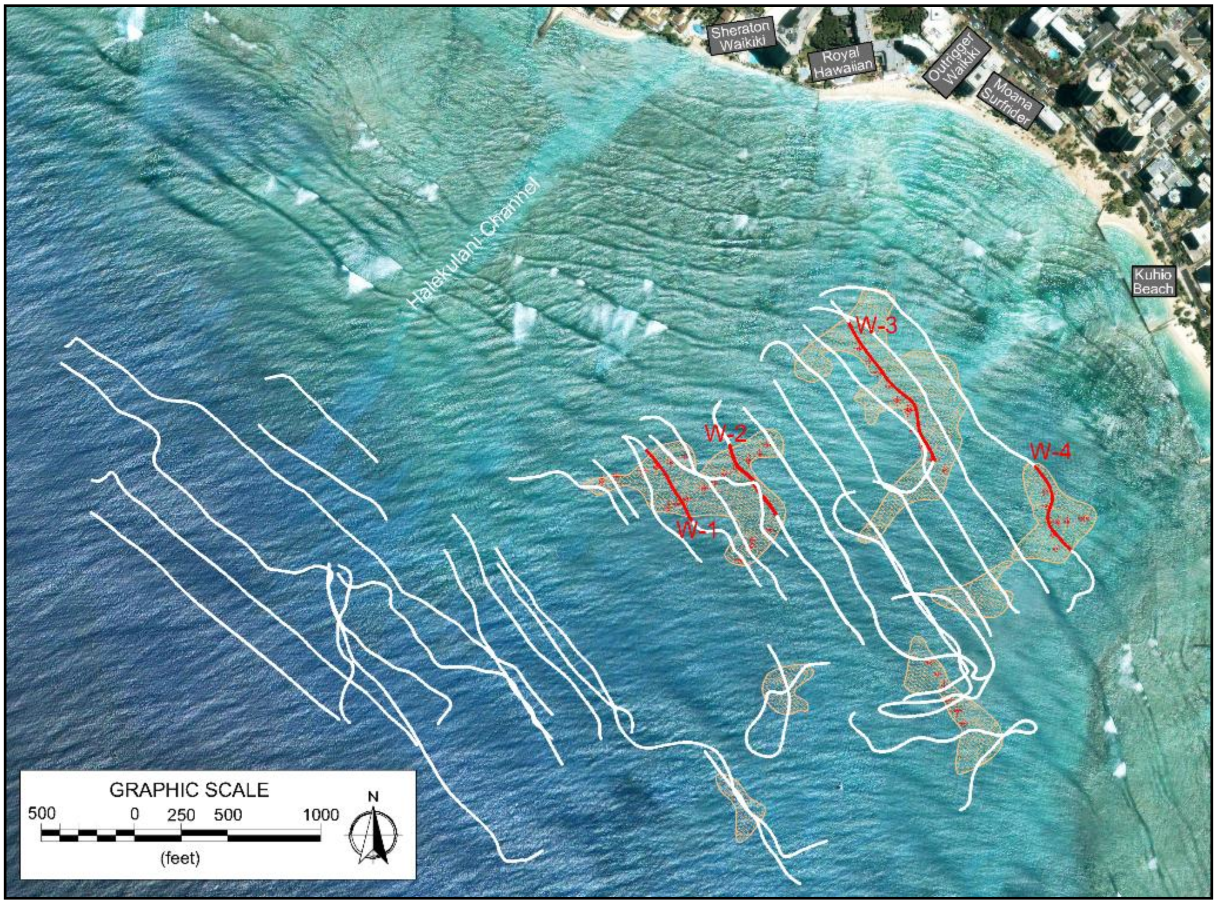

Figure 3-2 Sub-bottom tracklines (white and red lines), jet probe locations (red points), and visible sand deposits (tan outline and fill). Sea Engineering, 2010.

Table 3-1 Comparison of sand thicknesses (feet), Sea Engineering, 2010.

Trackline W-3		Trackline W-4	
Sub-bottom	Jet probe	Sub-bottom	Jet probe
5.2	6.5	4.6	5.5
5.9	7.5	3.6	4.0
6.2	7.0	3.0	4.0
2.0	3.0	4.3	5.0
2.3	2.0	3.9	4.0
2.6	2.0		

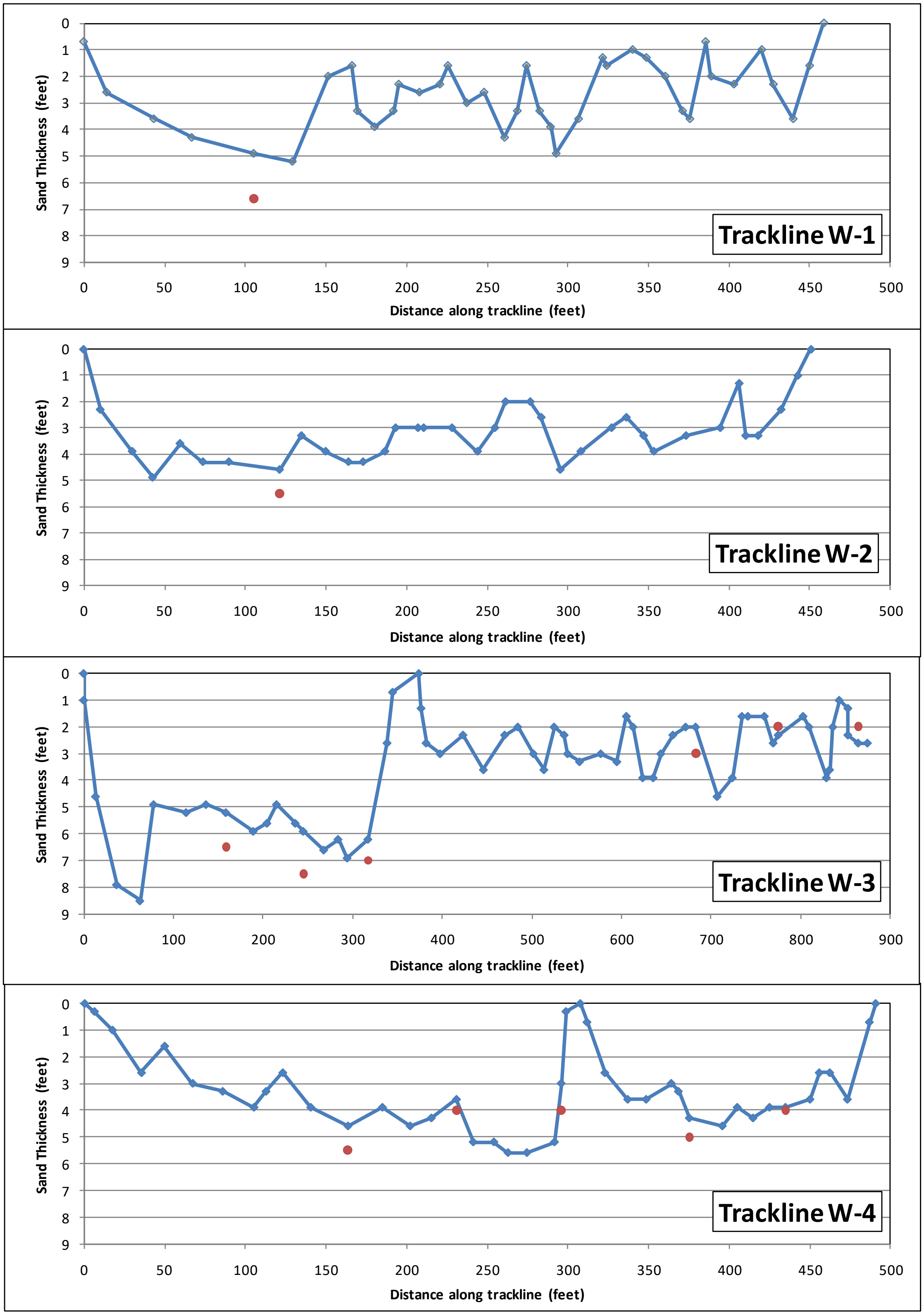

Figure 3-3 Sand thicknesses measured by sub-bottom profiler (blue) and jet probes (red).

(Note: tracklines begin in the northwest and progress toward the southeast).
Sea Engineering 2010.

3.1.2 2017 Sand investigations (Canoes/Queens)

Sea Engineering obtained two vibracore samples from Site A of the 2012 Waikiki Maintenance Project. The locations of those samples are shown on Figure 3-1. Vibracore "Waikiki 1.1" was obtained along the western edge of Site A in the location of the 2008 sand recovery, while Waikiki 2.1 was obtained from a more central location within the site. Grain size analysis shows the two samples to be quite similar, and generally consistent with the 18-in push-core sand sample "WAIK-6" obtained in 2009 as part of the 2012 maintenance project. The sand samples shown in the table have median diameter D_{50} of 0.29 to 0.33 mm and are considered to be moderately to moderately well sorted. The percentage of fine material was 0.6% or less. Grain size distributions for Waikiki 1.1 and Waikiki 2.1 are presented in Table 3-2 and Figure 3-4.

Table 3-2 *Canoes/Queens* offshore sand deposit summary

Location	D_{50} (mm)	Sorting σ	% Fines	Core length (inches)	Water depth (feet)	Source	Year
WAIK-4 (top)	0.26	0.7	0.0	18	~10	SEI	2009
WAIK-4 (bottom)	0.34	1.2	0.4	18	~10	SEI	2009
WAIK-6 (top)	0.29	0.6	0.0	18	~10	SEI	2009
WAIK-6 (bottom)	0.33	0.5	0.0	18	~10	SEI	2009
Waikiki 1.1	0.33	0.7	0.4	85	9	SEI	2017
Waikiki 2.1	0.33	0.8	0.6	85	13	SEI	2017

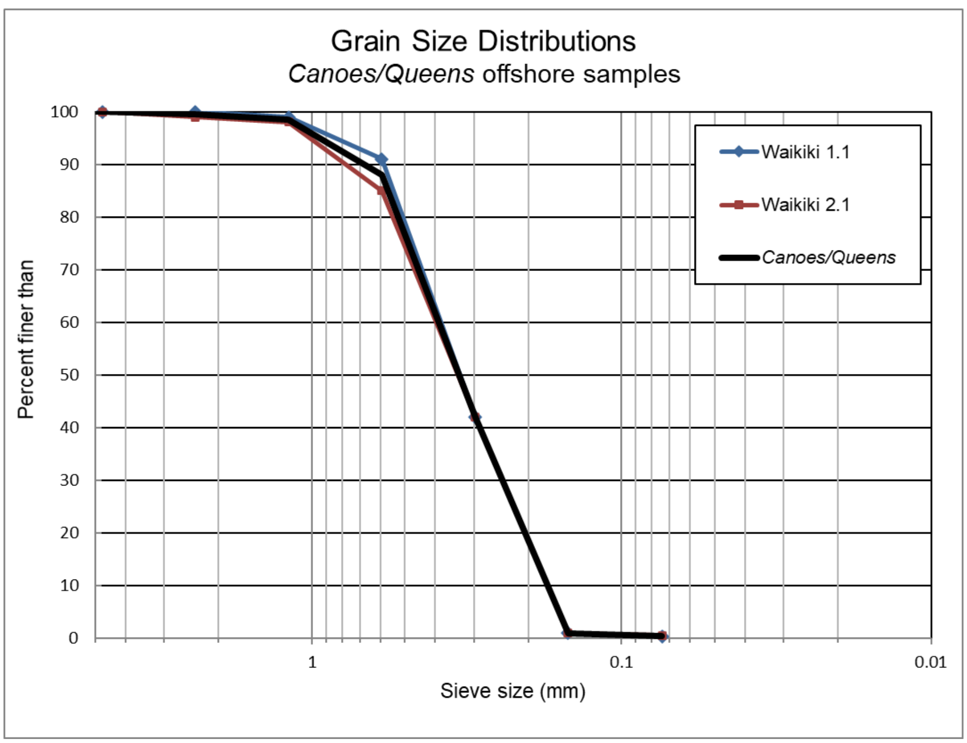

Figure 3-4 Grain size distribution for *Canoes/Queens* offshore sand deposit

3.1.3 Constraints (Canoes/Queens)

The sand deposit has been used three times in the last 15 years for beach nourishment. DLNR representatives reported that the dredge pit produced during the 2006-2007 project filled in quickly when south swells arrived. The offshore sand deposits have limited volume, and continued use of this deposit could result in a decline in available sand. This would be particularly true sand from this deposit were used to nourish other beach sectors, in which case the sand would be removed from the system and would not be expected to return to the deposit.

3.2 *Halekulani Channel* Offshore Sand Deposit

3.2.1 Historical sand data

The shoreward terminus of the Halekulani Channel is located at the Halekulani Hotel adjacent to the Sheraton Waikiki. 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 approximately 500,000 cu. yd. of sand is contained between the 40-foot and 100-foot depth contours and 80,000 cu. yd. contained shoreward of the 40-foot depth contour. During the Noda study, median grain size, D_{50}, in this deposit was found to vary from 0.20 mm to 0.39 mm with the coarser samples found in depths of less than 10 feet. The average sorting parameter, σ, was 1.1, indicating a moderate to poorly sorted sand. The samples exhibited a gray color.

The University of Hawaii Marine Minerals Technology Center (MMTC) produced a report on the sand deposits in and around the Halekulani Channel (Barry, 1995). They reported sand deposits as much as 40 feet thick over a 75-acre area between the 70 and 100-foot depth contours.

More recently, the U.S. Geological Survey (Hampton et al., 2003) investigated the resource potential of deposits around Oahu, particularly as a source of sand for beach replenishment. The Halekulani Channel was included in this study. Numerous vibracore samples up to 6 meters long were obtained between 2,500 and 5,000 ft offshore, in water depths from 10 to 120 ft. The Halekulani Channel is divided into two sections. The inshore section is about 900 ft long and up to about 160 ft wide. Water depths in this area range from 10 to 40 ft, and the sand deposit is flanked by shallow reef. The USGS obtained four vibracores in this area, and median diameters of the bulk samples ranged from 0.28 mm to 0.38 mm. The USGS also obtained several samples in a broader offshore part of the channel; samples in this area were obtained in water depths between 52 and 72 ft. Median diameters of the bulk samples ranged from 0.23 mm to 0.53 mm.

In February of 2011, Sea Engineering performed sub-bottom profiling along several tracklines across the Halekulani Sand Channel. The data showed thicknesses of as much as 40 feet in water depths of 75 to 100 feet. Although only a small portion (<6 acres) of the sand deposit was investigated, the estimated sand volume was calculated to be nearly 200,000 cy. The sand thickness measurements by Sea Engineering are less than those of MMTC; however, the trend is consistent.

In October of 2011, divers from Sea Engineering, Inc., obtained two sand cores in water depths of 52 and 67 feet. Each core penetrated about 18 in into the sand. Median grain size from the

52-ft depth sample measured to be 0.20 mm and the sand was well to moderately well sorted, while also containing 1.2% fine material (<0.075 mm). The sample from the 67-ft depth had a median diameter of 0.30 mm, was classified as moderately sorted, and contained 1.6% fine material. The sand samples were gray colored, which is typical of offshore sand deposits.

3.2.2 2017 sand investigations (Halekulani Channel)

Sea Engineering returned to the Halekulani Channel in March of 2017. Guided by the sub-bottom profiling performed previously by MMTC and SEI, two vibracore samples were obtained. Sand thicknesses from the MMTC and SEI investigations, along with the vibracore locations, are shown as Figure 3-5. Vibracore "Halekulani 1.1" was obtained in a water depth of 55 ft. The sample was measured to have a median diameter (D_{50}) of 0.23 mm with a sorting parameter of 0.8, which falls in the moderately sorted category. The grain size data is consistent with the 2011 SEI findings. The sample had 1.8% material classified as "fine" (i.e., passing through the #200 sieve. "Halekulani 2.2" was obtained in a water depth of 86 feet and had a D_{50} of 0.25 mm with sorting parameter of 1.6 (poorly sorted) with 5.5% fine material.

Four additional vibracores were obtained in May of 2018 ("HK 3.1" through "HK 3.4"). The characteristics of Halekulani Channel offshore sand deposits are summarized in Table 3-3 and Figure 3-7. Overall, the sand in this part of the channel was considered to be too fine for use on Waikiki's beaches.

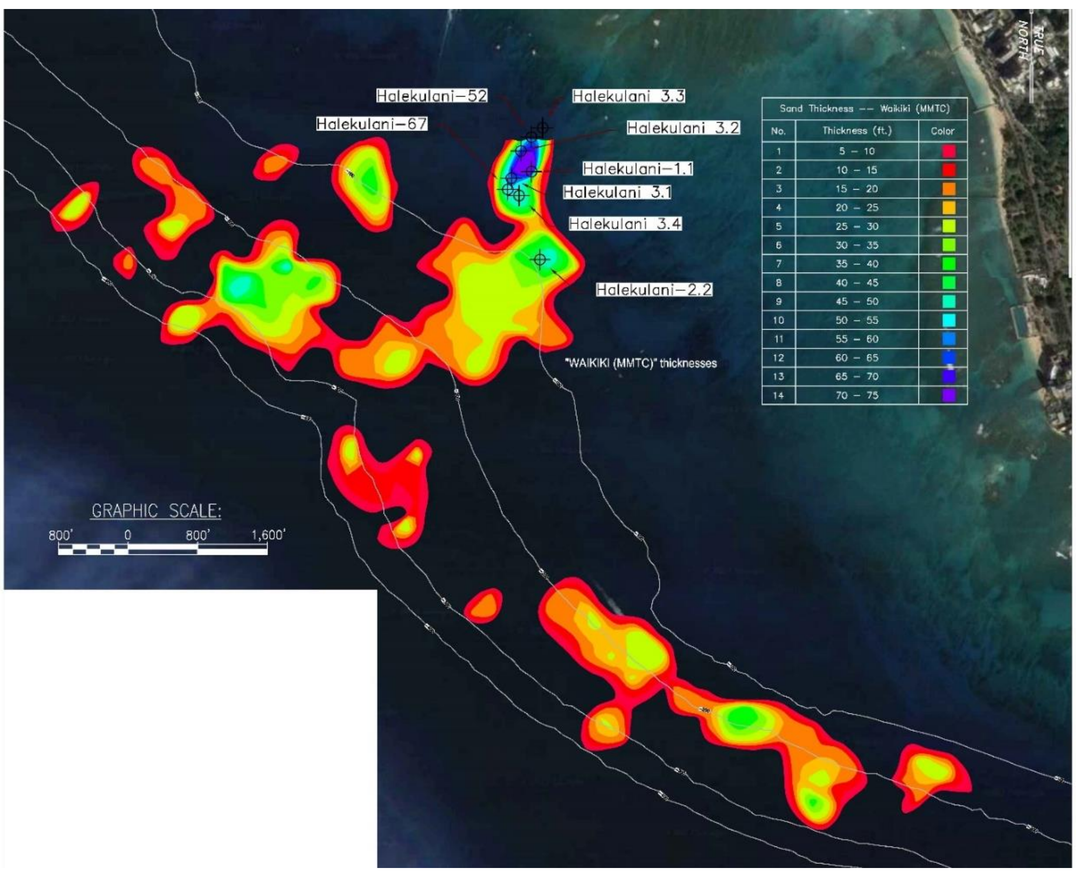

Figure 3-5 *Halekulani Channel* offshore sand deposit and core locations (black "+")

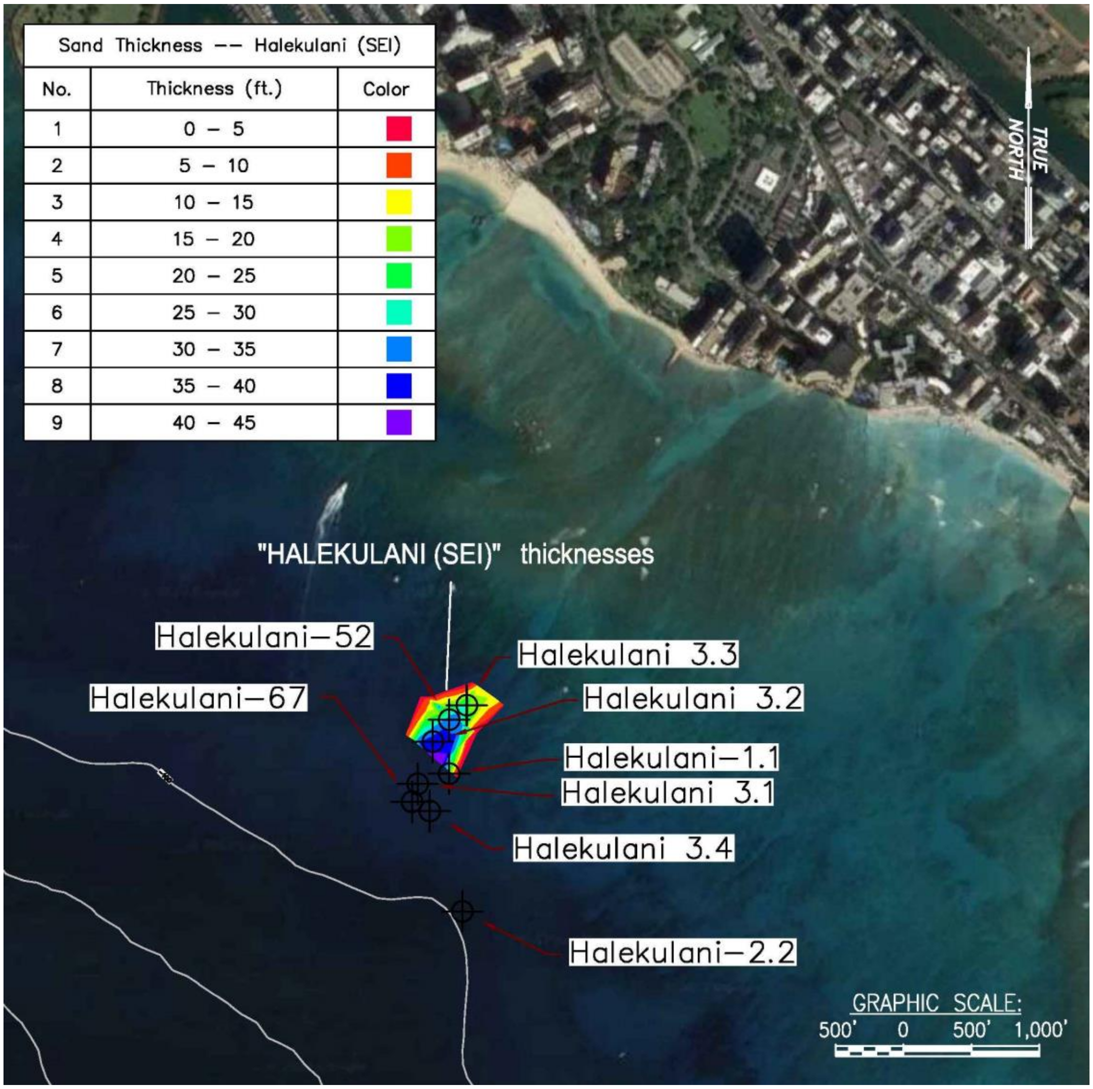

Figure 3-6 *Halekulani Channel* offshore sand deposit and core locations (black "+")

Table 3-3 *Halekulani Channel* offshore sand deposit summary

Location	D_{50} (mm)	Sorting σ	% Fines	Core length (inches)	Water depth (feet)	Source	Year
Halekulani 1	0.28–0.38	0.9–1.9	---	n/a	10-40	USGS	2003
Halekulani 2	0.23–0.53	0.9–1.2	---	n/a	52-72	USGS	2003
Halekulani-52	0.20	0.5	1.2	18	52	SEI	2011
Halekulani-67	0.30	0.9	1.6	18	67	SEI	2011
Halekulani 1.1	0.23	0.8	1.8	68	55	SEI	2017
Halekulani 2.2	0.25	1.6	5.5	84	86	SEI	2017
Halekulani HK 3.1	0.29	0.89	2.3	26	---	SEI	2018
Halekulani HK3.2	0.37	0.91	2.8	42	---	SEI	2018
Halekulani HK 3.3	0.20	0.81	3.9	25	---	SEI	2018
Halekulani HK 3.4	0.27	0.90	3.3	39	---	SEI	2018

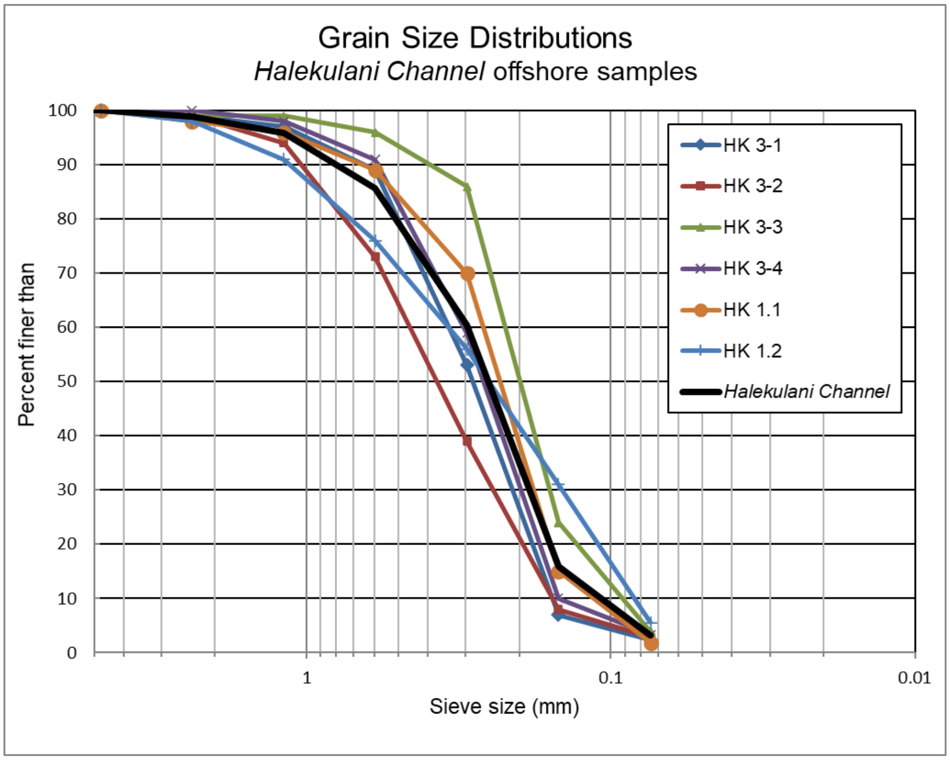

Figure 3-7 Grain size distribution for *Halekulani Channel* offshore sand deposit

3.3 *Hilton* Offshore Sand Deposit

3.3.1 Historical sand data

Sea Engineering (SEI) was contracted in 2004 to investigate possible inland and offshore sand sources for a project to improve the Hilton Hawaiian Village lagoon. In search of offshore sand, a survey was conducted offshore of the Hilton Hawaiian Village to identify and map possible marine sand sources for the lagoon restoration project.

The survey was conducted with differential GPS and divers swimming transects and probing sand thicknesses. Sand probes were accomplished using a combination of water jet, air jet, and manual probes. Sand samples were collected using a push corer and hand trowels. Representative samples were submitted for laboratory grain size analyses.

The primary deposit investigated was approximately 850 ft by 620 ft in dimension, located in water depths of 40 to 55 feet to the southwest of the Hilton Hawaiian Village beach. The maximum sand thickness probed was 5 feet, and the average sand thicknesses in the center of the deposit were about 4 feet. The total estimated volume of sand in the deposit was determined to be approximately 40,000 cubic yards. The size characteristics of a representative sample showed the sand to be very similar to the beach sand. The median grain size, D_{50}, was 0.55 mm and the sorting was considered moderate. The deposit was characterized by a gray color with visible shell fragments, giving the appearance of coarser, poorly sorted sand.

The offshore sand was not used for the lagoon improvement project.

3.3.1.1 2017-2018 sand investigations

SEI returned in 2017 to further investigate the *Hilton* sand deposit. During initial reconnaissance, vibracoring directed at the center of the deposit was noted to penetrate more than 6 feet into the sand deposit; 2004 jet probing had only estimated the thickness to be about 4 feet. Initial analyses of these cores, *Hilton 1.1* and *Hilton 1.2*, were favorable, so SEI followed with a dive team that systematically jet probed a total of 34 locations in the deposit along defined transects to better characterize the size of the deposit. The sampling locations and measured thicknesses are shown on Figure 3-8. The results of the jet probing showed an estimated sand volume of 45,000 cy of sand.

Five additional vibracore samples were obtained from the *Hilton* sand deposit following the jet probing. The vibracore locations are shown on Figure 3-8 and the grain size analysis data from those vibracores is presented in Figure 3-9 and Table 3-4. Median grain size ranges from 0.47 to 0.83 mm, with a minimal percentage of fines.

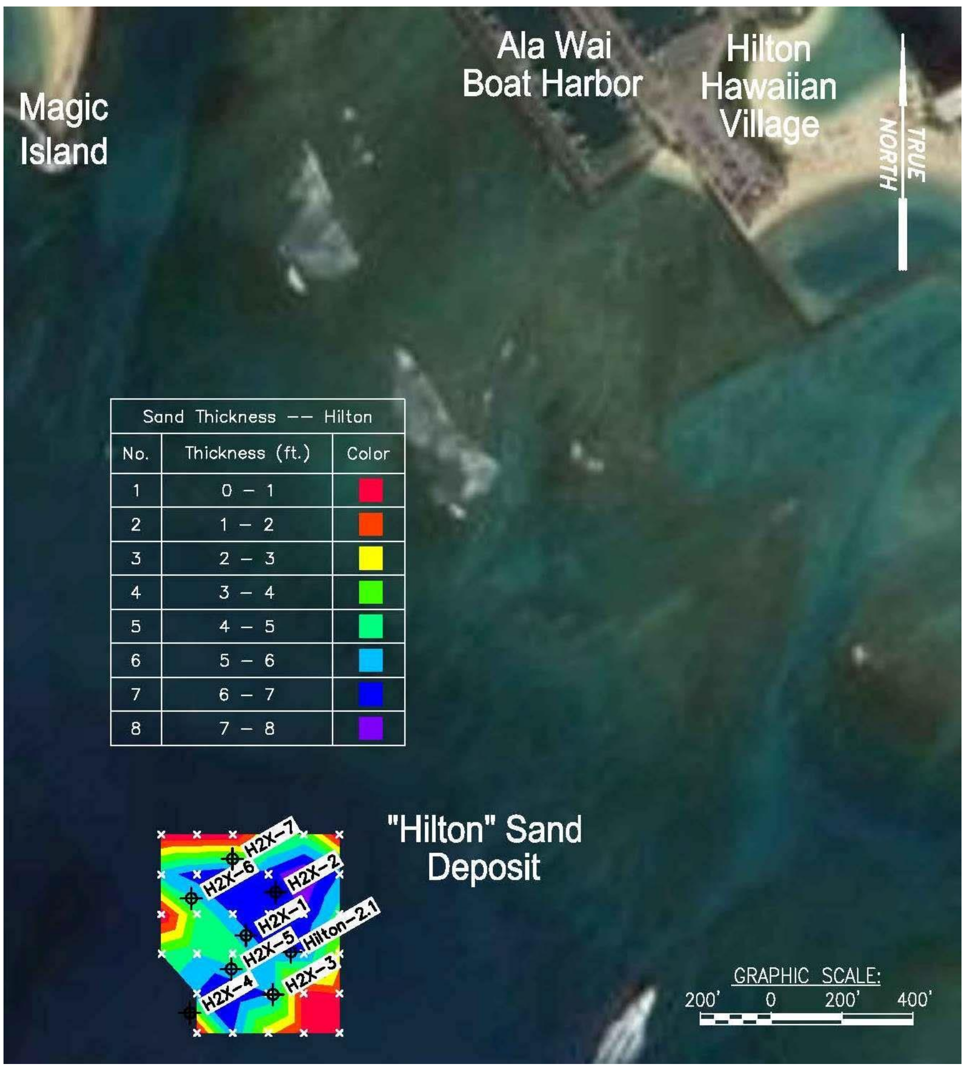

Figure 3-8 *Hilton* offshore sand deposit thickness.

Jet probes (white “x”) and vibracore locations (black “+”)

Table 3-4 *Hilton* offshore sand deposit summary

Location	D_{50} (mm)	Sorting σ	% fines	Core length (inches)	Water depth (feet)	Source	Year
Hilton 1.1	0.47	0.7	0.7	85	47	SEI	2017
Hilton 1.2	0.48	0.6	0.6	85	47	SEI	2017
H-2X.1	0.54	0.8	1.4	67	50	SEI	2017
H-2X.2	0.66	0.7	0.7	79	48	SEI	2017
H-2X.5	0.50	0.7	0.7	80	51	SEI	2017
H-2X.6	0.77	1.1	1.4	79	53	SEI	2017
H-2X.7	0.83	1.7	0.4	86	50	SEI	2017

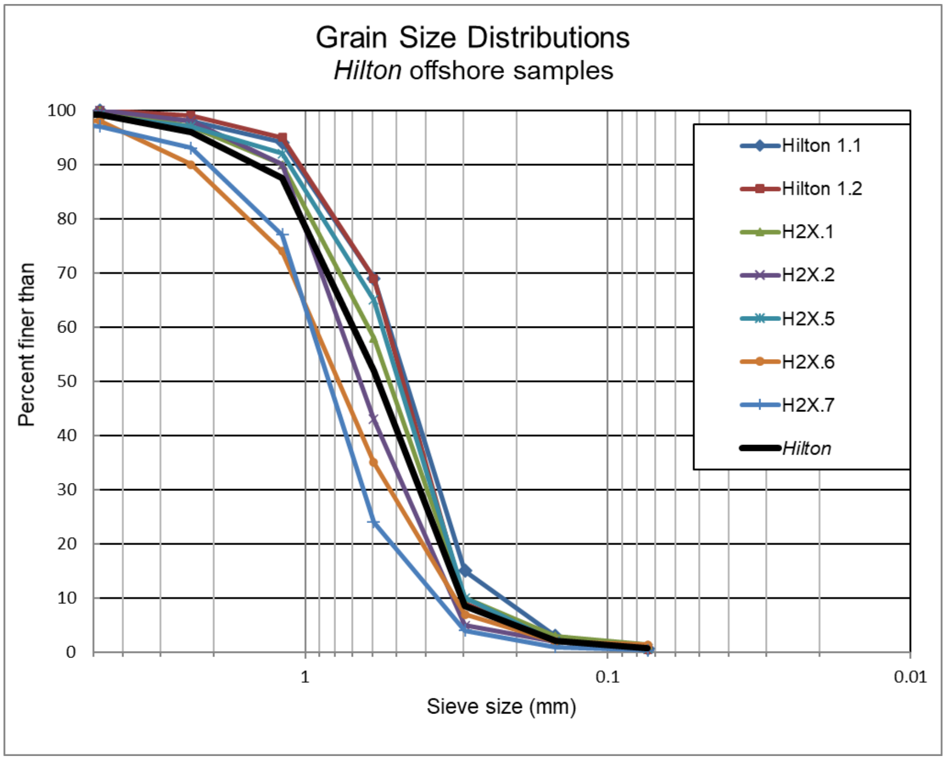

Figure 3-9 Grain size distribution for *Hilton* offshore sand deposit

3.4 *Diamond Head* Offshore Sand Deposit

3.4.1 Historical sand data

A field program was conducted in December 2010, February 2011, and March 2011 to investigate offshore sand deposits in the vicinity of Diamond Head. Using aerial photography and a University of Hawaii Coastal Geology Group (CGG) side-scan survey as guides, geophysical investigations were performed on specific offshore deposits using side-scan sonar and sub-bottom profiling. The surveys were performed within practical limits for sand recovery, including water depth and space for operations.

On December 17, 2010, Sea Engineering personnel conducted a survey utilizing a C-MAX CM2 side-scan sonar (SSS) system. The planned side-scan sonar coverage area was determined based on bathymetry, aerial photographs, and proximity to the project site. The University of Hawaii Coastal Geology Group previously performed a side-scan sonar survey offshore of Waikiki between Diamond Head and the Ala Wai boat harbor in water depths as shallow as 12 feet and as deep as 300 feet. The December 2010 SEI survey covered an area inshore of the CGG survey where potential sand deposits were identified using aerial photographs. The sonar results combined with an aerial view of the targeted offshore deposits are shown in Figure 3-10 and the full coverage is shown in Figure 3-11.

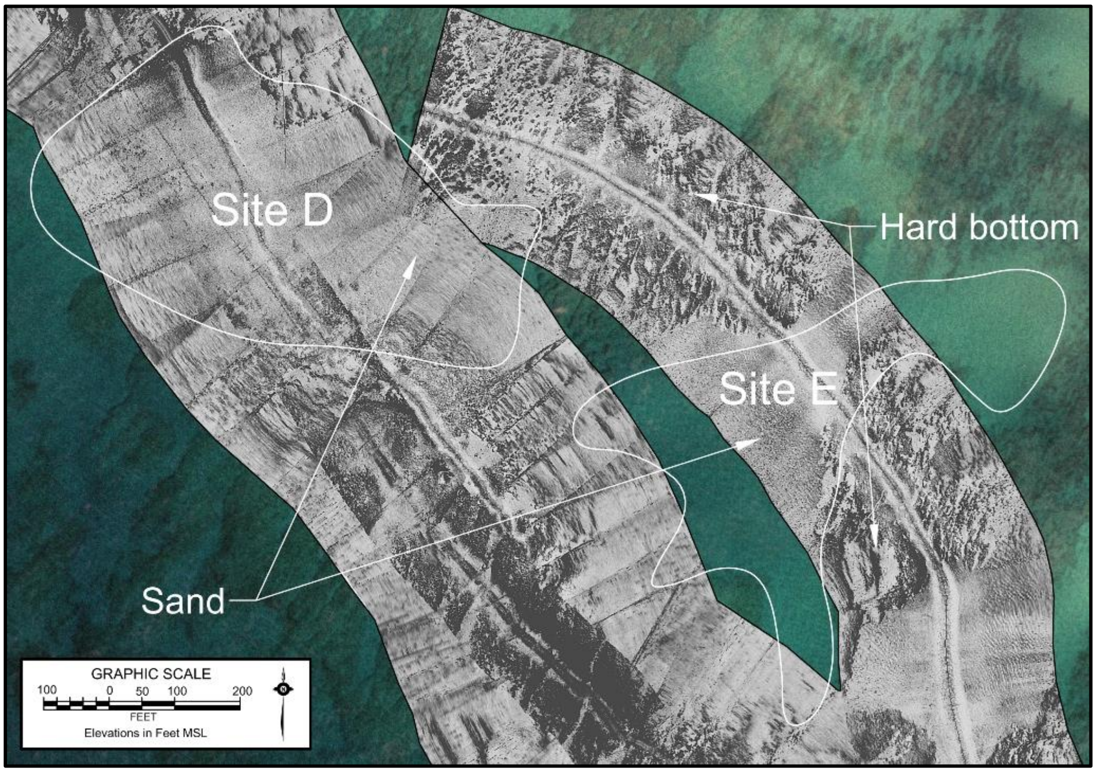

Figure 3-10 Side scan sonar mosaic for offshore sand deposits “D” and “E”

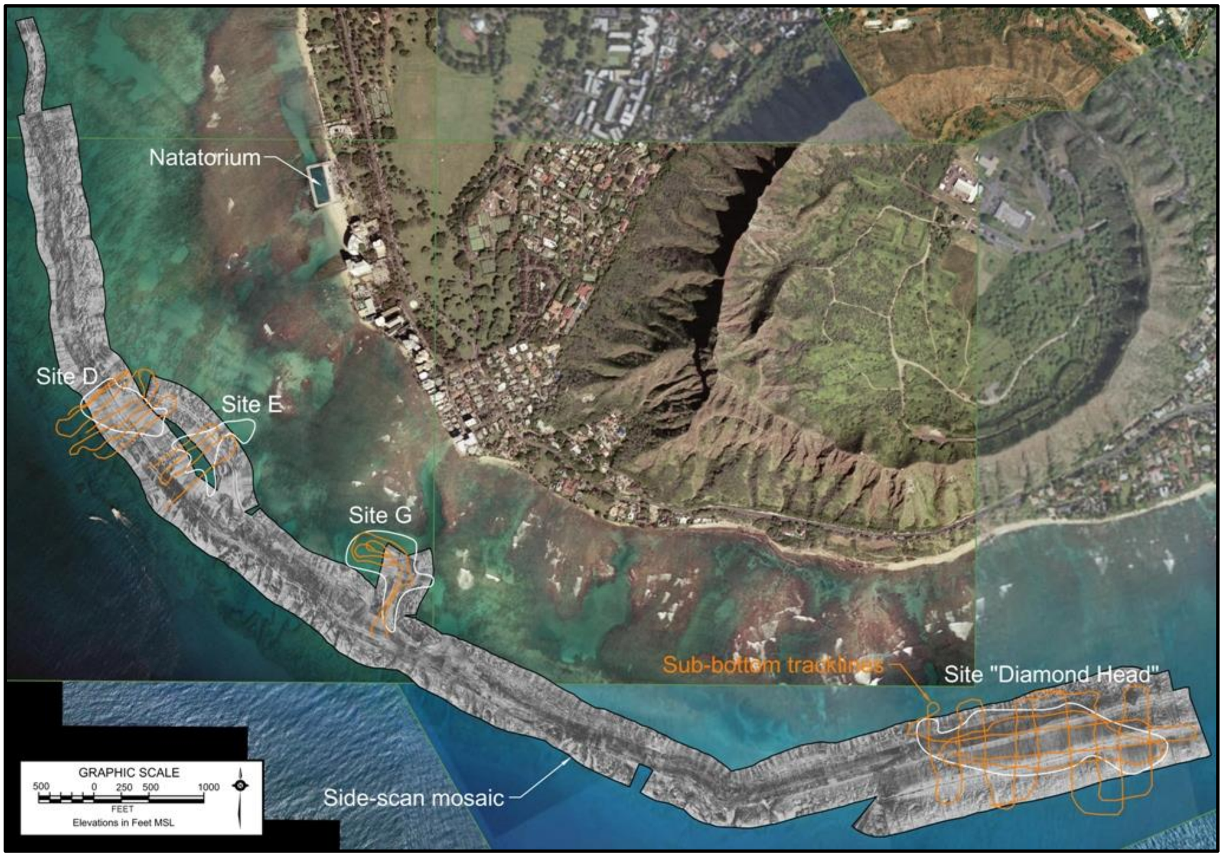

Figure 3-11 Side-scan sonar mosaic and sub-bottom profiler tracklines

On February 24, 2011, SEI conducted a sub-bottom survey utilizing an EdgeTech 0512i Subbottom Profiler. Tracklines from that sub-bottom survey were shown previously on Figure 3-11. The sub-bottom data was reviewed with EdgeTech software, sub-bottom horizons were digitized for processing, and sand thicknesses were measured at discrete locations along the survey tracklines. This geo-referenced data was imported into AutoCAD and surfaces of the bottom and sub-bottom were produced. These two surfaces were compared to produce an estimate the volume of sand in each deposit.

Several passes from west of the Waikiki Aquarium to offshore of Diamond Head Beach Park were performed with the side-scan sonar system. The tracklines were chosen to supplement the CGG survey, and to specifically investigate the sand deposits identified from aerial imagery. The survey data was combined into a single mosaic that covered 2.7 miles parallel to shore with average cross-shore coverage of 670 feet. The subsequent sub-bottom profiling targeted the sand deposits identified from aerial imagery and the side-scan sonar mosaic, covering 2.7 miles offshore of the Natatorium and 4.1 miles offshore of Diamond Head Beach Park.

Sand deposits identified in the side-scan and sub-bottom surveys were also shown previously on Figure 3-11, labeled as sites “D”, “E”, “G”, and “Diamond Head”. These potential deposits were outlined and the areas were calculated, and following the sub-bottom survey, estimates of the sand volumes were calculated. These values are shown in Table 3-5.

Table 3-5 Offshore sand deposit characteristics

Location	Water depth (ft)	D_{50} (mm)	Area (sq. ft.)	Volume (cu. yd.)
Site D	20-38	0.20	252,100	4,000
Site E	12-28	0.23	174,400	5,000
Site G	10-22	0.39	319,700	13,000
Diamond Head	20-30	0.40-0.45	1,019,800	110,000

Sites D and E were initially viewed as a favorable sand sources based on the large surface area; however, the sub-bottom profiling showed that much of the deposits were merely thin veneers of sand. Site G was found to contain a significant amount of sand—slightly more than 13,000 cu. yd. The deposit is situated in a gap in the reef that measures 600 ft long by 380 ft wide. Access to the site would be through a 100-ft wide gap in the reef on the offshore side of the deposit. The shallow water (typically between seven and 11 ft deep over the sand deposit), the nearby reef, and limited access could make recovery a challenge.

Table 3-5 also shows the findings of the surveys for a sand deposit identified off Diamond Head Beach Park (see Figure 3-11). The estimated volume of sand in that deposit based on geophysical investigations is more than 110,000 cu. yd. This sand deposit is further detailed in Section 3.4.2.

3.4.2 2018 sand deposit investigations

SEI performed jet probing and sand sampling on February 23, 2018, to further quantify the *Diamond Head* sand deposit identified in 2011. Jet probes penetrated between 3 and 6 feet within the sand deposit, encountering hard refusal at each location. The probe depths generally confirmed the sub-bottom results.

The sand was found to be light brown at the sand surface, becoming mixed brown and gray below. Push cores are typically limited to about 24 inches in sand, and samples at *Diamond Head* were no different. The sand samples had median grain size in the range of 0.40 to 0.45 mm, the samples were well sorted, and they had less than 1.0% fine material. Grain size distributions are presented in Table 3-6 and Figure 3-13. Vibracoring and turbidity analyses were not performed, though initial qualitative tests indicated that the deposit might have low turbidity.

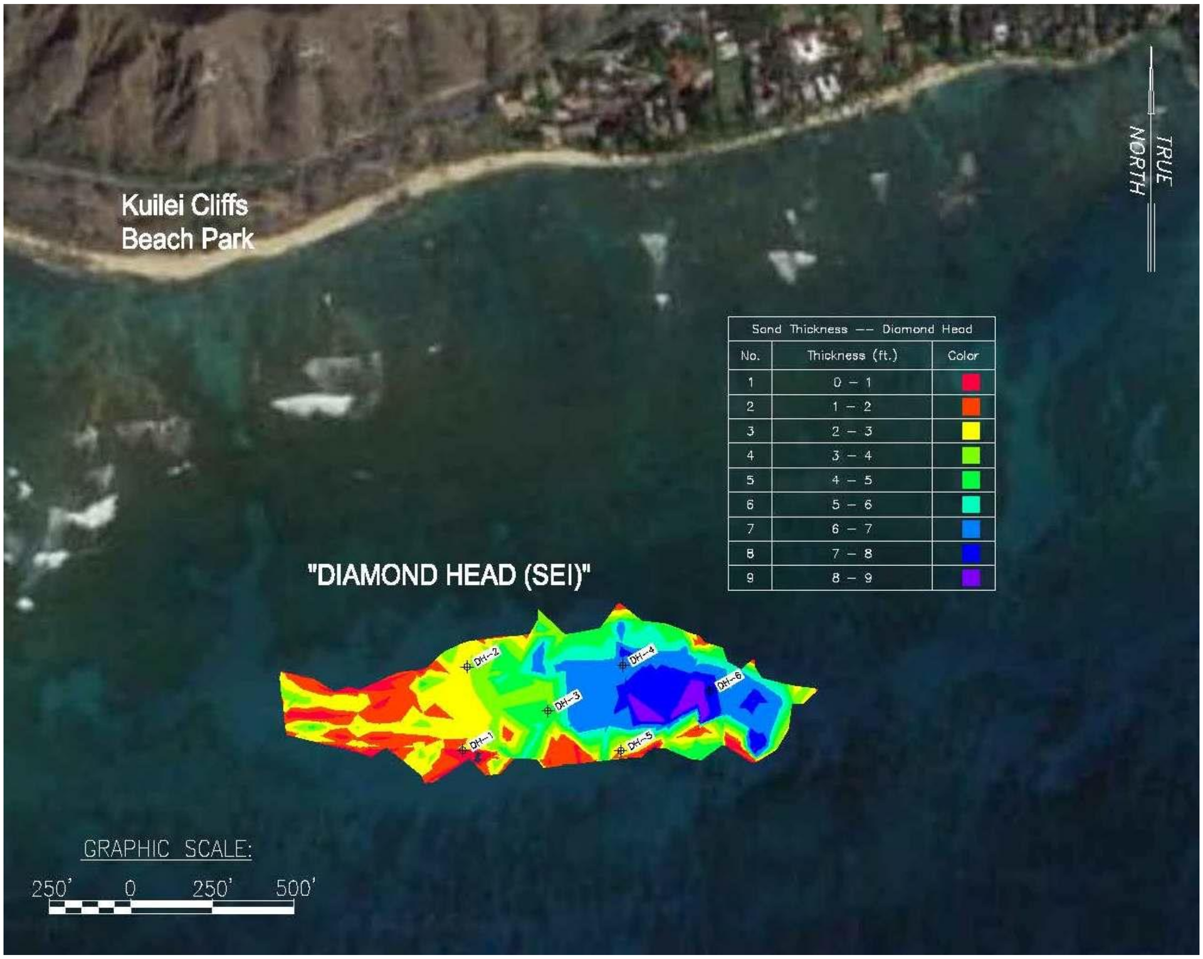

Figure 3-12 *Diamond Head* offshore sand deposit thickness and core locations (black "+")

Table 3-6 *Diamond Head* offshore sand source summary

Location	D_{50} (mm)	Sorting σ	% fines	Jet probe (feet)	Water depth (feet)	Source	Year
DH-1	0.45	0.5	0.8	4	25	SEI	2018
DH-2	0.40	0.6	1.0	6	30	SEI	2018
DH-3	0.43	0.5	1.0	6	30	SEI	2018
DH-4	0.45	0.5	1.0	6	30	SEI	2018
DH-5	n/a	n/a	n/a	6	35	SEI	2018
DH-6	n/a	n/a	n/a	3	35	SEI	2018

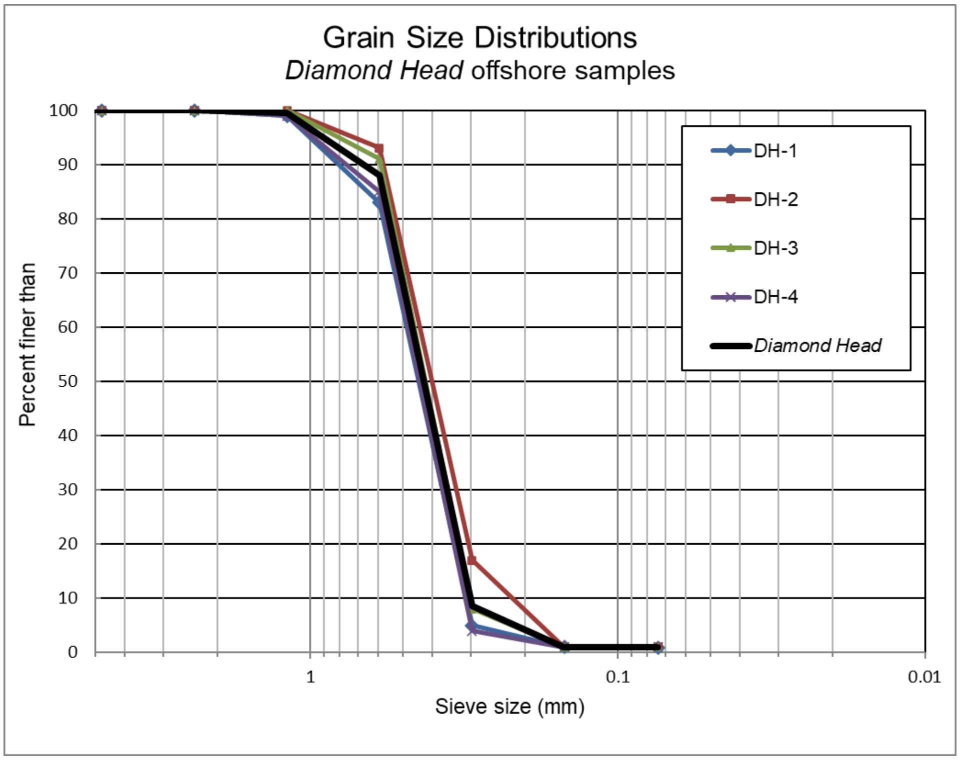

Figure 3-13 Grain size distribution for *Diamond Head* offshore sand deposit

3.4.3 Constraints (Diamond Head)

The *Diamond Head* sand deposit is estimated to contains about 60,000 cy of high-quality sand. The deposit is located near surf breaks and is exposed to wind and waves. The site rarely experiences extended periods of calm weather that the other shores do. Recovery attempts could result in frequent work stoppages.

Further, the sand would be used on a beach outside of the region, and there could be community opposition and regulatory requirements that prevent use of this sand in Waikiki.

3.5 *Reef Runway* Offshore Sand Deposit

3.5.1 Historical sand deposit data

Offshore sand resources at the Reef Runway have been investigated for the past three decades by a variety of organizations. The University of Hawaii Marine Minerals Technology Center (MMTC) produced a report on the sand deposits off the Diamond Head half of the Reef Runway. They reported sand deposits as much as 25 feet thick, though much of the sampling was performed in 100 to 300 feet of water.

Sea Engineering (1994) performed geophysical testing on a 100-acre site off the west end of the Reef Runway near the Pearl Harbor entrance channel. The testing was funded by CEROS for the development of a sub-bottom imaging instrument. Penetration of more than 150 feet into the sand deposit was achieved, along with 12 inches of vertical resolution of geological features. Nine sand samples were obtained along a north-south transect through the middle of the survey area. Two samples toward the north boundary of the study site showed median grain sizes of 0.44 mm and 0.55 mm, while the other samples were in the range of 0.15 mm to 0.31 mm. All samples were moderately to poorly sorted.

Sea Engineering (2001) performed single-beam and multi-beam bathymetric surveys and sub-bottom profiling offshore of the Reef Runway in support of the recovery of the *Ehime Maru*. The survey area covered about 500 acres in front of the Ewa half of the runway. The sub-bottom profiling showed that sand thickness within much of the survey area was up to about 20 feet thick, while two areas that overlapped the CEROS survey area were found to exceed 30 feet in thickness.

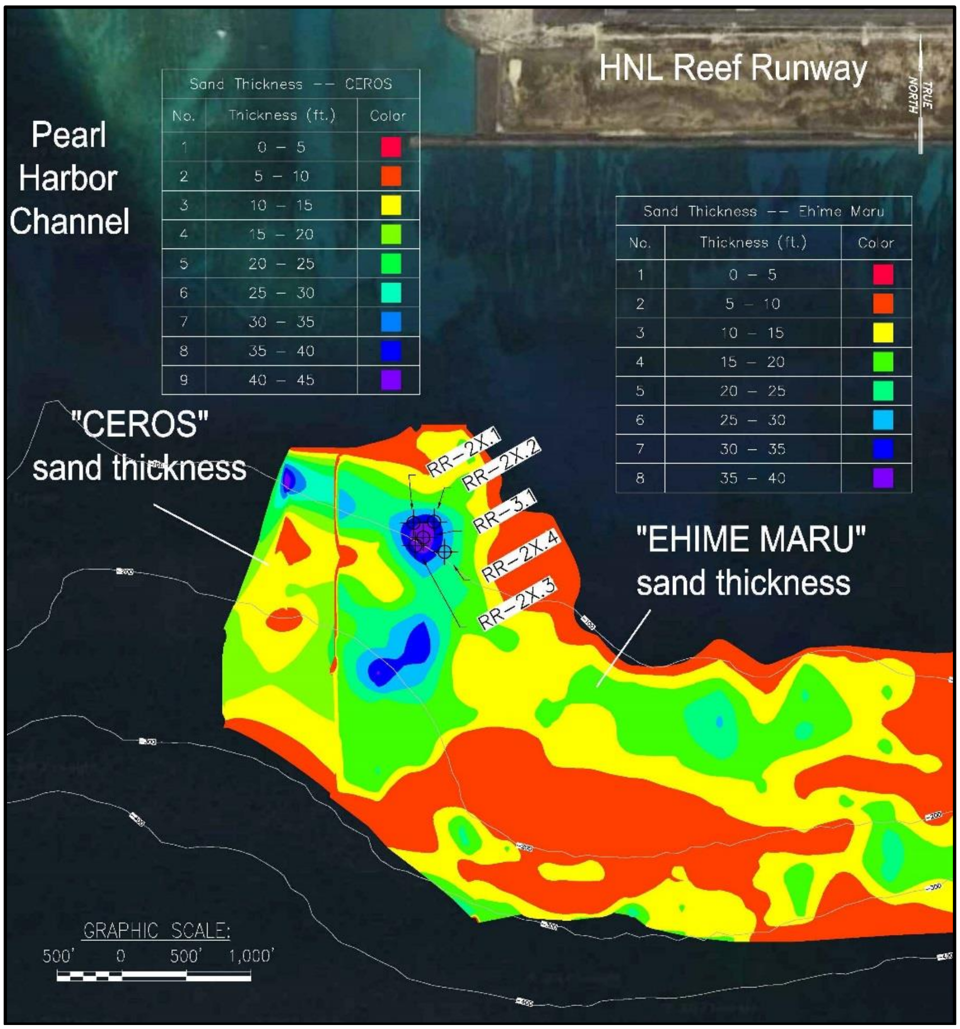

Figure 3-14 Reef Runway sand deposits and vibracore locations

3.5.2 2017-2018 sand investigations (Reef Runway—Outer)

Sea Engineering conducted investigations on the Reef Runway sand deposits in March and May of 2017. Initial investigations found patch reefs within the larger survey area, so divers and underwater video cameras were deployed to ground-truth the sub-bottom data and direct the vibracore toward larger patches of sand.

The subsequent vibracore deployments targeted a patch of sand identified from the sub-bottom profiling as being as much as 40 feet thick. Five vibracore samples were obtained at locations shown previously on Figure 3-14, and the grain statistics are presented in Table 3-7 and Figure 3-15

Table 3-7 *Reef Runway—Outer* offshore sand source summary

Location	D_{50} (mm)	Sorting σ	% fines	Core length (inches)	Water depth (feet)	Source	Year
RR-2X.1	0.21	0.9	2.7	50	87	SEI	2017
RR-2X.2	0.21	0.9	3.7	38	83	SEI	2017
RR-2X.3	0.15	0.9	5.6	65	105	SEI	2017
RR-2X.4	0.18	0.9	3.9	87	94	SEI	2017
RR 3.1	0.17	1.0	3.9	96	93	SEI	2017

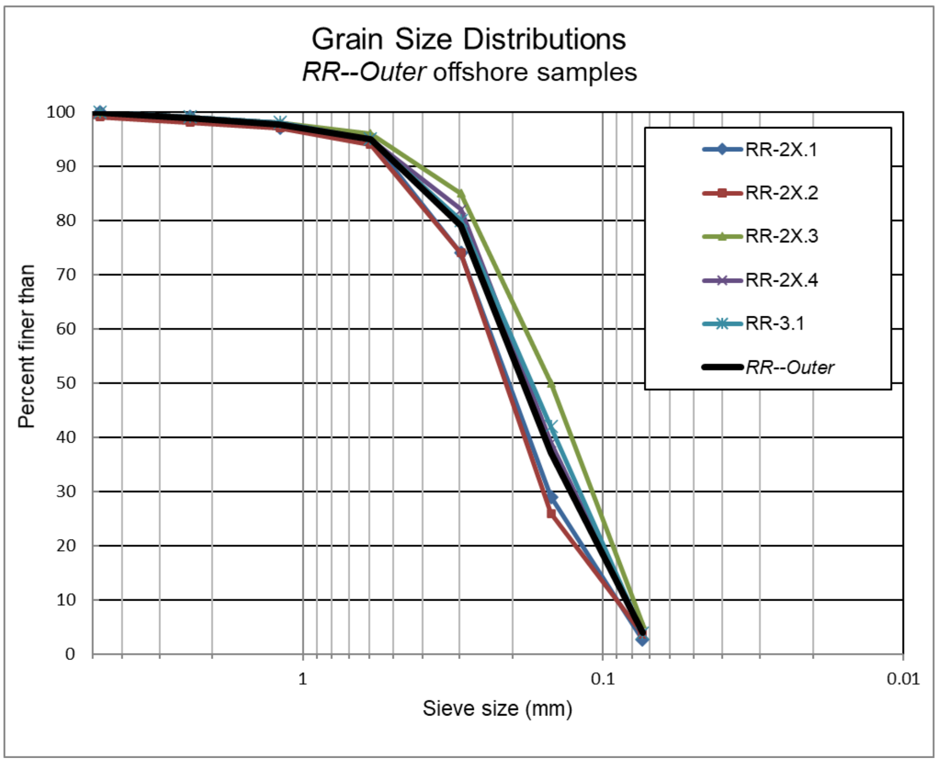

Figure 3-15 Grain size distribution for *Reef Runway—Outer* offshore sand deposit

3.5.3 2018 sand investigations (RR—Inner)

Investigation in the vicinity of the Reef Runway found a sand deposit located in about 60 feet of water approximately 1,500 to 3,000 feet from the runway (Figure 3-16). The patch of sand, referred to as *RR—Inner 1a* is roughly 1,000 ft by 2,000 feet in dimension and was initially investigated with a sub-bottom profiler to determine deposit thickness. Divers later investigated the site with a jet probe to verify deposit thickness, and later with a vibracore to determine the grain size through the deposit. Jet probes penetrated 2 to 4 ft into the sand. The grain size, jet probe, and vibracore information are presented in Table 3-8. The deposit contains an estimated 200,000 cy of sand based on the sub-bottom profiling data.

A smaller sand field located nearby to the northwest of the *RR—Inner 1a* site was also investigated by the field team. This sand field, labeled *RR Inner – 1b*, is shown in Figure 3-16 and covers approximately 450,000 sf. Divers performed jet probes in 10 locations and push core sediment sampling at 2 locations shown on that figure. Jet probes penetrated 2.5 feet to 5 feet with an average of 3.8 feet. This would indicate around 60,000 cy of sand is possible from this deposit.

The sand sample data from the two sites is presented in Table 3-8. Samples "RR-6.5" and "RR-6.6" are in *RR—Inner 1b*; all the rest are from *RR—Inner 1a*.

The median grain size for the samples was in the range of 0.24 to 0.41 mm. The fine material in the samples ranged from 2.1% to 6.6%, which on average is within DLNR's range of acceptability, but notably higher than beach sand, which is typically less than 1% fines. *RR Inner-1a* was estimated to have a significant volume of sand, because of the expanse of the deposit. The deposit is quite thin—jet probes extended only 15 to 30 inches into the sand. Sand is much less efficiently dredged from thin deposits. The dredging operation would recover only a small amount each cycle and would be required to move frequently. This is expected to become relatively expensive compared to other sites investigated.

State Department of Transportation Airports Division also expressed strong concern over cranes operating near the airport runway. Given the logistical constraints and the marginal sand quality, these two deposits were not considered for Waikiki.

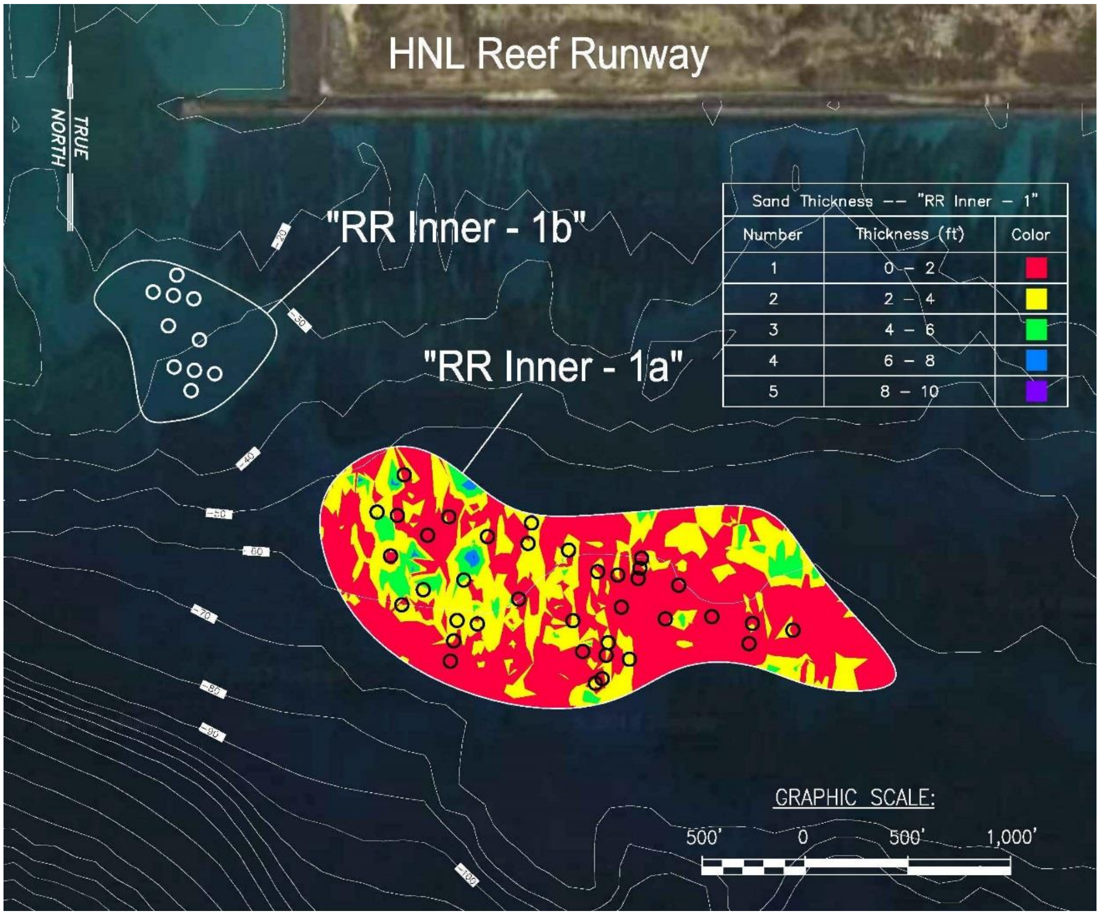

Figure 3-16 *RR—Inner* location map and sand deposit thickness. Jet probe locations shown by black and white circles.

Table 3-8 *RR—Inner* offshore sand source summary

Location	D_{50} (mm)	Sorting σ	% fines	Probe length (inches)	Source	Year
RR 3.1 (1a)	0.27	0.8	2.1	n/a	SEI	2018
RR 3.2 (1a)	0.34	0.8	2.2	n/a	SEI	2018
RR-3.3 (1a)	0.33	0.9	2.7	30	SEI	2018
RR 4.1 (1a)	0.36	0.7	2.9	19	SEI	2018
RR 4.2 (1a)	0.41	0.9	5.1	21	SEI	2018
RR 4.3 (1a)	0.34	1.1	6.6	15	SEI	2018
RR 4.4 (1a)	0.24	0.8	3.8	21	SEI	2018
RR-6.1 (1a)	0.41	1.1	1.4	n/a	SEI	2018
RR-6.2 (1a)	0.42	0.7	1.3	n/a	SEI	2018
RR-6.3 (1a)	0.27	0.8	1.8	n/a	SEI	2018
RR-6.4 (1a)	0.34	0.7	1.7	n/a	SEI	2018
RR-6.5 (1b)	0.36	0.8	1.4	n/a	SEI	2018
RR-6.6 (1b)	0.26	0.7	1.4	n/a	SEI	2018

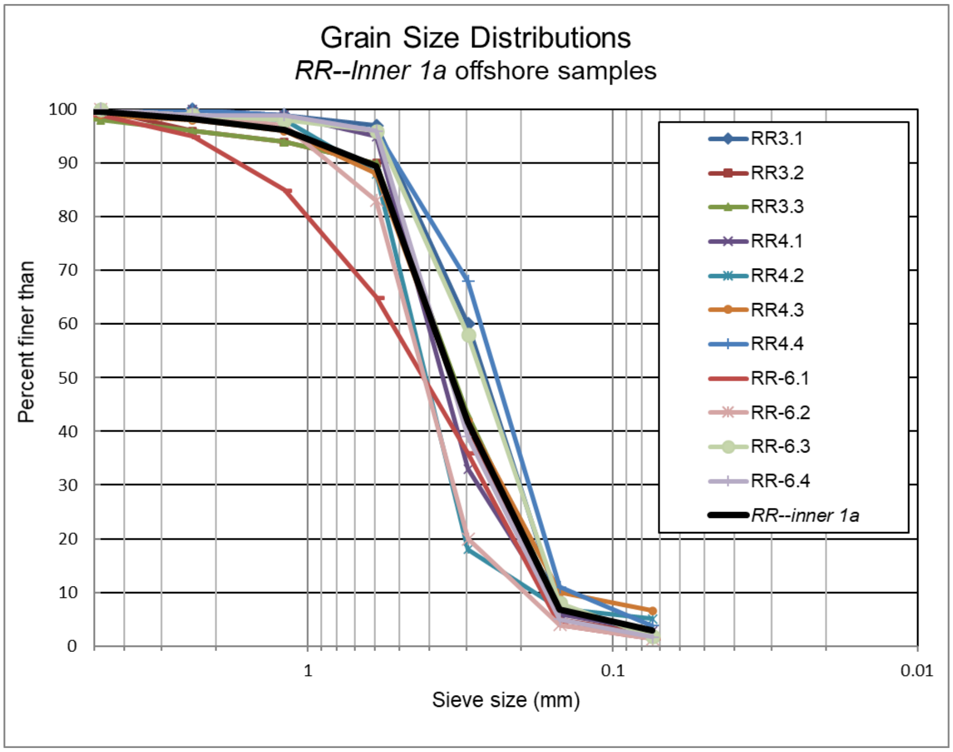

Figure 3-17 Grain size distributions for *RR—Inner 1a*.

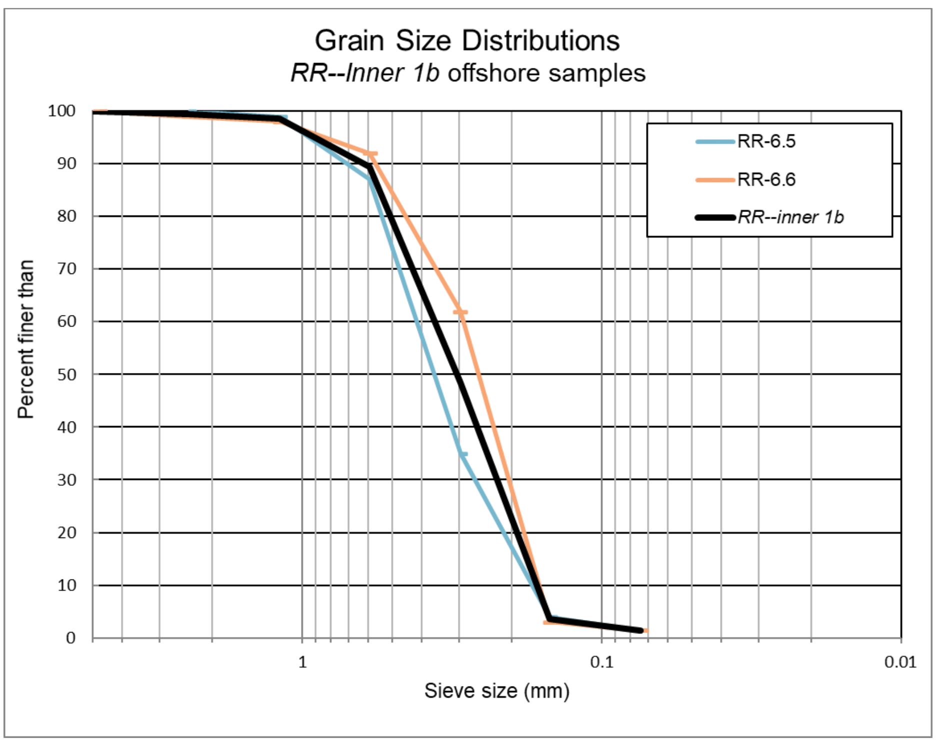

Figure 3-18 Grain size distributions for *RR—Inner 1b*.

3.5.4 Constraints (RR—Inner)

The *RR—Inner* sand deposits are located near the Ewa end of the Daniel K. Inouye Honolulu International Airport Reef Runway. The deposits are in 30 to 100 feet of water and are believed to contain more than 250,000 cy of sand. The measured median grain size ranged from 0.24 mm to 0.42 mm, which is generally similar to Waikiki beach sand. The offshore sand, however, contains a significant amount of fine material—2.1% to 6.1%—which is expected to produce noticeable turbidity, even though the fines are less than the limit set forth by DLNR.

Oceanographic conditions are not expected to be a concern during recovery, though waves and weather will have to be monitored. The site is not located significantly close to any surf sites or other recreational activities. The site is, however, located close to the Pearl Harbor channel. Operations are likely to require coordination with the military base and possible the airport. Our crew was interrogated by a military security boat during field work.

RR Inner—1b contains an estimated 200,000 cy of sand; however, the deposit is thin and dredging would be inefficient. Extraction of sand from this deposit is expected to have no effect of the airport's Reef Runway or any other structure; however, the Department of Transportation Airports Division has expressed concern over cranes operating near the runway. Coordination would be necessary for mining of that deposit.

3.6 *Ala Moana* Offshore Sand Deposit

3.6.1 2018 sand deposit investigations

The University of Hawaii Coastal Geology Group (CGG) produced a report entitled "South Oahu Reeftop Sand Bodies" as part of the U.S. Army Corps of Engineers' Regional Sediment Management program (2010). The study used aerial images to identify ephemeral and non-ephemeral sand deposits along the south shore of Oahu. The use of aerial images, however, limits the findings to visible deposits in shallow water. The sand deposits identified by the CGG were generally found at water depths less than 60 feet, and most at depths less than about 40 feet.

Sea Engineering performed additional investigations between Ala Wai Small Boat Harbor channel and Kewalo Basin channel, specifically focusing on water depths of 40 to 100 feet. Approximately 4.5 miles of drop camera footage and side-scan sonar were obtained. Analysis of the data revealed a sand deposit extending offshore of Ala Moana Beach Park. Diver jet probes and sand samples were obtained in 8 locations (Figure 3-19), and the data is presented in Table 3-9. Sand size characteristics and sand thickness were found to be variable across the deposit.

The diver investigations were later followed by a sub-bottom profiler survey of the deposit thickness (Figure 3-19). The sub-bottom survey found that the deposit had thickness of up to about 16 feet. The mapped part of the deposit, shown in Figure 3-19, is estimated to contain about 190,000 cy of sand; the central portion of the deposit, identified by the white polygon and having the greatest thickness, was estimated to contain 86,000 cy of sand based on sub-bottom profiling results. Additional jet probing was performed in 2020 to validate the subbottom data. The sand samples from vibracores of the *Ala Moana* deposit had median diameters in the range of 0.18 mm to 0.51 mm with an average of 0.39 mm and contained up to 1.7% to 5.4% fine material with an average of 3.6% fines.

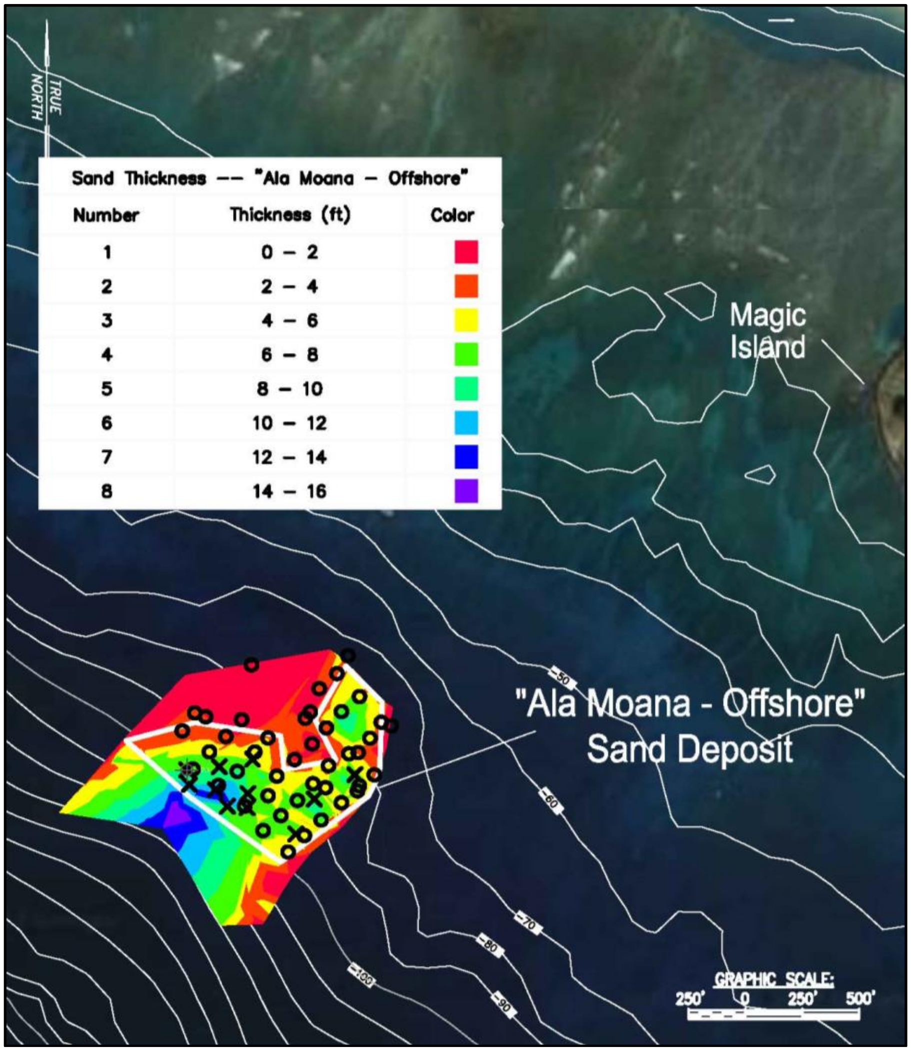

Figure 3-19 *Ala Moana* location map and sand deposit thickness. Jet probe locations shown as "o" and vibracore locations shown as "x".

Table 3-9 *Ala Moana* sand source summary (vibracores)

Location	D_{50} (mm)	Sorting σ	% fines	Source	Year
AMO-3.3	0.44	1.3	3.5	SEI	2018
AMO-3.4	0.49	1.3	3.0	SEI	2018
AMO-3.5	0.38	1.1	3.6	SEI	2018
AMO-3.6	0.46	1.2	3.1	SEI	2018
AMO-3.7	0.49	1.2	1.7	SEI	2018
AMO-3.8	0.23	1.1	3.4	SEI	2018
AMO-3.9	0.42	1.2	2.5	SEI	2018
AMO-4.1	0.34	1.2	5.1	SEI	2018
AMO-4.2	0.18	1.1	5.4	SEI	2018
AMO-4.4	0.51	1.3	4.7	SEI	2018

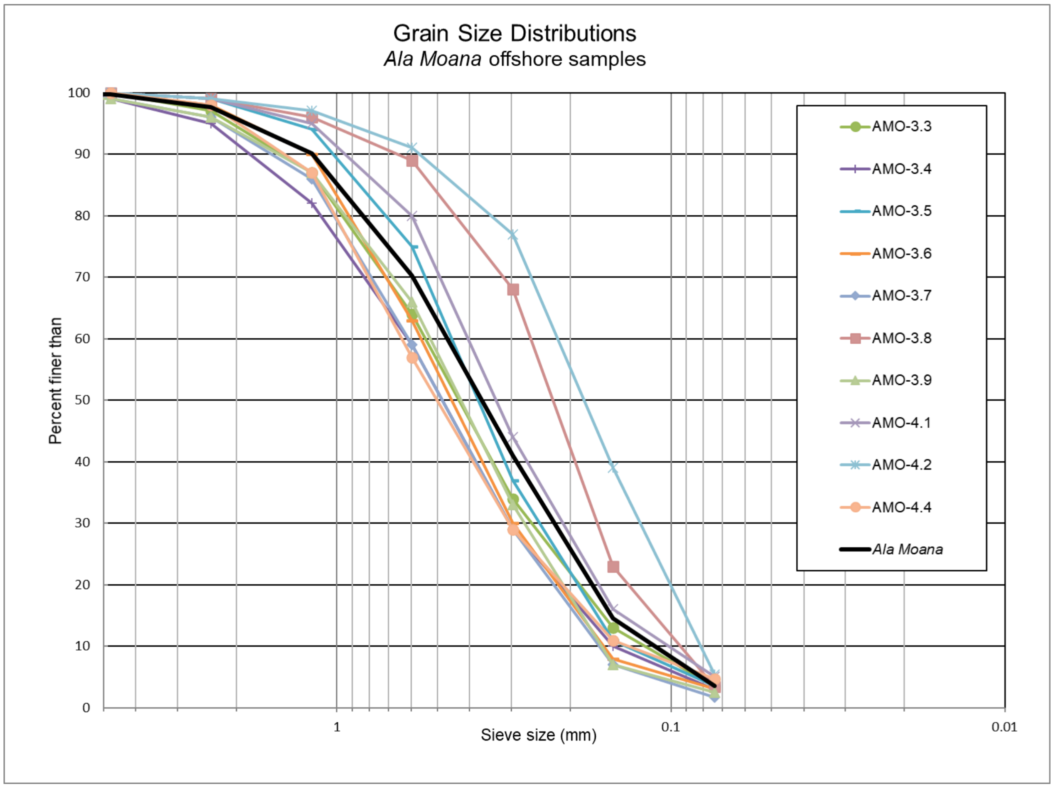

Figure 3-20 3-21 Grain size distribution for *Ala Moana* sand deposit

3.6.2 Constraints (Ala Moana)

The *Ala Moana* deposit is located in nearshore waters off Ala Moana Regional Park. The sand deposit is directly offshore of the popular *Courts* surf sites, approximately 2,300 feet offshore of the reef break. The sand deposit is in 70 to more than 100 feet of water, and the central part of the deposit contains the thickest sand.

Oceanographic conditions are not expected to be a concern, particularly in the favorable winter months. The City and County of Honolulu has thoroughly investigated this deposit and has proposed to use sand from the deposit for their Ala Moana Regional Park Beach Nourishment project. Use of this sand deposit for Waikiki projects could meet community and City opposition, as well as regulatory requirements for using sand outside of its native region.

3.7 Pacific Aggregate Inland Sand

Pacific Aggregate has a quarry and processing operation in Waianae that specializes in the production of coral base aggregate. The property covers 200 acres and the quarry that produces a wide variety of coral aggregates, primarily for the concrete industry.

During operations they found remnants of an inland beach from a higher sea level stand, now buried under roughly 30 feet of overburden. The deposit is referred to as "Natural" or "Inland" sand. This layer is up to about 10 feet thick and the spatial extent is not presently known. A boring elsewhere on their property showed sand, but no more detail is known at this point.

The quarry mines the “Natural” sand and stockpiles it separately from the crushed limestone sand. The quarry also produces a "Blended" sample, which is composed of sediment that they recover from the ground at the base of the “Natural” excavation. This is not actually a controlled blend, but rather a combination of the “Natural” sand and any surrounding material that crumbled through the excavation process. The owner reported that the “Blended” sample might be ~50% “Natural”, though identifying the relative percentages may be difficult.

Sand samples of the “Natural” sand had an observably high quantity of fine material, and in general, the sand was poorly sorted. At our request, the quarry performed additional processing, which involved reducing the speed of the rinsing augers and increasing the water flow. This reduced the percentage of material passing through the #200 sieve to 0.5%. The grain size characteristics of the four sand samples are presented in Table 3-10 and Figure 3-22.

Table 3-10 “Pacific Aggregate” sand source summary

Sample ID	D_{50} (mm)	Sorting (σ)	% fines	Source	Year
“Natural Inland”	0.51	1.4	2.8	Pac Agg	2018
“Natural Washed”	0.61	1.0	0.5	SEI	2018
“Blended”	0.93	1.3	n/a	Pac Agg	2018
“Blended Washed”	0.70	1.2	1.1	SEI	2018

The median diameter of the “Blended Washed” sample Table 3-10 is smaller than for the “Blended” sample, although the grain size of the washed sample should have been larger. This is likely because grain size analyses were performed at different times and probably from different locations in the quarry, highlighting the variability in the Blended sand.

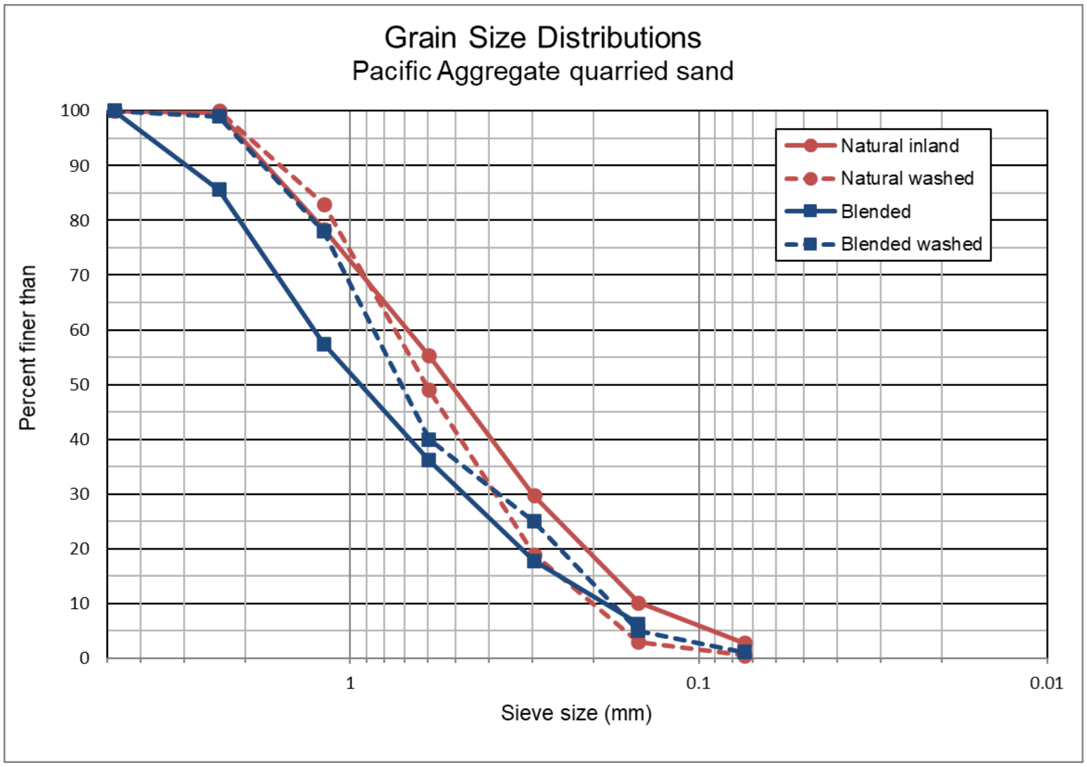

Figure 3-22 Grain size distribution for *Pacific Aggregate* washed quarry sand

3.7.1 Constraints (Pacific Aggregate)

The "Inland Sand" is a layer of relithified calcareous beach sand in an area where fossil reef is mined and processed. The Inland Sand is stockpiled and sold as it is mined. The quarry does not have an estimate of future available or sand quality in other parts of the property.

Trucking from the quarry in Waianae to Waikiki would be needed to use the sand in this project.

The sand has a high amount of fines that can be washed out by the quarry. The extra handling adds to the cost. Additionally, the sand has not been approved for use on the beach by DLNR.

3.8 Summary

Nine offshore sand deposits were considered for this project. The sand statistics are presented in Table 3-11 and turbidity test results are presented in Figure 3-23. A representative photograph of offshore sand samples is presented in Figure 3-24.

Of the sand sources presented in this report, three have direct applicability to the Waikiki EIS project: *Ala Moana*, *Hilton*, and *Canoes/Queens*. Sand from the *Canoes/Queens* deposit was used in the 2006-2007 Kuhio Beach nourishment project and the 2012 and 2021 Waikiki Beach Maintenance projects. Sand from that deposit is best used as a somewhat perpetual source of sand for the Royal Hawaiian Beach Sector. A Conservation District User Permit was granted to the City in February of 2021 to use *Ala Moana* to nourish Ala Moana beach. The other sand deposits have never been mined.

Table 3-11 Offshore sand source data summary.

Deposit	Depth (ft)	D_{50} (mm)	Sorting	% fines	Volume (cy)	Vibra-cored	Jet probed	Turbidity test?
Ala Moana	70-120	0.37	1.3	3.6	>86,000	Y	Y	Y
Diamond Head	20-30	0.43	0.6	1.0	110,000	N	Y	N
Halekulani	70-120	0.27	1.0	3.3	>200,000	Y	N	Y
Hilton	40-60	0.59	0.9	0.8	45,000	Y	Y	Y
RR-inner 1a	50-65	0.33	0.9	2.9	200,000	N	Y	Y
RR-inner 1b	25-35	0.33	0.9	1.4	50,000	Y	Y	Y
RR-outer	100-300	0.18	0.9	4.0	n/a	Y	Y	N
Canoes/Queens	10-20	0.33	0.8	0.5	>30,000	Y	Y	Y

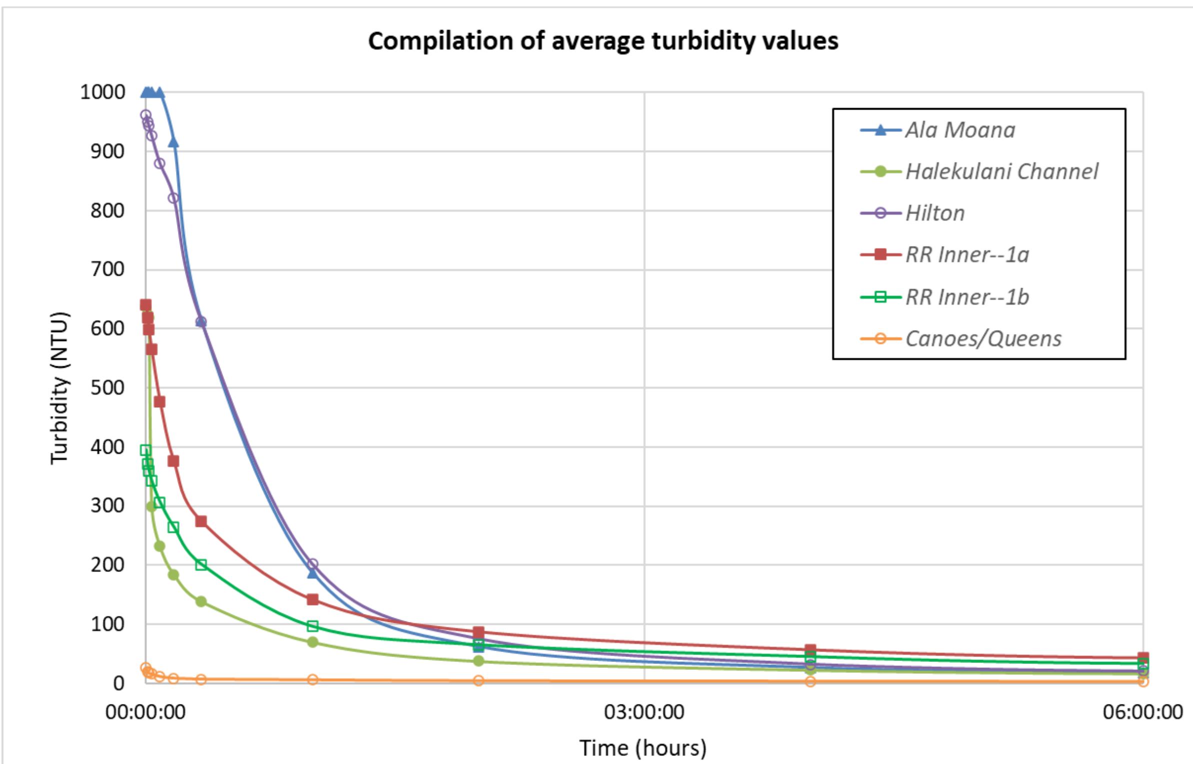

Figure 3-23 Turbidity analysis results for 6 offshore sand deposits

Reef Runway (Inner-1b)		Diamond Head
Hilton		Canoes/ Queens

Figure 3-24 Four representative sand samples from offshore deposits

4. BEACH SECTORS AND POTENTIAL OFFSHORE SAND SOURCES

The following sections present comparisons of sand from the offshore sand sources in relation to the four beach sectors for the Waikiki EIS. Recommendations based on the findings of the sand source investigations are presented. The recommendations are based on the physical characteristics of the sand deposit and the existing shoreline conditions and proposed project.

Beach nourishment at Waikiki and Ala Moana during the 20th century was accomplished by mining sand from distant beaches (e.g., Molokai, Waimea Bay, Yokohama Beach) and placing it directly on the beaches. While this practice is no longer allowed, there is still concern voiced over transporting sand from one region for use in another.

Beach nourishment using an offshore sand deposit has been performed a total of 4 times in Hawaii: Kuhio Beach (2006-2007), Waikiki Maintenance (2012 and 2021), and Iroquois Point (2013). In each of those projects, the sand source was directly offshore or otherwise connected to the project. The use of sand from an offshore source that is outside of the project area has not been done previously in Hawaii, and it is possible that proposed use could encounter community opposition and regulatory constraints that prohibitive the use of sand in other shoreline regions.

4.1 Kuhio Sector

Two sand samples were obtained from the beach face in the Kūhiō Beach Park ‘Ewa (west) basin in February 2021. Figure 4-1 shows the composite grain size distribution of those two samples, which have a median grain size (D_{50}) of 0.43 mm. Figure 4-1 also shows the composite grain size distributions for the offshore sand deposits investigated in this project. The best match for the beach is the *Diamond Head* offshore sand deposit. The *Ala Moana* and *Canoes/Queens* offshore sand are reasonable matches for the coarser part of the distribution, before passing outside the ±20% guideline for finer sand. The *Hilton* offshore sand falls on the coarser side; however, slightly coarser sand would be expected to be more stable on an eroding beach.

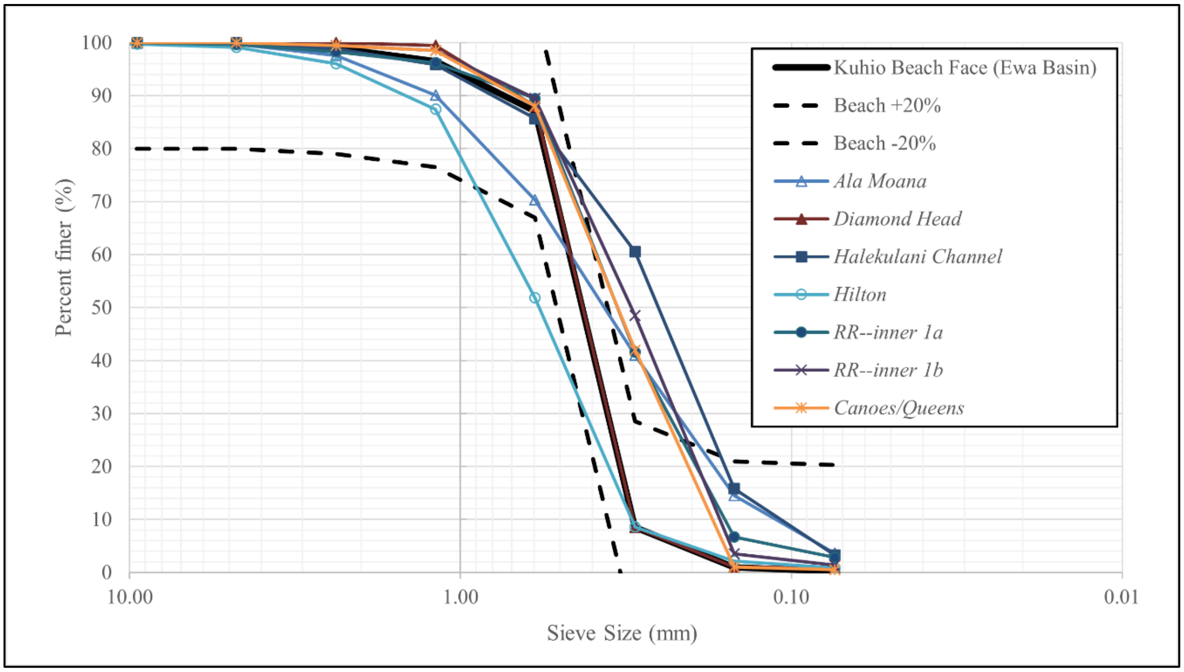

Figure 4-1 Grain size distributions: Kūhiō Beach Park, ‘Ewa Basin and offshore sand sources

Given the logistical challenges of obtaining sand from the *Diamond Head* offshore deposit, the preferred sand sources for the Kūhiō beach sector are the *Hilton*, *Ala Moana*, and *Canoes/Queens* offshore deposits. Figure 4-2 and Table 4-1 present the grain size distributions and statistics for the beach and the recommended sources. Sand recovered from the *Ala Moana* and *Hilton* offshore deposits could be used with only minimal overfill, whereas sand from the *Canoes/Queens* offshore deposit would require an additional 12,500 cy sand (total of 40,500 cy) due to the finer sand grain size and increased overfill ratio. Furthermore, the *Canoes/Queens* deposit contains a limited volume of sand, has been dredged multiple times, and is better suited for use in the Royal Hawaiian beach sector. The proposed beach nourishment and structural modifications should result in slightly reduced wave energy in the ‘Ewa (west) basin. Additionally, the sand would be contained within the basin by the historical dredge cut in the reef along the offshore margin of the basin.

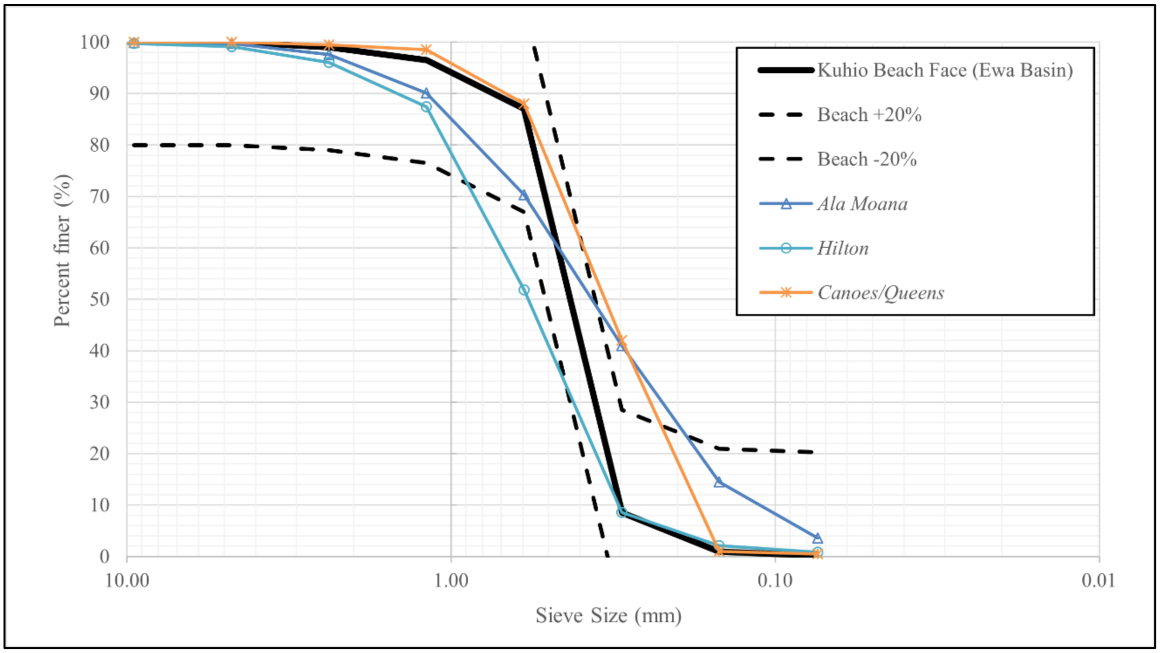

Figure 4-2 Grain size distributions: Kūhiō Beach Park, ‘Ewa Basin, Beach Face and recommended sand sources

Table 4-1 Comparison of sand parameters for Kūhiō Beach Park

	‘Ewa Basin	Canoes/Queens	Ala Moana	Hilton
Median diameter, D_{50} (mm)	0.43	0.34	0.37	0.59
Sorting	N/A	0.82	1.42	1.02
Overfill factor	N/A	1.50	1.10	1.00
Estimated sand required (cy)	25,000	37,500	27,500	25,000
Estimated sand available (cy)	N/A	40,000	86,000	40,000

4.2 Royal Hawaiian Sector

The preferred sand source for the proposed beach nourishment action is the *Canoes/Queens* offshore deposit, which is the same sand source that was used in the Waikīkī Beach Maintenance I and II projects in 2012 and 2021, respectively. The similar sand characteristics to the existing beach, close proximity to the shoreline, and small percentage of fine material in the *Canoes/Queens* offshore sand deposit makes it preferable for this beach sector.

Sand from the *Hilton* and *Ala Moana* offshore sand deposits are also viable options. Sand in the *Hilton* deposit is coarser and may be more stable on the beach. Utilizing clamshell dredging to recover sand from either of these deposits and trucking it to the project site may be more economical when compared to hydraulic dredging due to increased production and less projected downtime due to pipe plugging.

4.3 Halekulani Sector

One sand sample was obtained from the beach face fronting the Halekūlani Hotel in February 2021. Figure 4-3 shows the composite grain size distribution for the existing beach sand, which has a median grain size (D_{50}) of 0.35 mm. Figure 4-3 also shows the composite grain size distributions for the offshore sand deposits investigated in this project. Nearly all of the offshore sand falls within ±20% of the Halekūlani beach sand grain size distribution. Sand from the *Hilton* deposit falls on the coarser side; however, slightly coarser sand would be expected to stable on an eroding beach. This would be especially important with sea level rise, at which point the waves are expected to be more energetic.

The recommended potential sand sources for the Halekūlani beach sector are the *Hilton*, *Ala Moana*, and *Canoes/Queens* offshore deposits. Figure 4-4 and Table 4-2 present the grain size distributions and statistics for the beach and the recommended sources. Sand from any of the three sources presented (*Ala Moana*, *Hilton*, and *Waikīkī*) could be used with no required overfill. Furthermore, given the volume of sand required, sand combined from both the *Hilton* and *Ala Moana* sand deposits would be suitable for use in this sector.

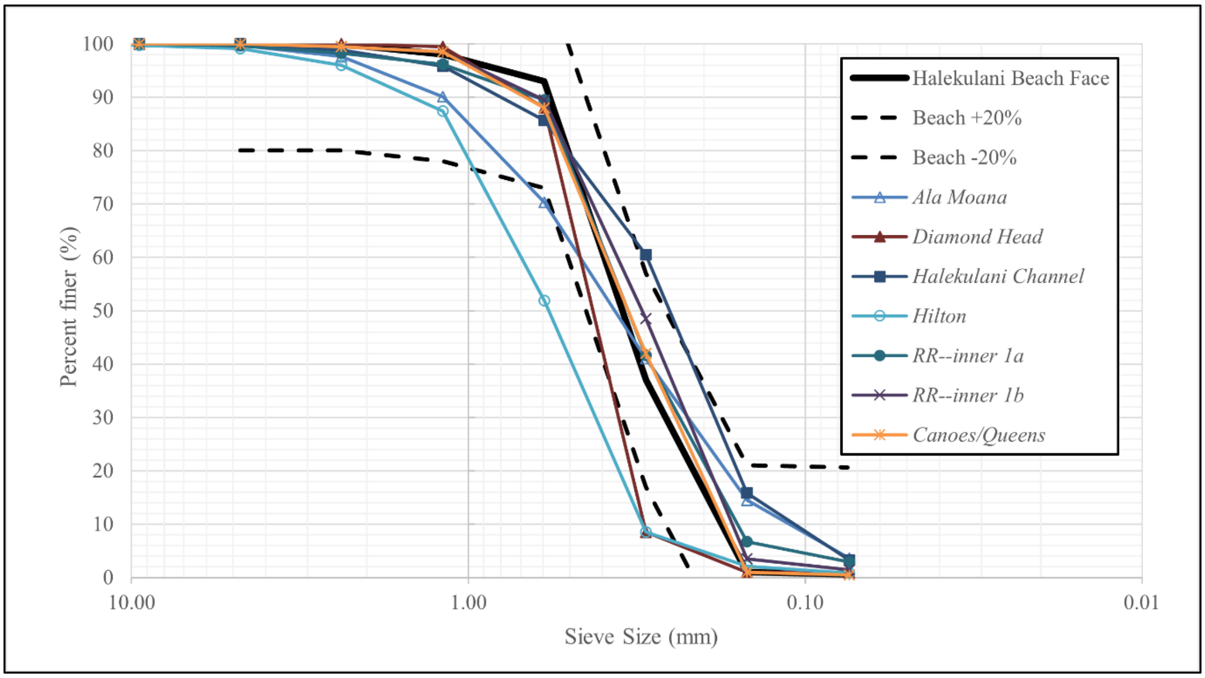

Figure 4-3 Comparison of grain size distributions for existing beach sand and offshore sand

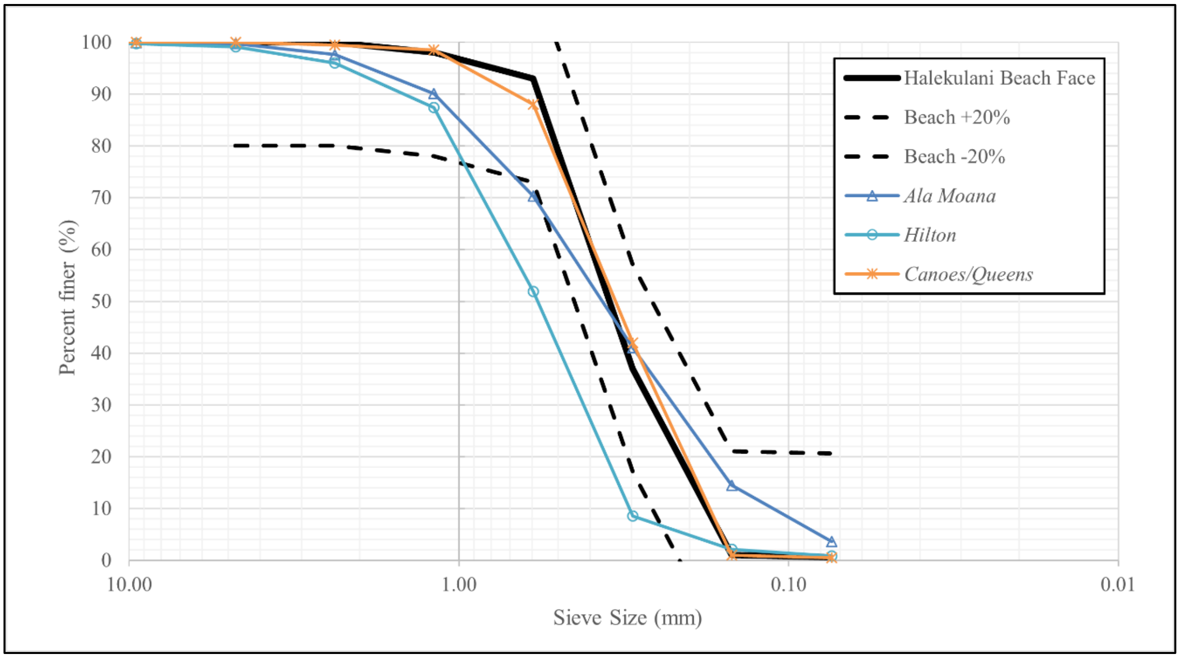

Figure 4-4 Grain size distributions for recommended sand sources - Halekūlani beach sector

Table 4-2 Comparison of sand parameters - Halekūlani beach sector

	Existing Beach Sand	Canoe/Queens	Ala Moana	Hilton
Median diameter, D_{50} (mm)	0.35	0.34	0.37	0.59
Sorting	N/A	0.82	1.42	1.02
Overfill factor	N/A	1.50	1.10	1.00
Estimated sand required (cy)	60,000	60,000	60,000	60,000
Estimated sand available (cy)	60,000	40,000	86,000	40,000

4.4 Ft. Derussy Sector

The proposed action in the Fort DeRussy beach sector involves moving sand from the beach face fronting the Hale Koa hotel to the beach fronting the U.S. Army Hawaiʻi Museum. Two sand samples were obtained from the beach face on each end of the beach sector in February 2021. Figure 4-5 shows the composite grain size distribution for the existing sand at the Diamond Head (east) end of the beach sector, which has a median grain size (D_{50}) of 0.35 mm. Figure 4-5 also shows the composite grain size distributions for two samples of the fill sand that will be obtained from the ʻEwa (west) end of the beach sector, which is slightly coarser but would be expected to be more stable on an eroding beach. This is particularly true for the Fort DeRussy beach sector where no additional sand stabilizing structures are proposed.

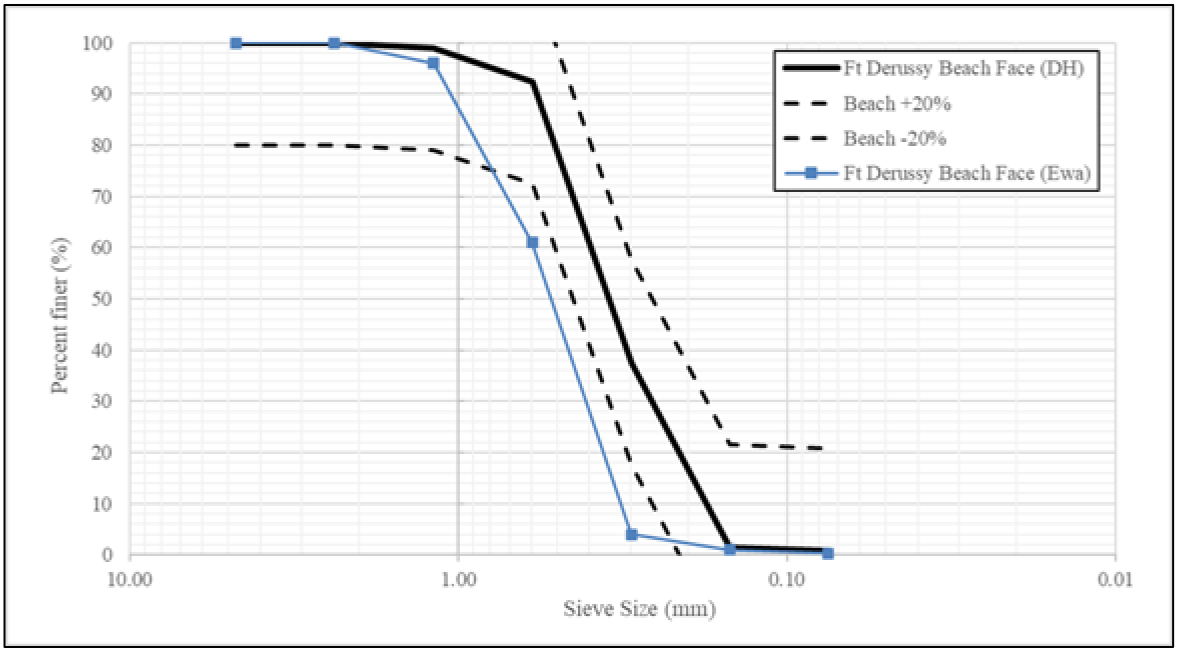

Figure 4-5 Grain size comparison of existing beach sand at borrow site and fill site

4.5 Summary

Comparison of native beach sand with the available offshore sand sources indicates that there are limited sand sources available that have sand that adequately meets DLNR's guidelines for beach nourishment in Waikiki. These deposits are *Ala Moana*, *Diamond Head*, *Hilton*, and *Canoes/Queens*. Within Waikiki, only *Hilton* and *Canoes/Queens* have suitable sand, and their volume is limited. *Ala Moana and Diamond Head* contain suitable sand; however, they are located outside of the project area. Use of offshore sand from deposits outside the project area has not been done to-date in Hawaii. Given heightened awareness on beach erosion, it is possible that community opposition to sand extraction from their beach area for use somewhere else could prove prohibitive. Sand availability for future projects in Waikiki could become increasingly difficult.

5. OFFSHORE SAND RECOVERY AND TRANSPORT METHODOLOGY

A variety of methods are available to recover the offshore sand. Each method has inherent advantages, disadvantages, and ranges of applicability. The three most common forms of dredging used in Hawai‘i are clamshell buckets; 2) submersible slurry pumps; and 3) self-contained hydraulic suction dredges.

5.1 Dredging System

Dredging systems for beach nourishment purposes are designed to recover sand from the seafloor and deliver it to an alternate site. There are various ways to accomplish these operations, some of which store the sand onboard the dredging vessel or deliver it to nearby barges or ships, while others transport the sand directly through a pipeline to the shore. Storing the sand on the dredging vessel requires that the vessel return to a commercial harbor on a regular basis to discharge recovered materials, requiring considerable time, energy, and harbor space. If the sand is pumped to shore, booster pumps and additional barges may be necessary if the distance to the project beach is excessive. The third strategy would be placement of the dredged sand in ships or barges that could be cycled through the recovery and delivery process close to the project site to increase dredging efficiency. This would allow for simultaneous loading and offloading of pairs of these barges and would allow the dredge barge to remain in place for the duration of the recovery effort.

All of these techniques require that the dredge barge be anchored with a stable, minimum four-point mooring in the recovery area. Anchors would be placed within the sand field and marked with floats or buoys, as depicted in Figure 5-1. A four-point mooring would allow the barge to change locations within the recovery area and remain securely anchored without having to adjust anchor placement.

There are several potential dredging techniques that might be employed for the project, all of which are discussed in the following sections.

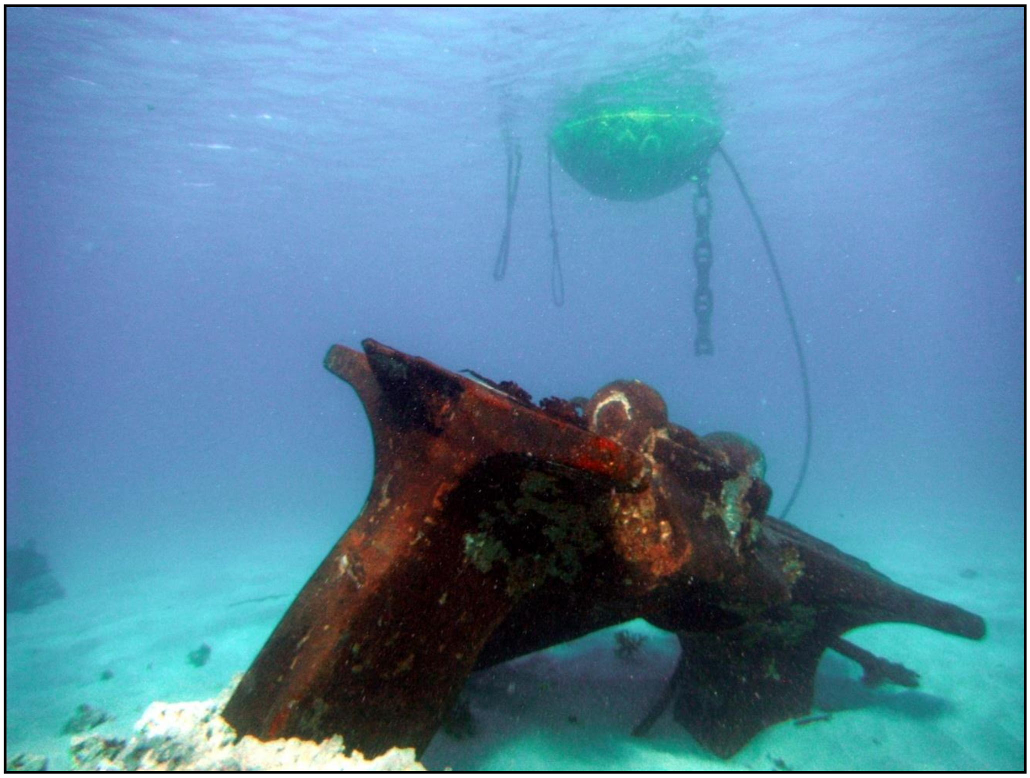

Figure 5-1 Example: Anchor and Anchor Float used in the 2012 Waikiki Beach Maintenance Project.

5.1.1 Clamshell Dredging

Clamshell dredging, shown in Figure 5-2, describes the process of mechanically scooping and lifting the sediment, in this case sand, from the seafloor. An environmental clamshell bucket, such as the one shown in Figure 5-3, is lowered from a crane in the open position, and upon the clamshell reaching the bottom, the crane operator closes the clamshell jaws and lifts the material out of the water. The operator then rotates the crane and opens the bucket to dispense the material into a waiting barge, such as a hopper barge (Figure 5-4).

A 15 cy rated bucket for example would have an open footprint of 13 ft by 13 feet, and would penetrate approximately 2 feet into the bottom, recovering about 12 cy of sand.

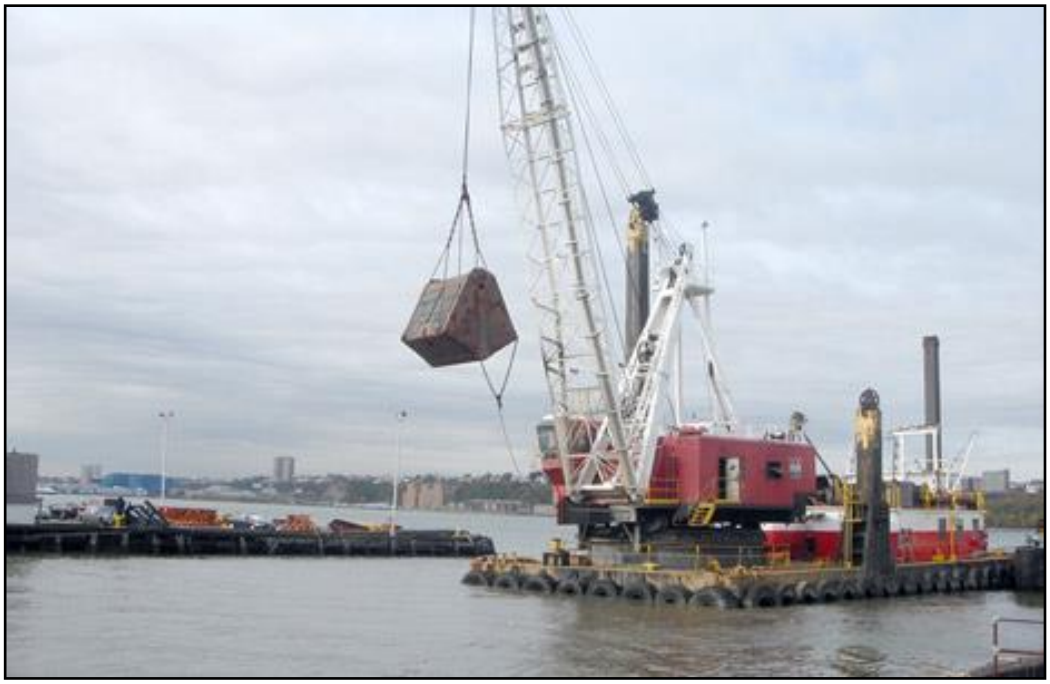

Figure 5-2 Example: Clamshell Dredge with Environmental Bucket
(http://www.conedison.com/ehs/2009annualreport/environmental_stewardship)

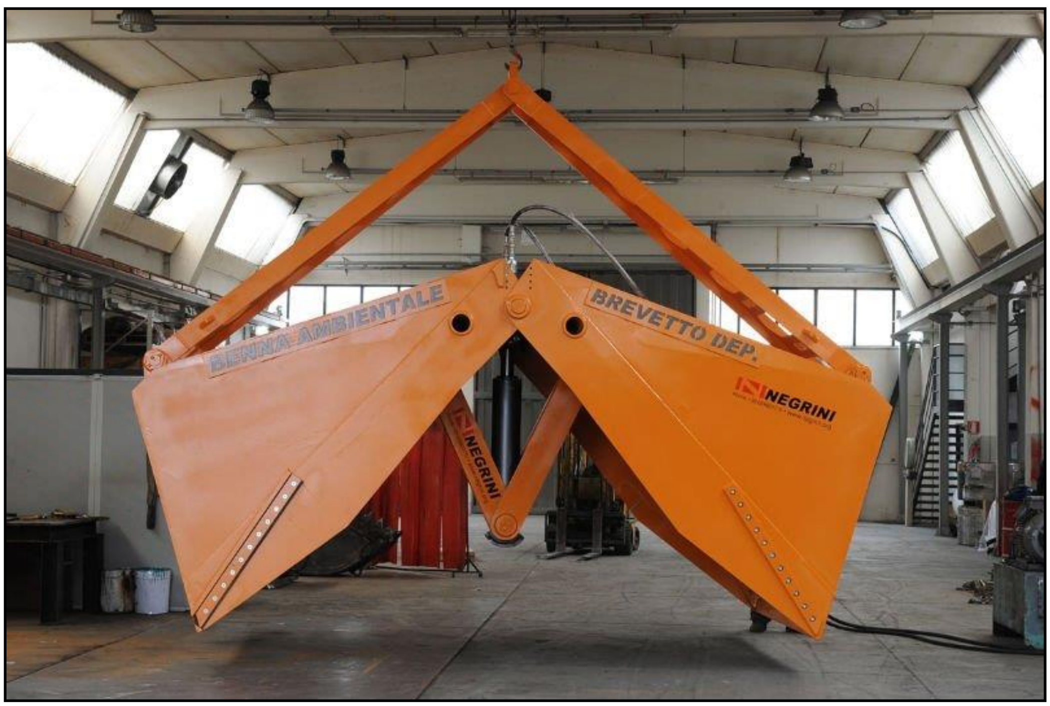

Figure 5-3 Example: Environmental Clamshell Bucket
(http://www.alibaba.com/product-free/107658423/Environmental_clamshell_grab.html)

Figure 5-4 Hopper Barge
(http://www.thecargogroup.net/)

Environmental clamshell buckets, also called level-cut buckets, are designed to be able to remove as little as 6 inches of sediment from the seafloor surface if necessary, while leaving the lower sediment undisturbed. Figure 5-5 shows a schematic of the level-cut process. The bucket is lowered to the seafloor with the jaws open. Upon reaching bottom, the jaws are closed, skimming off the upper portion of sediment. Although the bucket does not penetrate deeply into the seafloor, the jaw width is great enough that a 6-inch layer of sediment recovered would still amount to 3 cy of sand.

While recovering a thin surface layer is valuable when dealing with contaminated sediments, in the case of offshore sand recovery, this process allows for recovery of sand from thin deposits. Positioning software allows the operator to precisely place the bucket to recover sediment from the proper location.

Clamshell bucket sizes vary from as small as one cy to over 20 cy, and can be either sealed or open. Newer technology allows removal of material with only slightly more water content than in the *in situ* sediment. The end plates of the buckets overlap and rubber seals help to prevent loss of water and sediment as the bucket is raised.

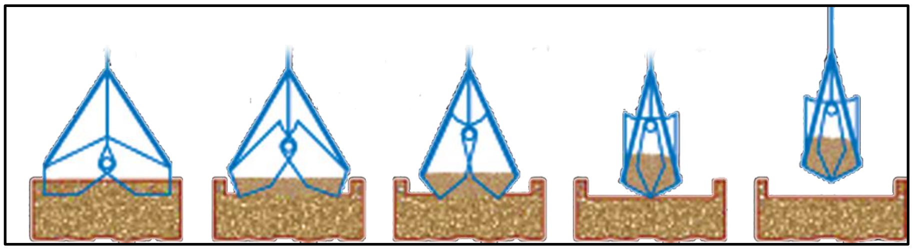

Figure 5-5 Level-cut dredging schematic (www.cablearm.com)

Clamshell dredging is often used in association with a large barge, such as the hopper barge shown in Figure 5-4, on which the sediment is deposited. Once the sediment is onboard the barge, transport is accomplished by either moving the barge to a dock and offloading or using a waterborne sand delivery system to deliver the sand to the shoreline.

The benefits of using clamshell dredging are that it is very mobile, it can operate at any depth that the crane cable can reach, it can be used in moderate swell conditions, and it can recover a wide variety of material types. Additionally, little specialized equipment beyond the clamshell is needed for dredging operations. The technology of the environmental buckets helps to reduce environmental impacts due to turbidity and increase efficiency in recovering sand, reducing time and cost of the operation. Additionally, the amount of water that is accumulated from the clamshell dredging process is much less than with hydraulic dredging presented in the next section, and the small amount of water can be discharged at an approved location.

The drawbacks are that it is less efficient than other dredging systems, such as those utilizing hydraulic or slurry pumps, and it requires the sand deposits to be thick enough that the clamshell does not reach hard substrate.

5.1.2 Submersible Slurry Pump

Submersible slurry pumps, referred to as "Toyo Pumps" after the largest supplier of such, are distinguishable by the way that they are lowered from overhead and suspended above the sediment they are pumping. The pumps can be hydraulically or electrically driven, and are available in a range of sizes. Models are available with up to 400 hp. Toyo DP75B (75hp) hydraulic pumps were used successfully for dredging both the 2006-2007 Kuhio Beach restoration project and 2012 Waikiki Beach Maintenance Project. Respectively, the projects pumped approximately 10,000 and 24,000 cy of sand from offshore onto the beach within the Kuhio Beach crib walls.

Several equipment elements are required to successfully recover sand utilizing a submersible pump. A barge and crane are necessary to position a hydraulic or electric powered pump over the sand bottom. The crane can move the pump across a small area, dependent on the crane size and length of its boom. Accessing different portions within the recovery area is achieved by repositioning of the pump barge using a minimum four-point mooring array. Additionally, depending on the size of the slurry pump, a booster pump may be required if the distance to the shoreline is excessive. An additional piece of equipment called a "jet ring" can be mounted on the pump to aid in entraining sand to increase the percent of sand in the slurry. This jet ring requires a water pump on deck and an additional 4-inch water hose connected to the submersible pump. An illustration of this dredge system is shown on Figure 5-6, taken from the Kuhio Beach project after-action report (American Marine, 2007). Figure 5-7 shows the Healy Tibbitts dredge barge used in the 2012 Waikiki Beach Maintenance Project.

The benefit of the submersible pump is its precise positioning and ability to reach into tight spaces. Using a crane-tip GPS unit to locate the pump, the operator can accurately position the pump to within a few feet of any location to effectively remove the sand from near the edges and corners of the recovery area. In addition, sand recovery with a slurry pump can be more efficient than mechanical recovery when a high sand to water ratio can be achieved.

The primary drawbacks to the submersible pump are that the operation is labor intensive and it requires dewatering. Operation requires a crane operator, a rigger, and several people to handle the pumps, generators, and pipelines on deck. Additionally, the pump must be held at a relatively constant height above the sand. If the pump is lifted too high it will not entrain the sand, and if it is too low the slurry will become too concentrated and the pipeline may clog. Maintaining this balance is especially difficult for the crane operator in the presence of swells greater than one to two feet; however, the dredge equipment can be operated from an ocean-going barge, which provides reasonable seaworthiness. Submersible pumping requires that the slurry be properly dewatered, which increases on-land space requirements. For example, the 2012 Waikiki Maintenance project utilized a one-acre dewatering basin within Kuhio Beach Park, requiring the Diamond Head basin to be completely closed to the public.

Production records for the 2012 Waikiki Maintenance project showed that the contractor recovered 400 to 800 cy of sand in a 10-hour day, and placed sand on the beach at a rate of 1,500 to 2,000 cy in a 5-hour day.

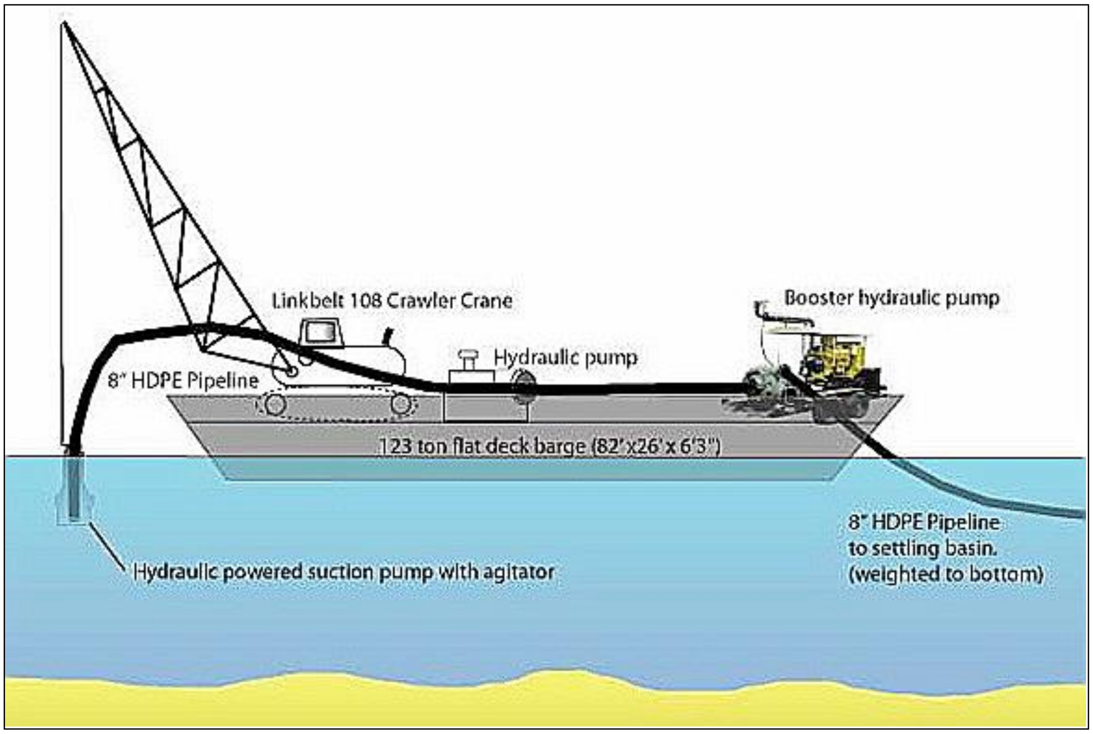

Figure 5-6 Schematic of sand pumping arrangement (American Marine, 2007)

Figure 5-7 Healy Tibbitts Crane Barge used in the 2012 Waikiki Beach Maintenance Project

5.1.3 Hydraulic Suction Dredge

A hydraulic dredge is a more traditional dredging technology that has proven to be effective for beach nourishment projects. A hydraulic dredge functions similarly to a submersible pump, except that the pump is above water on a surface platform (e.g., boat or barge), and a rigid suction pipe is lowered from the surface platform down to the seafloor. Dredged material is typically discharged as a sand-water slurry through a pipeline to shore. An example of hydraulic section dredging is shown in Figure 5-8.

Hydraulic dredges come in a wide range of sizes, from large ocean-going dredges for maintaining commercial ports and waterways, to small, trailerable units that are typically used for lake and reservoir clearing or small marina maintenance. A small hydraulic suction dredge (Mud Cat) was used in a small-scale sand pumping demonstration project conducted by the State of Hawai‘i Department of Land and Natural Resources in February 2000 (Noda, 2000). Approximately 1,400 cy of sand was dredged from a deposit located 1,500 ft offshore of Kūhiō Beach and pumped to a dewatering basin excavated into the dry beach area within the Diamond Head (east) basin of Kūhiō Beach Park. Hydraulic suction dredges are otherwise less common in Hawai‘i in comparison to submersible slurry pumps.

Figure 5-8 Example of hydraulic suction dredge (Ellicott Dredges)

5.2 Small-scale Maintenance Dredging

Nearshore sand deposits are typically too far from the coastline for land-based equipment such as excavators to reach, and too shallow to access via work vessels. Sand deposits located within approximately 1,000 ft of the shoreline may be viable for small-scale beach maintenance purposes, as this sand is likely eroded from the beach.

Novel dredging approaches must be utilized to recover sand from nearshore deposits. Two examples of equipment that could potentially be used for nearshore dredging projects are an ROV subdredge and a diver-operated dredge.

5.2.1 Remote Operated Submersible Dredge

A Remote Operated Submersible Dredge (ROV subdredge) is an electrically powered tracked hydraulic pump manufactured by EddyPump© Corporation (Figure 5-9). The pump was developed for the U.S. Army and U.S. Navy for Logistics-Over-the-Shore (LOTS) operations for early entry forces and areas that are too dangerous for human operators. It is fully submersible and capable of being operated remotely from shore. An umbilical would run along the pipeline providing power and control to the ROV subdredge. The pump would be powered by an electric power unit located on shore and a small submersible hydraulic power unit mounted on the ROV subdredge. A Real-time Kinematic (RTK) Global Positioning System (GPS) provides location data to the landside operator.

An advantage of an ROV subdredge is that it can be operated in shallow water that us inaccessible by barges. To recover nearshore sand deposits in Waikīkī, an ROV subdredge would be deployed and operated from shore. A pipeline would transport slurry from the ROV subdredge to two dewatering basins on shore. The pipeline would float on the water surface. A small support vessel (e.g., small boat or jet ski) would be used to maintain a safety buffer and assist with maneuvering the dredge pipeline. The operator would move the ROV subdredge through the sand deposit until a sufficient volume of sand was recovered. A camera mounted on the ROV subdredge allows the operator to direct the dredge head to the sand deposit for maximum efficiency. The production rate for the ROV subdredge is expected to be up to 30 to 50 cy of sand per hour.

Additional equipment would be required for proper operation of the ROV subdredge. A 100-kW diesel generator would be located onshore and provide power to the ROV via the umbilical. One thousand feet of floating pipeline would connect to the ROV. A bulldozer and skid-steer would be required to excavate the dewatering basins and push sand to the desired grade.

The primary disadvantage of an ROV subdredge is the initial cost for the equipment. The ROV subdredge itself would cost approximately $1 million.

Figure 5-9 Remote Operated Submersible Dredge (Eddy Pump, 2021)

5.2.2 Diver-operated Dredge

A diver-operated dredge is a dredge system that can be manipulated and operated by divers. Diver-operated dredges are typically used in shipyard operations and the mining and fracking industries. Using a diver to manipulate the suction hose offers a level of precision that cannot be achieved by lowering a pump over the side of a vessel. Figure 5-10 shows a diver-operated dredge pump manufactured by EddyPump© Corporation. The diver-operated dredge pump is roughly 6 ft long, 3 ft wide, and 3 ft tall, but dimensions vary depending on the size of the pump chosen. Figure 5-11 shows a diver on surface supplied area manipulating a diver-operated dredge nozzle.

Sand recovery would require a four-person dive team working from shore for Occupational Safety and Health Administration (OSHA) compliance. The dredge pump could be placed on shore on the beach face, or on a small vessel or float. A floating slurry pipeline and power cable would extend from the dredge pump to the sand recovery area. The pump would be powered by a 100kW generator located on shore. A suction hose would be connected to the dredge pump. The suction hose would be controlled by a single diver. The hose would have a length of 100 ft, which would enable the diver to dredge sand within a 100-ft radius of the pump. Once the sand is dredged to the desired depth, the pump would have to be relocated to another area. The 6-inch pump system can accommodate two divers and two hoses for greater efficiency. A bulldozer and/or skid-steer would be required to spread the sand to the design grade. The production rate for one diver is expected to be 20 to 40 cy of sand per hour.

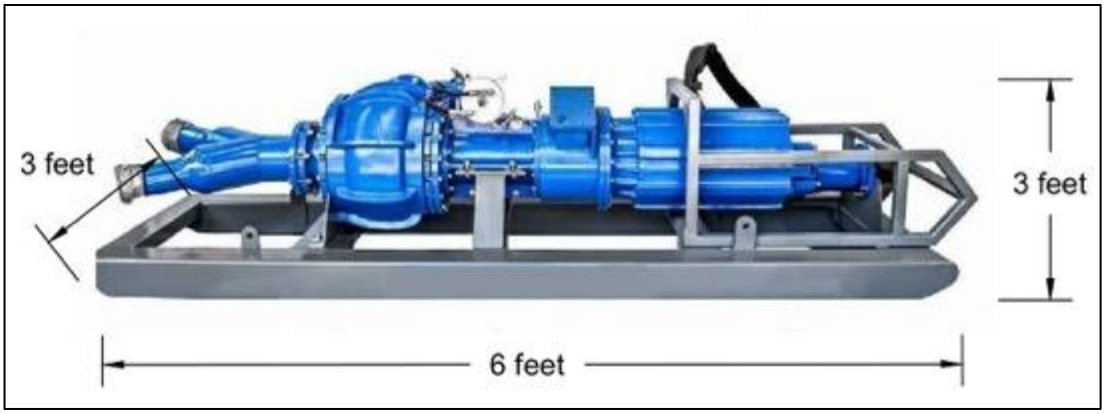

Figure 5-10 Diver-operated dredge pump

Figure 5-11 Surface supplied air (SSA) diver using a diver-operated dredge

5.2.3 Excavator with Dredge Pump Attachment

An excavator with a dredge pump attached to the boom is a direct method of dredging sand from nearshore onto the beach. The system would include an excavator, a submersible pump, a slurry pipeline to shore, and power for the pump. The pump could hang from or be attached to the excavator boom. The pump would be lowered into the water into contact with the sand and moved around by the excavator as necessary.

This method has been successfully used for ongoing beach maintenance at the Ko‘Olina lagoons, where sand regularly migrates (slumps) from the beach face into the water as a result of low wave energy. The excavator is positioned near the water line and a Toyo submersible pump is lowered into the water. The sand/water slurry is pumped to shore into dewatering basins. Sand recovery typically extends about 60 ft from waterline into the lagoon.

An excavator outfitted with a cutterhead pump attachment is potentially a more-efficient method for recovery sand. Eddy Pump makes an excavator attachment that is specifically designed to connect to the excavator's existing bucket linkage. The pump can also be powered by the excavator's hydraulics, eliminating the need for shore-based power. This configuration reduces crew size and allows the excavator operator to dredge sand by sweeping back-and-forth with the excavator arm.

The system could extend further from the waterline by placing the excavator on a Flexifloat system or in very shallow water by building a platform that rests on the sand. Minimum 40-ton class excavator is recommended. The coverage area could be extended by using a long-reach excavator, as long as it can remain balanced. Examples of excavator-mounted pumping are shown in Figure 5-12.

Advantages of an excavator with a dredge pump are that the equipment is available on-island, is relatively simple to maneuver and operate, and can be powered by the excavator (no additional power required). A disadvantage of an excavator is that it has limited reach. Extending the reach of the excavator would require a platform, such as Flexifloats, or construction of a berm to drive on. Additionally, a dewatering basin on land would be required. Production rates are dependent on the pump size and are expected to be 20 to 40 cy per hour.

Figure 5-12 Excavator dredge pump attachment with 10-in pump and power pack (EddyPump© Corporation, 2021)

5.3 Delivery to a Nearby Harbor

Sand sources identified in Section 1 that are too far from the project site to consider pumping the sand to shore would require dredging of the sand and loading it into a barge, either through clamshell dredging or hydraulic dredging. After the barge is loaded with sand, it could be transported to an offloading site such as a commercial harbor, where the sand would be offloaded, possibly stockpiled, and transported to the Waikiki project sire. Barging can require extensive time and energy between towing the barge to a commercial harbor, such as Honolulu Harbor or Kalaeloa (Barber's Point) Harbor. Barge travel distances are presented in Table 5-1.

Table 5-1 Barge distances from offshore sand sources to commercial harbors on Oahu

Barge distance (miles, roundtrip)			
	RR—Inner	***Ala Moana***	***Hilton***
to Honolulu Harbor	13	7	8
to Kalaeloa Harbor	30	40	42
to Ala Wai Boat Harbor	14	3	2

The most efficient method would be to deliver the sand through the Ala Wai Small Boat Harbor and offload it at the Magic Island parking lot, where the barge would be moored alongside the parking lot. The barge would be moored with two lines on shore and two anchors within the harbor. This mooring configuration has recently been used in the Ala Wai canal maintenance dredging project (R.M. Towill Corporation, 2017). A subsequent biological assessment of the mooring site for that project reportedly found no concern regarding impacts to EFH.

The sand would be offloaded onto a conveyor belt or similar system and transported into waiting dumptrucks which would then move the sand systematically to the Waikiki project site. Most of the Magic Island parking lot would stay open during the day, with the area adjacent to the barge closed for equipment. This method would have the shortest barge and truck routes, and it would likely be the fastest and least expensive of the delivery options. Production rates of around 1,000 cy per day could be anticipated with this method.

Alternatives initially considered include delivery to Honolulu and Kalaeloa Harbors. Pier space at Honolulu Harbor is limited, and personnel at Hawaii Department of Transportation, Harbors Division, reported that the harbor does not accept bulk product delivery such as sand. Kalaeloa Harbor would be the nearest commercial facility for offloading sand. Barging to Kalaeloa, however, would entail an ocean transit of as much as 25 miles to the harbor, offloading of the barge into dump trucks, and the 25-mile truck route back to the sand recovery site. This method would result in an involved and circuitous delivery to the project site, which is only a few miles from the sand deposits presented Section 1. In addition to the distance traveled to deliver the sand at pier side, additional travel may be required to dewater the barge at an acceptable offshore location prior to offloading.

If offloading alongside Magic Island is not possible, then discussions within State agencies are recommended to determine if a short-term offloading site at Honolulu Harbor could be developed for use during the projects. It is possible that a temporary offloading site could be accommodated on the west side of Sand Island. There is some presently unutilized land, and a barge could access the shoreline via the Kalihi channel and the seaplane runway adjacent to the shore.

Figure 5-13 Example of barge offloading at Ala Wai and Magic Island

5.3.1 Offloading and trucking to project site

Pier side delivery of sand from a barge requires adequate space to offload sand into dump trucks. The sand could be loaded onto trucks with an excavator or similar equipment, or a conveyor system could be deployed for more efficient handling. Examples of sand conveyance from barge to shore are shown as Figure 5-14 and Figure 5-15. Conveyor belt systems can move an estimated 150 cy of sand per hour.

Mid-size (15 cu. yd.) or larger (20 cu. yd.) dump trucks could be used to haul the sand to Waikiki. For reference, 1,000 cy of sand per day would require 50 to 70 truckloads of sand per day. Careful coordination amongst stakeholders would be necessary to deliver the sand to the project site.

The advantage of truck hauling is that it minimizes impacts to the seafloor by eliminating delivery pipes to the shoreline. The disadvantages would include the increased cost due to time, equipment, and energy to move the sand by trucks rather than pipe it directly to the shoreline, and additional traffic impacts from moving dump trucks into and out of the project area on a regular basis.

Figure 5-14 Barge-mounted conveyor system

Figure 5-15 Barge-mounted conveyor system

5.3.2 Sand Placement

Sand placement would be determined by the individual project needs. As sand is trucked to the project site, the sand would be moved directly to the beach and placed to the design lines and grades. There is no dewatering associated with the truck hauling method. Sand movement and placement during the 2012 Waikiki Beach nourishment project was accomplished using standard mechanical equipment, including a front-end bucket loader, dump trucks, and bulldozers. This method is proposed for use with the present project. Sand movement and placement during the 2006-2007 Kuhio Beach project was accomplished using standard mechanical equipment, a front-end bucket loader, bulldozers, and trucks (Figure 5-16 and Figure 5-17). Some noise and smell from the equipment, and possibly some additional short-lived odor from the sand, will be unavoidable.

For any project, the beach width will be increased from onshore to offshore, thus building dry substrate for machinery to operate on as it is built seaward. Construction to the design profile would be verified during construction with surveys and by placing survey stakes with final beach height markings as references. Design beach profiles and volume calculations would be part of the construction drawings.

A containment system will be required in the area of active sand placement to reduce the potential for turbidity impacts to coastal waters during sand placement in the water. Silt curtains and fences will be required, consistent with previous requirements of the DOH. Schematics of these containment devices are shown as Figure 5-18 through Figure 5-20.

Figure 5-16 Sand placement, 2012 Waikiki Beach Maintenance Project.

Figure 5-17 Example: floating silt curtain and small bulldozer used for sand placement in the 2012 Waikiki Beach Maintenance project.

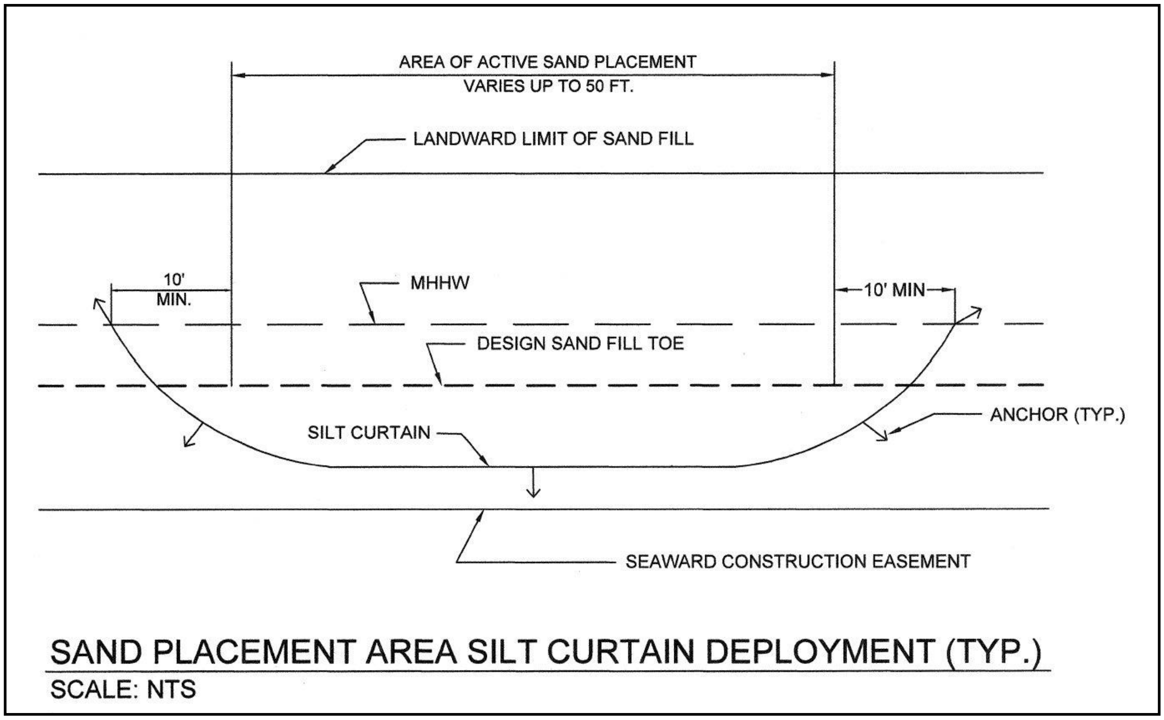

Figure 5-18 Silt curtain layout for sand placement

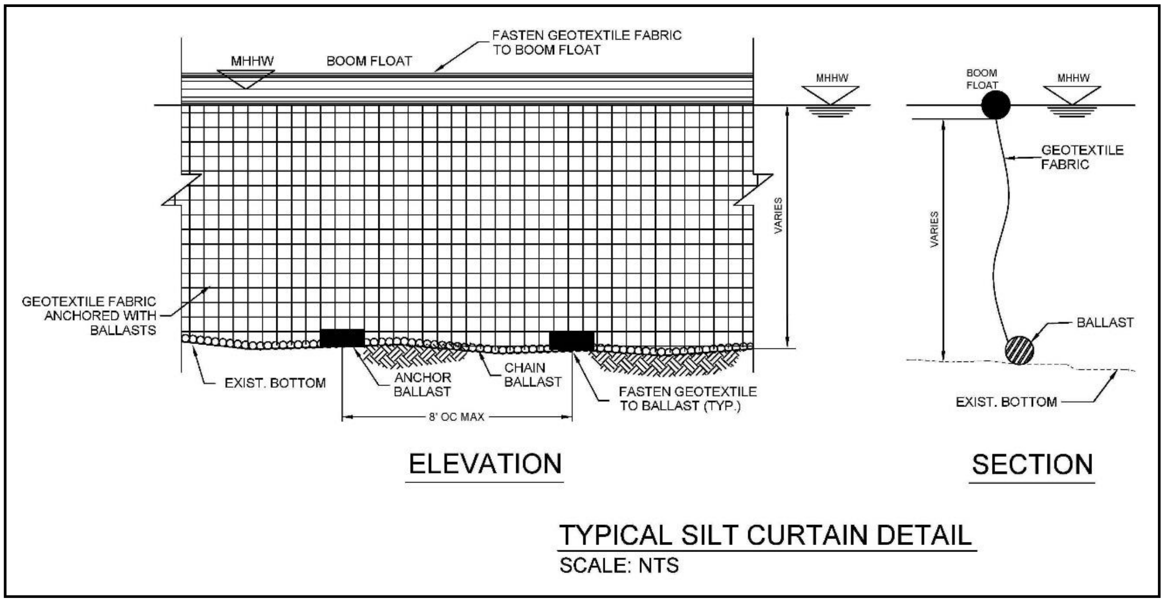

Figure 5-19 Typical silt curtain detail

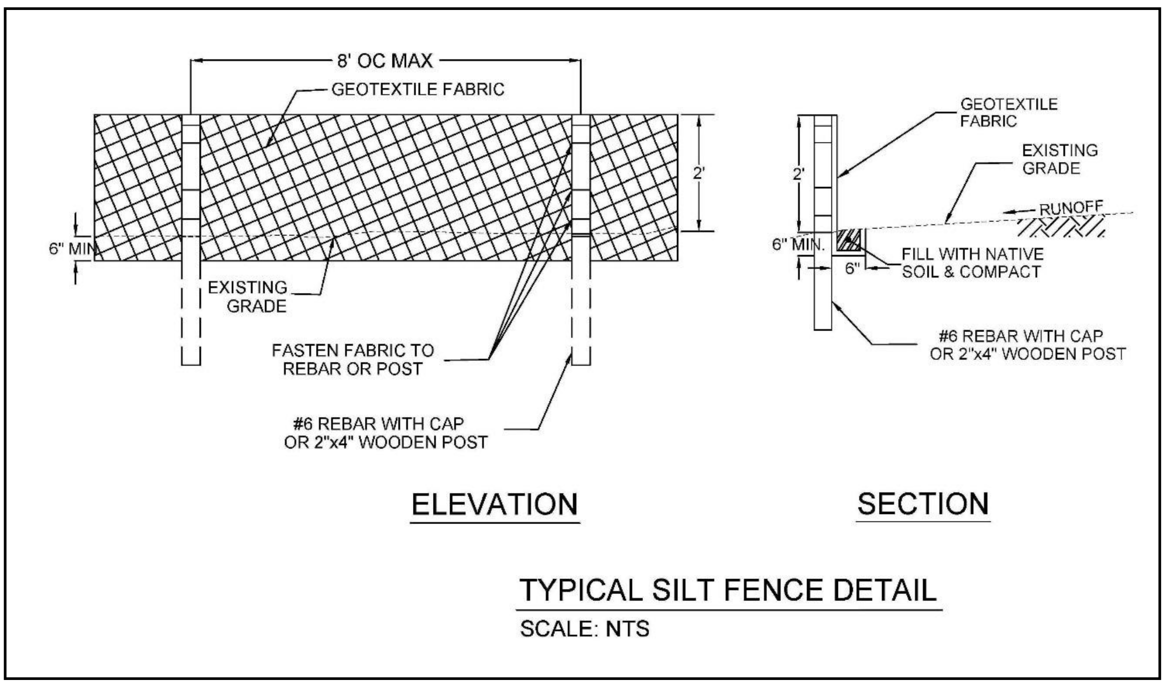

Figure 5-20 Typical silt fence detail

5.3.3 Dewatering

State of Hawaii Department of Health and U.S. Clean Water Act regulations require that the water accumulated on the barge during the dredging process be discharged in a way that reduces the occurrence of turbidity in the ocean water. Ideally, the discharge should be accomplished with no direct dredge water flow back to coastal waters. A direct and effective way to dewater a barge is to discharge the water into an enclosed basin on the beach, above the high water line, and let the water percolate into the ground.

Dewatering for the Waikiki Maintenance projects in 2012 and 2021 was performed in the Diamond Head basin of Kuhio Beach Park. A sand containment berm was constructed and weirs were installed to allow fine particles to settle before the water exited the basin.

5.3.4 Operational Considerations

The wave and wind environment at the sand recovery site presents a challenge for the dredging contractor. Dangerous conditions can occur from both south Pacific swell and tradewinds, and can be reasonably expected to occur at any point during project construction. The most advantageous work period is fall to early winter, when southern swell and tradewinds can be expected to be the least intense. Strong tradewinds can also create seas and currents that would make it difficult to hold the dredge barge and scows in relatively stable positions. For this reason, the operation is proposed to occur during low wave and wind conditions in the fall months.

There are no oceanographic constraints to offloading in a commercial harbor, which would be expected to be sheltered from wave energy. Placement of sand in Waikiki is generally preferred in the winter months, when waves are typically lower and low tides occur in the mornings.

5.4 Fines and Turbidity

Sand recovered from the ocean, though highly compatible with the dry beach sand, would still have some fine content that would be winnowed from the beach system and moved offshore during the initial equilibration process and beach erosion events. Dredging, transport, and placement of carbonate sand can also increase the percent of fines through mechanical abrasion of the friable grains. Turbidity, or a reduction in water transparency, occurs when fine sediment particles are suspended in the water column. Turbidity can occur at the offshore sand dredging site or along the beach where sand is placed.

5.4.1 Turbidity at Dredge Sites

Offshore turbidity is to be expected at the dredge site. As the clamshell bucket grabs sand from the seafloor, it would disturb fine particles adjacent to the bucket. As the bucket is raised through the water column, minor volumes of sand containing fine particles would be released into the water column. Turbidity at the dredge site will be reduced by using an environmental clamshell bucket, which is an industry best practice and has been used to minimize turbidity during dredging of harbor channels in Hawaii. Environmental clamshell buckets typically have tighter seals and overlapping sides. These buckets are designed to minimize sediment loss from within the bucket, resuspension at the dredge site, and water entrainment with each grab. A conservative estimate of the amount of material that leaks from an environmental bucket is only 0.5% (Palermo et al., 2008). This material is expected to fall out of suspension rapidly near the dredge location.

The use of a suction dredge would result in the majority of bottom material disturbed being drawn into the dredge pipeline, with only a small amount of disturbed material escaping the dredge to affect adjacent areas or water quality. Loss rates for suction dredges have been estimated to be less than 0.1% (Hayes and Wu, 2001). Careful placement of anchors and cables would insure that they do not move about and disturb/suspend bottom material.

Turbidity generated from dredging operations is expected to be transported with the currents moving parallel to shore. Wave action has the potential to transport turbidity inshore. These water quality impacts are expected to be temporary, lasting only during the actual dredging operations, and are expected to be localized to the immediate vicinity of the dredging. Best Management Practices (BMPs) will be followed throughout the sand recovery work, consistent with the State Department of Health Water Quality Certification that will be required for the project.

5.4.2 Turbidity at Placement Site

Beach restoration projects can generate turbidity plumes that can be unsightly and affect water clarity for days. Although sand fill placed on a beach must closely match the existing beach sand with respect to grain size, offshore sand will typically have a higher percentage of fines than native beach sand. Additionally, fines may be generated during dredging and placement of offshore sand onto the beach. After placement, wave action can suspend the fines creating turbidity plumes immediately offshore of the nourished beach.

Silt curtains and containment barriers would be deployed along the shoreline where sand placement is occurring. Following placement of sand on the beach, there will likely be periodic turbidity associated with equilibration of the beach profile and planform and during large wave events, as sand moves along the beach and cross-shore.

Turbidity is a complex phenomenon that is dependent on both the optical and physical properties of suspended particles, and is difficult to model or predict. To help evaluate possible impacts, pre- and post-project conditions in Waikiki were examined using available high elevation photographs, and laboratory turbidity analyses were conducted to compare the borrow and existing beach sand for this project.

5.4.2.1 Laboratory Turbidity Analysis Results

Turbidity test results for sand samples obtained from *Ala Moana*, *Halekulani Channel*, *Hilton*, *RR Inner-1a*, *RR Inner-1b*, and *Canoes/Queens* are plotted on Figure 5-21 through Figure 5-26. Data are plotted as turbidity versus time. The average value for each deposit is plotted on Figure 5-27 for comparison amongst the sand deposits. The turbidity results should not be considered indicative of turbidity levels that are to be expected during the actual beach nourishment because they result from artificial experiments in a small sample bottle. Rather, they are useful to evaluate differences between the existing beach sand and the possible nourishment sand.

All samples tested showed initial turbidity that decreased exponentially with time. *Canoes/Queens* samples had the lowest initial turbidity, which should be expected, since this is likely sand that had been recently transported and had the fine material worked out of it. *Halekulani Channel* had the next lowest turbidity; however, that was due to a very low value for one of the samples. That sample was obtained from the top of a core and may have had fines washed out. Sand from the other samples had significantly higher turbidity. *Hilton* and *Ala Moana* had the highest initial turbidity readings; however, the values decreased rapidly over the first 2 hours. Even though the *Hilton* samples were the coarsest of the sites, three of the five samples had initial turbidity in excess of 1,000 NTU, while the other two were in excess of 850 NTU.

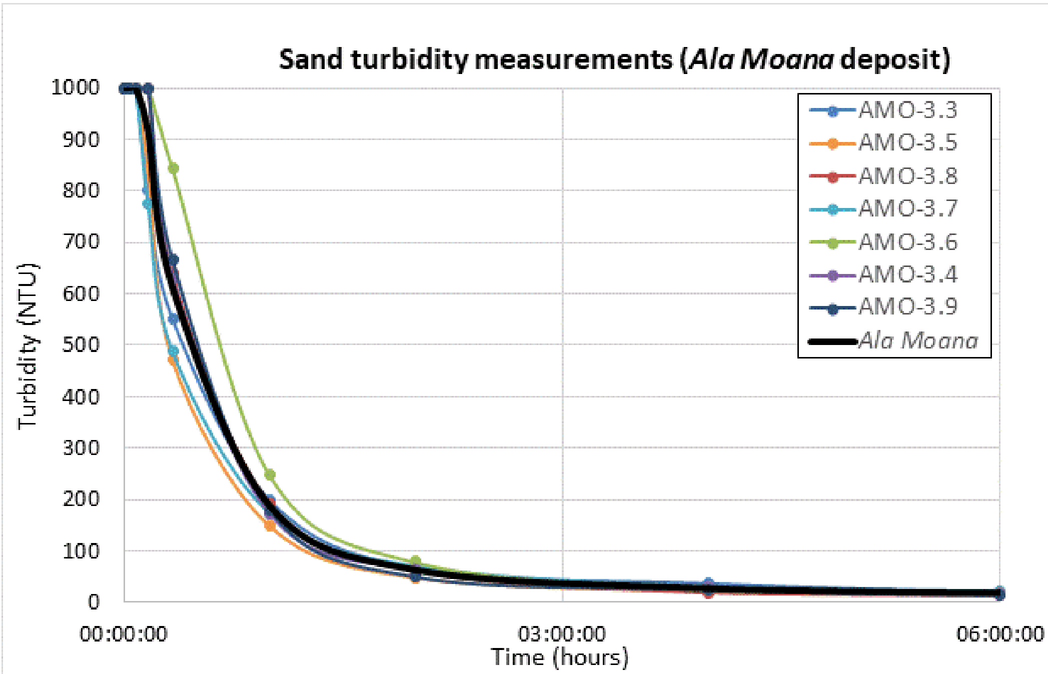

Figure 5-21 Turbidity results for *Ala Moana* sand deposit

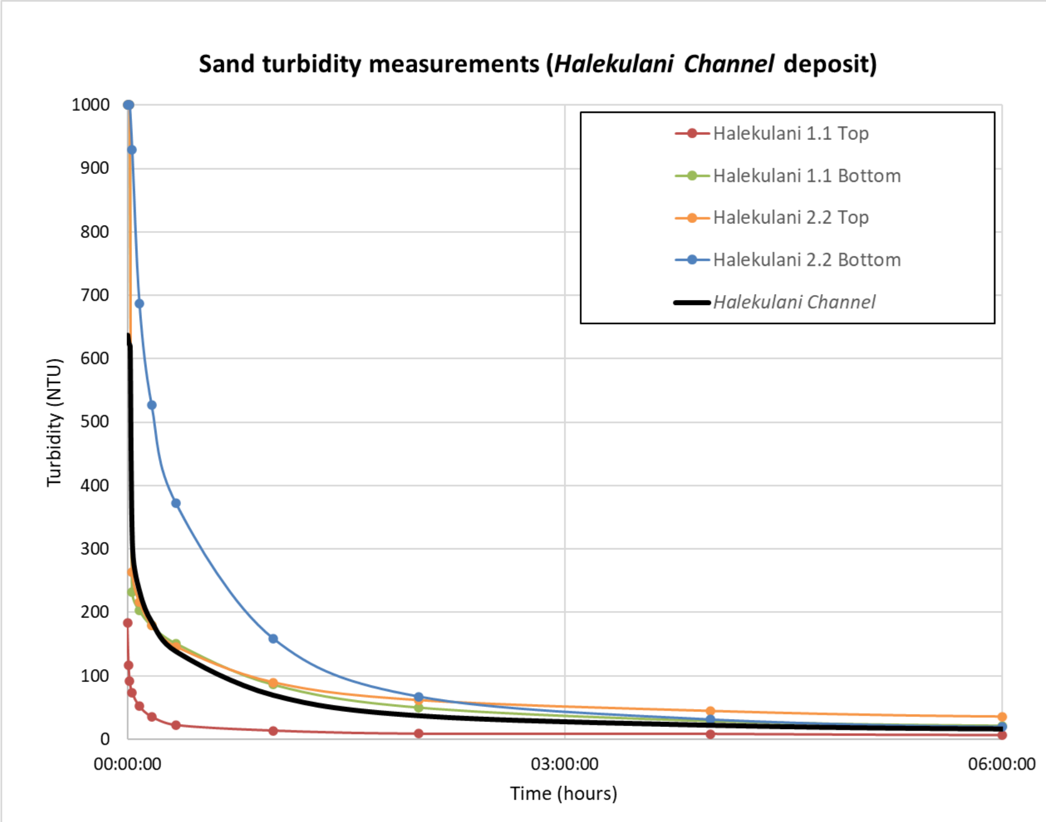

Figure 5-22 Turbidity results for *Halekulani Channel* sand deposit

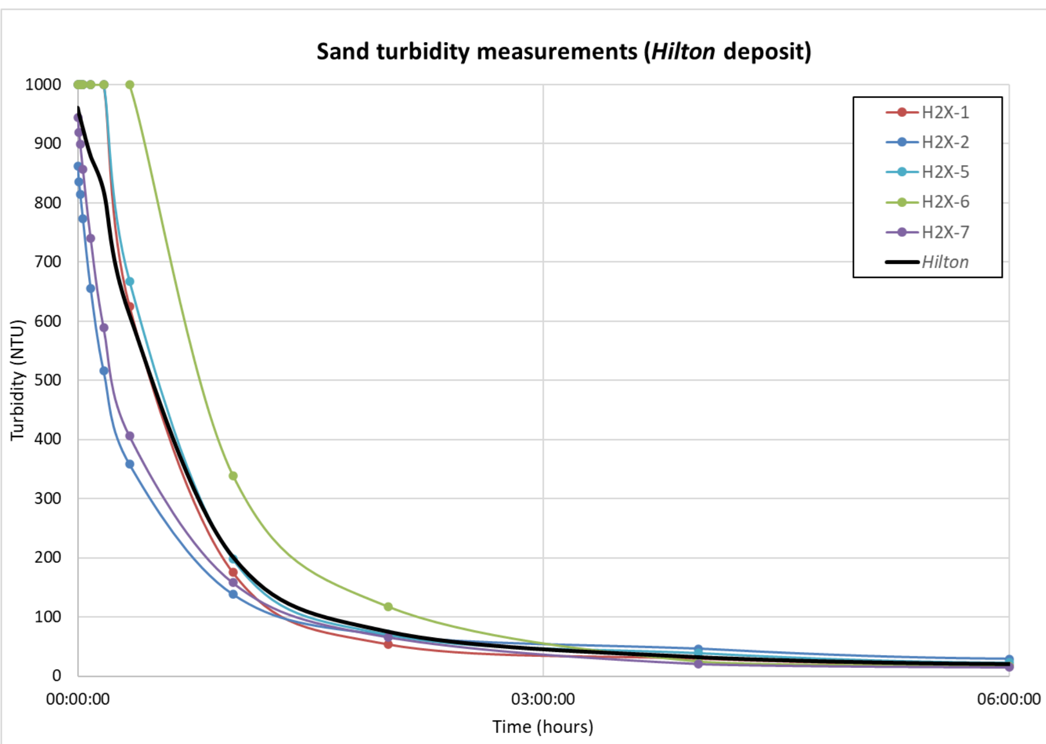

Figure 5-23 Turbidity results for *Hilton* sand deposit

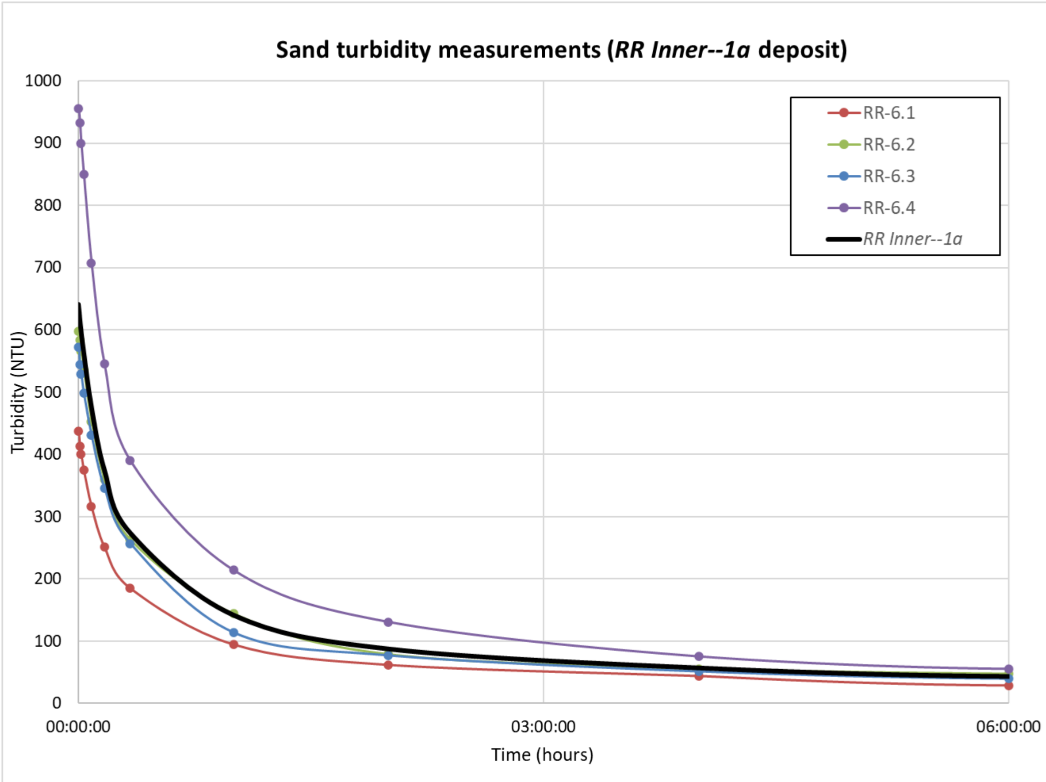

Figure 5-24 Turbidity results for *RR Inner – 1a* sand deposit

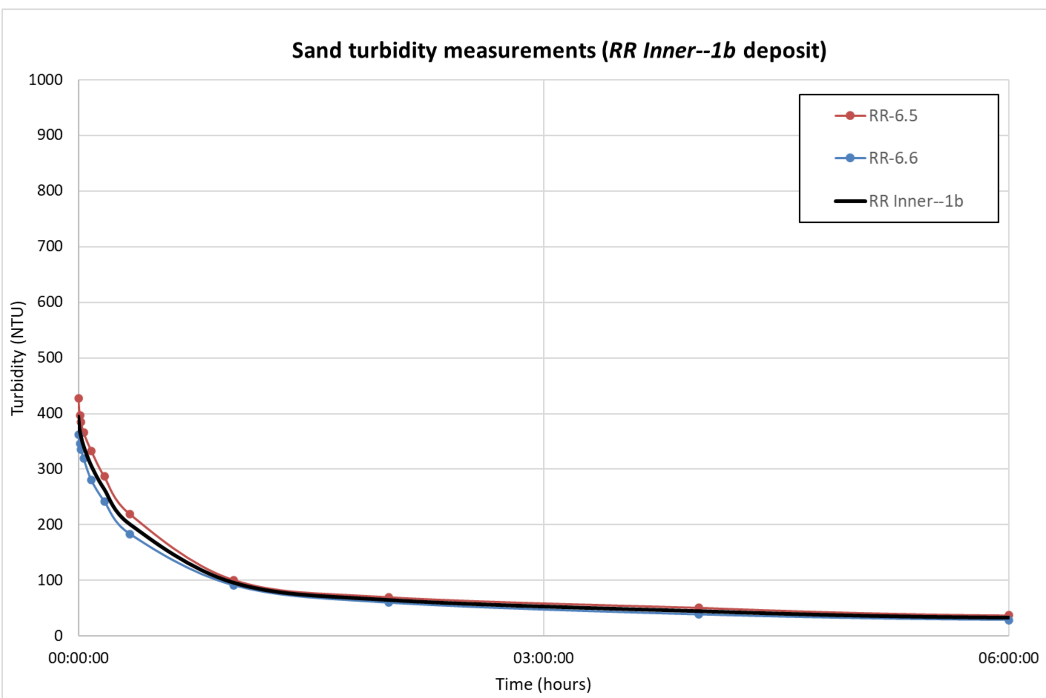

Figure 5-25 Turbidity results for *RR Inner - 1b* sand deposit

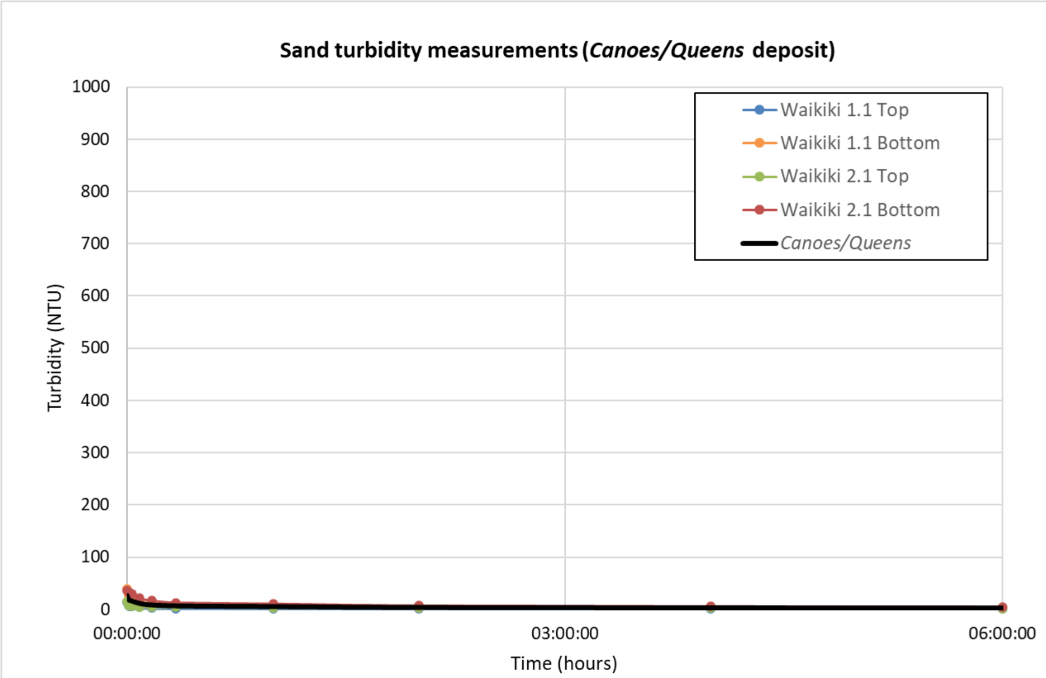

Figure 5-26 Turbidity results for *Canoes/Queens* sand deposit

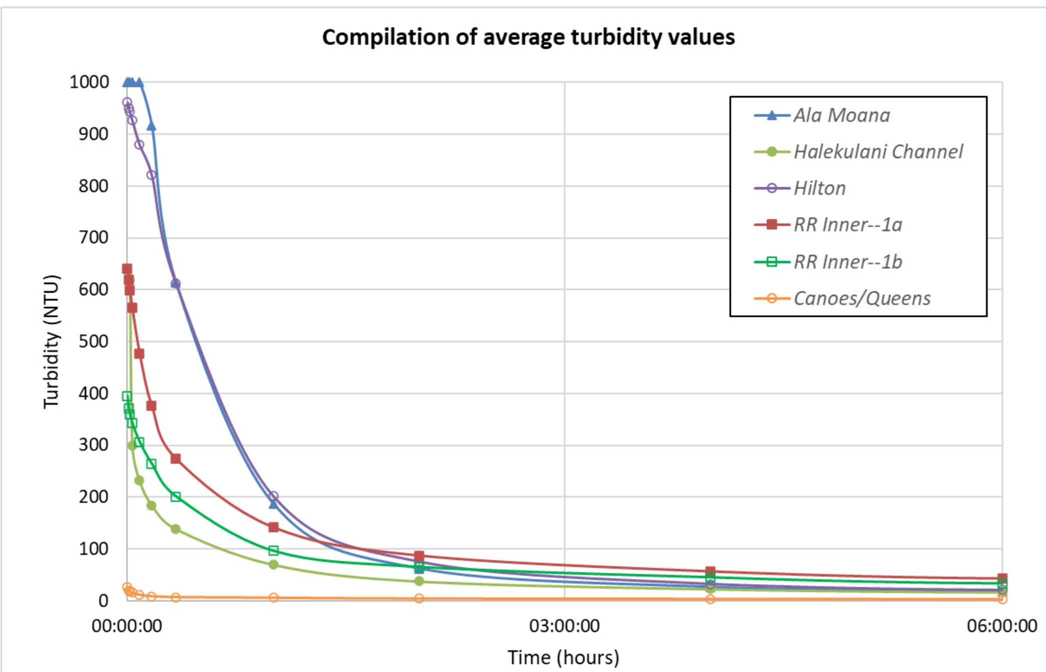

Figure 5-27 Compilation of average turbidity measurements for offshore sand sources

5.4.3 Waikiki Beach Maintenance Turbidity

The Waikiki Beach Maintenance project was performed in late winter and spring of 2012, when about 24,000 cy of sand was borrowed from an offshore deposit, pumped to shore, dewatered, and placed on the beach. The placement of the sand produced high levels of turbidity, and immediately following the completion of sand placement, the project experienced a series summer swell events.

Turbidity was assessed visually from photographs obtained via a University of Hawaii webcam mounted on the Sheraton Waikiki hotel. Turbidity levels appeared to decrease in general following completion of sand placement on April 25, 2012. By November of 2012, turbidity on calm days appeared to have decreased to pre-project levels, though turbidity was still high during higher wave conditions which are responsible for washing fine material from the beach and resuspending sediment. A June 24, 2019 view from the Sheraton Waikiki shows the nearshore water clarity to be comparable to pre-project levels.

5.4.4 Turbidity Impacts Evaluation

Sand from within the offshore sand deposits is expected to become well mixed during excavation, transport, and placement on the beach. Average turbidity values for the targeted area in the deposit are important, as they are representative of the material that will eventually be placed on the beach. Initial elevated turbidity is expected during sand placement and periodically during larger wave events. The laboratory turbidity analyses indicated that overall the turbidity should return to typical existing levels after a short period of adjustment.

The Waikiki Beach Nourishment project and results of the turbidity experiments described above suggest that elevated turbidity following sand placement should be expected.

5.5 Offshore Sand Deposit Chemical Quality

Offshore sand deposits are generally considered to be free of contaminants because they are typically distant from land runoff sources, are located in oceanic waters characterized by good mixing and flushing, and sand size particles do not absorb contaminants. The South Shore marine environment experiences currents driven by the tides, winds, and waves that approach from the south. The currents offshore of the reef are dominated by the tides. Due to the exposure to the numerous physical mixing forces, the residence time of the water is short (Tomlinson, 2011), resulting in high dilution.

Sand is not known to adsorb contaminants and is therefore not typically considered as a risk for contaminants by the regulatory agencies. The State of Hawaii Department of Health ecological risk assessment guidance for coastal marine environments in Hawaii states that “many chemicals that cause ecological effects are known to be associated most strongly with fine-grained sediment”. Furthermore, CFR Title 40 Section 227.13 used by the EPA to regulate dredge material disposal states that dredge material is considered to be environmentally acceptable for ocean dumping if it is composed of sand or to be used for beach nourishment, without the need for testing.

The offshore sand deposits investigated in this project are not expected to contain contaminants of concern. Deposit sampling and analysis, however, can be completed during the permitting phase of the project if deemed necessary by the regulatory agencies.

5.6 Sand Compaction

Compaction occurs when grains are pressed together, reducing pore space between them. Heavily compacted sand can become partially or wholly lithified (solidified), having consistency ranging from compact but friable (able to be easily broken down into sand grains), to more rock-like. Indurated (well compacted) beach rock cannot be easily broken up into individual sand grains.

Sand compaction was observed after the 2012 Waikiki Beach Maintenance project along the truck haul route between the dewatering basin and the sand placement area. A 1- to 3-foot tall hardened berm formed along the seaward edge of the haul route (Figure 5-28). SEI engineers attributed this sand compaction to loaded dump trucks traveling over the beach fill.

Additionally, chemical processes in the form of carbonate dissolution likely contributed to the hardening of the beach fill. The combination of pressure, dissolution of calcium carbonate material from fresh water, and the presence of fines could increase the chances of induration (hardening) of the placed sand. Compaction can be minimized by mechanically loosening or turning the sand along the truck haul route every few days. Moreover, haul routes can be monitored and plowed after project completion, if needed.

Figure 5-28 Sand compaction and induration along Waikiki Beach

5.7 Initial Sand Placement

The slope and shape of a beach face (i.e., beach profile) is a function of grain size and wave energy. Low energy beaches with finer sand tend to have flatter slopes than high-energy beaches composed of coarse sand. When sand is first placed on a beach, the sand will generally be loose and uncompacted. Wave action will help the beach adjust toward an “equilibrium profile” based on the characteristics of the nourishment sand. During this period, the sand can be expected to be loosely compacted and users might sink into the sand somewhat. Over a period of time, the sand is expected to become compacted and resemble the present condition of the beach. The length of time that compaction would take is a function of wave energy, and therefore, the exact time compaction would take is unknown.

Users should be alerted of potential changed conditions until the equilibrium profile has been achieved. The State should consider consulting a signage expert regarding the need to alert the public of such conditions.

5.8 Coral Rubble

Coral cobbles and rubble were an issue during the 2012 Waikiki Beach Maintenance project. These larger grains were uncomfortable for beach users, as they tended to accumulate in the nearshore at the toe of the beach. The potential for coral rubble should be addressed by engineers during the design process, and efforts should be made to reduce recovery of large pieces of rubble from the offshore sand deposit. After placement, the rubble may become concentrated at the beach toe, just offshore of the waterline. This coral rubble could be removed by hand.

Though the grain size distributions of the offshore sand areas have been documented, coral rubble, or sediment grains that are much larger than the median grain size, may exist sporadically within the sand deposit. During offshore sand sampling, limited coral rubble was encountered in the offshore sand deposits. Rubble, however, may exist in discreet pockets within the sand deposits.

One of the disadvantages of clamshell dredging is that there is no method to screen coral rubble from the recovered sand at the dredge site. The contractor, therefore, should monitor the sand for coral rubble as the clamshell bucket empties the sand onto the scow. If excessive coral rubble is encountered in an area within an offshore sand deposit, sand recovery operations should move to a different location within the deposit.

Screening the sand as it is offloaded from the scow is possible, but would drastically slow production and could still allow cobbles to enter the beach system. Use of a screen or a separator such as an Trommel screen (Figure 5-29) or a “grizzly” rock screen (Figure 5-30) could be used to remove coarse material at the placement site.

Figure 5-29 Anaconda TD620 Trommel Screen used to separate coarse material

Figure 5-30 Grizzly rock screen used to separate coarse material

5.9 Sand Dynamics

Chronic erosion will continue to affect the non-stabilized shoreline reaches in Waikiki. Seasonal and episodic erosion and beach adjustment events will continue to occur. In addition to these natural phenomena, Waikiki may also be impacted by large magnitude events such as strong Kona storms, hurricanes, tsunamis, extreme water level changes, and other oceanographic and atmospheric catastrophes. Any and all of these can cause a large-scale change in the beach. As a result of one or more of these events, all placed sand and more could be lost from the beach.

5.10 Anoxic Content

There are some portions of the offshore sand areas that have anoxic conditions beneath the surface of the sand. When sand is recovered from anoxic environments, it would typically have a gray color and an odor. Both of these issues would be expected as part of the restoration and enhancement phases. Both the color and odor have been documented to fade with exposure to sun and air, based on previous sand recovery efforts in Hawaii.

5.11 Marine Activities

The anchor lines at the offshore sand site would be in place for the duration of sand recovery operations, and floating sections or anchor lines would be marked with floats and lights as needed. The machinery operating on the barge would be run from the early morning until later in the afternoon each day. Some lighting would be needed on the barge to conduct operations during the morning hours.

Dredging and barging would be taking place in the nearshore waters, and are expected to directly impact ocean recreation and access in the area. Careful planning will be necessary to minimize these impacts, resulting in a recommendation for longer work days, and working seven days a week, to significantly reduce the overall duration of the project.

Public safety during construction is of utmost importance. A Notice to Mariners detailing construction activities and locations should be publicly issued through the United States Coast Guard prior to mobilization of construction equipment on site. A public awareness campaign is recommended to be initiated through DLNR to help spread awareness about construction activities. All onshore and offshore hazards will be clearly marked with signage and/or marker floats. Transit corridors, both on the beach and in the water, will be clearly labeled. Flag persons will be provided as needed.

5.12 Beach Activities

Placement operations on the beach would require lengths of the coast to be cordoned off during trucking operations. Crossing guards would be placed intermittently along the shoreline to assist the public in transiting across the access route. While operating, the heavy machinery would emit noise and exhaust. Again, working longer days, seven days a week, will limit the overall impact by reducing overall project duration. The 2012 Waikiki Beach Maintenance project moved sand to be beach only in the morning, reopening the beach around noon each day.

5.13 Recreational Hazards

Users experience certain recreational hazards in Waikiki. These hazards include swimming accidents such as drowning, collisions between users, trips and falls, sharp objects, and poor water quality. These hazards exist at times and will continue to exist after the improvement projects.

Users should be forewarned that bottom conditions have changed and may continue to change, and that hard material still lies below the sand. The State should consider consulting a signage expert to implement proper signage noting such conditions.

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APPENDIX A

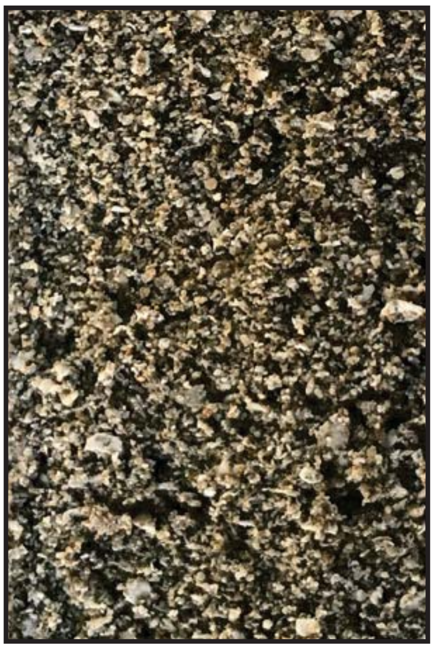
VIBRACORE LOGS AND GRAIN SIZE ANALYSIS

LOCATION: **HILTON AREA, WAIKIKI, OAHU, HAWAII**
CORE: **H-2X.1**
EASTING: 1693294.6
NORTHING: 39587.3
RECOVERED: 5/19/2017
LENGTH: 67 inches
DEPTH: 50 feet

LITHOLOGIC DESCRIPTION

SAND; calcareous; medium-coarse; unconsolidated; no compaction; moderate to poorly sorted; heterogeneous; trace amounts of terrigenous material; 5-10% shell hash, Halimeda, and coralline algae; downward darkening; downward coarsening.

- **0 – 20 in:** SAND; calcareous; medium-coarse; tan color; moderate to poorly sorted; poorly rounded; low sphericity; 0.75” coral cobble at 13”.

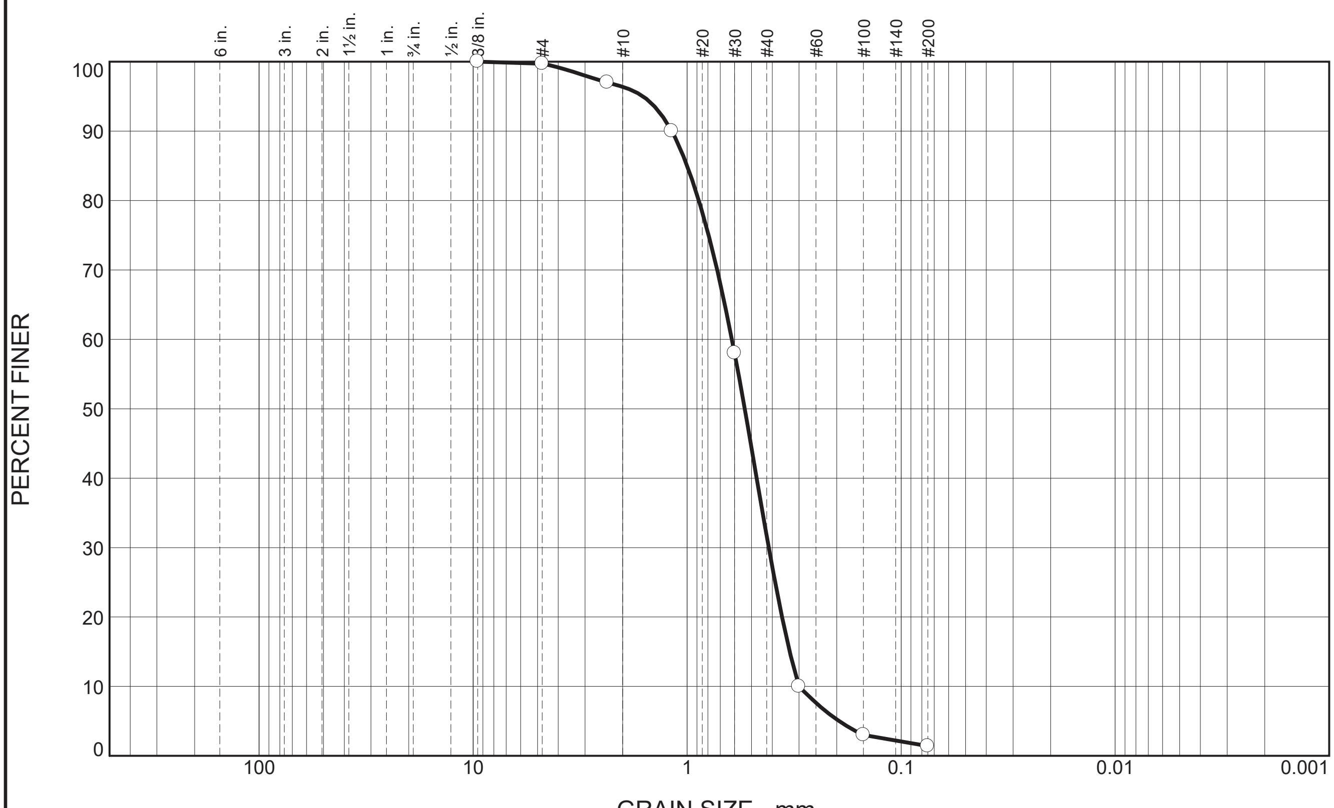


- **20 – 43 in:** SAND; calcareous; medium-coarse; grayish-tan color; moderate to poorly sorted; poorly rounded; low sphericity.

- **43 – 62 in:** SAND; calcareous; coarse-medium; light gray color; moderate to poorly sorted; poorly rounded to subangular; low sphericity.

REPRESENTATIVE APPEARANCE

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	4	64	31	1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	100		
#8	97		
#16	90		
#30	58		
#50	10		
#100	3		
#200	1.4		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.1800 D_{85}= 0.9995 D_{60}= 0.6175
D_{50}= 0.5382 D_{30}= 0.4155 D_{15}= 0.3318
D_{10}= 0.3000 C_u= 2.06 C_c= 0.93

Classification

USCS= SP AASHTO=

Remarks

Location: H2X.1
Sample Number: 83756 5
Date: 6/15/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: Material Qualification
Project No: SEAENG030 **Figure**

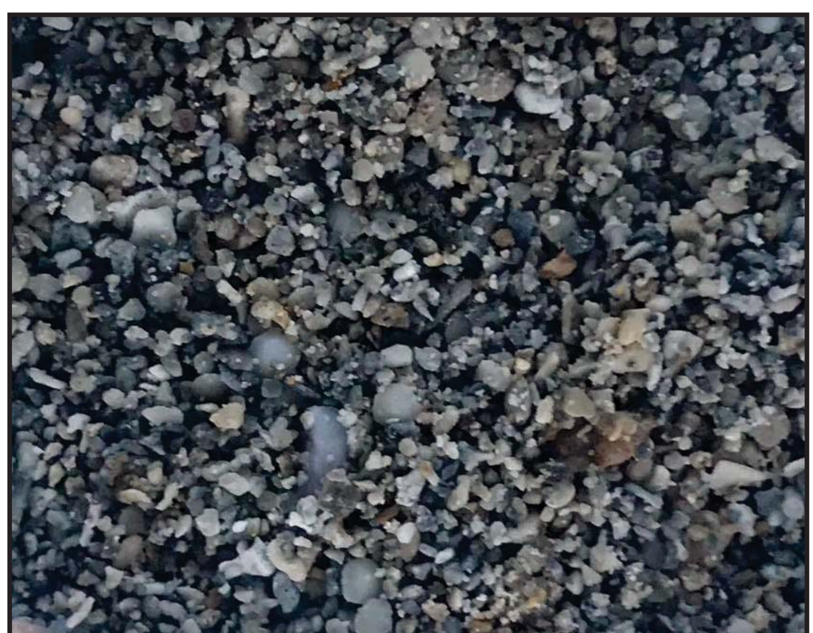
LOCATION: **HILTON AREA, WAIKIKI, OAHU, HAWAII**
CORE: **H-2X.2**
EASTING: 1693378
NORTHING: 39709.2
RECOVERED: 05/19/2017
LENGTH: 79 inches
DEPTH: 48 feet

LITHOLOGIC DESCRIPTION
SAND; calcareous; medium grain; unconsolidated; no compaction; moderate to poorly sorted; heterogeneous; trace amounts of terrigenous material; 0-5% coralline algae; 5-10% shell hash and subangular coral fragments; downward darkening; no downward coarsening.

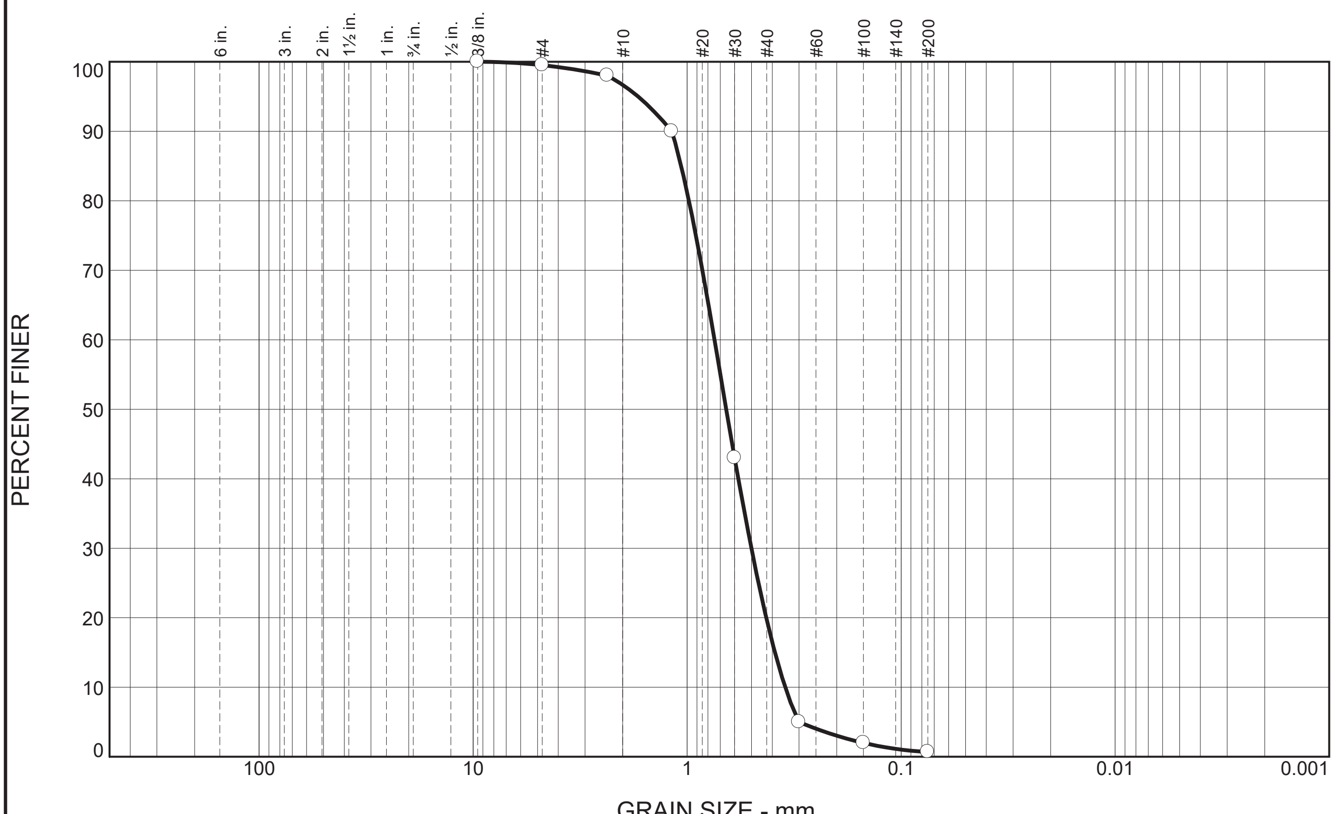
- **0 – 12 in:** SAND; calcareous; medium grain; tan color; moderate to poorly sorted; poorly rounded; low sphericity.

- **12 – 70 in:** SAND; calcareous; medium grain; grayish-tan color; moderate to poorly sorted; poorly rounded; low sphericity; 2” diameter coral cobble at 26”.

REPRESENTATIVE APPEARANCE



Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	3	77	19	0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	100		
#8	98		
#16	90		
#30	43		
#50	5		
#100	2		
#200	0.7		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.1800 D_{85}= 1.0655 D_{60}= 0.7450
D_{50}= 0.6565 D_{30}= 0.5010 D_{15}= 0.3889
D_{10}= 0.3483 C_u= 2.14 C_c= 0.97

Classification

USCS= SP AASHTO=

Remarks

Location: H2X.2
Sample Number: 83756 6

Date: 6/15/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: Material Qualification
Project No: SEAENG030 **Figure**

LOCATION: **HILTON AREA, WAIKIKI, OAHU, HAWAII**
CORE: **H-2X.5**
EASTING: 1693252.3
NORTHING: 39492.9
RECOVERED: 05/19/2017
LENGTH: 80 inches
DEPTH: 51 feet

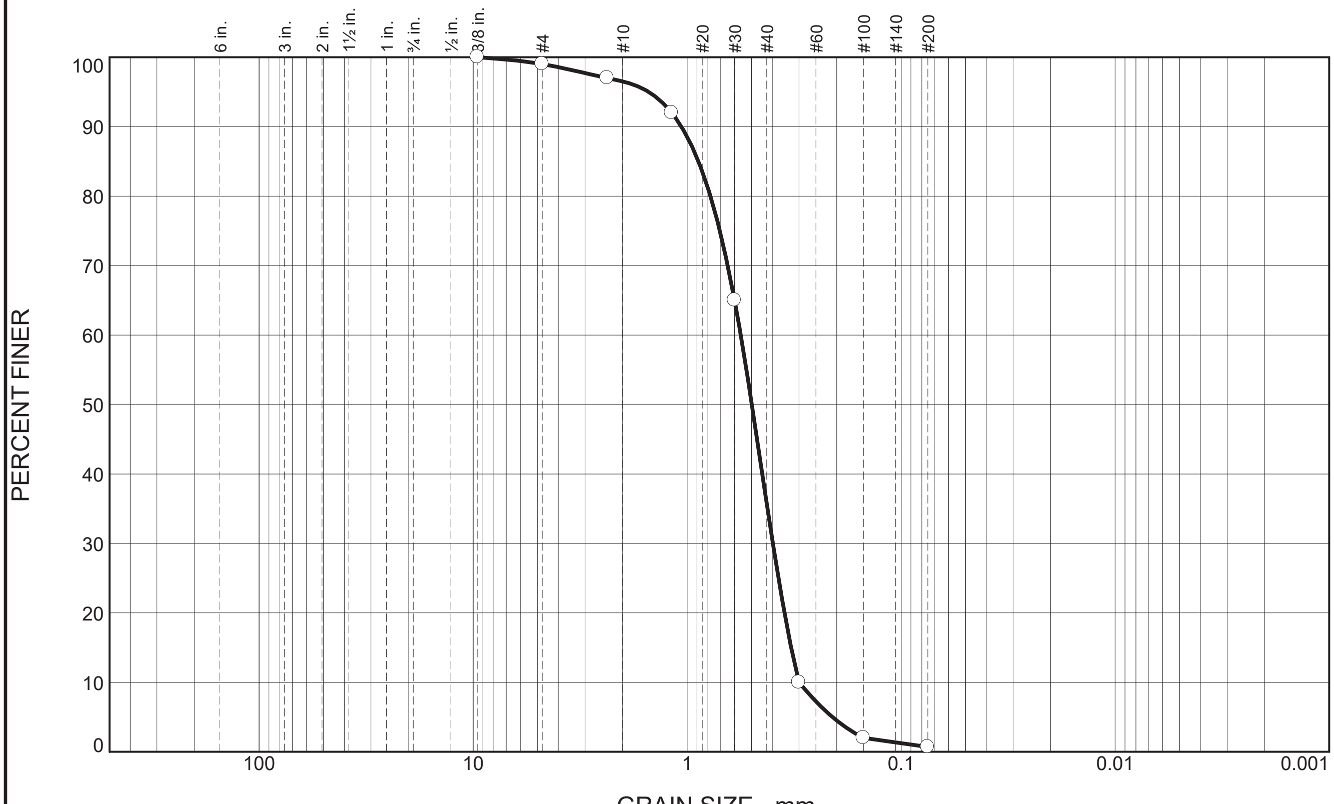
LITHOLOGIC DESCRIPTION
SAND; calcareous; heterogeneous; medium to coarse grain; unconsolidated; no compaction; moderate to poorly sorted; trace amounts of terrigenous material; 10-15% Halimeda and subangular coral fragments; 5-10% coralline algae; downward darkening; no downward coarsening.

- **0 – 8 in:** SAND; calcareous; medium to coarse grain; tan color; poorly sorted; poorly rounded; low sphericity; diffuse boundary between upper and lower sections; 3” coral cobble at 2”.

- **8 – 55 in:** SAND; calcareous; medium grain; grayish tan color; moderately to poorly sorted; poorly rounded; low sphericity; diffuse boundary between upper and lower sections; intact Echinoderm spines, shells, and subangular coral fragments; 4” coral cobble layer at 53”.

REPRESENTATIVE APPEARANCE

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	1	2	61	35	1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	99		
#8	97		
#16	92		
#30	65		
#50	10		
#100	2		
#200	0.7		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.0626 D_{85}= 0.8850 D_{60}= 0.5618
D_{50}= 0.4987 D_{30}= 0.3975 D_{15}= 0.3268
D_{10}= 0.3000 C_u= 1.87 C_c= 0.94

Classification

USCS= SP AASHTO=

Remarks

Location: H2X.5
Sample Number: 83756 7
Date: 6/15/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: Material Qualification
Project No: SEAENG030 **Figure**

LOCATION: **HILTON AREA, WAIKIKI, OAHU, HAWAII**
CORE: **H-2X.6**
EASTING: 1693140.2
NORTHING: 39692.3
RECOVERED: 05/19/2017
LENGTH: 79 inches
DEPTH: 53 feet

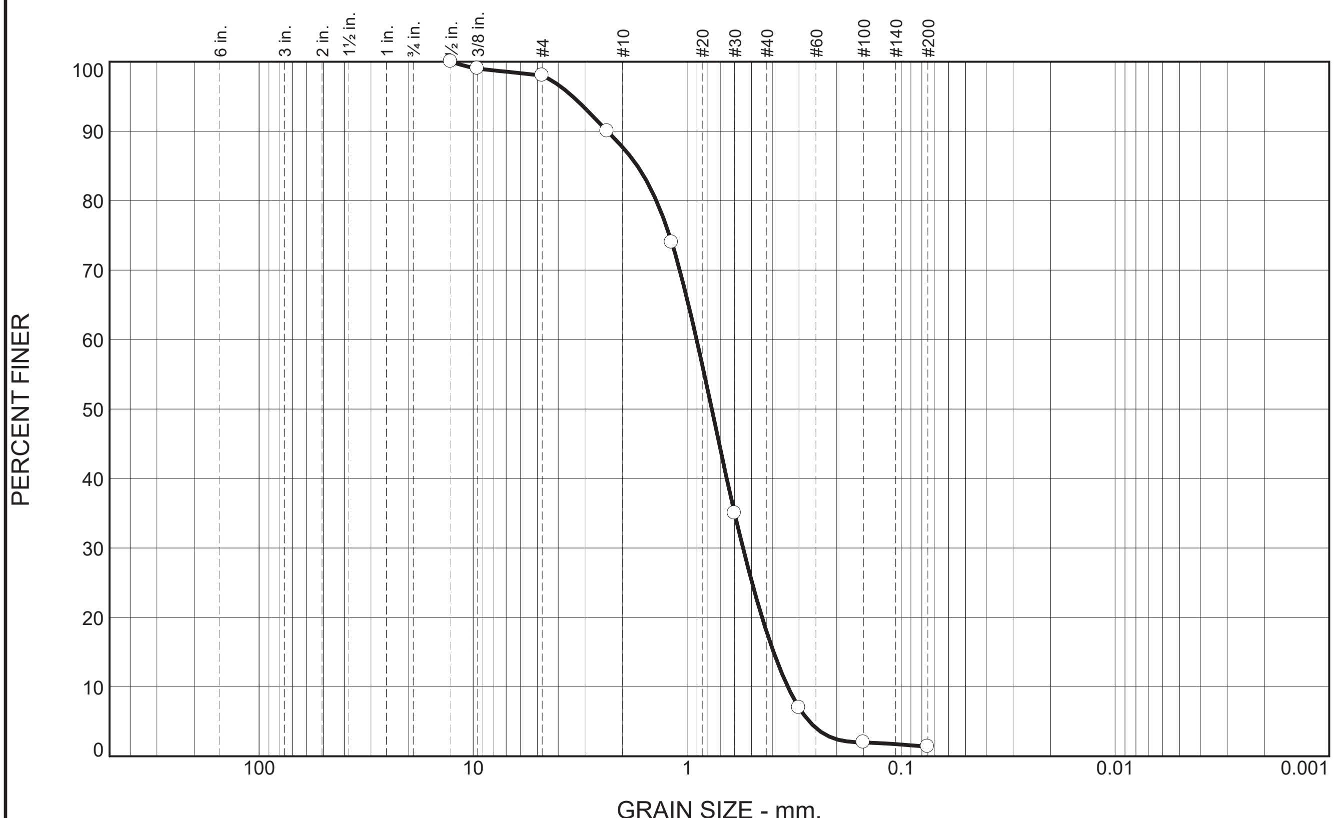
LITHOLOGIC DESCRIPTION

SAND; calcareous; heterogeneous; medium to coarse grain; unconsolidated; no compaction; moderate to poorly sorted; trace amounts of terrigenous material; 10-15% shell hash, Halimeda, and subangular coral fragments; downward darkening; downward coarsening.

- **0 – 22 in:** SAND; calcareous; medium grain; tan color; moderately to poorly sorted; poorly rounded; low sphericity; dark 2” diameter contact at 8-10”; sharp boundary between upper and middle sections.
- **22 – 51 in:** SAND; calcareous; medium to coarse grain; gray color; moderately-well sorted; poorly rounded; low sphericity. Diffuse boundary between middle and lower sections.
- **51 – 79 in:** SAND; calcareous; coarse to medium grain; gray color; very poorly sorted; angular to subangular; low sphericity; 1” coral cobble at 60-65”; 5” coral cobble at 72”; 2” coral cobble at 79”.

REPRESENTATIVE APPEARANCE

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	2	10	70	17	1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100		
3/8"	99		
#4	98		
#8	90		
#16	74		
#30	35		
#50	7		
#100	2		
#200	1.4		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 2.3600 D_{85}= 1.7087 D_{60}= 0.9028
D_{50}= 0.7671 D_{30}= 0.5484 D_{15}= 0.3944
D_{10}= 0.3385 C_u= 2.67 C_c= 0.98

Classification

USCS= SP AASHTO=

Remarks

Location: H2X.6
Sample Number: 83756 8
Date: 6/15/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: Material Qualification
Project No: SEAENG030 **Figure**

LOCATION: **HILTON AREA, WAIKIKI, OAHU, HAWAII**
CORE: **H-2X.7**
EASTING: 1693255.6
NORTHING: 39803.4
RECOVERED: 05/19/2017
LENGTH: 86 inches
DEPTH: 50 feet

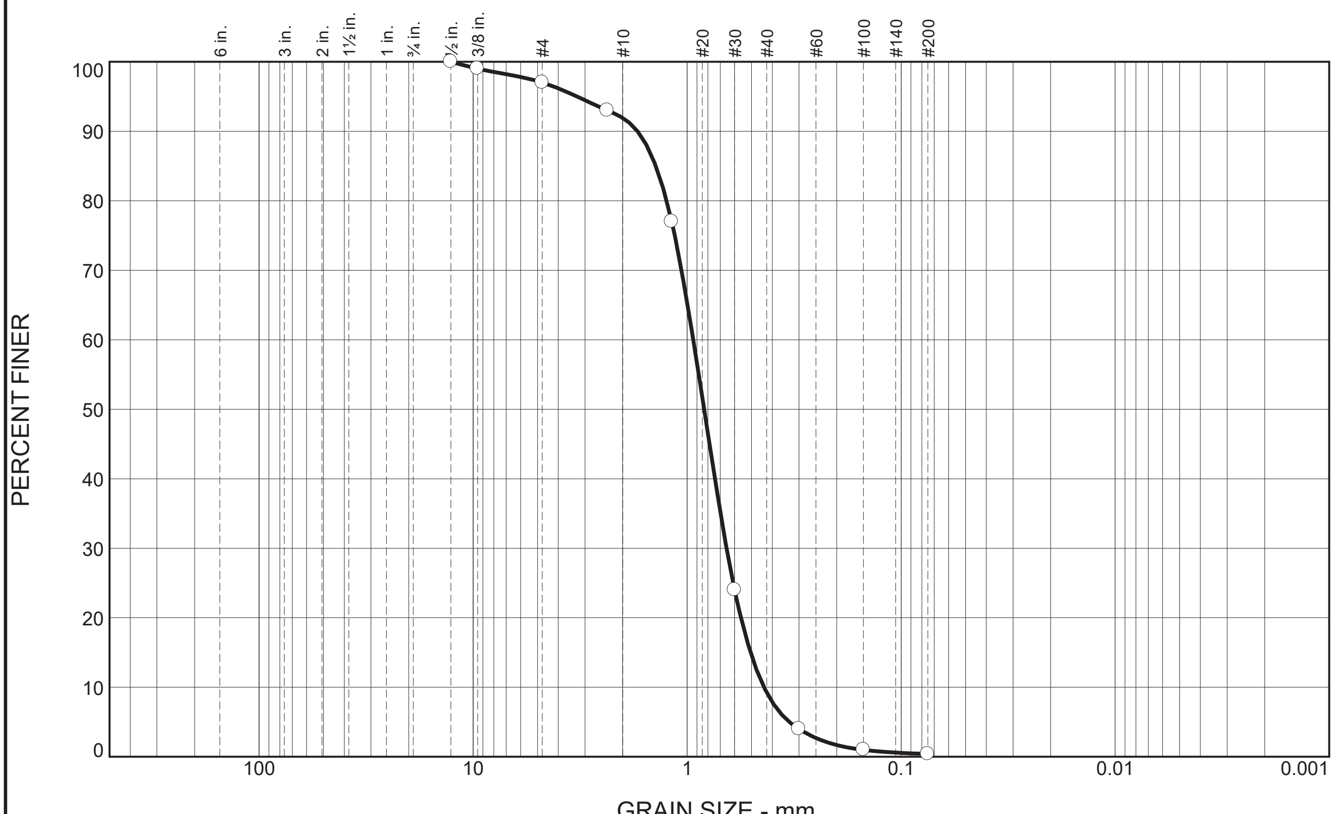
LITHOLOGIC DESCRIPTION

SAND; calcareous; heterogeneous; medium grain; unconsolidated; no compaction; moderate to poorly sorted; trace amounts of terrigenous material; 10-15% shell hash, Halimeda, and subangular coral fragments; no downward darkening; no downward coarsening; composition and color was nearly uniform throughout entire core. large-diameter coral fragments throughout.

0 – 83 in: SAND; calcareous; medium grain; light gray color; moderately sorted; moderately to poorly rounded; moderate to low sphericity; intact shell material; large diameter (1” to 3”) coral cobbles at 10”, 20”, 23”, 37”, 42”, 62”, and 82”.

REPRESENTATIVE APPEARANCE

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	3	5	83	9	0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100		
3/8"	99		
#4	97		
#8	93		
#16	77		
#30	24		
#50	4		
#100	1		
#200	0.4		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.7060 D_{85}= 1.4007 D_{60}= 0.9357
D_{50}= 0.8327 D_{30}= 0.6541 D_{15}= 0.5054
D_{10}= 0.4372 C_u= 2.14 C_c= 1.05

Classification

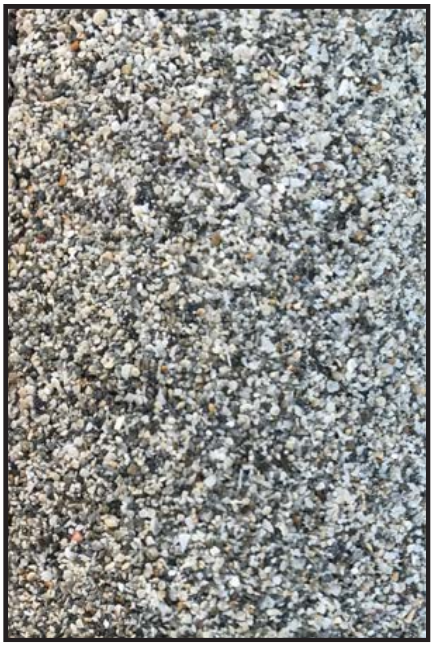
USCS= SP AASHTO=

Remarks

Location: H2X.7
Sample Number: 83756 9
Date: 6/15/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: Material Qualification
Project No: SEAENG030
Figure



LOCATION: **HILTON AREA, WAIKIKI, OAHU, HAWAII**
CORE: **Hilton 1.1**
EASTING: 1693421.2
NORTHING: 39541.4
RECOVERED: 3/20/2017
LENGTH: 85 inches
DEPTH: 47 feet

LITHOLOGIC DESCRIPTION

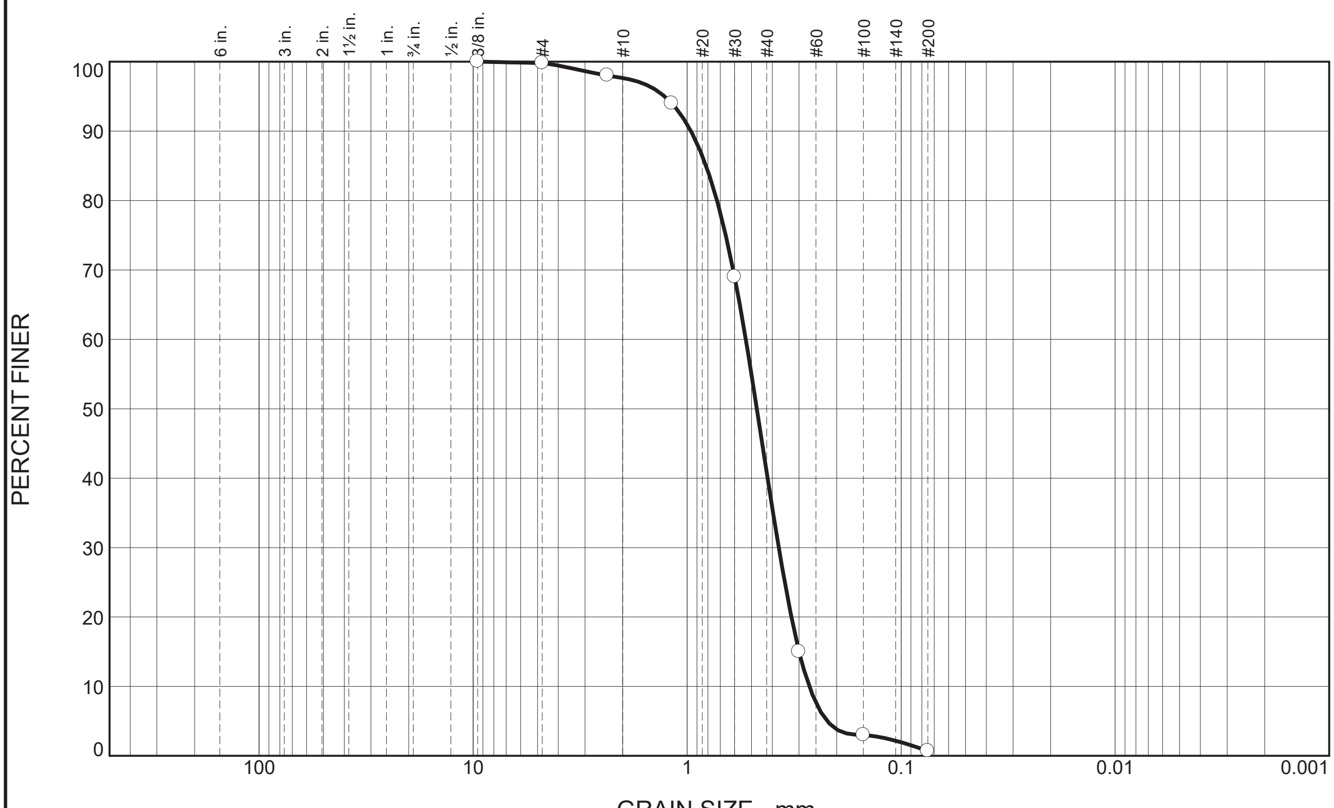
SAND; calcareous; heterogeneous; medium to coarse grain; unconsolidated; no compaction; moderately well-sorted; no terrigenous material; 10-15% shell hash, Halimeda, and coralline algae; no downward darkening; no downward coarsening; composition and color was nearly uniform throughout entire core.

- **0 – 34 in:** SAND; calcareous; medium; grayish-tan color (lightest at top); moderately well-sorted; poorly rounded; low sphericity; appears to beach quality sand.

- **34 – 48 in:** SAND; calcareous; medium-coarse; tannish-gray color (darkest at bottom); moderately well-sorted; poorly rounded; low sphericity; 5% Halimeda in bottom 1”; appears to beach quality sand.

REPRESENTATIVE APPEARANCE

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	2	57	40	1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	100		
#8	98		
#16	94		
#30	69		
#50	15		
#100	3		
#200	0.7		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.9594 D_{85}= 0.8160 D_{60}= 0.5322
D_{50}= 0.4723 D_{30}= 0.3732 D_{15}= 0.3000
D_{10}= 0.2688 C_u= 1.98 C_c= 0.97

Classification

USCS= SP AASHTO=

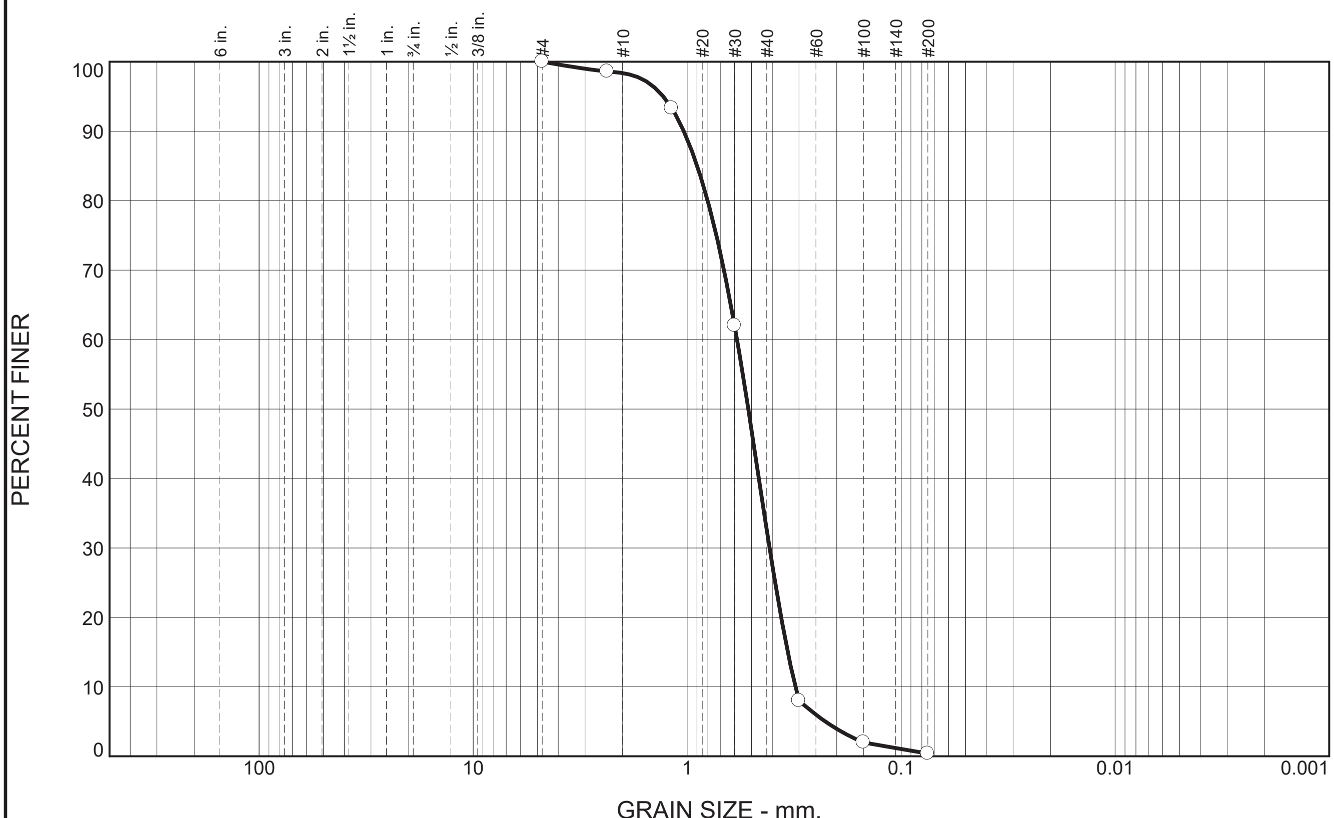
Remarks

Location: Hilton PP
Sample Number: 83756 3
Date: 6/15/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: Material Qualification
Project No: SEAENG030
Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.6	65.7	32.3	0.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	98.6		
#16	93.3		
#30	62.0		
#50	8.0		
#100	2.0		
#200	0.4		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.0362 D_{85}= 0.8974 D_{60}= 0.5846
D_{50}= 0.5181 D_{30}= 0.4119 D_{15}= 0.3389
D_{10}= 0.3121 C_u= 1.87 C_c= 0.93

Classification

USCS= SP AASHTO=

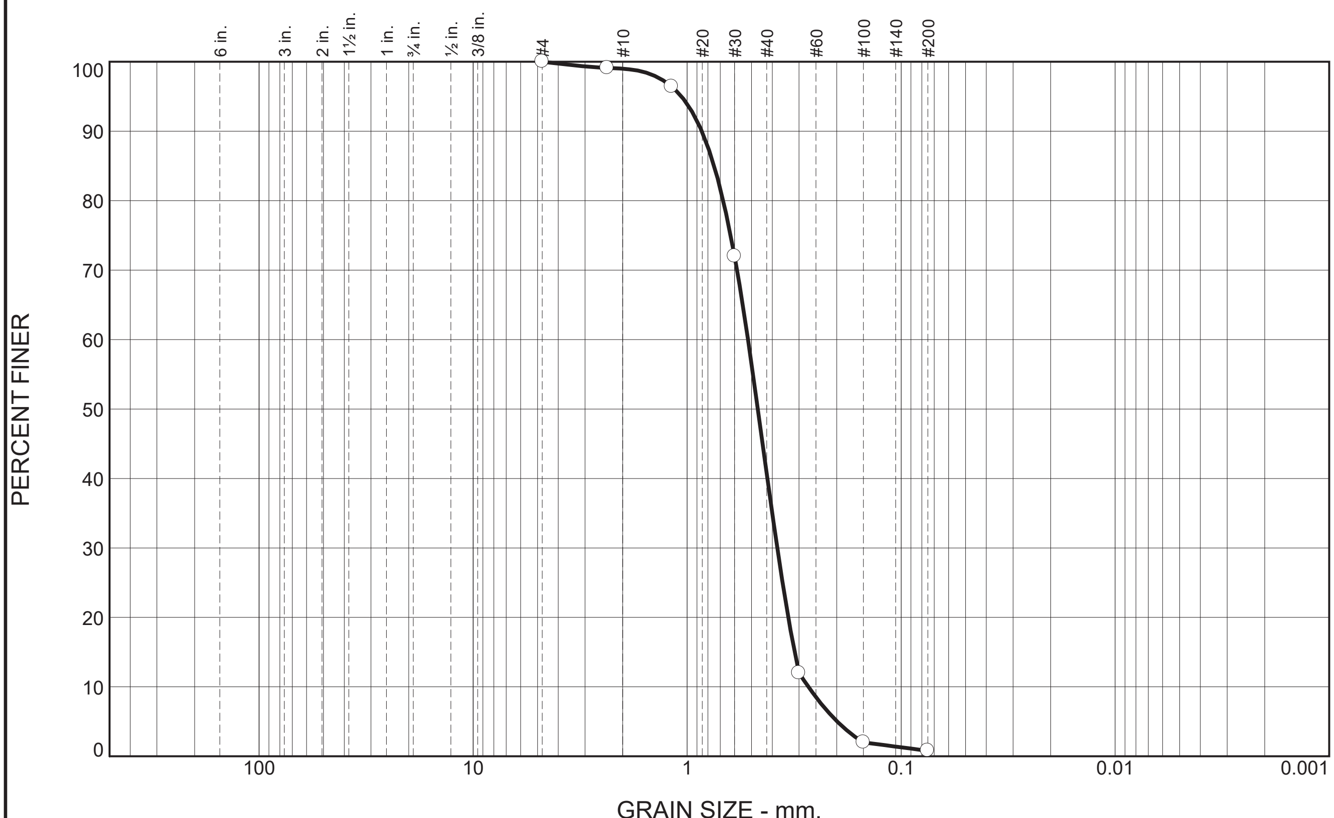
Remarks

Location: Hilton PP Top
Sample Number: 83037 5
Date: 5/10/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: 25548 Sand Testing
Project No: SEAENG031 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.0	58.2	40.0	0.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.1		
#16	96.4		
#30	72.0		
#50	12.0		
#100	2.0		
#200	0.8		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.8539 D_{85}= 0.7483 D_{60}= 0.5197
D_{50}= 0.4674 D_{30}= 0.3792 D_{15}= 0.3147
D_{10}= 0.2712 C_u= 1.92 C_c= 1.02

Classification

USCS= SP AASHTO=

Remarks

Location: Hilton PP Bottom
Sample Number: 83037 6

Date: 5/10/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: 25548 Sand Testing
Project No: SEAENG031 **Figure**

LOCATION: **HILTON AREA, WAIKIKI, OAHU, HAWAII**
CORE: **Hilton 1.2**
EASTING: 1693421.2
NORTHING: 39541.4
RECOVERED: 3/20/2017
LENGTH: 85 inches
DEPTH: 47 feet

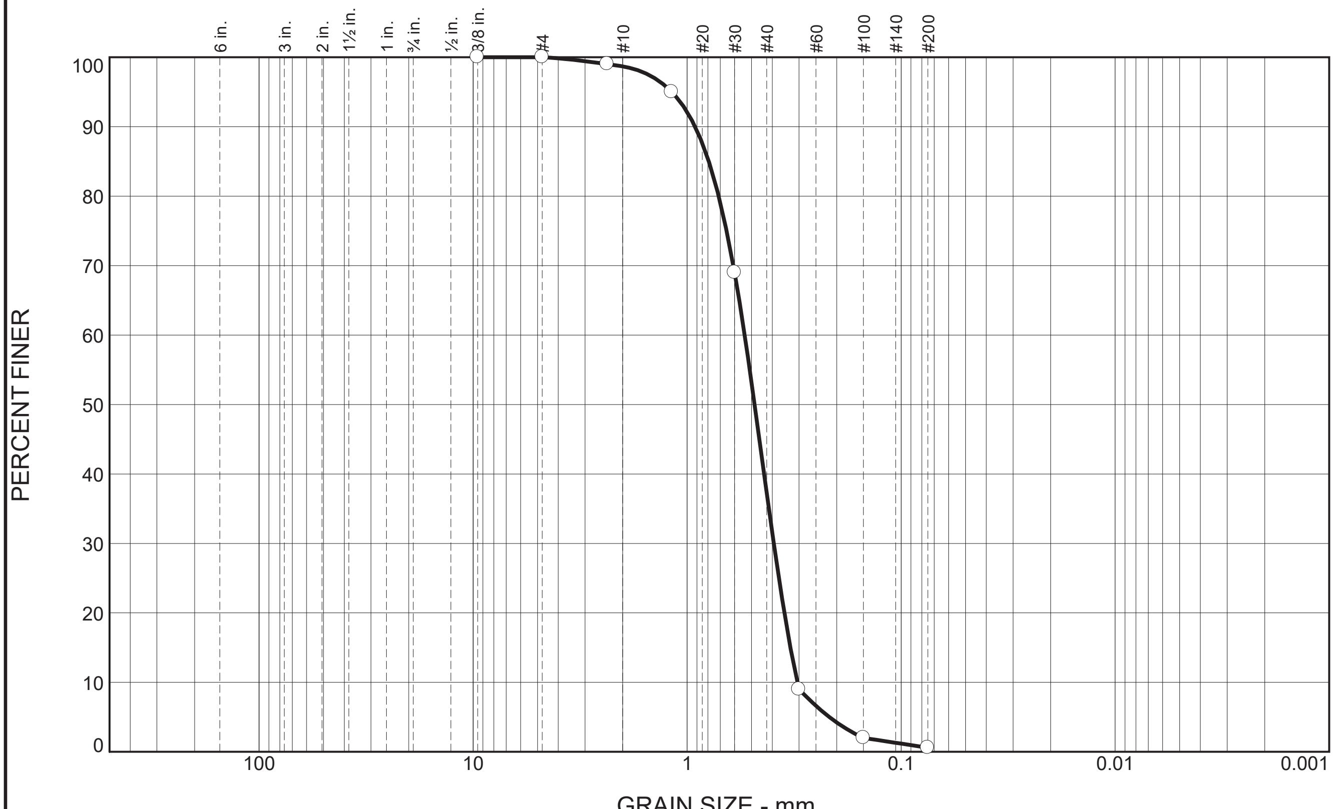
LITHOLOGIC DESCRIPTION

SAND; calcareous; heterogeneous; medium grain; unconsolidated; no compaction; moderately well-sorted; no terrigenous material; 10-15% shell hash, Halimeda, and coralline algae; downward darkening; no downward coarsening; composition and color was nearly uniform throughout entire core.

- **0 – 27 in:** SAND; calcareous; medium grain; tan color; moderately well-sorted; poorly rounded; low sphericity; 10-15% shell hash, Halimeda, and coralline algae; appears to be beach quality sand.
- **27 – 85 in:** SAND; calcareous; medium grain; dark tan-grayish color; moderately-well sorted; poorly rounded; low sphericity; 10-15% shell hash, Halimeda, and coralline algae; appears to be beach quality sand.

REPRESENTATIVE APPEARANCE

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	62	36	1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	100		
#8	99		
#16	95		
#30	69		
#50	9		
#100	2		
#200	0.6		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.9174 D_{85}= 0.7923 D_{60}= 0.5386
D_{50}= 0.4840 D_{30}= 0.3936 D_{15}= 0.3294
D_{10}= 0.3053 C_u= 1.76 C_c= 0.94

Classification

USCS= SP AASHTO=

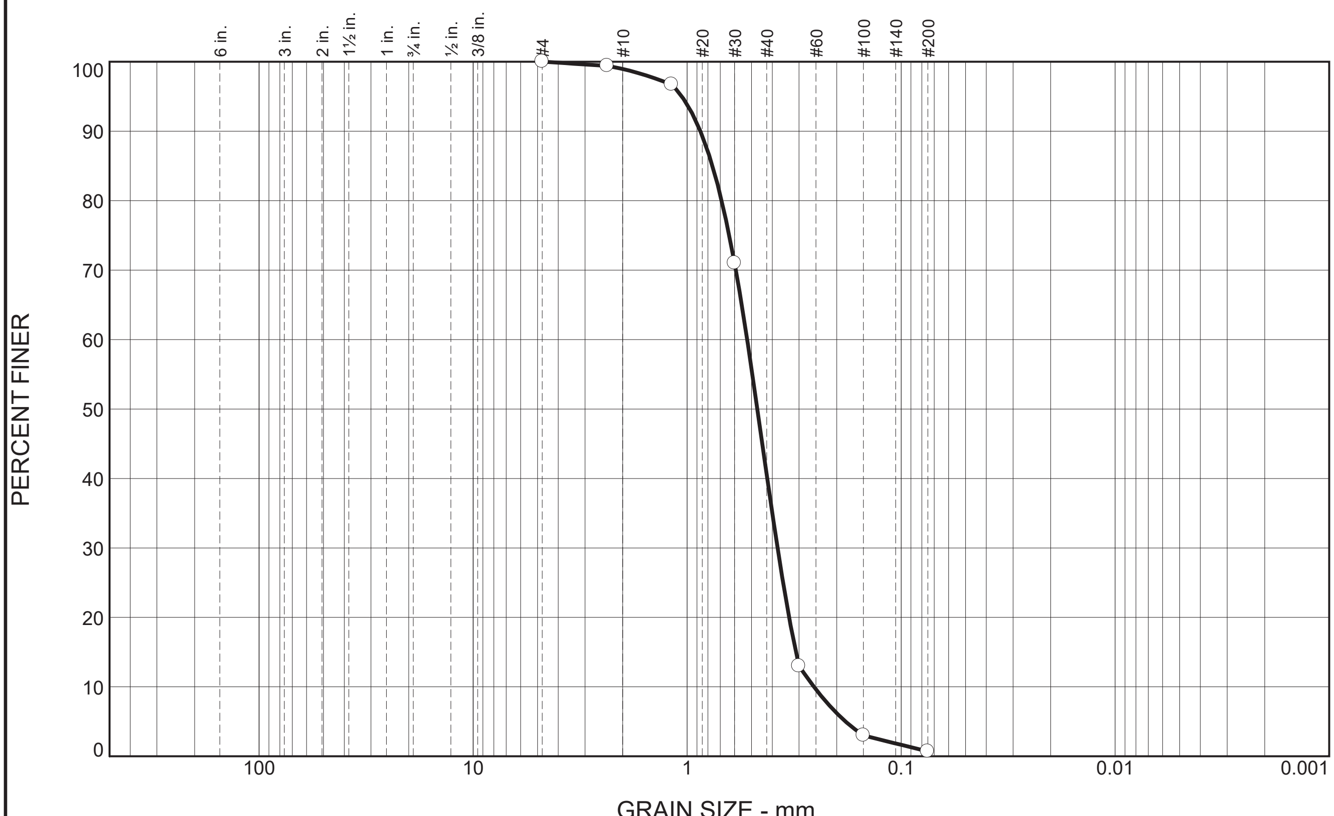
Remarks

Location: Hilton 2.1
Sample Number: 83756 4
Date: 6/15/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: Material Qualification
Project No: SEAENG030 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.1	58.3	39.9	0.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.4		
#16	96.7		
#30	71.0		
#50	13.0		
#100	3.0		
#200	0.7		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.8670 D_{85}= 0.7617 D_{60}= 0.5244
D_{50}= 0.4699 D_{30}= 0.3781 D_{15}= 0.3104
D_{10}= 0.2555 C_u= 2.05 C_c= 1.07

Classification

USCS= SP AASHTO=

Remarks

Location: Hilton 1.2 Top
Sample Number: 83037 7

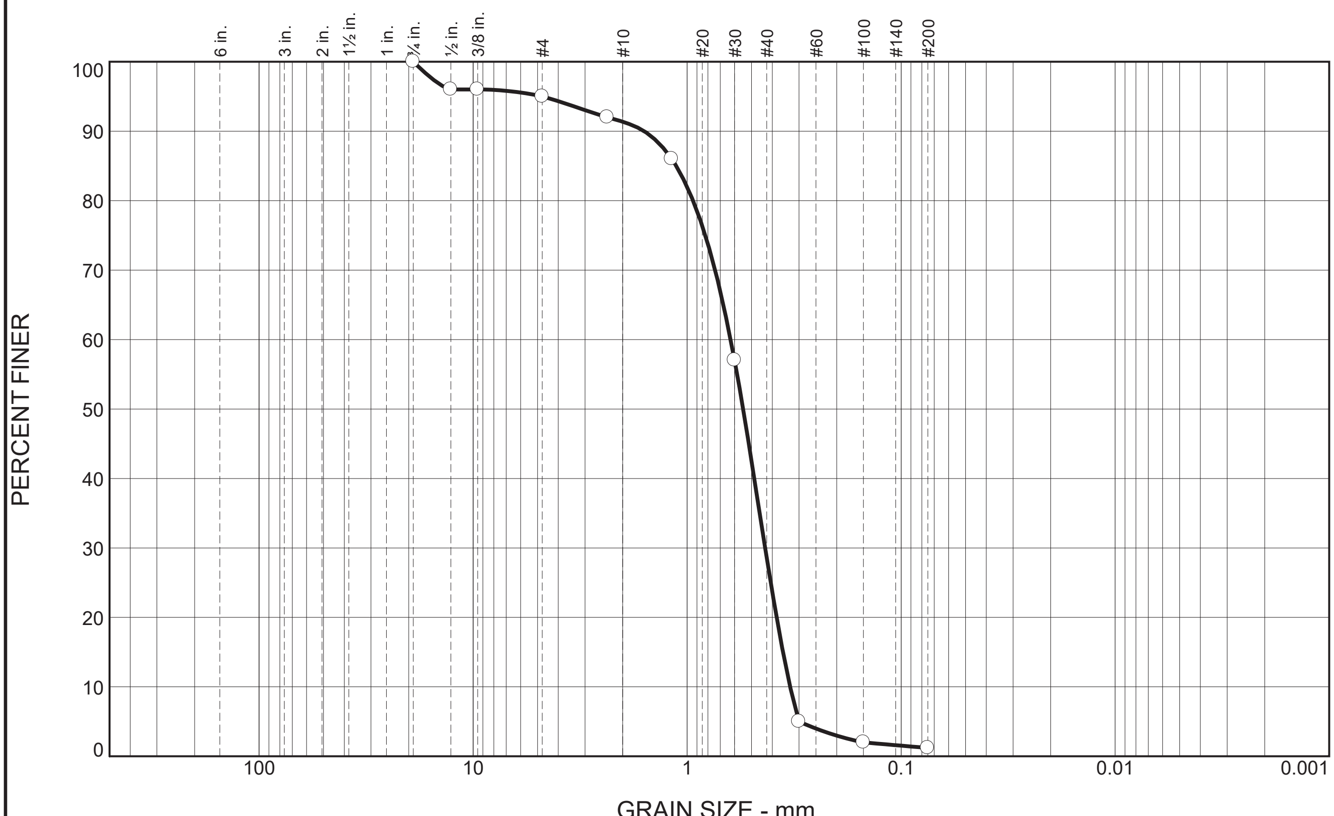
Date: 5/10/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: 25548 Sand Testing

Project No: SEAENG031 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	5.0	3.6	62.8	27.4	1.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	96.0		
3/8"	96.0		
#4	95.0		
#8	92.0		
#16	86.0		
#30	57.0		
#50	5.0		
#100	2.0		
#200	1.2		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.5903 D_{85}= 1.1249 D_{60}= 0.6262
D_{50}= 0.5476 D_{30}= 0.4320 D_{15}= 0.3567
D_{10}= 0.3303 C_u= 1.90 C_c= 0.90

Classification

USCS= SP AASHTO=

Remarks

Location: Hilton 1.2 Bottom
Sample Number: 83037 8
Date: 5/10/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: 25548 Sand Testing
Project No: SEAENG031 **Figure**

LOCATION: **REEF RUNWAY, HONOLULU, OAHU, HAWAII**
CORE: **RR-2X.1**
EASTING: 1693294.6
NORTHING: 39587.3
COLLECTED: 05/19/2017
LENGTH: 50 inches
DEPTH: 87 feet

LITHOLOGIC DESCRIPTION

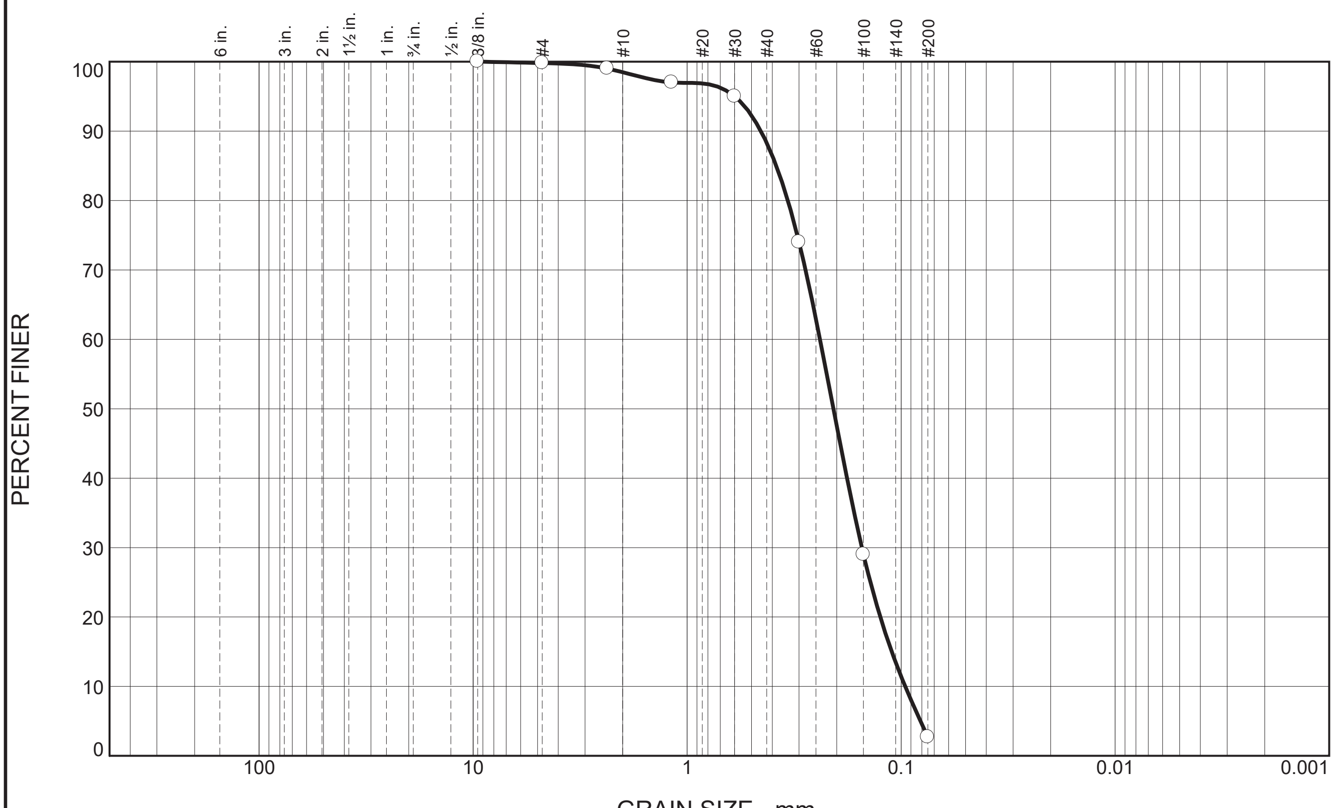
SAND; calcareous; heterogeneous; fine to very-fine grain; moderately-well sorted; moderately-compacted; trace amounts of terrigenous material; 5-10% Halimeda and coralline algae; traces of shell hash; downward darkening; minor downward coarsening.

- **0 – 6 in:** SAND; calcareous; fine to very-fine grain; light tan color; moderately-well sorted; rounded; low sphericity; sharp boundary between upper and lower sections.

- **6 – 29 in:** SAND; calcareous; fine grain; light-gray color; moderately-well sorted; poorly rounded; low sphericity.

REPRESENTATIVE PHOTO

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	2	10	85	3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	100		
#8	99		
#16	97		
#30	95		
#50	74		
#100	29		
#200	2.7		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4521 D_{85}= 0.3834 D_{60}= 0.2395
D_{50}= 0.2072 D_{30}= 0.1527 D_{15}= 0.1106
D_{10}= 0.0957 C_u= 2.50 C_c= 1.02

Classification

USCS= SP AASHTO=

Remarks

Location: RR-2X.1
Sample Number: 83756 13 **Date:** 6/15/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: Material Qualification

Project No: SEAENG030 **Figure**

LOCATION: **REEF RUNWAY, HONOLULU, OAHU, HAWAII**
CORE: **RR-2X.2**
EASTING: 1657473.5
NORTHING: 46894.6
COLLECTED: 05/18/2017
LENGTH: 38 inches
DEPTH: 83 feet

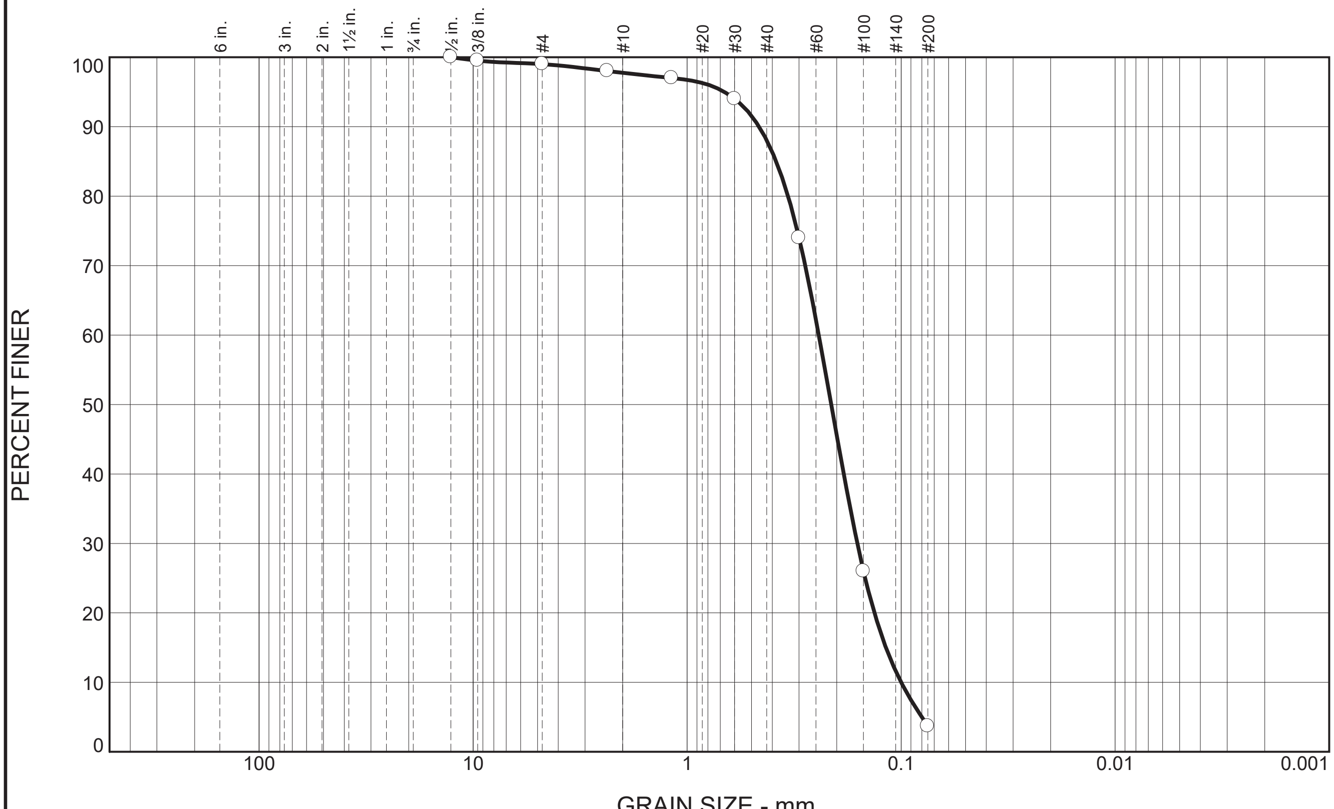
LITHOLOGIC DESCRIPTION
SAND; calcareous; heterogeneous; fine to very-fine; moderately-well sorted; consolidated; moderately-compacted; trace amounts of terrigenous material; 5-15% Halimeda and coralline algae; traces of shell hash; uniform appearance; minor downward darkening; no downward coarsening; sulfurous odor.

- **0 – 5 in:** SAND; calcareous; fine to very-fine; light tan color; moderately sorted; poorly rounded; low sphericity; sharp boundary between upper and lower sections.

- **5 – 20 in:** SAND; calcareous; fine grain; grayish-tan color; moderately sorted; poorly rounded; low sphericity; multiple 2-3” coral cobbles at 14-18”.

REPRESENTATIVE GRAIN SIZE

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	1	1	10	84	4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100		
3/8"	100		
#4	99		
#8	98		
#16	97		
#30	94		
#50	74		
#100	26		
#200	3.7		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4610 D_{85}= 0.3837 D_{60}= 0.2426
D_{50}= 0.2121 D_{30}= 0.1603 D_{15}= 0.1178
D_{10}= 0.1000 C_u= 2.43 C_c= 1.06

Classification

USCS= SP AASHTO=

Remarks

Location: RR-2X.2
Sample Number: 83756 14
Date: 6/15/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: Material Qualification
Project No: SEAENG030 **Figure**

LOCATION: **REEF RUNWAY, HONOLULU, OAHU, HAWAII**
CORE: **RR-2X.3**
EASTING: 1657329.9
NORTHING: 46710.3
COLLECTED: 05/18/2017
LENGTH: 65 inches
DEPTH: 105 feet

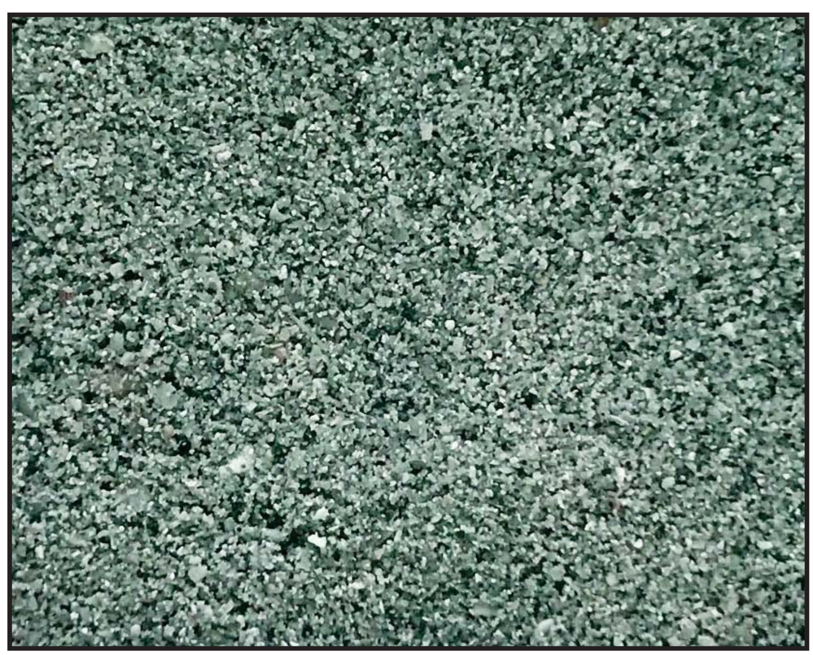
LITHOLOGIC DESCRIPTION

SAND; calcareous; heterogeneous; fine grain; well-sorted; consolidated; moderately-compacted; 0-5% shell hash, Halimeda, and coralline algae; mixed appearance in upper 10”; uniform appearance from 10-44”; minor downward darkening; no downward coarsening; sulfurous odor throughout.

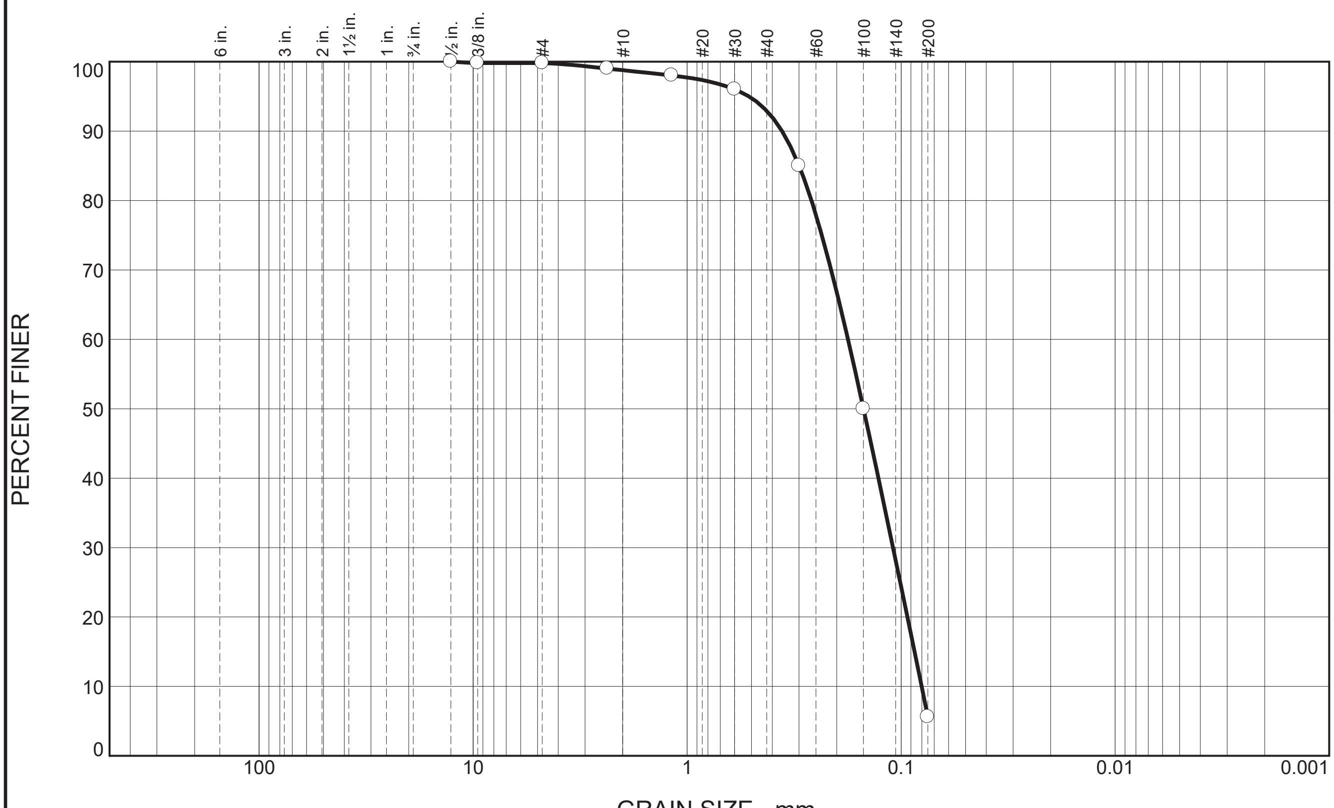
- **0 – 10 in:** SAND; calcareous; fine grain; tan color; well-sorted; poorly rounded; low sphericity; mottled appearance with dark gray intrusions with sulfurous odor (possibly organic material).

- **10 – 44 in:** SAND; calcareous; fine grain; grayish-tan color; moderately sorted; poorly rounded; low sphericity; mottled appearance with dark gray intrusions with sulfurous odor (possibly organic material).

REPRESENTATIVE GRAIN SIZE



Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	6	87	6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100		
3/8"	100		
#4	100		
#8	99		
#16	98		
#30	96		
#50	85		
#100	50		
#200	5.6		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.3605 D_{85}= 0.3000 D_{60}= 0.1773
D_{50}= 0.1500 D_{30}= 0.1091 D_{15}= 0.0866
D_{10}= 0.0802 C_u= 2.21 C_c= 0.84

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Location: RR-2X.3
Sample Number: 83756 15
Date: 6/15/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: Material Qualification
Project No: SEAENG030 **Figure**

LOCATION: **REEF RUNWAY, HONOLULU, OAHU, HAWAII**
CORE: **RR-2X.4**
EASTING: 1657555.2
NORTHING: 46661.4
COLLECTED: 05/18/2017
LENGTH: 87 inches
DEPTH: 94 feet

LITHOLOGIC DESCRIPTION

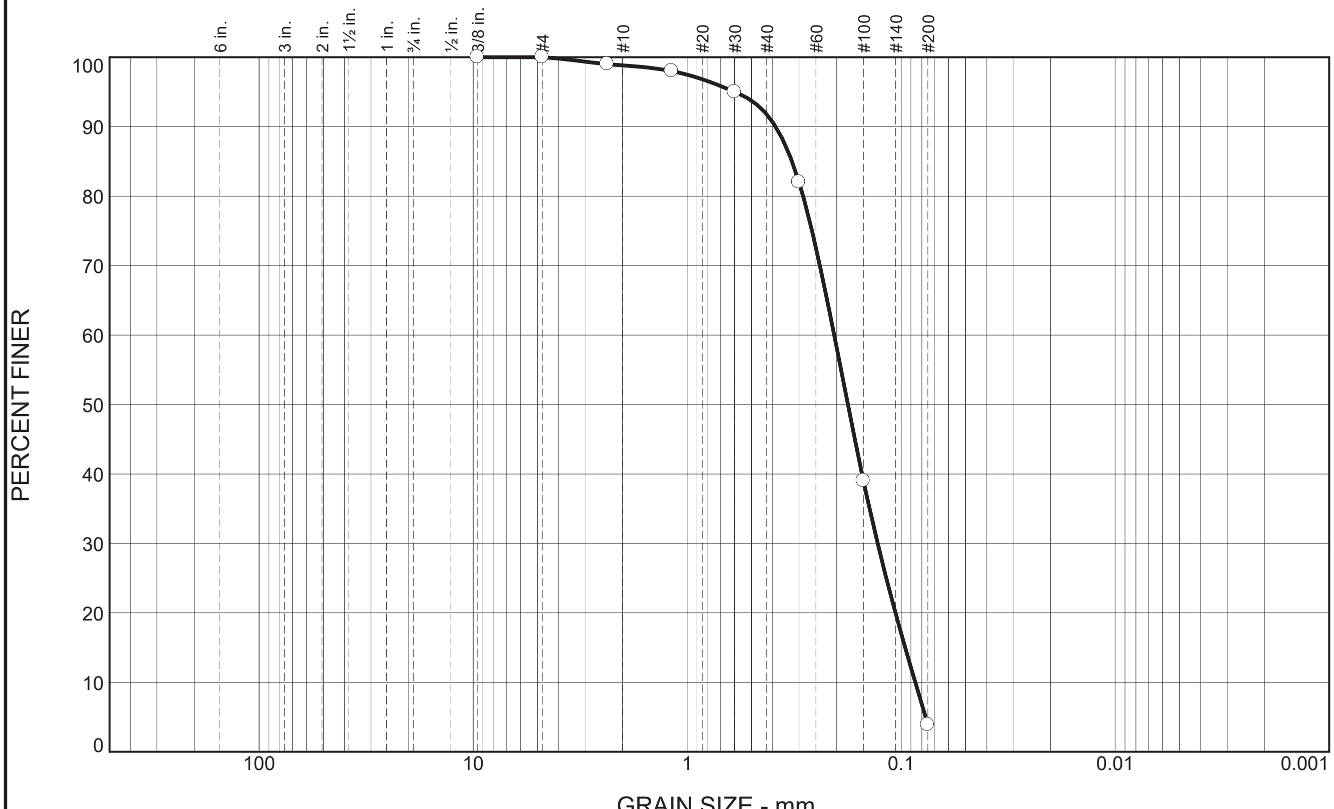
SAND; calcareous; heterogeneous; fine grain; well-sorted; consolidated; compacted; 0-5% shell hash, Halimeda, and coralline algae; no coral fragments or cobbles; minor downward darkening; no downward coarsening.

- **0 – 7 in:** SAND; calcareous; fine grain; light tan color; moderately sorted; poorly rounded; low sphericity; mottled appearance with dark gray intrusions with sulfurous odor (possibly organic material).

- **7 – 57 in:** SAND; calcareous; fine grain; light grayish-tan color; moderately sorted; poorly rounded; low sphericity; mottled appearance with dark gray intrusions with sulfurous odor (possibly organic material); 1” dark gray intrusion at 45”.

REPRESENTATIVE GRAIN SIZE

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	7	88	4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	100		
#8	99		
#16	98		
#30	95		
#50	82		
#100	39		
#200	3.9		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3859 D_{85}= 0.3236 D_{60}= 0.2055
D_{50}= 0.1774 D_{30}= 0.1287 D_{15}= 0.0957
D_{10}= 0.0859 C_u= 2.39 C_c= 0.94

Classification

USCS= SP AASHTO=

Remarks

Location: RR-2X.4
Sample Number: 83756 16
Date: 6/15/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: Material Qualification
Project No: SEAENG030 **Figure**

LOCATION: **REEF RUNWAY, HONOLULU, OAHU, HAWAII**
CORE: **RR-3.1**
EASTING: 1657390.3
NORTHING: 46771.7
COLLECTED: 3/21/2017
LENGTH: 96 inches
DEPTH: 93 feet

LITHOLOGIC DESCRIPTION

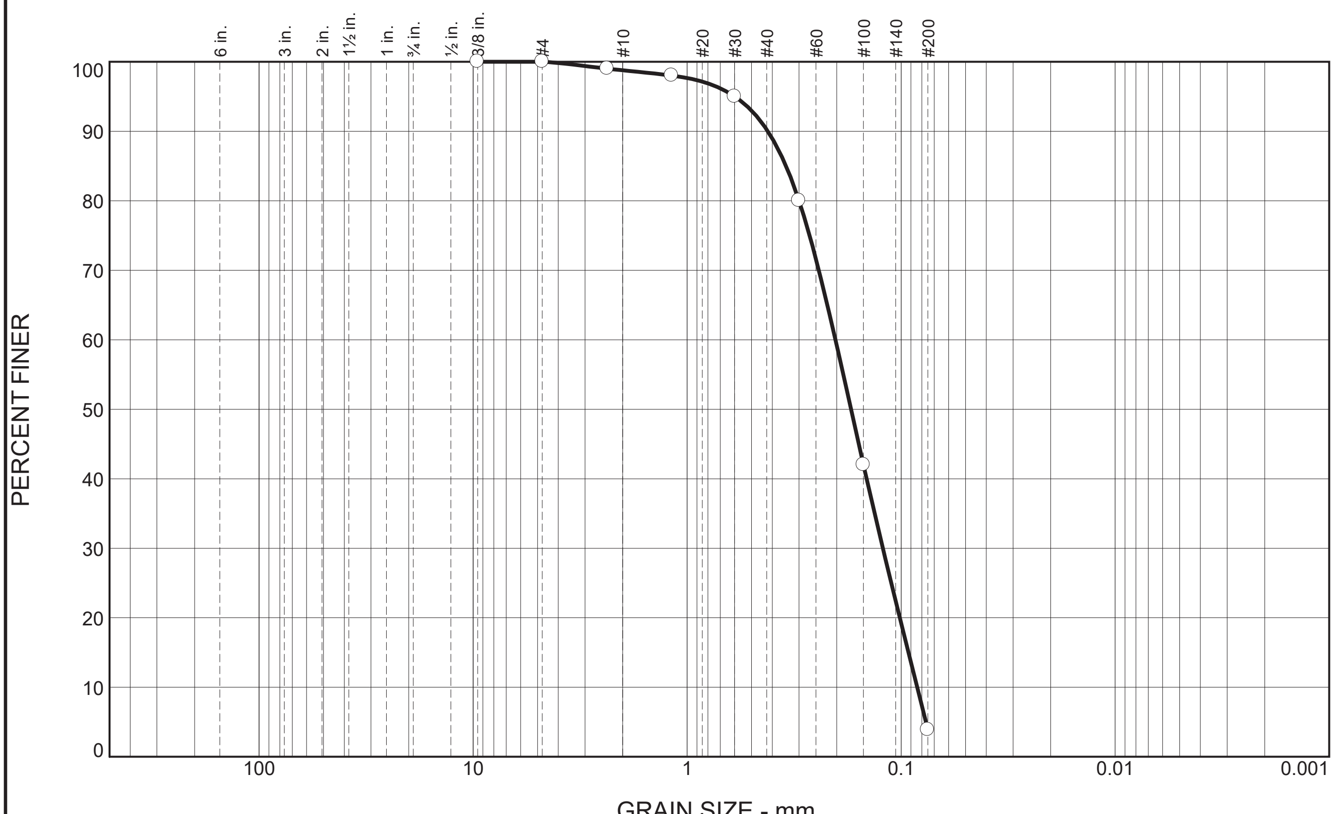
SAND; calcareous; heterogeneous; fine grain; moderately sorted; consolidated; moderately-compacted; trace amounts of terrigenous material; 0-5% Halimeda, coralline algae, and shell hash; minor downward darkening; no downward coarsening.

- **0 – 66 in:** SAND; calcareous; fine to very fine grain; light tannish-gray color; moderately sorted; poorly rounded; low sphericity; 2” diameter cobbles at 28”, 52”, and 56”.

- **66 – 82 in:** SAND; calcareous; fine to very fine grain; light gray color; moderately sorted; poorly rounded; low sphericity; mottled appearance with dark gray intrusions.

REPRESENTATIVE GRAIN SIZE

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	9	86	4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	100		
#8	99		
#16	98		
#30	95		
#50	80		
#100	42		
#200	3.9		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4198 D_{85}= 0.3453 D_{60}= 0.2028
D_{50}= 0.1715 D_{30}= 0.1217 D_{15}= 0.0924
D_{10}= 0.0841 C_u= 2.41 C_c= 0.87

Classification

USCS= SP AASHTO=

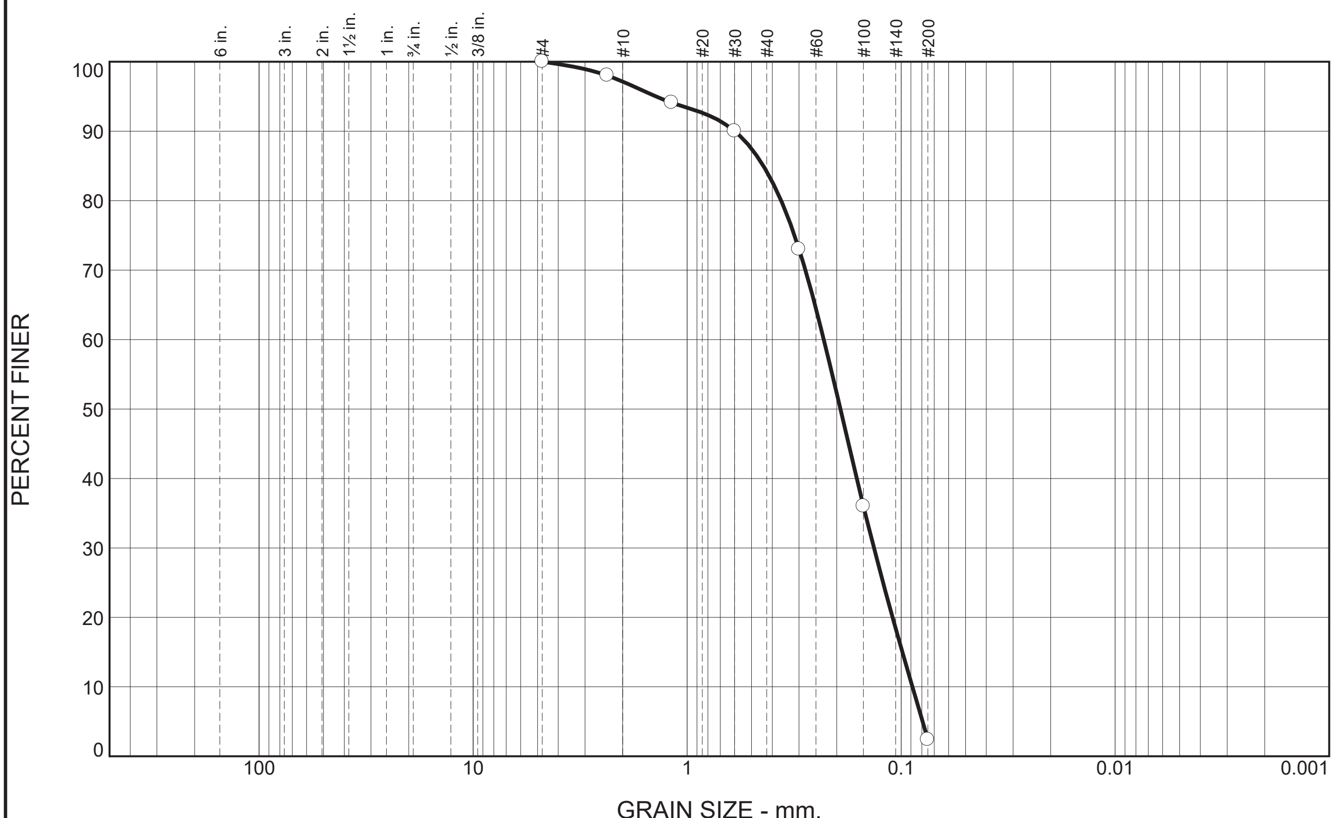
Remarks

Location: RR 3.1
Sample Number: 83756 12
Date: 6/15/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: Material Qualification
Project No: SEAENG030 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	2.9	12.9	81.8	2.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	98.0		
#16	94.1		
#30	90.0		
#50	73.0		
#100	36.0		
#200	2.4		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.6000 D_{85}= 0.4401 D_{60}= 0.2298
D_{50}= 0.1922 D_{30}= 0.1340 D_{15}= 0.0987
D_{10}= 0.0886 C_u= 2.59 C_c= 0.88

Classification

USCS= SP AASHTO=

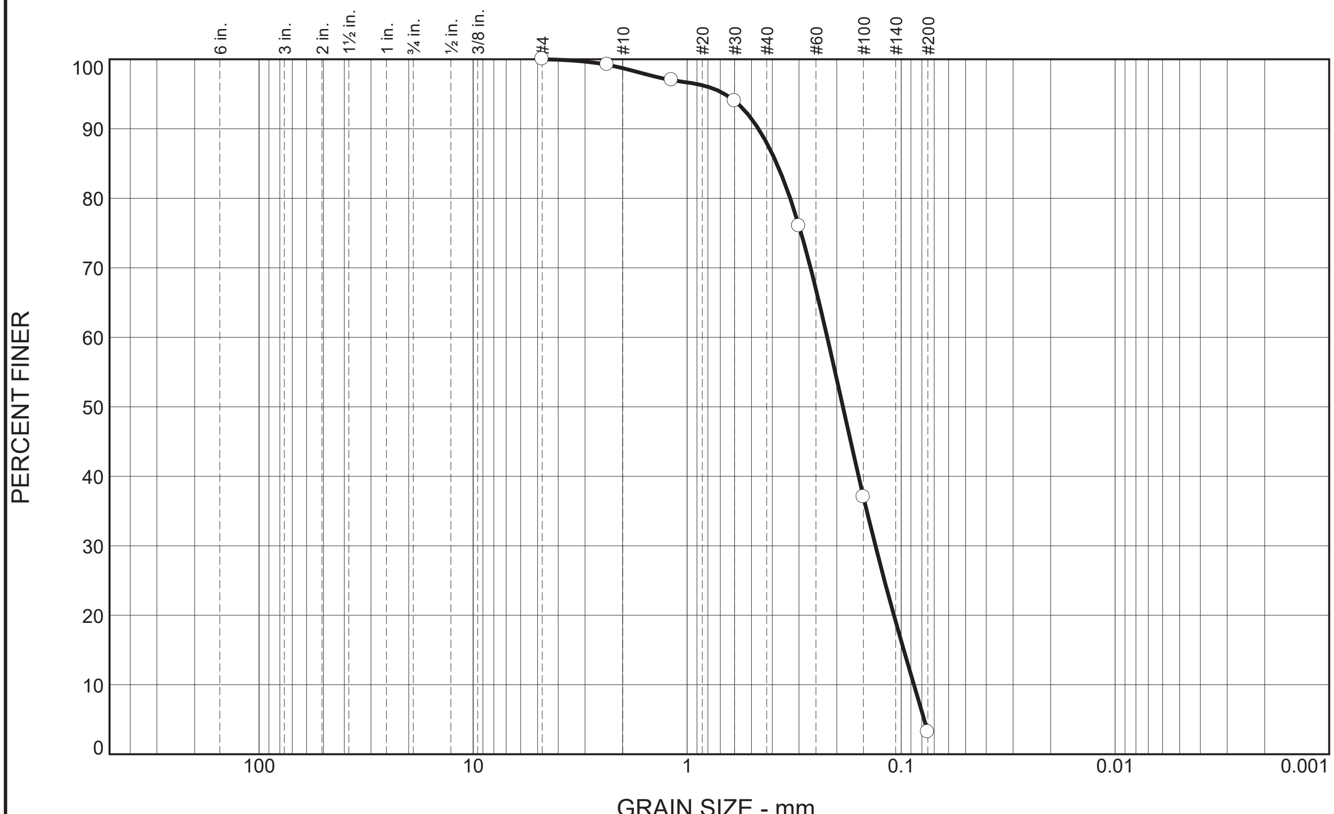
Remarks

Location: RR 3.1 Top
Sample Number: 83037 13
Date: 5/12/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: 25548 Sand Testing
Project No: SEAENG031 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.3	10.7	84.8	3.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.2		
#16	97.0		
#30	94.0		
#50	76.0		
#100	37.0		
#200	3.2		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4643 D_{85}= 0.3815 D_{60}= 0.2214
D_{50}= 0.1871 D_{30}= 0.1319 D_{15}= 0.0972
D_{10}= 0.0872 C_u= 2.54 C_c= 0.90

Classification

USCS= SP AASHTO=

Remarks

Location: RR 3.1 Bottom
Sample Number: 83037 14

Date: 5/12/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: 25548 Sand Testing

Project No: SEAENG031 **Figure**

LOCATION: **HALEKULANI CHANNEL, OAHU, HAWAII**
CORE: **Halekulani 1.1**
EASTING: 1695202.5
NORTHING: 37297.1
RECOVERED: 3/20/2017
LENGTH: 68 inches
DEPTH: 55 feet

LITHOLOGIC DESCRIPTION

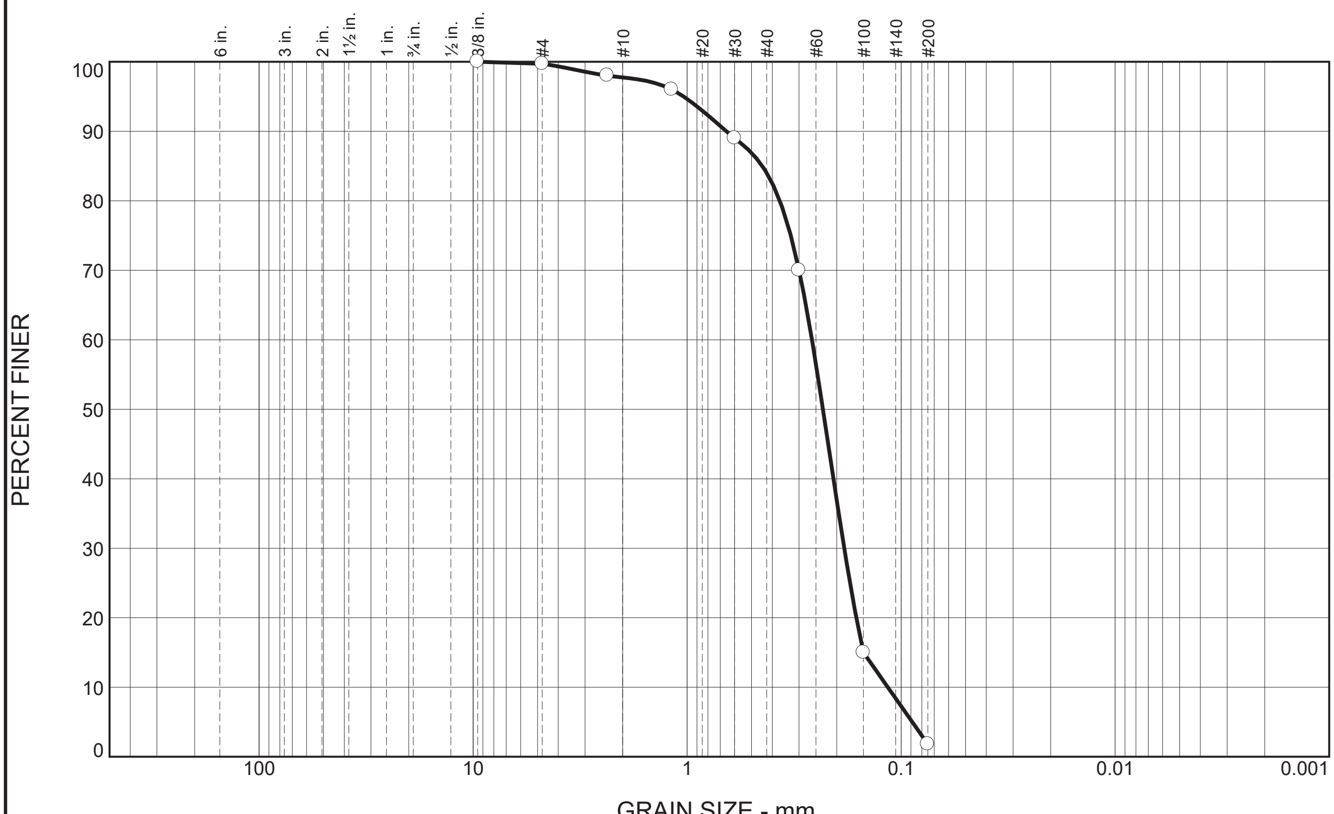
SAND; calcareous; heterogeneous; fine to medium grain; moderately consolidated; well-sorted; trace amounts of terrigenous material; 5-10% shell hash, Halimeda, and coralline algae; downward darkening; downward coarsening; downward darkening.

- **0 – 52 in:** SAND; calcareous; fine grain; grayish-tan color (lightest near top of section); well-sorted; rounded; moderate sphericity; no downward coarsening or darkening; 5-10 % shell hash, Halimeda, and coralline algae; diffuse boundary between upper and lower sections.

- **52 – 68 in:** SAND; calcareous; medium grain; darker grayish tan color; downward darkening; moderately-well sorted; rounded; moderate sphericity.

REPRESENTATIVE APPEARANCE

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	2	14	82	2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	100		
#8	98		
#16	96		
#30	89		
#50	70		
#100	15		
#200	1.8		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.6560 D_{85}= 0.4452 D_{60}= 0.2612
D_{50}= 0.2319 D_{30}= 0.1845 D_{15}= 0.1500
D_{10}= 0.1154 C_u= 2.26 C_c= 1.13

Classification

USCS= SP AASHTO=

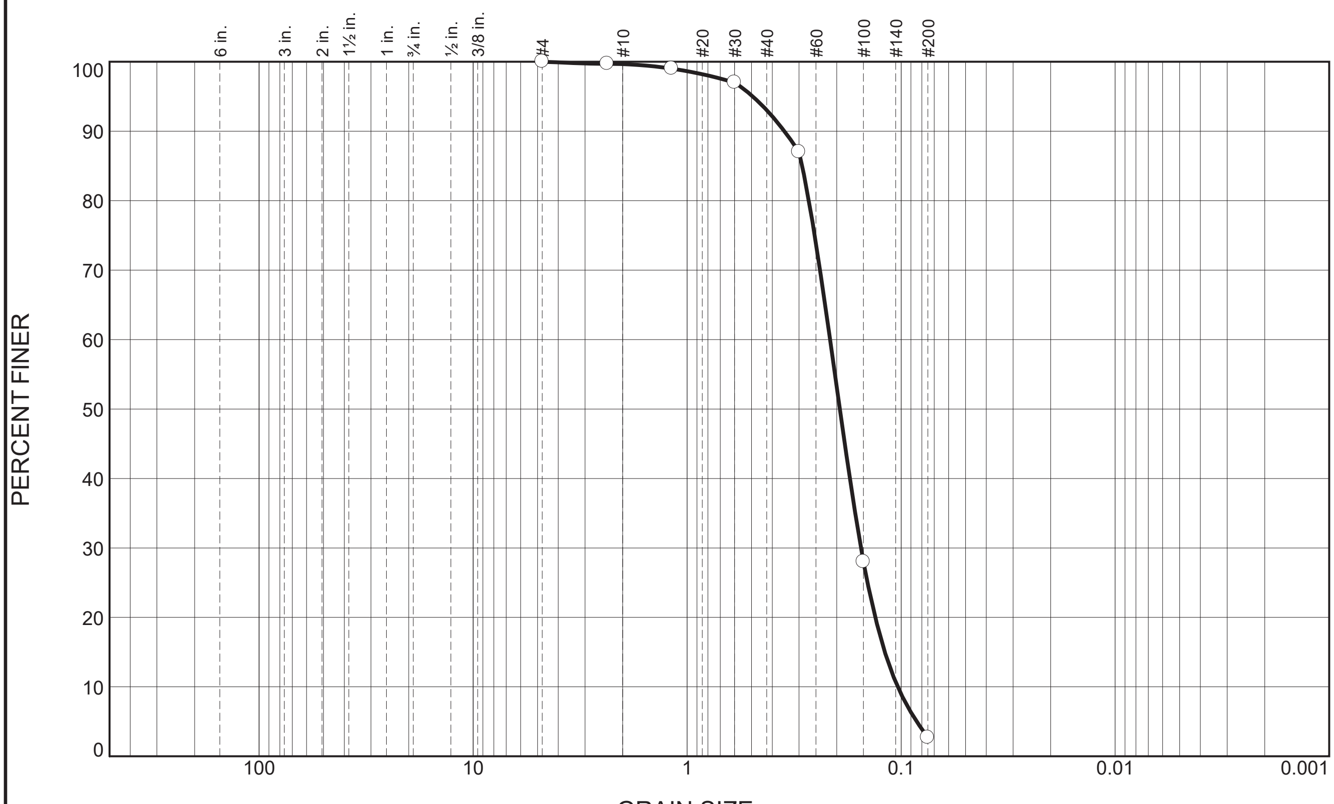
Remarks

Location: Halekulani 1.1
Sample Number: 83756 10
Date: 6/15/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: Material Qualification
Project No: SEAENG030 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	6.7	90.3	2.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.7		
#16	99.0		
#30	97.0		
#50	87.0		
#100	28.0		
#200	2.7		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3516 D_{85}= 0.2902 D_{60}= 0.2148
D_{50}= 0.1934 D_{30}= 0.1541 D_{15}= 0.1191
D_{10}= 0.1037 C_u= 2.07 C_c= 1.07

Classification

USCS= SP AASHTO=

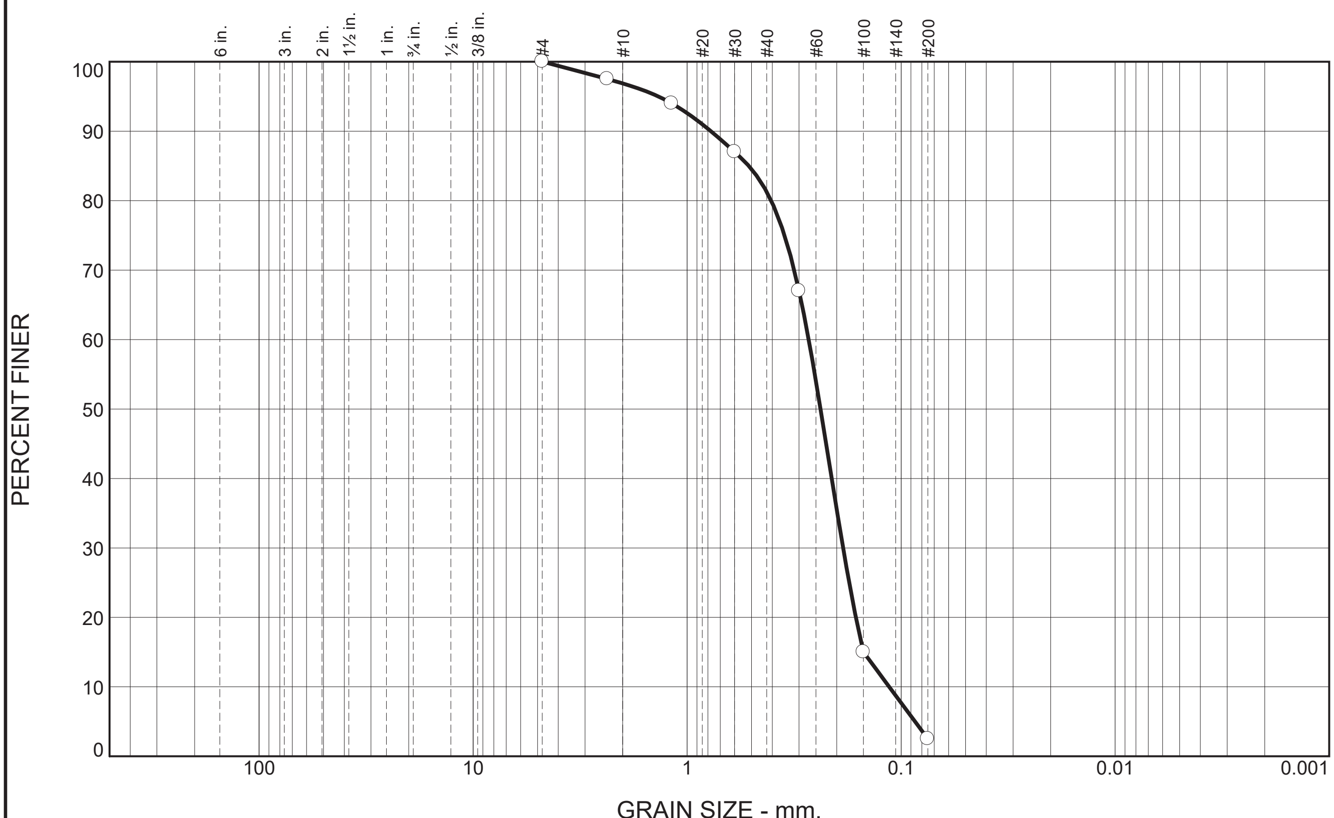
Remarks

Location: Halekulani 1.1 Top
Sample Number: 83037 9
Date: 5/11/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: 25548 Sand Testing
Project No: SEAENG031 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	3.1	15.6	78.8	2.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	97.5		
#16	94.0		
#30	87.0		
#50	67.0		
#100	15.0		
#200	2.5		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.7753 D_{85}= 0.5154 D_{60}= 0.2705
D_{50}= 0.2380 D_{30}= 0.1868 D_{15}= 0.1500
D_{10}= 0.1137 C_u= 2.38 C_c= 1.13

Classification

USCS= SP AASHTO=

Remarks

Location: Halekulani 1.1 Bottom
Sample Number: 83037 10
Date: 5/11/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: 25548 Sand Testing
Project No: SEAENG031 **Figure**

LOCATION: **HALEKULANI CHANNEL, OAHU, HAWAII**
CORE: **Halekulani 2.2**
EASTING: 1695299.2
NORTHING: 36284.4
RECOVERED: 3/20/2017
LENGTH: 84 inches
DEPTH: 86 feet

LITHOLOGIC DESCRIPTION

SAND; calcareous; heterogeneous; fine to medium grain; consolidated; high compaction; well-sorted; trace amounts of terrigenous material; 5-10% shell hash, Halimeda, and coralline algae; downward darkening; downward coarsening.

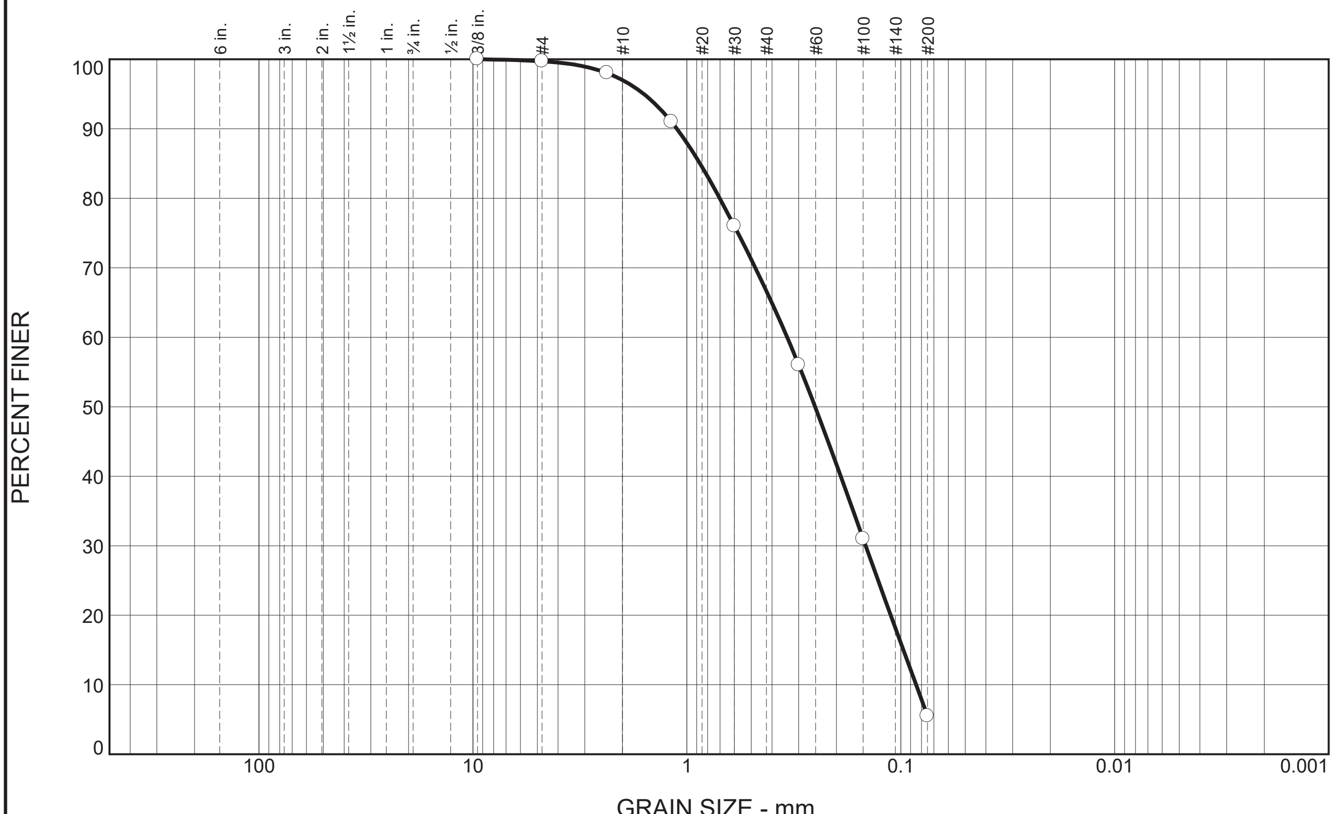
- **0 – 5 in:** SAND; calcareous; fine grain; very light tan color; well-sorted; subangular; low sphericity; 5-10% shell hash and coralline algae.

- **5 – 56 in:** SAND; calcareous; fine to medium grain; light tan to grayish color; well-sorted; subangular; low sphericity; 5-10% shell hash and coralline algae; 3” diameter coral cobble at 29”.

- **56 – 74 in:** SAND; calcareous; medium grain; medium-gray color; moderately well-sorted; subangular; low sphericity; mottled appearance with irregular seams of darker-gray material.

REPRESENTATIVE APPEARANCE

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	3	30	61	6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	100		
#8	98		
#16	91		
#30	76		
#50	56		
#100	31		
#200	5.5		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 1.1132 D_{85}= 0.8683 D_{60}= 0.3399
D_{50}= 0.2516 D_{30}= 0.1460 D_{15}= 0.0972
D_{10}= 0.0848 C_u= 4.01 C_c= 0.74

Classification

USCS= SP-SM AASHTO= A-3

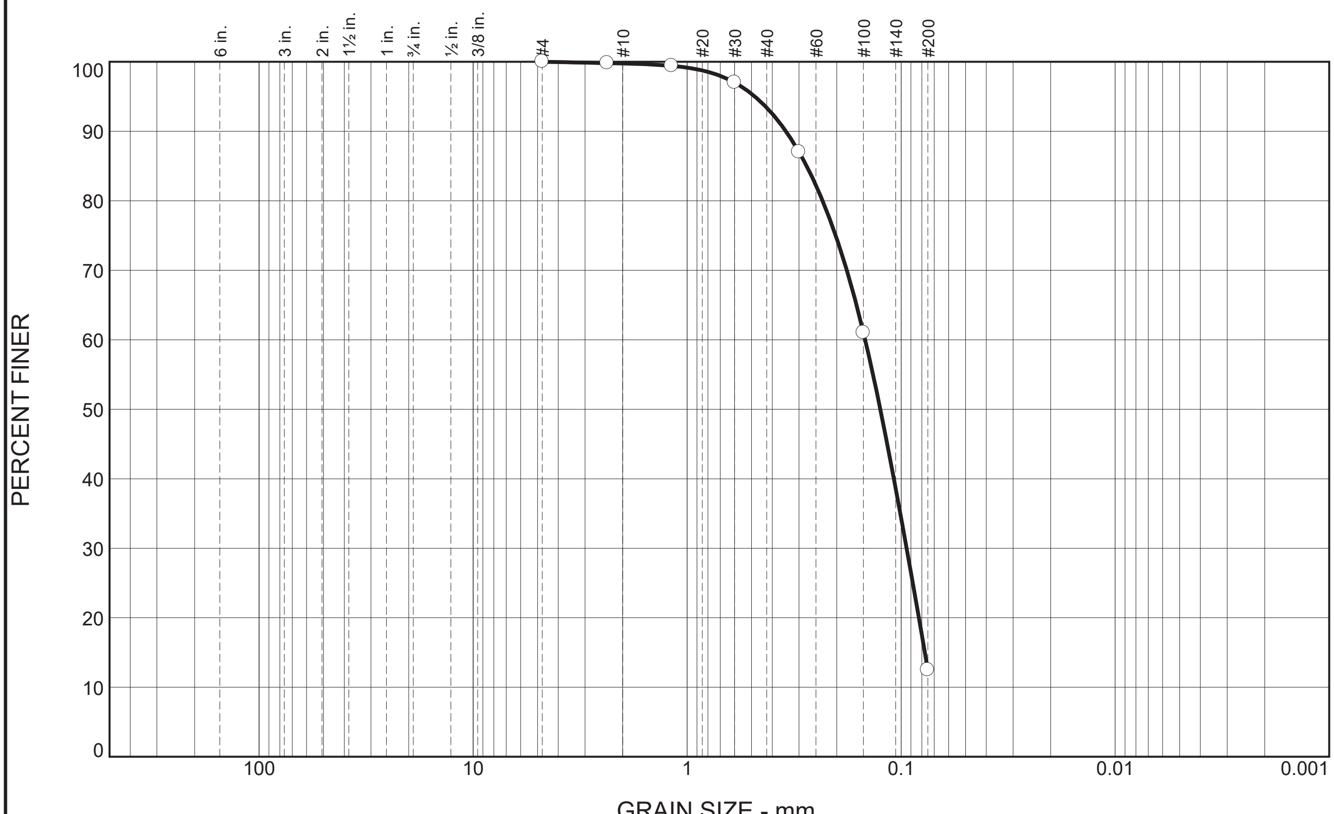
Remarks

Location: Halekulani 1.2
Sample Number: 83756 11
Date: 6/15/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: Material Qualification
Project No: SEAENG030 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	6.4	80.9	12.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.8		
#16	99.4		
#30	97.0		
#50	87.0		
#100	61.0		
#200	12.5		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3457 D_{85}= 0.2765 D_{60}= 0.1473
D_{50}= 0.1251 D_{30}= 0.0943 D_{15}= 0.0775
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

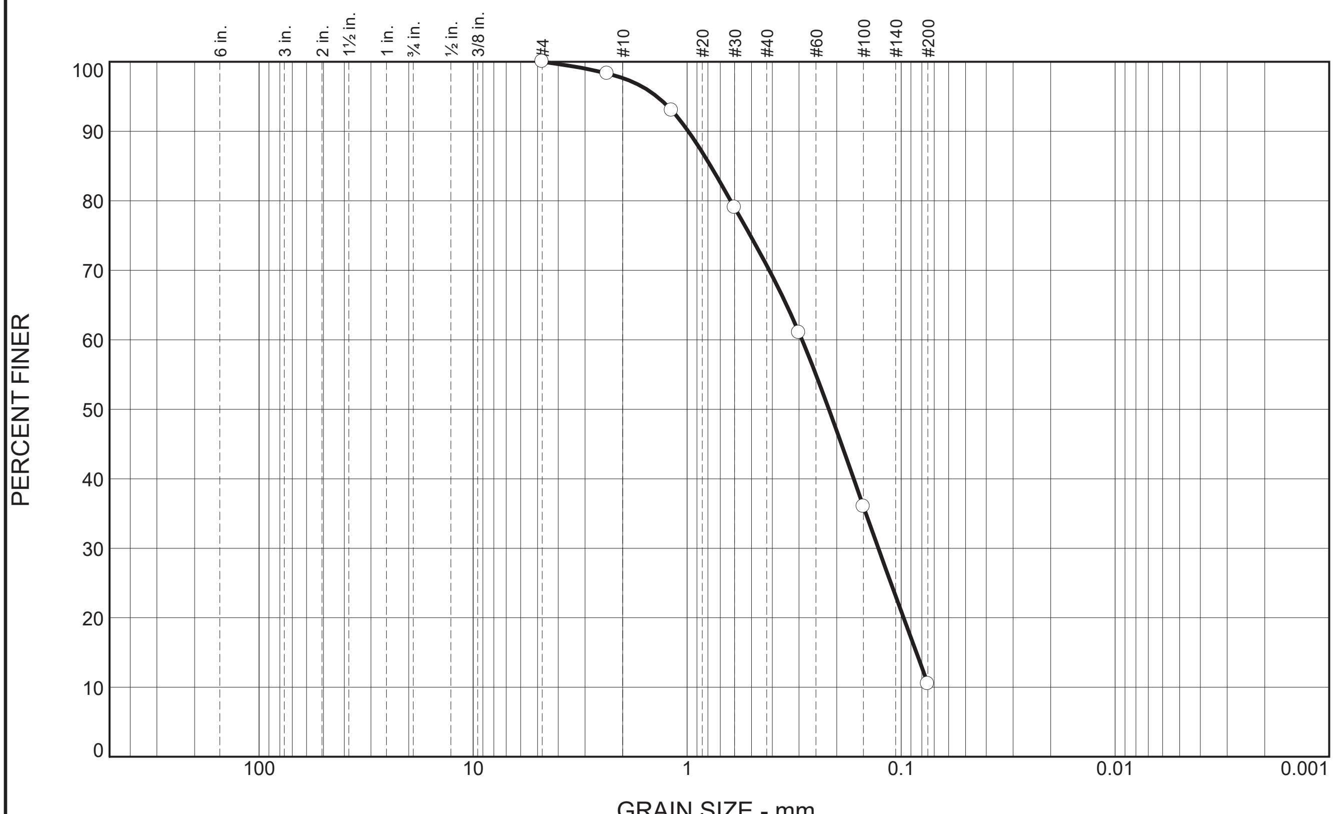
Location: Halekulani 2.2 Top
Sample Number: 83037 11 **Date:** 5/11/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: 25548 Sand Testing

Project No: SEAENG031 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	2.4	26.9	60.2	10.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	98.3		
#16	93.0		
#30	79.0		
#50	61.0		
#100	36.0		
#200	10.5		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.9872 D_{85}= 0.7767 D_{60}= 0.2906
D_{50}= 0.2176 D_{30}= 0.1278 D_{15}= 0.0849
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Location: Halekulani 2.2 Bottom
Sample Number: 83037 12
Date: 5/11/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: 25548 Sand Testing
Project No: SEAENG031 **Figure**

LOCATION: **WAIKIKI, OAHU, HAWAII**
CORE: **Waikiki 1.1**
EASTING: 1698355.9
NORTHING: 38492.7
RECOVERED: 3/20/2017
LENGTH: 64 inches
DEPTH: 9 feet

LITHOLOGIC DESCRIPTION

SAND; calcareous; heterogeneous; fine to medium grain; unconsolidated; well-sorted; trace amounts of terrigenous material; uniform composition/color throughout entire core; downward darkening; no downward coarsening; appears to be beach quality sand.

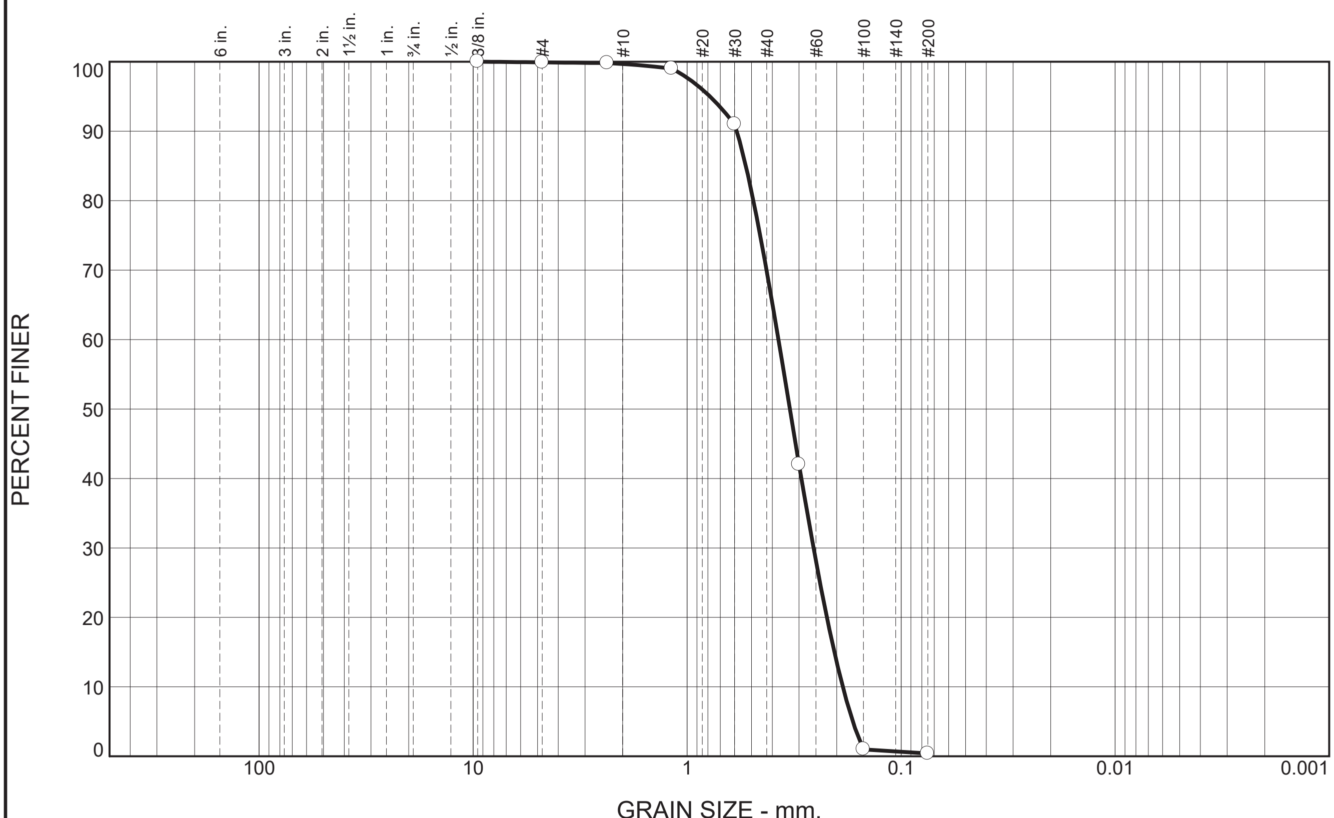
- **0 – 6 in:** SAND; calcareous; fine to medium grain; tan color; well-sorted; rounded; low sphericity; 0-5% Halimeda; lighter-tan sand in upper 6”.

- **6 – 51 in:** SAND; calcareous; fine to medium grain; medium-gray color; well-sorted; rounded; low sphericity; 0-5% Halimeda; 1” diameter coral cobbles at 19”.

- **51 – 62 in:** SAND; calcareous; fine-medium; darkish-gray color; well-sorted; rounded; low sphericity; darkest in bottom 12”.

REPRESENTATIVE APPEARANCE

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	30	70	0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	100		
#8	100		
#16	99		
#30	91		
#50	42		
#100	1		
#200	0.4		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.5864 D_{85}= 0.5318 D_{60}= 0.3745
D_{50}= 0.3312 D_{30}= 0.2567 D_{15}= 0.2051
D_{10}= 0.1874 C_u= 2.00 C_c= 0.94

Classification

USCS= SP AASHTO=

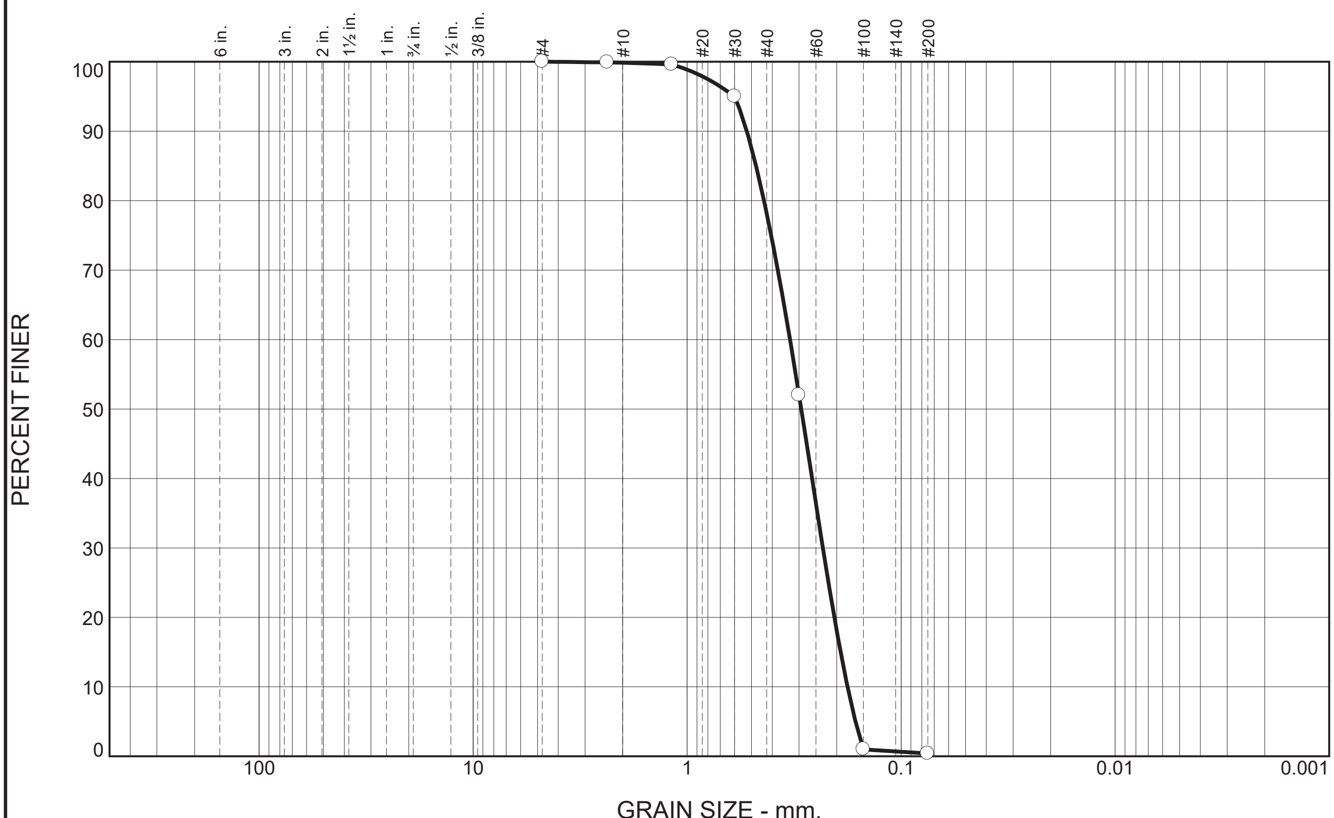
Remarks

Location: Waikiki 1.1
Sample Number: 83756 1
Date: 6/15/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: Material Qualification
Project No: SEAENG030 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	21.6	77.8	0.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.9		
#16	99.6		
#30	95.0		
#50	52.0		
#100	1.0		
#200	0.4		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.5265 D_{85}= 0.4764 D_{60}= 0.3307
D_{50}= 0.2930 D_{30}= 0.2321 D_{15}= 0.1918
D_{10}= 0.1782 C_u= 1.86 C_c= 0.91

Classification

USCS= SP AASHTO=

Remarks

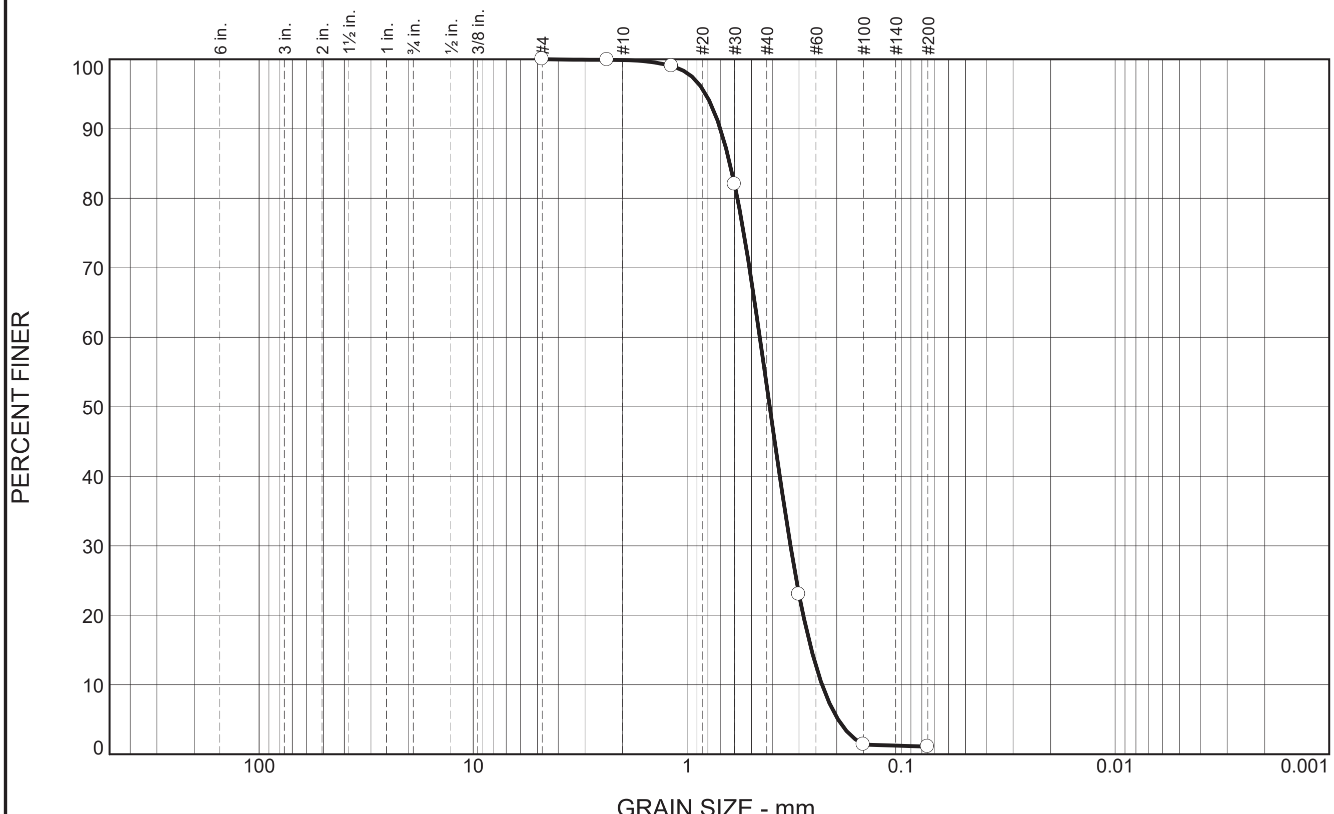
Location: Waikiki 1.1 Top
Sample Number: 83037 1

Date: 5/9/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: 25548 Sand Testing
Project No: SEAENG031 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	46.8	52.0	1.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.9		
#16	99.0		
#30	82.0		
#50	23.0		
#100	1.4		
#200	1.1		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.6996 D_{85}= 0.6308 D_{60}= 0.4574
D_{50}= 0.4111 D_{30}= 0.3290 D_{15}= 0.2625
D_{10}= 0.2342 C_u= 1.95 C_c= 1.01

Classification

USCS= SP AASHTO=

Remarks

Location: Waikiki 1.1 Bottom
Sample Number: 83037 2
Date: 5/9/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: 25548 Sand Testing
Project No: SEAENG031 **Figure**

LOCATION: **WAIKIKI, OAHU, HAWAII**
CORE: **Waikiki 2.1**
EASTING: 1698916.4
NORTHING: 38422.1
RECOVERED: 3/20/2017
LENGTH: 52 inches
DEPTH: 13 feet

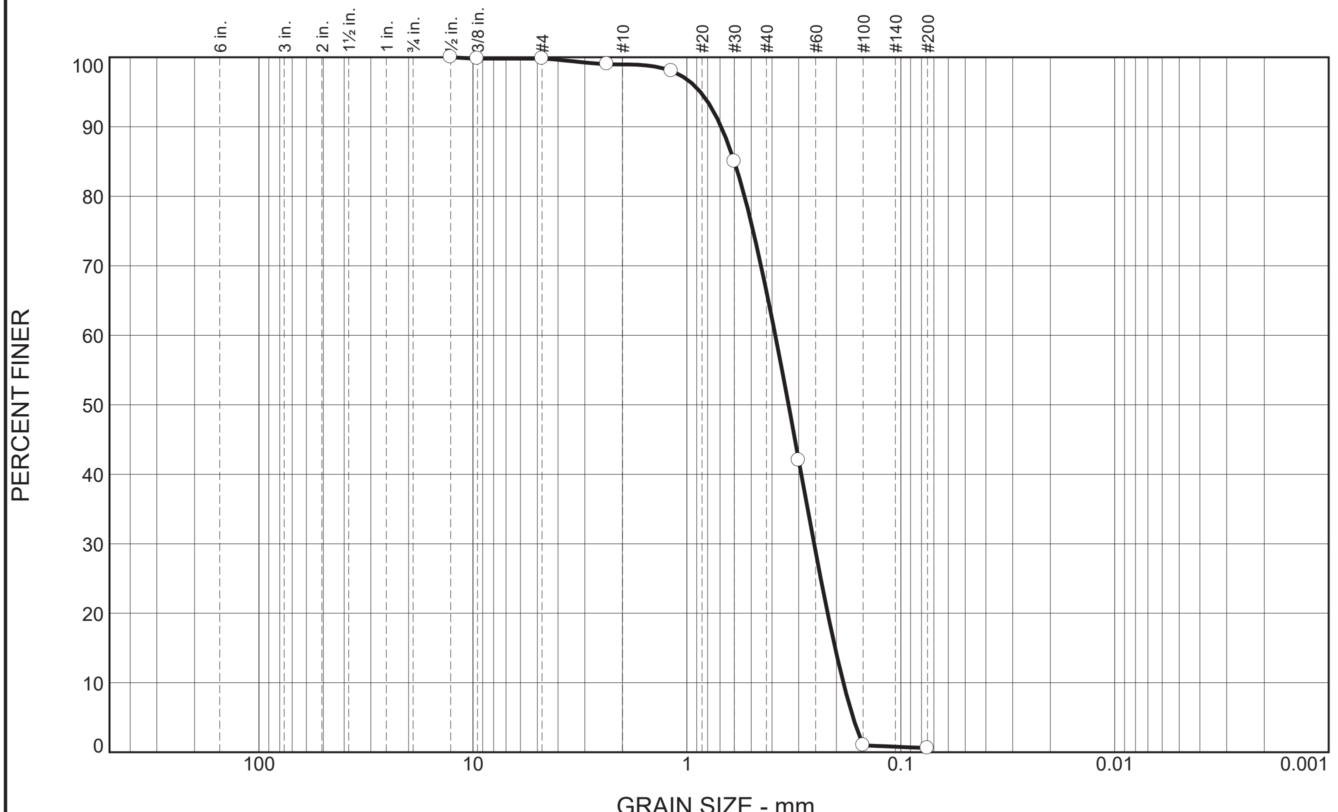
LITHOLOGIC DESCRIPTION

SAND; calcareous; heterogeneous; fine to medium grain; unconsolidated; well-sorted; trace amounts of terrigenous material; uniform composition/color throughout entire core; downward darkening; downward coarsening; appears to be beach quality sand.

- **0 – 7 in:** SAND; calcareous; fine to medium grain; light-tan color; well-sorted; rounded; low sphericity; 0-5% shell hash, Halimeda, and coralline algae; lighter-tan sand in upper 7”.
- **7 – 37 in:** SAND; calcareous; fine to medium grain; light tannish-gray color; well-sorted; moderately rounded; low sphericity; 0-5% Halimeda; 1” diameter coral cobbles at 19”.
- **37 – 52 in:** SAND; calcareous; medium grain; darkish-gray color; well-sorted; angular; low sphericity; intact shell material; 10-15% coralline algae.

REPRESENTATIVE APPEARANCE

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	33	65	1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100		
3/8"	100		
#4	100		
#8	99		
#16	98		
#30	85		
#50	42		
#100	1		
#200	0.6		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.6913 D_{85}= 0.6000 D_{60}= 0.3861
D_{50}= 0.3349 D_{30}= 0.2542 D_{15}= 0.2028
D_{10}= 0.1856 C_u= 2.08 C_c= 0.90

Classification

USCS= SP AASHTO=

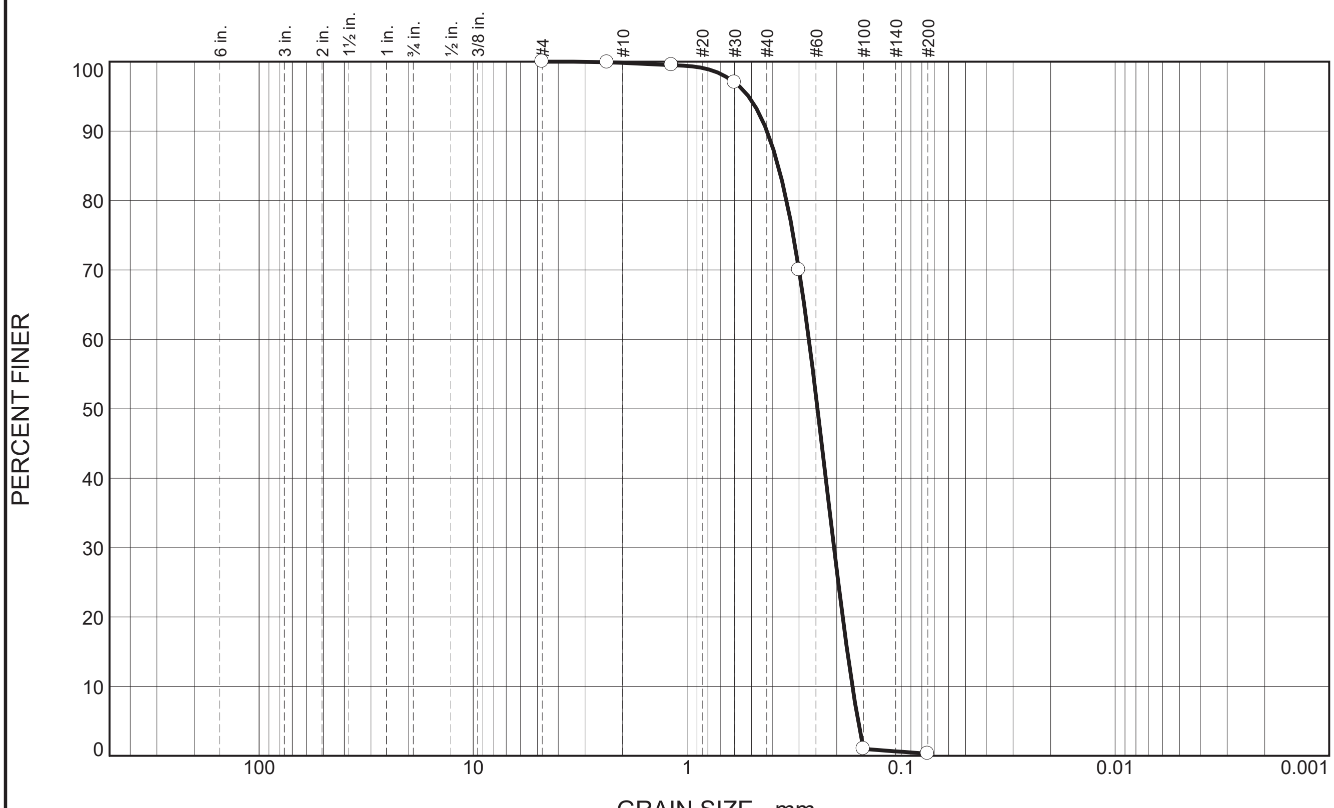
Remarks

Location: Waikiki 2.1
Sample Number: 83756 2
Date: 6/15/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: Material Qualification
Project No: SEAENG030 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	9.7	89.8	0.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.9		
#16	99.5		
#30	97.0		
#50	70.0		
#100	1.0		
#200	0.3		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4235 D_{85}= 0.3756 D_{60}= 0.2700
D_{50}= 0.2459 D_{30}= 0.2059 D_{15}= 0.1785
D_{10}= 0.1691 C_u= 1.60 C_c= 0.93

Classification

USCS= SP AASHTO=

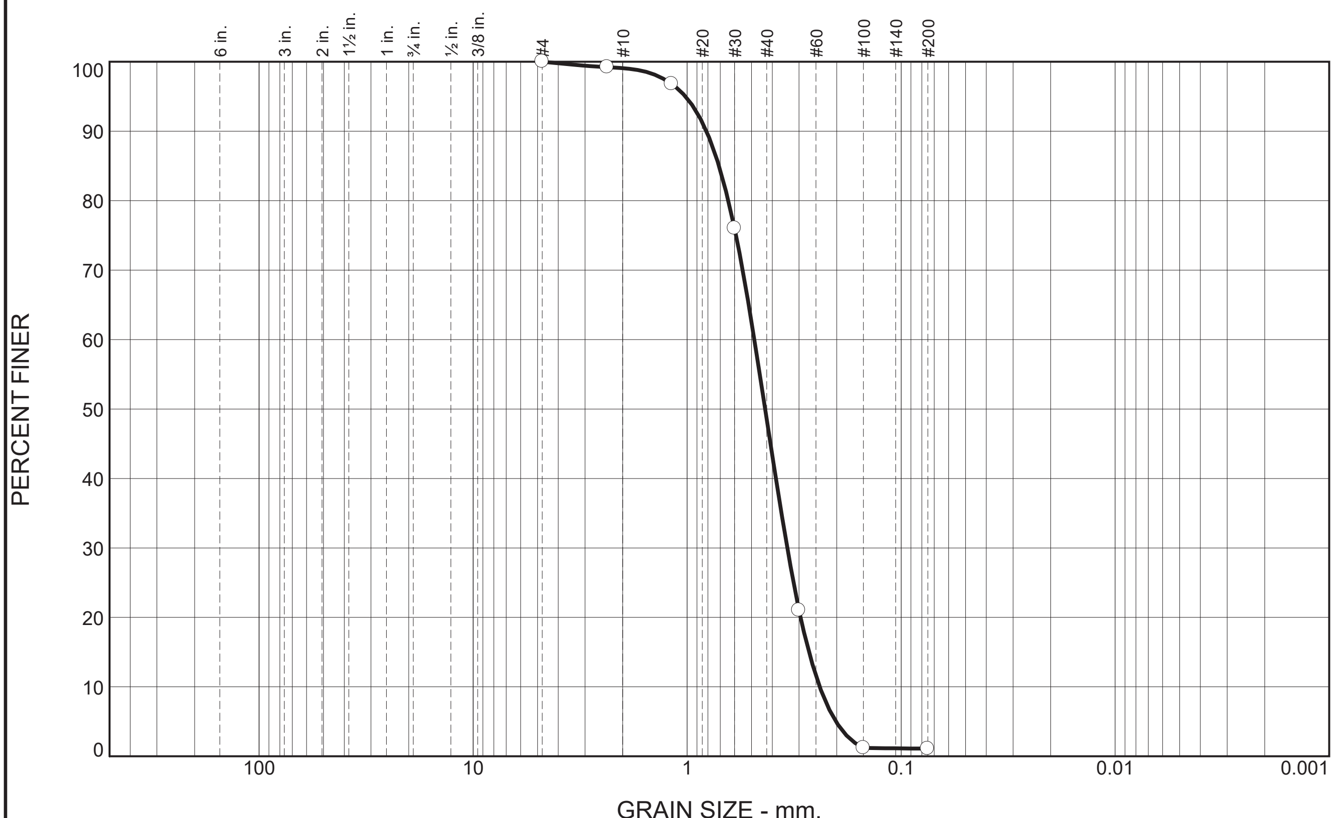
Remarks

Location: Waikiki 2.1 Top
Sample Number: 83037 3
Date: 5/9/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: 25548 Sand Testing
Project No: SEAENG031 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.9	50.5	47.5	1.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.2		
#16	96.8		
#30	76.0		
#50	21.0		
#100	1.2		
#200	1.1		

* (no specification provided)

Material Description

Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.8127 D_{85}= 0.7098 D_{60}= 0.4853
D_{50}= 0.4320 D_{30}= 0.3406 D_{15}= 0.2697
D_{10}= 0.2401 C_u= 2.02 C_c= 1.00

Classification

USCS= SP AASHTO=

Remarks

Location: Waikiki 2.1 Bottom
Sample Number: 83037 4

Date: 5/9/17

CONSTRUCTION ENGINEERING LABS, INC.
Pearl City, Hawaii

Client: Sea Engineering, Inc.
Project: 25548 Sand Testing

Project No: SEAENG031 **Figure**

FINAL PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

Waikīkī Beach Improvement and Maintenance Program

October 2024

Prepared for:
Hawai‘i Department of Land and Natural Resources
Office of Conservation and Coastal Lands
1151 Punchbowl Street, Suite 131
Honolulu, Hawai‘i 96813

Partnered with:
Waikīkī Beach Special Improvement District Association
2250 Kalākaua Ave. Suite 315
Honolulu, Hawai‘i 96815

Prepared by:
Sea Engineering, Inc.
Makai Research Pier
41-305 Kalaniana‘ole Hwy
Waimānalo, Hawai‘i 96795

APPENDIX C

Marine Biological Resources Assessment

Prepared By: AECOS, Inc.

AECOS No. 1662B

Marine biological resources off Waikīkī Beach, Oʻahu

Prepared by:

AECOS, Inc.
45-939 Kamehameha Hwy, Suite 104
Kāneʻohe, Hawaiʻi 96744-3221

April 8, 2021
Revised May 18, 2021

Marine biological resources off Waikīkī Beach, O‘ahu[1]

April 8, 2021
Revised May 18, 2021

DRAFT

AECOS No. 1662B

Stacey Kilarski
AECOS, Inc.
45-939 Kamehameha Hwy, Suite 104
Kāne'ohe , Hawai'i 96744
Phone: (808) 234-7770 Fax: (808) 234-7775 Email: stacey@aecos.com

[1] Report prepared for Sea Engineering, Inc. to become part of the public record.

Introduction

Waikīkī Beach extends along the shoreline of Māmala Bay on the south shore of the island of Oʻahu, Hawaiʻi (Figure 1). The beaches of Waikīkī are chronically eroding, and the backshore is frequently flooded, particularly during high tides and high surf events. As the beaches continue to erode, a process that will accelerate as sea level continues to rise, the shoreline will migrate further landward. The Hawaiʻi Department of Land and Natural Resources (HDLNR) proposes beach improvement and maintenance projects in the Fort DeRussy, Halekūlani, Royal Hawaiian, and Kūhiō Beach sectors of Waikīkī ("Project"). Included is the construction of new beach stabilization structures and the recovery of offshore sand for placement on the shore. Objectives of the proposed actions are to restore and improve Waikīkī's public beaches, increase beach stability through improvement and maintenance of shoreline structures, provide safe access to and along the shoreline, and increase resilience to coastal hazards and sea level rise. An Environmental Impact Statement (EIS) is being prepared for the Project, and *AECOS* was contracted to conduct marine surveys of the waters adjacent to the Project location to support the EIS development. Our surveys were undertaken in February and March, 2021. In March, 2021, we prepared an interim summary report. This full report supplements that summary report and presents details of our findings.

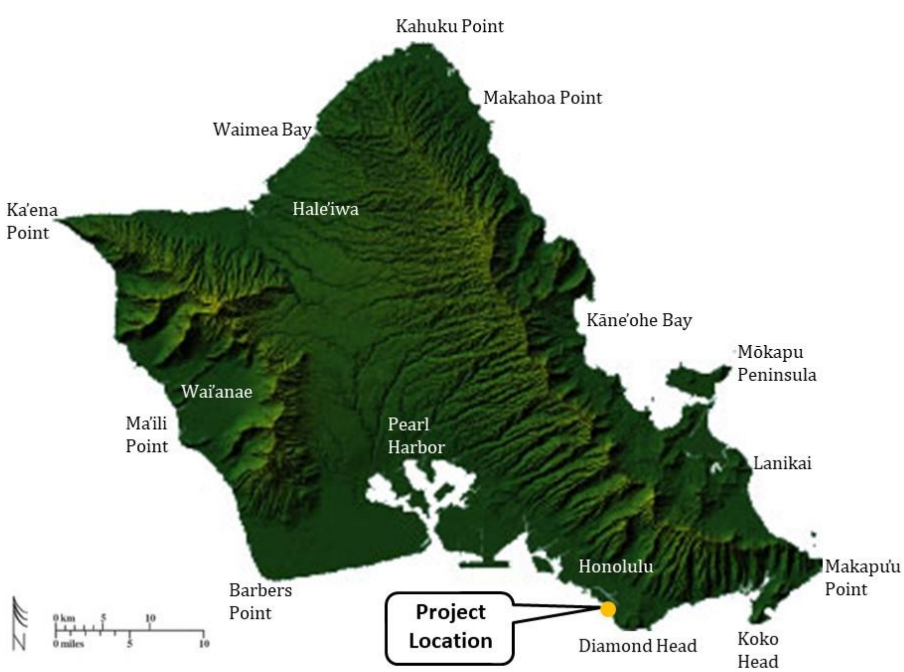


Figure 1. Waikīkī Project area.

Project description

The beaches of Waikīkī are composed primarily of imported sand and the existing shoreline configuration is mostly the result of previous projects to widen and stabilize the beach. Almost the entire length of Waikīkī is armored by seawalls, many of which are in various states of disrepair. In recent years, exceptional spring tides (now referred to as king tides) have exacerbated erosion and flooding in Waikīkī. Project improvement and maintenance actions encompass four beach sectors in Waikīkī' (Figures 2 through 6):

1. *Fort DeRussy Beach – beach maintenance*
   The proposed action for the Fort DeRussy Beach sector is to move sand from an accretion area at the west end of the beach to an eroding area at the east end, relocating approximately 917 cubic meters (1,200 cubic yards) of sand and widening the beach by an average of 3 m (10 ft).

2. *Halekūlani Beach – beach nourishment with stabilizing groins*
   The Halekulani Beach sector spans approximately 442 m (1,450 ft) of shoreline extending from the Fort DeRussy outfall groin east to the Royal Hawaiian groin. The proposed action for the Halekulani Beach sector is to construct a new beach with new stabilizing groins and produce a wide, stable beach with approximately 46,000 cubic meters (60,000 cubic yards) of sand fill.

3. *Royal Hawaiian Beach – beach nourishment and maintenance*
   The Royal Hawaiian Beach sector spans approximately 527 m (1,730 ft) of shoreline extending from the Royal Hawaiian groin east to the ʻEwa groin at Kūhiō Beach Park. The proposed action for the Royal Hawaiian Beach sector is to conduct periodic beach nourishment to maintain the beach by recovering sand from deposits located directly offshore and placing it on the beach.

4. *Kūhiō Beach – beach nourishment, breakwater and beach maintenance*
   The Kūhiō Beach sector spans approximately 457 m (1,500 ft) of shoreline extending from the ʻEwa groin at Kūhiō Beach Park east to the Kapahulu storm drain. The proposed actions for the Kūhiō Beach sector are divided into actions for the ʻEwa basin and the Diamond Head basin. The improvements to the ʻEwa basin would involve removing portions of the existing breakwater, construction of a new groin and segmented breakwater system, and placement of sand fill to increase beach width. The proposed action in the Diamond Head basin would consist of beach maintenance with no modifications to existing structures.

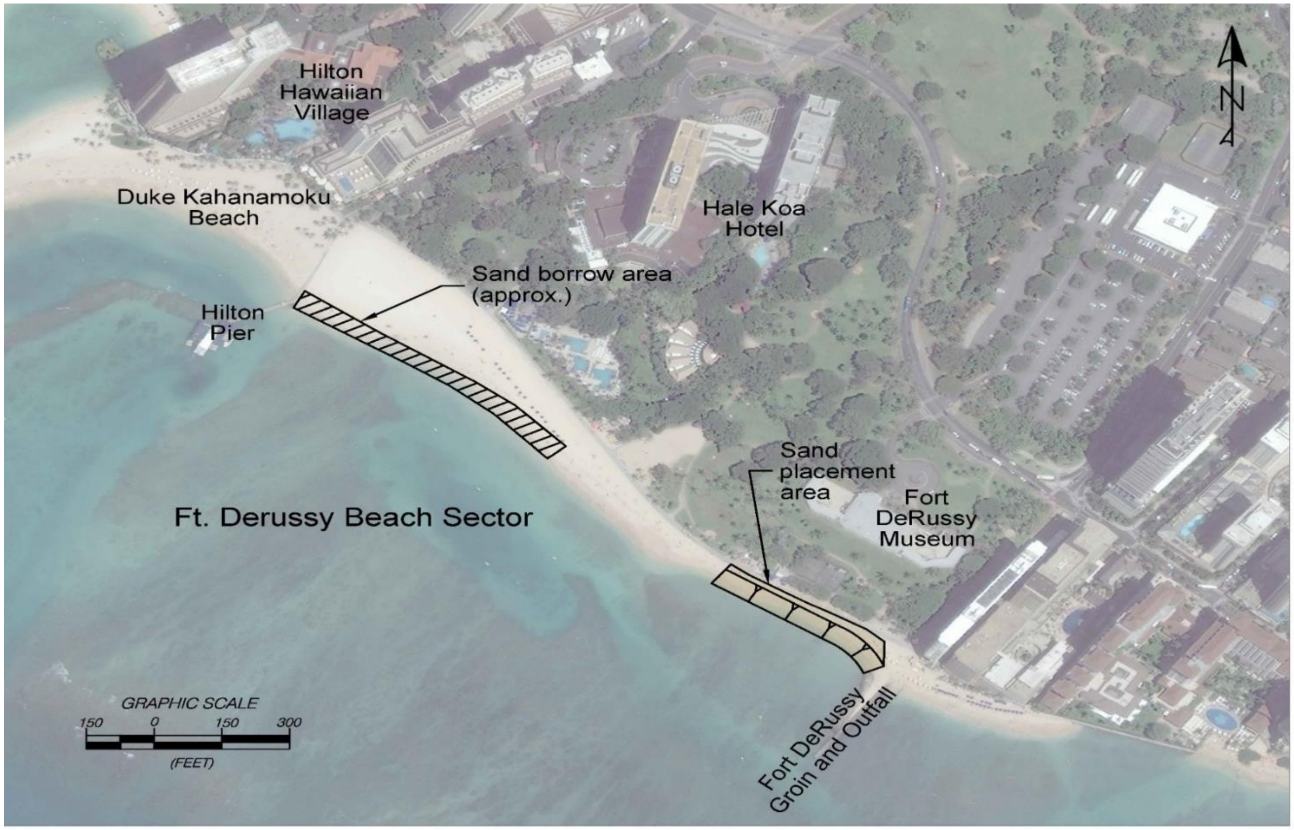


Figure 2. Ft. DeRussy Beach Sector conceptual design (SEI, 2021).

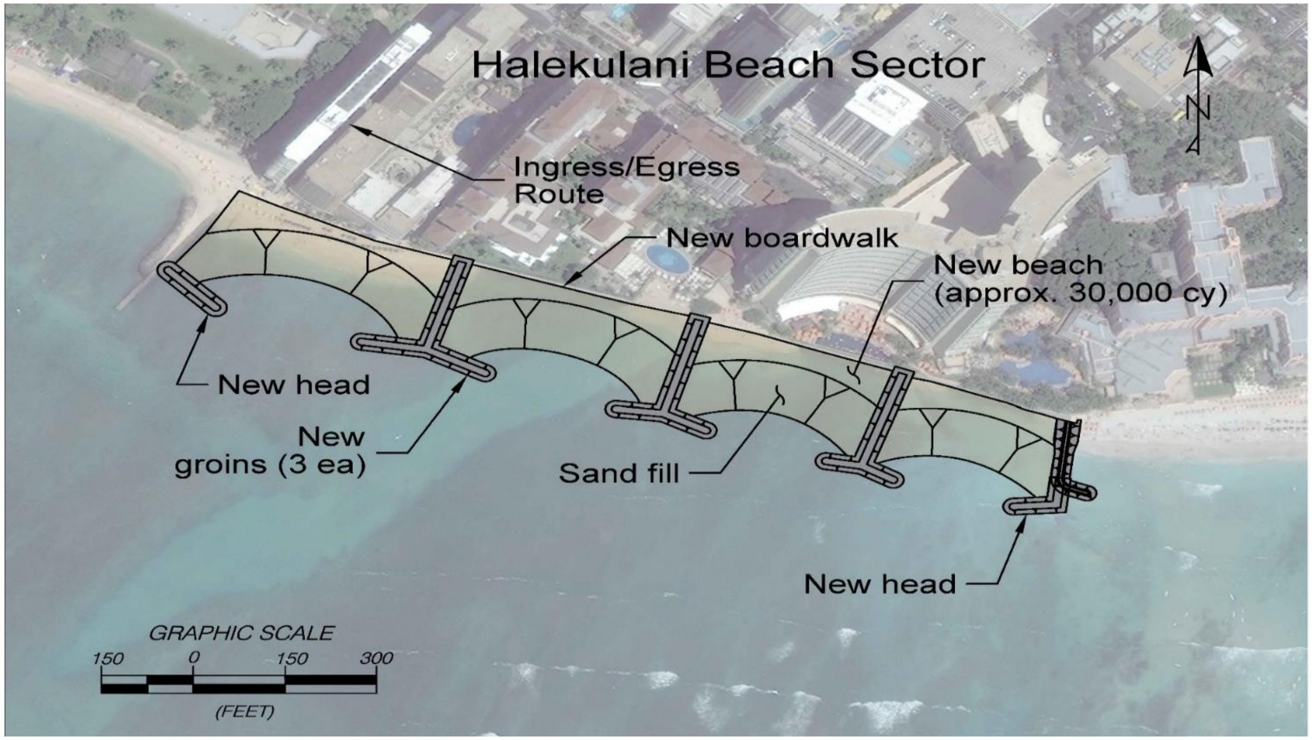


Figure 3. Halekūlani Sector conceptual design (SEI, 2021).

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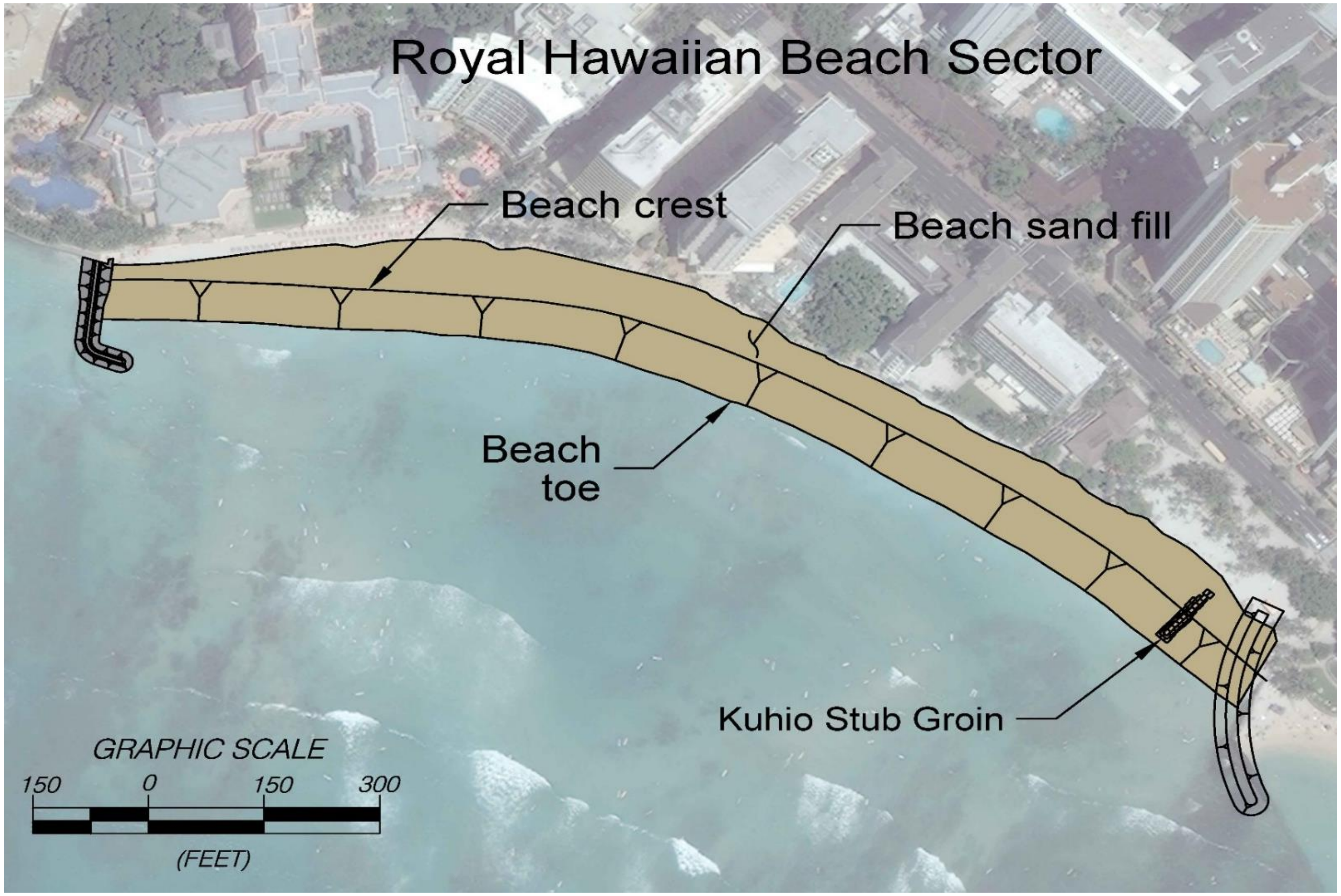

Figure 4. Royal Hawaiian Beach Sector conceptual design (SEI, 2021).

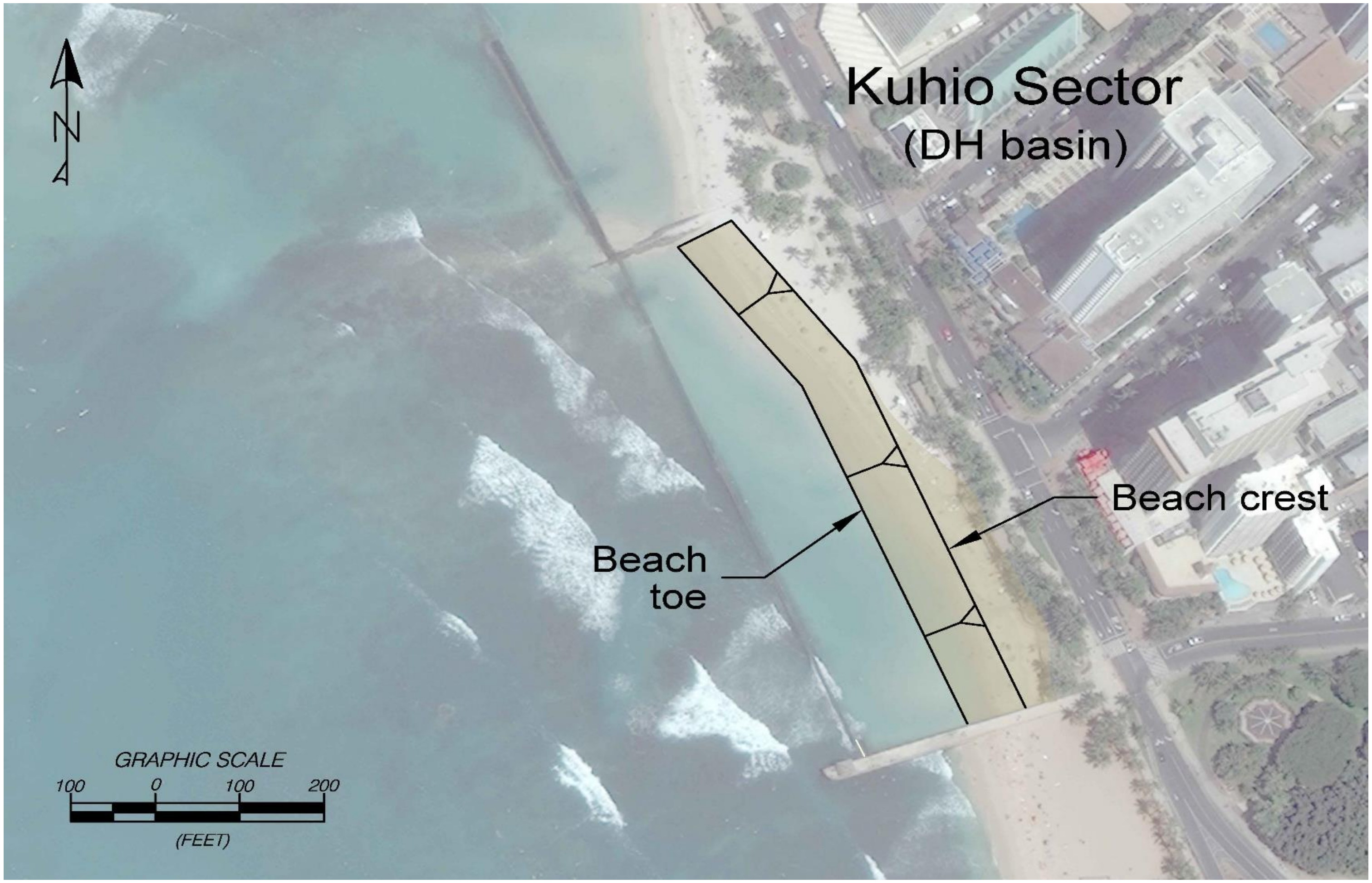

Figure 5. Kūhiō Sector (Diamond Head Basin) conceptual design (SEI, 2021).

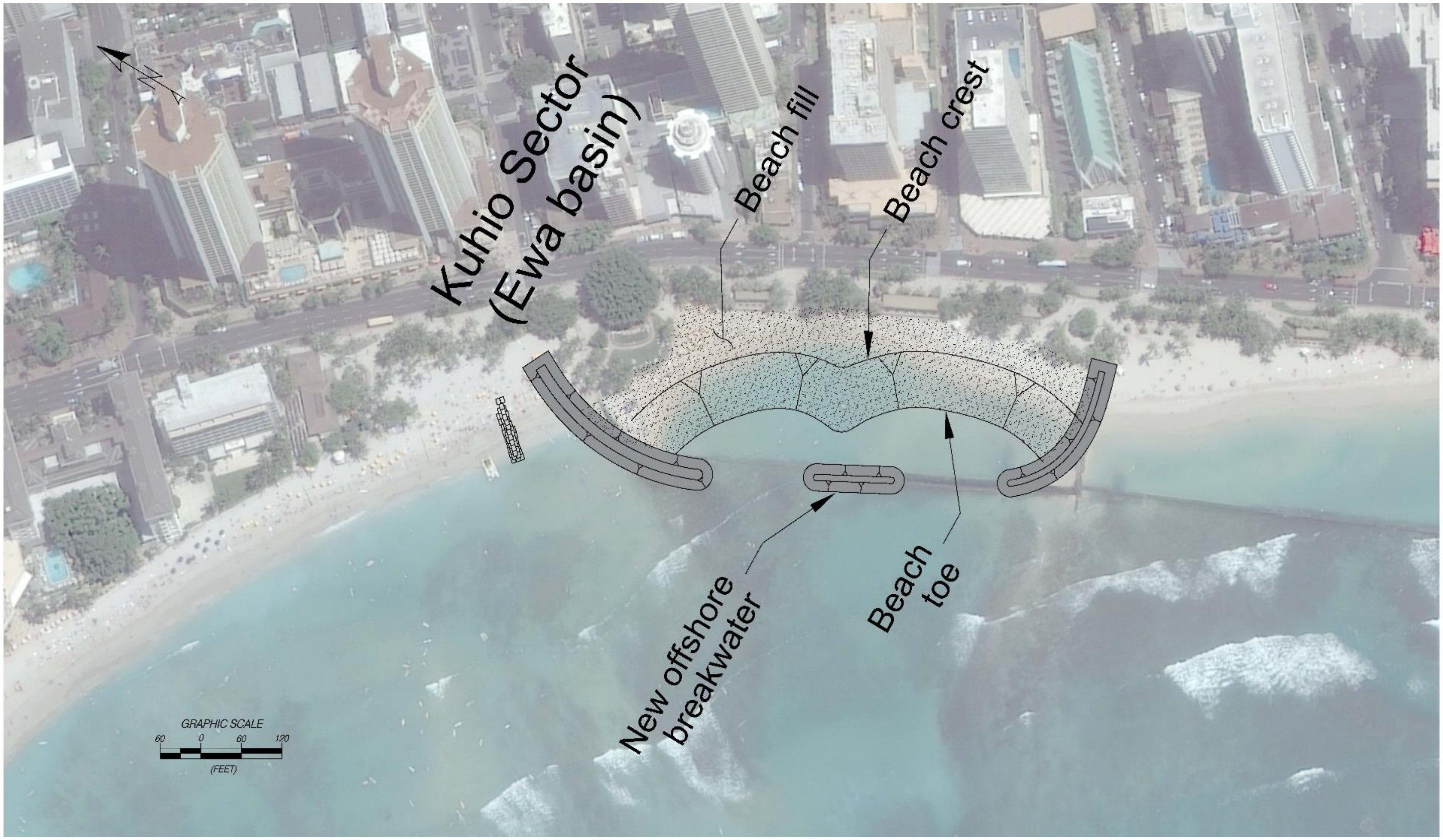

Figure 6. Kūhiō Sector (ʻEwa Basin) conceptual design (SEI, 2021).

Site Description

The fringing reef off Waikīkī is an eroded limestone platform influenced by sand suspension and scour caused by impinging waves. The areas of hard bottom are generally slightly raised above the sand plains and consist of heavily eroded biogenic limestone. Numerous dead and weathered coral colonies are attached to the limestone surfaces. Live coral colonies also occurred sporadically on the limestone platforms (MRC, 2021). The dominant benthic organisms on the reef platform off Waikīkī Beach are marine macro-algae or *limu*, which cover most exposed hard surfaces not scoured or buried by shifting sand. Nearshore algal cover is 75 to 100% (based on visual estimates), except in areas exposed to sand scour (such as channel margins and limestone outcrops in sand fields) where algae coverage is less than 25% of the hard bottom. The growth form of these algae is typically low-growing or turf-like.

Up to 87 different species of algae have been reported from the Waikīkī reef since 1969 (Doty, 1969; Chave et al., 1973; OI, 1991; Huisman et al., 2007; MRC, 2007; and *AECOS*, 2007, 2008, 2009, 2010). Table A is a checklist of algae observed on the reef off Waikīkī Beach from the most recent surveys (February and March 2021), and those observed previously in surveys off Waikīkī Beach (July 2009, May and June 2010) and Kūhiō Beach and Gray's Beach (*AECOS*, 2007, 2008, and 2009a). Although the flora of Waikīkī reef remains relatively diverse today, two invasive red algae (Rhodophyta): *Acanthophora spicifera* and *Gracilaria salicornia*, dominate the benthic flora (Smith et al., 2004; Huisman et al., 2007; MRC, 2007, 2021; *AECOS*, 2007a, 2008, 2009a).

Common macro-invertebrates observed in various surveys on the reef flat off Waikīkī include *Holothuria atra*, *H*. *nobilis*, *Echinothrix diadema*, *Tripneustes gratilla*, *Echinometra mathaei*, *Echinostrephus aciculatus*, and various sponges (OI, 1991); *E*. *matheai*, *E*. *aciculatus*, and *H*. *atra* (MRC, 2007, *AECOS*, 2007a, 2008, 2009a). Table B is a checklist of macro-invertebrates (other than coral) observed on the reef off Waikīkī Beach from the most recent survey (February and March 2021), and observed previously off Waikīkī Beach, Kūhiō Beach, and Gray's Beach (*AECOS*, 2007, 2008, 2009).

The most common (although total cover comprising less than one percent of the bottom) hermatypic corals found on the reef flat off Waikīkī Beach are *Pocillopora meandrina* and *Porites lobata* (OI, 1991; MRC, 2007, 2021; and *AECOS*, 2007, 2008, 2009). In addition, *Cyphastrea ocellina* (MRC, 2007, 2021; *AECOS,* 2007, 2008, 2009), *Montipora capitata*, *M. patula*, *P. evermanni*, *Psammocora stellata*, *Leptastrea purpurea* (*AECOS,* 2007, 2008, 2009), and *L*. *bewickensis* (2009 and 2010 surveys) have been recorded. Table C is a checklist of corals observed on the reef off Waikīkī Beach from the most recent survey and as observed previously (*AECOS*, 2007, 2008, 2009).

Distribution of fishes on the reef flat off Waikīkī is largely determined by local topography and bottom composition, Fishes are generally uncommon in keeping with the mostly low topography on this inner reef flat. Surveys off Waikīkī (MRC, 2007; *AECOS*, 2009) found the most common species to be wrasses (*Thalassoma duperrey*, *T. trilobatum*, *Stethojulis balteata*), *Acanthurus triostegus* (*manini*), and *Rhinecanthus rectangulus* (reef triggerfish). These surveys also found several species of small juvenile fishes inhabiting small holes and spaces in the reef structure. Table D is a check list of the 58 species observed on the reef off Waikīkī Beach from the most recent survey and as observed previously in surveys off Waikīkī Beach, Kūhiō Beach, and Gray's Beach (*AECOS*, 2007, 2008, 2009).

The nearshore waters of Māmala Bay off Waikīkī are designated as Class A coastal, marine waters in Hawaiʻi water quality standards (HDOH, 2014). It is the objective of Class A waters that their use for recreational purposes and aesthetic enjoyment be protected. Other uses are permitted so long as they are compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation. Class A waters are not to act as receiving waters for any discharge which has not received the best treatment or control practicable.

Waters in the Project area are included on the HDOH 2020 list of impaired waters in Hawaiʻi—prepared under Clean Water Act §303(d) (HDOH, 2020)—for nitrate+nitrite, ammonia, turbidity, and chlorophyll α. These nearshore waters are listed as a "Category 2" water body, meaning some uses are attained; in this case, total nitrogen, total phosphorus, and *Entercocci* bacteria. The Project area is also listed as a "Category 5" water body, meaning that "[a]vailable data and/or information indicate that at least one or more designated use is not being supported or is threatened, and a Total Maximum Daily Load Study (TMDL) is needed. The TMDL has been assigned a priority of low.

Methods

On February 18, 19 and March 4, 2021, *AECOS* biologists conducted surveys to inventory marine assemblages in the nearshore waters off the Project. Biologists used snorkel gear to collect data on bottom type, coral colony size-frequency (size, diversity, new recruits, large colonies, health); diversity, dentification and categorization (common vs. uncommon) of algae (including crustose coralline algae) and seagrass; and non-coral macro-invertebrates greater than 3 cm.

Survey Areas and Transect Placement

The baseline biological survey collected data in each of the Project sectors[2]: (1) Fort DeRussy; (2) Halekūlani; (3) Royal Hawaiian; and (4) Kūhiō Sector (ʻEwa Basin), shown in Figure 7.

[2] At the time of our surveys, sand renourishment was occurring in the Kūhiō Sector (Diamond Head basin), and biologists could not enter the sector due to construction.

<u>Fort DeRussy Sector</u> — Biologists surveyed the sand placement area of the Fort DeRussy Beach Sector. The survey consisted of a qualitative, reconnaissance snorkeling survey between the Fort DeRussy groin and the west end of the sand placement area, and out to approximately 25 m from the shoreline.

<u>Halekūlani Sector</u> — Six survey stations were established at the each of the potential groins and groin heads. One additional station was placed directly in front of the Halekūlani Hotel, traversing the sand channel. At the groin stations and Halekūlani station, a 60-m transect was run perpendicular to the shore from the beach crest and terminating near the end of the future groin footprint. At the proposed head stations, a 20-m transect was run parallel to the beach. A survey of benthic composition and coral size class and abundance (as described below) was undertaken along each 60-m "groin" transect and 20-m "head" transect.

<u>Royal Hawaiian Beach Sector</u> — Biologists surveyed the Royal Hawaiian Beach Sector, conducting qualitative surveys of the seafloor. The qualitative survey extended east from the Royal Hawaiian groin to the Kūhiō crib wall, and approximately 20 m out from the shoreline.

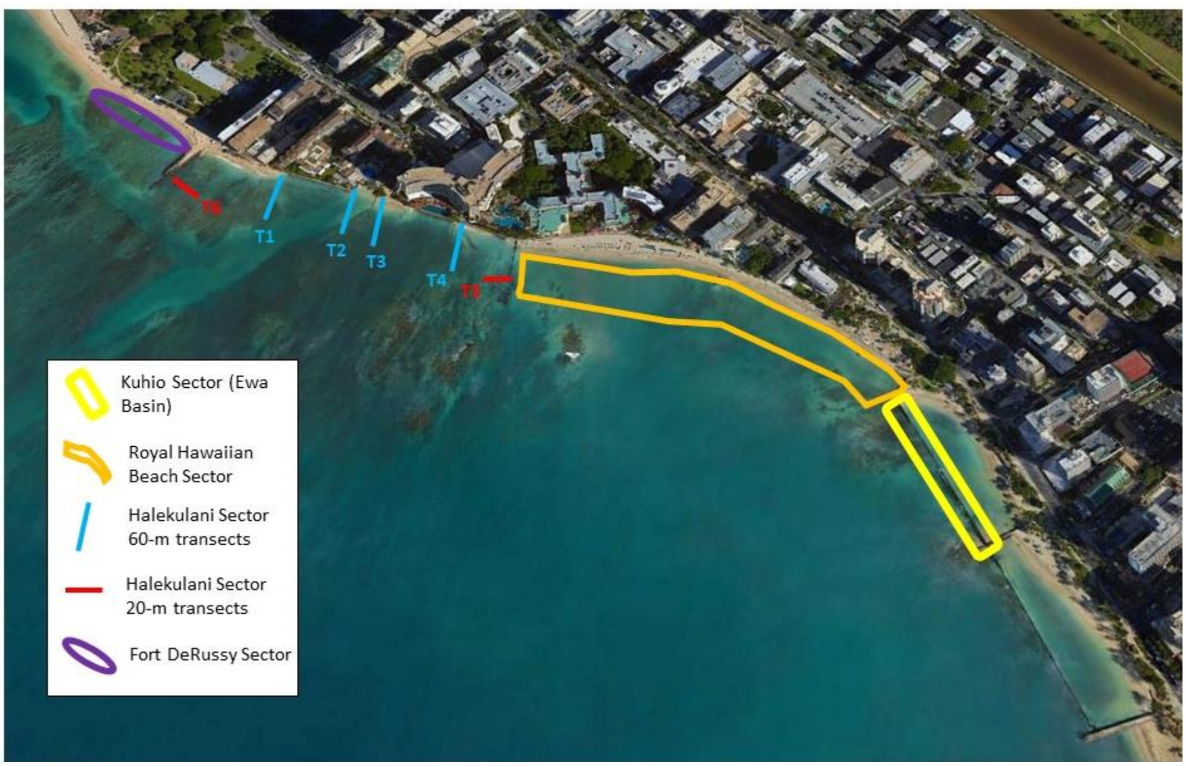

Figure 7. Location of survey areas.

Kūhiō Sector (ʻEwa Basin) — Biologists surveyed the entire existing breakwater structures and immediate surrounding basin floor for corals and other marine biota. A census of corals was made along the entirety of the existing groin.

Benthic Composition

The point intercept method (also termed a line-point intercept method) was used to assess benthic composition on each transect. This protocol uses meter marks on the transect line as sample points. At 0.5-m intervals, the nature of the bottom under each "point" is identified and assigned to one of the following categories: sand, rubble, limestone (rock or pavement), turf algae, crustose coralline algae (CCA), live coral, or macroinvertebrate. Benthic percent cover was calculated by dividing the total number of points for each category by the total number of points sampled times 100.

Coral Abundance and Size Class Distribution

A two-meter belt survey of coral colonies was conducted on each transect. All corals 1 m to either side of the transect line were counted. Coral abundance was determined as the number of individuals observed for each transect normalized to number of individuals per m^2. Coral heads were identified to species and assigned to a size class (1- to 5-cm; 6- to 10-cm; 11- to 20-cm; 21- to 40-cm; 41- to 80-cm; 81- to 160-cm; or >160-cm) based on the largest horizontal dimension of the colony. Coral size-class distribution was determined for each coral species recorded. Percent morbidity (amount of coral colony not alive) and any signs of disease were also recorded.

Results

Fort DeRussy Sector

The dominant substrate here is sand, with patches of rubble and limestone outcrops (Figure 8). Algal growth on the hard bottom was primarily *Padina* sp. and *A. spicifera*. One *Porites* sp. coral colony in the 6-10 cm size class was observed in this sector. Fishes were rare here and included threadfin butterflyfish (*Chaetodon Auriga*), Hawaiian sergeant (*Abudefduf abnominalis*), and spotted boxfish (*Ostracion meleagris*). Sand resuspension and shifting was visible.

Figure 8. At the Fort DeRussy Sector, sand and rubble make up the majority of the bottom type. Hardbottom areas host algal growth (*Padina* sp. and *A. spicifera*).

Halekūlani Sector

Figure 9 (above) displays representative photos of the Halekūlani Sector survey area. Two invasive red algae, *Acanthophora spicifera* and *Gracilaria salicornia* are abundant on the reef flat off the Halekūlani sector of Waikīkī Beach. In addition to these two invasive algal species, other common species include: *Dictyota* spp., *Neomeris* sp., *Codium edule*, *Padina australis*, *Tubinaria ornata*, and *Asparagopsos taxifolia*. Another invasive species, *Avrainvillea amadelpha*, is present. Sea urchins are the most conspicuous invertebrates on the reef flat, particularly *Echinometra mathaei*, which burrows into the limestone, and *Tripneustes gratilla*, which grazes open hard bottom areas. *Holothuria atra*, the black sea cucumber or *loli*, is the most common sea cucumber here. Scattered coral colonies (*Porites* spp. and *Pocillopora damicornis*) occur on the reef flat in the Halekūlani Sector.

Thalassoma duperrey (saddle wrasse) is the most common species on the reef flat in the Project area. *Acanthurus triostegus sandvicensis* (m*anini*) is also commonly seen in small schools feeding on benthic algae, and *Thalassoma trilobatum* (Christmas wrasse), *Stethojulis balteata* (belted wrasse), and *Rhinecanthus rectangulus* (reef triggerfish) are commonly seen solitarily scavenging for algae and benthic invertebrates. *Naso unicornis* (*kala*) and *Arothron hispidus* (*ʻoʻopu hue*) are encountered occasionally farther offshore

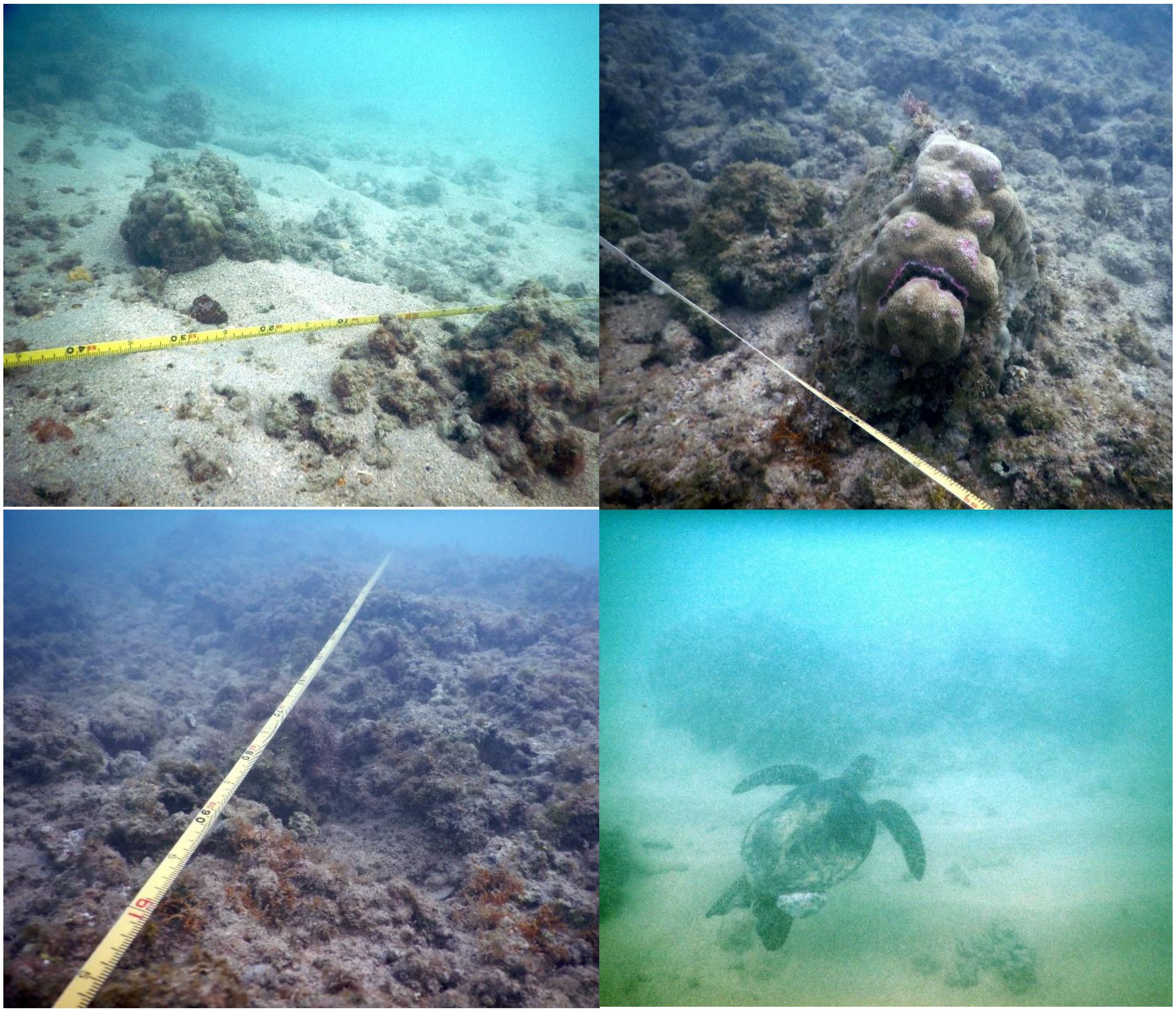

Figure 9. The dominant bottom types in the Halekulani Sector are sand and rubble (top left). Coral abundance is very low and coral distribution patchy; *Porites* sp. (top right) are uncommon. *Acanthophora spicifera* and *Gracilaria salicornia* are abundant on the reef flat (bottom left). One state- and federally-listed green sea turtle (*Chelonia mydas*) was observed (bottom right).

Benthic Composition - Four 60-m transects and two 25-m transects were used to assess the benthic community of the seafloor in the Halekūlani Sector area. The results of the point-intercept survey are presented in Figures 10 and 11. The dominant bottom type is rubble, at 24%, closely followed by sand and macroalgae, with similar covers at

23% and 19%, respectively. Live coral is low across the transects, at less than 1% of the total. The category "Other" accounts for basalt rock (boulders and seawall).

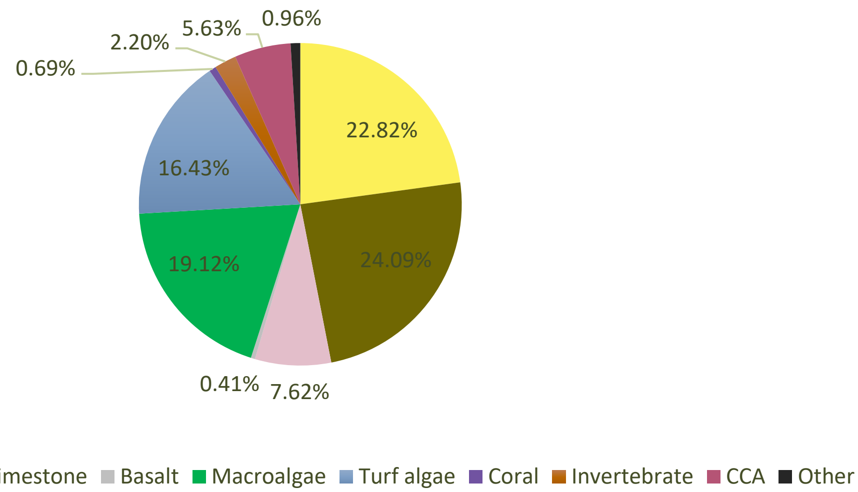

Figure 10. Percent benthic cover as measured using point-intercept along four 60-m transects and two 25-m transects in the Halekūlani Sector.

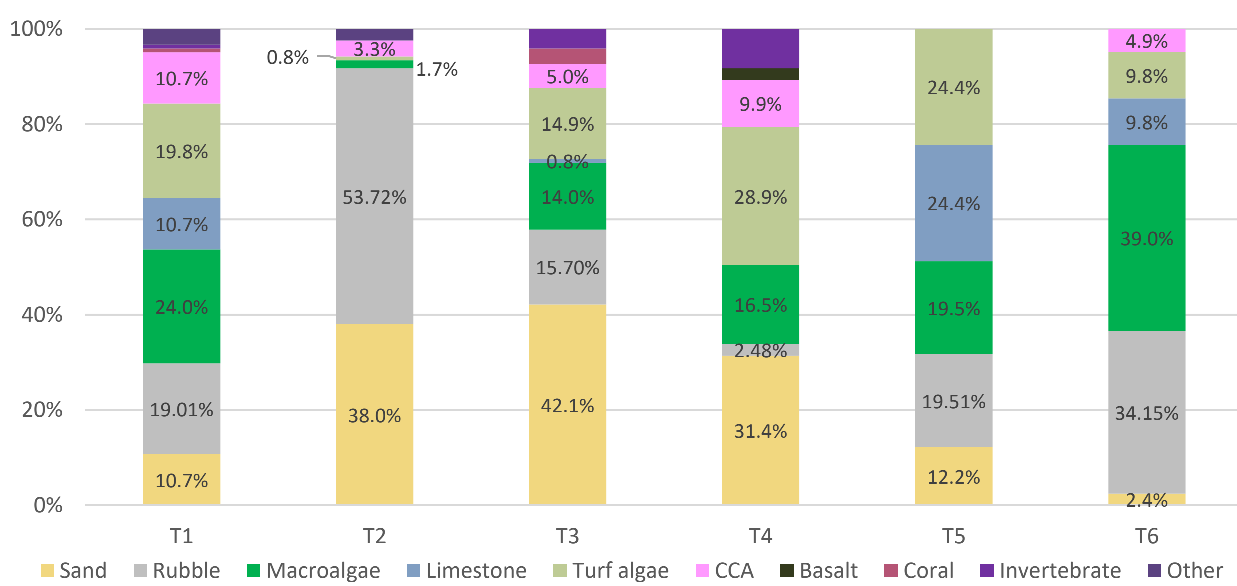

Figure 11. Percent benthic cover as measured using point-intercept along four 60-m transects (T1-T4) and two 25-m transects (T5 and T6).

Coral Abundance and Size Class Distribution - Coral abundance determined on each transect is presented in Table 1. A total of 28 colonies were counted on the six transects. Density of corals in the proposed groin and T-head footprints of the Halekūlani sector is low, with an average of 0.1 colony/m^2. Results of the coral size class survey are presented in Table 2 and Figure 12. A total of 28 coral colonies, representing at least three coral taxa (*Pocillopora damicornis*, *Porites compressa* and *Porites* sp.) were recorded. The most common species was *Porites* sp. at 57% of the total. The most common colony size was the 1- to 5-cm class (39% of the total). Large (41- to 80- cm) colonies were rare (one *Porites* sp. colony). No colonies greater than 80 cm was recorded.

Royal Hawaiian Beach Sector

The Royal Hawaiian Beach Sector is sand with occasional limestone outcrops with algae (*Acanthophora spicifera, Padina* sp., and patches of *Gracilaria salicornia*). Corals and seagrass are absent. Much of this area is intertidal or shallow subtidal marked by small, breaking waves most days of the year. Constant resuspension of sediments and sand scour is observed (MRC, 2021, *AECOS*, 2009). As such, biotic communities inhabiting this area are subjected to the effects of shifting sand. Because of these stresses, as well as limited solid substrate required for settlement, coral communities and seagrass do not occur in this sector, and are not expected to occur between the Royal Hawaiian Beach and the dredge site.

Table 1. Total number of coral colonies and coral colony abundance (mean colonies per m^2) counted on six transects.

Transect	Survey area (m^2)	Coral count (colonies)	Coral abundance (no./m^2)
1	60	4	0.1
2	60	2	0.0
3	60	14	0.2
4	60	2	0.0
5	20	1	0.1
6	20	5	0.3
Total	**280**	**28**	**0.1**

Table 2. Number of coral colonies in each size class by species from two nearshore transects (100 m^2 survey area).

	Size class (cm)							
Taxa	**1 to 5**	**6 to 10**	**11 to 20**	**21 to 40**	**41 to 80**	**81 to 160**	**Total**	***Percent of total***
Poc. damicornis	8	3	--	--	--	--	11	***39.3%***
P. compressa	--	--	1	--	--	--	1	***3.6%***
Porites sp.	3	4	3	5	1	--	16	***57.1%***
Total count	**11**	**7**	**4**	**5**	**1**	--	28	
Percent of total	*39.3%*	*25.0%*	*14.3%*	*17.9%*	*3.6%*	*0%*		

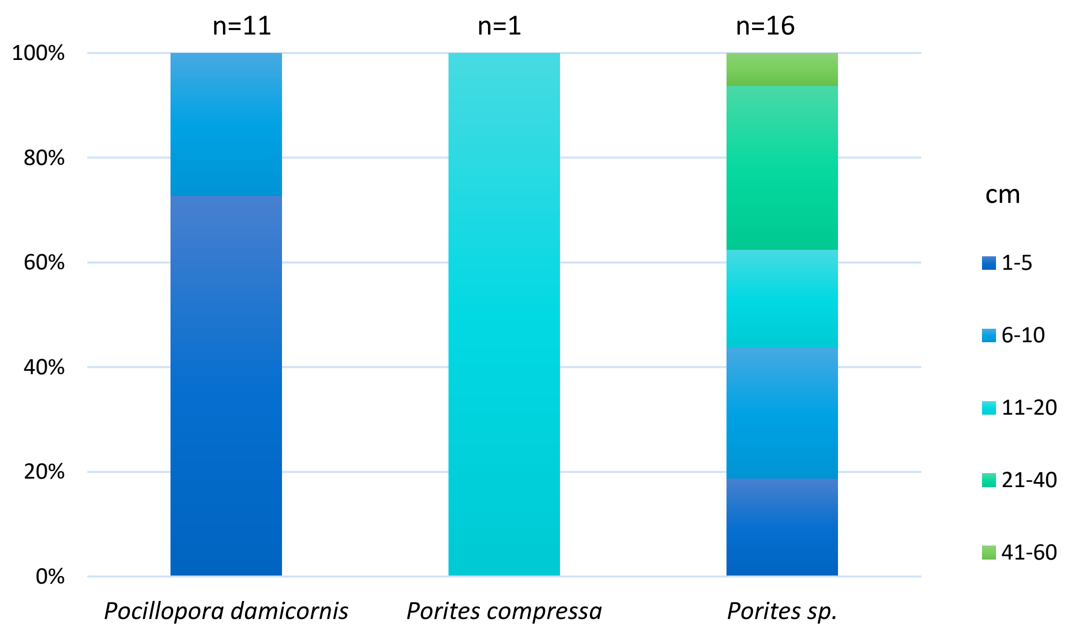

Figure 12. Coral colony sizes (cm) for transects in the Halekūlani Sector survey area. n = total number of colonies measured in size class.

Kūhiō (ʻEwa Basin) Sector

Figure 13 displays representative photos of the Kūhiō (ʻEwa Basin) Sector survey area. Biologists surveyed the entire existing Kūhiō crib wall structures and immediate surrounding basin floor for corals and other marine biota. The bottom substrate in the basin is sand. No corals or seagrass were observed on the sea floor of the basin. The intertidal zone of the existing structures is covered with small numbers of nerite snail (*Nerita picea*), thin shelled rock crab (*Grapsus tenuicrustatus*), and macroalgae (*Cladophora* sp. *Hydrolithon onkodes*, *Dictyota acutiloba*, *Laurencia nidifica*, *Acanthophora spicifera,* and *Gracilaria salicornia*). Invertebrates common here include urchins (*E. mathaei* and *Diadema paucispinum*) and sea cucumbers (*Holothuria atra* and *H. cinerascens*).

A census of corals was made along the entirety of the existing crib wall. No corals were observed on the existing structure. Several coral colonies (*Pocillopora damicornis*) in the <5 cm size class were observed on the outside of the seafloor beyond the crib wall, approximately 10 ft (3 m) seaward from the structure.

A total of 17 species of fishes were identified in and around the basin. Fishes closely associated with the structures included: trumpetfish (*Alustomus chinensis*), Hawaiian gregory (*Stegastes marginatus*), yellowfin goatfish (*Mulloidichthys vanicolensis*), and tobies (*Canthigaster amboinensis*, and *C. jacator*). Other fishes observed included: surgeonfishes (*Acanthurus triostegus*, *Acanthurus blochii*, juvenile *Naso unicornis*), wrasses (*Stethojulis balteata*, *Thalassoma duperrey* and *T. purpurem*), schools of flagtail (*āholehole* or *Kuhlia xenura*), schools of goatfishes (*Parupeneuss multifasciatus* and *P. porphyreus*).

Kūhiō (Diamond Head Basin) Sector

At the time of our February and March 2021 surveys, the Kūhiō Sector (Diamond Head basin) was an active de-watering basin and biologists could not enter the water However, conclusions about this basin can be made about this sector based on visual observations and comparisons to the ʻEwa Basin. The Diamond Head basin is a highly disturbed area, with visible turbidity plumes. As observed in and around the ʻEwa Basin, the Diamond Head basin is assumed to be sand bottom. Due to elevated turbidity, no seagrass or corals would be expected on the seafloor. Because no corals were observed on the crib wall of the ʻEwa Basin, we conclude a similar composition would be found on the Diamond Head basin wall structures.

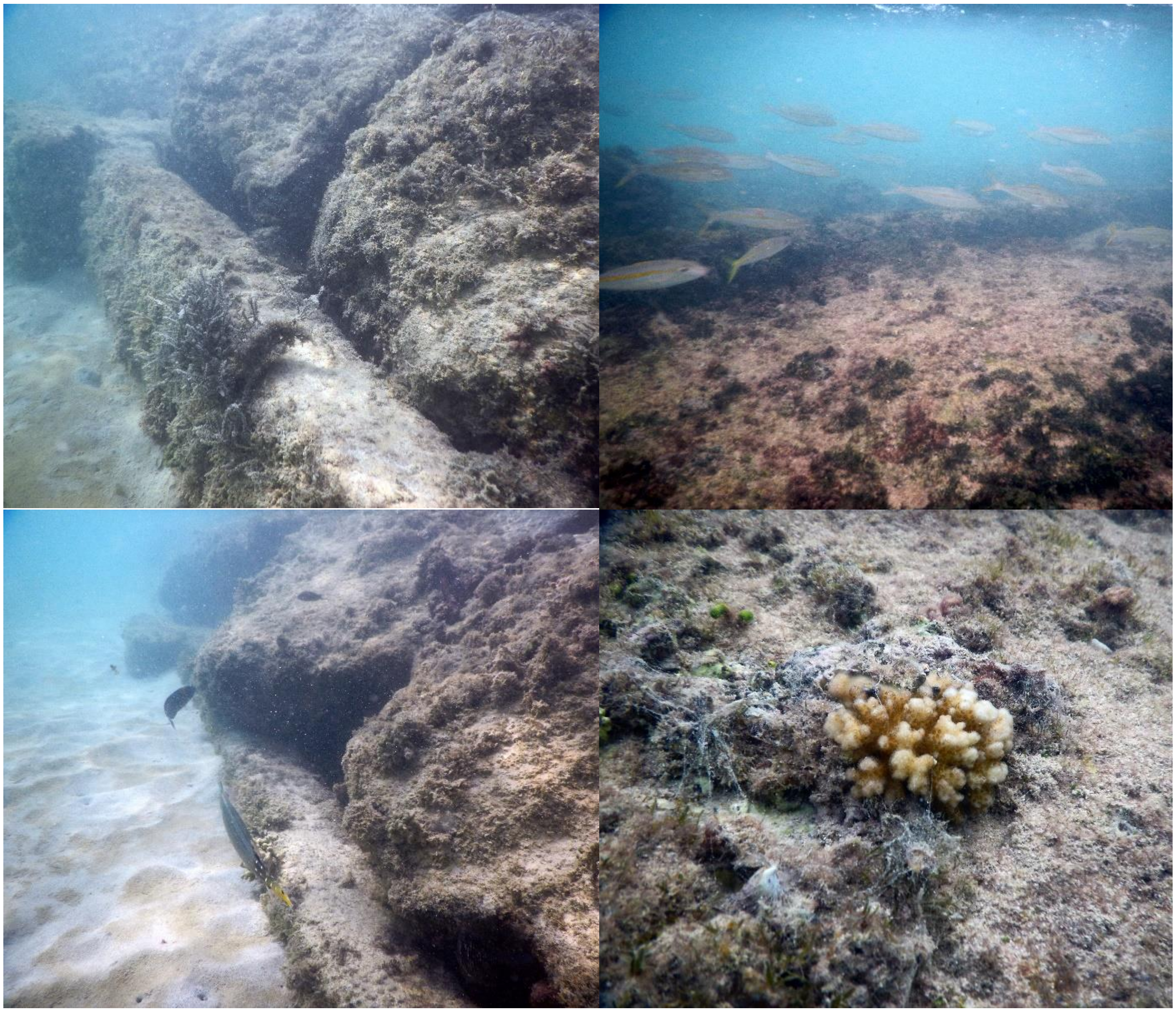

Figure 13. *Acanthophora spicifera* and *Gracilaria salicornia* are abundant on the structure of the Kuhio Sector (top left). Fishes associated with the Kuhio basin structures include schools of yellowfin goatfish (*Mulloidichthys vanicolensis*; top right), trumpetfish (*Alustomus chinensis*) and wrasses (*Thalassoma duperrey*; bottom left). Several coral colonies (*Pocillopora damicornis*) in the <5 cm size class were observed on the outside of the seafloor beyond the crib wall (bottom right).

Discussion

Listed and Protected Species

One state- and federally-listed (endangered or threatened; USFWS and NOAA-NMFS, 2016; HDLNR, 2015; USFWS, undated) marine species was encountered in our survey: green sea turtle (*Chelonia mydas*). Other state- and federally-listed marine species—hawksbill sea turtle (*Eretmochelys imbricata*) and monk seal (*Neomonachus schauinslandi*)—may occur in the general vicinity of the Project, considering the distribution of these species and their occurrences throughout the Islands as discussed below.

Invertebrates — Coral species are protected by Hawaiʻi State regulations that prohibit damage to "any stony coral by any intentional or negligent activity causing the introduction of sediment, biological contaminants, or pollution into state waters" (HDLNR, 2014). On August 27, 2014, NOAA issued a final rule for listing 20 coral species as threatened under the Endangered Species Act (ESA; NOAA-NMFS, 2014), but none of these listed coral species occurs in Hawaiʻi. On September 20, 2018, NOAA issued a proposed rule for listing the cauliflower coral (*Pocillopora meandrina*) as an endangered or threatened species under ESA (NOAA-NMFS, 2018). A global status review has been initiated by NOAA to determine whether listing throughout the species range is warranted.

Hawaiʻi Department of Land and Natural Resources (HDLNR) regulates shellfishes such as pearl oysters (HDLNR, 1987) and ʻ*opihi* (HDLNR, 1989). No ʻ*opihi* species or pearl oyster (*Pinctada margaritifera*) were observed in our survey of the Project area.

Sea turtles — The distinct population segment (DPS) of green sea turtle that occurs in Hawaiʻi is federally-listed as a threatened species (USFWS and NOAA-NMFS, 2016; UFWS, 2018) and as a threatened subspecies (*Chelonia mydas agassizi*) under Hawaiʻi regulations (DLNR, 2014).

Threats to the green sea turtle in Hawaiʻi include: disease and parasites, accidental fishing take, boat collisions, entanglement in marine debris, loss of foraging habitat to development, and ingestion of marine debris. Throughout the global range of green sea turtle, nesting and foraging habitats are being altered and destroyed by coastal development, beach armoring, beachfront lighting, vehicular/pedestrian traffic, invasive species, and pollution from discharges and runoff (NOAA & USFWS, 2007a, 2007b). Adult green sea turtles forage in shallow nearshore areas and on coral reefs. Contamination from effluent discharges and runoff has degraded these environments, and invasive species may reduce native algae species preferred by green sea turtles or could exacerbate susceptibility to, or development of disease (NOAA-NMFS and USFWS, 2007a). Fibropapillomatosis, a disease characterized by the presence of internal and/or external tumors that may grow large enough to hamper swimming, vision, feeding, and potential escape from predators continues to be a major threat to green sea turtles. Extremely high incidence has been reported in Hawaiʻi, where affliction rates peaked at 47-69% in some turtle foraging areas (Murakawa et al., 2000).

Hawksbill sea turtle is distributed across the Pacific, Indian, and Atlantic oceans. Hawksbill sea turtle is much less common in the Hawaiian Islands than green sea turtle and is known to nest only in the southern reaches of the state (NOAA-PIFSC, 2010). Hawksbill sea turtle is federally-listed as endangered (USFWS, nd) and is also listed as an endangered subspecies (*Eretmochelys imbricata bissa*) under Hawaiʻi regulations (HDLNR, 2014). Hawksbill sea turtle faces many of the same threats affecting green sea turtle (see above section; NOAA & USFWS, 2007b).

<u>Monk Seal</u> — The endangered Hawaiian monk seal (*Monachus schauinslandi*) is known to occur in the Project vicinity. The Hawaiian monk seal was first listed as an endangered species pursuant to the ESA on November 23, 1976 (41 FR 51612) and remains listed as endangered. In that same year, the Hawaiian monk seal population was designated as "depleted" under the Marine Mammal Protection Act (MMPA). Critical habitat for Hawaiian monk seals has been designated (NOAA-NMFS, 2015) and includes the seafloor and marine environment to 10 m above the seafloor from the 200 m depth contour, through the shoreline and extending onto the land 5 m inland from the shoreline between identified boundary points. These terrestrial boundary points define preferred pupping areas and significant haul-out areas. Waikīkī is excluded from terrestrial critical habitat designation (NOAA-NMFS, 2015).

Essential Fish Habitat

The 1996 Sustainable Fishery Act amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) and subsequent Essential Fish Habitat (EFH) Regulatory Guidelines (NOAA, 2002) describe provisions to identify and protect habitats of federally-managed marine and anadromous fish species. Under the various provisions, federal agencies that fund, permit, or undertake activities that may adversely affect EFH are required to consult with the National Marine Fisheries Service (NMFS).

Congress defines EFH as “those waters and substrate necessary to fish[es] for spawning, breeding, feeding, or growth to maturity” (MSFCMA, 1996; NOAA, 2002). EFH provisions in MSFCMA designate that species harvested in sufficient quantities to require fisheries management are to be subdivided into similar Management Unit Species (MUS). Five MUS groups are currently managed in Hawaiian waters: bottomfishes, pelagics, precious corals, crustaceans, and coral reef ecosystem (Table 3). In the waters surrounding the Hawaiian Islands, EFH for coral reef ecosystem MUS as defined by the Final Coral Reef Ecosystem Fishery Management Plan (WPRFMC, 2001) and subsequent Fishery Ecosystem Plan for the Hawaiian Archipelago (WPRFMC, 2009a, 2009b, 2016) "includes all waters and habitat at depths from the sea surface to 50 fathoms extending from the shoreline (including state and territorial land and waters) to the outer boundary of the Exclusive Economic Zone (EEZ)."

Table 3. EFH Designations for Hawaiian Archipelago FEP Management Unit

Management Unit	Species Complex	EFH
Pelagic	Temperate species, Tropical species, Sharks, Squid	**Eggs and larvae:** the water column extending from the shoreline to the outer limit of the EEZ down to a depth of 650 ft (200 m). **Juvenile/adults:** the water column extending from the shoreline to a depth of 3,280 ft (1,000 m).
Bottomfish and Seamount Groundfish	Shallow-water species (0 to 50 fm)	**Eggs and larvae:** the water column extending from the shoreline to the outer limit of the EEZ down to a depth of 1,310 ft (400 m). **Juvenile/adults:** the water column and all bottom habitat extending from the shoreline to a depth of 1,310 ft (400 m).
Bottomfish and Seamount Groundfish	Deep-water species (50 to 200 fm)	**Eggs and larvae:** the water column extending from the shoreline to the outer limit of the EEZ down to a depth of 1,310 ft (400 m). **Juvenile/adults:** the water column and all bottom habitat extending from the shoreline to a depth of 1,310 ft (400 m).
Crustacean	Spiny and slipper lobster complex, Kona crab	**Eggs and larvae:** the water column from the shoreline to the outer limit of the EEZ down to a depth of 490 ft (150 m). **Juvenile/adults:** all of the bottom habitat from the shoreline to a depth of 330 ft (100 m).
Coral Reef Ecosystem	All Currently Harvested Coral Reef Taxa All Potentially Harvested Coral Reef Taxa	EFH for the Coral Reef Ecosystem MUS includes the water column and all benthic substrate to a depth of 330 ft (100 m) from the shoreline to the outer limit of the EEZ for eggs, larvae, juveniles and adults.

The Western Pacific Regional Fishery Management Council (WPRFMC) has restructured its management framework from species-based fishery management plans (FMPs) to place-based fishery ecosystem plans (FEPs). The Hawaiian Archipelago FEP establishes the framework under which the WPRFMC will manage fishery resources and begin the integration and implementation of ecosystem approaches to management in the Hawaiian Archipelago. This FEP does not establish any new fishery management regulations, but rather consolidates existing fishery regulations for demersal species. Specifically, this FEP identifies as MUS those species known to be present in waters around the Hawaiian Archipelago and incorporates all of the management provisions of the Bottomfish and Seamount Groundfish FMP, the Crustaceans FMP, the Precious Corals FMP, and the Coral Reef Ecosystems FMP that are applicable to the area.

In addition to EFH, the WPRFMC identifies Habitat Areas of Particular Concern (HAPC) within EFH for all FEPs. Specific subsets of EFH, HAPCs are areas within EFH that are essential to the life cycle of federally managed coral reef species. In determining whether a type or area of EFH should be designated as a HAPC, one or more of the following criteria established by NMFS should be met: (a) the ecological function provided by the habitat is important; (b) the habitat is sensitive to human-induced environmental degradation; (c) development activities are, or will be, stressing the habitat type; or (d) the habitat type is rare.

The waters off Waikīkī are designated as EFH (including water column and all bottom areas) for coral reef ecosystem, bottomfish, pelagic and crustacean MUS. Of the thousands of species which are federally managed under the coral reef FMP, at least 40 (juvenile and adult life stages) are known to occur in waters in the vicinity.

Impact Assessment

Marine Resources

The Waikīkī Beach Improvement and Maintenance Project is taking place on an engineered beach and shallow reef flat. Overall, the proposed groin project area is 24% rubble and 23% sand, offering limited topographical relief and structural complexity. The Project area supports a low abundance of fishes with low species richness and a marginal coral community. The daily use by large numbers of waders, fishers, paddlers, and swimmers influences negatively the biotic community. Areas with little or no vertical relief are affected by the continually shifting sand and tend to have little algal and macro-invertebrate diversity, with few or no coral colonies present. These hard bottom areas may be regularly covered and uncovered by shifting sand.

Coral assemblages in Waikīkī are limited by availability of stable hard bottom, silt cover, competition with algae, and freshwater influence among other factors. No corals were observed in the Royal Hawaiian Beach Sector, and one colony was observed in the Fort DeRussy Sector. At the Kuhio (ʻEwa Basin) Sector, no colonies were observed on the breakwater structures.

At the Halekulani Sector, overall coral cover at the proposed groin locations is very low (mean of 0.1 colony/m^2). In general, coral colonies here are small, with 64% being less than 10 cm in diameter. Coral settlement and growth in Waikīkī are limited by impinging waves, scour by rubble and sand, reduced light conditions associated with turbid water events, and burial with fine sediment. Project-placed boulders and sand fill will bury a portion of the existing subtidal environment of primarily low relief sand, rubble, and limestone. This limestone provides substrate for macroalgae and coralline algae growth, as well as habitat for macroinvertebrates. Placement of boulders and sand will result in loss of some benthic organisms, including corals. These corals provide ecological services to the coral reef ecosystem: shelter, reef consolidation, food for corallivores, or coral gametes. Impacts to corals could be avoided by relocating the few scattered corals that occur in the footprint of the placed sand and groins. Benthic invertebrates will repopulate from surrounding habitat after construction is completed and sessile organisms will colonize new hard surfaces (*AECOS*, 2014-2020). Additionally, the Project will provide stable, hard bottom for coral settlement and possibly calmer waters for coral development, but coral assemblage development may be compromised by competition for space, freshwater influence, sediment transport, and heavy utilization of the nearshore by the human population.

Fish abundance and diversity are directly correlated with topographical structure and complexity (Friedlander and Parrish, 1998; Ménard et al., 2012). Fish species richness, biomass, and diversity tend to be highest in environments with considerable spatial relief such as along limestone outcrop/sand bottom interfaces; fish biomass is lowest on shallow reef flats (Friedlander and Brown, 2006) of the sort in the Project area. Although most of the Project area reef has low topographic relief, where vertical structure does occur, fishes are present and sometimes in high numbers. The distribution of topographical relief on this reef is highly patchy and weakly captured by our transect locations and survey areas. Stations with visibly greater relief, in the form of limestone outcrops, existing breakwaters and groins had greater fish abundance than the reef flat. The substantial structural complexity and topographical relief offered by the groins is expected to provide habitat for fishes and an increase in fish species richness, biomass, and abundance can be anticipated, which has been observed at T-head groins placed at Iroquois Point, Oʻahu (*AECOS*, 2020).

Two common algae species found in Waikīkī are non-native and invasive: *A. spicifera* and *G. salicornia*. These species are widespread off the shores of the Islands, and *A. spicifera* is a food favored by green sea turtle. While some turtle foraging resources may be lost due to sand and groin placement, benthic resources for grazing occur throughout Waikīkī Beach. As such, we expect minimal impacts to turtle foraging. The groin structures are not expected to affect species introductions to Hawaiʻi but may serve as habitat for existing introduced species. Future monitoring events should note any changes in the distribution of *A. spicifera* and other invasive species in Waikīkī.

The proposed Project is not expected to result in any significant long-term degradation of the environment or loss of habitat. Rather, by the construction of the proposed T-head groins, the Project will improve the shoreline conditions, restore beaches and increase potential biological habitat in a relatively barren reef flat area. Ecological services of reef flat habitat will be lost under the project footprints (sand and groin) but these services are expected to recover over time as the benthic community (including hard corals) re-establishes. The boulders of the groins are expected to offer a substratum for sessile organisms, such as corals, and provide increased habitat complexity for motile fauna (*AECOS*, 2020). A biological and water quality monitoring program should be implemented to enhance control over Project construction impacts.

Mitigation

Mitigating for impacts to marine resources is a sequential process of avoiding impacts, minimizing impacts, and then compensating for unavoidable adverse impacts. The first step is to avoid impacts through project design. The second step, after avoidance measures have been incorporated, is to minimize remaining impacts. If unavoidable impacts still exist after avoidance and minimization, then replacement of lost ecosystem functions and values is appropriate. This last step is called compensatory mitigation (Bentivoglio, 2003). Project design decisions should incorporate measures to avoid and minimize impacts to marine communities associated with beach stabilization to the extent possible. In particular, impacts to corals in the footprint of the proposed sand borrow margins should be avoided by excluding those areas from the dredging limits.

The United States Coral Reef Task Force (USCRTF) has identified a portfolio of compensatory mitigation and restoration options (USCRTF, 2016) and a list of Best Management Practices (BMPs) that could be implemented to offset adverse impacts on coral reef communities from development projects. The USCRTF list was reviewed and screened for appropriateness to anticipated Project impacts, ability to successfully implement, and impacts already minimized by project specific BMPs. Possible avoidance and minimization measures that could be taken to offset adverse impacts are provided below.

Water quality improvements:
- Storm water BMPs

Coral response and rescue team:
- Movement of at-risk corals from a project area

Offsite placement of structures to enhance substrate:

- Placement of material that mimics natural coral reef structure
- Deposition of boulders or other artificial material
- Placement of artificial reef modules

Nuisance species removal:

- Removal of nuisance or invasive algae species
- Super sucker removal of invasive algae

Coral and Macroinvertebrate Relocation - To avoid and minimize impacts to selected marine resources that occur in the Project area, any coral colonies and other macroinvertebrates (e.g., sea urchins, sea cucumbers) that occur within the direct footprint of the Project could be relocated, as practicable. Removing corals from the Project area and transplanting them to another site could avoid and minimize impacts to the coral assemblage. Additionally, different macroinvertebrates are potential candidates for relocation, including primarily urchins and sea cucumbers.

Placement of Structures - The Project contains an inherent mitigation in that the proposed groins are hard substratum additions with substantial vertical relief that would be suitable for attraction of reef fishes and provide substratum for a wide variety of algae and invertebrates (including corals). The improvements are intended to increase beach stability and sand retention, increase resilience and sustainability of the Waikīkī shoreline to sea level rise projections.

Nuisance Species Removal and urchin out-planting - To offset loss of biological assemblages associated with the loss of hard substrate beneath the enhanced beach, invasive algae elsewhere could be removed as part of a reef restoration effort. This effort could allow for an increase in diversity as native algae and invertebrates recolonize the reef. The key to maintaining low levels of invasive algae is the presence of native herbivores and native collector urchins (*Tripneustes gratilla*) are spawned and raised in captivity at the DLNR-DAR's Anuenue Fisheries Research Center (Oʻahu) for use as a biological tool to fight invasive alien seaweeds on reef areas throughout Hawaiʻi. Echinoderms rescued from the Project footprint could be used in such an effort, but only if a location can be identified where increasing the urchin population would provide the desired benefit.

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TABLE A
List of algae observed on the reef flat in the Project area
off Waikīkī Beach (2007-2021).

PHYLUM, CLASS, ORDER, FAMILY *Species*	**Common name**	**Location of reef** Gray's	Kūhiō	Waikīkī	**QC Code**
CYANOPHYTA	BLUE-GREEN ALGAE				
Leptolyngbya crosbyana		R			05
Lyngbya sp.		P			07
Lyngbya majuscule			R	R	05, 10
Symploca hydnoides		R	R	O	05, 10
CHLOROPHYTA	GREEN ALGAE				
indet.		R	R		05
Avrainvillea amadelpha		C, C	U	R, O	05, 07, 21
Bornetella sp.		P			07
Bornetella sphaerica			R		05
Bryopsis sp.		O	R	R	05, 21
Caulerpa racemosa			R	O	05, 21
Caulerpa sertularioides			U	O	05, 10, 21
Chaetomorpha antennina			R		05
Cladophoropsis luxurians		R			05
Cladophora sp.		R		O	07, 21
Cladophora fascicularis			R		05
Cladophora luxurians			R		05
Cladophora sericea				R	10
Cladophoropsis luxurians		R			05
Codium arabicum		O	R	R, U, O	05, 10, 21
Codium edule		C	O	R, R, O	05, 10, 21
Dictyosphaeria cavernosa			U	U	05, 21
Dictyosphaeria versluysii		P	R	R	07, 05, 10
Dictyosphaeria sp.			U	U	05, 21
Enteromorpha sp.		U	R		05
Halimeda sp.				U, U	10, 21
Halimeda opuntia		R	O	O	05, 21
Halimeda discoidea		O		O	07, 21
Microdictyon setchellianum			R		05
Microdictyon umbilicatum			U		05
Neomeris annulata		R	R	R	07, 05, 10
Neomeris sp.				U	21
Ulva fasciata	sea lettuce	U	O	C, O	07, 05, 10, 21
Ulva reticulata			U	R	05, 21
PHAEOPHYTA	BROWN ALGAE				
Asteronema breviarticulatum			U	U	05, 21
Chnoospora sp.			R		05
Colpomenia sinuosa			R		05
Colpomenia tuberculata			R		05

PHYLUM, CLASS, ORDER, FAMILY *Species*	Common name	Location of reef Gray's	Kūhiō	Waikīkī	QC Code
PHAEOPHYTA (cont.)					
Dictyopteris australis			R	R	05, 10
Dictyopteris plagiogramma			R		05
Dictyota sp.				C, O	10, 21
Dictyota acutiloba		O	O	O	05, 10, 21
Dictyota bartayresiana	*alani*	R	O		05
Dictyota ceylanica		P		O	07, 21
Dictyota friabilis		R	R	O	05, 21
Dictyota sandvicensis			R	O	05, 21
Dictyota spp.		A, C, A	U		05, 06, 07
Distromium flabellatum			R		05
Lobophora variegata		R	R	O	05, 21
Padina spp.		C, P	U	A, U	06, 07, 05, 10, 21
Padina australis		O	O	O	05, 21
Padina japonica		O	O		05
Padina sanctae-cruis				O	21
Sargassum spp.		C			06
Sargassum echinocarpum		C, C	C	A	05, 07, 10
Sargassum obtusifolium				A	10
Sargassum polyphyllum				R	10
Sphacelaria furcigera			R		05
Stypopodium hawaiiensis			U		05
Turbinaria ornata		U, C, A	R	R	05, 06, 07, 10, 21
RHODOPHYTA	RED ALGAE				
indet.		R	R		05
Acanthophora spicifera	spiny seaweed	A, A, A	C	A, C	05, 06, 07, 10, 21
Asparagopsis taxiformis		R, C, P	U	U, C	05, 06, 07, 10, 21
Botryocladia skottsbergii		R			05
Centroceras clavulatum		C	R		05
Coelothrix irregularis			R		05
Dasya sp.		P	R		07, 05
Dasya iridescens				R	21
Dichotomaria marginata			R		05
Dichotomaria obtusata			O		05
Galaxaura spp.		O, C, O	R	R, U	05, 06, 07, 21
Galaxaura fastigiata		O	R		05
Galaxaura rugosa			R		05
Gelidium pusillum			R	O	05, 21
Gelidiopsis scoparia			R		045
Gracilaria sp.			R		05
Gracilaria bursa-pastoris			R		05
Gracilaria coronopifolia		O	R	R	05, 10
Gracilaria salicornia		A, A, O	C	C, C	05, 06, 07, 10, 21
Hydrolithon breviclavium			O		05
Hydrolithon gardineri		R	C		05
Hydrolithon onkodes		R	C	C	05, 21

PHYLUM, CLASS, ORDER, FAMILY *Species*	Common name	Location of reef Gray's	Kūhiō	Waikīkī	QC Code
RHODOPHYTA (cont.)					
Hydrolithon reinboldii			O	O, C	05, 10, 21
Hypnea sp.			R	R	05, 10, 21
Hypnea cervicornis			U		05
Hypnea chordacea			R		05
Jania sp.		C	C	O, O	05, 10, 21
Laurencia sp.		R	O	O	05, 21
Laurencia mcdermidiae		R	R		05
Laurencia nidifica		R	U		05
Liagora sp.		P	R	R, R	07, 05, 10, 21
Liagora ceranoides			U	R	05, 21
Martensia fragilis		U	O		05
Martensia sp.		P			07
Melanamansia glomerata		U	C		05
Peyssonnelia rubra		R	R	R	05, 21
Plocamium sandvicense		R, P	R		05, 07
Pneophyllum conicum			R		05
Portieria hornemannii		R	R	R, R	05, 10, 21
Pterocladiella sp.		C			06
Pterocladiella caerulescens		R	R		05
Sporolithon sp.		P	R	O	07, 05, 21
Spyridia filamentosa			R		05
Tricleocarpa cylindrica		R	R	R	05, 21
Trichogloea sp.		C			06
Trichogloea lubrica		R			05
Wrangelia sp.		R			05
Wrangelia elegantissima			O		05

KEY TO SYMBOLS USED IN TABLE:

Abundance categories:

R - Rare - Only one or two individuals or specimens observed in area.
U - Uncommon - Three to no more than a dozen individuals or specimens observed in area.
O - Occasional – Seen irregularly and always in small numbers;
C - Common – Seen regularly, although generally in small numbers.
A - Abundant - Found in large numbers and widely distributed.

QC Code:

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06 - Reported previously by aquatic biologists from reef offshore Gray's Beach in March 2007 (MRC, 2007).
07 - Reported previously by aquatic biologists from reef offshore Gray's Beach on November 30, 2007, December 10 - 11, 2007, December 13, 2007, December 17, 2007, December 29, 2007, January 18, 2008, and April 21, 2008 (*AECOS*, 2009a).
10 – Reported previously by aquatic biologists on July 29, 2009, May 27, 2010, June 4, 2010, and June 8, 2010 (*AECOS*, 2010).
21 – Observed in the field by aquatic biologists on February 18, 2021, February 19, 2021 and March 4, 2021 or collected for identification in the laboratory. None was saved as voucher specimens.

Table B
List of macro-invertebrates (other than coral) observed on the reef flat in the Project area off Waikīkī Beach (2007-2021).

PHYLUM, CLASS, ORDER, FAMILY *Species*	**Common name**	**Location of reef** Gray's	Kūhiō	Waikīkī	**QC Code**
PORIFERA, CALCAREA	SPONGES				
LEUCETTIDAE					
Leucetta solida	white leucetta			R	10
PORIFERA, DEMOSPONGIAE	SPONGES				
unid.	red, orange sponge			U	10
unid.	black sponge			R	21
ANCHINOIDAE					
Hamigera sp.	red boring sponge			R	10
CHONDRILLIDAE					
Chondrosia chucalla	meandering sponge			R	10
SPIRASTRELLIDAE					
Spirastrella vagabunda	vagabond boring sponge			R	10
SPONGIIDAE					
Spongia oceania	black reef sponge			R	10
CNIDARIA, ANTHOZOA ACTINIARIA	SEA ANEMONE				
AIPTASIIDAE					
Aiptasia pulchella	glass anemone			R	10, 21
ANNELIDA, POLYCHAETA	WORMS				
unid.				R	10
MOLLUSCA, GASTROPODA	MOLLUSKS				
PATELLIDAE					
Cellana sp.	ʻopihi			R	21
SIPHONARIIDAE					
Siphonaria normalis	false ʻopihi, *ʻopihi-ʻawa*			O	21
NERITIDAE					
Nerita pacea	black nerite, *pipipi*			O	21
LITTORINIDAE					
Littoraria pintado	dotted periwinkle, *pipipi kōlea*			O	21
VERMETIDAE					
Serpulorbis variabilis	variable worm snail, *kaunaʻoa*			O	21
Dendropoma sp.	worm snail			O	21
CONIDAE					
Conus imperialis	imperial cone			R	10
Conus lividus	spiteful cone			R	10
Conus marmoreus	marble cone			R	10
Conus pulicarius	flea-bite cone			R	10
Conus (Vigiconus) flavidus	golden-yellow cone			R	21

PHYLUM, CLASS, ORDER, FAMILY *Species*	Common name	Location of reef Gray's	Kūhiō	Waikīkī	QC Code
CYPRAEIDAE					
Cypraea sp.	unid. cowry			R	10
Cypraea caputserpentis	serpent's-head cowry			R	10
Cypraea tigris†	tiger cowry			R	10
MURICIDAE					
Morula granulata	drupe			U	10
Morula uva	grape drupe	P		U, O	07, 10, 21
Drupa ricina	spotted drupe			R	21
RANELLIDAE					
Cymatium pileare	hairy triton			R	10
TURBINIDAE					
Turbo sandwicensis	Hawaiian turban, *ʻalīlea, pūpū mahina*			R	10
TURRIDAE					
unid.	unid. turrid			R	10
MOLLUSCA, ANASIPIDAE					
APLYSIDAE					
Aplysia parvula	small sea hare, *kualakai*			R	10
MOLLUSCA, SACOGLOSSA					
ELYSIIDAE					
Plakobranchus ocellatus	ringed sap-sucking slug			R	21
MOLLUSCA, NUDIBRANCHIA					
CHROMODORIDAE					
Chromodoris decora	decorated nudibranch			R	10
DENDRODORIDAE					
Dendrodoris nigra	black dendrodoris			R	10
MOLLUSCA, AEOLIDACEA					
FLABELLINIDAE					
Flabellina exoptata	desirable nudibranch			R	10
MOLLUSCA, BIVALVIA					
MYTILIDAE					
Brachidontes crebricostatus	Hawaiian mussel			R	10
PINNIDAE					
Streptopinna saccata	baggy pen shell			R	10
ISOGNOMONIDAE					
Isignomon perna	brown purse shell, *nahawele pāpaua*			O	21
MOLLUSCA, CEPHALOPODA, OCTOPODA					
OCTOPODIDAE					
Octopus cyanea	day octopus, *heʻe mauli*			R, R	10, 21
MOLLUSCA, CEPHALOPODA, TEUTHOIDEA					
SEPIOLIDAE					
Sepioteuthis lessoniana	big fin squid, *muheʻe*	R			05

PHYLUM, CLASS, ORDER, FAMILY *Species*	Common name	Location of reef Gray's	Kūhiō	Waikīkī	QC Code
ARTHOPODA, CRUSTACEA, CIRRIPEDIA					
BALANIDAE					
Amphibalanus amphitrite	amphitrite's rock barnacle			O	21
CHTHAMALIDAE					
Chthamalus proteus	proteus' rock barnacle			O	21
ARTHOPODA, CRUSTACEA, STOMATOPODA					
unid.	mantis shrimp	R			05
Pseudoquilla ciliata	ciliated mantis shrimp			R	21
ARTHOPODA, CRUSTACEA, DECAPODA					
STENOPODIDAE					
Stenopus hispidus	banded coral shrimp			R, R	10, 21
ALPHEIDAE					
Alpheus deuteropus	petroglyph shrimp	P			07
CORALLIANASSIDAE					
Corallianassa borradailei	Borradaile's ghost shrimp			R, R	10, 21
ARTHOPODA, CRUSTACEA, DECAPODA, ANOMURA					
DIOGENIDAE					
unid.	hermit crab			O	10
Calcinus c.f. elegans	elegant hermit crab			R	21
ARTHOPODA, CRUSTACEA, DECAPODA, BRACHYURA					
XANTHIDAE					
unid.	pebble crab			R	10
GRAPSIDAE					
Grapsus tenuicrustheus	thin-shelled rock crab, *ʻaʻama*			O	21
Percnon planissimum	flat rock crab, *pāpā*			O	21
Plagusia squamosa	scaly rock crab			O	21
ECHINODERMATA, OPHIUROIDEA	BRITTLE STARS				
OPHIOCOMIDAE					
Ophiocoma erinaceus	spiny brittle star	P		U, O	07, 10, 21
ECHINODERMATA, ECHINOIDAE	SEA URCHINS				
CIDARIDAE					
Eucidaris metularia	ten-lined urchin, *haʻueʻue*			R	10

PHYLUM, CLASS, ORDER, FAMILY *Species*	Common name	Location of reef Gray's	Kūhiō	Waikīkī	QC Code
DIADEMATIDAE					
Diadema paucispinum	long-spined urchin	O, U			06, 07
Echinothrix diadema	blue-black urchin, *wana*	O, R	R	U	05, 06, 01
Echinothrix calamaris	banded urchin, *wana*	C	R	O, O	07, 05, 10, 21
ECHINOMETRIDAE					
Echinometra mathaei	rock-boring urchin, *ʻina*	O, P, C	C	C, C	05, 06, 07, 10, 21
Echinometra oblonga	oblong urchin, *ʻina*		R	R, C	05, 10, 21
Echinostrephus aciculatus	needle-spined urchin	P		R	06, 10
Heterocentrotus mammillatus	red-pencil urchin	U	O	R, O	07, 05, 10, 21
TOXOPNEUSTIDAE					
Tripneustes gratilla	collector urchin, *hāwaʻe*	R, O	U	C, R	05, 07, 10, 21
ECHINODERMATA, HOLOTHUROIDAE	SEA CUCUMBERS				
HOLOTHURIIDAE					
Actinopyga mauritiana	white-spotted sea cucumber, *loli*	R, P	R	O	05, 07, 21
Holothuria atra	black sea cucumber, *loli okuhi kuhi*	C, O, C	U	R, O	05, 06, 07, 10, 21
Holothuria cinerascens	ashy sea cucumber, *loli pua*	U	U	C	05, 21
Holothuria whitmaei	teated sea cucumber, *loli*			R, R	10, 21
CHORDATA, TUNICATA	TUNICATES				
unid. spp.	unid. blue, gray, white colonial tunicates			U	10
Palythoa tuberculosa	Blue-gray/ rubbery/pillow zoanthid			R	21
Zoanthus pacificus	Striped zooanthid			R	21
Zoanthus spp.	Mat zoanthid			O	21

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C - Common – Seen regularly, although generally in small numbers.
A - Abundant - Found in large numbers and widely distributed.

Other symbols and categories:

† - identified by shell or carapace only.

QC Code:

Table B (continued).

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21 – Observed in the field by aquatic biologists on February 18, 2021, February 19, 2021 and March 4, 2021 or collected for identification in the laboratory. None was saved as voucher specimens.

Table C
List of corals observed on the reef flat in the Project area
off Waikīkī Beach (2007-2021).

PHYLUM, CLASS, ORDER, FAMILY		**Location**			**QC Code**
Genus species	**Common name**	**Gray's**	**Kūhiō**	**Waikīkī**	
CNIDARIA, ANTHOZOA					
ALCYONACEA					
ALCYONIIDAE					
Sarcothelia edmondsoni	blue soft coral, *ʻokole*	<1%	<1%		07, 21
TELESTACEA, ZOANTHINARIA, ZOANTHIDAE					
SCLERACTINIA,					
ACROPORIDAE					
Montipora capitata	rice coral	<1%		<1%	05, 06, 07, 10
Montipora patula	spreading coral	<1%		<1%	05, 06, 07, 10
FAVIIDAE					
Leptastrea bewickensis	Bewick coral			<1%	10
Leptastrea purpurea	crust coral	<1%			05
Cyphastrea ocellina	ocellated coral	<1%			05, 06, 21
POCILLOPORIDAE					
Pocillopora damicornis	lace coral	<1%			10, 21
Pocillopora meandrina	cauliflower coral, *koʻa*	<1%		<1%	05, 06, 07, 10
PORITIDAE					
Porites evermanni		<1%			05, 21
Porites lobata	lobe coral, *puna*	<1%		<1%	05, 06, 07, 10
Porites lutea	mound coral				07
Porites sp.			<1%		21
SIDERASTREADAE					
Psammocora sp.		<1%			05
Psammocora stellata	stellar coral	<1%		<1%	07, 10, 21

Coral abundances are given in percent coverage.

KEY TO SYMBOLS USED IN TABLE:
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Table D.
List of fishes observed on the reef flat in the Project area
off Waikīkī Beach (2007-2021).

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	**Common name,** ***Hawaiian***	**Location** Gray's	Kūhiō	Waikīkī	**QC Code**
CNIDARIA, ANTHOZOA					
ALCYONACEA					
ALCYONIIDAE					
Sarcothelia edmondsoni	blue soft coral, *ʻokole*	<1%	<1%		07, 21
TELESTACEA, ZOANTHINARIA, ZOANTHIDAE					
SCLERACTINIA,					
ACROPORIDAE					
Montipora capitata	rice coral	<1%		<1%	05, 06, 07, 10
Montipora patula	spreading coral	<1%		<1%	05, 06, 07, 10
FAVIIDAE					
Leptastrea bewickensis	Bewick coral			<1%	10
Leptastrea purpurea	crust coral	<1%			05
Cyphastrea ocellina	ocellated coral	<1%			05, 06, 21
POCILLOPORIDAE					
Pocillopora damicornis	lace coral	<1%			10, 21
Pocillopora meandrina	cauliflower coral, *koʻa*	<1%		<1%	05, 06, 07, 10
PORITIDAE					
Porites evermanni		<1%	<1%		05, 21
Porites lobata	lobe coral, *puna*	<1%		<1%	05, 06, 07, 10
Porites lutea	mound coral				07
Porites sp.					21
SIDERASTREADAE					
Psammocora sp.		<1%			05
Psammocora stellata	stellar coral	<1%		<1%	07, 10, 21

KEY TO SYMBOLS USED IN TABLE D:

Abundance categories:
R - Rare - Only one or two individuals or specimens observed in area.
U - Uncommon - Three to no more than a dozen individuals or specimens observed in area.
O - Occasional – Seen irregularly and always in small numbers;
C - Common – Seen regularly, although generally in small numbers.
A - Abundant - Found in large numbers and widely distributed.
Other symbols and categories:
E – Endemic – Found in Hawaiʻi and nowhere else.
QC Code:
06 - Reported previously by aquatic biologists from reef offshore Gray's Beach in March 2007 (MRC, 2007).

Table D (continued).

07 - Reported previously by aquatic biologists from reef offshore Gray's Beach on November 30, 2007, December 10 - 11, 2007, December 13, 2007, December 17, 2007, December 29, 2007, January 18, 2008, and April 21, 2008 (*AECOS*, 2009a).

10 – Reported previously by aquatic biologists on July 29, 2009, May 27, 2010, June 4, 2010, and June 8, 2010 (*AECOS*, 2010).

21 – Observed in the field by aquatic biologists on February 18, 2021, February 19, 2021 and March 4, 2021 or collected for identification in the laboratory. None was saved as voucher specimens.

FINAL PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

Waikīkī Beach Improvement and Maintenance Program

October 2024

Prepared for:
Hawai‘i Department of Land and Natural Resources
Office of Conservation and Coastal Lands
1151 Punchbowl Street, Suite 131
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Partnered with:
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Prepared by:
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APPENDIX D

Cultural Impact Assessment

Prepared By: International Archaeology, LLC

— *Final* —

A Cultural Impact Assessment for the Proposed Waikīkī Beach Improvement and Maintenance Program, Waikīkī Ahupuaʻa, Kona District, Island of Oʻahu, Hawaiʻi

TMK (1) 2-6-001:002, 003, 004, 008, 012, 013, 015, 017, 018, 019; 2-6-002:005, 006, 017, 026; 2-6-004:005, 006, 007, 008, 009, 010, 012; 2-6-005:001, 006; 2-6-008:029

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INTERNATIONAL ARCHAEOLOGY, LLC

JUNE 2022

— FINAL —

A CULTURAL IMPACT ASSESSMENT FOR THE PROPOSED WAIKĪKĪ BEACH IMPROVEMENT AND MAINTENANCE PROGRAM, WAIKĪKĪ AHUPUA‘A, KONA DISTRICT, ISLAND OF O‘AHU, HAWAI‘I

TMK (1) 2-6-001:002, 003, 004, 008, 012, 013, 015, 017, 018, 019; 2-6-002:005, 006, 017, 026; 2-6-004:005, 006, 007, 008, 009, 010, 012; 2-6-005:001, 006; 2-6-008:029

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June 2022

ABSTRACT

At the request of Sea Engineering, Inc. (SEI), and on behalf of the Department of Land and Natural Resources (DLNR), Office of Conservation and Coastal Lands, International Archaeology, LLC prepared a cultural impact assessment (CIA) in support of the proposed Waikīkī Beach Improvement and Maintenance Program. The beach improvement and maintenance program encompasses four areas of Waikīkī Beach—the Kūhiō Beach sector, the Royal Hawaiian sector, the Halekūlani sector, and the Fort DeRussy sector—along the shoreline of Māmala Bay in the Kona District of the Island of Oʻahu, seaward of TMKs (1) 2-6-001:002, 003, 004, 008, 012, 013, 015, 017, 018, 019; 2-6-002:005, 006, 017, 026; 2-6-004:005, 006, 007, 008, 009, 010, 012; 2-6-005:001, 006; and 2-6-008:029. These sectors include portions of the active beach and nearshore marine areas and extend to a maximum of approximately 70 m offshore. The CIA is a component of the program's Environmental Impact Statement prepared by SEI for the DLNR. The proposed project includes the construction of new beach stabilization structures and shoreline replenishment primarily using sand recovered from offshore areas.

The Waikīkī region was an important traditional location, noted for its chiefly associations as well as the wealth of its agricultural and aquacultural development. It has historical associations as the beachside retreat for the 19th century Hawaiian royalty and wealthy Honolulu residents, and has more recently become the center of the modern Hawaiian hospitality economy. During the past 130 years, the Waikīkī shoreline has been substantially engineered to create larger sandy beaches for recreation. As such, most of the maintenance program will occur within modern beach deposits seaward of the 19th century and early 20th century shorelines.

The intent of the CIA is to present information about past and present practices and resources for coastal Waikīkī to identify issues and concerns relating to the proposed beach improvement and maintenance program. Over 200 potential cultural consultants were contacted to provide information about cultural activities and resources within the maintenance program area and to identify any potential affects to these activities and resources by the proposed program. Seven individuals responded to the consultation request and provided written consent to include their information in the CIA. In addition, several Oʻahu Island Burial Council members and meeting participants provided verbal comments following an informatory presentation about the maintenance program during the February 2021 meeting.

The primary concern for most of the cultural consultants who commented on the project is the inadvertent disturbance of *iwi kūpuna* (ancestral human skeletal remains) along the beach or in the offshore sand deposits that will be dredged to expand and replenish the beach. Although the current Waikīkī Beach shoreline is almost entirely engineered and unlikely to contain primary burials, the history and sources of the sand used to build and replenish the beach during the 20th century remain a concern to some individuals. Several consultants also expressed concern about the potential disturbance of modern cremated human remains in the submerged sand deposits immediately offshore from Waikīkī Beach where cremated remains are frequently spread. Alternatively, some consultants feel that the replenishment and stabilization of Waikīkī Beach will protect the burials and cultural deposits inland of the active beach (some of which are recorded as archaeological sites) from erosion damage.

Several consultants emphasized that the waters of Kawehewehe (also known as Gray's Beach or the Halekūlani Channel) in the Halekūlani sector are still actively used by *kūpuna* for healing and to *pikai* (purify). One consultant remembers that *limu kālā* (*Sargassum echinocarpum*) grew in Kawehewehe, and does not want the area to be disturbed. Two consultants from the City and County of Honolulu's Department

of Design and Construction cited the danger that coastal erosion poses to the existing causeway structures and lifeguard stations on the beach.

To address these concerns, IA recommends that project proponents take the following actions: [1] carefully evaluate new sources of replenishment sand to confirm they do not contain *iwi kūpuna* or other cultural material, [2] monitor all ground-disturbing project work within the historical (pre-20th century) shoreline areas for exposed or disturbed cultural material and develop a plan to protect these resources in consultation with cultural stakeholders/organizations and appropriate government agencies, [3] reasonably address concerns from community members about the disposition of cremated remains, [4] protect Kawehewehe from damage and allow cultural practitioners reasonable access to the area during construction work, and [5] regularly engage cultural stakeholders and the local community in future project planning.

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I. INTRODUCTION

At the request of Sea Engineering, Inc. (SEI), and on behalf of the Department of Land and Natural Resources (DLNR), Office of Conservation and Coastal Lands, International Archaeology, LLC (IA) prepared a cultural impact assessment (CIA) in support of the proposed Waikīkī Beach Improvement and Maintenance Program (Figure 1 and Figure 2). The beach improvement and maintenance program encompasses four sectors of Waikīkī Beach—Fort DeRussy, Halekūlani, Royal Hawaiian, and Kūhiō Beach—along the shoreline of Māmala Bay in the Kona District of the Island of O‘ahu, seaward of TMKs (1) 2-6-001:002, 003, 004, 008, 012, 013, 015, 017, 018, 019; 2-6-002:005, 006, 017, 026; 2-6-004:005, 006, 007, 008, 009, 010, 012; 2-6-005:001, 006; and 2-6-008:029. The CIA is a component of the program's Environmental Impact Statement (EIS) prepared by SEI for the DLNR. The proposed project includes the construction of new beach stabilization structures and shoreline replenishment primarily using sand recovered from offshore areas.

The purpose of the CIA is to collect information about the past and present cultural resources and practices associated with Waikīkī Beach in order to identify any issues and concerns that may arise from the proposed beach improvements and future maintenance activities. Individuals and organizations with historical and cultural knowledge of the project area were contacted by email or letter and invited to review and comment on the planned project work; the project was also introduced at a meeting of the O‘ahu Island Burial Council (OIBC) to elicit further comments. The results of these consultations are presented in this report, along with a summary of the traditional and historical background of the Waikīkī area and recommendations from previous CIAs for Waikīkī.

PROJECT AREA DESCRIPTION

Waikīkī Beach is an approximately 3,130-m (10,260-ft.) ocean shoreline along the southwest edge of the Waikīkī neighborhood of Honolulu, extending from a breakwater fronting the Hilton Hawaiian Village Waikīkī Beach Resort to the west to a groin fronting the New Otani (Kaimana) Hotel to the east. Almost the entire length of the beach is armored by seawalls and stabilized by groins that compartmentalize the shoreline into eight individual "littoral cells" or sectors. The Waikīkī Beach Improvement and Maintenance Program will affect four of these sectors (Figure 3 through Figure 7), which are described individually.

1. The Kūhiō Beach sector consists of approximately 460 m (1,500 ft.) of shoreline extending from the ‘Ewa (west) groin at Kūhiō Beach Park to the Kapahulu storm drain. The northwestern half of the sector (called the ‘Ewa basin here) was created in 1939 (Figure 3); the southeastern half of the sector (called the Diamond Head basin here) was built between 1951 and 1953 (Figure 4). The sector is essentially an enclosed body of water within a set of constructed crib walls and groins. It is at the southern end of the curving and protected portion of the Waikīkī coastline, between two of the three major stream outlets (Ku‘ekaunahi and ‘Āpuakēhau) that once flowed into the ocean.

2. The Royal Hawaiian sector consists of approximately 530 m (1,730 ft.) of shoreline extending from the Royal Hawaiian groin to the ‘Ewa (west) groin at Kūhiō Beach Park (Figure 5). It lies at an inward curve in the Waikīkī coastline that allows the development of a wide sand beach, and sits between two of the three major stream outlets (Ku‘ekaunahi and ‘Āpuakēhau) that once flowed into the ocean. This sector is the core of traditional and historical activity in Waikīkī.

3. The Halekūlani sector consists of approximately 440 m (1,450 ft.) of shoreline extending from the Fort DeRussy outfall groin to the Royal Hawaiian groin (Figure 6). The south-facing shoreline is a mix of seawalls and discontinuous, small, and narrow sand beaches that front a fully developed urban landscape. The Royal Hawaiian groin was constructed in 1925-1926; the Fort DeRussy groin was built in 1917 and was extended in 1969. The remains of at least five, 10- to 20-m concrete block groins are spaced along the length of the sector.

4. The Fort DeRussy sector consists of approximately 510 m (1,680 ft.) of shoreline extending from the Hilton Hawaiian Village pier to the Fort DeRussy outfall groin (Figure 7). The southwest-facing shoreline is a continuous sand beach that fronts a landscaped open space of tended lawn and coconut trees in the Fort DeRussy Armed Forces Recreation Center. The Hale Koa Hotel is just inland of the western portion of the sector, and the U.S. Army Museum of Hawai‘i, housed in the historic 1914 Battery Randolph, is at the eastern end of the sector. A wide concrete promenade runs along the inland edge of the beach.

THE WAIKĪKĪ BEACH IMPROVEMENT AND MAINTENANCE PROGRAM

The proposed Waikīkī Beach Improvement and Maintenance Program is intended to address the ongoing erosion of the shoreline and frequent flooding of the backshore. Without improvements and follow-up maintenance, sand erosion and rising sea level will likely result in the total loss of Waikīkī Beach by the end of the 21st century. The project's immediate goals are to restore and improve Waikīkī's public beaches, increase beach stability, provide safe access to and along the shoreline, and increase resilience to coastal hazards and sea level rise.

The planned actions and construction methods for each beach sector in the project area are summarized below.

1. For the Kūhiō Beach sector, separate plans are proposed for the ‘Ewa basin (west) and the Diamond Head basin (east):

   a. For the ‘Ewa basin, the existing groins on the east and west ends will be removed and reconstructed to accommodate sea level rise (see Figure 3). The west groin will be approximately 150 feet long with a crest elevation of +7.5 feet mean sea level (msl), and the east groin will be approximately 125 feet long and vary in elevation from +7.5 feet msl at the shoreline to +6 feet msl at the head. A 125-foot-long detached breakwater will be built in the gap between the groins and will be approximately +6 feet mslto match the heads of the groins. Construction equipment and material would be transported to the work area through either the central portion of the park or along the shoreline past the Duke Kahanamoku statue. Demolition and construction will be conducted with an excavator that is supported by a temporary work platform extending from the shore to the breakwater. Sand fill from offshore deposits will be added to the beach after the new structures are completed.

   b. For the Diamond Head basin, existing structures will not be modified, but the beach will be replenished using eroded sand that has settled in a submerged deposit just offshore (see Figure 4). Approximately 4,500 cubic yards will be recovered and spread across the beach, widening the existing shoreline by approximately 18 to 26 feet and reducing the offshore depth of the basin to a uniform bottom elevation of -4 feet msl. The sand will be recovered and redeposited using either a long-reach excavator operating on an excavated sand causeway, or a diver-operated dredge that will pump the sand to an onshore recovery area. A bulldozer and/or skid-steer will spread the sand across the beach.

2. For the Royal Hawaiian sector, sand recovered from deposits directly offshore will be used to widen and replenish the beach (see Figure 5). The beach crest elevation will be increased from about +7 feet above mean sea level (msl) to +8.5 feet msl. Approximately 30,000 cubic yards of recovered sand will be required to complete the work. To counter ongoing erosion and shoreline recession, beach nourishment will need to be repeated every eight to 10 years or more frequently if required. The recovered sand will probably be dredged with a submersible pump mounted on a crane barge and pumped through a bottom-mounted pipeline to a dewatering basin in the Diamond Head basin of Kūhiō Beach Park. After drying, the sand will be stockpiled and transported to Royal Hawaiian, where it will be distributed using bulldozers.

3. For the Halekūlani sector, a new beach with stabilizing groins will be constructed (see Figure 6). Three new sloping rock rubble mound T-head groins will be combined with the existing Fort DeRussy and Royal Hawaiian groins to create four stable beach cells. The groin stems will extend approximately 200 feet seaward from the shoreline and will be of sufficient size to stabilize a +10-foot beach crest elevation. The groin stem crests could also be wide enough (approximately 10 feet) to accommodate construction equipment or a pedestrian walkway. The Halekūlani Channel will be left unobstructed for beach catamaran navigation. In addition, approximately 60,000 cubic yards of sand fill recovered from offshore deposits will be used to create approximately 3.8 acres of new dry beach area. Construction equipment and materials will likely be transported into the area across the east end of the Fort DeRussy sector, which may require construction of a temporary access road from Kalia Road to the beach and a temporary rock rubble mound access berm along the shoreline from Fort DeRussy to the Royal Hawaiian groin.

4. For the Fort DeRussy sector, sand will be transported from an accretion area at the west end of the beach (near the Hilton Pier) to an eroding area at the east end (see Figure 7). The sand will be excavated from the existing beach face extending inshore only as far as necessary to obtain the required amount, estimated to be approximately 1,200 cubic yards. Dump trucks will transport the sand across the beach, and a bulldozer will distribute it across the eroding area. This process will need to be repeated periodically in the future to maintain a stable beach profile.

Construction work will be confined to the active sand portion of Waikīkī Beach and nearshore marine areas up to approximately 200 feet offshore. The work will not extend outside the inland boundary of the active beach, which is defined by any buildings, roads, seawalls, or other types of construction that constrain the sand beach.

The sand required for beach nourishment will be almost exclusively recovered from submerged offshore deposits. In addition to the near-offshore areas mentioned in the descriptions above, sand will be dredged from one or more known deposits further offshore of the south coast of O‘ahu, using submersible slurry pumps, self-contained hydraulic suction dredges, and/or clamshell buckets.

ORGANIZATION OF THE REPORT

The CIA is organized as followings. Section I is the introduction, and contains a description of the project area and a summary of the proposed project work. Section II summarizes the cultural geography of the general Waikīkī area and the Waikīkī Beach sectors that will be affected by the proposed project work. It includes a discussion of local place names, the traditional history of Waikīkī before European contact, and the post-Contact history of Waikīkī through the mid-20th century. Section III presents the results of consultation with Waikīkī cultural stakeholders and community members who evaluated the project for potential cultural impacts. It also contains a summary of responses received following the presentation of the project at the February 2021 OIBC meeting. The section concludes with a summary of cultural recommendations for the Waikīkī Beach area compiled from previous Waikīkī CIAs (Gollin 2017). Section IV summarizes the major cultural issues that consultants identified after reviewing the proposed project work, and contains recommendations for addressing these concerns. References cited and a glossary of Hawaiian words used in the report follows Section IV. Appendix A is the consultation letter. Appendix B is a list of all individuals approached to provide cultural consultation for this CIA. Appendix C contains emails from consultants giving permission for their responses to be included in the CIA.

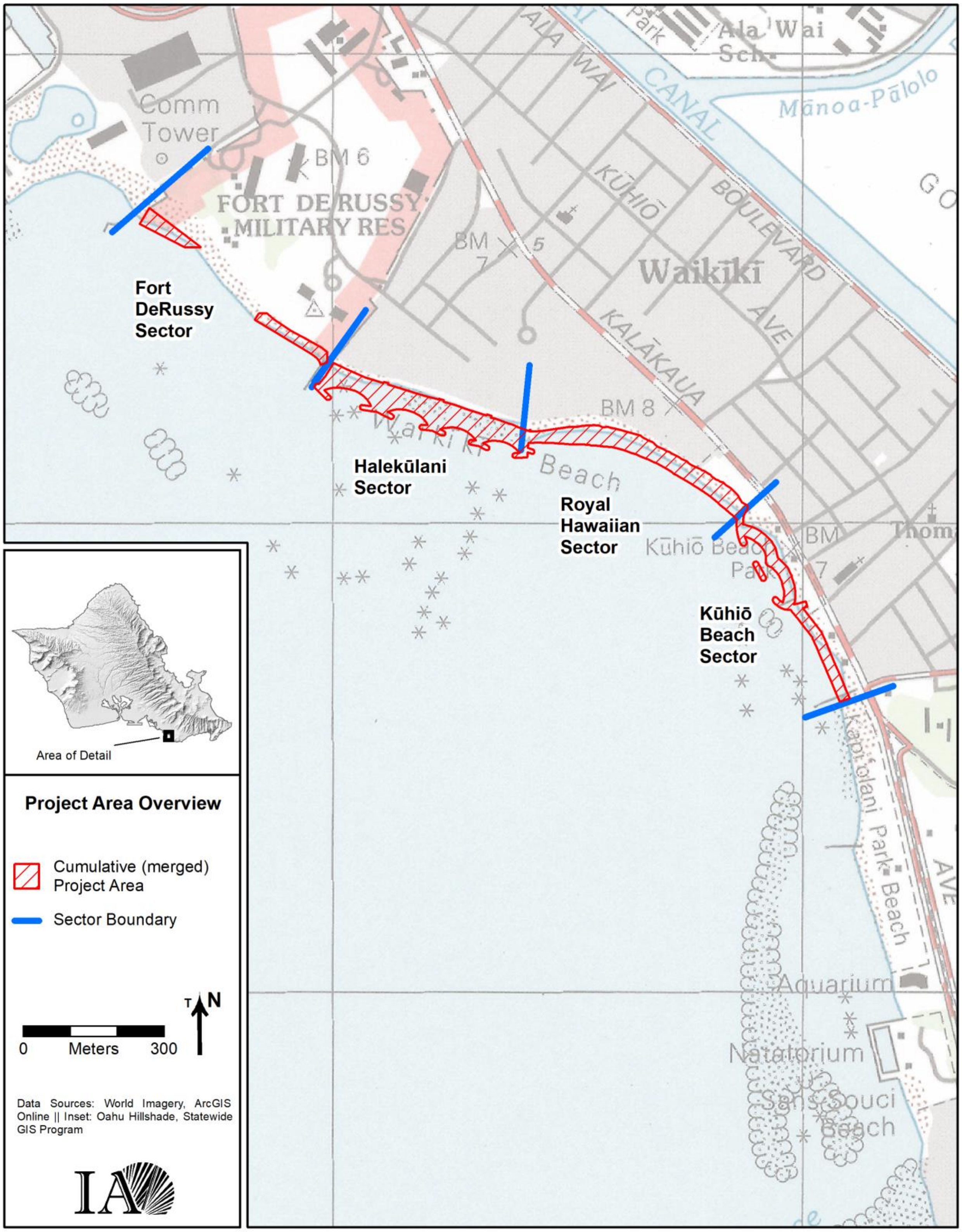

Figure 1. The Waikīkī Beach Improvement and Maintenance Program project area overlaid onto the Honolulu 1998 topographic quadrangle map.

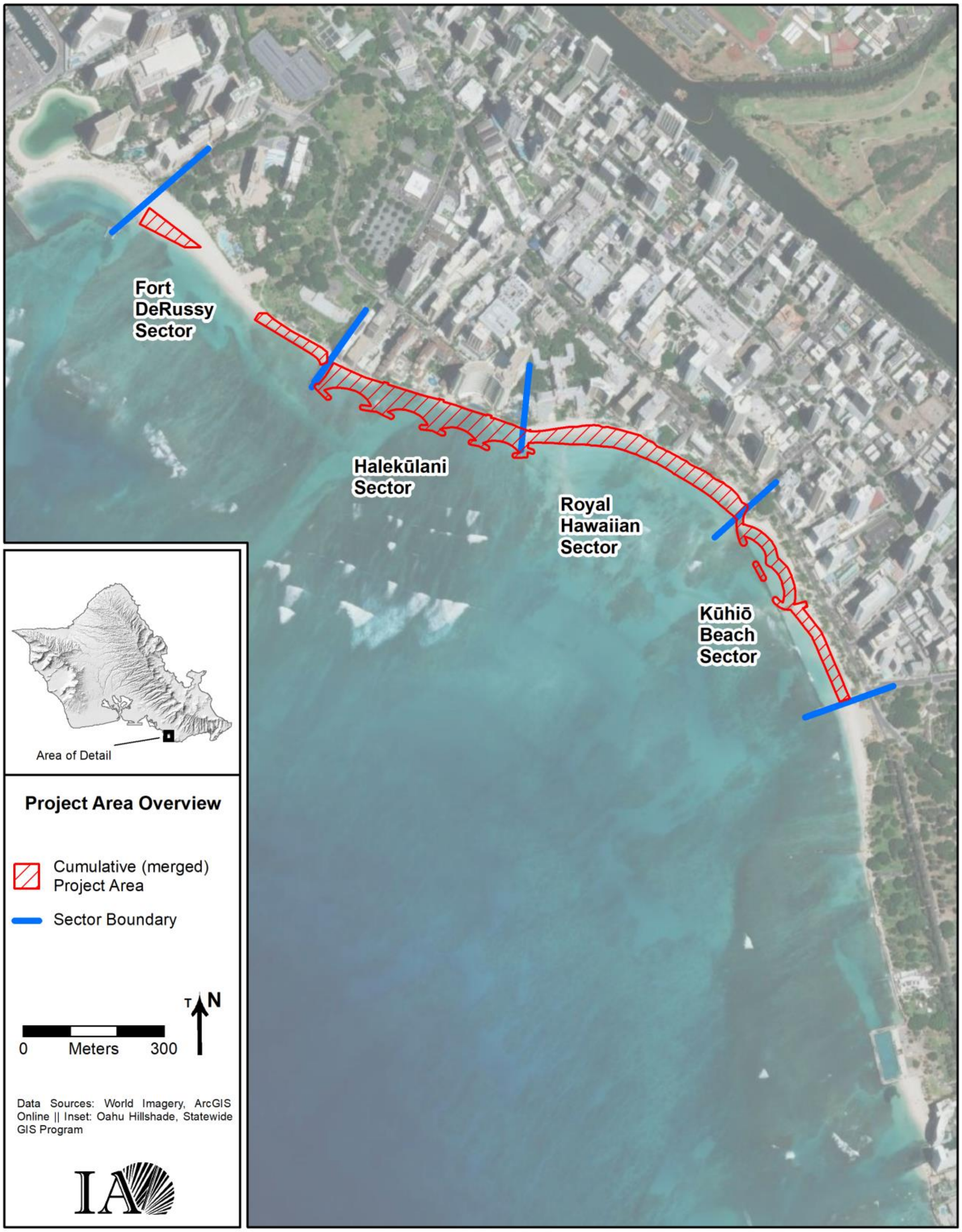

Figure 2. The Waikīkī Beach Improvement and Maintenance Program project area overlaid onto aerial imagery.

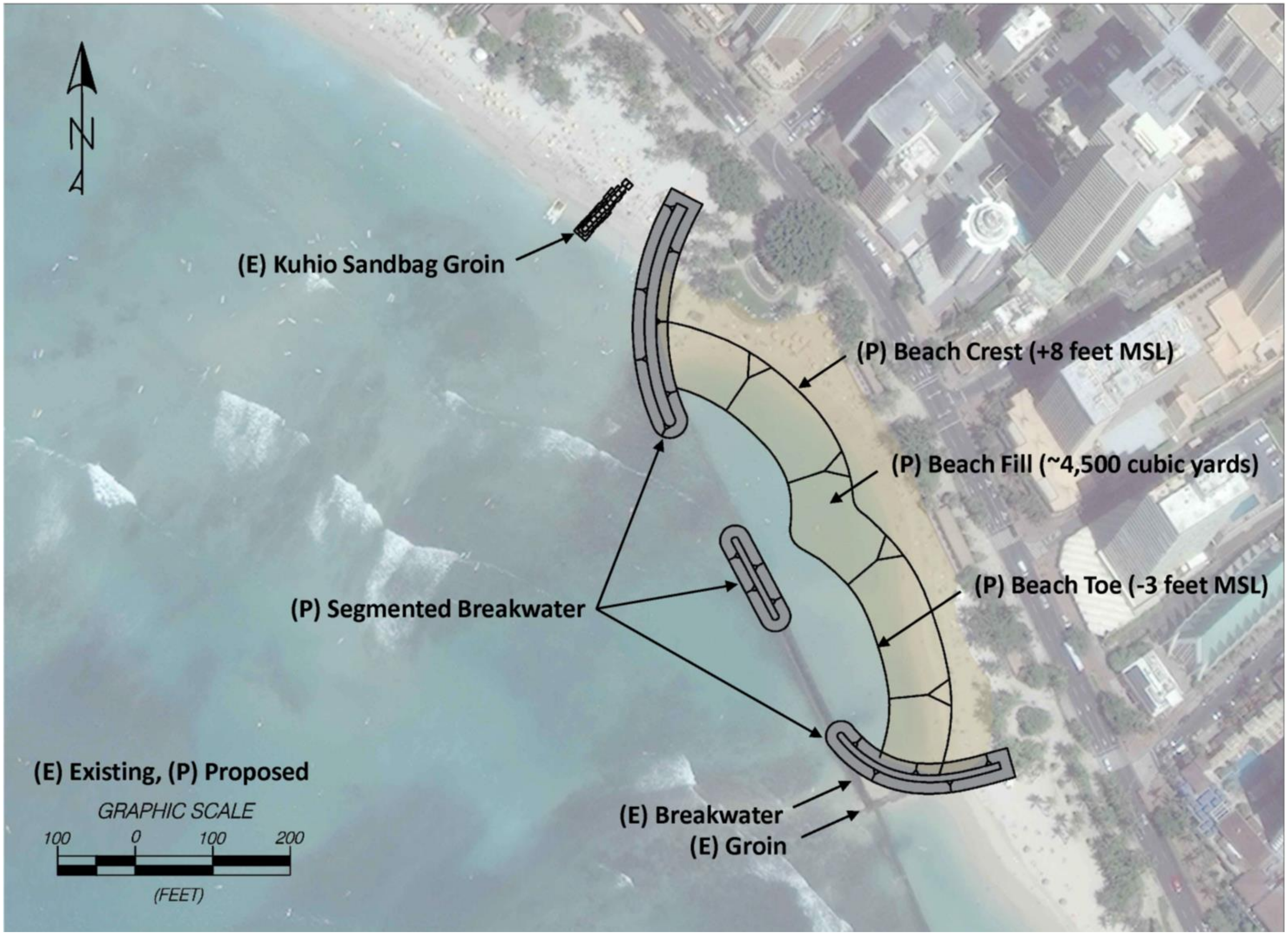

Figure 3. Planned beach improvement activates within the Kūhiō Beach sector, ‘Ewa Basin. Image provided by Sea Engineering, Inc.

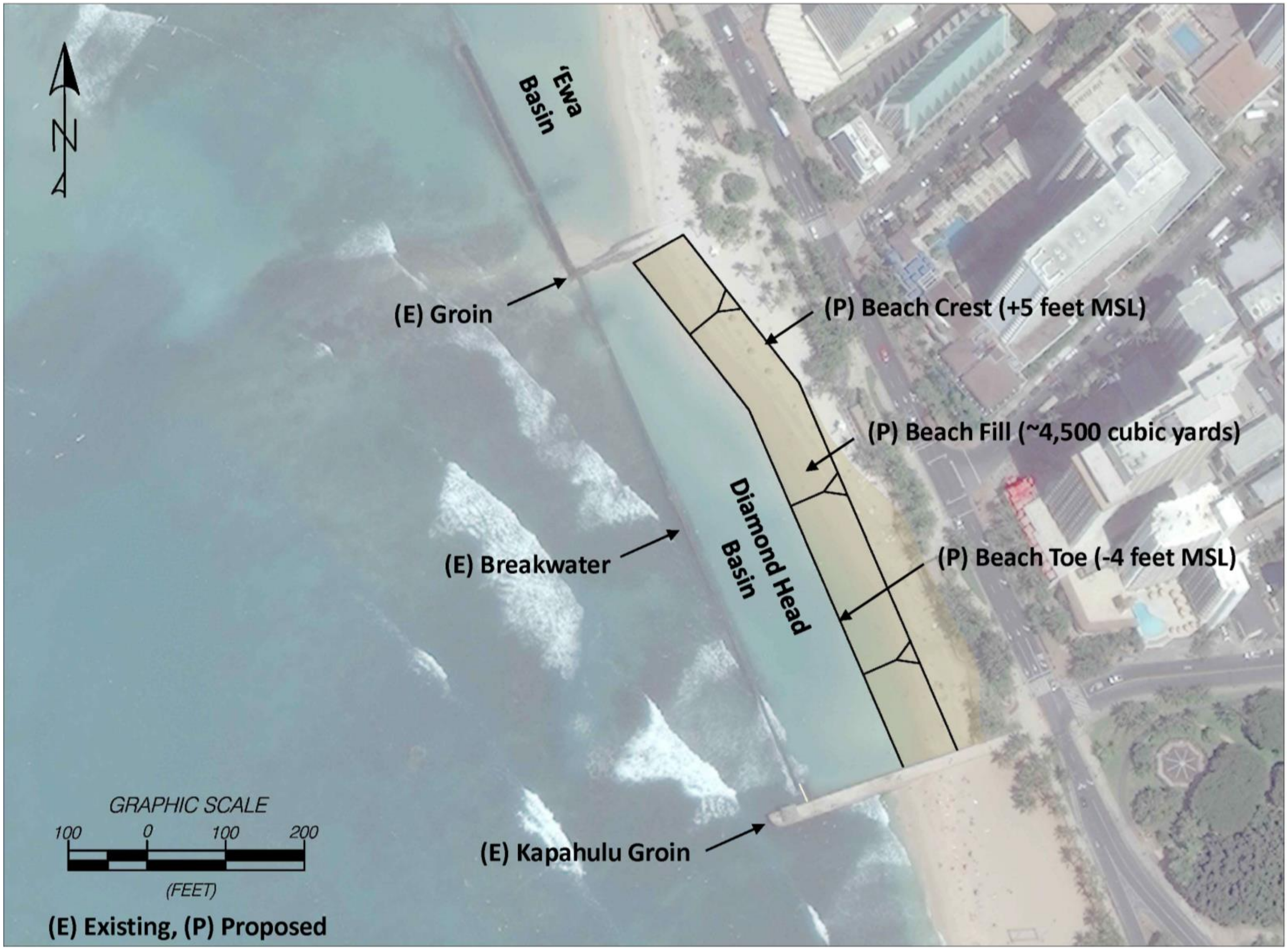

Figure 4. Planned beach improvement activities within the Kūhiō Beach sector, Diamond Head Basin. Image provided by Sea Engineering, Inc.

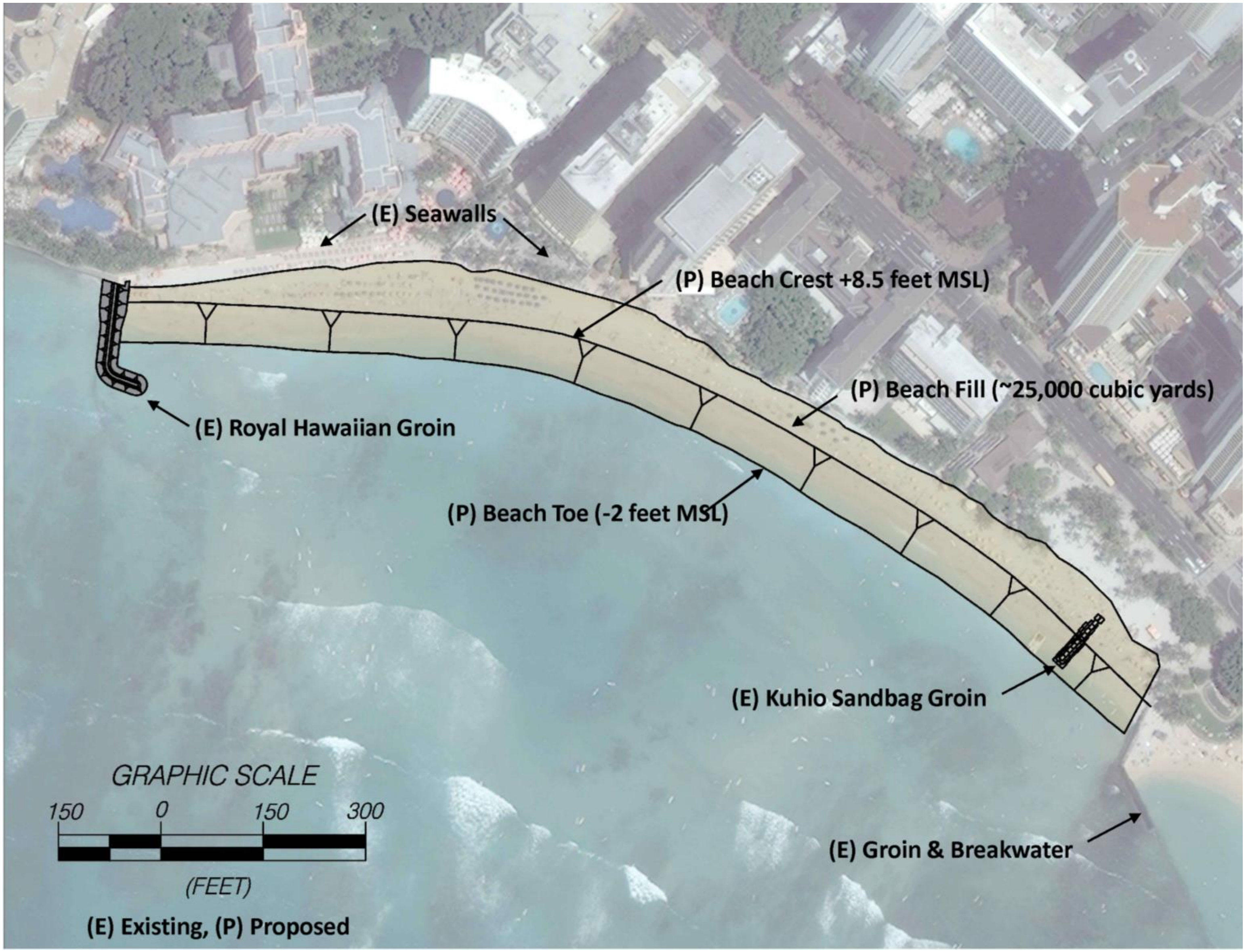

Figure 5. Planned beach improvement activities within the Royal Hawaiian sector. Image provided by Sea Engineering, Inc.

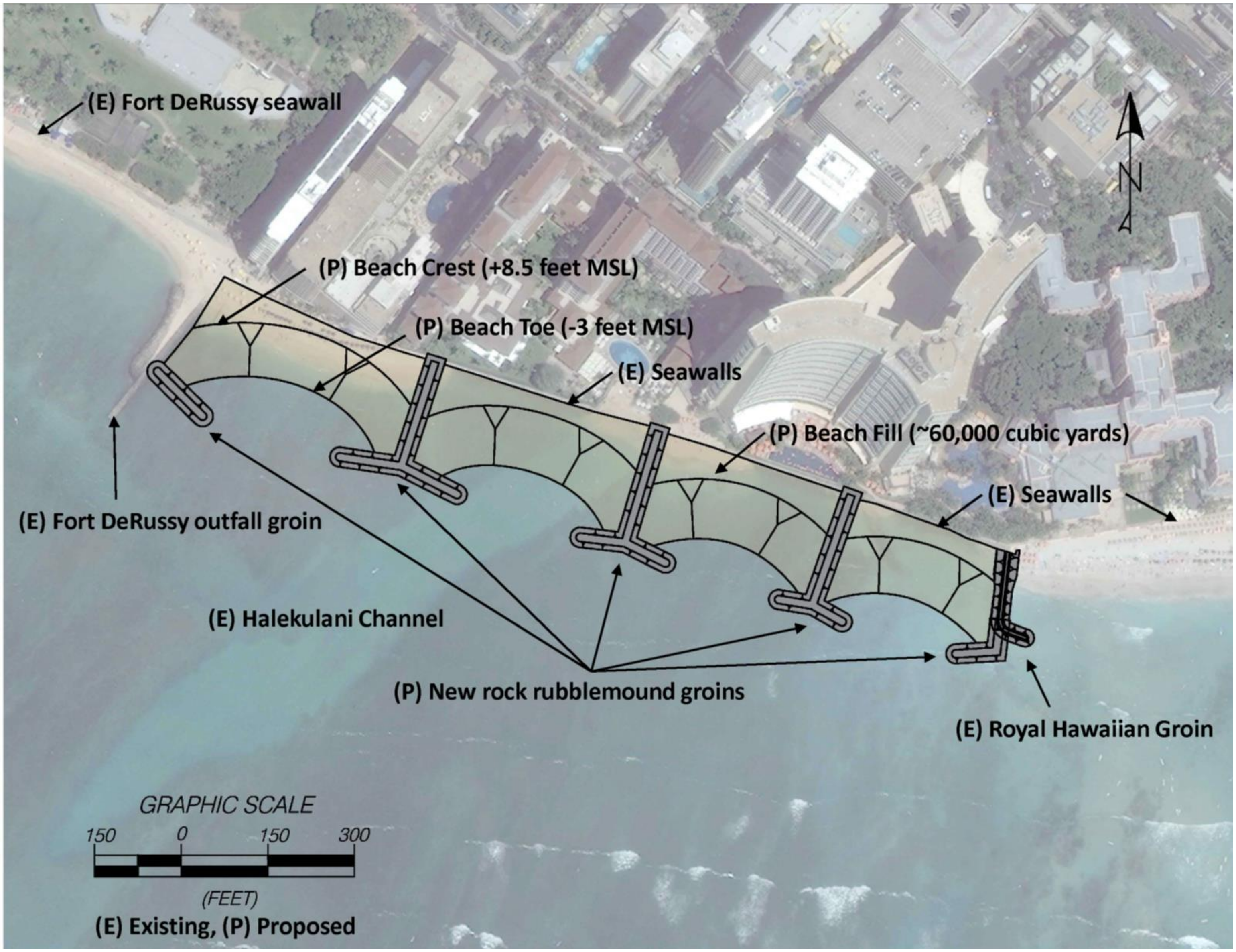

Figure 6. Planned beach improvement activities within the Halekūlani sector. Image provided by Sea Engineering, Inc.

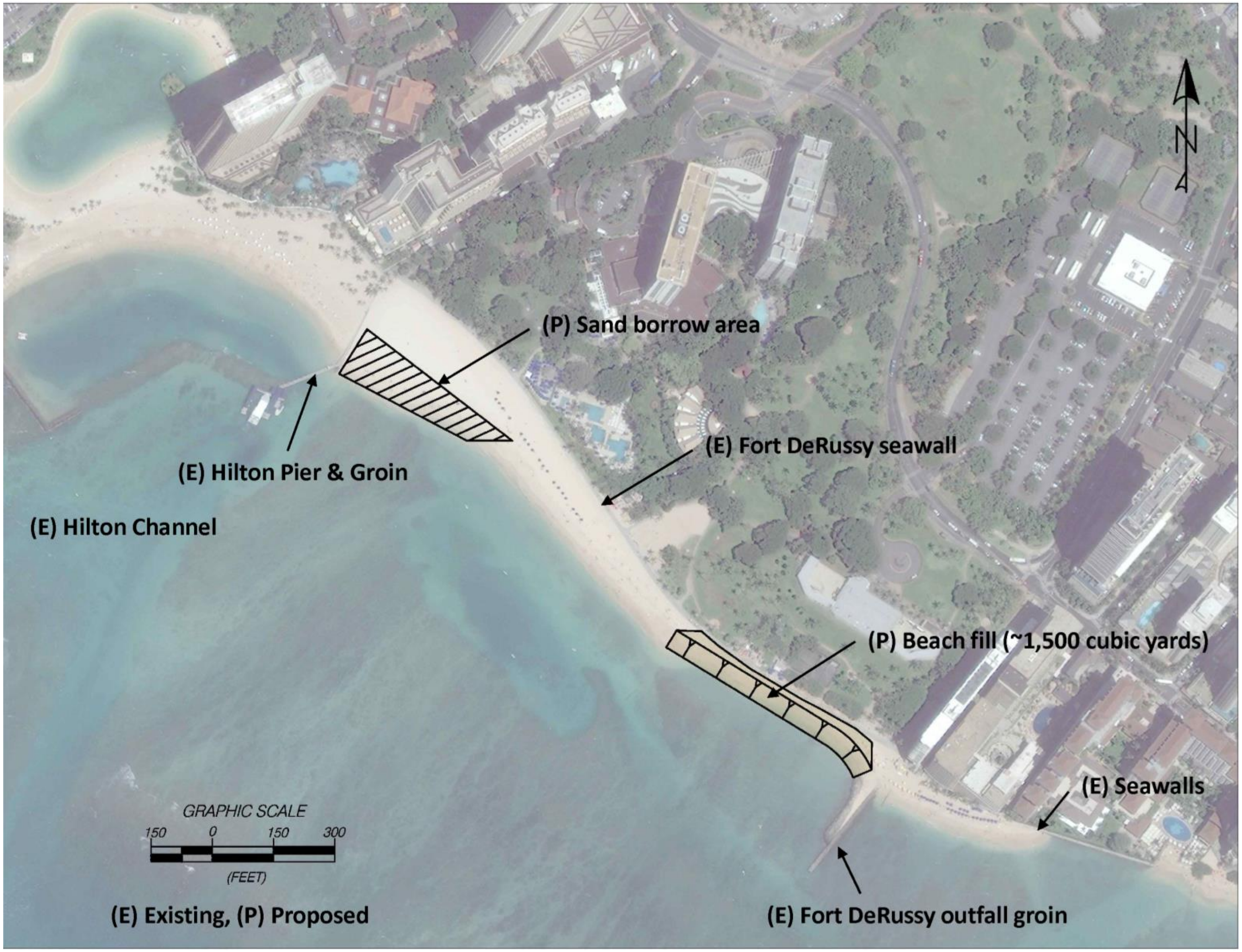

Figure 7. Planned beach improvement activities within the Fort DeRussy sector. Image provided by Sea Engineering, Inc.

II. CULTURAL GEOGRAPHY

This section provides an overview of the cultural geography of the Waikīkī area and the Waikīkī Beach sectors that will be affected by the planned improvement and maintenance program. Components of this section are [1] place names that indicate connections between physical locations in Waikīkī and traditional Hawaiian cultural practices, notable people, and important events; [2] the traditional history of Waikīkī, reflecting its political, economic, and spiritual significance in Hawaiian society before European contact; and [3] the history of Waikīkī following European contact in 1778, and its subsequent transformations in the approximately 200-year span through the mid-20th century.

This section has largely been adapted from Tomonari-Tuggle (2017) and Lauer et al. (2019). Both reports relied on primary references from Bishop (1881)[1], Kamakau (1976, 1991, 1992), Pukui et al. (1974), and Sterling and Summers (1978). Historical inform ation was also obtained from books and reports held in the IA library, the State Historic Preservation Division (SHPD) Kapolei Library, and the State Office of Environmental Quality Control online library of environmental assessments and impact statements (archaeological reports and CIAs are generally included as appendices).

PLACE NAMES

The project area falls within the *ahupua‘a* of Waikīkī in the traditional district of Kona. Waikīkī includes the seven valleys from Mānoa on the west to Kuli‘ou‘ou on the east; in contrast, the western half of Kona district consists of smaller *ahupua‘a* whose boundaries are generally coterminous with valley areas (e.g., Nu‘uanu, Kalihi, Kahauiki, and Moanalua). The reasoning behind this difference in *ahupua‘a* size is unknown, although the political prominence of Waikīkī and the concentration of chiefs who came to live and play in this area may have been a factor (Tomonari-Tuggle and Blankfein 1998).

Waikīkī translates as "spouting water" (Pukui and Elbert 1986:223), in reference to the wetlands and abundant water sources of this region. Many traditional place names in Waikīkī relate to agriculture or the requirements for successful agriculture. Three place names (Wai‘a‘ala, Waiaka, and Waikīkī) reference water (*wai*), one (‘Āpuakēhau) may be the name of a rain, two refer to soil or sand (Kapahulu and Ke‘okea), and three relate to food plants, *niu* (*Cocos nucifera*) (Niukūkahi and Uluniu) and *‘uala* (*Ipomoea batatas*) (Kalau‘uala). The sea (‘Au‘aukai and Hamohamo) is another theme; the place name Kanukuā‘ula refers to a very fine-meshed fishing net. A single place name, Kalua‘olohe, relates to a historical event and person.

Other Waikīkī place names refer to locations where events recounted in Hawaiian traditions occurred, or places that are related to Hawaiians of historical note (Table 1; Figure 8). An example of the former is ‘Āpuakēhau (in the Royal Hawaiian sector, roughly where the Royal Hawaiian Hotel sits), which is said to be where the Maui king Kahekili landed his invasion force in his successful conquest of O‘ahu (Fornander 1919:VI-2:289; Kanahele 1995:79); the general area was called Helumoa and was the site of royal residences, a *heiau*, athletic grounds, and a royal coconut grove. Another example is Kawehewehe (at the boundary between Halekūlani and Fort DeRussy sectors), which was the residence of the Luluka family of noted Hawaiian historian, John Papa ‘Ī‘ī. The family moved to O‘ahu in the early 1800s, in the company of Kamehameha who was preparing for the invasion of Kaua‘i (‘Ī‘ī 1959:15); Papa ‘Ī‘ī's uncle was a member of

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[1] S.E. Bishop completed a survey and map in 1881. He reconstructed the map with a different datum in 1888, and in 1922, Joseph Iao copied the map "with additions and alterations from Government Survey Records."

the royal court, and members of the Luluka family were responsible for the royal residence of Kamehameha at Pua‘ali‘ili‘i at Helumoa.

Traditional place names are associated with each of the Waikīkī Beach sectors included in the proposed project area. In the Fort DeRussy sector, the two place names are Kālia, which is the traditional Hawaiian name for this general area, and Kawehewehe, which is the name of the former drainage that marks the east side of the sector (roughly the alignment of Saratoga Road).

Prior to modern development, the Halekūlani sector lay between two drainages, ‘Āpuakēhau to the east (in the Royal Hawaiian sector) and Kawehewehe to the west (along the boundary with the Fort DeRussy sector). Kawehewehe was the outflow from the large fishpond complex of Kālia, the inland area of present Fort DeRussy. As markers of a former landscape, ‘Āpuakēhau and Ku‘ekaunahi are important as the names of two of the three major drainages that once cut through the Waikīkī coastal plain (see above).

The single place name in the Halekūlani sector is Kawehewehe, which refers to the land and sea area at the west end of the sector, as well as to the mouth of a drainage that emptied the fishponds of inner Kālia (roughly along the present alignment of Saratoga Road). It might also be the name of the channel through the reef in front of the present Halekūlani Hotel (Pukui et al. 1974:99).

Place names in the Royal Hawaiian sector reflect the *ali‘i* connections to the area: Helumoa as the royal center, Helumoa Heiau and Kahuamokomoko as adjuncts to the royal center, Hamohamo along the coast as part of Lili‘uokalani’s birthright, and Pualeilani as the first beach home of Prince Kūhiō. Another historical place is Muliwai ‘Āpuakēhau, which was the mouth of ‘Āpuakēhau Stream, which was one of three major drainages that flowed into Waikīkī waters.

The Kūhiō Beach sector contained Lili‘uokalani’s beachside residence, Kealohilani (Kanahele 1928b), which was subsequently the Pualeilani home of Prince Jonah Kūhiō Kalaniana‘ole. In the mid-century Māhele, the *‘ili* of Hamohamo was awarded to the high chief Keohokālole. In 1859, Keohokālole transferred the land to her daughter Lili‘uokalani (future queen of Hawai‘i), who established a residence at Paoakalani (*makai* of the present Ala Wai Canal) and a beachside cottage that she called Kealohilani. In 1918, Prince Kūhiō acquired Kealohilani through an out-of-court settlement of his challenge to Lili‘uokalani’s establishment of a trust (Hibbard and Franzen 1986:37), and built a new home called Pualeilani on the property.

Until the late 1800s, Ku‘ekaunahi Stream flowed as a wide and slow-moving estuary into the ocean in the southern portion of the Kūhiō Beach sector (the Diamond Head basin, around the present alignment of Paoakalani Avenue). Another historical place in the Kūhiō Beach sector is Muliwai Ku‘ekaunahi, which was the mouth of Ku‘ekaunahi Stream. This stream was one of three major drainages that flowed into Waikīkī waters.

Table 1. Place Names of Waikīkī Within or Near the Project Area.

Name	Description	Translation	Reference
ʻĀpuakēhau	stream, *muliwai*; site of present-day Moana Hotel	basket [of] dew, probably named for a rain	Bishop (1881, 1882) Kamakau (1991:50, 1992)
ʻAuʻaukai	land area; designated Fort Land	to bathe in the sea	Bishop (1882); Pukui and Elbert (1986)
Halemauʻuola (Loko Halemauʻuola)	fishpond	--	Bishop (1881)
Hamohamo	land area *(ʻili lele*?)	rub gently (as the sea on the beach)	Bishop (1881, 1882)
Helumoa	name of *ʻili* that was a royal center from at least the 15th century; site of present-day Royal Hawaiian Hotel	chicken scratch (chickens scratched to find maggots in the victim's body, possibly a reference to a sacrificial *heiau* formerly at that location)	Bishop (1881); Nāpōkā (1986); Kanahele (1995); Pukui et al. (1974:44)
Kaʻihikapu (Loko Kaʻihikapu)	fishpond	the taboo sacredness	Bishop (1881); Pukui et al. (1974)
Kawehewehe	stream, *muliwai*; outlet for fishpond complex in inland Kālia (Fort DeRussy); shown as "Muliwai Kawehewehe" on GRM 1720 (n.d.) but not on other historical maps	the removal	Reg. Map 1720; Pukui et al. (1974:99)
Kawehewehe	location of the residence of John Papa ʻĪʻī, an advisor to Kamehameha, from around 1803 when Kamehameha moved to Oʻahu; also the "reef entrance and channel off Gray's Beach, just east of the Hale-kū-lani Hotel, Waikīkī, Honolulu"; the sea water of Kawehewehe is said to have had healing qualities and was known for its fragrant *līpoa* seaweed	the removal	ʻĪʻī (1959:17); Pukui et al. (1974:99); Kanahele (1995:98); McGuire et al. (2001:69-70); Pukui (1983:246)

Name	Description	Translation	Reference
Kahuamokomoko	athletic field, including *'ulu maika* field, said to be on grounds of Royal Hawaiian Hotel; see Site 9980	*kahua mokomoko*, "a place where people assembled to wrestle"(Andrews 1922:239)	McAllister (1933:77); Kanahele (1995:99)
Kālia	name of *'ili* and general area of Fort DeRussy	waited for	Bishop (1881); Pukui et al. (1974:77)
Kapuni	land area, surf break	the surrounding (perhaps named for the spreading banyan tree on the Cleghorn ʻĀina-hau estate)	Bishop (1881); Kamakau (1991:44, 1992b:290)
Kapuʻuiki (Loko Kapuʻuiki)	fishpond	the small hill	Bishop (1881); Thrum (1922:646)
Kaohai (Loko Kaohai)	fishpond	the ʻ*ōhai* shrub (*Sesbania tomentosa*)	Bishop (1881); Thrum (1922:644)
Kealohilani	beachside home of Queen Liliʻuokalani; later site of Prince Kūhiō's second Pualeilani home; this is just seaward of Site 5859	heavenly brightness	Pukui et al. (1974:102)
Kekio	land area	pool	Bishop (1881, 1882); Thrum (1922:650)
Keōmuku Kamoku Kamaku	land area	the shortened sand	Bishop (1881, 1882); Pukui et al. (1974:108)
Kuʻekaunahi Kukaunahi Kukaʻiunahi	stream, *muliwai*; see Site 5943	--	Bishop (1881, 1882); Kamakau (1964:74); Winieski et al. (2002)
Kūihelani	Kamehameha's residence at Puaʻaliʻiliʻi near the mouth of ʻĀpuakēhau Stream	standing at Helani (a mythical land), name of one of Kamehameha's chiefs	Kanahele (1995:136); Pukui et al. (1974:120)
ʻŌʻō (Loko ʻŌʻō)	fishpond	black honeyeater, *Moho nobilis*	Bishop (1881); Pukui et al. (1974:171)

Name	Description	Translation	Reference
Paweo (Loko Paweo I/Loko Paweo II)	fishpond	turn aside	Bishop (1881); Pukui et al. (1974:182)
Pi‘inaio	stream, *muliwai*, *kahawai*	ascend for (go upstream in search of?) *naio*, *Myoporum sandwicense*	Bishop (1881, 1882); Thrum (1922:666)
Pua‘ali‘ili‘i	place of Kamehameha’s residence Kūihelani near the mouth of ‘Āpuakēhau Stream	little pig	Kanahele (1995:91); Pukui et al. (1974:190)
Pualeilani	name of two residences of Prince Kūhiō; see Site 5859 and Site 5863	royal garland of flowers	Hibbard and Franzen (1986:37-39)
Uluniu	land area	coconut grove	Pukui et al. (1974:215)

Figure 8. Place names plotted along the late 19th century Waikīkī coastline.

TRADITIONS

The chronology of pre-Contact occupation along the Waikīkī shoreline is based on a suite of 16 radiocarbon determinations obtained from previous archaeological investigations in the area. The radiocarbon determinations are problematic in that most samples were run on unidentified charcoal which has potential to produce dates with inbuilt age (i.e., dates that are older than the target event). Considering this limitation, the use of Bayesian modeling provides the best current estimate for occupation along the Waikīkī shoreline of no later than *AD 1350–1610 (95.4%),* and likely *AD 1379–1600 (68.2%)* (Tomonari-Tuggle 2017).

The earliest Hawaiian settlers probably made their homes on the windward shores of the islands, and visited the drier southern and western areas only for selected resources like fish and birds. As time passed and settlers eventually migrated to other parts of O‘ahu, coastal Waikīkī was probably one of the earliest areas occupied as it offered easy access to rich ocean resources, a ready freshwater supply from springs and streams, level and easily developed lands for cultivation and aquaculture, and a bounty of game foods like ducks and other wildfowl. Some cultivation probably followed the stream courses into valleys like Mānoa, which were also sources for items like hardwood (for tools, weapons, and building materials) and birds (for feathers) (Tomonari-Tuggle and Blankfein 1998).

The traditions of Waikīkī indicate its significance as a nexus of interconnected *ali‘i* histories and as a highly productive agricultural region. In ancient times, Waikīkī was a center of *ali‘i* power, "a land beloved of the chiefs" who resided there because the lands were rich and the surfing was excellent (Kamakau 1991:44).

CHIEFLY ASSOCIATIONS

It is said that Mā‘ilikūkāhi, the ruling chief of O‘ahu in the mid-14th century (based on genealogical reckoning), made Waikīkī the royal seat of chiefs (Beckwith 1970:383). From that time, it was the residence, either permanently or part-time, of the high *ali‘i*. In the 16th century, the Maui chief Kiha-a-Pi‘ilani was born at ‘Āpuakēhau (Kamakau 1991:50). In the 18th century, after his conquest of the island, Maui king Kahekili made his home at Waikīkī, as did Kamehameha after he succeeded in wresting control of the island from Kahekili's successor. Kamakau (1992:394) writes that Kamehameha made Kekāuluohi his wife at ‘Āpuakēhau; she later became one of Liholiho's five wives and through a later husband, Kana‘ina, she bore Lunalilo, who would become the first elected Hawaiian king after the death of Kamehameha V in 1872.

Helumoa and Ulukou, areas at the mouth of ‘Āpuakēhau Stream, were the focal points of chiefly residence. The stream emptied into a protected curve of the shoreline that created a "famous surfing spot called Kalehuawehe" (Nāpōkā 1986:2). Rich fishponds lay to the west, and the expansive inland wetlands produced a bounty of *kalo* and other crops. The ocean provided an array of fish. A visitor in the 1850s described a typical catch (Nāpōkā 1986:3, quoting Harriet Newell Foster Deming):

> Sometimes four canoes would be drawn up on the beach at once, filled with shining beauties in nets … the wealth of color fascinated us as we hung over the sides of the canoes watching the bronzed fishermen who, naked except for a loincloth, scooped up the fish in their hands and laid them in piles on the sand.

AGRICULTURE AND FISHPONDS

Waikīkī was famous for its extensive irrigated pondfields and fishponds that covered the coastal plain "from the inland side to the coconut grove beside the sea" (Kamakau 1991:45). Fed by the waters of Mānoa and Pālolo Valleys and by the numerous springs that gave Waikīkī its name, the wetland system of expansive *lo'i* is credited to the 15th century ruling chief Kalamakua-a-Kaipūhōlua (Kamakau 1991:45):

> He was noted for cultivating, and it was he who constructed the large pond fields Ke'okea, Kūalulua, Kalāmanamana, and the other *lo'i* in Waikīkī. He traveled about his chiefdom with his chiefs and household companions to cultivate the land and gave the produce to the commoners, the *maka'āinana*.

Kamakau (1992:192) also credits Kamehameha with the creation of the extensive pondfield system, including the pondfields attributed to Kalamakua-a-Kaipūhōlua, but this likely reflects Kamehameha's modification or expansion of extant *lo'i*.

HEIAU

The significance of Waikīkī Ahupua'a is also emphasized by the number and kinds of *heiau* distributed across this area, particularly along the coast (Kamakau 1976:144; Thrum 1907:44-45). Three of the eight *heiau* identified by Thrum (1907) (Table 2) are of the *po'o kanaka* class, i.e., sacrificial *heiau* that were "only for the paramount chief, the *ali'i nui*, of an island or district (*moku*)" (Kamakau 1976:129).

Table 2. Heiau in Waikīkī, Based on Thrum (1907).

Name	Location	Type	Description from Thrum (1907)
Helumoa	'Āpuakēhau	*Heiau po'o kanaka*	place of sacrifice of Kauhi-a-Kama, defeated *mō'ī* of Maui, after his failed raid on O'ahu in early 1600s; during the reign of O'ahu chief, Ka'ihikapu
Papa'ena'ena	at foot of Diamond Head slope	*Heiau po'o kanaka*	walled and paved structure of open terraced front; destroyed by Kana'ina about 1856, and the stones used to enclose Queen Emma's premises and for road work; said to be the place of a number of sacrifices by Kamehameha I in early 1800s
Kupalaha	Kapi'olani Park	unknown	said to be associated with working of Papa'ena'ena; entirely obliterated by 1906
Kapua	Kapi'olani Park	*Heiau po'o kanaka*	torn down in 1860; said to be the place of sacrifice of Kaolohaka, a chief from Hawai'i, on suspicion of being a spy
Kamauakapu	Kapahulu, Diamond Head	husbandry class	erected by Kalākaua in 1888 for his Naua Society; in partial ruins in 1906
Kulanihakoi	Waikīkī	unknown	site of grass house on Kalākaua's premises; in ruins in 1862 (walls torn down much earlier)
Makahuna	Diamond Head	Ku'ula class	large enclosure dedicated to Kāne and Kanaloa
Pahu-a-Maui	Diamond Head (site of lighthouse station)	unknown	destroyed by 1906

BATTLES

In the late 1700s, warfare in the islands raged. High chiefs amassed huge armies and sailed flotillas of war canoes between islands in a quest for territorial expansion. At least two assaults on O‘ahu took place on the beaches of Waikīkī. From Maui in 1779 came the warrior-chief Kahekili, who conquered O‘ahu after three years of fighting. With victory, the high chief made Waikīkī his home, specifically at Helumoa near the mouth of ‘Āpuakēhau Stream (the location of Helumoa Heiau). After some time on Maui and Hawai‘i, Kahekili returned to Waikīkī, where he died in 1794. He was succeeded by his son, Kalanikūpule.

A year later, in 1795, Kahekili’s chief rival for power, Kamehameha, staged an attack on O‘ahu. It is said that his armada, which included 1,200 double canoes and 10,000 warriors, landed at Waikīkī, a beachhead of relatively calm waters and sandy beaches that offered abundant water, *kalo*, and other supplies for his vast army (Kanahele 1995:87). Unlike Kahekili’s three-year battle, Kamehameha was quickly successful in defeating his adversary, Kalanikūpule, and taking control of O‘ahu. Like the Maui chief, Kamehameha settled in Waikīkī near the mouth of ‘Āpuakēhau Stream. Along with Kona on Hawai‘i Island and Lāhaina on Maui, this served as one of the capitals of his unified (except for Kaua‘i) kingdom.

HISTORICAL BACKGROUND

In 1778, British Captain James Cook made first Western landfall in Hawai‘i, and other European and American explorers, traders, and missionaries followed. Many wrote accounts and journals that provide an image of the wetland agricultural landscape of Waikīkī. For example, Archibald Menzies (1920:23-24), an early Western visitor who was naturalist and surgeon on board the *HMS Discovery* captained by George Vancouver (in Hawai‘i in 1792-1793), described a visit to Waikīkī:

> The verge of the shore was planted with a large grove of coconut palms, affording a delightful shade to the scattered habitations of the natives.… We pursued a pleasing path back to the plantation, which was nearly level and very extensive, and laid out with great neatness into little fields planted with taro, yams, sweet potatoes and the cloth plant. These, in many cases, were divided by little banks on which grew the sugar cane and a species of Draecena without the aid of much cultivation, and the whole was watered in a most ingenious manner by dividing the general stream into little aqueducts leading in various directions so as to be able to supply the most distant fields at pleasure, and the soil seemed to repay the labor and industry of these people by the luxuriance of its productions. Here and there we met with ponds of considerable size, and besides being well stocked with fish, they swarmed with waterfowl of various kinds such as ducks, coots, water hens, bitterns, plovers and curlews.

Although Waikīkī was the initial capital and residence of Kamehameha on O‘ahu, the growing number of American and European traders looked to the harbor at Kou (present Honolulu) as a safer and therefore favored berth for their deeper draft ships. In the first decade of the 19th century, Kamehameha gradually shifted his capital to that once rural village, and by 1809, he had an established residence near the Honolulu harbor frontage. His family and members of court and government also made the move, leaving Waikīkī in the care of lesser chiefs and land managers (Kanahele 1995:104-105).

Waikīkī, however, remained an attraction for the *ali‘i*. Only three or so miles from Honolulu, it was the only place near the city with beaches and surf, and provided an easy escape from the increasingly Western atmosphere of the new capital (Hibbard and Franzen 1986:10). *Ali‘i*, particularly members of the Kamehameha extended family, built beach cottages on the ocean front. As the 19th century progressed, they replaced their grass roofed, wooden buildings with more elaborate and modern homes. Hawaiian chiefs and royalty were joined by *haole* residents and visitors to form a relaxed community. By the late 19th century, the homes of *ali‘i* like Emma (wife of Kamehameha IV), Kapi‘olani (wife of Kalākaua), and Lili‘uokalani (Queen of Hawai‘i) were located between ‘Āpuakēhau and the present Kapi‘olani Park, and residences of *haole* businessmen like Davies, Robinson, Brown, and Damon were on the beachfront west of ʻĀpuakēhau (Wall 1893). The beginnings of the Waikīkī tourist trade were also represented at this time by the presence of the Long Branch, the earliest known bathing establishment at which visitors were provided "a towel, bathing suit, dressing rooms and a stretch of beach and ocean to enjoy" (Hibbard and Franzen 1986:52), and the W.C. Peacock property ("Peacock's"), which would become the site of the first major hotel in Waikīkī, the Moana Hotel, in 1901.

MID-19TH CENTURY LAND PARCELS

In the mid-19th century, major structural changes were made to the ways land was held in Hawaiʻi. In 1848, the traditional system of land tenure was replaced with a Western system of fee-simple land ownership. This radical restructuring, called the Māhele, divided all lands between the king and 245 high-ranking *aliʻi*; the king later divided his lands between himself (called Crown Lands) and the government (Kameʻeleihiwa 1992). Subsequently, commoners were offered the opportunity to claim fee-simple title to the land on which they lived or improved; these became known as *kuleana* lands and were awarded in the form of Land Commission awards (LCAs; often referred to as *kuleana* lands).

Unlike most *aliʻi* land awards that were for entire *ahupuaʻa*, *aliʻi* awards in the *ahupuaʻa* of Waikīkī were for *ʻili*. As Kameʻeleihiwa (1992:232) explains, land on Oʻahu was desirable and therefore *ʻili* on Oʻahu were as valuable as *ahupuaʻa* on the other islands:

> On Oʻahu, the moku of Kona (especially in Honolulu and Waikīkī), ʻEwa, and Koʻolaupoko were defined predominantly by ʻili. This division of ʻĀina into a great number of rather small areas indicates that Oʻahu was not only more populated, but its ʻĀina were more desired by the Aliʻi and konohiki.… Although an ʻili was almost always smaller in size than an ahupuaʻa, an ʻili on Oʻahu was considered as desirable as an ahupuaʻa on the outer islands.

About 250 Land Commission awards (to six *aliʻi* and the remaining to local land managers and commoners) were made in Waikīkī (Kanahele 1995:115). The *aliʻi* awardees included Kauikeauoli (Kamehameha III) (62 acres), high chiefs William Lunalilo (2,229 acres) and Ana Keohokālole (100 acres), and three lesser-ranked chiefs, Mataio Kekūanaōʻa (133 acres), Keoni Ana (11 acres), and Kaisara Kapaʻakea (9 acres). As noted by Kanahele (1995:116), "Their properties all included choice spots located near the beach, streams or fish ponds." It is notable that the heirs of these *aliʻi* awardees include the monarchs Kamehameha V, David Kalākaua, and Liliʻuokalani; queen consorts Emma Rooke and Kapiʻolani; Princesses Ruth Keʻelikōlani, Likelike, and Kaʻiulani; and Prince Jonah Kūhiō Kalanianaʻole.

Kuleana awards, most of which were generally less than an acre, lined the Waikīkī shore, with associated inland pieces that provided land for farming. Of the shoreline *ʻāpana*,[2] two fall in the Fort DeRussy sector, ten in the Halekūlani sector, three in the Royal Hawaiian sector, and one in the Kūhiō Beach sector. There were no LCAs awarded south of Kuʻekaunaha Stream (roughly the alignment of present Paoakalani Avenue).

THE LATE 19TH CENTURY

In the second half of the 19th century, changes to the Waikīkī landscape entailed improvements to transportation connections between Waikīkī and Honolulu, including construction of a tram line between the

[2] Only those LCAs that fall in or adjacent to the Waikīkī beach improvements project area are counted.

two areas, and the development of Kapiʻolani Park and an associated residential neighborhood on June 11, 1877 (Brown and Monsarrat 1883).

In the 1860s, rice cultivation experienced a boom across the islands, directed at two markets: export to California for Chinese emigrants who had settled there after the mid-century Gold Rush and local consumption by a growing number of Chinese contract laborers who had come to Hawaiʻi to work on the sugarcane plantations (by 1884, there were 18,254 Chinese in the islands; see Coulter and Chun 1937:13). Rice was second only to sugar in the economic hierarchy in the islands (Haraguchi 1987:xiii). Like sugar, Hawaiʻi's rice production filled the void created by the U.S. Civil War, when rice farming in the southern United States was severely curtailed (Coulter and Chun 1937:13). During negotiations for the Reciprocity Treaty between the U.S. and Hawaiian governments, efforts were made to ensure that rice shared the same protection as sugar.

Land speculators purchased *kalo* fields, and in some cases, pulled up young *kalo* plants to replace them with rice seedlings (Haraguchi 1987:viv). Many *kuleana* owners leased their former *kalo* fields to rice entrepreneurs, although in some cases, they retained land for the Hawaiian staple food. By 1892, there were 542 acres in Waikīkī planted in rice, representing almost 12 percent of the total 4,659 acres in rice cultivation on Oʻahu (Hammatt and Shideler 2007:17). Nakamura (1979:20, quoting Iwai 1933:80, brackets added) notes that Waikīkī was one of "the most important [rice] growing districts on Oahu."

At the end of the 19th century, Waikīkī Road (roughly the alignment of the present Kalākaua Avenue) marked the boundary between fishponds and beach lots to the *makai*, and rice fields to the *mauka* (Monsarrat 1897). Kapahulu Avenue was the southeastern boundary of the rice fields, with the gridded Kapahulu house lots and Kapiʻolani Park extending toward the base of Diamond Head (the Kapahulu lands to the east of the present Kapahulu Avenue appear to have been planned for subdivision in 1899, see Monsarrat 1899).

20TH CENTURY LANDSCAPE CHANGES

The 20th century saw the definitive transformation of Waikīkī from quiet retreat and agricultural breadbasket to a bustling tourist destination. As the popularity of Waikīkī among residents—particularly the foreign/*haole* population—and visitors grew, the region was eyed for development. Kapiʻolani Park in 1877 was originally developed as a private recreational/open space amenity for high-end residences at the base of Diamond Head and along the coast (Brown and Monsarrat 1883). In the early 20th century, the extensive wetlands complex on the coastal plain was valuable for rice cultivation and raising ducks, but was described as "swamp lands" by those who had visions of development. As noted by Steele (1992:8-3), "in the eyes of many in Honolulu, [it could] be put to better use … but only if the land could be 'reclaimed' (filled in)." The first effort in Waikīkī reclamation was by the U.S. Department of War in its development of Fort DeRussy at the western end of Waikīkī, which required filling in a large portion of the fishponds.

The agricultural landscape of Waikīkī was nearing its end, victim to the allure of Waikīkī as a resort destination. Nakamura (1979:34) writes:

> A conflict was developing at Waikiki between wet agriculture and aquaculture, on the one hand, and urbanization on the other. Urbanization was adversely affecting the good and proper drainage of surface water flowing from the mountains to the sea. This restricted water, in turn, was labeled unsightly and unsanitary by those who wished to see wet agriculture and aquaculture at Waikiki destroyed.

By the end of the first decade of the 20th century, the rice fields and duck ponds that once covered the entire coastal plain inland of Kalākaua Avenue appear to have been contracted to the northwest, leaving the eastern portion of the wetlands complex as pasture or open fields, with scattered buildings and a network of dirt roads (U.S. Army 1909-1913).

ALA WAI CANAL

The primary impetus for landscape change was construction of the Ala Wai Canal in the 1920s. The canal effectively cut off Waikīkī from the rest of the Honolulu urban and suburban landscape, and created developable lands where before there were the expansive wetland agricultural fields. In addition, the canal was seen as remedying a perceived impact of outflow from the wetlands on the growing bathing industry: "the proposed drainage canal would carry the runoff away from the Waikīkī beaches" (Steele 1992:8-4).

Using so-called unsanitary conditions as a justification, the government (first the post-overthrow Hawaiian Republic and then the Territorial Government) enacted legislation that forced landowners to fill in the wetlands, and if they did not, the government would do so and put a lien on the property to pay for the "improvements." The end result was the destruction of the agricultural system and in many cases, the loss of land (Nakamura 1979:67-68):

> The Sanitary Commission of 1912 estimated that, of the total amount of land in the district of Honolulu located below the foothills, one third was wet land. This wet land, which was used for agriculture and aquaculture, represented, then, a considerable amount of urban real estate if filled in.
>
> Such laws as Chapter 83, R.L. 1905 already existed to deal with filling in wet land. The justification for such actions would be sanitation, that is, if wet lands were allowed to exist within the district of Honolulu, the public health would be endangered, for mosquitoes, carriers of dangerous diseases, would continue to breed.... Thus sanitation was presented as the primary motive in the destruction of wet agriculture and aquaculture while the profitability of reclaimed was hardly mentioned at all.

Land acquisition for the two-mile long canal began in 1918, either through voluntary purchase or condemnation (Steele 1992:8-5). Construction began in 1921, with Walter F. Dillingham's Hawaiian Dredging Company contracted by the Territory of Hawaii to carry out the work (Nakamura 1979:90). By 1924, the entire length of the canal from its outflow at the west end of Waikīkī to its head at Kapahulu Road was excavated; a proposed outflow from Kapahulu Road to the eastern end of Waikīkī was never completed, aborted by a concern that the on-shore current would take canal runoff west onto the pristine beaches (Cocke 2013). Although the canal was dredged as planned, additional fill was needed to "reclaim" adjacent lands and additional funds were authorized to widen the canal from 150 to 250 feet. In 1928, the canal was completed. Steele (1992:8-7) describes the resultant changes in land values and tourism:

> … land values had gone from $500 an acre for a piece of agricultural property prior to the construction of the canal to up to $4 a square foot for business property in 1928. With a great increase in available property, numerous residential development projects were undertaken in Waikīkī. The number of visitors was also on the rise since the beginning of the reclamation project. Between 1921 and 1927, the number of visitors to Waikīki doubled from 8,000 to 17,451 according to the Hawaii Visitors Bureau.

In addition to the dredge and fill operations related to the Ala Wai Canal, the Waikīkī portions of natural drainages, like ʻĀpuakēhau and Kuʻekaunahi Streams, were also filled.

BEACH CONTROL INFRASTRUCTURE

In the mid- to late 19th century, Waikīkī became a retreat for town dwellers in Honolulu who wearied of dry, dusty urban life. Royalty escaped to their beachfront estates. Families began to frequent the beach on weekend bathing trips. In 1881, James Dodd opened the first commercial hospitality operation, the Long Branch, which was a small cottage where visitors could change their clothes for a small fee (Kanahele 1995:152). Modest residences were common, and it was not until the 1890s that sumptuous homes began to appear along the beachfront (Hibbard and Franzen 1986:27).

As more visitors frequented Waikīkī and more properties developed along the coast, shoreline improvements were made to enhance the visitors' beach experience (the chronology of shore improvements is primarily from Wiegel 2008:26-27). One of the first infrastructure projects was construction of a bridge/causeway at the entrance to the new Kapiʻolani Park around 1880, a portion of which was replaced in 1890 by a seawall to protect Waikīkī Road (now Kalākaua Avenue near Kapahulu Avenue). Also in 1890, picturesque piers were built at Queen Liliʻuokalani's Kealohilani beach home and at W.C. Peacock's residence; both structures graced the Waikīkī shoreline for over 40 years. When the Moana Hotel was constructed on Peacock's property in 1901, the pier became known as Moana Pier.

In the first three decades of the 20th century, seawalls were constructed at various locations, but with no apparent overall design or strategy. The earliest record of a constructed retaining wall at a specific property is an 1897 map showing a wall fronting Liliʻuokalani's property at Kealohilani, adjoining the inland end of her pier (Kanakanui 1897). As hotels began to develop, each protected its shorefront with a seawall: the Moana Hotel in 1901, the Seaside in 1906, Gray's Hotel (now the Halekūlani) in 1916, and the Royal Hawaiian Hotel in 1925-1926. When the U.S. War Department acquired lands at Kālia for Fort DeRussy, it too protected its beachfront with walls built in 1909 and 1916. By 1920, almost the entire shorefront of Kapiʻolani Park was lined in seawalls.

Groins were also built to protect and enhance the beach, and many have come and gone, leaving only the present five groins in the project area. The first was a concrete wall projecting into the shallows at the mouth of ʻĀpuakēhau Stream, built sometime between 1906 and 1910, presumably by Moana Hotel; it was removed in 1927. Between 1917 and 1930, nine groins were built along the shore between the Royal Hawaiian Hotel and Fort DeRussy, and experimental sand bag groins were installed between the Royal Hawaiian Hotel and Gray's Hotel. Groins were also constructed at the original Honolulu Aquarium; they appear on a 1928 map of the Waikīkī shoreline (Kanahele 1928c).

HISTORICAL EVENTS IN THE PROJECT AREA

Table 3 to Table 6 contain summaries of historical events pertaining to shoreline changes in the four Waikīkī Beach sectors (Fort DeRussy, Halekūlani, Royal Hawaiian, and Kūhiō Beach) within the project area.

Table 3. Fort DeRussy Sector: Historical Events.

Year	Event	Reference
1803-1804	Luluka family established residence at Kawehewehe, when they moved to Oʻahu with Kamehameha; members of family were in charge of the royal residence at Puaʻaliʻiliʻi.	ʻĪʻī (1959:17)
1904-1910	U.S. War Department acquired 73 acres of Kalia through purchase, condemnation, and Executive Order.	Hibbard and Franzen (1986:79)
1909	Fort DeRussy established; over next two years, Kalia fishponds filled by dredging off-shore reefs and pumping into ponds.	Hibbard and Franzen (1986:79), Clark (1977:58)
1910-1914	Batteries Randolph and Dudley constructed as part of Artillery District of Honolulu.	Davis (1989:7)
1916	1,150-foot long seawall built along the Fort DeRussy shoreline.	Wiegel (2008:Figure 18, 26)

Year	Event	Reference
1917	70-foot long groin built at east boundary of Fort DeRussy sector.	Wiegel (2008:22)
1941	Fort DeRussy shoreline closed to the public for duration of WWII.	Clark (1977:58)
1945	Fort DeRussy beach reopened to public.	Clark (1977:58)
1969	Box culvert/groin at east boundary lengthened from 70 to 300 feet.	Wiegel (2008:22)

Table 4. Halekūlani Sector: Historical Events.

Year	Event	Reference
1600s	First dated occupation of Halekūlani area.	Davis (1984)
1803-1804	Kawehewehe became residence of the Luluka family when they moved to Oʻahu as part of Kamehameha's entourage (Kamehameha was preparing for the invasion of Kauaʻi); members of family were in charge of the royal residence at Puaʻaliʻiliʻi.	ʻĪʻī (1959:17)
1912	Gray's by the Sea boarding house established by La Vancha Maria Chapin Gray in a two-story house built by Minnie Gilman (Mrs. Joseph A. Gilman) in 1903; source of the name Gray's Beach for the area.	Clark (1977:56)
1913-1914	Seawalls built in front of S.C. Wilder home and Gray's by the Sea.	Wiegel (2008:26)
1917	70-foot long Fort DeRussy box culvert/groin built at west boundary of Halekūlani sector.	Wiegel (2008:22)
1926-1929	Eight groins built between Royal Hawaiian Hotel and Fort DeRussy.	Wiegel (2008:26)
1928	Stone groin built off of Minnie Gilman's property (incorporated into future Halekūlani Hotel).	Kanahele (1928a)
1929	Charles Kimball acquired Gray's by the Sea and adjacent land and established Halekūlani Hotel.	Clark (1977:56)
1931	New Halekūlani Hotel opened.	Hibbard and Franzen (1986:103)
1932	Aerial photograph shows five piers or groins in Halekūlani sector.	Wiegel (2008:Figure 19)
1969	Fort DeRussy box culvert/groin at west boundary lengthened from 70 to 300 feet.	Wiegel (2008:22)

Table 5. Royal Hawaiian Sector: Historical Events.

Year	Event	Reference
1500s	Ruling chief of Oʻahu Kakūhihewa lived at Ulukou; during his reign, legend of Kalehuawehe and Pīkoi (surfing at what is now called Populars).	Pukui (1983:161-162), Nāpōkā (1986:2), Kanahele (1995:73)
1600s	Maui chief Kauhi-a-Kama attacked Oʻahu; landed at Waikīkī but was defeated and killed by Oʻahu chief Kaʻihikapu, and then sacrificed at Helumoa Heiau.	McAllister (1933:76), Nāpōkā (1986:5), Kanahele (1995:74)

Year	Event	Reference
1783	Maui king Kahekili conquered O‘ahu, after which he established a residence at ‘Āpuakēhau.	Fornander (1919:VI-2:289), Kanahele (1995:79)
1794	Kahekili died at his home at Ulukou.	--
1803	Kamehameha established his residence at Pua‘ali‘ili‘i between the mouth of ‘Āpuakēhau Stream and “the old road” (Royal Hawaiian Hotel); built a stone house enclosed by a fence; Kaahumanu and her family lived at Helumoa (within Pua‘ali‘ili‘i); members of Luluka family (family of Papa Ii) were in charge of the royal residence.	‘Ī‘ī (1959:17), Kanahele (1995:91, 92)
1859	Lili‘uokalani received the land of Hamohamo from her mother, Keohokālole (who was awarded the land in the Māhele); a section of Hamohamo covers almost the entire beach in the Royal Hawaiian sector and a large section of the Kūhiō Beach sector.	Hibbard and Franzen (1986:8)
1866	Kamehameha V purchased property at Helumoa (LCA 1445:1).	Kanahele (1995:132)
1868	Kamehameha V purchased additional property (LCA 228) at Helumoa (inland of LCA 1445:1).	Kanahele (1995:132)
1880	Kalākaua purchased beachfront land at Uluniu and built a house (LCA 6616:4).	Kanahele (1995:133)
1881	James Dodd established the first bathhouse in Waikīkī at Ulukou; called the Long Branch, it was a cottage where bathers could change their clothes for a small charge.	Hibbard and Franzen (1986:53), Kanahele (1995:152)
1883	Bernice Pauahi Bishop inherited the lands of Ruth Ke‘elikōlani, which included the estate of Kamehameha V (who died in 1872); this included Helumoa, where Bishop and her husband built a house on the former LCA 1445:1.	Kanahele (1995:132)
1884	first building constructed at location of present Waikiki Beach Center; known over the years as Ilaniwai Baths, Wright’s Villa, Waikiki Inn, Heinie’s Tavern, and Waikiki Tavern.	Clark (1977:54), Hibbard and Franzen (1986:51)
1890	240-foot long timber pier on piles constructed off the W.C. Peacock home (which preceded the Moana Hotel); originally called Peacock Pier and subsequently renamed Moana Pier.	Wiegel (2008:21)
1899	Prince Kūhiō inherited his beachside property at Uluniu called Pualeilani from his *hānai* mother Kapi‘olani, who had inherited it from her husband Kalākaua when he died in 1891; this was the location of LCA 6616:4.	Kanahele (1995:134)
1901	Moana Hotel opened, Waikīkī’s first major hotel; 230-foot long seawall built in front of hotel.	Hibbard and Franzen (1986:58-59), Wiegel (2008:21, 26)
1906	Cottage-style Seaside Hotel opened; property included the royal coconut grove of Helumoa.	Hibbard and Franzen (1986:62)
1915	Thatched houses of original Outrigger Canoe Club replaced with two-story, pavilion-like clubhouse.	Hibbard and Franzen (1986:77)
1918	Concrete wings added to Moana Hotel, doubling hotel’s capacity.	Hibbard and Franzen (1986:61)

Year	Event	Reference
1918	Prince Kūhiō removed the high board fence around his property and opened it to the public (he moved to Liliʻuokalani's Kealohilani property about 1,000 feet to the southeast and built a new Pualeilani home).	Clark (1977:52), Hibbard and Franzen (1986:37)
1925-1926	Royal Hawaiian Hotel built on the site of the former Seaside Hotel; groin built at same time; new seawall built shoreward of old seawall.	Wiegel (2008:21, 26)
1926	Ala Wai Canal completed; water supply to ʻĀpuakēhau Stream cut off.	--
1927	Concrete groin between Moana Hotel and Royal Hawaiian Hotel removed.	Wiegel (2008:26)
1930	Royal Hawaiian Groin extended to 368 feet.	Wiegel (2008:26)
1931	Moana Pier demolished.	Wiegel (2008:21, 26)
1937	Territory acquired Dean's Hotel and Luella Emman's properties to be used for park (present Kūhiō Park).	SSRI (1985:A-15)
1969	21-story Surfrider Hotel opened on the west side of the Moana Hotel.	Wiegel (2008:21)

Table 6. Kūhiō Beach Sector: Historical Events.

Year	Event	Reference
1859	Liliʻuokalani received the land of Hamohamo from her mother, Keohokālole (who was awarded the land in the Māhele; a section of Hamohamo covers almost the entire beach in Royal Hawaiian sector and a large section of Kūhiō Beach sector.	Hibbard and Franzen (1986:8)
1877	Kapiʻolani Park opened.	Hibbard and Franzen (1986:43)
1880	Around this time, a bridge/causeway was built across mouth of Kuʻekaunahi Stream at entrance to Kapiʻolani Park; the bridge ran from around the present ʻŌhua Avenue to Monsarrat Avenue.	Wiegel (2008:26)
1890	390-foot long retaining wall built to protect Waikīkī Road (now Kalākaua Avenue), replacing part of bridge and causeway near entrance to Kapiʻolani Park.	Wiegel (2008:26)
1890	Ca. 130-foot long wooden timber pier on piles built sometime prior to 1890 off of Liliʻuokalani's Kealohilani residence; known as Queen Liliʻuokalani Pier or Kūhiō Pier.	Kanahele (1995:136), Wiegel (2008:17)
1918	Prince Kūhiō acquired Liliʻuokalani's beach residence Kealohilani through an out-of-court settlement of his challenge to Liliʻuokalani's establishment of a trust; he built a new home called Pualeilani on the property.	Clark (1977:52), Hibbard and Franzen (1986:37)
1922	The original Pualeilani was given to the City when Prince Kūhiō died.	Clark (1977:52)
1934-1935	City and County purchased the second Pualeilani house, including Liliʻuokalani Pier, and demolished both for beach improvements; this was the last residence of an *aliʻi* in Waikīkī.	Hibbard and Franzen (1986:38), Wiegel (2008:17, 26)

Year	Event	Reference
1939	650-foot long crib wall built about 200 feet from shore (parallel to shore), with shore return structures at each end of seawall; this is the ‘Ewa portion of the Kūhiō Beach sector; concrete seawall built along Kalākaua Avenue to protect road.	Wiegel (2008:17)
1940	Kūhiō Park was officially dedicated.	Clark (1977:52)
1951	355-foot long Kapahulu Storm Drain/Groin built as part of Waikīkī Beach Improvement Project; it is an extension of the storm drain running under Kapahulu Avenue; project also included building a retaining wall on the Diamond Head side of the groin and importing sand; the Storm Drain/Groin is commonly referred to as “The Wall.”	Clark (1977:53), Wiegel (2008:17)
1953	750-foot long retaining wall built on ‘Ewa side of Kapahulu Groin to keep sand from eroding away; called “Slippery Wall” because of very slick surface when wet due to growth of fine seaweed; connected to 1939 crib wall.	Clark (1977:53), Wiegel (2008:17, 27)
1960	Waikiki Tavern demolished to make way for Waikiki Beach Center.	Clark (1977:54)
1972	Retaining wall to protect Kalākaua Avenue removed.	Wiegel (2008:27)

III. CULTURAL CONSULTATION

This section contains the results of the cultural consultation solicited as part of the preparation of this CIA. It also summarizes Gollin's (2017) overview of previous CIAs and consultations for Waikīkī, which contain additional cultural concerns and recommendations applicable to the current project.

Between January 5 and January 7, 2021, IA distributed consultation letters (using email and conventional mail) to 213 Waikīkī cultural stakeholders and community members, including cultural descendants, government officials at the federal, state, and county levels, and leaders of local businesses and civic organizations. Most of the prospective consultants were identified through previous Waikīkī CIAs and archaeological reports, public websites, or referrals from SHPD staff and other consultants. The letter contained a description of the project area, a summary of the planned improvement and maintenance work, a discussion of relevant cultural concerns for the project area identified in a feasibility study for the project (Tomonari-Tuggle 2017), and a review of CIA studies for previous Waikīkī projects (Gollin 2017). The letter concluded with a request for the consultant to share any personal knowledge about the cultural impacts the proposed project might have on the Waikīkī shoreline and associated areas. It further stated that all responses would be summarized or reproduced in the CIA report, made no requirements about the amount or type of information shared, and made clear that consultants could request anonymity or ask that certain information not be made publically available. IA requested that all responses be received by February 12, 2021. The full letter is reproduced in Appendix A. A list of all individuals approached to provide cultural consultation for the project is in Appendix B.

Ten consultants provided IA with written or verbal responses to the request letter. On March 6 and March 8, 2021, IA sent follow-up email messages to these consultants asking them to review their comments, edit them if desired, and to consent that their responses could be reproduced in the CIA. IA also restated the nature and function of the CIA and emphasized that participation was voluntary. Seven consultants provided written or verbal agreement that their original or revised responses could be included. The consent letters are reproduced in Appendix C. The remarks of consultants who did not respond to the consent letter are not included in the CIA.

Table 7 presents the consultant responses (with minor revisions for clarity). Bracketed comments were inserted by the report authors.

O'AHU ISLAND BURIAL COUNCIL MEETING

On February 10, 2021, Hannah Kaumakamanōkalanipō Anae, M.A., and Robert Pacheco, M.A., of IA presented a summary of the project to the OIBC during its monthly public meeting (via videoconference) to request additional cultural consultation. Several council members and participants provided comments during and immediately after the meeting. These comments (as recorded in IA's meeting notes) are summarized below.

Council Chair Hinaleimoana Wong-Kalu is concerned about any sand replenishment project due to the potential disturbance of *iwi kūpuna*, due in large part to previous cases (e.g., Mōkapu and Maui) where sand dunes containing *iwi* were mined. She views the Waikīkī Beach Improvement Project as primarily serving the interests of the tourism industry, and as a "band-aid" approach to global warming and sea level rise.

Table 7. Responses from Cultural Consultants Concerning the Proposed Waikīkī Beach Improvement and Maintenance Program.

Name	Title and/or Affiliation	Response
Apo, Peter	Office of Hawaiian Affairs (OHA)	I am familiar with the Waikiki shoreline erosion situation particularly with respect to iwi. If there is any specific aspect of your quest to be inclusive in your reach out to the community I'd be happy to opine. But, there's too many land mines in navigating iwi issues along the Waikiki corridor so I can't give you a general response. Also, Rob Iopa, a person with whom I shared your email of the project is head of WCIT Architecture whose company has a long history of Waikiki development projects.
Cáceres, Norman "Mana"	Waikīkī cultural descendant; Ohana Kūpono Consulting, Inc.	After reading the information sent to us, my ʻohana and I support the project. As State Recognized Cultural Descendants to native Hawaiian Human Remains documented in Waikīkī as well as being trained burial practitioners, we have both extensive knowledge as well as a responsibility to ensure the proper care and protection of the iwi kūpuna of that area. Beach erosion is a serious concern to us because the more the beach erodes the more potential impacts there are to burials along the coast. Just a few weeks ago we were assisting the community and descendants of the Kaʻaʻawa area in protecting two burials that were exposed due to erosion.
Clark, John	Author and *kūpuna* who frequented Waikīkī	If you have a copy of *Hawaiian Surfing: Traditions from the Past*, I included a section at the end called "Waikiki Place Names Related to Surfing." There's material in it that addresses some of the information that you're after. Several years ago the Department of Education asked me if I would narrate a surfing history of Waikīkī. We finished it in 2017 and premiered it at my alma mater in Waikīkī, Jefferson Elementary School. If you haven't seen it, this is the link: https://www.youtube.com/watch?v=NbFigfXH5Yg. FYI, it's 48 minutes long. Please feel free to share it.

Name	Title and/or Affiliation	Response
Kozlov, Alex	Director, Department. of Design and Construction, City and County of Honolulu	Thank you for the opportunity to review and comment. The Department of Design and Construction's Facilities Division has the following comments. 1. The proposed project along the Halekulani Beach Sector will restore a severely eroded section of beach in an area which tourists and local residents historically could access and utilize our valuable beach resource for recreational and cultural practices. The erosion is resulting in the closure of Brow 141A to protect the public from a hazardous condition. This project will insure that free access can be restored and protect against future sea level rise and coastal erosion. 2. Along the C, D, and E areas the City provides valuable lifeguard services which insures the safety of both tourists and locals who enjoy the various water activities that this shoreline has been and will continue to be intensively used for. To undertake this service the City has in place lifeguard towers which are key to enable the lifeguards to perform their duties. The severe erosion has endangered those structures which make it more difficult for the City to provide this service. The restoration of those shorelines will protect these structures ensuring that the City lifeguards will be able to continue to provide their service. 3. All around the island we see severe erosion of the shoreline at beach parks. When this occurs we see burials in the sand deposits being exposed. We see this project providing protection of sensitive cultural deposits which exist inland from the immediate beach area. If this kind of project is not undertaken we fully expect that the coastal erosion will progress mauka and will expose burial which we know to exist in this coastal area. With sea level rise taking no action to restore the beach and raise the elevation will leave the sensitive cultural areas exposed. Sincerely, Alex Kozlov, P.E. Director Designate

Name	Title and/or Affiliation	Response
Lau, Clifford	Facilities Branch Chief, Department of Design and Consultation, City and County of Honolulu	[The following paragraph is a summary of a phone conversation with Mr. Lau.] Mr. Lau says that the Department of Design and Construction supports the proposed project as it will restore shoreline access and protect lifeguard stations along Waikiki Beach which [are] being endangered by the beach erosion.
Lemmo, Sam	Administrator, DLNR-Office of Conservation and Coastal Lands	[Mr. Lemmo requested a copy of a 2008 report by Robert Wiegel (Waikīkī Beach, O‘ahu, Hawai‘i: History of Its Transformation from a Natural to an Urban Shore), but provided no further comment.]
Norman, Carolyn (Keli‘ipa‘akaua)	Waikīkī cultural descendant	Mahalo for including my ohana and I in the consultation process. This is how we connect to Waikiki. My Great grandfather William Nehemiah Keaweamahi, my grandmother Alice Kekahiliokamoku Keaweamahi-Kawainui and my mother Eileen Kekahiliokamoku "Kahili" Kawainui-Norman, who is still with us, were all born and raised in Kalia, Waikiki. 2 of my siblings were born at the old Kaiser Hospital that was once on my Kupuna Moehonua's aina in Kalia, Waikiki. My mother Kahili Norman remembers as a child going to the beach where Hilton Hawaiian Village is currently located with her mother and grand Aunts to pick limu for lunch and dinner." You mentioned in your letter that shoreline replenishment using sand recovered from offshore to help stabilize the shoreline. I have concerns about that and would like to know where and how the sand will be recovered because my great grandfather and his brother, who both were original Waikiki Beach Boys, have their ashes scattered offshore in Waikiki. When a person's body is cremated, not all the bones are burned down to ashes. It would be very disturbing if iwi is found on the shore because of this project. Iwi kūpuna were found in multiple areas spanning from Hilton Hawaiian Village down towards the Royal Hawaiian Hotel. They were found more inland but, that doesn't mean they won't be found near the shore. Iwi kūpuna have been found in some areas at Fort DeRussy in depths as shallow as 12 inches below the surface. Kawehewehe also known as Gray's Beach between Outrigger Reef Hotel and Halekulani,

Name	Title and/or Affiliation	Response
		was a place where kupuna would go for healing and to pikai. My Aunty Ka'anohi, my son Kepo'o and I went there to pikai after we had kanu iwi kūpuna from the Outrigger Reef Hotel. I remember seeing limu kala growing there. I haven't been to Kawehewehe for a while, but I wouldn't want that area to be disturbed because it is a place for kanaka to go for healing.

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Council member Kai Markell of the Office of Hawaiian Affairs (OHA) expressed concerns about whether sand previously used to replenish Waikīkī Beach contained *iwi kūpuna*, and if the proposed offshore sand sources contained remains from recent burials, such as scattered ashes.

Participant Carolyn Norman also expressed concerns about human remains in offshore sand, and about the potential disturbance of the Kawehewehe healing waters, which are still actively used. She later provided a written response (see Table 7).

Participant Edward Halealoha Ayau requested more information about the sources of the current Waikīkī Beach sand, and asked if any processes were followed to ensure that *iwi* were not impacted during previous replenishment. He has no concerns about *iwi* if the sand was manufactured. He mentioned a historical case where sand was taken from Papohaku, Moloka‘i on behalf of the State Department of Transportation to build the Honolulu Airport reef runway. He said that Hawaiian truck drivers observed the disturbed *iwi* in the sand as it was driven to Haleolono for loading onto barges sailing to O‘ahu.

Due to concerns about the disturbance of *iwi kūpuna* potentially present in the existing beach sand and the replenishment sand, several council members, including Hinaleimoana Wong-Kalu, Kai Markell, and Chuck Ehrhorn, believe it is OIBC's mandate to formally evaluate the project. Council Chair Wong-Kalu informally requested that SEI and IA participate in the next OIBC meeting to address several engineering questions, including the history and sources of the current Waikīkī sand, and the distances of proposed offshore sand deposits from the shoreline. SEI subsequently responded to this request in a letter sent to the OIBC prior to the council's March meeting.

After the meeting, council member Kamana‘o Mills of Kamehameha Schools forwarded an ethnohistoric study of Waikīkī (Cruz and Hammatt 2011) with an emphasis on the lands of Helumoa, which is now the site of the Hilton Hawaiian Shopping Center. Council member Auli‘i Mitchell also provided information about the "Ka Pa‘akai Analysis," a legal process by which the reasonable exercise of customarily and traditionally exercised rights of native Hawaiians must be protected to the extent feasible when the State Land Use Commission grants a petition for reclassification of district boundaries.

SUMMARY OF CULTURAL CONSULTATION

The primary concern for most of the cultural consultants who commented on the project is the inadvertent disturbance of *iwi kūpuna* along the beach or in the offshore sand deposits that will be dredged to expand and replenish the beach. Although the current Waikīkī Beach shoreline is almost entirely engineered and unlikely to contain primary burials, the history and sources of the sand used to build and replenish the beach during the 20th century remain a concern to some individuals. A few consultants cited historical examples of sand mining from beaches on O‘ahu, Maui, and Moloka‘i, which contained *iwi kūpuna*. However, it is not known whether sand containing *iwi kūpuna* has ever been redeposited in the project area, or has eroded into offshore deposits.

Several consultants also expressed concern about the potential disturbance of modern human remains in the submerged sand deposits immediately offshore from Waikīkī Beach where cremated remains are frequently spread. Some consultants reported that their own relatives' remains have been scattered in the area.

Alternatively, some consultants feel that the replenishment and stabilization of Waikīkī Beach will protect the burials and cultural deposits inland of the active beach (some of which are recorded as archaeological sites) from erosion damage. Two consultants noted that shoreline burials in beach parks around O‘ahu and in Ka‘a‘awa along Kamehameha Highway have already been disturbed by coastal erosion.

Two consultants from the City and County of Honolulu's Department of Design and Construction cited the danger that coastal erosion poses to the existing causeway structures and lifeguard stations on the beach. One of them noted that the project would also restore an eroded portion of the Halekūlani sector that has historically been accessible to beach users.

Finally, several consultants emphasized that the waters of Kawehewehe (also known as Gray's Beach or the Halekūlani Channel) in the Halekūlani sector are still actively used by *kūpuna* for healing and to *pikai* (purify). One consultant remembers that *limu kālā* (*Sargassum echinocarpum*) grew in Kawehewehe, and does not want the area to be disturbed.

REVIEW OF PREVIOUS WAIKĪKĪ CIA STUDIES

There have been numerous CIA studies for previous projects in Waikīkī, some of which address the shoreline and areas immediately inland of the active beach, including portions of the four Waikīkī Beach sectors (Fort DeRussy, Halekūlani, Royal Hawaiian, and Kūhiō Beach) within the current project area. In 2016, IA reviewed 10 of these previous studies to evaluate and highlight the cultural uses and issues for Waikīkī Beach up to that time (Gollin 2017). The CIA review enumerates several cultural concerns and recommendations that are relevant to the proposed beach improvement and maintenance project, and are summarized below.

The most frequently mentioned concern in the CIAs reviewed (mentioned in eight of the 10 studies) was the inadvertent exposure of cultural material, particularly *iwi kūpuna* (ancestral remains or bones), during ground-disturbing construction work or sand replenishment activity. To mitigate potential disturbance of this material, one study (McGuire et al. 2001) recommended that [1] cultural monitoring be conducted during all ground-disturbing project work; [2] in the event that *iwi* are encountered, all ground disturbance activity must stop, and lineal and/or cultural descendants and relevant agencies and groups (e.g. SHPD, the OIBC, OHA) be contacted; and [3] a Burial Treatment Plan be developed in consultation with the previously-mentioned parties and agencies.

The second most-mentioned concern in the CIA studies, raised by consultants in six of the 10 CIAs, involved past and present ocean and shoreline cultural-natural resources (Groza et al. 2009; Spearing et al. 2009; Cruz et al. 2010; Genz and Hammatt 2011; Dagher and Spear 2013; Duhaylonsod and McElroy 2015). Consultants emphasized the significance of *honu* in Hawaiian culture (e.g., as ancestral spirits, ʻaumakua), and recalled that the makai areas of Waikīkī Beach were formerly a rich place for gathering seaweed (e.g., limu kohu, limuʻeleʻele, limu līpeʻepeʻe [sic]) and sea urchins (wana, hāʻukeʻuke), and for fishing (e.g., upāpalu). They emphasized ongoing threats to these resources, particularly sea turtle habitats. Kawehewehe (at the boundary between the Fort DeRussy and Halekūlani sectors) was also frequently mentioned as both a historical and ongoing place of spiritual and physical healing, where the sick still underwent ritual bathing.

The third most frequently mentioned concern was the ongoing development of Waikīkī in general. Several respondents cited cumulative impacts resulting from rampant construction in Waikīkī, including and obstruction of *mauka-makai* view corridors by tall buildings/hotels, harm to associated cultural features on the landscape, the "overtaxed infrastructure" in Waikīkī, including traffic, noise and waste management problems, and most critically, the loss of a "Hawaiian sense of place" and the feel of "old Waikīkī."

All 10 of the CIA studies reviewed advised proactive planning for inadvertent burial and cultural finds, and often recommended burial treatment planning. Four of the CIA studies recommended that project proponents engage regularly with cultural consultants and, in some cases, the "wider Waikīkī community" (Groza et al. 2009:i) to address concerns raised by consultants and to incorporate design ideas into the planning of proposed developments. One CIA advised that project proponents landscape using plant species native to the project area (especially drought-resistant plants), utilize "Hawaiian themes" in design elements, and strive to perpetuate the "feeling of old Waikīkī." Two CIA studies recommended that project proponents find a way to give back to the community via donations, cultural programs, etc., and that project proponents seek design ideas from the community (Groza et al. 2009; Spearing et al. 2009).

The CIA review concludes by providing a list of recommendations and mitigation measures that should be incorporated into all future project work planned for Waikīkī Beach. These recommendations, which are listed below, were informed by the CIA literature review and the author's knowledge of concerns elicited in community consultations conducted in Waikīkī and across O'ahu Island.

- Address the concern that *iwi kūpuna* may be encountered during the course of development through proactive planning, including cultural monitoring. In the event of inadvertent burial and cultural finds, lineal and cultural descendants, appropriate agencies, and community groups (SHPD, OIBC, etc.), should be immediately notified and consulted regarding handling and treatment of remains.

- It is advised that project proponents carefully consider where sand for beach replenishment is being sourced. Should sand be obtained from other parts of O'ahu or elsewhere in Hawai'i, it will expand the scope of the project (including the CIA requirements) and may be strongly opposed by the community from which it is sourced as well as Waikīkī and broader community stakeholders.

- Proactively engage Waikīkī shoreline and broader community stakeholders to address issues such as beach access, ocean water quality, protecting surf breaks, safety issues, protecting threatened aquatic wildlife with an emphasis on turtle feeding habitat, and—with rising sea levels—planned shoreline setbacks. Stakeholders should be engaged in all phases of the planning and implementation of the beach improvements project.

IV. RECOMMENDATIONS

The responses provided by the cultural consultants who evaluated the proposed Waikīkī Beach Improvement and Maintenance Program emphasize that the inadvertent disturbance of *iwi kūpuna* is a primary cultural concern. As the current Waikīkī Beach shoreline is engineered and consists entirely of imported sand, at least two options are available to mitigate this cultural concern:

1. Carefully evaluate where the sand for future beach replenishment will be collected, in order to ensure that *iwi kūpuna* and other cultural material potentially present in the sand are not disturbed. Offshore sand deposits have a low likelihood of containing human skeletal remains and should be a preferred source for beach replenishment.

2. Require an archaeological monitor and/or cultural monitor to be present during all ground-disturbing project work within the historical (pre-20th century) shoreline to regularly inspect the redeposited sand for *iwi kūpuna* or archaeological material. If *iwi* or archaeological material is encountered, all construction work in the area should stop, and the appropriate government agencies, descendant groups, and cultural organizations contacted. A written plan to address the inadvertent disturbance of cultural material during project work should be in place before construction work begins, and developed in consultation with the appropriate government agencies and cultural stakeholders/organizations.

Several consultants are also concerned about the cremated remains of loved ones that have been scattered in the ocean off of Waikīkī Beach, and their potential disturbance if they have settled in offshore sand deposits that will be dredged for beach replenishment. This concern is difficult to verify physically, as it is not clear what happens to the ashes after they are scattered in the sea, or if they would be identifiable in a submerged sand deposit. However, the probability that identifiable *iwi kūpuna* (e.g., skeletal or dental elements) are present in the offshore sands is very low due to the capability of typical marine transport processes. Nevertheless, project proponents should remain sensitive to this issue and reasonably accommodate community members who express concern, perhaps by holding public information sessions or sponsoring a blessing ceremony before near-shore dredging begins.

The waters of Kawehewehe in the Halekūlani sector are also a major concern for responding cultural consultants, as Hawaiian healing and purification rituals are still practiced there, and *limu kālā*—a plant used in healing and *ho'oponopono* ceremonies—may still grow in the area. To address these concerns, project proponents should make efforts to clearly delineate the Kawehewehe area in project plans, avoid burying or damaging the area during construction work, and allow Hawaiian practitioners regular and reasonable access to the waters throughout the duration of the project. The project's marine biological and water quality resources survey (AECOS, Inc. 2021:24) states that groin construction in the Halekūlani sector will improve shoreline and nearshore conditions and recommends a biological and water quality monitoring program, which can also address some of the concerns of cultural consultants. Additionally, sand placement and groin construction is not anticipated to significantly impede submarine groundwater discharge (pers. comm. from Shellie Habel [Hawaiʻi Sea Grant][3] to Andy Bohlander [Sea Engineering, Inc.], April 19, 2021). Available and forthcoming (via monitoring) biological and water quality data should be conveyed in a clear and timely manner to cultural consultants and the public.

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[3] Also quoting Henrietta Dulai and Craig Glenn of the Coastal Groundwater Research Group at the University of Hawaiʻi-Mānoa.

Finally, although not explicitly mentioned by the cultural consultants who evaluated the current project, the proactive involvement of Waikīkī cultural stakeholders and community members in all aspects of future project planning—including cultural issues, beach access, ocean water quality, the protection of wildlife habitats and surf breaks, and project design and landscaping—is a priority emphasized in a review of previous CIAs for the Waikīkī area (Gollin 2017). Positive and transparent engagement between project proponents and the spectrum of interested parties affected by the planned work will likely encourage an open exchange of ideas and opinions and facilitate community engagement and support. Waikīkī descendants in particular should be engaged as early as possible during the project planning stage, and be given monthly updates and opportunities to provide feedback as work progresses. Appropriate accommodations should also be made for descendants who are unable to regularly attend project meetings.

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GLOSSARY OF HAWAIIAN WORDS

Hawaiian Spelling*	Definition
ahupuaʻa	land division usually extending from the uplands to the sea, so called because the boundary was marked by a heap (ahu) of stones surmounted by an image of a pig (puaʻa), or because a pig or other tribute was laid on the altar as tax to the chief
ʻāina	land, earth
aliʻi	chief, chiefess, officer, ruler, monarch, peer, headman, noble, aristocrat, king, queen, commander
aliʻi nui	high chief
hānai	to adopt, to raise; adopted or fostered
haole	foreign; belonging to another country
heiau	temple, shrine
honu	general name for turtle and tortoise
hoʻoponopono	mental cleansing: family conferences in which relationships are set right through prayer, discussion, confession, repentance, and mutual restitution and forgiveness
ʻili	traditional land unit, a subdivision of an ahupuaʻa
iwi	bone, carcass, core, bone of the dead
kahuna (singular); kāhuna (plural)	priest, sorcerer, magician, wizard, minister, expert in any profession; in the 1845 laws, doctors, surgeons, and dentists were called kahuna
kalo	taro, *Colocasia esculenta*
kanaka	human being, person, individual
kanu	planting, burial
konohiki	head man of an ahupuaʻa land division under the chief
kuleana	small piece of property, as within an ahupuaʻa; right, privilege, concern, title, property, estate, portion, interest, claim, ownership
kūpuna	elder, grandparent, ancestor
limu	a general name for all kinds of plants living under water, both fresh and salt, also algae growing in any damp place in the air, as on the ground, on rocks, and on other plants
limu kala	common, long, brown seaweeds (*Sargassum echinocarpum*); used in ceremonies to drive away sickness and to obtain forgiveness
loʻi	irrigated terrace, especially for taro (loʻi kalo)

Hawaiian Spelling*	Definition
lua	hand-to-hand fighting involving bone breaking, joint dislocation, and pressure points
mahele	portion, division, section, zone, lot, piece, quota, installment, bureau, department, precinct, category, scene or act in a play; share, as of stocks; measure in music; land division of 1848 (the great mahele)
makaʻāinana	commoner
makai	toward the sea
mauka	toward the mountain, or inland
moku	district; island
moʻolelo	story, tale, myth, history, tradition, literature, legend, journal, log, yarn, fable, essay, chronicle, record, article
muliwai	river mouth, estuary, pool near the mouth of a stream
naio	bastard sandalwood, *Myoporum sandwicense*; indigenous shrubs and small trees
niu	coconut palm , *Cocos nucifera*
ʻohana	family, relative, kin group; related
pīkai	to sprinkle with sea water or salted fresh water to purify or remove taboo
poʻo kanaka	class of sacrificial heiau (lit. human head, skull)
ʻuala	sweet potato, *Ipomoea batatas*
ʻulu maika	disk-shaped gaming stone
wai	water

* Adapted from Mary K. Pukui and Samuel H. Elbert, 1986, *Hawaiian Dictionary*, University of Hawaii Press, Honolulu, unless otherwise noted.

APPENDIX A: REQUEST LETTER TO PROSPECTIVE CONSULTANTS

INTERNATIONAL ARCHAEOLOGY, LLC

January 14, 2020

SUBJECT: Request for Cultural Consultation for a Proposed Waikīkī Beach Improvement and Maintenance Program.

Dear Sir or Madam,

My name is Hannah Kaumakamanōkalanipō Anae, and I am an archaeologist/cultural anthropologist with International Archaeology, LLC (IA), a cultural resource management firm based in Honolulu. My company is currently preparing a Cultural Impact Assessment (CIA) for inclusion into an Environmental Impact Statement (EIS) by Sea Engineering, Inc. (SEI) for the State Department of Land and Natural Resources' (DLNR) proposed Waikīkī Beach Improvement and Maintenance Program. The EIS will examine and analyze potential beach improvements for portions of the Waikīkī shoreline, including construction of new beach stabilization structures and shoreline replenishment using sand recovered from offshore areas.

We are writing to ask your assistance in preparing this CIA. The purpose of the CIA is to collect information about the past and present cultural resources and practices associated with Waikīkī Beach, in order to identify any issues and concerns that may arise from the proposed beach improvements as well as future maintenance activities. Examples of information that would be helpful to this effort include:

- General history and present and past land use of the Waikīkī Beach project area.
- Knowledge of cultural sites – for example, historical sites, archaeological sites, and burials.
- Traditional gathering practices in the project area, both past and ongoing.
- Legends, places and place names, and traditional uses in the project area.
- Cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the project area.

With your permission, your response will be added to the CIA and subsequent EIS and will influence all future planning for the project. In addition to the CIA, IA is preparing separate reports that will inventory and describe all known archaeological and architectural sites within and immediately adjacent to the project area.

Details about the specific work areas, planned actions, and construction methods proposed for the project are summarized below. Please refer to the end of this letter for project area maps and conceptual renderings of the proposed improvements.

Summary of Planned Waikīkī Beach Improvements

The Waikīkī Beach improvements are intended to address the ongoing erosion of the shoreline and frequent flooding of the backshore. Without improvements and follow-up maintenance, sand erosion and rising sea level will likely result in the total loss of Waikīkī Beach by the end of the 21st century. The project's immediate goals are to restore and improve Waikīkī's public beaches, increase beach stability, provide safe access to and along the shoreline, and increase resilience to coastal hazards and sea level rise.

The DLNR is proposing improvements for four sections of the Waikīkī shoreline, listed below from west to east:

- Fort DeRussy Beach, consisting of approximately 1,680 feet of shoreline extending from the Hilton Hawaiian Village pier to the Fort DeRussy outfall groin.
- Halekūlani Beach (formerly "Gray's Beach"), consisting of approximately 1,450 feet of shoreline extending from the Fort DeRussy outfall groin to the Royal Hawaiian groin.
- Royal Hawaiian Beach, consisting of approximately 1,730 feet of shoreline extending from the Royal Hawaiian groin to the ʻEwa (west) groin at Kūhiō Beach Park.
- Kūhiō Beach, consisting of approximately 1,500 feet of shoreline extending from the ʻEwa (west) groin at Kūhiō Beach Park to the Kapahulu storm drain.

To better understand the impact of the project on the Waikīkī shoreline, the planned actions and construction methods for each beach section are summarized below:

- For Fort DeRussy Beach, sand will be transported from an accretion area at the west end of the beach (near the Hilton Pier) to an eroding area at the east end. The sand will be excavated from the existing beach face extending inshore only as far as necessary to obtain the required amount, estimated to be approximately 1,200 cubic yards. Dump trucks will transport the sand across the beach, and a bulldozer will distribute it across the eroding area. This process will need to be repeated periodically in the future to maintain a stable beach profile.
- For Halekūlani Beach, a new beach with stabilizing groins will be constructed. Three new sloping rock rubble mound T-head groins will be combined with the existing Fort DeRussy and Royal Hawaiian groins to create four stable beach cells. The groin stems will extend approximately 200 feet seaward from the shoreline and will be of sufficient size to stabilize a +10-foot beach crest elevation. The groin stem crests could also be wide enough (approximately 10 feet) to accommodate construction equipment or a pedestrian walkway. The Halekūlani Channel will be left unobstructed for beach catamaran navigation. In addition, approximately 60,000 cubic yards of sand fill (recovered from offshore deposits) will be used to create approximately 3.8 acres of new dry beach area. Construction equipment and materials will likely be transported into the area across the east end of Fort DeRussy Beach, which may require construction of a temporary access road from Kalia Road to the beach and a temporary rock rubble mound access berm along the shoreline from Fort DeRussy to the Royal Hawaiian groin.
- For Royal Hawaiian Beach, sand recovered from deposits directly offshore will be used to widen and replenish the beach. The beach crest elevation will be increased from about +7 feet above mean sea level (MSL) to +8.5 feet MSL. Approximately 30,000 cubic yards of recovered sand will be required to complete the work. To counter ongoing erosion and shoreline recession, beach nourishment will need to be repeated every eight to 10 years or more frequently if required. The recovered sand will probably be dredged with a submersible pump mounted on a crane barge and pumped through a bottom-mounted pipeline to a dewatering basin in the Diamond Head basin of Kūhiō Beach Park. After drying, the sand will be stockpiled and transported to Royal Hawaiian Beach, where it will be distributed using bulldozers.
- For Kūhiō Beach, separate plans are proposed for the ʻEwa basin (west) and the Diamond Head basin (east):
    - For the ʻEwa basin, the existing groins on the east and west ends will be removed and reconstructed to accommodate sea level rise. The west groin will be approximately 150 feet long with a crest elevation of +7.5 feet MSL, and the east groin will be approximately 125 feet long and vary in elevation from +7.5 feet MSL at the shoreline to +6 feet MSL at the head. A 125-foot-long detached breakwater will be built in the gap between the groins and will be approximately +6 feet MSL to match the heads of the groins. Construction equipment and material would be transported to the work area through either the central portion of the park or along the shoreline past the Duke Kahanamoku statue. Demolition and construction will be conducted with an excavator that is supported by a temporary work

platform extending from the shore to the breakwater. Sand fill from offshore deposits will be added to the beach after the new structures are completed.

  - For the Diamond Head basin, existing structures will not be modified, but the beach will be replenished using eroded sand that has settled in a submerged deposit just offshore. Approximately 4,500 cubic yards will be recovered and spread across the beach, widening the existing shoreline by approximately 18 to 26 feet and reducing the offshore depth of the basin to a uniform bottom elevation of -4 feet MSL. The sand will be recovered and redeposited using either a long-reach excavator operating on an excavated sand causeway, or a diver-operated dredge that will pump the sand to an onshore recovery area. A bulldozer and/or skid-steer will spread the sand across the beach.

Construction work will be confined to the active sand portion of Waikīkī Beach and nearshore marine areas up to approximately 200 feet offshore. The work will not extend outside the inland boundary of the active beach, which is defined by any buildings, roads, seawalls, or other types of construction that constrain the sand beach.

The sand required for beach nourishment will be almost exclusively recovered from submerged offshore deposits. In addition to the near-offshore areas mentioned in the descriptions above, sand will be dredged from one or more known deposits further offshore of the south coast of Oʻahu, using submersible slurry pumps, self-contained hydraulic suction dredges, and/or clamshell buckets. A map showing the locations of several proposed deposits is included in this letter.

Cultural Issues and Concerns

Although Waikīkī is now known internationally as the center of the Hawaiian hospitality industry, the region has been an important traditional Hawaiian cultural location for hundreds of years, noted primarily for its associations with *aliʻi* (chiefs) and its advanced agricultural and aquacultural development, including *loʻi* (wetland fields) and fishponds. It also served as a beachside retreat for Hawaiian royalty and wealthy Honolulu residents during the 19th century. Multiple archaeological sites have been exposed during construction in Waikīkī over recent decades, typically consisting of buried cultural deposits representing traditional Hawaiian and post-Contact historical occupation. *Iwi kūpuna* (human skeletal remains) associated with traditional and historical Hawaiian burials have also been found in the area, ranging from isolated fragments to intact burial pits. In addition, Waikīkī contains many architectural sites that date to the post-Contact historical period, including buried seawalls along the shoreline that may have been built during the late 19th century, as well as places that have no physical remains but whose names and locations are still well known today.

When evaluating the potential impact of the planned beach improvements on the cultural resources and significance of Waikīkī Beach, it is important to note that the Waikīkī shoreline has been extensively engineered since the late 19th century and now consists almost entirely of sand imported from other locations. Further, the vast majority of known archaeological and architectural resources in Waikīkī is located inland from the active beach and will not be affected by project work. Nevertheless, several potential cultural resources within or near the proposed refurbishment area have been identified through literature review and archival research and may merit consideration when evaluating the impact of project activity. These resources are listed below, organized by the beach section where they are (or are thought to be) located:

- Fort DeRussy Beach
  - The Fort DeRussy Groin may require evaluation as a potential historic property.
- Halekūlani Beach
  - The Royal Hawaiian Groin, the Fort DeRussy Groin, and five other groins in the area may require evaluation as potential historic properties.

- Royal Hawaiian Beach
    - The ‘Ewa Kūhiō Groin complex and the Royal Hawaiian Groin may require evaluation as potential historic properties.
    - Buried cultural deposits in the area of the former ‘Apuakēhau Stream, or buried cultural deposits and/or burials related to mid-19th century Land Commission awards (LCAs) 6616:4 and 7597:3, and/or the beach residences of Kalākaua and Kūhiō, may exist in the area. Buried cultural deposits could also be inland of the buried seawall at the southeast end of the Royal Hawaiian Cell.
    - Additional review and consultation for the historical places, ‘Apuakēhau, Helumoa, Hamohamo, and Pualeilani, may be required, as all of these places are associated with important people in Hawai‘i's history and/or have traditional associations.
- Kūhiō Beach
    - The existing beach infrastructure (Kapahulu Storm Drain, Slippery Wall, and the ‘Ewa Kūhiō Groin complex) may require evaluation as potential historic properties.
    - Buried deposits and/or burials related to the LCA 1433:1, and the subsequent homes of Lili‘uokalani (Kealohilani) and Kūhiō (Pualeilani) could exist in the area, although they are unlikely to be present within the active beach.
    - Though the homes are no longer standing, Kealohilani and Pualeilani are significant historical places that may merit additional review and consultation.

The project's most important cultural concern will be the inadvertent discovery or disturbance of *iwi kūpuna* or other cultural material during construction work. Procedures will be in place during the project to protect known archaeological and historical sites in the project area, to monitor any ground-disturbing work that may impact cultural resources, and in the event of inadvertent burial or cultural finds, to immediately notify and consult with lineal and cultural descendants, appropriate government agencies, and community groups regarding the handling and treatment of the remains and/or material. Nevertheless, any additional concerns or recommendations the community may have about these procedures will be carefully considered.

Lastly, the cultural significance of Waikīkī Beach does not depend solely on the cultural material it contains, but also on its "integrity," or how the area's physical qualities combine to convey its significance. Several qualities contribute to this sense of integrity, including the area's physical environment or setting, the design, materials, and workmanship used for the physical elements it contains, and its overall aesthetic or historic feeling. Although integrity can sometimes be a subjective judgment, it is an important factor to consider when evaluating the impact of the proposed improvements on the current shoreline.

Request for Cultural Information and Assessment of Project Effects

This letter is being distributed to cultural stakeholders and community members who have a demonstrated interest in the historical and cultural significance of Waikīkī, and who can provide thoughtful and informed opinions about the cultural impacts the proposed project may have on the Waikīkī shoreline and associated areas. We humbly ask that you share with us any knowledge you can about the cultural resources or ongoing cultural practices that may be affected by the project work described above. We would also appreciate any insight you can provide into how the project may impact the cultural integrity and significance of Waikīkī Beach, and/or propose alternative actions that could help mitigate the project's impact on the shoreline's cultural legacy.

All responses received will be summarized or reproduced in full for the CIA report. Your name and cultural/community affiliation will normally be attached to your response, but you may request that your contribution remain anonymous or that certain information not be shared publicly. Please share as much (or as little) information as you like. Also, if you know of other community members who you feel should review and comment on the proposed work, please forward this letter to them.

The deadline for receiving responses is Friday, February 12, 2021. Please send your response by email to hanae@iarii.org, or by conventional mail to:

International Archaeology, LLC
ATTN: Kaumaka Anae
2081 Young Street
Honolulu, HI 96826-2231

Due to time considerations and current COVID-19 community restrictions, we will be unable to arrange in-person, phone, or online interviews.

Mahalo for your kokua,

Kaumaka Anae, M.A.
Archaeologist and Cultural Specialist

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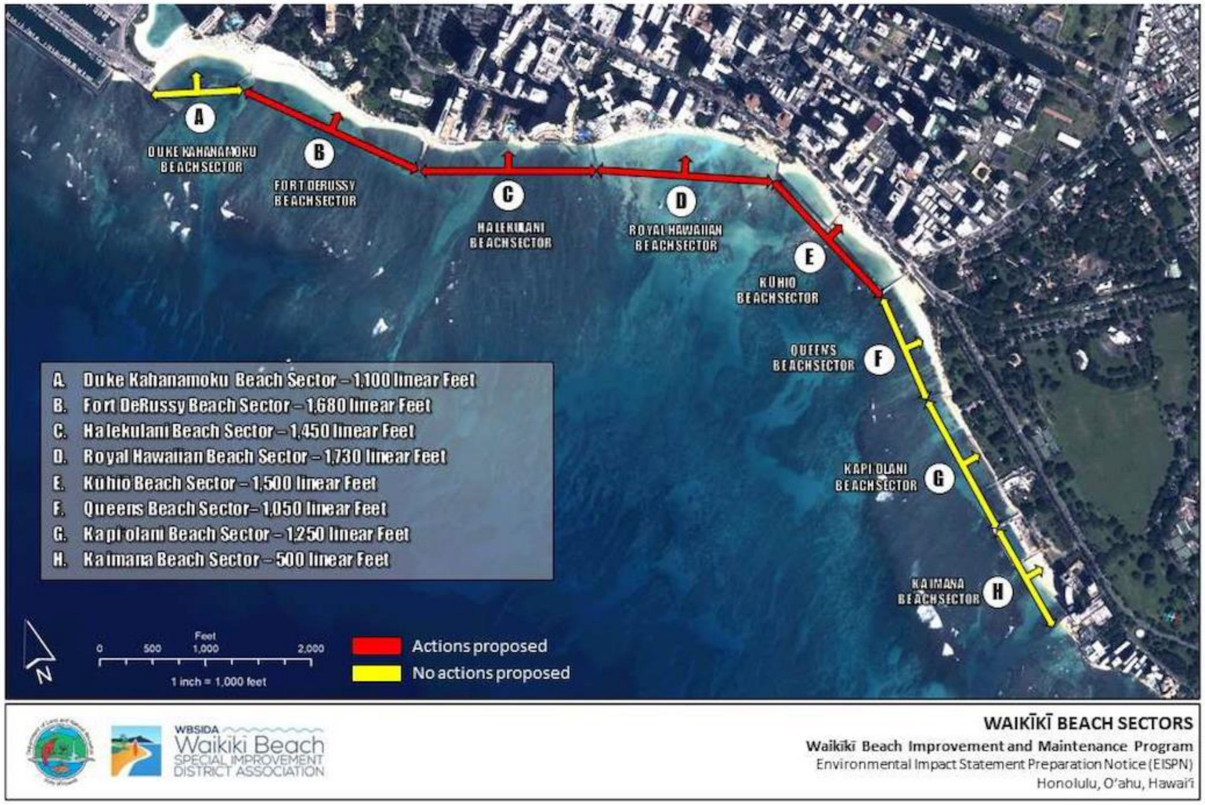


Figure 1-2 Waikīkī beach sectors

57

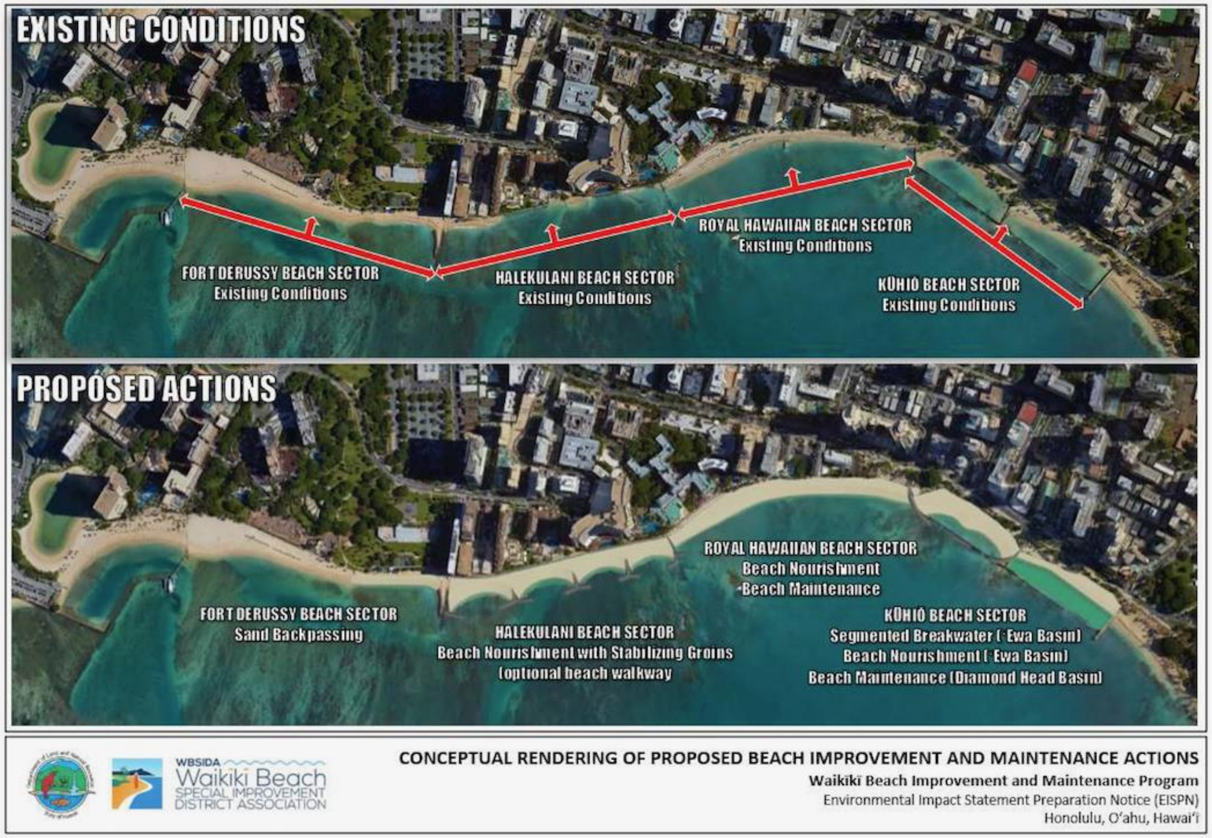
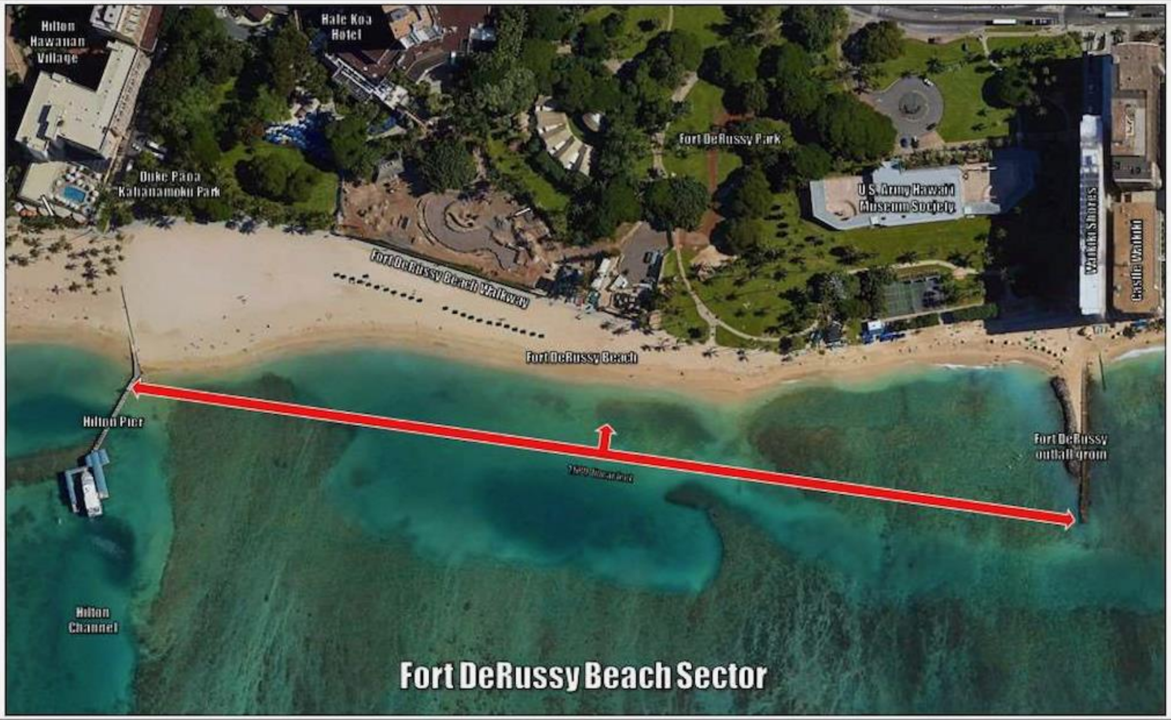


Figure 2-1 Conceptual rendering of the proposed actions

58



OVERVIEW MAP – FORT DERUSSY BEACH SECTOR
Waikīkī Beach Improvement and Maintenance Program
Environmental Impact Statement Preparation Notice (EISPN)
Honolulu, O'ahu, Hawai'i

WBSIDA Waikiki Beach Special Improvement District Association

Figure 3-1 Overview map – Fort DeRussy Beach sector

WBSIDA Waikiki Beach SPECIAL IMPROVEMENT DISTRICT ASSOCIATION

CONCEPTUAL RENDERING OF PROPOSED ACTION – FORT DERUSSY BEACH SECTOR
Waikīkī Beach Improvement and Maintenance Program
Environmental Impact Statement Preparation Notice (EISPN)
Honolulu, O'ahu, Hawai'i

Figure 3-7 Conceptual rendering of proposed action – Fort DeRussy Beach sector

60

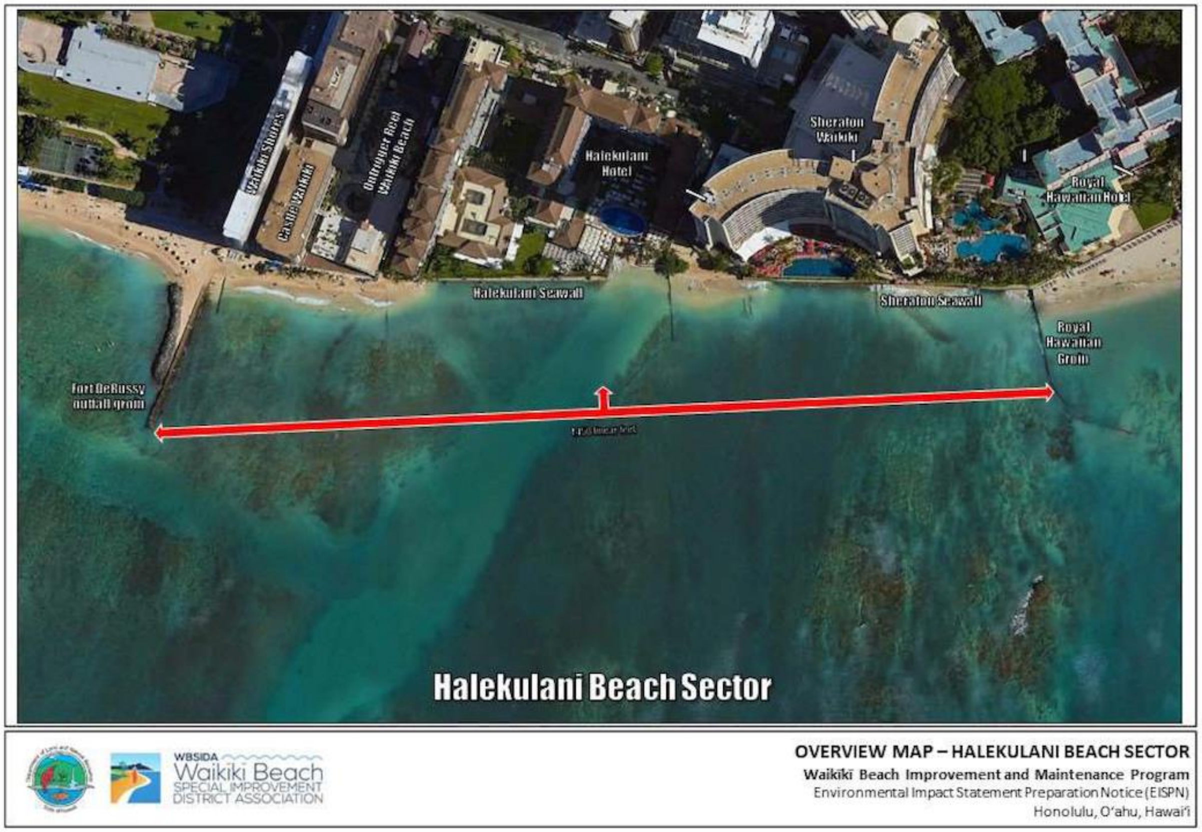
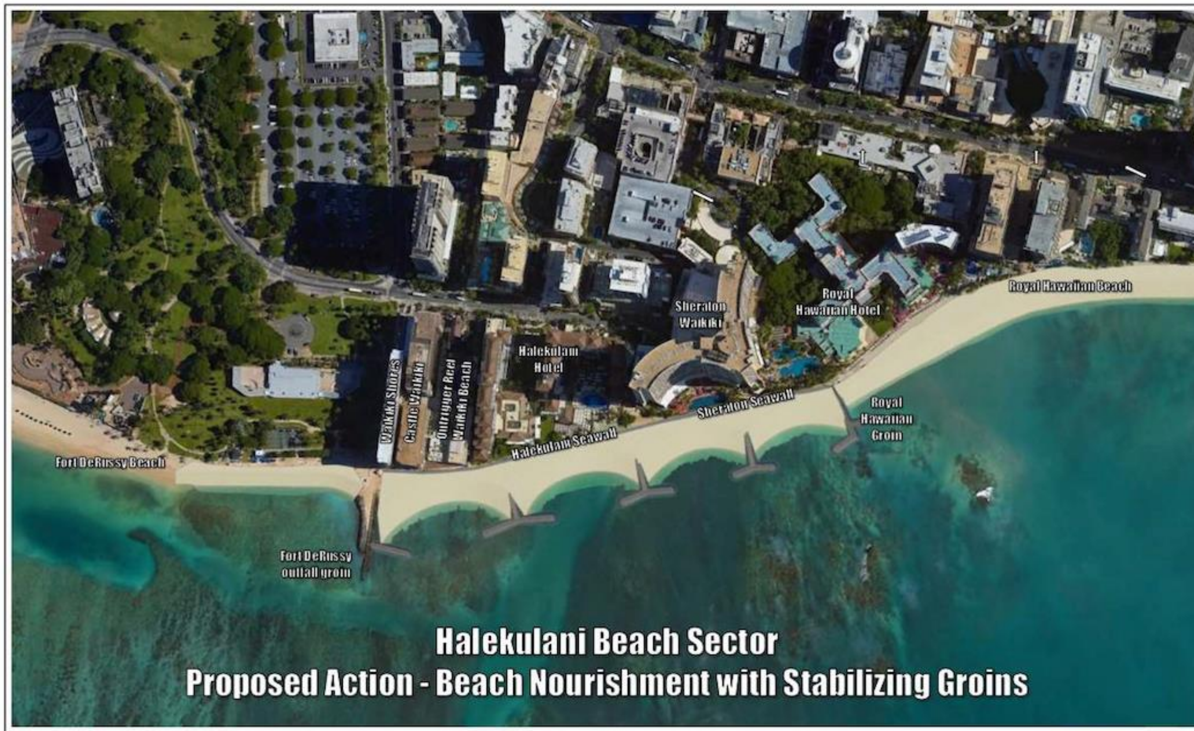


Figure 4-1 Overview map – Halekulani Beach sector

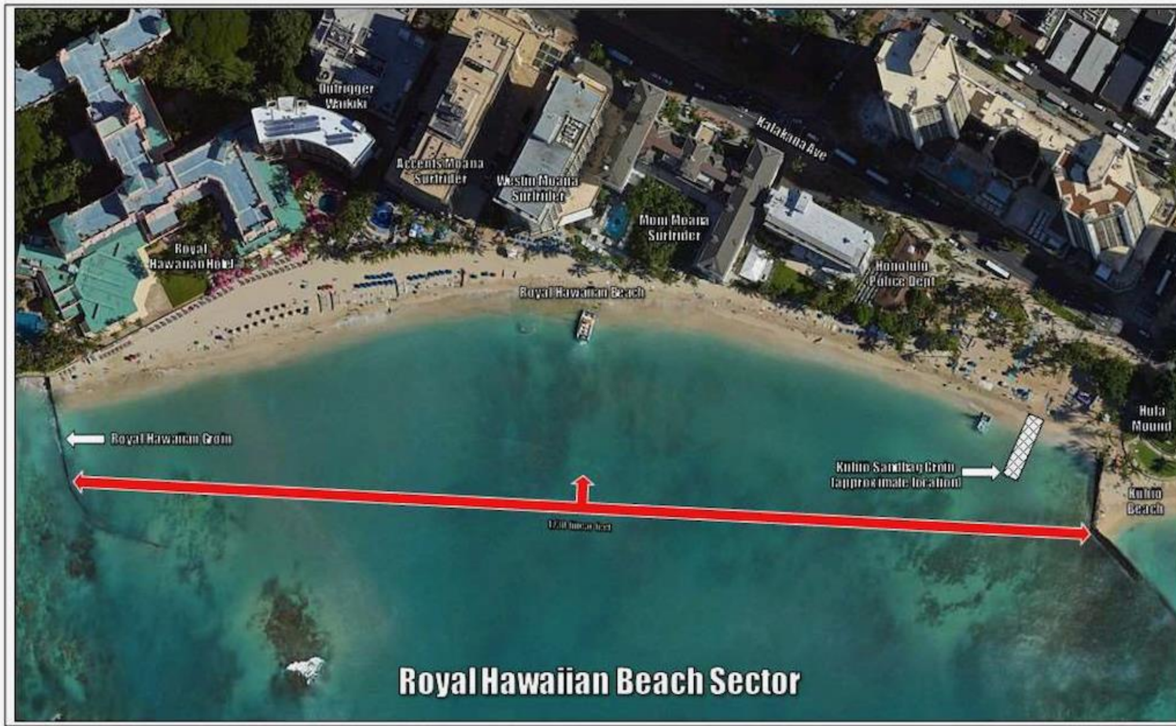
61



WBSIDA Waikiki Beach SPECIAL IMPROVEMENT DISTRICT ASSOCIATION

CONCEPTUAL RENDERING OF PROPOSED ACTION – HALEKULANI BEACH SECTOR
Waikīkī Beach Improvement and Maintenance Program
Environmental Impact Statement Preparation Notice (EISPN)
Honolulu, O'ahu, Hawai'i

Figure 4-8 Conceptual rendering of proposed action – Halekulani Beach sector



OVERVIEW MAP – ROYAL HAWAIIAN BEACH SECTOR
Waikīkī Beach Improvement and Maintenance Program
Environmental Impact Statement Preparation Notice (EISPN)
Honolulu, O'ahu, Hawai'i

WBSIDA Waikiki Beach SPECIAL IMPROVEMENT DISTRICT ASSOCIATION

Figure 5-1 Overview map – Royal Hawaiian Beach sector

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CONCEPTUAL RENDERING OF PROPOSED ACTION – ROYAL HAWAIIAN BEACH SECTOR
Waikīkī Beach Improvement and Maintenance Program
Environmental Impact Statement Preparation Notice (EISPN)
Honolulu, O'ahu, Hawai'i

WBSIDA Waikiki Beach SPECIAL IMPROVEMENT DISTRICT ASSOCIATION

Figure 5-8 Conceptual rendering of proposed action – Royal Hawaiian Beach +

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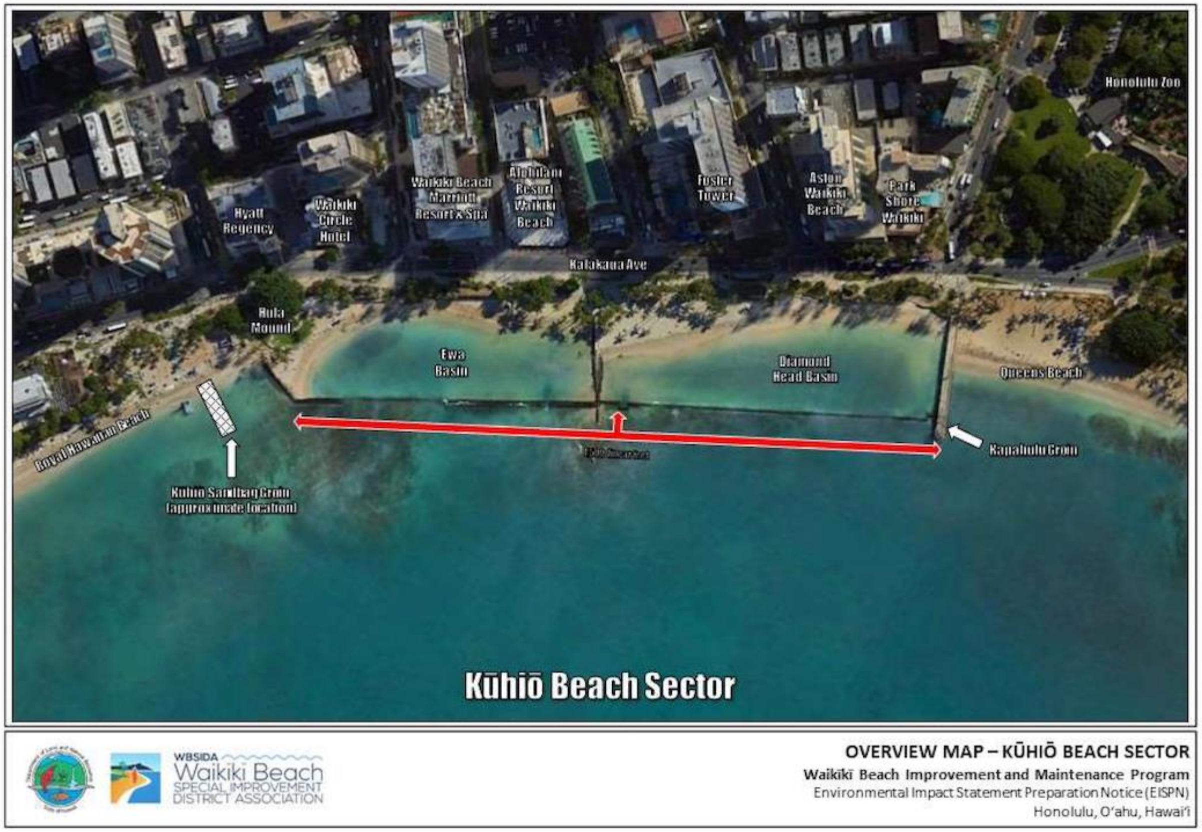

Figure 6-1 Overview map – Kūhiō Beach sector

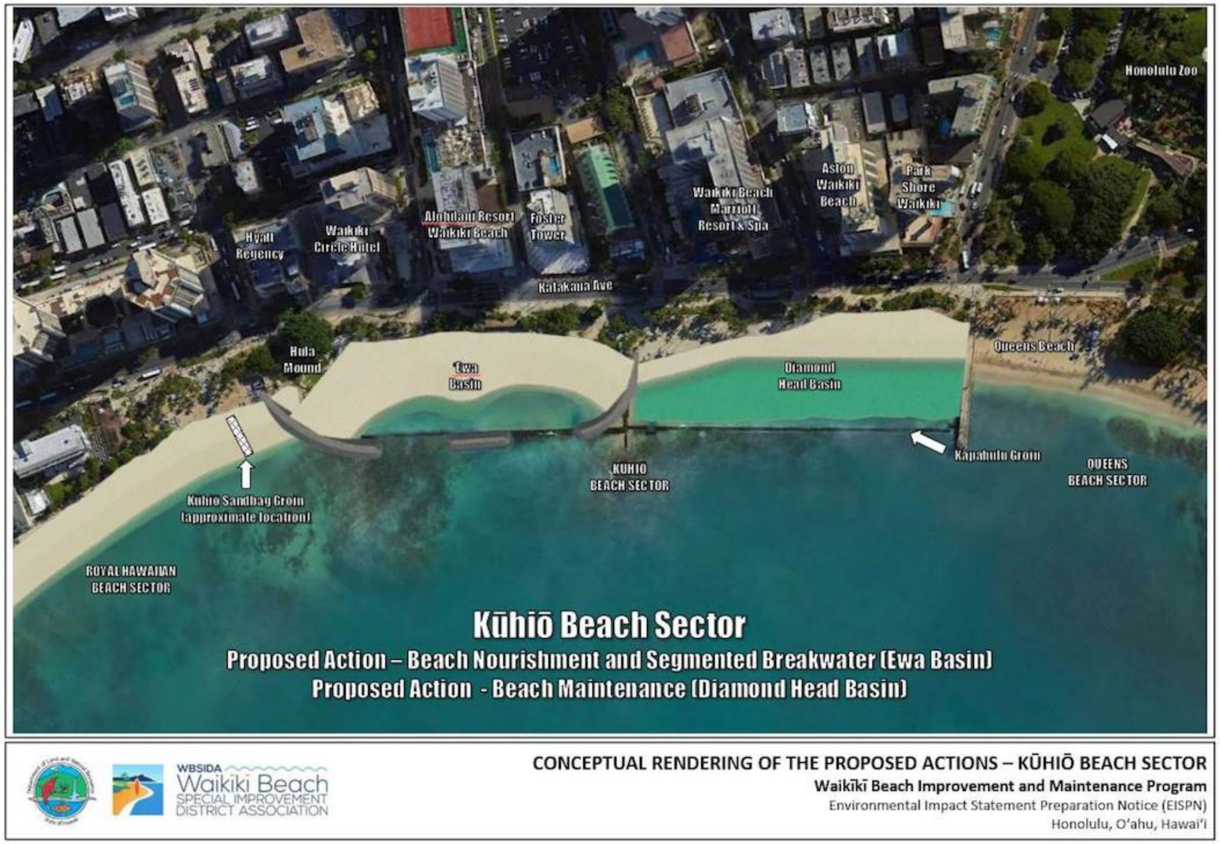

Figure 6-13 Conceptual rendering of proposed action for Kūhiō Beach sector

66

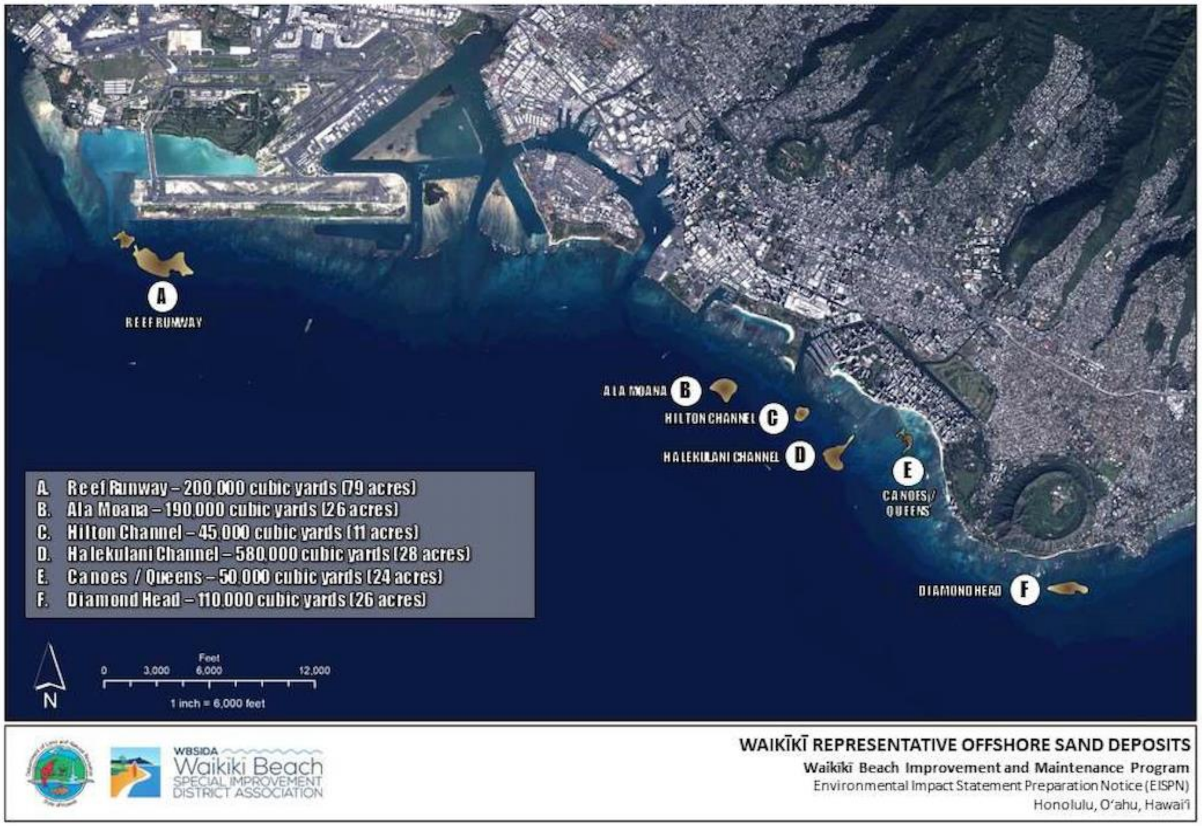

Figure 2-2 Representative Waikīkī offshore sand deposits

APPENDIX B: INDIVIDUALS APPROACHED TO PROVIDE CULTURAL CONSULTATION FOR THE WAIKĪKĪ BEACH IMPROVEMENT AND MAINTENANCE PROGRAM

Name	Organization or Affiliation	Title	Date Request Sent	Email (E) or Letter (L)	Date Response Received	Response
Abordo, Chelsea	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Abrams, Mary	U.S. Department of the Interior, Fish and Wildlife Service; Pacific Islands Fish and Wildlife Office	Field Supervisor	01/07/2021	L	N/A	None
Ahlo, Charles	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Akau, Marlene	Royal Hawaiian Center	General Manager	01/07/2021	L	N/A	None
Akimo Jr., Peter Ahoe	Waikīkī kupuna		01/07/2021	L	N/A	None
Alapa, Clarence	Waikīkī cultural descendant		01/05/2021	E	N/A	None
Anderson, Jim	Waikīkī kupuna		01/07/2021	L	N/A	None
Apo, Peter	Office of Hawaiian Affairs (OHA)		01/05/2021	E	--	Received (see Table 7)
ʻĀpuakēhau, Jay	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Arcalas, Cara	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Ayau, Edward Halealoha	Ka Wai Ola (OHA)	Executive Director; Author	01/05/2021	E	N/A	None
Bates, Cline	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Bates, Keʻala	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Battle, Cherie Kahealani Keohokālole	Waikīkī cultural descendant		01/07/2021	L	N/A	None

Name	Organization or Affiliation	Title	Date Request Sent	Email (E) or Letter (L)	Date Response Received	Response
Bautista, Jerome	City and County of Honolulu, Waikīkī Neighborhood Board No. 9, Subdistrict 1		01/07/2021	L	N/A	None
Becket, Jan	Hawaiian historian, author, and photographer		01/07/2021	L	N/A	None
Bissen, Tony	Cultural Historian, Moana Surfrider Hotel	Pūʻā Foundation Executive Director	01/05/2021	E	N/A	None
Blangiardi, Rick	City and County of Honolulu	Mayor	01/07/2021	L	N/A	None
Boyack, Robert	City and County of Honolulu, Waikīkī Neighborhood Board No. 9, Subdistrict 1		01/07/2021	L	N/A	None
Boyd, Manu	Royal Hawaiian Shopping Center; Hawaiian Civic Club of Honolulu	Cultural Director; President	01/07/2021	L	N/A	None
Bridges, Cy	Native Hawaiian Hospitality Association	President	01/07/2021	L	N/A	None
Brown, Desoto	Bishop Museum Archivist		01/05/2021	E	N/A	None
Brown, Michael	City and County of Honolulu, Waikīkī Neighborhood Board No. 9, Subdistrict 3		01/07/2021	L	N/A	None
Bush, Ted	Waikīkī Beach Services	Owner	01/05/2021	E	02/10/2021	Received but not shown (see Section III)

Name	Organization or Affiliation	Title	Date Request Sent	Email (E) or Letter (L)	Date Response Received	Response
Cabanero, Lisa	City and County of Honolulu, Waikīkī Neighborhood Board No. 9, Subdistrict 1	Secretary	01/07/2021	L	N/A	None
Cáceres, Norman "Mana"	Waikīkī cultural descendant; Ohana Kūpono Consulting, Inc.		01/07/2021	L		Received (see Table 7)
Carroll, Helen T.	City and County of Honolulu, Waikīkī Neighborhood Board No. 9, Subdistrict 1		01/07/2021	L	N/A	None
Cayan, Phyllis ("Coochie")	State Historic Preservation Division (SHPD)	Intake Specialist	01/05/2021	E	01/05/2021	None
Ching, Dylan	TS Restaurants	Regional Manager	01/07/2021	L	N/A	None
Ching, Ricky	Historic Hawaiʻi Foundation	President, Board of Trustees	01/07/2021	L	N/A	None
Christensen, Makani	Aha Moku		01/05/2021	E	N/A	None
Clark, John	Author and *kūpuna* who frequented Waikīkī		02/10/2021		02/10/2021	Received (see Table 7)
DaMate, Leimana	DLNR Aha Moku Advisory Committee	Executive Director	03/09/2021	E	N/A	None
Deguair, Connie	Hilton Hawaiian Village	Special Projects Manager	01/07/2021	L	N/A	None
Deltoro, Benjamin	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Deltoro, Daniel	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Deltoro, Rachel	Waikīkī cultural descendant		01/07/2021	L	N/A	None

Name	Organization or Affiliation	Title	Date Request Sent	Email (E) or Letter (L)	Date Response Received	Response
Deltoro, Samuel	Waikīkī cultural descendant		01/07/2021	L	N/A	None
DeMello, Mark	Aqua-Aston Hospitality LLC	General Manager/Special Projects	01/07/2021	L	N/A	None
Diamond, Randy	Aston Waikīkī Beach Hotel	General Manager	01/07/2021	L	N/A	None
Downing, Keone	Save Our Surf Organization; Waikīkī kupuna		01/05/2021	E	N/A	None
Egged, Rick	Waikīkī Improvement Association	President	01/05/2021	E	N/A	None
Erteschik, Louis	City and County of Honolulu, Waikīkī Neighborhood Board No. 9, Subdistrict 2	Vice Chairperson	01/07/2021	L	N/A	None
Eversole, Dolan	Hawai‘i Sea Grant	Secretary	01/05/2021	E	N/A	None
Filek, Melissa	City and County of Honolulu, Waikīkī Neighborhood Board No. 9, Subdistrict 3		01/07/2021	L	N/A	None
Finley, Robert J.	City and County of Honolulu, Waikīkī Neighborhood Board No. 9, Subdistrict 2	Chairperson	01/07/2021	L	N/A	None
Flood, Walt	City and County of Honolulu, Waikīkī Neighborhood Board No. 9, Subdistrict 2		01/07/2021	L	N/A	None

Name	Organization or Affiliation	Title	Date Request Sent	Email (E) or Letter (L)	Date Response Received	Response
Foti, Thomas	Waikīkī Beach Marriott Resort & Spa	General Manager	01/07/2021	L	N/A	None
Garrity, Mark	City and County of Honolulu, Waikīkī Neighborhood Board No. 9, Subdistrict 1		01/07/2021	L	N/A	None
Gersaba, Nalani J.	Waikīkī descendant		01/07/2021	L	N/A	None
Gomes, Celeste (Fukuhara)	Waikīkī descendant		01/07/2021	L	N/A	None
Gomes, Jared	Waikīkī descendant		01/07/2021	L	N/A	None
Gomes, Jeffrey	Waikīkī descendant		01/07/2021	L	N/A	None
Gomes, Phoebe	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Gomes, Robert Jr.	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Gomes, Robin	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Gonser, Matthew	City and County of Honolulu, Office of Climate Change, Sustainability and Resiliency	Chief Resilience Officer and Executive Director	01/05/2021	E	N/A	None
Gomes-Silva, Lisa	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Gora, Amelia K.	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Grace, Nadine	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Hampton, Bob	Waikīkī Beach Activities	Chairperson	01/07/2021	L	N/A	None
Harris, Cy	Waikiki Halia Aloha descendants		01/07/2021	L	N/A	None
Hatchie, Andrew	Waikīkī cultural descendant		01/07/2021	L	N/A	None

Name	Organization or Affiliation	Title	Date Request Sent	Email (E) or Letter (L)	Date Response Received	Response
Heanu, Arthur Lanakila Jr.	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Heanu, Gilbert Kahōkūokalani	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Heanu, Glenn Ione	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Heanu, Jadelyn Kealohilani	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Heanu, Kyle Ikaika	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Heanu, Sharleen	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Hemenway, Samantha	State Historic Preservation Division (SHPD)	Oʻahu Island Archaeologist	01/05/2021	E	N/A	None
Henski, Kathryn	City and County of Honolulu Waikīkī Neighborhood Board No. 9, Subdistrict 3		01/07/2021	L	N/A	None
Hilo, Regina	State Historic Preservation Division (SHPD)	Burial Sites Specialist	01/05/2021	E	N/A	None
Hinaga, Reid	Bank of Hawaiʻi, Waikīkī	Treasurer	01/07/2021	L	N/A	None
Hoen, Kelly	Outrigger Reef Waikīkī Beach	Area Manager/General Manager	01/07/2021	L	N/A	None
Hoʻohuli, William	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Iaukea, Lesley K.	SHPD	Burial Sites Specialist	01/05/2021	E	N/A	None
Joto, Lorelei	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Kaʻawakauo, Emma	Waikīkī kupuna		01/07/2021	L	N/A	None
Kahanamoku, Samuel A.	Waikīkī/Kālia kupuna		01/07/2021	L	N/A	None

Name	Organization or Affiliation	Title	Date Request Sent	Email (E) or Letter (L)	Date Response Received	Response
Kaleikini, Ali‘ikaua (Arthur W. Kaleikini Jr)	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Kaleikini, Hāloa Keko‘o Namakaokalani	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Kaleikini, Kala	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Kaleikini, No‘eau	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Kaleikini, Paulette	Waikīkī cultural descendant; Oiwi Cultural Resources				N/A	Deceased
Kaleikini, Tuahine	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Kam, George	Quicksilver	Ambassador of Aloha	01/07/2021	L	N/A	None
Kam, Thelma	Sheraton Waikīkī	Cultural Director	01/07/2021	L	N/A	None
Kamai, Dwynn	Waikīkī Hawaiian Civic Club		01/05/2021	E	N/A	None
Kanakanui, Sam	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Kanohokula, Shanlyn Maile	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Kawainui, Eryke Kalani Naeole	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Ke‘ana‘āina, Betty	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Ke‘ana‘āina, Kīhei	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Ke‘ana‘āina, Luther	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Ke‘ana‘āina, Michelle	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Ke‘ana‘āina, Noelani	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Ke‘ana‘āina, Regina	Waikīkī cultural descendant		01/07/2021	L	N/A	None

Name	Organization or Affiliation	Title	Date Request Sent	Email (E) or Letter (L)	Date Response Received	Response
Keʻanaʻāina, Vicky	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Keʻanaʻāina, Wilsam	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Keala, Kathryn	Office of Hawaiian Affairs (OHA)		01/05/2021	E	N/A	None
Keaweamahi, April Leimomi	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Keaweamahi, Michael Alan Lani Jr.	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Kekaula, Ashford	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Kekaula, Mary K.	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Keliʻipaʻakaua, Chase	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Keliʻipaʻakaua, Justin	Waikīkī cultural descendant		01/07/2021	L		Received but not shown (see Section III)
Keliʻinoi, Moani	*Kona moku* cultural descendant		01/07/2021	L	N/A	None
Keohokālole, Adrian K.	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Keohokālole, Dennis Ka'imina'auao	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Keohokālole, Emalia E.	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Keohokālole, James Hoapili	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Keohokālole, Joseph Moses Keaweaheulu	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Keohokālole, Lori Lani	Waikīkī cultural descendant		01/07/2021	L	N/A	None

Name	Organization or Affiliation	Title	Date Request Sent	Email (E) or Letter (L)	Date Response Received	Response
Kihikihi, Kauna	Waikīkī cultural historian, E Noa Tours		01/07/2021	L	N/A	None
Kini, Debbie (Norman)	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Kini, Nalani or Nalani Gasper	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Koko, Kanaloa	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Kozlov, Alex	City and County of Honolulu, Department of Design and Construction	Director	01/07/2021	L	02/17/2021	Received (see Table 7)
Krauer, Ulrich	Halekūlani Hotel	General Manager	01/07/2021	L	N/A	None
Kruse, T. Kehaulani	Former member of the Oahu Island Burial Council (OIBC)		01/07/2021	L	N/A	None
Kuloloio, Manuel	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Lau, Clifford	City and County of Honolulu,Department of Design and Consultation, 650 S. King St., 11th floor, Honolulu, HI 96813	Facilities Branch Chief	01/07/2021	E	1/7/21	Received (see Table 7)
Lebo, Susan A.	State Historic Preservation Division (SHPD)	Archaeology Branch Chief	01/05/2021	E	N/A	None
Lemmo, Sam	DLNR-Conservation & Coastal Lands	Administrator	01/05/2021	E	01/05/2021	Received (see Table 7)
Lew, Haumea (Haumea Hanakahi)	Waikīkī cultural descendant		01/07/2021	L	N/A	None
L‘Heureux, Ray L.	Pacific Historic Parks		01/05/2021	E	N/A	None

Name	Organization or Affiliation	Title	Date Request Sent	Email (E) or Letter (L)	Date Response Received	Response
Lindsey, Keola	Office of Hawaiian Affairs (OHA)		01/05/2021	E	N/A	None
Lopes, Kamahaʻo	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Lopes, Leinaʻala (Moses-Hukiku)	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Lopes, Puahone Kini	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Lopes, Wilfred	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Luka, Alika	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Luthy, Tamara	State Historic Preservation Division (SHPD)	Ethnographer	01/05/2021	E	N/A	None
Makahi, Merlin	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Mamac, Violet L. Medeiros	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Mau, Alika	Waikīkī Business Plaza	Vice President	01/07/2021	L	N/A	None
Maxwell Jr., Philip P.	Waikīkī kupuna		01/05/2021	E	N/A	Deceased
Medeiros, David	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Medeiros, Jacob L.	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Medeiros, Jaimison K.	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Medeiros, Jayla A.	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Medeiros, Kareen K.	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Medeiros, Lincoln K.	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Medeiros, Lolani			01/07/2021	L	N/A	None
Medeiros, Roland	Waikīkī cultural descendant		01/07/2021	L	N/A	None

Name	Organization or Affiliation	Title	Date Request Sent	Email (E) or Letter (L)	Date Response Received	Response
Merz, Jeffrey D.	City and County of Honolulu Waikīkī Neighborhood Board No. 9, Subdistrict 1		01/07/2021	L	N/A	None
Miller, ʻIhilani Silva	Sheraton Moana Surfrider	Entertainer	01/07/2021	L	N/A	None
Miyamoto, Florence Kamakaʻōpiopio Clark	Waikīkī *kupuna*		01/07/2021	L	N/A	None
Morvant, Irby	Hyatt Regency Waikīkī Beach Resort and Spa	General Manager	01/07/2021	L	N/A	None
Naeole, Joelle Kamakaonaona	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Naeole, Kainoa Kanewokawaiola	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Naguwa, Joan	Executive Director Waikīkī Community Center		01/07/2021	L	N/A	None
Nakaoka, Bruce	Queen Emma Land Company, Queen's Hospital	Vice President	01/07/2021	L	N/A	None
Nakayama, Jennifer	Waikīkī Business Improvement District Association	President & Executive Director	01/07/2021	L	N/A	None
Napoleon, Nanette	Hawaiian historian, writer, and researcher		01/05/2021	E	N/A	None
Nigro, John	City and County of Honolulu Waikīkī Neighborhood Board No. 9, Subdistrict 3		01/07/2021	L	N/A	None
Nobrega-Olivera, Malia	Waikīkī Hawaiian Civic Club	Director	01/05/2021	E	N/A	None

Name	Organization or Affiliation	Title	Date Request Sent	Email (E) or Letter (L)	Date Response Received	Response
Norman, Carolyn (Keli‘ipa‘akaua)	Waikīkī cultural descendant		01/07/2021	L		Received (see Table 7)
Norman, Eileen	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Norman, Kaleo	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Norman, Keli‘inui	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Norman, Theodore	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Olds, Nalani	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Orr, Fred	Sheraton Princess Kai‘ulani	General Manager	01/07/2021	L	N/A	None
Paglinawan, Richard	Queen Emma Trust; *lua* expert		01/07/2021	L	N/A	None
Paik, Kaleo	DLNR Aha Moku Advisory Committee		01/05/2021	E	N/A	None
Paoa, Robert Clarke	Waikīkī/Kālia kupuna		01/07/2021	L	N/A	None
Pascua, Bruce H.	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Pauio, Alvina (Angeline) Napua	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Peters, David	Queen Lili‘uokalani Trustee		01/07/2021	L	01/12/2021	Received but not shown (see Section III)
Phua, April Haunani	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Phua, Kamakani	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Polido, Mahealani	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Polido, Matthew	Waikīkī cultural descendant		01/07/2021	L	N/A	None

Name	Organization or Affiliation	Title	Date Request Sent	Email (E) or Letter (L)	Date Response Received	Response
Polido, Melinda (Tajon)	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Polido, Michael	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Rafid, Raiyan	City and County of Honolulu Waikīkī Neighborhood Board No. 9, Subdistrict 2		01/07/2021	L	N/A	None
Rash, Regina	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Robello, Harry "Didi"	Waikīkī descendant and beachboy		01/07/2021	L	N/A	None
Robinson, Rob	Springboard Hospitality	Vice President	01/07/2021	L	N/A	None
Rodrigues, Hinano R.	State Historic Preservation Division (SHPD)	History & Culture Branch Chief	01/05/2021	E	N/A	None
Roy, Jr., Corbett	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Sasamura, Ross	City and County of Honolulu, Department of Facility Maintenace	Director & Chief Engineer	01/07/2021	L	N/A	None
Shirai, Jacqueline	Waikīkī cultural descendant		01/05/2021	E	N/A	None
Shirai, Jr., Thomas T.	Waikīkī cultural descendant		01/05/2021	E	N/A	None
Smith, Mark	City and County of Honolulu Waikīkī Neighborhood Board No. 9, Subdistrict 3		01/07/2021	L	N/A	None
Solis, Ka‘āhiki	State Historic Preservation Division (SHPD)	Cultural Historian (O‘ahu, Kaua‘i, and Ni‘ihau)	01/05/2021	E	01/06/2021	None
Sorensen, Betty Dyer	Waikīkī kupuna		01/07/2021	L	N/A	None

Name	Organization or Affiliation	Title	Date Request Sent	Email (E) or Letter (L)	Date Response Received	Response
Souza, William D.	Royal Order of Kamehameha, Kūhiō Chapter		01/07/2021	L	N/A	None
Spinney, Charles	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Suzuki, Ashley	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Suzuki, Ashley	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Suzuki, Kimberly	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Takaki, Miles	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Takaki, Moses	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Takaki, Tracy (Kaahanui)	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Takayama, Mike	Kyoya Hotel and Resorts LP	Director of Real Estate	01/07/2021	L	N/A	None
Takizawa, Lorna Medeiros	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Theone, Nicole Gulia	Waikīkī cultural descendant		01/07/2021	L	N/A	None
Thielen, Laura	City and County of Honolulu, Department of Parks & Recreation	Director	01/05/2021	E	N/A	None
Tomczyk, Piʻikea	Waikīkī Hawaiian Civic Club	President	01/05/2021	E	N/A	None
Utterdyke, Aileen	Pacific Historic Parks	Chief Executive Officer	01/05/2021	E	N/A	None
Valbuena, Manuel	City and County of Honolulu, Budget and Fiscal Services	Deputy Director	01/05/2021	E	N/A	None
Wagner, Pat (Low)	Waikīkī kupuna		01/07/2021	L	N/A	None

Name	Organization or Affiliation	Title	Date Request Sent	Email (E) or Letter (L)	Date Response Received	Response
Walker, Isaiah	Waikīkī cultural descendant; Brigham Young University—Hawaii	Professor	01/05/2021	E	N/A	None
Waters, Tommy	City and County of Honolulu, City Council, District 4	Council Chair and Presiding Officer	01/05/2021	E	N/A	None
Wiencek, Jacob	City and County of Honolulu Waikīkī Neighborhood Board No. 9, Subdistrict 2		01/07/2021	L	N/A	None
Wilder, Kenny D.	City and County of Honolulu Waikīkī Neighborhood Board No. 9, Subdistrict 2		01/07/2021	L	N/A	None
Wong, Donna	O‘ahu Island Parks Conservancy		01/05/2021	E	N/A	None
Wong-Kalu, Hinaleimoana	O‘ahu Island Burial Council (OIBC)	Chair	01/07/2021	L	N/A	None
Yagi, Pamela	Hilton Grand Vacations at Hilton Hawaiian Village	General Manager	01/07/2021	L	N/A	None
Yokooji, Dayleen	Waikīkī cultural descendant		01/07/2021	L	N/A	None

APPENDIX C: CONSULTANT CONSENT LETTERS

IARII

Robert Pacheco [redacted]

Please Review Your Comment for the Waikiki Beach Improvement CIA

3 messages

Robert Pacheco [redacted] Sat, Mar 6, 2021 at 9:50 AM
To: [redacted]
Cc: Hannah Anae [redacted]

Aloha e Mr. Apo,

Mahalo for your recent contribution to the Cultural Impact Assessment (CIA) being prepared by International Archaeology, LLC (IA), for the Waikīkī Beach Improvement and Maintenance Program. As mentioned in our initial request letter, your comments about the cultural impacts of the project will be reproduced in the CIA so they can be read and considered during future project planning.

We would like to give you a final opportunity to review your comment as it will appear in the CIA. IA has edited your original response slightly for clarity, but we believe that your information and opinions are still accurately represented. The text of your response is reproduced below:

"I am familiar with the Waikiki shoreline erosion situation particularly with respect to iwi. If there is any specific aspect of your quest to be inclusive in your reach out to the community I'd be happy to opine. But, there's too many land mines in navigating iwi issues along the Waikiki corridor so I can't give you a general response. Also, Rob Iopa, a person with whom I shared your email of the project is head of WCIT Architecture whose company has a long history of Waikiki development projects."

If you agree that your comment as presented above may appear in the CIA, please confirm your agreement via email reply as soon as possible. We will not include your comment in the CIA without your consent.

If you would like to edit or add more to your response, please do so and send it to us, and we will replace your original statement with the revised comment. Alternatively, if you no longer want your comment to be included in the CIA, we will remove it from the report at your request. There are no consequences for revising or retracting your comment. If you decide on either option, please inform us as soon as possible, as we cannot alter your response once the CIA is finalized.

As noted in our request letter, your name and cultural/community affiliation will be added to your response in the CIA. If you want your comment to be anonymous, we can remove your identifying information upon request.

Finally, we would like to remind you that the CIA is a public document that will be added to an Environmental Impact Statement (EIS) by Sea Engineering, Inc. (SEI), on behalf of the Hawaiʻi Department of Land and Natural Resources' (DLNR). The purpose of the CIA is to collect information about the past and present cultural resources and practices associated with Waikīkī Beach in order to identify any issues and concerns that may arise from the proposed beach improvements or future maintenance activities. Your participation in this project is completely voluntary, and there will be no negative consequences if you decide not to participate.

We look forward to hearing from you soon.

Mahalo,
Robert Pacheco

--
Robert Pacheco, M.A.
Project Director / Ethnographer / Safety Officer
International Archaeology, LLC (IA)
2081 Young Street
Honolulu, HI 96826
[redacted]
www.internationalarchaeologyllc.com

Peter Apo [redacted] Sat, Mar 6, 2021 at 4:06 PM
To: Robert Pacheco [redacted]
Cc: Hannah Anae [redacted]

Yes, I approve. Mahalo

Peter Apo
[Quoted text hidden]
--
The Peter Apo Company
[redacted]
www.peterapocompany.com
www.peterapomusic.com

Robert Pacheco [redacted] Mon, Mar 8, 2021 at 9:57 AM
To: Peter Apo [redacted]
Cc: Hannah Anae [redacted]

Mahalo e Mr. Apo.

Sincerely,
Robert
[Quoted text hidden]

IARII

Robert Pacheco [redacted]

Please Review Your Comment for the Waikiki Beach Improvement CIA

3 messages

Robert Pacheco [redacted] Mon, Mar 8, 2021 at 2:32 PM
To: [redacted]
Cc: Hannah Anae [redacted]

Aloha e Mr. Cáceres,

Mahalo for your recent contribution to the Cultural Impact Assessment (CIA) being prepared by International Archaeology, LLC (IA), for the Waikīkī Beach Improvement and Maintenance Program. As mentioned in our initial request letter, your comments about the cultural impacts of the project will be reproduced in the CIA so they can be read and considered during future project planning.

We would like to give you a final opportunity to review your comment as it will appear in the CIA. IA has edited your original response slightly for clarity, but we believe that your information and opinions are still accurately represented. The text of your response is reproduced below:

"After reading the information sent to us, my ʻohana and I support the project. As State Recognized Cultural Descendants to native Hawaiian Human Remains documented in Waikīkī as well as being trained burial practitioners, we have both extensive knowledge as well as a responsibility to ensure the proper care and protection of the iwi kūpuna of that area. Beach erosion is a serious concern to us because the more the beach erodes the more potential impacts there are to burials along the coast. Just a few weeks ago we were assisting the community and descendants of the Kaʻaʻawa area in protecting two burials that were exposed due to erosion."

If you agree that your comment as presented above may appear in the CIA, please confirm your agreement via email reply as soon as possible. We will not include your comment in the CIA without your consent.

If you would like to edit or add more to your response, please do so and send it to us, and we will replace your original statement with the revised comment. Alternatively, if you no longer want your comment to be included in the CIA, we will remove it from the report at your request. There are no consequences for revising or retracting your comment. If you decide on either option, please inform us as soon as possible, as we cannot alter your response once the CIA is finalized.

As noted in our request letter, your name and cultural/community affiliation will be added to your response in the CIA. If you want your comment to be anonymous, we can remove your identifying information upon request.

Finally, we would like to remind you that the CIA is a public document that will be added to an Environmental Impact Statement (EIS) by Sea Engineering, Inc. (SEI), on behalf of the Hawaiʻi Department of Land and Natural Resources' (DLNR). The purpose of the CIA is to collect information about the past and present cultural resources and practices associated with Waikīkī Beach in order to identify any issues and concerns that may arise from the proposed beach improvements or future maintenance activities. Your participation in this project is completely voluntary, and there will be no negative consequences if you decide not to participate.

We look forward to hearing from you soon.

Mahalo,
Robert Pacheco

--
Robert Pacheco, M.A.
Project Director / Ethnographer / Safety Officer
International Archaeology, LLC (IA)
2081 Young Street
Honolulu, HI 96826
[redacted]
www.internationalarchaeologyllc.com

Mana Caceres [redacted] Mon, Mar 8, 2021 at 2:48 PM
To: Robert Pacheco [redacted]
Cc: Hannah Anae [redacted]

Aloha e Robert,

Mahalo for the follow up regarding the comments I've made for the CIA mentioned above. Please feel free to use my statement, quoted above, in the CIA. You can also leave my name and affiliation in the CIA.

Please let me know if there is anything else I can do to support the efforts to mitigate the erosion issues in Waikīkī.

Ola nā iwi,

Mana

e kolo ana nō ke ēwe i ka ʻiewe

descendants of the same ancestors crawl together

Mana Kaleilani Cáceres

[Quoted text hidden]

Robert Pacheco [redacted] Mon, Mar 8, 2021 at 2:54 PM
To: Mana Caceres [redacted]
Cc: Hannah Anae [redacted]

Mahalo e Mr. Cáceres.

Sincerely,
Robert
[Quoted text hidden]

IARII

Robert Pacheco [redacted]

Please Review Your Comment for the Waikiki Beach Improvement CIA

3 messages

Robert Pacheco [redacted] Sat, Mar 6, 2021 at 9:50 AM
To: [redacted]
Cc: [redacted]

Aloha e Mr. Clark,

Mahalo for your recent contribution to the Cultural Impact Assessment (CIA) being prepared by International Archaeology, LLC (IA), for the Waikīkī Beach Improvement and Maintenance Program. As mentioned in our initial request letter, your comments about the cultural impacts of the project will be reproduced in the CIA so they can be read and considered during future project planning.

We would like to give you a final opportunity to review your comment as it will appear in the CIA. IA has edited your original response slightly for clarity, but we believe that your information and opinions are still accurately represented. The text of your response is reproduced below:

"If you have a copy of Hawaiian Surfing: Traditions from the Past, I included a section at the end called "Waikiki Place Names Related to Surfing." There's material in it that addresses some of the information that you're after.
Several years ago the Department of Education asked me if I would narrate a surfing history of Waikīkī. We finished it in 2017 and premiered it at my alma mater in Waikīkī, Jefferson Elementary School. If you haven't seen it, this is the link: *https://www.youtube.com/watch?v=NbFigfXH5Yg*. **FYI, it's 48 minutes long. Please feel free to share it."**

If you agree that your comment as presented above may appear in the CIA, please confirm your agreement via email reply as soon as possible. We will not include your comment in the CIA without your consent.

If you would like to edit or add more to your response, please do so and send it to us, and we will replace your original statement with the revised comment. Alternatively, if you no longer want your comment to be included in the CIA, we will remove it from the report at your request. There are no consequences for revising or retracting your comment. If you decide on either option, please inform us as soon as possible, as we cannot alter your response once the CIA is finalized.

As noted in our request letter, your name and cultural/community affiliation will be added to your response in the CIA. If you want your comment to be anonymous, we can remove your identifying information upon request.

Finally, we would like to remind you that the CIA is a public document that will be added to an Environmental Impact Statement (EIS) by Sea Engineering, Inc. (SEI), on behalf of the Hawaiʻi Department of Land and Natural Resources' (DLNR). The purpose of the CIA is to collect information about the past and present cultural resources and practices associated with Waikīkī Beach in order to identify any issues and concerns that may arise from the proposed beach improvements or future maintenance activities. Your participation in this project is completely voluntary, and there will be no negative consequences if you decide not to participate.

We look forward to hearing from you soon.

Mahalo,
Robert Pacheco

--
Robert Pacheco, M.A.
Project Director / Ethnographer / Safety Officer
International Archaeology, LLC (IA)
2081 Young Street
Honolulu, HI 96826
[redacted]
www.internationalarchaeologyllc.com

[redacted] Sat, Mar 6, 2021 at 3:55 PM

To: Robert Pacheco [redacted]
Cc: Hannah Anae [redacted]

Aloha e Mr. Pacheco,

I agree that my comment as presented below may appear in the CIA.

Me ke aloha,

John Clark

[Quoted text hidden]

Robert Pacheco [redacted] Mon, Mar 8, 2021 at 9:57 AM
To: [redacted]
Cc: [redacted]

Mahalo e Mr. Clark.

Sincerely,
Robert
[Quoted text hidden]

IARII

Robert Pacheco [redacted]

Please Review Your Comment for the Waikiki Beach Improvement CIA

3 messages

Robert Pacheco [redacted] Sat, Mar 6, 2021 at 9:51 AM
To: [redacted]
Cc: Hannah Anae [redacted]

Aloha e Mr. Lau,

Mahalo for your recent contribution to the Cultural Impact Assessment (CIA) being prepared by International Archaeology, LLC (IA), for the Waikīkī Beach Improvement and Maintenance Program. As mentioned in our initial request letter, your comments about the cultural impacts of the project will be reproduced in the CIA so they can be read and considered during future project planning.

We would like to give you and Mr. Kozlov a final opportunity to review your comments as they will appear in the CIA. IA has edited your original responses slightly for clarity, but we believe that your information and opinions are still accurately represented. The text of your responses is reproduced below:

[redacted]

Mr. Kozlov:
Thank you for the opportunity to review and comment. The Department of Design and Construction's Facilities Division has the following comments.
1. The proposed project along the Halekulani Beach Sector will restore a severely eroded section of beach in an area which tourists and local residents historically could access and utilize our valuable beach resource for recreational and cultural practices. The erosion is resulting in the closure of Brow 141A to protect the public from a hazardous condition. This project will insure that free access can be restored and protect against future sea level rise and coastal erosion.
2. Along the C, D, and E areas the City provides valuable lifeguard services which insures the safety of both tourists and locals who enjoy the various water activities that this shoreline has been and will continue to be intensively used for. To undertake this service the City has in place lifeguard towers which are key to enable the lifeguards to perform their duties. The severe erosion has endangered those structures which make it more difficult for the City to provide this service. The restoration of those shorelines will protect these structures ensuring that the City lifeguards will be able to continue to provide their service.
3. All around the island we see severe erosion of the shoreline at beach parks. When this occurs we see burials in the sand deposits being exposed. We see this project providing protection of sensitive cultural deposits which exist inland from the immediate beach area. If this kind of project is not undertaken we fully expect that the coastal erosion will progress mauka and will expose burial which we know to exist in this coastal area. With sea level rise taking no action to restore the beach and raise the elevation will leave the sensitive cultural areas exposed.
Sincerely,
Alex Kozlov, P.E.
Director Designate

If you agree that your comments as presented above may appear in the CIA, please confirm your agreement via email reply as soon as possible. We will not include your comments in the CIA without your consent.

If you would like to edit or add more to your responses, please do so and send them to us, and we will replace your original statements with the revised comments. Alternatively, if you no longer want your comments to be included in the CIA, we will remove them from the report at your request. There are no consequences for revising or retracting your comments. If you decide on either option, please inform us as soon as possible, as we cannot alter your responses once the CIA is finalized.

As noted in our request letter, your names and cultural/community affiliations will be added to your responses in the CIA. If you want your comments to be anonymous, we can remove your identifying information upon request.

Finally, we would like to remind you that the CIA is a public document that will be added to an Environmental Impact Statement (EIS) by Sea Engineering, Inc. (SEI), on behalf of the Hawai'i Department of Land and Natural Resources' (DLNR). The purpose of the CIA is to collect information about the past and present cultural resources and practices associated with Waikīkī Beach in order to identify any issues and concerns that may arise from the proposed beach improvements or future maintenance activities. Your participation in this project is completely voluntary, and there will be no negative consequences if you decide not to participate.

We look forward to hearing from you soon.

Mahalo,
Robert Pacheco

--
Robert Pacheco, M.A.
Project Director / Ethnographer / Safety Officer
International Archaeology, LLC (IA)
2081 Young Street
Honolulu, HI 96826
[redacted]
www.internationalarchaeologyllc.com

Lau, Clifford [redacted] Mon, Mar 8, 2021 at 7:53 AM
To: Robert Pacheco [redacted]

Robert,

See my comments to the summary of the phone conversation in red. The Kozlov write up is ok.

Regards,

Clifford

From: Robert Pacheco [redacted]
Sent: Saturday, March 6, 2021 9:51 AM
To: Lau, Clifford
Cc: Hannah Anae
Subject: Please Review Your Comment for the Waikiki Beach Improvement CIA

Aloha e Mr. Lau,

Mahalo for your recent contribution to the Cultural Impact Assessment (CIA) being prepared by International Archaeology, LLC (IA), for the Waikīkī Beach Improvement and Maintenance Program. As mentioned in our initial request letter, your comments about the cultural impacts of the project will be reproduced in the CIA so they can be read and considered during future project planning.

We would like to give you and Mr. Kozlov a final opportunity to review your comments as they will appear in the CIA. IA has edited your original responses slightly for clarity, but we believe that your information and opinions are still accurately represented. The text of your responses is reproduced below:

Mr. Lau:

[The following paragraph is a summary of a phone conversation with Mr. Lau.]
Mr. Lau says that the Department of Design and Construction supports [redacted] the proposed project as it will restore shoreline access and protect lifeguard stations along Waikiki Beach which being endangered by the beach erosion.

[Quoted text hidden]

Robert Pacheco [redacted] Mon, Mar 8, 2021 at 9:58 AM
To: "Lau, Clifford" [redacted]
Cc: Hannah Anae [redacted]

Mahalo e Mr. Lau. We will change your response as indicated.

Sincerely,
Robert
[Quoted text hidden]

Robert Pacheco [redacted]

Please Review Your Comment for the Waikiki Beach Improvement CIA

12 messages

Robert Pacheco [redacted] Sat, Mar 6, 2021 at 9:53 AM
To: [redacted]
Cc: Hannah Anae [redacted]

Aloha e Mr. Lemmo,

Mahalo for your recent contribution to the Cultural Impact Assessment (CIA) being prepared by International Archaeology, LLC (IA), for the Waikīkī Beach Improvement and Maintenance Program. As mentioned in our initial request letter, your comments about the cultural impacts of the project will be reproduced in the CIA so they can be read and considered during future project planning.

We would like to give you a final opportunity to review your response as it will appear in the CIA. Although you did not provide commentary on the project, IA will instead include a short statement acknowledging your response to our initial request letter. The text of this summary is reproduced below:

[Mr. Lemmo requested a copy of a 2008 report by Robert Wiegel (Waikīkī Beach, O'ahu, Hawai'i: History of Its Transformation from a Natural to an Urban Shore), but provided no further comment.]

If you agree that your response as presented above may appear in the CIA, please confirm your agreement via email reply as soon as possible. We will not include your response in the CIA without your consent.

If you would like to edit or add more to your response, please do so and send it to us, and we will replace your original statement with the revised comment. Alternatively, if you no longer want your comment to be included in the CIA, we will remove it from the report at your request. There are no consequences for revising or retracting your comment. If you decide on either option, please inform us as soon as possible, as we cannot alter your response once the CIA is finalized.

As noted in our request letter, your name and cultural/community affiliation will be added to your response in the CIA. If you want your comment to be anonymous, we can remove your identifying information upon request.

Finally, we would like to remind you that the CIA is a public document that will be added to an Environmental Impact Statement (EIS) by Sea Engineering, Inc. (SEI), on behalf of the Hawai'i Department of Land and Natural Resources' (DLNR). The purpose of the CIA is to collect information about the past and present cultural resources and practices associated with Waikīkī Beach in order to identify any issues and concerns that may arise from the proposed beach improvements or future maintenance activities. Your participation in this project is completely voluntary, and there will be no negative consequences if you decide not to participate.

We look forward to hearing from you soon.

Mahalo,
Robert Pacheco

--
Robert Pacheco, M.A.
Project Director / Ethnographer / Safety Officer
International Archaeology, LLC (IA)
2081 Young Street
Honolulu, HI 96826
[redacted]
www.internationalarchaeologyllc.com

Lemmo, Sam J [redacted] Mon, Mar 8, 2021 at 10:13 AM
To: Robert Pacheco [redacted]
Cc: Hannah Anae [redacted]

I would like tom talk to you folks when you have an opportunity.

Mahalo

[Quoted text hidden]

Robert Pacheco [redacted] Mon, Mar 8, 2021 at 11:07 AM
To: "Lemmo, Sam J" [redacted]
Cc: Hannah Anae [redacted]

Dear Mr. Lemmo,

Yes, we'd be happy to talk. Can we reach you at these numbers?
[redacted]

Mahalo,
Robert
[Quoted text hidden]

Lemmo, Sam J [redacted] Mon, Mar 8, 2021 at 11:38 AM
To: Robert Pacheco [redacted]
Cc: Hannah Anae [redacted]

Thanks Robert. [redacted] is the best number to reach me. Can we talk tomorrow in the morning sometime?

[Quoted text hidden]

Robert Pacheco [redacted] Mon, Mar 8, 2021 at 11:42 AM
To: "Lemmo, Sam J" [redacted]
Cc: Hannah Anae [redacted]

Sounds good. We'll call tomorrow morning between 9 and 11. Just shoot us an email if you want to narrow the window.

Mahalo,
Robert
[Quoted text hidden]

[redacted]

Lemmo, Sam J [redacted] Mon, Mar 8, 2021 at 12:23 PM
To: Robert Pacheco [redacted]
Cc: Hannah Anae [redacted]

OK, I will get back to you.

[Quoted text hidden]

[redacted]

Lemmo, Sam J [redacted] Tue, Mar 9, 2021 at 8:16 AM
To: Robert Pacheco [redacted]
Cc: Hannah Anae [redacted]

Can you call me at 10:00 please?

[Quoted text hidden]

Robert Pacheco [redacted] Tue, Mar 9, 2021 at 8:35 AM
To: "Lemmo, Sam J" [redacted]
Cc: Hannah Anae [redacted]

Yes, will do.

Mahalo,
Robert
[Quoted text hidden]

Lemmo, Sam J [redacted] Tue, Mar 9, 2021 at 3:25 PM
To: Robert Pacheco [redacted]
Cc: Hannah Anae [redacted]

Thanks for the conversation. I do recommend you reaching out to [redacted]

Mahalo

[redacted]

[Quoted text hidden]

Robert Pacheco [redacted] Tue, Mar 9, 2021 at 3:32 PM
To: "Lemmo, Sam J" [redacted]
Cc: Hannah Anae [redacted]

Thank you, Sam. [redacted], I will send you our initial consultation request letter in a separate email.

Mahalo,
Robert
[Quoted text hidden]

IARII

Robert Pacheco [redacted]

Please Review Your Comment for the Waikiki Beach Improvement CIA

3 messages

Robert Pacheco [redacted] Mon, Mar 8, 2021 at 2:33 PM
To: [redacted]
Cc: Hannah Anae [redacted]

Aloha e Ms. Norman,

Mahalo for your recent contribution to the Cultural Impact Assessment (CIA) being prepared by International Archaeology, LLC (IA), for the Waikīkī Beach Improvement and Maintenance Program. As mentioned in our initial request letter, your comments about the cultural impacts of the project will be reproduced in the CIA so they can be read and considered during future project planning.

We would like to give you a final opportunity to review your comment as it will appear in the CIA. IA has edited your original response slightly for clarity, but we believe that your information and opinions are still accurately represented. The text of your response is reproduced below:

[redacted]

If you agree that your comment as presented above may appear in the CIA, please confirm your agreement via email reply as soon as possible. We will not include your comment in the CIA without your consent.

If you would like to edit or add more to your response, please do so and send it to us, and we will replace your original statement with the revised comment. Alternatively, if you no longer want your comment to be included in the CIA, we will remove it from the report at your request. There are no consequences for revising or retracting your comment. If you decide on either option, please inform us as soon as possible, as we cannot alter your response once the CIA is finalized.

As noted in our request letter, your name and cultural/community affiliation will be added to your response in the CIA. If you want your comment to be anonymous, we can remove your identifying information upon request.

Finally, we would like to remind you that the CIA is a public document that will be added to an Environmental Impact Statement (EIS) by Sea Engineering, Inc. (SEI), on behalf of the Hawaiʻi Department of Land and Natural Resources'

(DLNR). The purpose of the CIA is to collect information about the past and present cultural resources and practices associated with Waikīkī Beach in order to identify any issues and concerns that may arise from the proposed beach improvements or future maintenance activities. Your participation in this project is completely voluntary, and there will be no negative consequences if you decide not to participate.

We look forward to hearing from you soon.

Mahalo,
Robert Pacheco

--
Robert Pacheco, M.A.
Project Director / Ethnographer / Safety Officer
International Archaeology, LLC (IA)
2081 Young Street
Honolulu, HI 96826
[redacted]
www.internationalarchaeologyllc.com

Carolyn Norman [redacted] Mon, Mar 8, 2021 at 5:10 PM
To: Robert Pacheco [redacted]
Cc: Hannah Anae [redacted]

Aloha e Robert,

Mahalo. Yes, I would like to edit my response. Below is my edited response.

"Mahalo for including my ohana and I in the consultation process.
This is how we connect to Waikiki. My Great grandfather William Nehemiah Keaweamahi, my grandmother Alice Kekahiliokamoku Keaweamahi-Kawainui and my mother Eileen Kekahiliokamoku "Kahili" Kawainui-Norman, who is still with us, were all born and raised in Kalia, Waikiki. 2 of my siblings were born at the old Kaiser Hospital that was once on my Kupuna Moehonua's aina in Kalia, Waikiki.
My mother Kahili Norman remembers as a child going to the beach where Hilton Hawaiian Village is currently located with her mother and grand Aunts to pick limu for lunch and dinner."
You mentioned in your letter that shoreline replenishment using sand recovered from offshore to help stabilize the shoreline. I have concerns about that and would like to know where and how the sand will be recovered because my great grandfather and his brother, who both were original Waikiki Beach Boys, have their ashes scattered offshore in Waikiki.
When a person's body is cremated, not all the bones are burned down to ashes. It would be very disturbing if iwi is found on the shore because of this project.
Iwi kūpuna were found in multiple areas spanning from Hilton Hawaiian Village down towards the Royal Hawaiian Hotel. They were found more inland but, that doesn't mean they won't be found near the shore. Iwi kūpuna have been found in some areas at Fort DeRussy in depths as shallow as 12 inches below the surface.
Kawehewehe also known as Gray's Beach between Outrigger Reef Hotel and Halekulani, was a place where kupuna would go for healing and to pikai. My Aunty Ka'anohi, my son Kepo'o and I went there to pikai after we had kanu iwi kūpuna from the Outrigger Reef Hotel. I remember seeing limu kala growing there. I haven't been to Kawehewehe for a while, but I wouldn't want that area to be disturbed because it is a place for kanaka to go for healing.

Mahalo nunui,
Keala Norman

From: Robert Pacheco [redacted]
Sent: Monday, March 8, 2021 2:33 PM
To: [redacted]
Cc: Hannah Anae [redacted]
Subject: Please Review Your Comment for the Waikiki Beach Improvement CIA

[Quoted text hidden]

Robert Pacheco [redacted] Mon, Mar 8, 2021 at 7:14 PM
To: Carolyn Norman [redacted]
Cc: Hannah Anae [redacted]

Mahalo e Ms. Norman. We will use your revised response for the CIA.

Sincerely,
Robert
[Quoted text hidden]

FINAL PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

Waikīkī Beach Improvement and Maintenance Program

October 2024

Prepared for:
Hawai‘i Department of Land and Natural Resources
Office of Conservation and Coastal Lands
1151 Punchbowl Street, Suite 131
Honolulu, Hawai‘i 96813

Partnered with:
Waikīkī Beach Special Improvement District Association
2250 Kalākaua Ave. Suite 315
Honolulu, Hawai‘i 96815

Prepared by:
Sea Engineering, Inc.
Makai Research Pier
41-305 Kalaniana‘ole Hwy
Waimānalo, Hawai‘i 96795

APPENDIX E

Archaeological Assessment

Prepared By: International Archaeology, LLC

— Final —

An Archaeological Overview for the Waikīkī Beach Improvement and Maintenance Program, Waikīkī Ahupua‘a, Kona District, Island of O‘ahu, Hawai‘i

TMK (1) 2-6-001:002, 003, 004, 008, 012, 013, 015, 017, 018, 019; 2-6-002:005, 006, 017, 026; 2-6-004:005, 006, 007, 008, 009, 010, 012; 2-6-005:001, 006; 2-6-008:029

Prepared by:
Summer Moore
M.J. Tomonari-Tuggle
Timothy M. Rieth

Prepared for:
Sea Engineering, Inc.
41-305 Kalanianaole Highway
Makai Research Pier
Waimānalo, Hawai‘i 96795

INTERNATIONAL ARCHAEOLOGY, LLC
JUNE 2022

IA201639

— FINAL —

AN ARCHAEOLOGICAL OVERVIEW FOR THE WAIKĪKĪ BEACH IMPROVEMENT AND MAINTENANCE PROGRAM

WAIKĪKĪ AHUPUAʻA, KONA DISTRICT, ISLAND OF OʻAHU, HAWAIʻI

TMK (1) 2-6-001:002, 003, 004, 008, 012, 013, 015, 017, 018, 019; 2-6-002:005, 006, 017, 026; 2-6-004:005, 006, 007, 008, 009, 010, 012; 2-6-005:001, 006; 2-6-008:029

Prepared by:

Summer Moore, Ph.D.
M.J. Tomonari-Tuggle, M.A.
Timothy M. Rieth, M.A.

Prepared for:

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International Archaeology, LLC
2081 Young Street
Honolulu, Hawaiʻi 96826

June 2022

ABSTRACT

At the request of Sea Engineering, Inc. (SEI), and on behalf of the Department of Land and Natural Resources (DLNR), Office of Conservation and Coastal Lands, International Archaeology, LLC prepared an archaeological overview in support of the proposed Waikīkī Beach Improvement and Maintenance Program. The beach improvement and maintenance program encompasses four areas of Waikīkī Beach—the Kūhiō Beach sector, the Royal Hawaiian sector, the Halekūlani sector, and the Fort DeRussy sector—along the shoreline of Māmala Bay in the Kona District of the Island of Oʻahu, seaward of TMKs (1) 2-6-001:002, 003, 004, 008, 012, 013, 015, 017, 018, 019; 2-6-002:005, 006, 017, 026; 2-6-004:005, 006, 007, 008, 009, 010, 012; 2-6-005:001, 006; and 2-6-008:029. These sectors include portions of the active beach and nearshore marine areas and extend to a maximum of approximately 70 m offshore. The archaeology overview is a component of the program's Environmental Impact Statement prepared by SEI for the DLNR. The proposed project includes the construction of new beach stabilization structures and shoreline replenishment primarily using sand recovered from offshore areas.

The Waikīkī region was an important traditional location, noted for its chiefly associations as well as the wealth of its agricultural and aquacultural development. It has historical associations as the beachside retreat for the 19th century Hawaiian royalty and wealthy Honolulu residents, and has more recently become the center of the modern Hawaiian hospitality economy. During the past 130 years, the Waikīkī shoreline has been substantially engineered to create larger sandy beaches for recreation. As such, most of the maintenance program will occur within modern beach deposits seaward of the 19th century and early 20th century shorelines. For the purposes of this report, previous archaeological investigations and known archaeological sites were evaluated within a study area that is inclusive of both the project area and a 50-m buffer extending outward from the project area.

The immediate shoreline project area, much of which consists of active beach or imported sand, contains few archaeological resources. The Royal Hawaiian sector is the only portion of the maintenance program with known archaeological resources. These consist of a partially exposed seawall (no State Inventory of Historic Places number has been assigned) and an extension of Site 50-80-14-5863, which was the location of a human bone fragment found on a graded fill surface; this fragment was recovered at the time of discovery and did not represent an in situ burial. A 50-m-wide area surrounding the maintenance program sectors included 15 archaeological sites with human remains and 10 sites representing buried archaeological deposits or discrete features.

Given the cultural and historical importance of the region, as well as the possibility that the active beach may abut intact archaeological deposits in the Kūhiō Beach and Royal Hawaiian sectors, we recommend that an archaeological monitor be present during ground-disturbing project work in areas within the historical shorelines. We also recommend historic preservation documentation and review of the exposed seawall and possible building foundation exposed in the Royal Hawaiian sector. Documentation of the beach control features along the shoreline, including the Kapahulu Storm Drain, the Kūhiō groin complex, the Royal Hawaiian Groin, Fort DeRussy Groin, and several unnamed groins, prior to commencement of the project is also recommended (these recommendations are discussed in the maintenance program's companion historical architectural overview [Moore and Tomonari-Tuggle 2021]).

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I. INTRODUCTION

At the request of Sea Engineering, Inc. (SEI), and on behalf of the Department of Land and Natural Resources (DLNR), Office of Conservation and Coastal Lands, International Archaeology, LLC (IA) prepared an archaeological overview in support of the proposed Waikīkī Beach Improvement and Maintenance Program (Figure 1 and Figure 2). The beach improvement and maintenance program encompasses four sectors of Waikīkī Beach— Kūhiō Beach, Royal Hawaiian, Halekūlani, and Fort DeRussy—along the shoreline of Māmala Bay in the Kona District of the Island of O‘ahu, seaward of TMKs (1) 2-6-001:002, 003, 004, 008, 012, 013, 015, 017, 018, 019; 2-6-002:005, 006, 017, 026; 2-6-004:005, 006, 007, 008, 009, 010, 012; 2-6-005:001, 006; and 2-6-008:029. These sectors include portions of the active beach and nearshore marine areas and extend to a maximum of approximately 70 m offshore. The archaeological overview is a component of the program's Environmental Impact Statement (EIS) prepared by SEI for the DLNR. The proposed project includes the construction of new beach stabilization structures and shoreline replenishment primarily using sand recovered from offshore areas.

PROJECT AREA DESCRIPTION

Waikīkī Beach is an approximately 3,130-m (10,260-ft.) ocean shoreline along the southwest edge of the Waikīkī neighborhood of Honolulu, extending from a breakwater fronting the Hilton Hawaiian Village Waikīkī Beach Resort to the west to a groin fronting the New Otani (Kaimana) Hotel to the east. Almost the entire length of the beach is armored by seawalls and stabilized by groins that compartmentalize the shoreline into eight individual "littoral cells" or sectors. The Waikīkī Beach Improvement and Maintenance Program will affect four of these sectors (Figure 3 through Figure 7), which are described individually.

1. The Kūhiō Beach sector consists of approximately 460 m (1,500 ft.) of shoreline extending from the ‘Ewa (west) groin at Kūhiō Beach Park to the Kapahulu storm drain. The northwestern half of the sector (called the ‘Ewa basin here) was created in 1939 (Figure 3); the southeastern half of the sector (called the Diamond Head basin here) was built between 1951 and 1953 (Figure 4). The sector is essentially an enclosed body of water within a set of constructed crib walls and groins. It is at the southern end of the curving and protected portion of the Waikīkī coastline, between two of the three major stream outlets (Ku‘ekaunahi and ‘Āpuakēhau) that once flowed into the ocean.

2. The Royal Hawaiian Beach sector consists of approximately 530 m (1,730 ft.) of shoreline extending from the Royal Hawaiian groin to the ‘Ewa (west) groin at Kūhiō Beach Park (Figure 5). It lies at an inward curve in the Waikīkī coastline that allows the development of a wide sand beach, and sits between two of the three major stream outlets (Ku‘ekaunahi and ‘Āpuakēhau) that once flowed into the ocean. This sector is the core of traditional and historical activity in Waikīkī.

3. The Halekūlani Beach sector consists of approximately 440 m (1,450 ft.) of shoreline extending from the Fort DeRussy outfall groin to the Royal Hawaiian groin (Figure 6). The south-facing shoreline is a mix of seawalls and discontinuous, small, and narrow sand beaches that front a fully developed urban landscape. The Royal Hawaiian groin was constructed in 1925-1926; the Fort

DeRussy groin was built in 1917 and was extended in 1969. The remains of at least five, 10- to 20-m concrete block groins are spaced along the length of the sector.

4. The Fort DeRussy Beach sector consists of approximately 510 m (1,680 ft.) of shoreline extending from the Hilton Hawaiian Village pier to the Fort DeRussy outfall groin (Figure 7). The southwest-facing shoreline is a continuous sand beach that fronts a landscaped open space of tended lawn and coconut trees in the Fort DeRussy Armed Forces Recreation Center. The Hale Koa Hotel is just inland of the western portion of the sector, and the U.S. Army Museum of Hawaiʻi, housed in the historic 1914 Battery Randolph, is at the eastern end of the sector. A wide concrete promenade runs along the inland edge of the beach.

THE WAIKĪKĪ BEACH IMPROVEMENT AND MAINTENANCE PROGRAM

The proposed Waikīkī Beach Improvement and Maintenance Program is intended to address the ongoing erosion of the shoreline and frequent flooding of the backshore. Without improvements and follow-up maintenance, sand erosion and rising sea level will likely result in the total loss of Waikīkī Beach by the end of the 21st century. The project's immediate goals are to restore and improve Waikīkī's public beaches, increase beach stability, provide safe access to and along the shoreline, and increase resilience to coastal hazards and sea level rise.

The planned actions and construction methods for each beach sector in the project area are summarized below:

1. For the Kūhiō Beach sector, separate plans are proposed for the ʻEwa basin (west) and the Diamond Head basin (east):

    a. For the ʻEwa basin, the existing groins on the east and west ends will be removed and reconstructed to accommodate sea level rise (see Figure 3). The west groin will be approximately 150 feet long with a crest elevation of +7.5 feet mean sea level (msl), and the east groin will be approximately 125 feet long and vary in elevation from +7.5 feet msl at the shoreline to +6 feet msl at the head. A 125-foot-long detached breakwater will be built in the gap between the groins and will be approximately +6 feet msl to match the heads of the groins. Construction equipment and material would be transported to the work area through either the central portion of the park or along the shoreline past the Duke Kahanamoku statue. Demolition and construction will be conducted with an excavator that is supported by a temporary work platform extending from the shore to the breakwater. Sand fill from offshore deposits will be added to the beach after the new structures are completed.

    b. For the Diamond Head basin, existing structures will not be modified, but the beach will be replenished using eroded sand that has settled in a submerged deposit just offshore (see Figure 4). Approximately 4,500 cubic yards will be recovered and spread across the beach, widening the existing shoreline by approximately 18 to 26 feet and reducing the offshore depth of the basin to a uniform bottom elevation of -4 feet msl. The sand will be recovered and redeposited using either a long-reach excavator operating on an excavated sand causeway, or a diver-operated dredge that will pump the sand to an onshore recovery area. A bulldozer and/or skid-steer will spread the sand across the beach.

2. For the Royal Hawaiian Beach sector, sand recovered from deposits directly offshore will be used to widen and replenish the beach (see Figure 5). The beach crest elevation will be increased from

about +7 feet msl to +8.5 feet msl. Approximately 30,000 cubic yards of recovered sand will be required to complete the work. To counter ongoing erosion and shoreline recession, beach nourishment will need to be repeated every eight to 10 years or more frequently if required. The recovered sand will probably be dredged with a submersible pump mounted on a crane barge and pumped through a bottom-mounted pipeline to a dewatering basin in the Diamond Head basin of Kūhiō Beach Park. After drying, the sand will be stockpiled and transported to Royal Hawaiian Beach, where it will be distributed using bulldozers.

3. For the Halekūlani Beach sector, a new beach with stabilizing groins will be constructed (see Figure 6). Three new sloping rock rubble mound T-head groins will be combined with the existing Fort DeRussy and Royal Hawaiian groins to create four stable beach cells. The groin stems will extend approximately 200 feet seaward from the shoreline and will be of sufficient size to stabilize a +10-foot beach crest elevation. The groin stem crests could also be wide enough (approximately 10 feet) to accommodate construction equipment or a pedestrian walkway. The Halekūlani Channel will be left unobstructed for beach catamaran navigation. In addition, approximately 60,000 cubic yards of sand fill recovered from offshore deposits will be used to create approximately 3.8 acres of new dry beach area. Construction equipment and materials will likely be transported into the area across the east end of Fort DeRussy Beach, which may require construction of a temporary access road from Kālia Road to the beach and a temporary rock rubble mound access berm along the shoreline from Fort DeRussy to the Royal Hawaiian groin.

4. For the Fort DeRussy Beach sector, sand will be transported from an accretion area at the west end of the beach (near the Hilton Pier) to an eroding area at the east end (see Figure 7). The sand will be excavated from the existing beach face extending inshore only as far as necessary to obtain the required amount, estimated to be approximately 1,200 cubic yards. Dump trucks will transport the sand across the beach, and a bulldozer will distribute it across the eroding area. This process will need to be repeated periodically in the future to maintain a stable beach profile.

Construction work will be confined to the active sand portion of Waikīkī Beach and nearshore marine areas up to approximately 200 feet offshore. The work will not extend outside the inland boundary of the active beach, which is defined by any buildings, roads, seawalls, or other types of construction that constrain the sand beach.

The sand required for beach nourishment will be almost exclusively recovered from submerged offshore deposits. In addition to the near-offshore areas mentioned in the descriptions above, sand will be dredged from one or more known deposits further offshore of the south coast of Oʻahu, using submersible slurry pumps, self-contained hydraulic suction dredges, and/or clamshell buckets.

PROPOSED TASKS

This overview presents a general discussion of the Waikīkī region, as well as a more detailed discussion of the four beach sectors. The general discussion addresses the extent of coverage by previous archaeological studies, and provides a summary of findings in the format of a cultural history of the region and associated relevant contributions to Hawaiian archaeology. This includes a synthesis of the area's pre-Contact chronology based on the analysis of the suite of radiocarbon dates generated by previous archaeology projects. For the specific beach sectors, the more detailed discussion identifies [1] previous archaeological studies and results within each area, [2] historical records that can inform on the potential for archaeological remains, [3] historical changes to the shoreline, as represented on historical maps and other archival records, and [4] sites that could be anticipated to occur within each sector.

Research to carry out these tasks focused on compiling archaeological reports from the IA library, the State Historic Preservation Division (SHPD) library, and the State Office of Environmental Quality Control (OEQC) online library of environmental assessments and impact statements. Historical maps of Waikīkī were downloaded from the State Land Survey Division online map library, and were also researched at the Hawai‘i State Archives. A set of five maps of the Waikīkī shoreline from the Ala Wai to Diamond Head (Kanahele 1928a, 1928b, 1928c, 1928d, 1928e) provide detailed information on the coast as it appeared in 1928. The State Archives was also a source for historical photographs of Waikīkī.

Published works on Waikīkī were a primary resource for background information, most notably (but not limited to) Wiegel (2008) for a history of shoreline changes, Hibbard and Franzen (1986) for a history of the resort area, including a chapter on traditional Hawaiian settlement (Nāpōkā 1986), and Kanahele (1995) for a general history of Waikīkī from pre-Contact times to 1900.

ORGANIZATION OF THE REPORT

This document is organized as follows. Section I is the introduction. Section II summarizes the physical environmental characteristics and important cultural background information for the project area and Waikīkī region. Section III provides an overview of the archaeological resources of the Waikīkī shoreline, summarizes historical and archaeological information for each of the four sectors, and provides information about changes to the coastline that may affect the potential of each sector to contain intact archaeological resources. Section IV addresses expectations and recommendations for each sector based on the foregoing information. A list of cited references and a glossary of Hawaiian terms used in the text are included at the end of this document.

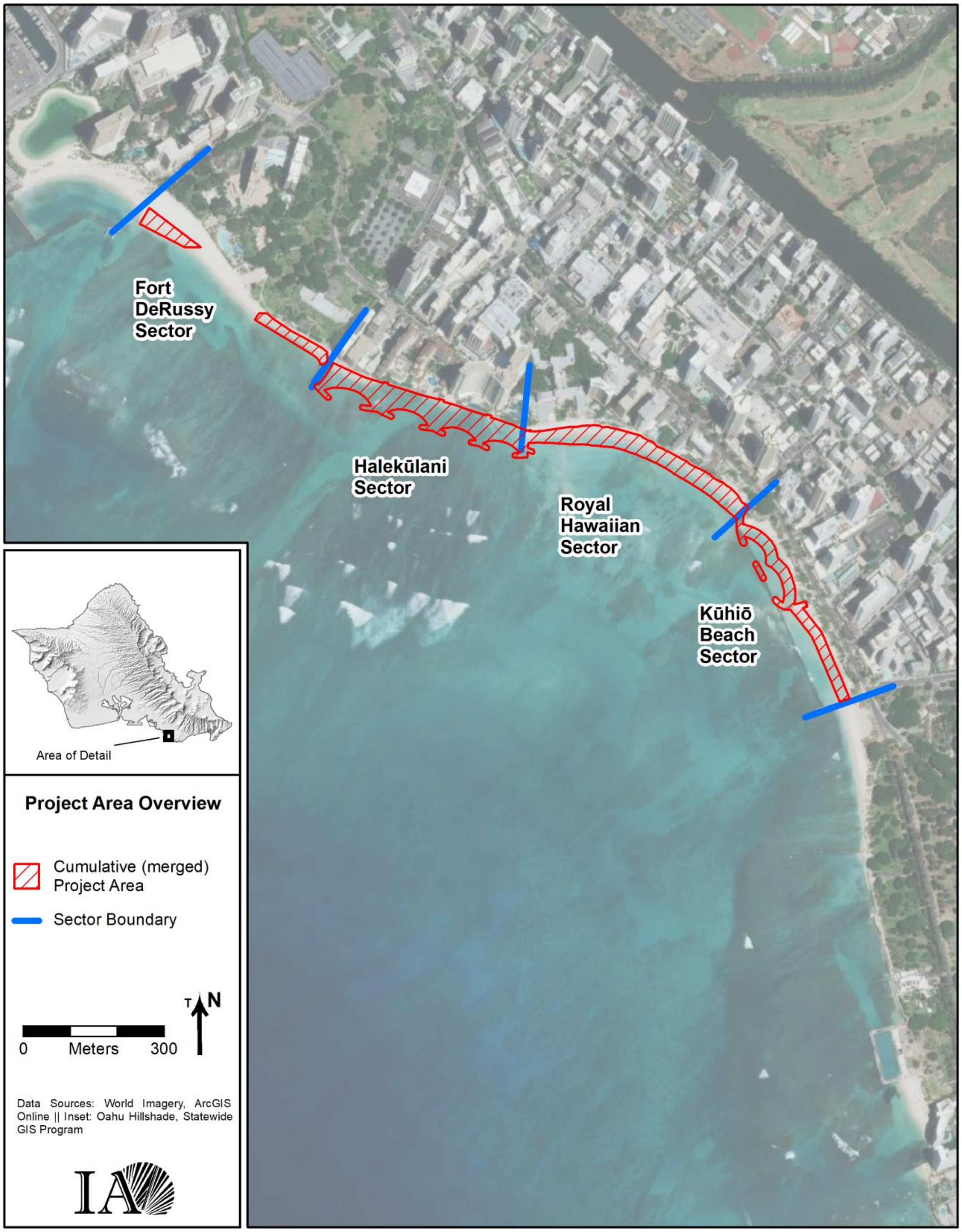

Figure 1. The Waikīkī Beach Improvement and Maintenance Program project area overlaid onto the Honolulu 1998 topographic quadrangle map.

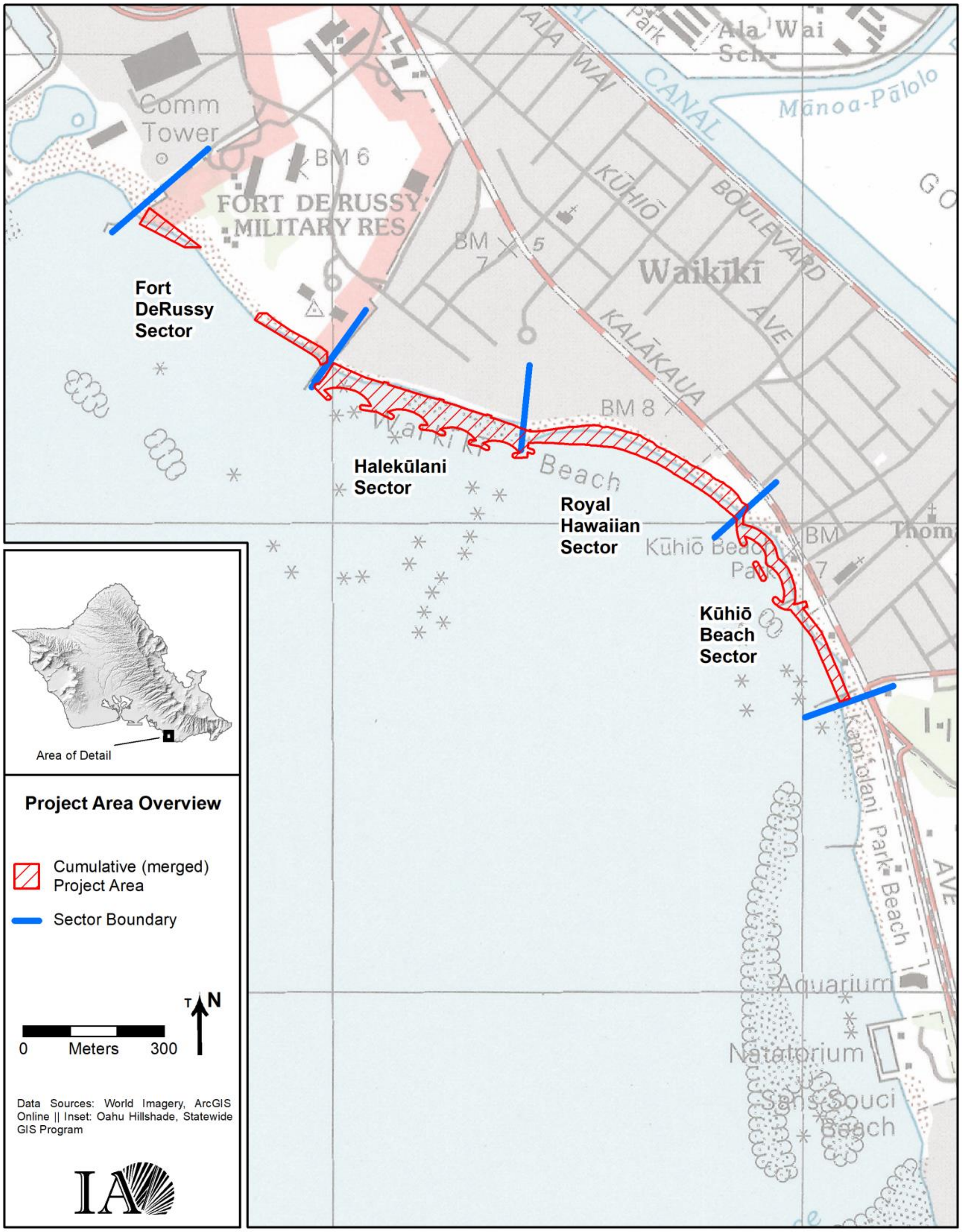

Figure 2. The Waikīkī Beach Improvement and Maintenance Program project area overlaid onto aerial imagery.

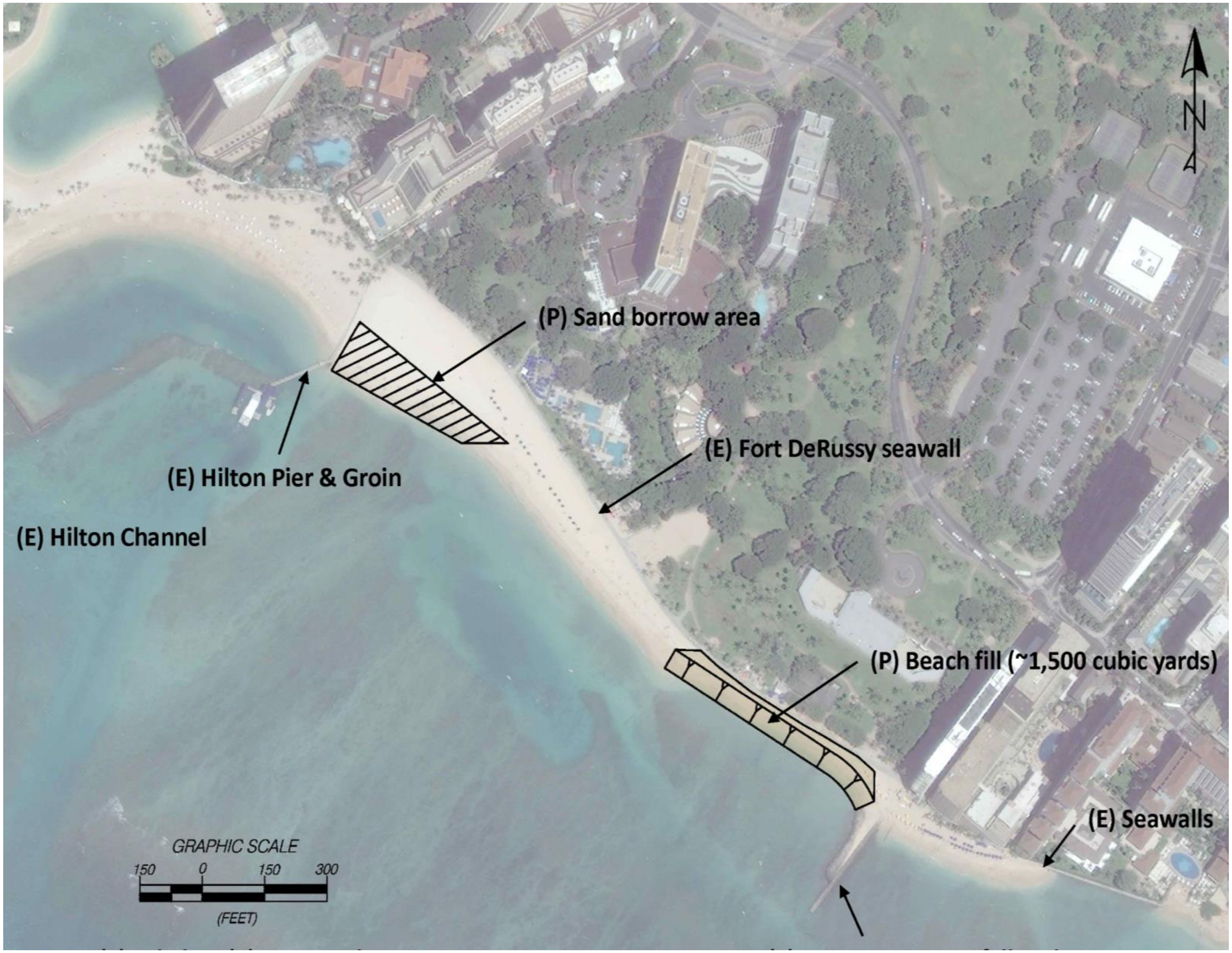

Figure 3. Planned beach improvement activates within the Kūhiō Beach sector, ‘Ewa basin. Image provided by Sea Engineering, Inc.

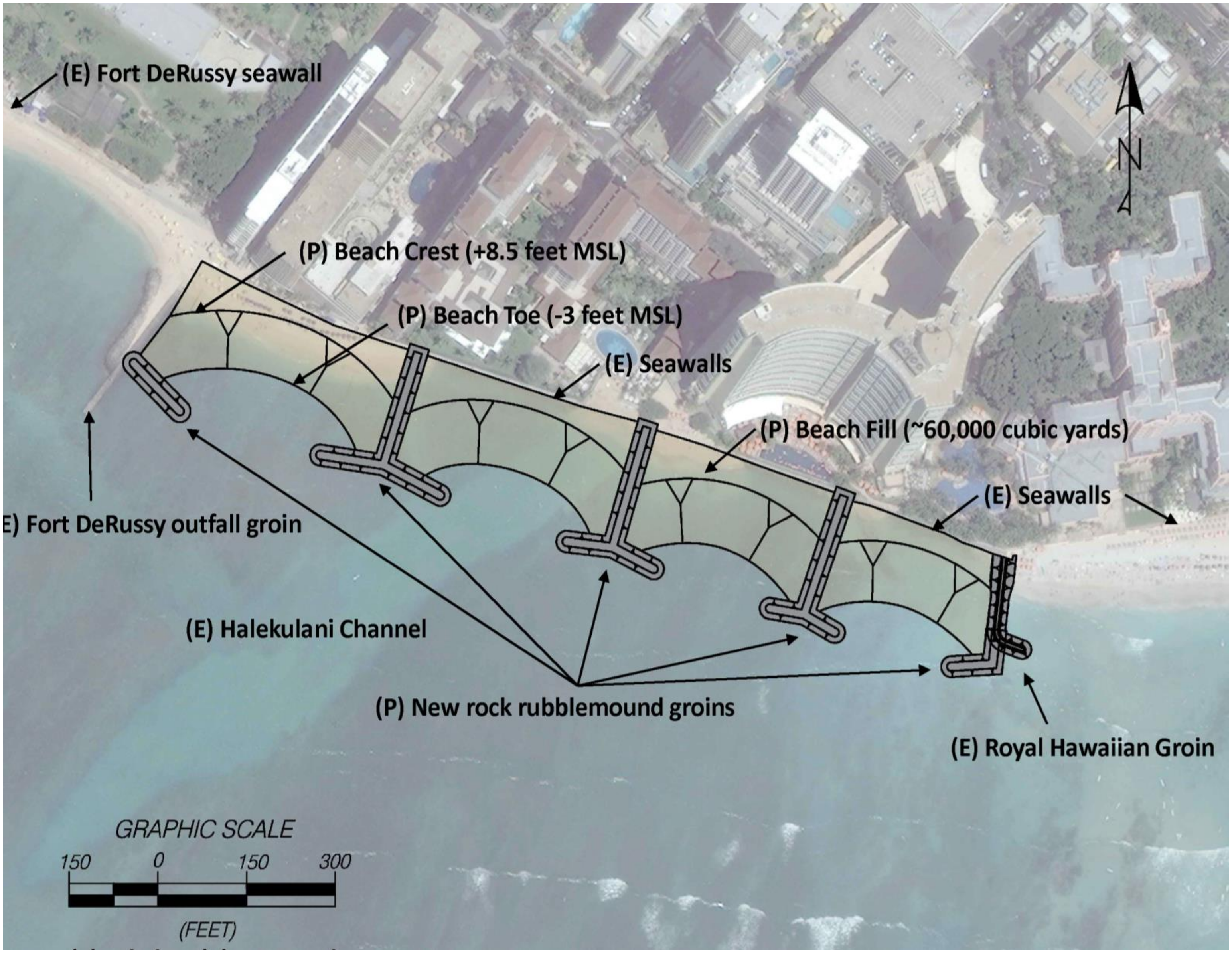

Figure 4. Planned beach improvement activities within the Kūhiō Beach sector, Diamond Head basin. Image provided by Sea Engineering, Inc.

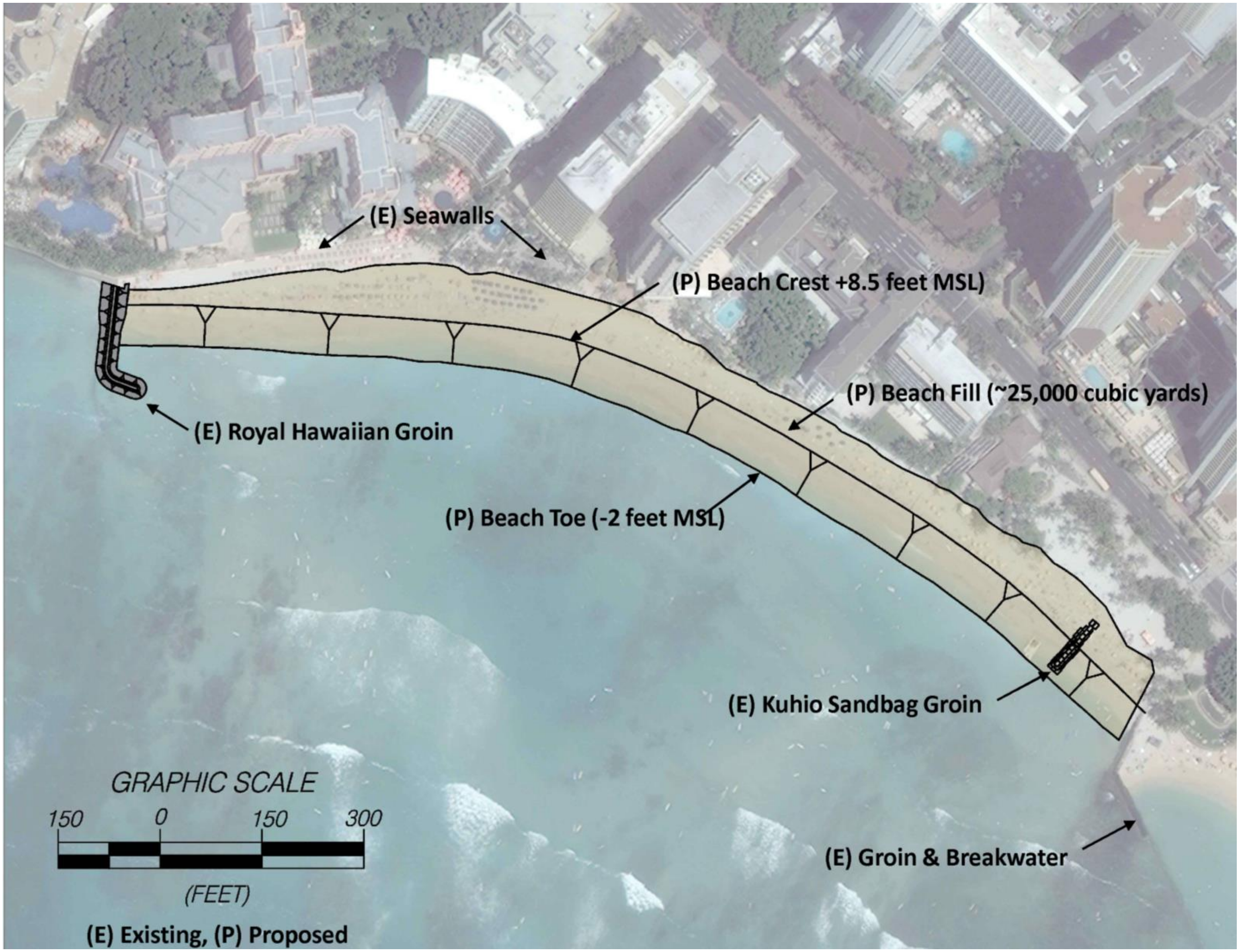

Figure 5. Planned beach improvement activities within the Royal Hawaiian sector. Image provided by Sea Engineering, Inc.

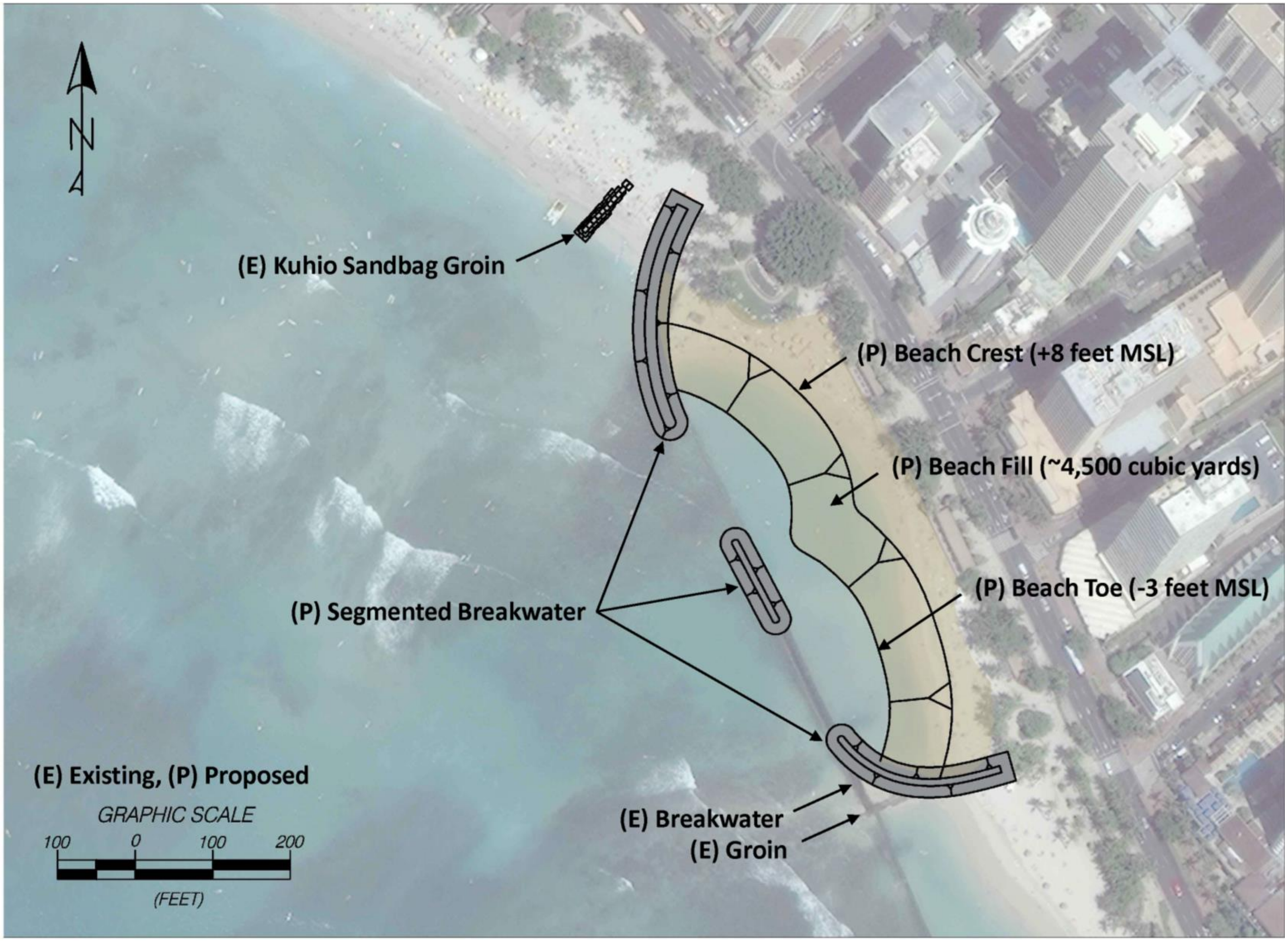

Figure 6. Planned beach improvement activities within the Halekūlani sector. Image provided by Sea Engineering, Inc.

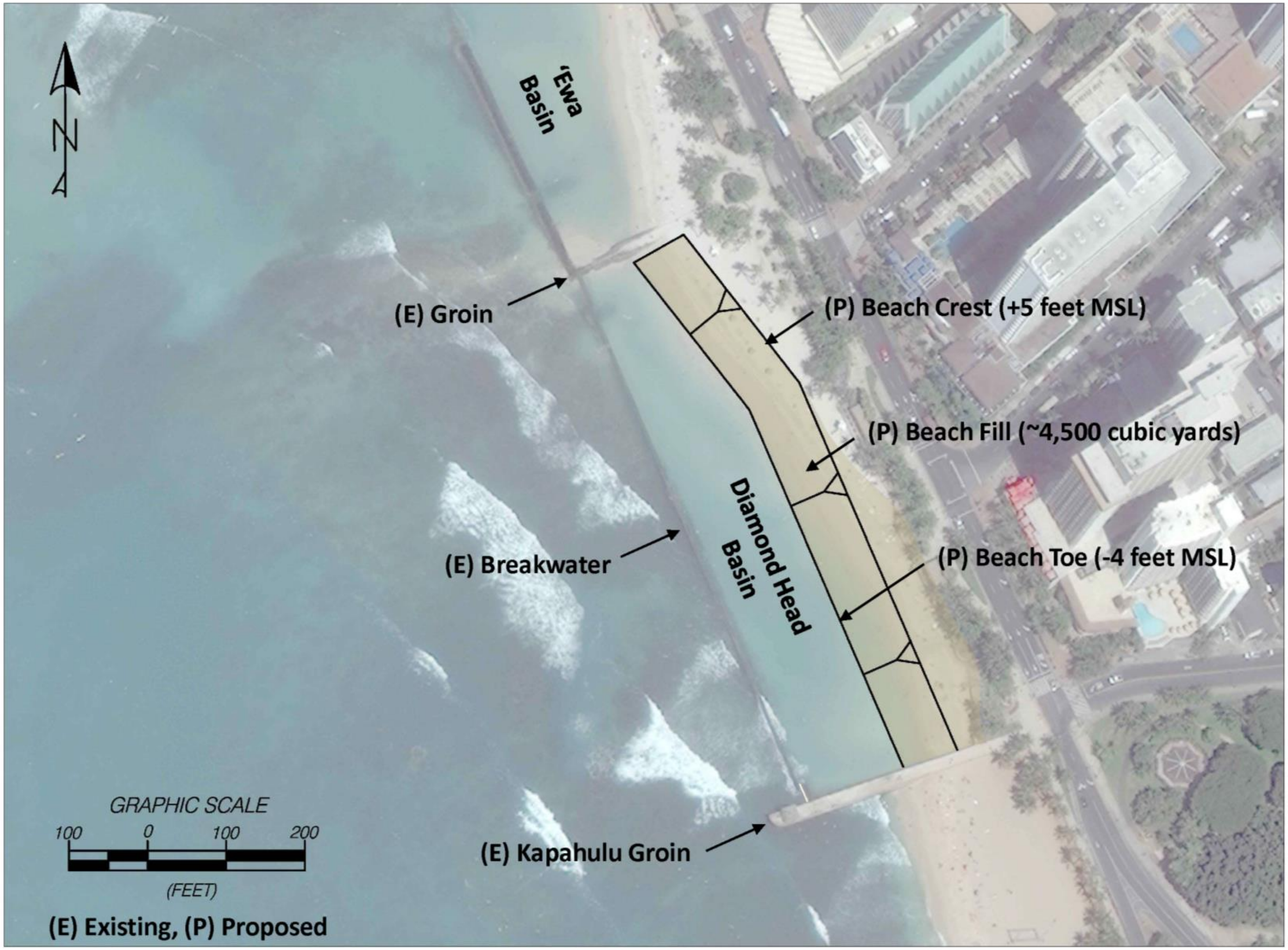

Figure 7. Planned beach improvement activities within the Fort DeRussy sector. Image provided by Sea Engineering, Inc.

II. ENVIRONMENTAL AND HISTORICAL BACKGROUND

This section presents information about the physical and cultural environment, history, and archaeology of the project area and the general Waikīkī region, which is intended to provide context for the discussion of individual beach sectors that follows. Portions of this section have been adapted from Duarte et al. (2017) and Rieth et al (2017).

PHYSICAL SETTING

The project area extends along approximately 2 km of shoreline in the Waikīkī area of southern O‘ahu. Waikīkī Beach occupies the seaward edge of a coastal plain of coral limestone along the southern leeward shore of the island. The underlying geology for the greater area is limestone bedrock formed from elevated coral reefs, in places interbedded with Honolulu Series lava flows (Macdonald and Abbott 1970:355). Before large-scale land reclamation in the early 20th century, much of coastal Waikīkī was covered by ponds, wetlands, and streams.

The project area includes portions of the beach and surf zone; the soil unit is beach sand (BS) (Foote et al. 1972) (Figure 8). Sand cover on the reef on the Waikīkī beaches is shallow, with limestone bedrock generally about 0.6 m deep below the sand (Wiegel 2008:5). The beach within the project area incorporates both naturally deposited and imported sand. Sedimentary analysis suggests that until beach alteration began in the early 20th century, the Waikiki beach environment was depositional or prograding, at least in the area of the Halekūlani Hotel (Allen-Wheeler 1984:IV-7).

The project area falls within the tropical savannah climate zone. Rainfall in Waikīkī near the project area is approximately 640 mm per year. The majority of precipitation occurs between October and March, with these months seeing 63.6 to 94.8 mm of rain per month (Giambelluca et al. 2013). The average daily temperature in Waikīkī ranges from a high of 78.2°F in August to a low of 71.1°F in January.

The project area was once watered by several watercourses: Ku‘ekaunahi, ‘Āpuakēhau, and Pi‘inaio Streams, and the outlet of Kawehewehe. These streams originated in Mānoa and Pālolo Streams, and were known as Kālia and Pāhoa Streams after entering the coastal plain of Waikīkī. Converging together “near Hamohamo (*mauka* of the Kapahulu Library),” these streams diverged again into Ku‘ekaunahi, ‘Āpuakēhau, and Pi‘inaio Streams to flow into the ocean[1] (Kanahele 1995:7). Mānoa and Pālolo Streams have since been re-routed into the Ala Wai Canal and now bypass the Waikīkī Plain.

Vegetation in the vicinity of the project area, which has been much altered over the past century, consists of modern landscaping dominated by exotic grasses and coconut palm (*Cocos nucifera*). Kanahele (1995:8) describes the types of vegetation that would have been found in the area prior to Polynesian settlement:

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[1] Kanahele (1995:7) indicates that Kawehewehe is another name for ‘Āpuakēhau Stream; however, Kawehewehe is shown on at least one 19th-century map (Government Registered Map No. 1720) as a separate watercourse and apparent outlet for the Kālia fishpond complex and is considered as such in this report.

> The beaches and marshlands are covered with grasses and sedges, many of which look alike. The *ʻakiʻaki* [*Sporobolus virginicus*] grows profusely on the shore (a name that refers to the supposed power of this grass to exorcise evil spirits) as do the succulent *ʻakulikuli* [*Sesuvium portulacastrum*]. The different sedges include the common *puʻukaʻa* [*Cyperus trachysanthos*] which is somewhat related to the *makaloa* [*Cyperus laevigatus*] native to Niʻihau. The three-to-nine-feet tall *ʻakaʻakai* [*Schoenoplectella tabernae-montani*] or bulrush also grows here.

Other shore plants may have included *naupaka* (*Scaevola taccada*), *alaheʻe* (*Psydrax odorata*), *lama* (*Diospyros sandwicensis*), *wiliwili* (*Erythrina sandwicensis*), and *hala* (*Pandanus tectorius*) (Kanahele 1995:9).

Birds would likely have included the heron (*ʻaukuʻu*), Hawaiian duck (*koloa*), Hawaiian stilt (*aeʻo*), coot (*ʻalae keʻokeʻo*), and mud hen (*ʻalaeʻula*). While exposed reef is largely absent between the former locations of the Piʻinaio and Kuʻekaunahi stream mouths, abundant fish were present at either end of the project area. The mouth of Piʻinaio was particularly known for its aquatic resources and array of *limu* in the early 20th century (and to this day), and presumably this abundance would have also characterized earlier periods. As described by Fred Paoa (SSRI 1985:532-535):

> We lived at Kalia, where my dad was a net fisherman. He caught kala [surgeonfish, Acanthuridae], mullet, and weke [Mullidae, surmullets, or goatfish]. He also caught squid. There was limu eleele [green seaweed, *Enteromorpha prolifera*] where Piʻinaio Stream entered the ocean. Towards Fort DeRussy there was limu manauea [red seaweed, *Gracilaria coronopifolia*] and limu huluhulu waena and a lot of wana [sea urchin]. We caught lobsters using nets at night. We used to catch a lot of kala. Where the stream entered the ocean, there was a lot of mud, and there were clams in the mud. We caught opae [shrimp] and oopu [freshwater fishes such as Eleotridae, Gobiidae, or Blennidae] in the stream. We fished for papio [juvenile crevalle, jack, or pompano] and white eels. We caught two types of crabs, aama and alamihi. On the reef my dad dived for uhu [parrotfish, Scaridae] and kumu [goatfish, Mullidae], and we did torch fishing at night for mullet, uhu, and kumu.

CULTURAL GEOGRAPHY

The cultural geography of Waikīkī includes numerous place names and traditions. The following summary provides general information about the project area and immediate vicinity. Primary references include Bishop (1881), Kamakau (1991, 1992a, 1992b), Pukui et al. (1974), and Sterling and Summers (1978).

The project area falls within the *ahupuaʻa* of Waikīkī and the traditional *moku* of Kona. Mid-19th-century land records recognize a number of *ʻili* or smaller subdivisions of land within the greater area. The project area overlaps or is adjacent to the subdivisions Kekio, Hamohamo, Helumoa, Keōmuku, and Kālia.

PLACE NAMES

Table 1 lists place names for the area along the shoreline between the Kapahulu storm drain and the Hilton Hawaiian Village pier. Figure 9 shows their general locations. Waikīkī translates as "spouting water" (Pukui and Elbert 1986:223), in reference to the wetlands and abundant water sources of this region. Unsurprisingly, many of these place names refer to water or the beach environment. ʻĀpuakēhau may be the name of a rain. The sea itself is referenced in the names ʻAuʻaukai and Hamohamo, with ʻAuʻaukai meaning "to bathe in the sea" and Hamohamo "to rub gently (as the sea on the beach)." The meaning of Keōmuku is said to be "the shortened sand," while Kekio means "pool."

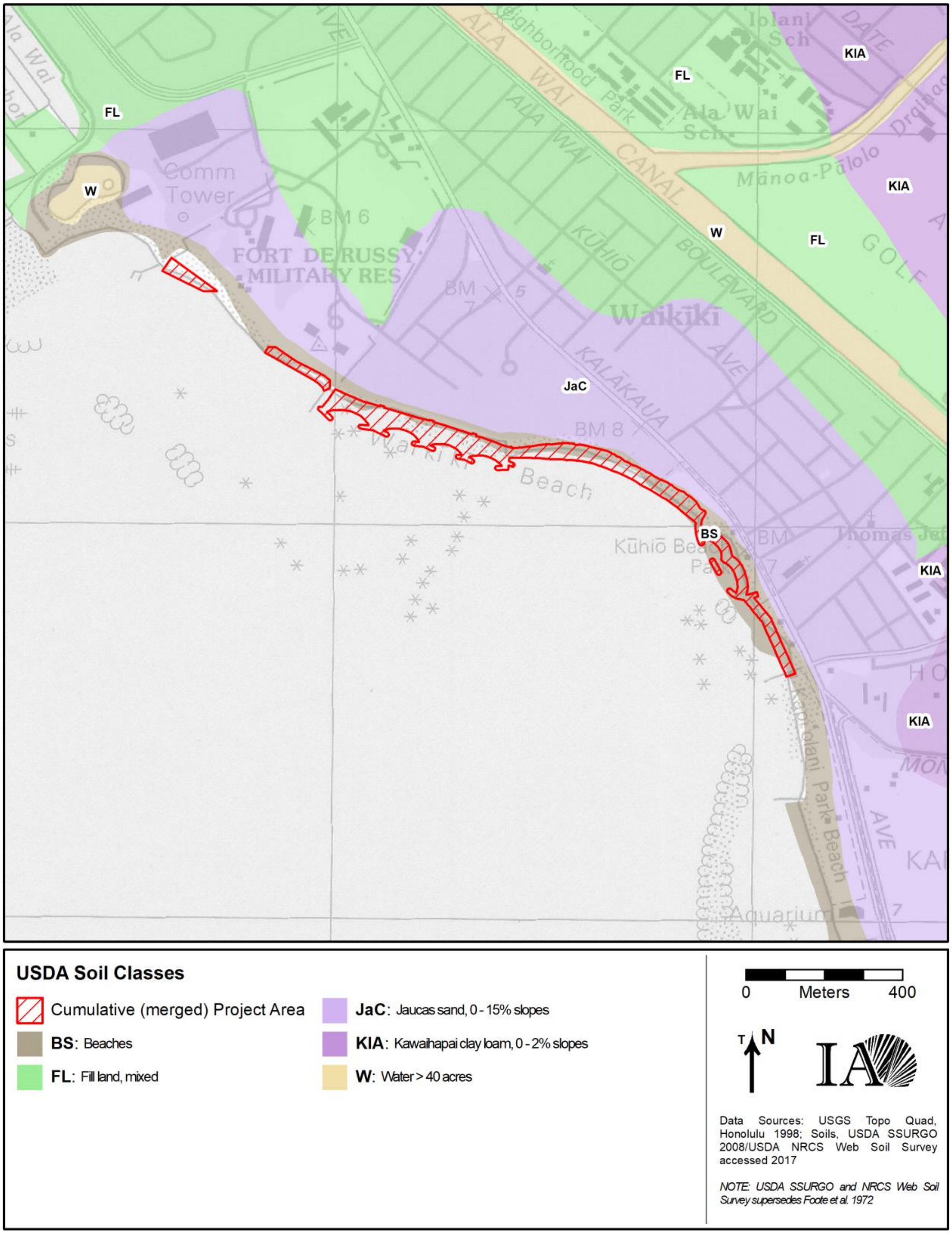

Figure 8. Soils within and around the Waikīkī Beach Improvement and Maintenance Program project area.

TRADITIONS

The traditions of Waikīkī denote its significance for intertwining historical threads of *ali'i* histories and as a highly productive agricultural region. In ancient times, Waikīkī was a center of power of the *ali'i*, "a land beloved of the chiefs" who resided there because the lands were rich and the surfing was excellent (Kamakau 1991:44).

Chiefly Associations

The shoreline within the project area, particularly the area near the mouth of 'Āpuakēhau Stream within the Royal Hawaiian sector, became the focus of chiefly activities in Waikīkī as early as the mid-1400s. The stream emptied into a protected curve of the shoreline that created a renowned surf break called Kalehuawehe. The O'ahu ruling chief Ma'ilikūkahi is said to have moved the royal seat of O'ahu to Waikīkī around this time (Beckwith 1970:383). Oral traditions record that the O'ahu chief Kakūhihewa lived at the "chief-eating sands" of Ulukou in the 1500s (Nāpōkā 1986:2). The great Maui chief Kiha-a-Pi'ilani was born at 'Āpuakēhau in the 1600s (Kamakau 1991:50).

In the 18th century, after his conquest of the island, Maui king Kahekili made his home at Waikīkī, residing at Helumoa near the mouth of 'Āpuakēhau Stream. After some time on Maui and Hawai'i Island, Kahekili returned to Waikīkī, where he died in 1794. He was succeeded by his son, Kalanikūpule.

Kamehameha also lived at Waikīkī after wresting control of the island from Kalanikūpule. He established his capital at Waikīkī and set up a residence, named Kūihelani, at Pua'ali'ili'i on the northwest side of 'Āpuakēhau Stream and just inland of the shore ('Ī'ī 1959:17; Kanahele 1995:91, 92). He was joined by his favorite wife, Ka'ahumanu, as well as his retainers who likely occupied the entire coast around the stream mouth.

The immediate vicinity of the project area includes several 19th century *ali'i* land awards. Hamohamo was part of a large award to the high chiefess Keohokālole, who was the principal heir to two Kona chiefs, Keaweaheulu and Kame'eiamoku. These two chiefs were instrumental in Kamehameha's rise to power (Kame'eleihiwa 1992:230, 245). Keohokālole was the mother of the future rulers of Hawai'i, Kalākaua and Lili'uokalani. Additional *ali'i* awards included the award of Kapuni/Uluniu to Mataio Kekūanaō'a, Kekio to Pehu for his wife Ke'ekapu, and Keōmuku to Samuel Kuluwailehua.

Agriculture and Fishponds

Waikīkī is famous for its extensive irrigated pondfields and fishponds that covered the coastal plain "from the inland side to the coconut grove beside the sea" (Kamakau 1991:45). Fed by the waters of Mānoa and Pālolo Valleys and by the numerous springs that gave Waikīkī its name, the wetland system with its expansive *lo'i* is credited to the AD 1400s-era ruling chief Kalamakua-a-Kaipūhōlua (Kamakau 1991:45):

> He was noted for cultivating, and it was he who constructed the large pond fields Ke'okea, Kūalulua, and Kalāmanamana, and the other lo'i in Waikīkī. He traveled about his chiefdom with his chiefs and household companions to cultivate the land and gave produce to the commoners, the *maka'āinana*.

Table 1. Place Names of Lands and Physiographic Features within and near the Project Area.

Name	Description	Translation	Reference
ʻĀpuakēhau	stream, *muliwai*; site of present-day Moana Hotel	basket [of] dew, probably named for a rain	Bishop (1881, 1882) Kamakau (1991:50, 1992b)
ʻAuʻaukai	land area; designated Fort Land	to bathe in the sea	Bishop (1882); Pukui and Elbert (1986)
Halemauʻuola (Loko Halemauʻuola)	fishpond	--	Bishop (1881)
Hamohamo	land area *(ʻili lele*?)	rub gently (as the sea on the beach)	Bishop (1881, 1882)
Helumoa	name of *ʻili* that was a royal center from at least the 15th century; site of present-day Royal Hawaiian Hotel	chicken scratch (chickens scratched to find maggots in the victim's body, possibly a reference to the supernatural chicken Kaʻau-hele-moa)	Bishop (1881); Nāpōkā (1986); Kanahele (1995); Pukui et al. (1974:44)
Kaʻihikapu (Loko Kaʻihikapu)	fishpond	the taboo sacredness	Bishop (1881); Pukui et al. (1974)
Kawehewehe	stream, *muliwai*; outlet for fishpond complex in inland Kālia (Fort DeRussy); shown as "Muliwai Kawehewehe" on GRM 1720 but not on other historical maps	the removal	Reg. Map 1720; Pukui et al. (1974:99)
Kawehewehe	location of the residence of John Papa ʻĪʻī, an advisor to Kamehameha, from around 1803 when Kamehameha moved to Oʻahu; also the "reef entrance and channel off Gray's Beach, just east of the Hale-kū-lani Hotel, Waikīkī, Honolulu"; the sea water of Kawehewehe is said to have had healing qualities and was known for its fragrant *līpoa* seaweed	the removal	ʻĪʻī (1959:17); Pukui et al. (1974:99); Kanahele (1995:98); McGuire et al. (2001:69-70); Pukui (1983:246)

Name	Description	Translation	Reference
Kahuamokomoko	athletic field, including *ʻulu maika* field, said to be on grounds of Royal Hawaiian Hotel; see Site 9980	*kahua mokomoko*, “a place where people assembled to wrestle”(Andrews 1922:239)	McAllister (1933:77); Kanahele (1995:99)
Kālia	name of *ʻili* and general area of Fort DeRussy	waited for	Bishop (1881); Pukui et al. (1974:77)
Kapuni	land area, surf break	the surrounding (perhaps named for the spreading banyan tree on the Cleghorn ʻĀina-hau estate)	Bishop (1881); Kamakau (1991:44, 1992b:290)
Kapuʻuiki (Loko Kapuʻuiki)	fishpond	the small hill	Bishop (1881); Thrum (1922:646)
Kaohai (Loko Kaohai)	fishpond	the ʻ*ōhai* shrub (*Sesbania tomentosa*)	Bishop (1881); Thrum (1922:644)
Kealohilani	beachside home of Queen Liliʻuokalani; later site of Prince Kūhiō’s second Pualeilani home; this is just seaward of Site 5859	heavenly brightness	Pukui et al. (1974:102)
Kekio	land area	pool	Bishop (1881, 1882); Thrum (1922:650)
Keōmuku Kamoku Kamaku	land area	the shortened sand	Bishop (1881, 1882); Pukui et al. (1974:108)
Kuʻekaunahi Kukaunahi Kukaʻiunahi	stream, *muliwai*; see Site 5943	--	Bishop (1881, 1882); Kamakau (1964:74); Winieski, Perzinski, Shideler et al. (2002)
Kūihelani	Kamehameha’s residence at Puaʻaliʻiliʻi near the mouth of ʻĀpuakēhau Stream	standing at Helani (a mythical land), name of one of Kamehameha’s chiefs	Kanahele (1995:136); Pukui et al. (1974:120)
ʻŌʻō (Loko ʻŌʻō)	fishpond	black honeyeater, *Moho nobilis*	Bishop (1881); Pukui et al. (1974:171)

Name	Description	Translation	Reference
Paweo (Loko Paweo I/Loko Paweo II)	fishpond	turn aside	Bishop (1881); Pukui et al. (1974:182)
Pi‘inaio	stream, *muliwai*, *kahawai*	ascend for (go upstream in search of?) *naio*, *Myoporum sandwicense*	Bishop (1881, 1882); Thrum (1922:666)
Pua‘ali‘ili‘i	place of Kamehameha’s residence Kūihelani near the mouth of ‘Āpuakēhau Stream	little pig	Kanahele (1995:91); Pukui et al. (1974:190)
Pualeilani	name of two residences of Prince Kūhiō; see Site 5859 and Site 5863	royal garland of flowers	Hibbard and Franzen (1986:37-39)
Uluniu	land area	coconut grove	Pukui et al. (1974:215)

Figure 9. Place names plotted along the late 19th century Waikīkī coastline.

Kamakau (1992b:192) also credits Kamehameha with the creation of the extensive pondfield system, including the pondfields attributed to Kalamakua, but this likely reflects Kamehameha's modification or expansion of extant *lo'i*.

Fishponds were another important source of food for the inhabitants of Waikīkī. While the relatively small *loko i'a kalo* or taro fishponds were found throughout Waikīkī, several large inshore ponds or *loko pu'uone* were clustered near the mouth of Pi'inaio Stream at Kālia. These fishponds were at the present location of Fort DeRussy (Figure 10). The *loko pu'uone* were fed by streams or *'auwai* and were used to raise *'ama'ama* (mullet) and *awa* (milkfish), which grew well in the brackish water (Kanahele 1995:44).

The development the Kālia fishponds may have been concurrent with the intensification of taro cultivation attributed to the chief Kalamakua (Davis 1989:11). The complex just *mauka* of the Fort DeRussy sector contained at least 10 large fishponds by the end of the 19th century. Bishop's (1881) map of Waikīkī gives several of the pond names, including Ka'ihikapu, Paweo (I and II), Kaohai, Kapu'uiki, and Kaipuni.

Heiau

The significance of Waikīkī Ahupua'a is also emphasized by the number and kinds of *heiau* distributed across the area, particularly along the coast (Kamakau 1992a:144; Thrum 1906:44-45). Three of the eight *heiau* identified by Thrum (1906) (Table 2) are of the *po'o kanaka* class, i.e.., sacrificial *heiau* that were "only for the paramount chief, the *ali'i nui*, of an island or district (*moku*)" (Kamakau 1992a:129).

Helumoa Heiau (also known as 'Āpuakēhau) was near the mouth of 'Āpuakēhau Stream, which falls within the project area. Helumoa Heiau is said to have been the "principal *heiau luakini*" of O'ahu for centuries until it was replaced by Papa'ena'ena (Becket and Singer 1999:xii). Although the *heiau*'s exact location is unknown, it is presumed to have been on or near the grounds of the Royal Hawaiian Hotel.

Battles

In the late 1700s, warfare in the islands raged. High chiefs amassed huge armies and sailed flotillas of war canoes between islands in the quest for territorial expansion. At least two assaults on O'ahu took place on the beaches of Waikīkī. From Maui in 1779 came the warrior-chief Kahekili, who conquered O'ahu after three years of fighting. With victory, the high chief made Waikīkī his home, specifically at Helumoa near the mouth of 'Āpuakēhau Stream (the location of Helumoa Heiau).

In 1795, a year after Kahekili's death, Kahekili's chief rival for power, Kamehameha, staged an attack on O'ahu. It is said that his armada, which included 1,200 double canoes and 10,000 warriors, landed at Waikīkī, a beachhead of relatively calm waters that offered abundant water, taro, and other supplies for his vast army (Kanahele 1995:87). Unlike Kahekili's three-year battle, Kamehameha was quickly successful in defeating Kahekili's son Kalanikūpule, and taking control of O'ahu. Like the Maui chief, Kamehameha settled in Waikīkī near the mouth of 'Āpuakēhau Stream. Along with Kona on Hawai'i Island and Lāhainā on Maui, Waikīkī served as one of the capitals of his unified kingdom (except for Kaua'i).

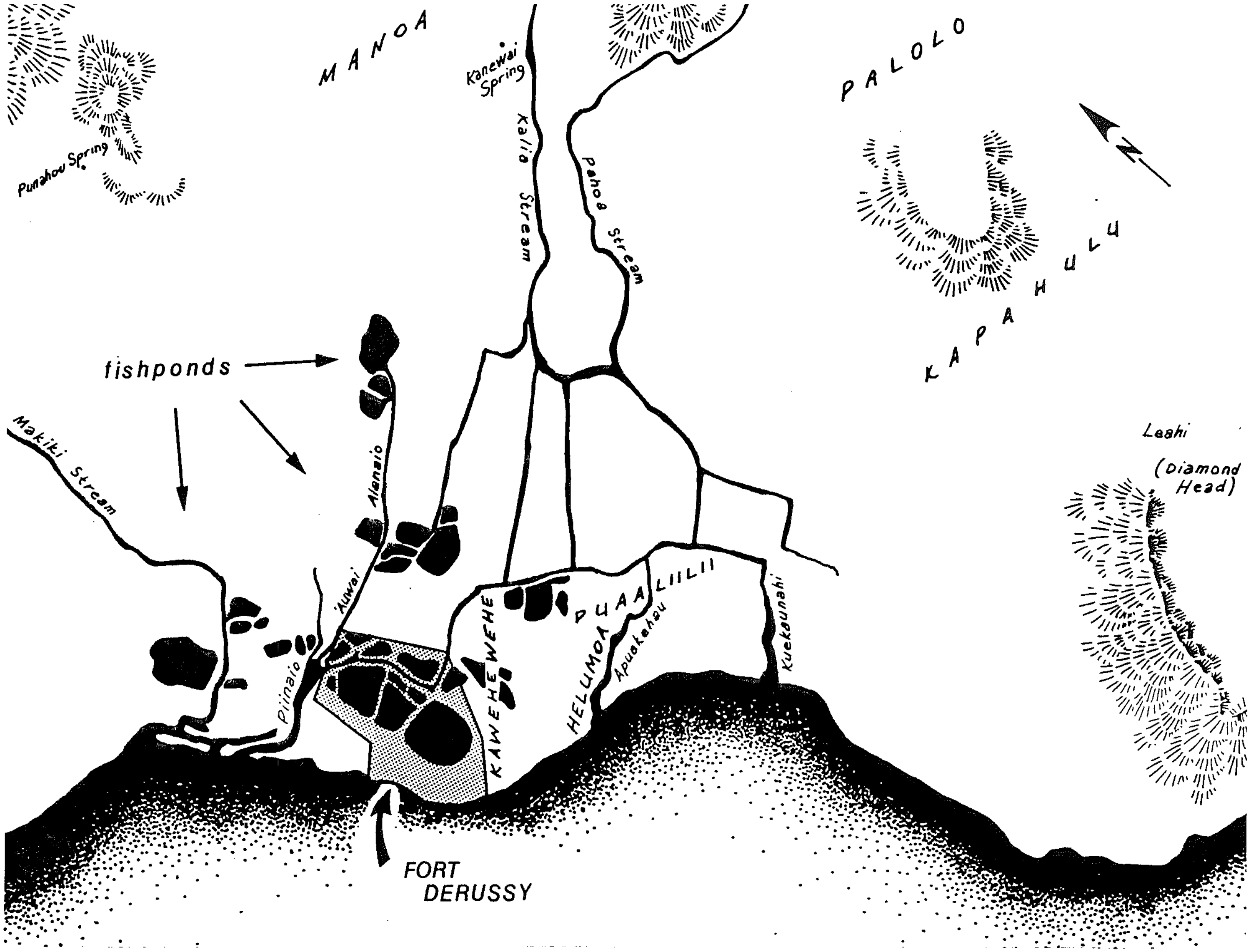

Figure 10. Reconstruction of Waikīkī ca. 1800-1810, reproduced from Davis (1989:2). The Kālia fishpond complex is on the current grounds of Fort DeRussy.

Table 2. *Heiau* in Waikīkī, Based on Thrum (1906).

Name	Location	Type	Description from Thrum (1906)
Helumoa	ʻĀpuakēhau	*Heiau poʻo kanaka*	place of sacrifice of Kauhi-a-Kama, defeated *mōʻī* of Maui, after his failed raid on Oʻahu in the early 1600s, during the reign of Oʻahu chief Kaʻihikapu
Papaʻenaʻena	at foot of Diamond Head slope	*Heiau poʻo kanaka*	walled and paved structure of open terraced front; destroyed by Kana'ina about 1856, and the stones used to enclose Queen Emma's premises and for road work; said to be the place of a number of sacrifices by Kamehameha I in early 1800s
Kupalaha	Kapiʻolani Park	unknown	said to be associated with working of Papaʻenaʻena; entirely obliterated by 1906
Kapua	Kapiʻolani Park	*Heiau poʻo kanaka*	torn down in 1860; said to be the place of sacrifice of Kaolohaka, a chief from Hawaiʻi, on suspicion of being a spy
Kamauakapu	Kapahulu, Diamond Head	husbandry class	erected by Kalākaua in 1888 for his Naua Society; in partial ruins in 1906
Kulaihakoi	Waikīkī	unknown	site of grass house on Kalākaua's premises; in ruins in 1862 (walls torn down much earlier)
Makahuna	Diamond Head	*Kūʻula*	large enclosure dedicated to Kāne and Kanaloa
Pahu-a-Maui	Diamond Head (site of lighthouse station)	unknown	destroyed by 1906

Trails

By the late pre-Contact period, an extensive network of trails had been developed to link important places across the island. ʻĪʻī (1959:92) describes the old route leading between Honolulu and Waikīkī, as he knew it ca. 1810:

> A trail led out of the town at the south side of the coconut grove of Honuakaha and went on to Kalia. From Kalia it ran eastward along the borders of the fish ponds and met the trail from lower Waikiki … [It] went along Kaananiau, into the coconut grove at Pawaa, the coconut grove of Kuakuaka, then down to Piinaio; along the upper side of Kahanamaikai's coconut grove, along the border of Kaihikapu pond, into Kawehewehe; then through the center of Helumoa to Puaaliilii, down to the mouth of the Apuakehau stream; along the sandy beach of Ulukou to Kapuni, where the surfs roll in; then to the stream of Kuekaunahi; to Waiaula and to Paliiki, Kamanawa's house site.

Although the route described by ʻĪʻī ran along the coast on the *makai* side of the fishponds, by the 1850s the route as shown by La Passe (1855) had shifted to approximate the current alignment of Kalakaua Avenue. Originally known as Waikiki Road, this path led from the intersection at Pawaʻa to the vicinity of ʻĀpuakēhau Stream near the contemporary entrance of Kapiʻolani Park.

PRE-CONTACT SETTLEMENT AND HISTORY

The following discussion frames the chronology of changes in Waikīkī settlement within the context of Oʻahu and the archipelago as a whole, using both archipelago-wide studies such as those of Hommon (1986, 2013) and Kirch (2010) and Oʻahu-based studies (e.g., Cordy 2002). In these studies, archaeological data is considered alongside oral traditions obtained from sources such as Fornander (1919), Kamakau (1991), Beckwith (1970), and others.

The most recent paleoenvironmental and archaeological studies indicate that the Hawaiian Islands were settled sometime between AD 940 and 1130, with the most likely date for initial settlement falling between AD 1000 and 1100 (Athens et al. 2014; see also Kirch 2011). Hawaiʻi's first colonists found well-forested islands with lush rainforests in the wet uplands and open, dry forests on the leeward lowlands. These forests offered little in the way of plant food; it is easy to imagine that a colonizing party's first priority was to establish gardens of the starchy plants that comprise the bulk of the typical Polynesian diet.

The first settlements in the archipelago were likely small communities distributed sparsely and discontinuously, primarily along the coast in the fertile windward regions. The windward *ahupuaʻa* of Waimānalo, Kailua, and Kāneʻohe may have been among the first settled locations on Oʻahu; during the earliest period of settlement, Oʻahu residents dwelling in windward areas may have come to the drier leeward areas for selected resources like fish and birds (Cordy 2002:9).

By the AD 1200s, populations in the archipelago had begun to increase exponentially (Kirch 2010; see also Dye and Komori 1992). Hawaiians moved outward from their original settlements, spreading into leeward areas of the islands; on Oʻahu, this expansion would likely have included Oʻahu's southern shores. Between the AD 1200s and 1400s, Oʻahu, as well as Kauaʻi and Molokaʻi, likely saw the construction of large-scale taro irrigation systems in the most advantageous areas (Kirch 2010:128).

Coastal Waikīkī, which offered easy access to rich ocean resources, a ready freshwater supply from springs and streams, level and easily developed lands for cultivation and aquaculture, and a bounty of wild foods like ducks and other wildfowl, was almost certainly settled early in the period of leeward expansion. Some cultivation probably followed the stream courses into valleys like Mānoa and Pālolo, which were also sources for items like hardwood (for tools, weapons, and building materials) and birds (for feathers).

The limited number of reliable radiocarbon dates for Waikīkī makes it difficult to pinpoint the chronology of initial settlement with any certainty. A summary of previously obtained radiocarbon dates is provided in Table 3. The earliest radiocarbon dates obtained so far suggest that the settlement of Waikīkī likely began sometime between the AD 1200s and 1400s. A piece of unidentified charcoal[2] from a burial pit at Fort DeRussy produced a radiocarbon determination of 580±140 BP (Denham and Pantaleo 1997b), which calibrates to AD 1170-1640. Denham and Pantaleo (1997a) obtained another radiocarbon determination of 520±50 BP from an uncharred *Aleurites moluccana* (*kukui*) endocarp[3]—a Polynesian-introduced plant—which provides a bi-modal calibrated date of AD 1306-1364 and AD 1385-1458.

The period between the 1400s and the 1500s saw the Hawaiian political system change, as political power gradually replaced kinship as the means of legitimizing rule (Hommon 1986, 2013; Kirch

2 Unidentified charcoal may result in inbuilt age for radiocarbon dating, that is, the dated event (i.e., death of the plant) is significantly older than the target archaeological event (e.g., use of the wood for fuel in a hearth).

3 Note that the *kukui* nut was recovered from the base of a sand berm with no clear cultural association.

2010). At some point during this period, Oʻahu was unified into a single polity, called the Oʻahu Kingdom by Cordy (2002:24), with the royal center initially located at Līhuʻe in inland ʻEwa. One way that chiefs expressed their power was through construction of monumental architecture including *heiau*, irrigation systems, and fishponds.

The mouth of ʻĀpuakēhau Stream was the major outlet of drainages originating in Mānoa and Pālolo Valleys and served as the focus of *aliʻi* activity along the Waikīkī shoreline. This area, which extends from the Royal Hawaiian Hotel to the north side of the Moana Hotel, is said to have been the home of the Oʻahu chiefs from at least the 1400s (Nāpōkā 1986; Hibbard and Franzen 1986). While the construction chronology of the large Waikīkī *heiau* is unknown, it is possible that they may have been built as early as the AD 1400s when similar structures were built on Maui (Kolb 1994).

As noted above, the construction of the extensive taro fields (and probably fishponds) at Waikīkī is credited to the AD 1600s-era ruler Kalamakua. The earliest radiocarbon dates on Waikīkī agricultural sediments are from the AD 1400s to 1600s, providing support for the initiation of widespread agriculture by that time. A piece of unidentified charcoal from agricultural sediments near the base of a large berm or bund near the intersection of Kūhiō Avenue and ʻOlohana Street produced a radiocarbon determination of 490±40 BP (Borthwick et al. 2002), which has a bi-modal calibrated date of AD 1305-1365 and AD 1383-1452. Tulchin et al. (2004) obtained a similar radiocarbon determination of 500±50 BP from an *Aleurites moluccana* (*kukui*) endocarp, which has a bi-modal calibrated date of AD 1312-1362 and AD 1387-1478.

The earliest radiocarbon dates obtained on buried fishpond sediments trend slightly later. Denham and Pantaleo (1997a) obtained ages of 520±50 BP and 380±50 BP from a sand berm pre-dating the construction of Loko Paweo II; the calibrated dates are AD 1306-1364 and AD 1385-1458 and AD 1441-1637, respectively. Davis (1989) obtained an age of 390±70 BP from the pond wall separating Loko Paweo I from the ʻAuwai of Pau; the calibrated date is AD 1421-1646. Together, these dates suggest that use of Loko Paweo I began between the AD 1400s and 1600s, while Loko Paweo II was first used no earlier than the AD 1400s.

In the final stage before European contact, beginning ca. AD 1650, the archipelago was characterized by a high-density yet stable population that had grown to occupy all ecological zones (Kirch 2010). While rulers continued to make investments in *heiau* building, corvée labor as a means to express authority appears to have been usurped by ritual consumption facilitated by taxation (Kolb 1994). In a full-land situation with constant population, a by-product of the taxation system was an increasing reliance on wars of plunder and conquest that could expand a chief's tax base quickly. Conquest warfare became increasingly frequent after the late AD 1600s, with chiefly competition extending beyond district-level rivalries to encompass rivalries between rulers of differing islands (Kolb 1991:67).

On Oʻahu, this period saw a disintegration of the unified kingdom, replaced by warring factions among district chiefs. It also saw the intensification of existing settlements and expansion into more remote (and thus probably less desirable) locales. Cordy (2002:36-37) summarizes archaeological data for the construction of permanent residences in the upper Mākaha, Nānākuli, and Lualualei Valleys in the dry leeward Waiʻanae District, in upper Hālawa in ʻEwa District, and in upland Kāneʻohe on the windward side of the island. Irrigation systems were pushed into comparatively more remote and difficult localities.

Table 3. Summary of Radiocarbon Determinations for Waikīkī; Determinations Obtained from Archaeological Sites near the Current Project Area are Shaded Gray.

Lab No. (Beta-)	Site (50-80-14-)	Sample Type	Provenience	Feature Type	Conventional Radiocarbon Age	13C/12C	Calibrated Date Range	Reference
66282	4966	unidentified charcoal	4966:1, Unit 7, Layer V, 80-90 cmbs	burial pit	580±140 BP	-26.5	AD 1170-1640 (0.95)	Denham and Pantaleo (1997b:Appendix B)
95117	4579	*Aleurites moluccana* (*kukui*) endocarp, uncharred	Area C, Layer IV-5	base of sand berm (pre-dating Loko Paweo II)	520±50 BP	-25.5	AD 1306-1364 (0.27) AD 1385-1458 (0.69)	Denham and Pantaleo (1997a:67)
183617	6407	*Aleurites moluccana* (*kukui*) endocarp	TU 1, Str. IIIc, 188-208 cmbs	*paukū* agricultural sediments	500±50 BP	-25.5	AD 1312-1362 (0.15) AD 1387-1478 (0.80)	Tulchin et al. (2004:Appendix A)
169337	6407	unidentified charcoal	unspecified	agricultural sediments near base of large berm or bund	490±40 BP	-25.6	AD 1305-1365 (0.33) AD 1383-1452 (0.63)	Borthwick et al. (2002:Appendix A)
31307	Loko Paweo/‘Auwai o Pau	*Aleurites moluccana* (*kukui*) endocarp, uncharred	Trench 6, Layer Va/b, 202-205 cmbs	beneath *‘auwai*	480±50 BP	not provided	AD 1322-1357 (0.07) AD 1391-1502 (0.87) AD 1598-1616 (0.02)	Davis (1989:74)
13195	n/a	unidentified charcoal	Feat. 5, Grid 4, Layer III, 52-56 cmbd	firepit	470±60 BP	-25.6	AD 1320-1359 (0.07) AD 1389-1524 (0.79) AD 1572-1630 (0.09)	Beardsley and Kaschko (1998:49)
66283	4966	unidentified charcoal	4966:1, Unit 8, Layer V, 66-76 cmbs	burial pit	460±70 BP	-19.8	AD 1321-1359 (0.07) AD 1390-1529 (0.70) AD 1540-1635 (0.19)	Denham and Pantaleo (1997b:Appendix B)

Lab No. (Beta-)	Site (50-80-14-)	Sample Type	Provenience	Feature Type	Conventional Radiocarbon Age	13C/12C	Calibrated Date Range	Reference
31310	4570	unidentified charcoal	Trench 19, Str. III, Pit B1, 90-100 cmbs	hearth	410±50 BP	-24.3	AD 1422-1529 (0.65) AD 1546-1635 (0.31)	Davis (1989:74)
31308	Loko Paweo/‘Auwai o Pau	unidentified charcoal	Trench 6, Layer IV, 155-165 cmbs	pond walls	390±70 BP	not provided	AD 1421-1646 (0.95)	Davis (1989:74)
13193	n/a	unidentified charcoal	Feat.1, Grids 2&10, Layer III, 51-57 cmbd	firepit	390±60 BP	-21.37	AD 1431-1639 (0.95)	Beardsley and Kaschko (1998:49)
169338	6407	unidentified charcoal	Trench 6, Str. III, ca. 180 cmbs	agricultural sediments near base or large berm or bund	380±80 BP	-26.3	AD 1409-1662 (0.95)	Borthwick et al. (2002:Appendix A)
95116	4579	*Aleurites moluccana* (*kukui*) endocarp, uncharred	Area B, Layer IV-6	base of sand berm (pre-dating Loko Paweo II)	380±50 BP	-24.6	1441-1637 (0.95)	Denham and Pantaleo (1997a:67)
183616	6407`	*Aleurites moluccana* (*kukui*) endocarp	TU 1, Str. IIIc, 168-178 cmbs	*paukū* agricultural sediments	360±60 BP	-23.9	AD 1442-1646 (0.95)	Tulchin et al. (2004:Appendix A)
26725	1947	unidentified charcoal	Area 7, Profile 20	cultural layer near Individual 13	350±90 BP	not provided	AD 1408-1684 (0.89) AD 1735-1803 (0.05) AD 1930-1950 (0.01)	Simons et al. (1991:205)
13194	n/a	unidentified charcoal	Feat. 4, Grid 3, Layer III, 58-64 cmbd	firepit	340±60 BP	-14.37	AD 1446-1657 (0.95)	Beardsley and Kaschko (1998:49)
138915	5940	unidentified charcoal	Feat. C, Str. II, 70-85 cmbs	hearth	340±60 BP	-25.0	AD 1446-1657 (0.95)	Winieski, Perzinski, Shideler et al. (2002:202)

Lab No. (Beta-)	Site (50-80-14-)	Sample Type	Provenience	Feature Type	Conventional Radiocarbon Age	13C/12C	Calibrated Date Range	Reference
31312	sand berm/Loko Paweo II	unidentified charcoal	Trench 10, Layer V, 95-125 cmbs	pond subsoil	320±90 BP	not provided	AD 1421-1695 (0.83) AD 1725-1812 (0.10) AD 1873-1876 (0.00) AD 1916-1950 (0.03)	Davis (1989:74)
96115	4579	possible *Acacia koa*	Trench 92-1, Layer IV-4	base of spit edge	320±70 BP	-27.8	AD 1437-1679 (0.91) AD 1741-1752 (0.01) AD 1763-1800 (0.04)	Denham and Pantaleo (1997a:67)
158863	n/a	unidentified charcoal	Trench 10	*imu* (with burnt pig)	320±60 BP	-23.2	AD 1449-1665 (0.94) AD 1784-1795 (0.01)	Bush et al. (2002:Appendix C)
354014	5796	plant material	Trench 14, Str. IIb	wetland sediments	310±30 BP	-20.6	AD 1490-1649 (0.95)	Pammer et al. (2014:Appendix A)
26726	1947	unidentified charcoal	Area 1, Profile 3	cultural layer?	300±130 BP	not provided	AD 1424-1895 (0.89) AD 1903-1950 (0.06)	Simons et al. (1991:206)
66280	4570	unidentified charcoal	4570:8, pit fill	burial pit	290±80 BP	-26.2	AD 1441-1695 (0.77) AD 1725-1812 (0.14) AD 1839-1845 (0.00) AD 1852-1877 (0.01) AD 1916-1950 (0.04)	Denham and Pantaleo (1997b:Appendix B)
259332	n/a	unidentified charcoal	Trench E, Feat. 1	midden	290±40 BP	-27.6	AD 1483-1665 (0.93) AD 1784-1795 (0.02)	Runyon et al. (2009:Appendix C)
55779	4576	unidentified charcoal	Area B, 102N/99E, Lens F	Loko Paweo II fill	280±70 BP	-26.2	AD 1449-1694 (0.77) AD 1726-1812 (0.15) AD 1917-1950 (0.04)	Denham and Pantaleo (1997a:67)
55780	4570	unidentified charcoal	Trench 92-5, Layer V-2	basalt sediment beneath bund	280±70 BP	-27.3	AD 1449-1694 (0.77) AD 1726-1812 (0.15) AD 1917-1950 (0.04)	Denham and Pantaleo (1997a:67)
157184	5940	unidentified charcoal	Feat. A, Str. II, 100 cmbs	charcoal lens	280±60 BP	-27.8	AD 1458-1684 (0.81) AD 1734-1804 (0.12) AD 1929-1950 (0.02)	Winieski, Perzinski, Shideler et al. (2002:202)

Lab No. (Beta-)	Site (50-80-14-)	Sample Type	Provenience	Feature Type	Conventional Radiocarbon Age	13C/12C	Calibrated Date Range	Reference
48483	4570	unidentified charcoal	Unit 1/2, Layer IIf/III, Hearth B3/I, 79-97 cmbs	hearth	280±60 BP	-25.3	AD 1458-1684 (0.81) AD 1734-1804 (0.12) AD 1929-1950 (0.02)	Davis (1992:50)
138915	5940	unidentified charcoal	Fea. C, Stratum II, 70-85 cmbs	Hearth	240±60 BP	-25.0	AD 1488-1699 (0.53) AD 1722-1814 (0.29) AD 1835-1885 (0.05) AD 1910-1950 (0.09)	Winieski, Perzinski, Shideler et al. (2002)
66277	4570	unidentified charcoal	4570:8, pit fill	burial pit	230±80 BP	-26.6	AD 1491-1896 (0.85) AD 1902-1950 (0.10)	Denham and Pantaleo (1997b:Appendix B)
183614	6407	unidentified charcoal	TU 1, Str. IIIb, 149 cmbs	lower level of *kuāuna* feature	220±30 BP	-22.8	AD 1639-1687 (0.37) AD 1731-1807 (0.50) AD 1926-1950 (0.08)	Tulchin et al. (2004:Appendix A)
259333	7066	unidentified charcoal	Trench O, Feat. 2	unidentified pit feature	210±40 BP	-24.4	AD 1530-1539 (0.01) AD 1635-1699 (0.29) AD 1722-1814 (0.48) AD 1835-1885 (0.05) AD 1910-1950 (0.13)	Runyon et al. (2010:Appendix C)
157185	5940	unidentified charcoal	Str. III, 75-80 cmbs	charcoal pocket	210±40 BP	-22.3	AD 1530-1539 (0.01) AD 1635-1699 (0.29) AD 1722-1814 (0.48) AD 1835-1885 (0.05) AD 1910-1950 (0.13)	Winieski, Perzinski, Shideler et al. (2002:202)
183615	6407	*Aleurites moluccana* (*kukui*) nutshell	TU 1, Str. IIIc, 158-168 cmbs	*paukū* agricultural sediments	190±80 BP	-23.5	AD 1521-1585 (0.07) AD 1623-1950 (0.89)	Tulchin et al. (2004:Appendix A)
158862	n/a	bone collagen (pig bone)	Trench 10	*imu* (burnt pig)	160±60 BP	-17.8	AD 1661-1950 (0.95)	Bush et al. (2002:Appendix C)

Lab No. (Beta-)	Site (50-80-14-)	Sample Type	Provenience	Feature Type	Conventional Radiocarbon Age	13C/12C	Calibrated Date Range	Reference
66279	4570	unidentified charcoal	4570:8, pit fill	burial pit	140±90 BP	-27.0	AD 1529-1548 (0.01) AD 1634-1950 (0.94)	Denham and Pantaleo (1997b:Appendix B)
254012	5796	plant material	Trench 14, Str. IIa	wetland sediments	140±30 BP	-27.5	AD 1672-1778 (0.37) AD 1798-1944 (0.58)	Pammer et al. (2014:Appendix A)
70726	4570	unidentified charcoal	4570:4, pit fill, 53-100 cmbs	firepit	130±70 BP	-28.6	AD 1664-1786 (0.40) AD 1793-1950 (0.56)	Denham and Pantaleo (1997b:Appendix B)
48481	4570	unidentified charcoal	Unit 1, Layer IId, over Hearth N, 59-69 cmbs	cultural layer immediately over hearth	130±60 BP	-26.0	AD 1666-1784 (0.39) AD 1795-1950 (0.57)	Davis (1992:50)
259984	7068	bulk sediment	Trench G, cultural layer	cultural layer	90±40	-26.0	AD 1680-1740 (0.26) AD 1753-1763 (0.01) AD 1800-1940 (0.68)	Thurman et al. (2009)
288158	1735	*Metrosideros polymorpha* (*ʻōhiʻa lehua*) charcoal	Trench 6, Pit Feature 27	unidentified pit feature	90±40 BP	-25.3	AD 1680-1740 (0.26) AD 1753-1763 (0.01) AD 1800-1940 (0.68)	Yucha et al. (2013:126)
354016	5796	plant material	Trench 14, Str. IId	pond material	80±30 BP	-27.9	AD 1691-1729 (0.26) AD 1808-1921 (0.69)	Pammer et al. (2014:Appendix A)
48482	4570	unidentified charcoal	Unit 1, Layer IIe, Hearth O, 79-84 cmbs	hearth	40±60 BP	-24.8	AD 1679-1742 (0.27) AD 1752-1764 (0.02) AD 1799-1941 (0.67)	Davis (1992:50)
55775	4970	unidentified charcoal	Trench 92-1, Lens E	bund separating *ʻauwai* from Loko Paweo I	10±60 BP	-27.4	AD 1682-1738 (0.27) AD 1754-1762 (0.01) AD 1801-1938 (0.68)	Denham and Pantaleo (1997a:67)

In the early AD 1700s, the chief Kualiʻi came to power and reestablished the primacy of the island ruler. He also ventured into the political dominions of neighboring islands, gaining windward Kauaʻi and making war against chiefs on Molokaʻi, Lānaʻi, and Hawaiʻi (Cordy 2002:32).

When British Captain James Cook made the first Western landfall in Hawaiʻi in 1778, he found a group of islands ruled by an elite corps of chiefs, served by a multi-layered hierarchy of lower *aliʻi* and a body of *makaʻāinana*. On Oʻahu, Waikīkī was the chiefly center of the southern Oʻahu coast, home to the ruling chief and his subordinate *aliʻi* (Cordy 2002; Nāpōkā 1986). ʻĪʻī (1959:69) writes that the "chiefs like to live at Waikīkī because of the surfing." Houses clustered among the coconut trees on the shoreline from Kālia to the base of Diamond Head. Several large *heiau*, including Helumoa (ʻĀpuakēhau) and Papaʻenaʻena, were the focus of chiefly religious ceremonies.

WAIKĪKĪ AT EUROPEAN CONTACT

Following Cook's 1778 arrival in the archipelago, other European and American explorers and traders soon began to visit the south shore of Oʻahu. Although many wrote accounts and journals, these observations are difficult to pinpoint in terms of location and provide only a general description of the Waikīkī coastal plain. Nonetheless, they provide an image of the wetland agricultural landscape that occupied the area at that time. For example, the first written descriptions of Waikīkī were made by Vancouver's party in 1792. Vancouver (quoted in Kanahele 1995:82-83) provides the following description:

> On the shores, the villages appeared numerous, large, and in good repair; and the surrounding country pleasingly interspersed with deep, though not extensive, valleys; which, with the plains near the sea-side, presented a high degree of cultivation and fertility…
>
> … [After landing] our boats remained perfectly quiet on the beach, having passed to the shore between some rocks, which completely protected it from the surf. The natives, who were present, received us in a very orderly manner … and on inquiring for water, they directed us to some stagnant brackish ponds near the beach. This being rejected, we were given to understand that good water was to be had in abundance at some distance, to which they readily took us; … Our guides led us northward through the village, to an exceedingly well-made causeway, about twelve feet broad, with a ditch on each side.
>
> This opened to our view a spacious plain, which … had the appearance of the open common fields of England; but, on advancing, the major part appeared divided into fields of irregular shape and figure, which were separated from each other by low stone walls, and were in a very high state of cultivation. These several portions of land were planted with the eddo or taro root, in different stages of inundation; none being perfectly dry, and some from three to six or seven inches under water. The causeway led us near a mile from the beach, at the end of which was the water which we were in quest of. It was a rivulet five or six feet wide, and about two or three feet deep, well banked up, and nearly motionless; some small rills only, finding a passage through the dams that checked the sluggish stream, by which a constant supply was afforded to the taro plantations.

Archibald Menzies (1920:23-24, the naturalist and surgeon accompanying Vancouver, further described the wetland agricultural landscape of Waikīkī in the late 18th century:

> The verge of the shore was planted with a large grove of cocoanut palms, affording a delightful shade to the scattered habitations of the natives.… We pursued a pleasing path back to the plantation, which was nearly level and very extensive, and laid out with great neatness into little fields planted with taro, yams, sweet potatoes and the cloth plant. These, in many cases, were divided by little banks on which grew the sugar cane and a species of Draecena without the aid of

much cultivation, and the whole was watered in a most ingenious manner by dividing the general stream into little aqueducts leading in various directions so as to be able to supply the most distant fields at pleasure, and the soil seemed to repay the labour and industry of these people by the luxuriancy of its productions.

The ocean provided an array of fish; a visitor in the 1850s described a typical catch (Nāpōkā 1986:3, quoting Harriet Newell Foster Deming):

> Sometimes four canoes would be drawn up on the beach at once, filled with shining beauties in nets … the wealth of color fascinated us as we hung over the sides of the canoes as we watched the bronzed fishermen who, naked except for a loincloth, scooped up the fish in their hands and laid them in piles on the sand.

Fishponds were another important source of food for the inhabitants of Waikīkī. Bloxam (1925:35-36), who sailed past on the *Blonde* in 1825, provides some details about the appearance of the fishponds that filled Waikīkī in the early 19th century:

> The whole distance [from Honolulu] to the village of Whyteete is taken up with innumerable artificial fishponds extending a mile inland from the shore, in these the fish taken by nets in the sea are put, and though most of the ponds are fresh water, yet the fish seem to thrive and fatten. Most of these fish belong to the chiefs, and are caught as wanted. The ponds are several hundred in number and are the resort of wild ducks and other water fowl. It [the village of Waikīkī] is pleasently situated and built along the shore among numerous groves of coconut and other trees, and in this respect far better than Honoruru, as scarcely any trees are to be found there.

HISTORICAL BACKGROUND

This section describes historical land use in Waikīkī with a focus on the shoreward area. Waikīkī has undergone many changes during this period, transitioning from an agricultural center and *ali'i* settlement to a highly developed tourist destination.

EARLY POST-CONTACT PERIOD

Although Kamehameha initially settled at Waikīkī on Oʻahu, the growing number of American and European traders arriving in Hawaiʻi looked to the harbor at Kou (present-day downtown Honolulu) as a safer and therefore favored berth for their deeper draft ships. In the first decade of the 19th century, Kamehameha gradually shifted his capital to that once-rural village and, by 1809, he had an established residence near the Honolulu harbor frontage. His family and members of court also made the move, leaving Waikīkī in the care of lesser chiefs and land managers (Kanahele 1995:104-105). As the only place near the city with beaches and surf, Waikīkī provided an easy escape from the Western atmosphere of the new capital (Hibbard and Franzen 1986:10). *Aliʻi*, particularly members of the Kamehameha extended family, built beach cottages on the ocean front. As the 19th century progressed, they replaced their grass-roofed, wooden buildings with more elaborate homes.

By the early 19th century, land use in Waikīkī had begun to shift gradually away from intensive taro cultivation and other traditional Hawaiian subsistence practices. During an 1828 visit to the area, the missionary Levi Chamberlain (1957:26) observed that large areas of the Waikīkī agricultural lands appeared to have been recently abandoned:

> Our path led us along the border so extensive plats of marshy ground, having raised banks on one or more sides, and which were once filled with water, and replenished abundantly with esculent

> fish; but now overgrown with tall rushes waving in the wind. The land all around for several miles has the appearance of having once been under cultivation. I entered into conversation with the natives respecting this present neglected state. They ascribed it to the decrease of population.

The introduction of epidemic disease to the Hawaiian population is understood to have resulted in widespread and catastrophic population loss by the early 1830s, which certainly affected the residents of Waikīkī. The emergence of nearby Honolulu Harbor as a center for commerce and trade by the early 19th century may also have drawn some former inhabitants away from the Waikīkī fields to other parts of the island.

CHANGES IN LAND TENURE

In the mid-19th century, major structural changes were made in the manner in which land was held in Hawai‘i. In 1848, the traditional system of land tenure was replaced with a Western system of fee-simple land ownership. This radical restructuring, called the Mahele, divided all lands between the king and 245 high-ranking *ali‘i*; the king later divided his lands between himself (called Crown Lands) and the government (Kame‘eleihiwa 1992). Subsequently, commoners were offered the opportunity to claim fee simple title to the land on which they lived or improved; these lands became known as *kuleana* lands and were awarded in the form of Land Commission awards (LCAs) (often referred to as *kuleana* lands).

Unlike most *ali‘i* land awards that were for entire *ahupua‘a*, *ali‘i* awards in the *ahupua‘a* of Waikīkī were for *‘ili*. As Kame‘eleihiwa (1992:232) explains, land on O‘ahu was desirable and therefore *‘ili* on O‘ahu were as valuable as *ahupua‘a* on the other islands:

> On O‘ahu, the moku of Kona (especially in Honolulu and Waikīkī), ‘Ewa, and Ko‘olaupoko were defined predominantly by ‘ili. This division of ‘Āina into a great number of rather small areas indicates that O‘ahu was not only more populated, but its ‘Āina were more desired by the Ali‘i and konohiki.… Although an ‘ili was almost always smaller in size than an ahupua‘a, an ‘ili on O‘ahu was considered as desirable as an ahupua‘a on the outer islands.

About 250 Land Commission awards were made in Waikīkī to six *ali‘i* and the remaining to local land managers and commoners (Kanahele 1995:115). The *ali‘i* awardees included Kauikeaouli (Kamehameha III) (62 acres), high chiefs William Lunalilo (2,229 acres) and Ana Keohokālole (100 acres), and three lesser ranked chiefs, Mataio Kekūanaō‘a (133 acres), Keoni Ana (11 acres), and Kaisara Kapa‘akea (9 acres). As noted by Kanahele (1995:116), “Their properties all included choice spots located near the beach, streams or fish ponds.” It is notable that the heirs of these *ali‘i* awardees include the monarchs Kamehameha V, David Kalākaua, and Lili‘uokalani, queen consorts Emma Rooke and Kapi‘olani, Princesses Ruth Ke‘elikōlani, Likelike, and Ka‘iulani, and Prince Jonah Kūhiō Kalaniana‘ole.

Kuleana awards, most of which were generally less than an acre, lined the Waikīkī shore, with associated inland pieces that provided land for farming. Of the shoreline *‘āpana*,[4] five fall in the Fort DeRussy sector, 11 in the Halekūlani sector, three in the Royal Hawaiian sector, and seven in the Kūhiō Beach sector (Figure 11 and Figure 12). There were no LCAs awarded south of Ku‘ekaunahi Stream (roughly the alignment of present Paoakalani Avenue).

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[4] Only those LCAs that fall in or adjacent to the Waikīkī beach improvements project area are counted.

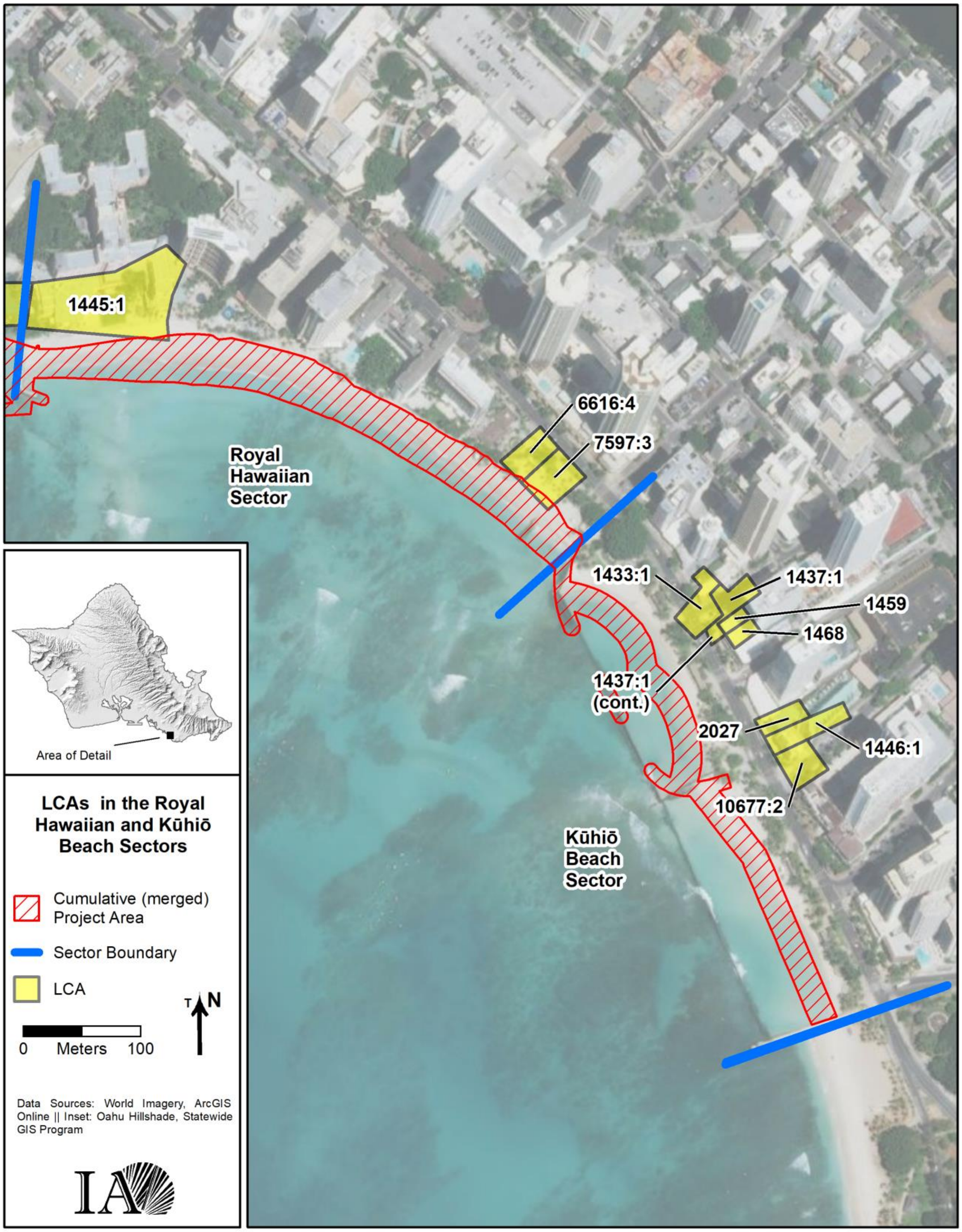

Figure 11. *Kuleana* awards in the Royal Hawaiian and Kūhiō Beach sectors.

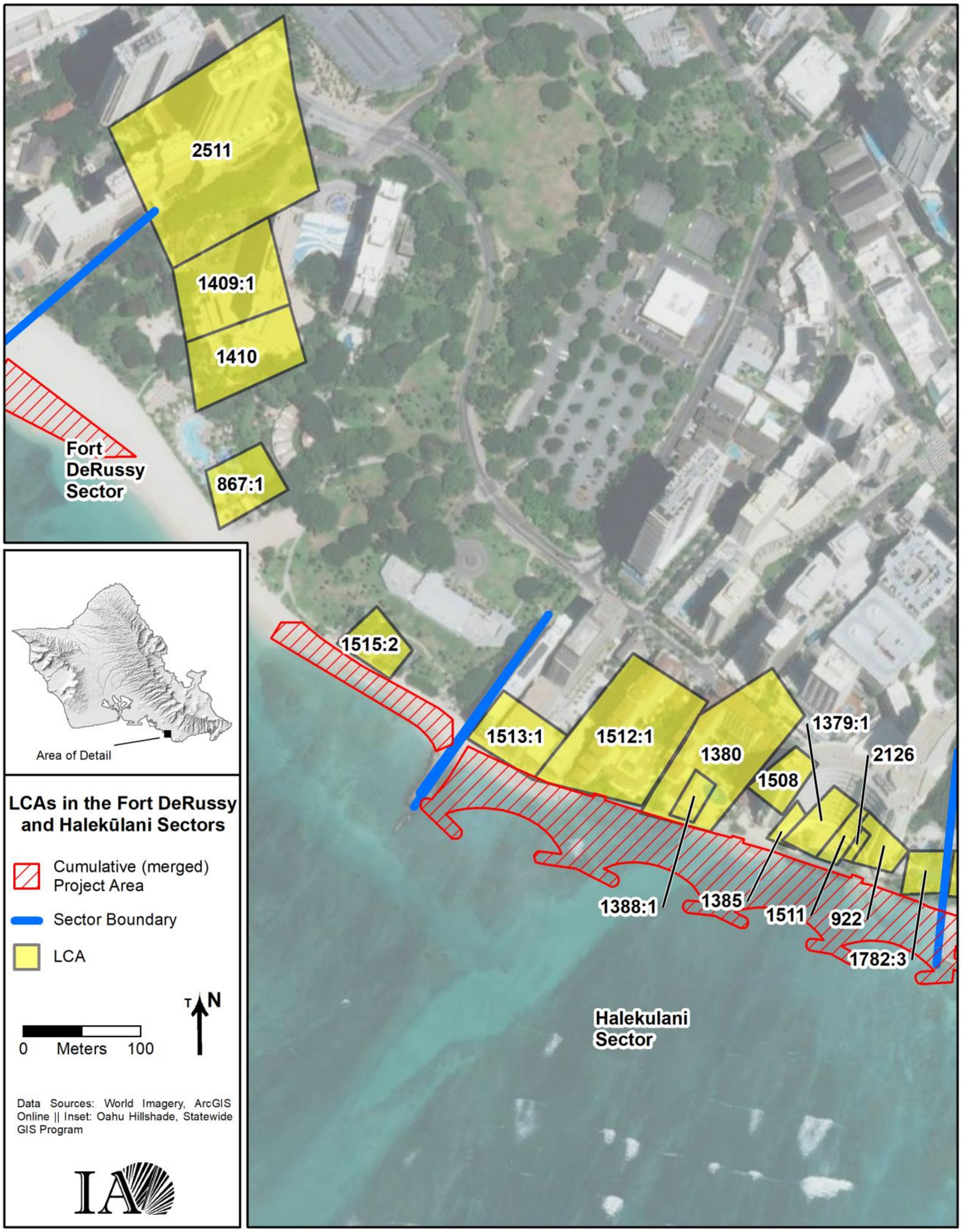

Figure 12. *Kuleana* awards in the Fort DeRussy and Halekūlani sectors.

AFTER THE MAHELE

While much of the Waikīkī Plain continued to be used as agricultural lands into the second half of the 19th century, the amount of land being used for traditional Hawaiian agriculture began to decrease. The La Passe (1855) map shows Waikīkī as filled with "Marais et Pecheries" (marshlands and fishponds), stretching from the edge of downtown Honolulu eastward nearly to Diamond Head.

In the 1860s, rice cultivation experienced a boom across the islands, directed at two markets: export to California for Chinese emigrants who had settled there after the mid-century Gold Rush and local consumption by a growing number of Chinese contract laborers who had come to Hawaiʻi to work on the sugarcane plantations[5]. Rice was second only to sugar in the economic hierarchy in the islands (Haraguchi 1987:xiii). Like sugar, Hawaiʻi's rice production filled the void created by the U.S. Civil War, when rice farming in the southern United States was severely curtailed (Coulter and Chun 1937:13). During negotiations for the Reciprocity Treaty between the U.S. and Hawaiian governments, efforts were made to ensure that rice shared the same protection as sugar.

Land speculators purchased taro fields, and in some cases, pulled up young taro plants to replace with rice seedlings (Haraguchi 1987:viv). Many *kuleana* owners leased their former taro fields to rice entrepreneurs, although in some cases, they retained land for the Hawaiian staple food. By 1892, there were 542 acres in Waikīkī planted in rice, representing almost 12 percent of the total 4,659 acres in rice cultivation on Oʻahu (Hammatt and Shideler 2007:17). Nakamura (1979:20, quoting Iwai 1933:80, brackets added) notes that Waikīkī was one of "the most important [rice] growing districts on Oahu."

Whereas at the time of the Mahele the Waikīkī fishponds were all awarded to Hawaiians, in succeeding decades they left Hawaiian hands as many ponds were leased to Chinese farmers. According to Kanahele (1995:128):

> … by 1900 the 15 ponds of Waikīkī, with the exception of one which had been planted in rice, were being leased to, and operated by, Chinese. Some of these Chinese operators included Ah Kiau and Leong Fook in Kālia; Chun Yat in Kawehewehe; and Young Chong in Kapaʻakea.

Chinese entrepreneurs continued to raise *ʻamaʻama* and *ʻawa* for the Hawaiian market. The fishponds were also used to grow goldfish (*iʻa pake* or Chinese fish), which many Hawaiians liked to eat raw, and ducks (Kanahele 1995:128-129).

An overview of the extent of rice cultivation in Waikīkī is provided by a late 19th-century map by Wall (1893), which shows the rice fields as extending from a point north of Waikiki Road (now Kalākaua Avenue) *mauka* to the lower part of Mānoa Valley and, when measured along the coast, from King Street to Kapiʻolani Park (Figure 13).

HOTELS AND TOURISM

As early as the 1860s, Waikīkī began to attract foreign residents and beachgoers, especially Americans. In 1873, the region was described by one visitor as "a hamlet of plain cottages, whither the people of Honolulu go to revel in bathing clothes, mosquitoes, and solitude, at odd times of the year" (Bliss 1873:195-196). Kapiʻolani Park in 1877 was originally developed as a private recreational/open space amenity for high-end residences at the base of Diamond Head and along the coast (Brown and

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[5] By 1884, there were 18,254 Chinese in the islands (see Coulter and Chun 1937:13).

Monsarrat 1883). Over time, Waikīkī emerged as both a popular residential area and a hub for tourists, with attendant hotels, restaurants, and other establishments.

By the end of the 19th century, proprietors were opening bathhouses such as the Long Branch, established at Ulukou in 1881, where bathers could change their clothes for a small charge. The Long Branch was soon followed by other bathing pavilions such as the Ilaniwai Baths and the Waikiki Villa (Hibbard and Franzen 1986:53-54).

In 1901, the first major hotel, the Moana, opened on the grounds of W.C. Peacock's home on the south side of the river (Photo 1). The Moana Hotel was outfitted with a 300-ft-long pier (which was demolished in 1930). After the establishment of the Moana Hotel, hotels and other guest-oriented businesses sprang up alongside elegant homes of the wealthy. Five years after the establishment of the Moana Hotel, the cottage-style Seaside Hotel opened on Bernice Pauahi Bishop's property in Helumoa.

West of the Moana Hotel, several smaller establishments were introduced in the early 20th century. In 1907, a small hotel called the Hau Tree opened in the former home of Robert Lewers. The Hau Tree, which became the Halekūlani in 1917, eventually incorporated the neighboring resort property Gray's-By-the Sea. In 1925-1926, the iconic Royal Hawaiian Hotel replaced the Seaside (Photo 2); the Royal Hawaiian Groin was constructed around this time.

FORT DERUSSY

The U.S. Army Corps of Engineers began to acquire land for a military reservation in the area of the Kālia fishponds and along the beach between 1904 and 1908. It was subsequently occupied by a detachment from the 1st Battalion of Engineers from Fort Mason, California. The fort was first referred to as Kalia Military Reservation but was subsequently renamed in honor of Brevet Brigadier General Rene Edward DeRussy, a veteran of both the War of 1812 and the Civil War (White and Kraus 2007:80). Land acquisition for Fort DeRussy continued into World War I (Davis 1989:7). The U.S. Army immediately began to fill the new Fort DeRussy property, including the Kālia fishponds, by dredging material from the offshore reefs (Hibbard and Franzen 1986:79).

Construction of Batteries Randolph and Dudley was begun at Fort DeRussy in 1910 as part of a coastal defense system intended to protect Honolulu. The fort housed these batteries, equipped with two 14-inch guns, between ca. 1910 and 1944. Figure 14 presents the Waikīkī coastline, including Fort DeRussy, ca. 1909-1912.

ALA WAI CANAL

The land reclamation project responsible for excavating the Ala Wai Canal brought permanent changes to Waikīkī. In 1920, the Territory of Hawai'i began to solicit bids to fill the low-lying and marshy lands, with the fill to be dredged during the construction of a new artificial waterway. For Waikīkī, the canal was seen as remedying the perceived impact of outflow from the wetlands on the growing bathing industry, since "the proposed drainage canal would carry the runoff away from the Waikiki beaches" (Steele 1992:8-4). Construction began in 1921, with Walter F. Dillingham's Hawaiian Dredging Company contracted by the Territory of Hawaii to carry out the work (Nakamura 1979:90). By 1928, the canal was completed; a proposed outflow from Kapahulu Road to the eastern end of Waikīkī was never finished, aborted by a concern that the on-shore current would take canal runoff west onto the pristine beaches (Cocke 2013).

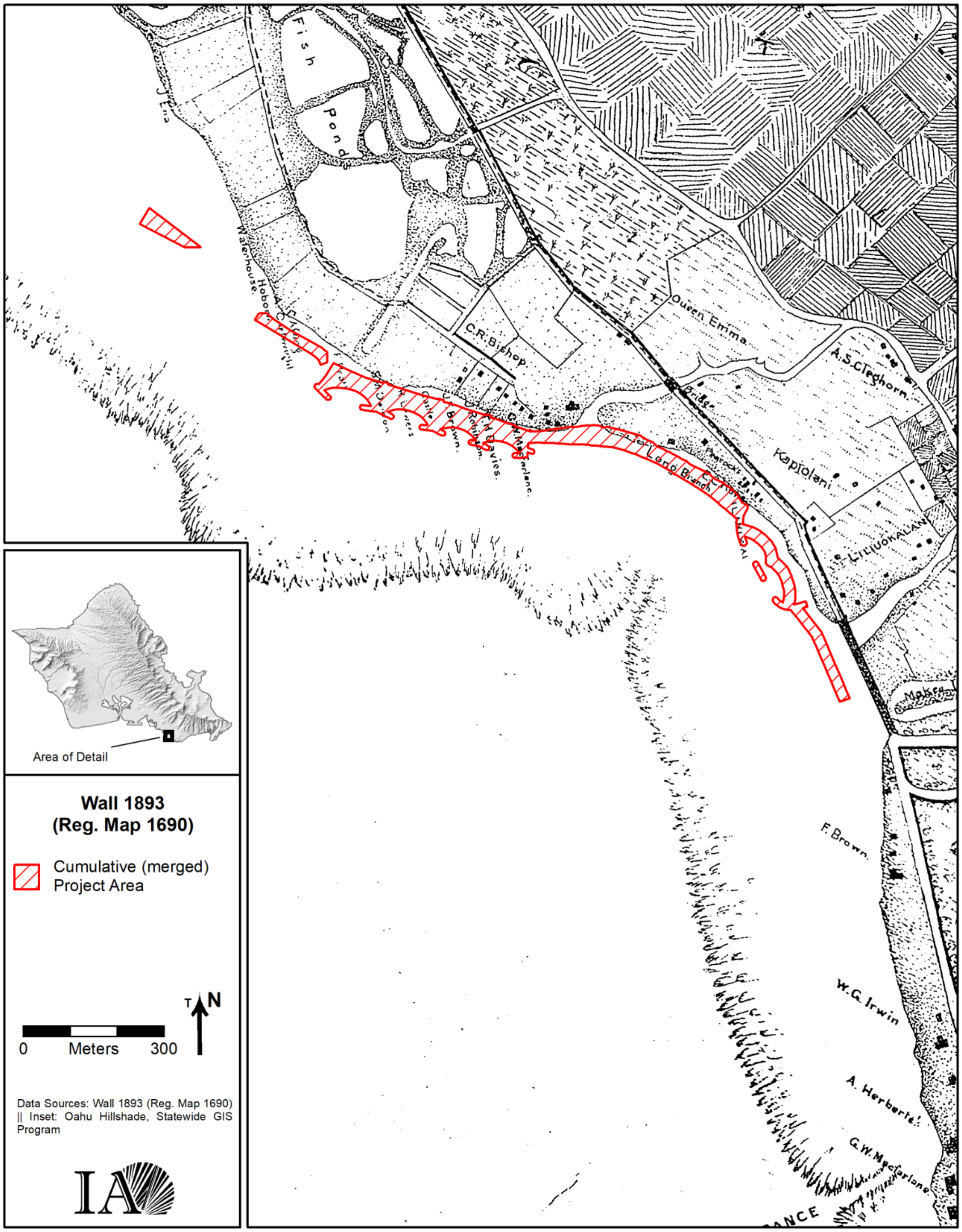

Figure 13. The Waikīkī beach improvements project area overlaid on map by Wall (1893). Note the fishpond complex, backed by marshland, and then a gridded network of rice fields (former taro fields).

Photo 1. Moana Hotel, ca. 1905. Hawai‘i State Archives (Call No. PPWD-10-2-014).

Photo 2. Royal Hawaiian Hotel, ca. 1928. The Royal Hawaiian Groin is visible to the left of the hotel. University of Hawai‘i Library (Call No. B-1252).

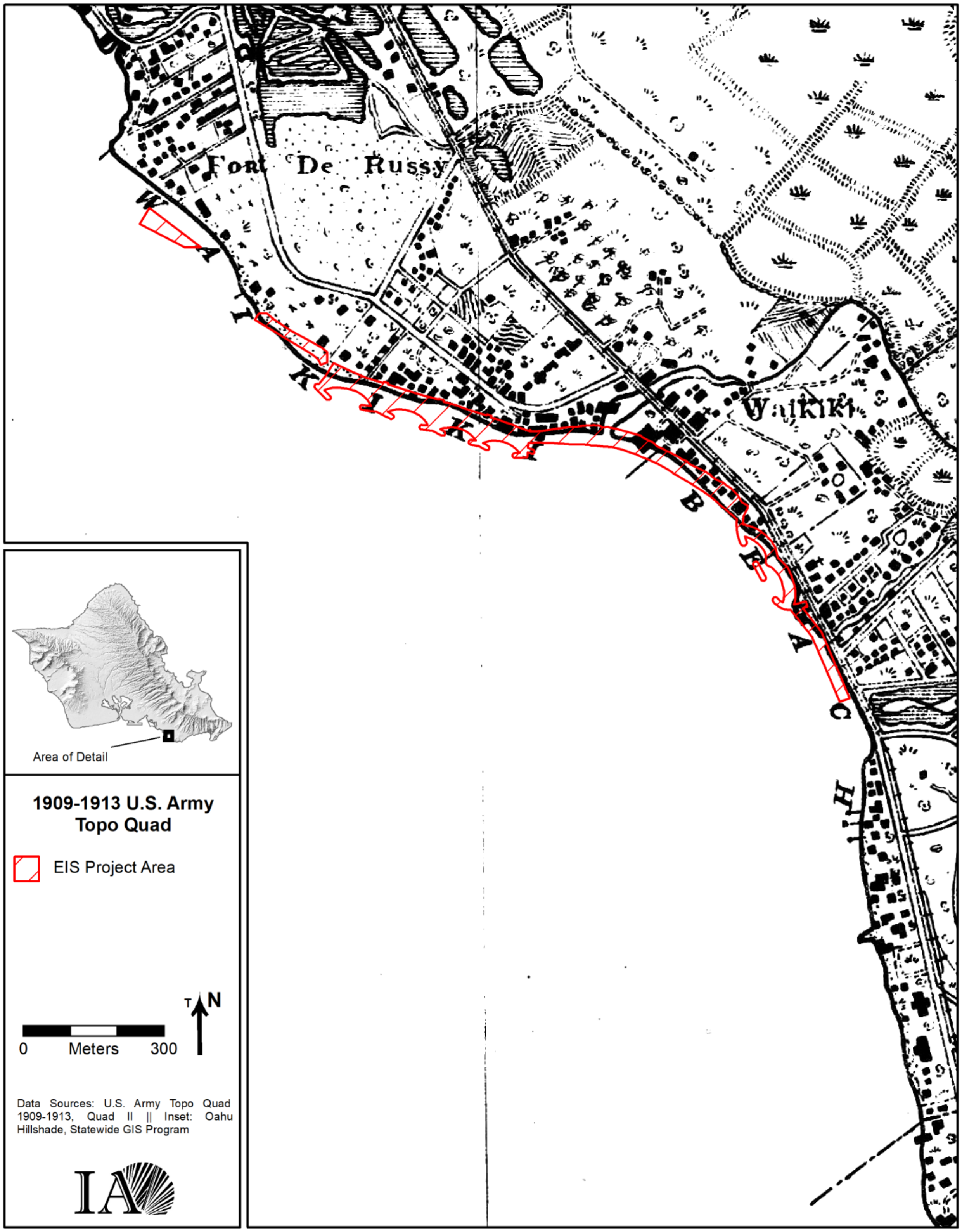

Figure 14. The Waikīkī beach improvements project area overlaid on 1909-1913 U.S. Army topographical quadrangle map (1913).

Construction of the Ala Wai Canal and accompanying land reclamation resulted in the in-filling of all remaining ponds and irrigated fields in Waikīkī; the filled areas also extended to the surrounding neighborhoods of Kapahulu, Mōʻiliʻili, McCully, and lower Makiki and Mānoa. Following land reclamation, the filled area was gridded with streets and house lots according to a "standard plan for new neighborhoods" (Johnson 1991:311).

While the areas along the coast, including the project area, were not filled as part of the Waikīkī land reclamation project, the construction of the Ala Wai Canal still had significant effects for the shoreline. Principally, construction of the canal cut off the three waterways—Kuʻekaunahi Stream, Āpuakēhau Stream, and Piʻinaio Stream—that previously entered the sea within the project area by rerouting water flowing from the uplands into the canal. The stream mouths have since been filled, and no visible traces remain.

POST-WORLD WAR II

As the popularity of Waikīkī among Hawaiʻi residents, particularly the *haole* population, and visitors grew, the region was eyed for development. The growth of the tourist industry in the 1950s, in the aftermath of World War II, led to increasing urbanization along the shoreline and throughout Waikīkī. Several major attractions opened in the post-war period, including the Honolulu Zoo (1952), the Waikīkī Aquarium (1955), and the Duke Kahanamoku Beach and Lagoon (1956). Kūhiō Beach Park had opened just prior to World War II, in 1940, with the building of an off-shore seawall creating a sheltered area for inexperienced swimmers. The Waikiki Tavern (which included the Waikiki Inn), was opened in the 1920s and occupied the lot just ʻEwa to the Kūhiō groin complex (Photo 3; Figure 15); it was demolished in 1960 to make way for Waikīkī Beach Center (Clark 1977:54; Hibbard and Franzen 1986:51)

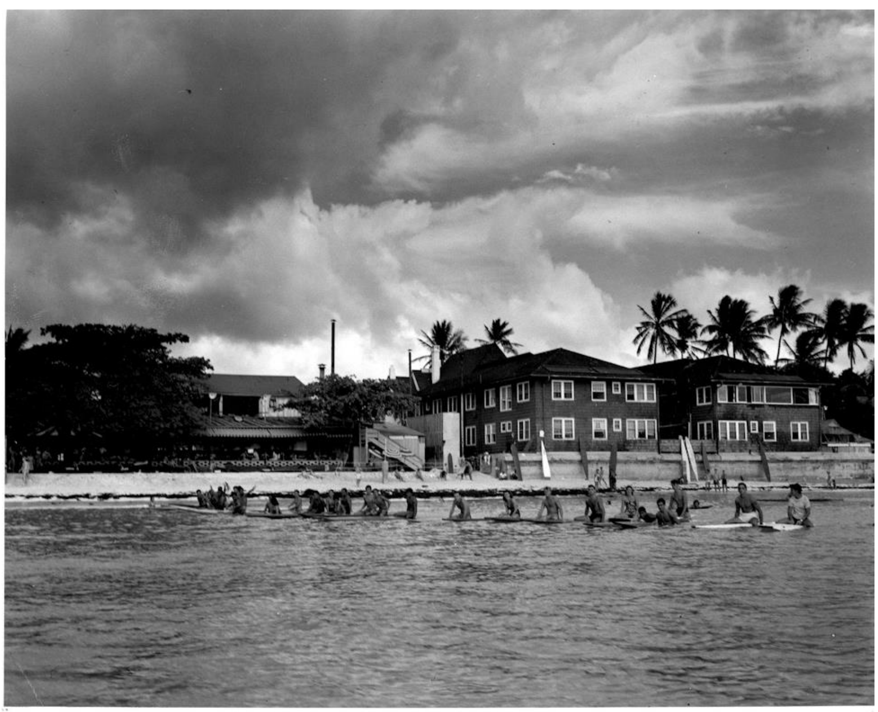

Photo 3. Surfers in front of Waikīkī Beach, ca. 1951. The building at right (containing two separate wings) is the Waikiki Inn, which was part of the Waikiki Tavern. Photo courtesy of Ian Lind.

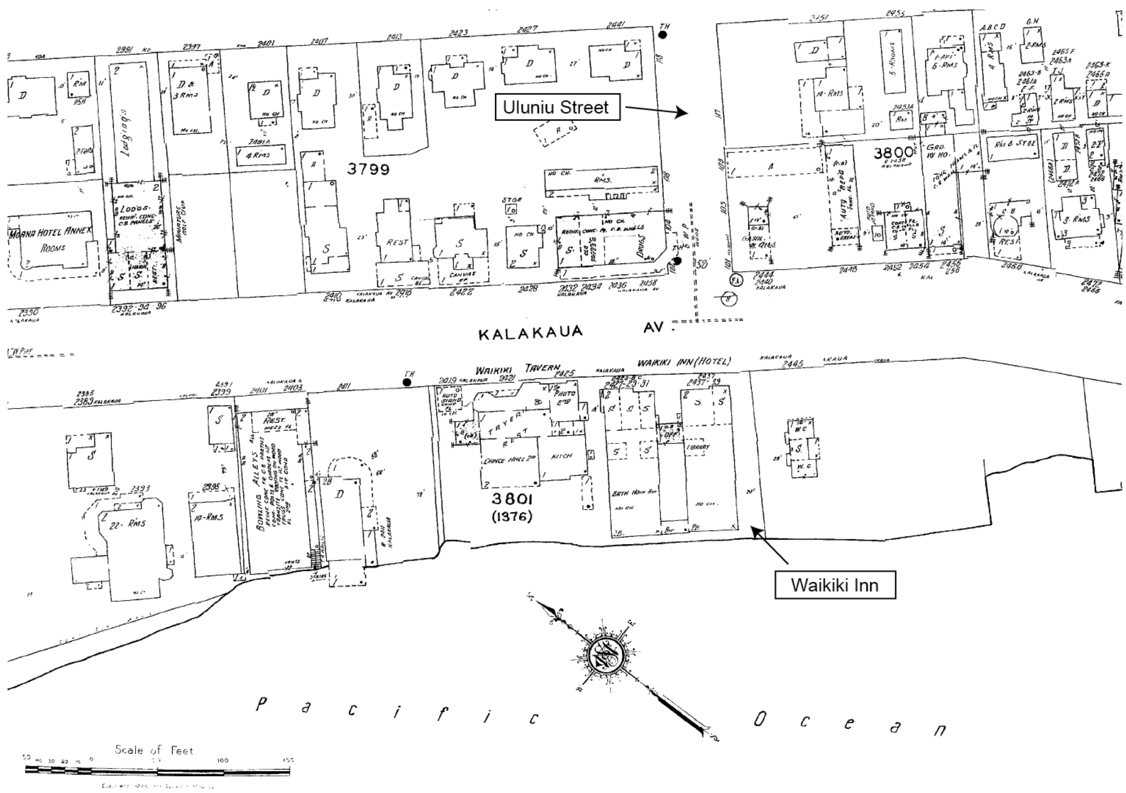

Figure 15. A 1949 Sanborn Fire Insurance map showing the Waikiki Inn (part of Waikiki Tavern).

III. ARCHAEOLOGICAL RESOURCES OF THE WAIKĪKĪ SHORELINE

The following discussion presents an overview of archaeological resources along the Waikīkī shoreline and detailed reviews for each of the four beach sectors. No known archaeological sites are within the Kūhiō Beach, Halekūlani, and Fort DeRussy sectors, though sites abut the latter two areas. One site partially overlaps with the Royal Hawaiian sector with three additional sites adjacent to its inland edge.

PREVIOUS ARCHAEOLOGICAL PROJECTS

A summary of previous archaeological projects within 50 m of the present project area is provided in Table 4 and their locations are shown in Figure 16. The locations of known archaeological sites and burials within and near the Waikīkī Beach Improvement and Maintenance Program area are shown in Figure 17.

One of the earliest archaeological surveys in Waikīkī was Thrum's (1906:44) listing of *heiau*, which described eight *heiau*. Although no remnants have yet been found, ʻĀpuakēhau or Helumoa Heiau was placed by Thrum near the shoreline at Helumoa close to the mouth of ʻĀpuakēhau Stream. McAllister (1933:74-78) subsequently devoted several pages of discussion to pre-Contact and early post-Contact-era Waikīkī, which he listed as Oʻahu's "Site 60." McAllister (1933:76) describes the *heiau* mentioned by Thrum and the taro lands and fishponds that once covered the area, noting that "all of this land has now been drained and filled."

The construction of the major hotels along the Waikīkī shoreline early in the 20th century encountered numerous burials, although these were not subjected to preservation or technical investigation. Kenneth Emory of the Bishop Museum collected human skeletal remains from five individuals at Helumoa, Waikīkī, in 1923, which were considered to be "victims of the 1853 smallpox epidemic" (NPS 1998:4278). Hammatt and Shideler (2007c:59) suggest these individuals, which they link to Bishop Museum ID numbers Oa-19 through Oa-23, were disinterred during the construction at the Royal Hawaiian Hotel[6]. It also appears likely, based on later finds by Simons et al. (1991), that human skeletal remains were disturbed and reinterred during the construction of the Moana Hotel ca. 1901.

Further inadvertent discoveries of human skeletal remains prior to the initiation of systematic, compliance-related investigations include remains observed eroding from a sand dune in front of the future Surfrider Hotel in 1964 (Bishop Museum site files, referenced in Davis 1989:24-25) and the disinterment of eight individuals during "excavations for tank construction" at the Sheraton Hotel in 1970 (NPS 1998:4282). The exact locations of these finds are unknown[7].

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[6] There are accounts of numerous *ʻulu maika* encountered during construction work for the Royal Hawaiian Hotel in the 1920s, with the *ʻulu maika* thought likely to be associated with the royal sports field Kahuamokomoko (Kanahele 1995:99).

[7] A human female "forearm bone" was reportedly encountered during construction ca. 1993 at the Sheraton Waikīkī Hotel and reinterred on the property (Hammatt and Shideler 2007c:59).

Table 4. Previous Archaeological Projects within 50 m of the Current Project Area.

Fieldwork Year	Reference	Type of Investigation	General Location	Sector^	Findings (Site 50-80-14-)*
--	Thrum (1906)	reconnaissance survey	Hawai‘i	all	Helumoa Heiau placed at ‘Āpuakēhau on or near the grounds of the Royal Hawaiian Hotel
--	McAllister (1933)	reconnaissance survey	O‘ahu	all	Waikīkī was designated as McAllister’s (1933) “Site 60”
early 1920s	reported in Kanahele (1995:99), numerous reports	construction	Royal Hawaiian Hotel	RH	9980: many *‘ulu maika* thought to be associated with former sports field (Kahuamokomoko)
1923	reported in Hammatt and Shideler (2007c:59) and NPS 1998:4278)	inadvertent discovery	Royal Hawaiian Hotel	RH	five human burials collected by Dr. Kenneth Emory of Bishop Museum from Helumoa, possibly associated with Royal Hawaiian Hotel construction (BM ID Nos. OA0019-OA0022)
1964	referenced in Davis (1989:24-25, Groza et al. (2010:54)	inadvertent discovery	Moana Surfrider Hotel	RH	3705: burials eroding from sand dune in front of 1969 Surfrider Hotel (BM Site No. Oa-A4-24)
1970	reported in Hammatt and Shideler (2007c:59) and NPS (1998:4282)	inadvertent discovery	Sheraton Waikīkī Hotel	HK	human skeletal remains from eight individuals (BM ID No. OA0522)
1978	Rogers- Jourdane (1978)	reconnaissance survey	Halekūlani Hotel	HK	None
1981	Neller (1981)	reconnaissance survey	Halekūlani Hotel	HK	9957: four sets of disturbed human skeletal remains and historic artifacts
1981-1982	Davis (1984)	data recovery	Halekūlani Hotel	HK	9957: pre-Contact features, historic trash pits, privies, and animal burials, and human burials
1988	Simons et al. (1991)	data recovery and monitoring	Moana Surfrider Hotel	RH	1974: firepits, postholes, possible planting pits, cat burials, human burials and dispersed skeletal remains

Fieldwork Year	Reference	Type of Investigation	General Location	Sector[^]	Findings (Site 50-80-14-)[*]
1989	Davis (1989)	reconnaissance survey	Fort DeRussy	FD	4570: pre-Contact to mid-19th century habitation deposits
1990-1991	Davis (1992)	data recovery and monitoring	Fort DeRussy	FD	4570: pre-Contact to mid-19th century habitation deposits and 19th-century human burial
1992	Pietrusewsky (1992)	inadvertent discovery	Moana Surfrider Hotel	RH	human mandible fragment
1993	reported in Hammatt and Shideler (2007c:59)	recovery and reinterment of human skeletal remains	Sheraton Waikīkī Hotel	HK	human female “forearm bone”
1992-1995	Denham and Pantaleo (1997a, 1997b, 1998)	data recovery and monitoring	Fort DeRussy	FD	4570: five human burials
2001	Cleghorn (2001a, 2001b)	burial recovery	Waikīkī Burger King	KB	5861: four sets of human skeletal remains
--	PHRI (2001)	assessment	Waikīkī Beach Walk	HK	None
1997-1998	Winieski and Hammatt (2001)	monitoring	Kalākaua Avenue	KB	None
1999-2000	Bush et al. (2002); Perzinski et al. (2001); Winieski, Perzinski, Shideler et al. (2002); Winieski, Perzinski, Souza et al. (2002)	monitoring	Kalākaua Avenue	KB; RH	5857: one burial; 5858: nine burials; 5859: eight burials; 5860: 24 burials; 5861: five burials; 5862: two burials; 5863: five burials: 5940: pre-Contact cultural deposit; 5941: historic-era pit; 5942: light-gauge rail; 5943: Muliwai Ku‘ekaunahi; 5948: historic seawall

Fieldwork Year	Reference	Type of Investigation	General Location	Sector^	Findings (Site 50-80-14-)*
2006	Groza et al. (2010)	literature review and field inspection	Sheraton Waikīkī Hotel (Gray’s Beach)	HK	None
2006	Hammatt and Shideler (2007c)	literature review and field inspection	Royal Hawaiian Hotel; Sheraton Waikīkī Hotel	HK; RH	None
2007	Hammatt and Shideler (2007b)	monitoring	Moana Surfrider Hotel	RH	None
2007	Thurman and Hammatt (2008)	monitoring	Royal Hawaiian Hotel; Sheraton Waikīkī Hotel	HK; RH	None
2009	Thurman et al. (2009)	inventory survey	Moana Surfrider Hotel	RH	7068: historic-period cultural layer; 7069: historic-period trash pit
2009	Runyon et al. (2010)	monitoring	Moana Surfrider Hotel	RH	None
2011	Thurman et al. (2012)	monitoring	Royal Hawaiian Hotel	RH	None
2010-2011	Yucha et al. (2013)	inventory survey	St. Augustine-by-the-Sea	KB	None

Fieldwork Year	Reference	Type of Investigation	General Location	Sector^	Findings (Site 50-80-14-)*
2012-2013	Lima et al. (2014)	monitoring	Kalākaua Avenue	KB	None
2020	Morrison (2020)	monitoring	Royal Hawaiian Groin	RH	None

^ FD = Fort DeRussy, HK = Halekūlani, KB = Kūhiō Beach, RH = Royal Hawaiian.

* Only archaeological findings 50 m from the present project area (or of unknown location, possibly within 50 m of the project area) are shown.

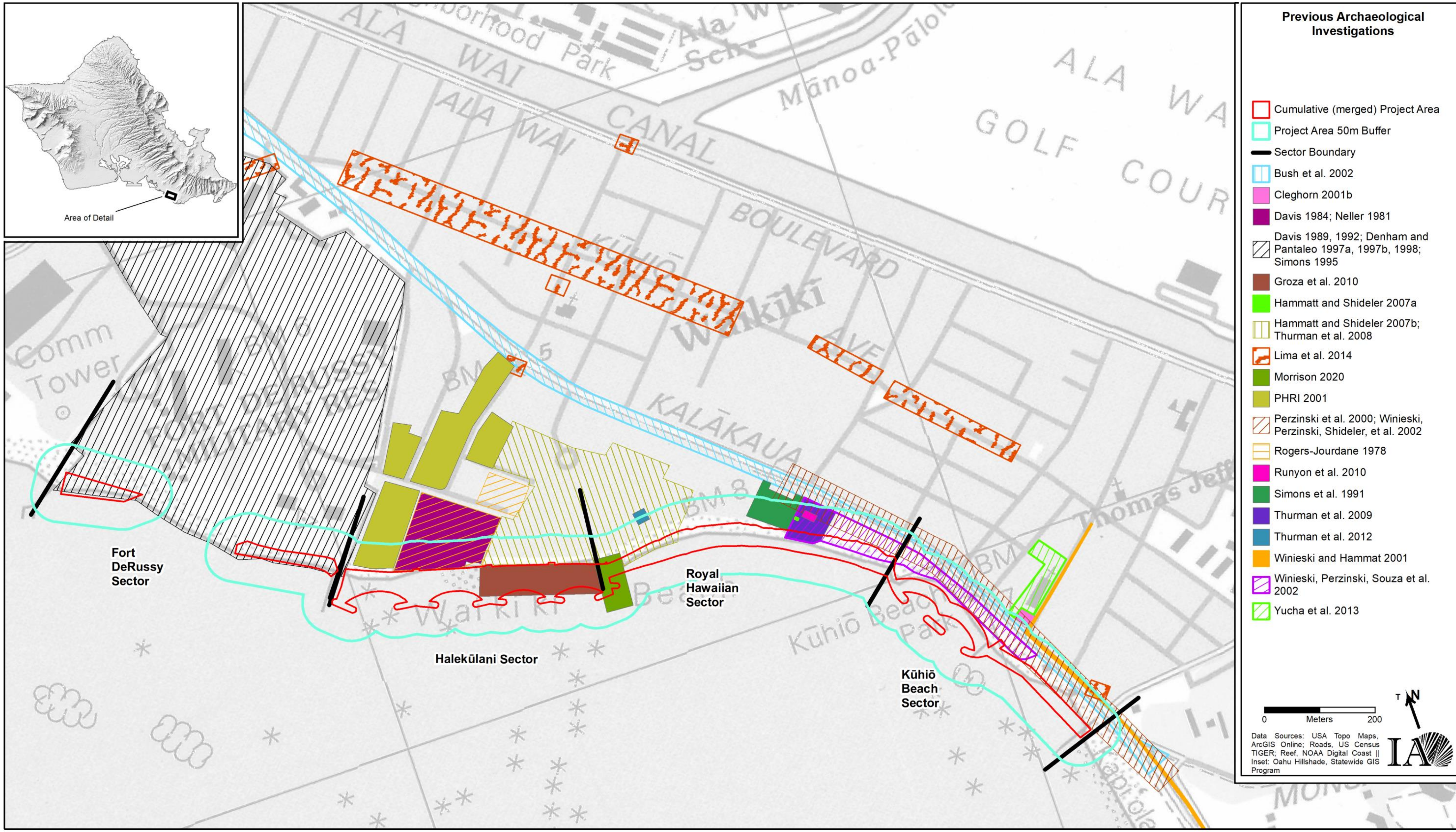


Figure 16. Previous archaeological investigations within 50 m of the project area.

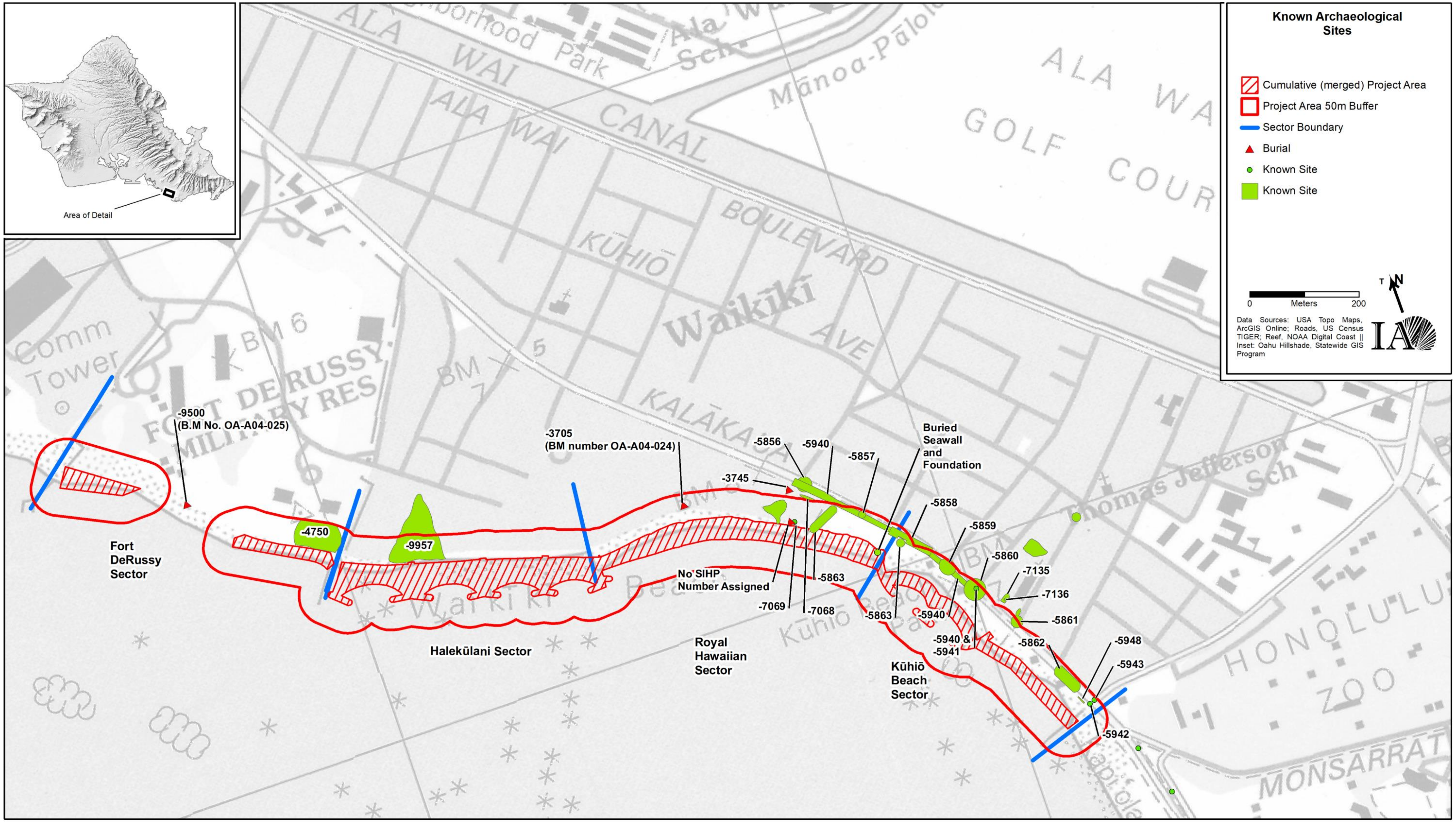


Figure 17. Known archaeological sites and burials within 50 m of the project area.

One of the earliest data recovery investigations in Waikīkī was conducted at the site of the Halekūlani Hotel. Neller (1981) documents an emergency reconnaissance survey during construction on the Halekūlani Hotel grounds after the discovery of numerous human bones and glass bottles was reported to the SHPD. At least four disturbed burials were noted during a site visit, along with various ceramic and glass artifacts, but construction was reportedly not stopped to allow additional investigations (Neller 1981:5). Davis (1984) subsequently conducted data recovery investigations and monitoring at the Halekūlani Hotel site in late 1981 and 1982. Fieldwork, which included excavation of nine trenches and 30 m^2 of controlled excavation, identified discrete archaeological deposits and human burials dating to the pre-Contact to early post-Contact eras and historic eras, respectively. The late 19th-century deposits were interpreted as most likely associated with the Robert Lewers residence built between 1881 and 1897.

Davis (1989, 1992) conducted a second large-scale project, including reconnaissance survey, monitoring, and data recovery, on the grounds of Fort DeRussy. Testing at Fort DeRussy encountered features associated with the Kālia fishpond complex, including pond sediments, walls, *'auwai*, and a sand berm, as well as traditional Hawaiian habitation deposits with hearths, *imu*, post molds, and midden, 19th-century trash pits, and debris associated with early 20th-century use of the property by the U.S. Army. Deposits from Loko Kaipuni (three ponds), Loko Paweo I and II, Loko Kaʻihikapu, and Loko o Pau, as well as the ʻAuwai o Pau that brought water to the fishponds from the uplands were recorded. Subsequent data recovery investigations at LCA 1515:2 encountered both pre-Contact-era and historic-era cultural deposits and a historic-era human burial.

Simons et al. (1991) conducted monitoring, data recovery, and historical research associated with renovations at the Moana Surfrider Hotel. Investigations revealed layers of historical-era fill overlying discrete archaeological deposits dating to the pre-Contact and post-Contact periods. A total of 24 "sets of human bones" were identified, which account for at least 17 individuals (Simons et al. 1991:99). The skeletal remains had no associated artifacts and were presumed to be of pre-Contact or early post-Contact age. The position of some of the remains suggested they were disturbed and reinterred during the original construction of the Moana Hotel in 1901. Pietrusewsky (1992) later documented the inadvertent discovery of a human mandible fragment on the grounds of the hotel.

BioSystems Analysis, Inc., conducted monitoring and data recovery at Fort DeRussy in the early 1990s in association with the realignment of Kālia Road and construction at the Hale Koa Hotel. The results of this fieldwork were later compiled by Denham and Pantaleo (1997a, 1997b, 1998), with a burial report by Carlson et al. (1994). Fieldwork was carried out across the Fort DeRussy property, with only a small portion occurring near the coastline. Investigations yielded features associated with the Kālia fishponds, including Loko Paweo (I and II), Loko Kaʻihikapu, and historical-era cultural deposits.

Another major set of archaeological investigations involved monitoring of several projects by Cultural Surveys Hawaiʻi in the late 1990s and early 2000s. These projects were conducted for the installation of anti-crime lighting along Kalākaua Avenue (Bush et al. 2002), the installation of a water main (Perzinski et al. 2000; Winieski, Perzinski, Shideler et al. 2002), the installation of a force main (Winieski and Hammatt 2001), and the expansion of Kūhiō Beach Park (Winieski, Perzinski, Souza et al. 2002). These projects encountered both pre-Contact and historical-era archaeological deposits, as well as numerous burials. Results of these projects demonstrate that substantial buried archaeological deposits exist along Kalākaua Avenue near the former location of Kuʻekaunahi Stream.

An archaeological inventory survey by Thurman et al. (2009) on the grounds of the Moana Surfrider Hotel provided additional data on subsurface deposits near the former ʻĀpuakēhau Stream. This project, which was undertaken in advance of the renovations of the hotel's Diamond Head Tower, encountered archaeological deposits dating to the late pre-Contact or early post-Contact periods and the historical era.

Several additional recent archaeological investigations have taken place along coastal Waikīkī with negative results, at least near the current project area. These projects include field inspections by Groza et al. (2010) and Hammatt and Shideler (2007c); monitoring by Hammatt and Shideler (2007a), Thurman and Hammatt (2008) Runyon et al. (2010), Thurman et al. (2012), Lima et al. (2014), and Morrison (2020); and an archaeological inventory survey by Yucha et al. (2013).

OVERVIEW OF ARCHAEOLOGICAL RESOURCES

The archaeological record of the Waikīkī shoreline is fragmented, disturbed, and damaged by over a century of urbanization. Nonetheless, archaeological investigations have shown that remnants of the former landscape lie beneath the asphalt and concrete of the modern resort area. This record can be characterized as an extensive but discontinuous buried A-horizon, with high-density clusters of archaeological material and burials representing the most intensive pre-Contact and historical-period occupations.

There are 15 sites that contain human skeletal remains, including at least 97 identifiable individuals (Table 5). The largest burial clusters include Sites 50-80-14-1974 and 50-80-14-5860, each of which contained 24 discrete burials. Site 50-80-14-1974 is on the grounds of the Moana Surfrider Hotel, while Site 50-80-14-5860 is at the intersection of Kalākaua Avenue and Kealohilani Avenue. Also along Kalākaua Avenue are Sites 50-80-14-5858 and 50-80-14-5859, which include eight burials each. Site 50-80-14-5861 at the intersection of Kalākaua and ʻŌhua Avenues includes seven burials.

There are also 10 sites that are buried archaeological deposits or discrete features (Table 6). Of particular note is Site 50-80-14-5940, which is described as a discontinuous deposit of very dark-stained sand containing diffuse charcoal flecks, traditional Hawaiian artifacts, midden, firepits, hearths, and other pits. It is a linear site that runs along Kalākaua Avenue between Kaʻiulani and Liliʻuokalani Avenues. This delineation of a site boundary is deceptive in two respects: (1) burial Sites 50-80-14-5857 through 50-80-14-5859, as well as the inland edge of Site 50-80-14-5863, fall within same area and thus could be included as clusters within the site; and (2) archaeological deposits have been identified with burial associations at the not-distant Sites 50-80-14-5860 and 50-80-14-5861 to the south and Sites 50-80-14-1974, 50-80-14-3705, 50-80-14-4570, and 50-80-14-9975 to the north and northwest. Thus, in actuality, it could be argued that the pre-Contact and historical-era occupation of Waikīkī beach encompasses the entire length of the shoreline adjacent to the project area, with probable concentrations of occupation at advantageous locations near stream mouths, fishing grounds, or easy canoe access to the open ocean.

Ten radiocarbon dates have been obtained from archaeological sites near the Waikīkī Beach Improvement and Maintenance Program area (Table 3). The earliest radiocarbon determination for the shoreward area is 410±50 BP (Davis 1989), obtained on a piece of unidentified charcoal from a hearth, which produces a bi-modal calibrated date of AD 1422-1529 and AD 1546-1635. Most dates indicate that the shoreline was occupied by the 15th or 17th centuries AD. It reasonable to assume, however, given the lack of extensive archaeological investigations in this area and the presence of earlier dates elsewhere on the Fort DeRussy property, that the immediate area was settled even earlier.

Table 5. Summary of Archaeological Sites with Human Remains within 50 m of Project Area.

SIHP No. (50-80-14-)	Site Description	Reference	Sector^
--	5 burials found during construction of Royal Hawaiian Hotel in October 1923, specific location unknown	reported in Hammatt and Shideler (2007c:59) and NPS (1998:4278)	RH
--	human mandible fragment identified on grounds of Moana Surfrider Hotel in 1992	Pietrusewsky (1992)	RH
--	human skeletal remains from eight individuals recovered on the grounds of the Sheraton Waikīkī in 1970	reported in Hammatt and Shideler (2007c:59) and NPS (1998:4282)	HK
--	human female “forearm bone” recovered on the grounds of the Sheraton Waikīkī Hotel in 1993	reported in Hammatt and Shideler (2007c:59)	HK
1974	24 burials plus pre-Contact and historic-period deposits; exposed during renovations of Moana Hotel in 1988	Simons et al. (1991)	RH
3705	burials eroding from sand dune in front of Surfrider Hotel, observed in 1964; specific location unknown	Bishop Museum site files; referenced in Davis (1989:24-25), Groza et al. (2010:54)	RH
4570	traditional Hawaiian and historic-period deposits; associated with LCA 1515:2; 1 historic-period burial	Davis (1989, 1992)	FD
5857	1 burial on Kalākaua Avenue between Ka‘iulani and Lili‘uokalani Avenues	Perzinski et al. (2000); Winieski, Perzinski, Shideler et al. (2002)	RH
5858	8 burials along Kalākaua Avenue between Uluniu and Lili‘uokalani Avenues	Perzinski et al. (2000); Winieski, Perzinski, Shideler et al. (2002); Winieski, Perzinski, Souza et al. (2002)	KB
5859	8 burials near intersection of Kalākaua and Lili‘uokalani Avenues	Perzinski et al. (2000); Winieski, Perzinski, Shideler et al. (2002)	KB
5860	pre-Contact and historic-period cultural deposits; 24 burials near intersection of Kalākaua Avenue and Kealohilani Avenue	Bush et al. (2002); Perzinski et al. (2000); Winieski, Perzinski, Shideler et al. (2002)	KB
5861	7 burials near intersection of Kalākaua and ‘Ōhua Avenues; pre-Contact and historic-period features and materials	Cleghorn (2001a, 2001b); Perzinski et al. (2000); Winieski, Perzinski, Shideler et al. (2002)	KB

SIHP No. (50-80-14-)	Site Description	Reference	Sector^
5862	pre-Contact and historic-period cultural deposits; two burials along Kalākaua Avenue between Paoakalani and Kapahulu Avenues	Perzinski et al. (2000); Winieski, Perzinski, Shideler et al. (2002); Winieski, Perzinski, Souza et al. (2002)	KB
5863	two burials *makai* of Kalākaua Avenue between Kaʻiulani and Uluniu Avenues	Winieski, Perzinski, Souza et al. (2002)	RH
9957	intact cultural deposit containing animal burials, postholes, trash pits, privies, pits; four burials; historic material associated with Robert Lewers residence	Davis (1984); Neller (1981)	HK

^ FD = Fort DeRussy, HK = Halekūlani, KB = Kūhiō Beach, RH = Royal Hawaiian.

Table 6. Summary of Archaeological Sites Without Human Remains within 50 m of the Project Area.

SIHP No. (50-80-14-)	Site Description	Reference	Sector^
--	portion of historic seawall; buried section extending northwest from inland end of Kūhiō Beach's ʻEwa basin; possibly associated with Waikiki Tavern	Nick Belluzzo, personal communication (2016); Davis (2017); Kanahele (1928c)	RH
5940	very dark-stained sand with diffuse charcoal flecks; contains traditional Hawaiian artifacts, midden, firepits, hearths, other pits; discontinuous, along Kalākaua Avenue between Kaʻiulani and Liliʻuokalani Avenues	Winieski, Perzinski, Shideler et al. (2002); Winieski, Perzinski, Souza et al. (2002)	KB
5940	very dark-stained sand with diffuse charcoal flecks; contains traditional Hawaiian artifacts, midden, firepits, hearths, other pits; discontinuous, along Kalākaua Avenue between Kaʻiulani and Liliʻuokalani Avenues	Winieski, Perzinski, Shideler et al. (2002); Winieski, Perzinski, Souza et al. (2002)	RH
5941	historic trash pit overlying Burial 36 of Site 5860	Winieski, Perzinski, Shideler et al. (2002)	KB
5942	remnant of the historic Honolulu Transit light-gauge trolley rail	Winieski, Perzinski, Shideler et al. (2002)	KB
5943	low-energy alluvial sediments associated with now-channelized Muliwai Kuʻekaunahi; near intersection of Kalākaua and Kapahulu Avenues	Winieski, Perzinski, Shideler et al. (2002)	KB

SIHP No. (50-80-14-)	Site Description	Reference	Sector^
5948	basalt boulder retaining wall exposed near intersection of Kalākaua and Kapahulu Avenues; may be remains of wall built as early as 1890 to protect Waikīkī Road (Kalākaua Avenue)	Winieski, Perzinski, Souza et al. (2002)	KB
7068	intact historic-period cultural layer; on north side of Moana Hotel Diamond Head Tower, along Kalākaua Avenue	Thurman et al. (2009)	RH
7069	historic-period trash pit; just inland of seawall at Moana Hotel Diamond Head Tower	Thurman et al. (2009)	RH
9980	several *ʻulu maika* found during construction of Royal Hawaiian Hotel in 1925; specific location unknown	reported in Kanahele (1995); numerous reports	RH

^ KB = Kūhiō Beach, RH = Royal Hawaiian.

KŪHIŌ BEACH SECTOR

The Kūhiō Beach sector consists of approximately 460 m (1,500 ft.) of shoreline extending from the ʻEwa (west) groin at Kūhiō Beach Park to the Kapahulu storm drain. The shoreline within this sector, which includes the southern portion of Kūhiō Beach Park, is essentially an enclosed body of water within a set of seawalls and groins built in the mid-20th century. This sector is at the southern end of the curving, protected portion of the Waikīkī coastline, where the shoreline runs nearly adjacent to Kalākaua Avenue. Until the late 1800s, Kuʻekaunahi Stream flowed as a wide, slow-moving estuary into the ocean in the southern portion of the Kūhiō Beach sector (around the present alignment of Paoakalani Avenue). This sector comprises portions of the *ʻili* of Hamohamo, Uluniu/Kapuni, and Kekio.

Kalākaua Avenue runs almost adjacent to the shoreline within this sector and there are no major buildings *makai* of Kalākaua Avenue. The Kūhiō Beach Hula Mound is at the northern end of the sector, and an outdoor concession stand is *mauka* of the ʻEwa basin of the Kūhiō groin complex.

HISTORICAL EVENTS

Notable historical events pertaining to the potential for archaeological resources within the Kūhiō Beach sector are summarized in Table 7. The sector is immediately south-southeast of the former mouth of ʻĀpuakēhau Stream, which served as the royal center of Hawaiian rulers in Waikīkī since the mid-1400s based on oral traditions.

Lands within and near the sector were transferred during the Māhele via three *aliʻi* land awards and seven *kuleana* awards (Table 8; Figure 18). The *aliʻi* awards included Kapuni/Uluniu in the north to Mataio Kekūanaōʻa (LCA 104FL:5); Hamohamo in the center (on the north side of Kuʻekaunahi Stream) to Keohokālole (LCA 8452:1), and Kekio in the south (on the south side of the stream) to Pehu for his wife Keʻekapu (LCA 5931:2). Hamohamo, which encompassed extensive inland lands, also included the coastal strip between Kuʻekaunahi and ʻĀpuakēhau Stream—nearly all of the Kūhiō Beach and Royal Hawaiian sectors—and as a result, Kapuni/Uluniu did not have any coastal access in this area.

Table 7. Historical Events Pertaining to the Kūhiō Beach Sector.

Year	Event	Reference
ca. 1400s	area near mouth of ʻĀpuakēhau Stream (Royal Hawaiian sector) becomes chiefly center for Oʻahu rulers	Beckwith (1970:383)
ca. 1848	LCAs included 3 *aliʻi* awards and 7 *kuleana* awards along shoreline	Māhele Book; NT
1859	Liliʻuokalani received the land of Hamohamo from her mother, Keohokālole (who was awarded the land in the Māhele)	Hibbard and Franzen (1986:8)
1877	Kapiʻolani Park opened	Hibbard and Franzen (1986:43)
1880	around this time, a bridge/causeway was built across mouth of Kuʻekaunahi Stream at entrance to Kapiʻolani Park; the bridge ran from around the present ʻŌhua Avenue to Monsarrat Avenue	Wiegel (2008:26)
1890	390-foot long retaining wall built to protect Waikiki Road (now Kalākaua Avenue), replacing part of bridge and causeway near entrance to Kapiʻolani Park	Wiegel (2008:26)
1890	ca. 130-foot long wooden timber pier on piles built sometime prior to 1890 off of Liliʻuokalani's Kealohilani residence; known as Queen Liliʻuokalani Pier or Kūhiō Pier	Kanahele (1995:136); Wiegel (2008:17)
1918	Prince Kūhiō acquired Liliʻuokalani's beach residence Kealohilani and built a new home called Pualeilani (his second home of the same name) on the property	Clark (1977:52); Hibbard and Franzen (1986:37)
1934-1935	City and County purchased the second Pualeilani house, including Liliʻuokalani Pier, and demolished both for beach improvements	Hibbard and Franzen (1986:38); Wiegel (2008:17, 26)
1939	650-foot long crib wall built along ʻEwa portion of Kūhiō Beach sector about 200 feet from shore (parallel to shore), with shore return structures at each end	Wiegel (2008:17)
1940	Kūhiō Park officially dedicated	Clark (1977:52)
1951	355-foot long Kapahulu Storm Drain built as part of Waikīkī Beach Improvement Project	Clark (1977:53); Wiegel (2008:17)
1953	750-foot long retaining wall built on ʻEwa side of Kapahulu Groin to keep sand from eroding away; called "Slippery Wall"	Clark (1977:53); Wiegel (2008:17, 27)
1972	retaining wall to protect Kalākaua Avenue removed	Wiegel (2008:27)

Table 8. LCAs in the Vicinity of the Kūhiō Beach Sector (Based on Bishop 1881).

LCA No.	Grantee	Description/Land Use	Other Reference
104 FL:5	Mataio Kekūanaōʻa	*aliʻi* award of Kapuni and Uluniu	NR Vol. 3, pp. 765-766
1433:1	Kaluhi	house lot in Hamohamo	NR Vol. 3, p. 109
1437:1	Kauhulenui (also Kaohulenui)	house lot	NR Vol. 3, p. 111
1446:1	Naa	unfenced house lot	NR Vol. 3, pp. 114-115
1459	Kuihewa	fenced house lot with two houses	NR Vol. 3, pp. 119-120
1468:1	Kaiahopuwale	fenced house lot with one house *mauka* of Government Road	NR Vol. 3, p. 123
2027	Palaualelo	house lot	NR Vol. 3, p. 329
5931:2	Pehu (for Keʻekapu)	*aliʻi* award of Kekio	NR Vol. 5, p. 182
8452:3	Analea Keohokālole	*aliʻi* award of Hamohamo (later inherited by Liliʻuokalani)	NR Vol. 5, pp. 567-568
10677	Pupuka	house lot	NR Vol. 4, p. 576

No *kuleana* awards were made within the Kūhiō Beach sector, though several were nearby. These clustered in two locations along the coast, one along the north side of Kuʻekaunahi Stream and the other about 80 m farther to the north. The southern cluster falls at the present intersection of Kalākaua and ʻŌhua Avenues. The northern cluster is at the intersection of Kalākaua and Liliʻuokalani Avenues. All are described in claims and testimonies as house lots.

LCA 1433:1, originally awarded to Kaluhi, is particularly notable because it is just inland of the location of Liliʻuokalani's beachside residence Kealohilani, which was subsequently the second Pualeilani home of Prince Jonah Kūhiō Kalanianaʻole (Figure 19). In the mid-century Mahele, the *ʻili* of Hamohamo was awarded to the high chief Keohokālole. In 1859, Keohokālole transferred the land to her daughter Liliʻuokalani (future queen of Hawaiʻi), who established Waikīkī residences at Paoakalani (*makai* of the present Ala Wai Canal) and a beachside cottage on the former LCA 1433:1 that she called Kealohilani.

One of the earliest structures to modify the shoreline was a bridge and causeway built across the mouth of Kuʻekaunahi Stream at the entrance to Kapiʻolani Park, which opened in 1877 (Photo 4). In 1890, a 390-foot-long retaining wall was built to protect Waikīkī Road (now Kalākaua Avenue), replacing part of the original bridge and causeway (Photo 5). Photo 6 shows a retaining wall at this location in 1931. The 1890 retaining wall is said to have been removed in 1972 (Wiegel 2008: 27); as discussed below, an existing portion of the wall may have been discovered during construction along Kalākaua Avenue.

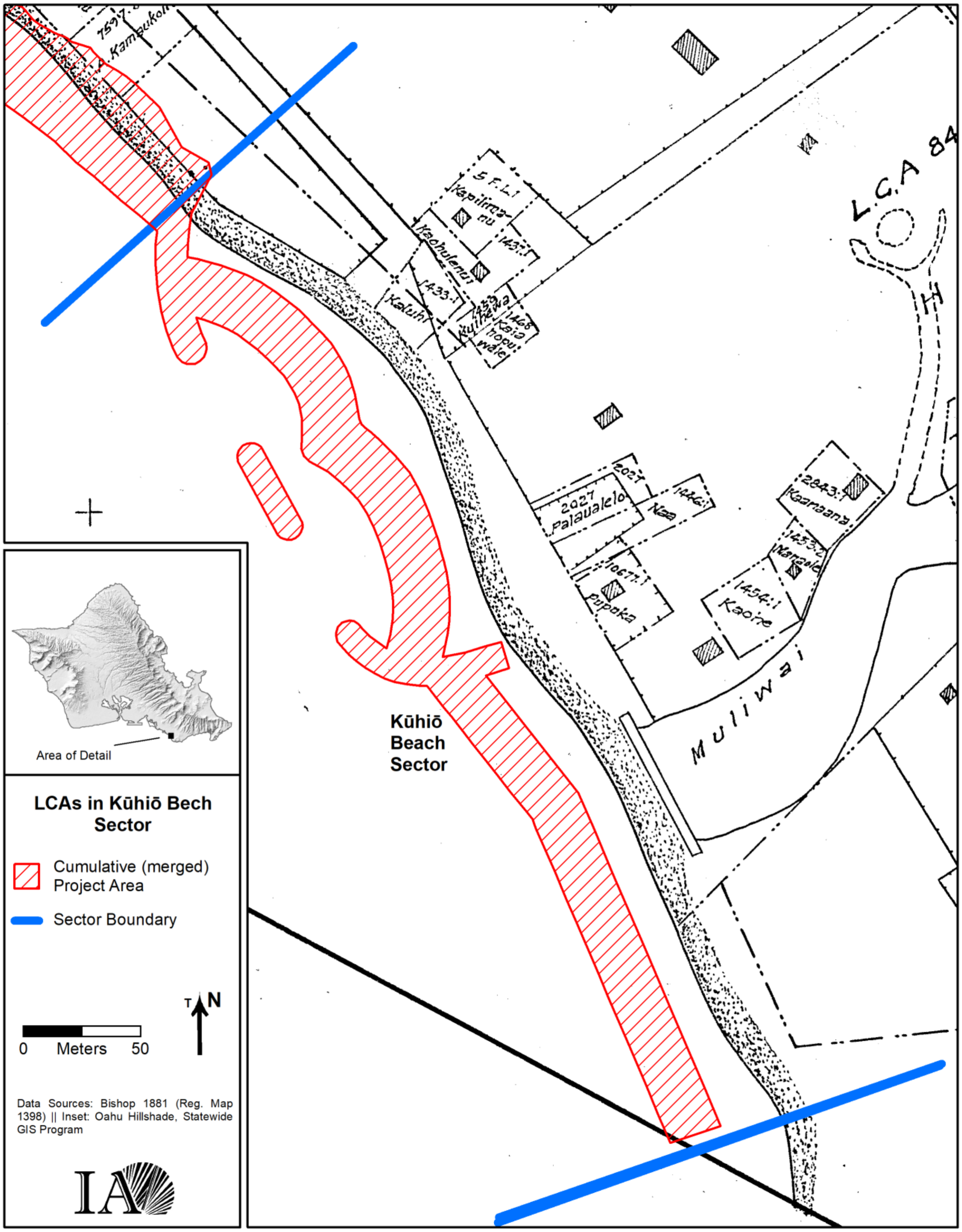


Figure 18. Overlay of Bishop's (1881) map showing LCAs near the Kūhiō Beach sector.

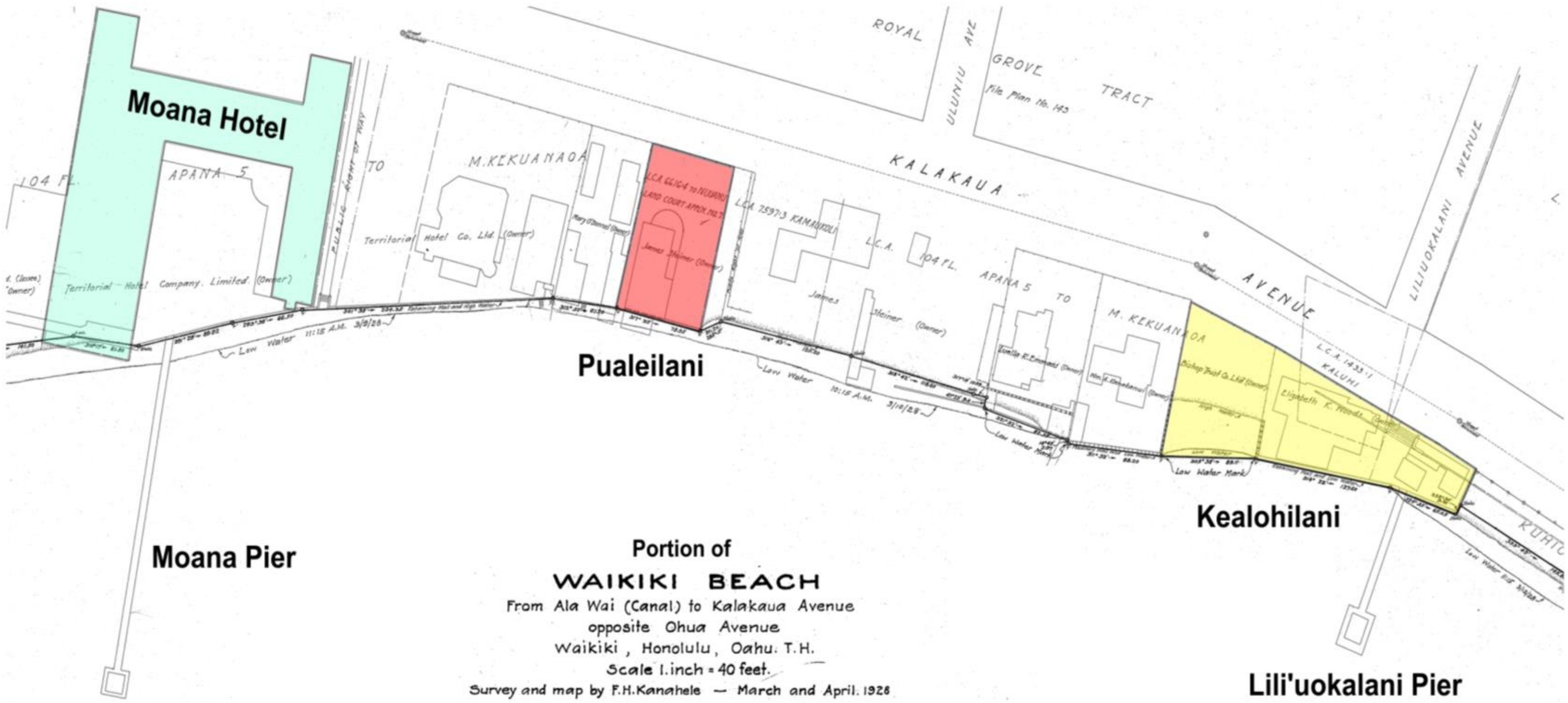


Figure 19. Section of Kanahele's (1928c) map of the Waikīkī shoreline, showing the location of Liliʻuokalani's Kealohilani parcel and Liliʻuokalani Pier; also shown is the location of Prince Kūhiō's original Pualeilani parcel and the Moana Hotel (in the Royal Hawaiian Beach sector).

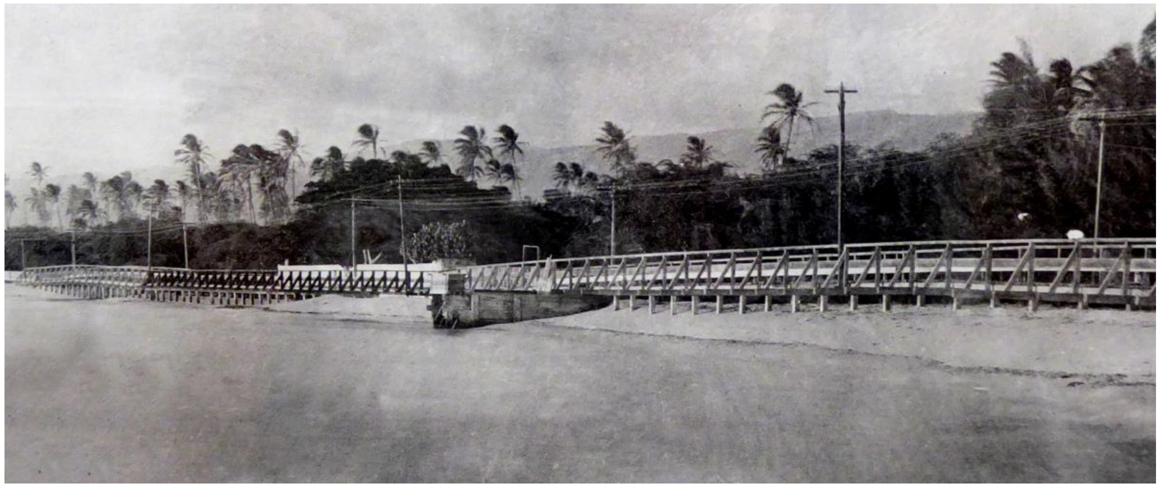


Photo 4. Bridge/causeway at the entrance to the new Kapiʻolani Park, around 1880, view to northeast. Hawaiʻi State Archives (PP115-11-006).

Photo 5. Kalākaua Avenue near Kapiʻolani Park, 1914; note the seawall along the left side of the photograph. Source: Hawaiʻi State Archives (PP115-7-012).

Photo 6. Aerial view of the Waikīkī shoreline, 1931. The retaining wall protecting Kalākaua Avenue is in the center of the photograph. Source: Hawai‘i State Archives.

An approximately 130-foot-long timber pier on piles was built sometime prior to 1890 off of Lili‘uokalani’s Kealohilani residence (Photo 7). Known as Queen Lili‘uokalani or Kūhiō Pier, it was demolished in 1934 (Kanahele 1995:136; Wiegel 2008:17).

Prince Kūhiō acquired Kealohilani in 1918 through an out-of-court settlement from his challenge to Lili‘uokalani’s establishment of a trust (Hibbard and Franzen 1986:37). He built a new home called Pualeilani on the property. This Pualeilani was the second home of this name owned by Kūhiō; his former Pualeilani home was approximately 300 m to the north (in the Royal Hawaiian sector). In 1922, the *Paradise of the Pacific* magazine noted that it was the last space in Waikīkī that was retained by a member of the royal family (Hibbard and Franzen 1986:38). The property was acquired by the City and County in 1934-1935 and the house was demolished for beach improvements (Hibbard and Franzen 1986:38).

Preparations for the opening of Kūhiō Beach Park in 1940 included the construction of a 650-foot-long crib wall built in 1939 200 feet from shore (parallel to shore) off the ‘Ewa end of Kūhiō Beach, with shore return structures at each end of the seawall (Wiegel 2008:17). The 355-foot-long Kapahulu Storm Drain was built in 1951 at the end of Kapahulu Avenue. The structure is an extension of the storm drain running under Kapahulu Avenue; the storm drain and groin, which is still a prominent feature of the

Waikīkī Beach shoreline, is commonly referred to as “The Wall” (Clark 1977:53). Other improvements included construction of a retaining wall on the Diamond Head side of the groin and importing sand.

In 1953, a 750-foot-long retaining wall was built between the 1939 crib wall and the Kapahulu Groin to keep sand from eroding. This wall, also still extant, is called “Slippery Wall” because of its very slick surface when wet due to the growth of fine seaweed (Clark 1977:53; Wiegel 2008:17, 27). It forms the boundary of Kūhiō Beach’s Diamond Head basin. The beach sand has been further supplemented several times, including through off-shore dredging ca. 2000 (Wiegel 2008:19).

Photo 7. Liliʻuokalani Pier, ca. 1890-1934. Hawaiʻi State Archives..

SHORELINE CHANGES

The Kūhiō Beach sector has seen extensive modification over the past century and a half. A comparison of the historical and contemporary coastlines shows that the present project area is entirely within beach that has been added since ca. 1880s (Figure 20). Nineteenth-century maps of the Waikīkī coastline show that this sector contained the mouth (*muliwai*) of Kuʻekaunahi Stream. Kuʻekaunahi Stream ceased to flow in the 1920s after it was cut off from the upland waterways by the Ala Wai Canal.

Shore structures built along the Kūhiō Beach sector shoreline are summarized in Table 9. The earliest of these was a bridge or causeway built along Kalākaua Avenue at the entrance to Kapiʻolani Park. Subsequent structures include Liliʻuokalani Pier (removed in 1934), a retaining wall along Kalākaua Avenue (possibly removed in 1972), and the structures of the Kūhiō groin complex, which include two shore-parallel seawalls enclosing a protected swimming area supplemented by groins. The most prominent of these groins is the Kapahulu Storm Drain at the Diamond Head end of the complex.

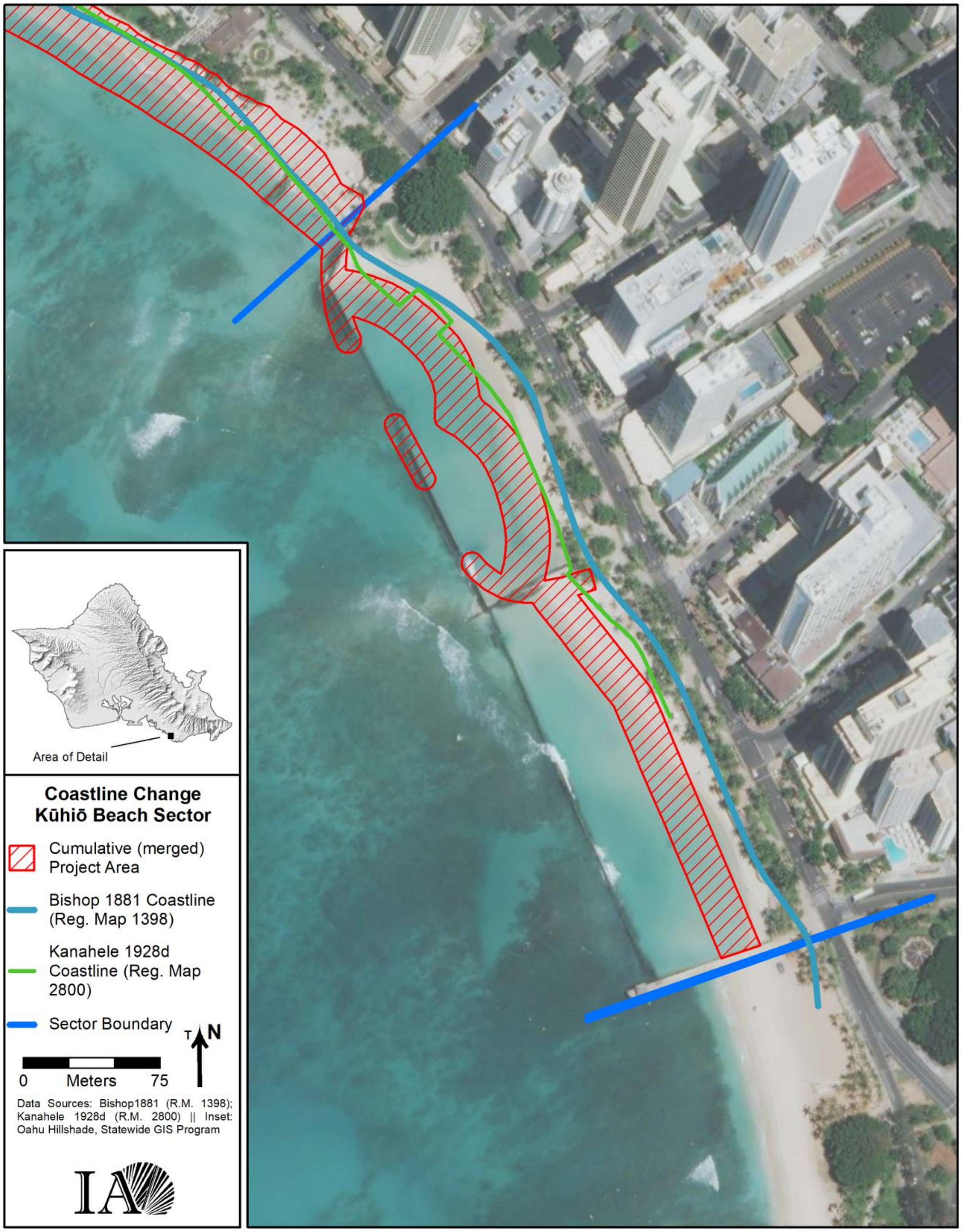


Figure 20. Historical coastlines in the Kūhiō sector.

Table 9. Seawalls and Groins within the Kūhiō Beach Sector.

Year Built	Year Demolished	Description	Length	Location	Reference
ca. 1880	1972?	bridge/causeway	?	Kapi‘olani Park entrance	Wiegel 2008:26
before 1890	1934	Lili‘uokalani (Kūhiō) Pier	130 ft	end of Lili‘uokalani Avenue	Kanahele 1995:136; Wiegel 2008:17
1890	1972?	retaining wall to protect Waikīkī Road (Kalākaua Avenue)	390 ft	Kapi‘olani Park entrance	Wiegel 2008:26, 27
1939	Extant	crib wall	650 ft	‘Ewa portion of Kūhiō Beach; 200 ft from shore	Wiegel 2008:17
1951	Extant	Kapahulu Storm Drain/Groin (“The Wall”)	355	end of Kapahulu Avenue	Clark 1977:53
1953	Extant	retaining wall (“Slippery Wall”)	750	‘Ewa side of Kapahulu Groin	Clark 1977:53; Wiegel 2008:17

KNOWN ARCHAEOLOGICAL SITES

No known archaeological sites are within the Kūhiō Beach sector. Eleven sites, inclusive of 52 burials, have been recorded within 50 m of the project area (Figure 21; Table 10). Site 50-80-14-5859 is a cluster of eight burials near the intersection of Kalākaua and Lili‘uokalani Avenues, which is the location of LCA 1433:1 and a group of nearby *kuleana* awards (LCAs 5FL:1, 1437:1, 1459, and 1468); it is also the location of Lili‘uokalani’s beach residence, Kealohilani. Non-burial sites include Site 50-80-14-5940 (an extensive but discontinuous archaeological deposit along Kalākaua Avenue between Ka‘iulani and Lili‘uokalani Avenues), Site 50-80-14-5941 (historical trash pit), Site 50-80-14-5942 (remnant of light-gauge rail), Site 50-80-14-5943 (low-energy alluvial deposits related to Ku‘ekaunahi Stream), and Site 50-80-14-5948 (an exposed seawall that might date to around 1890) (Figure 22).

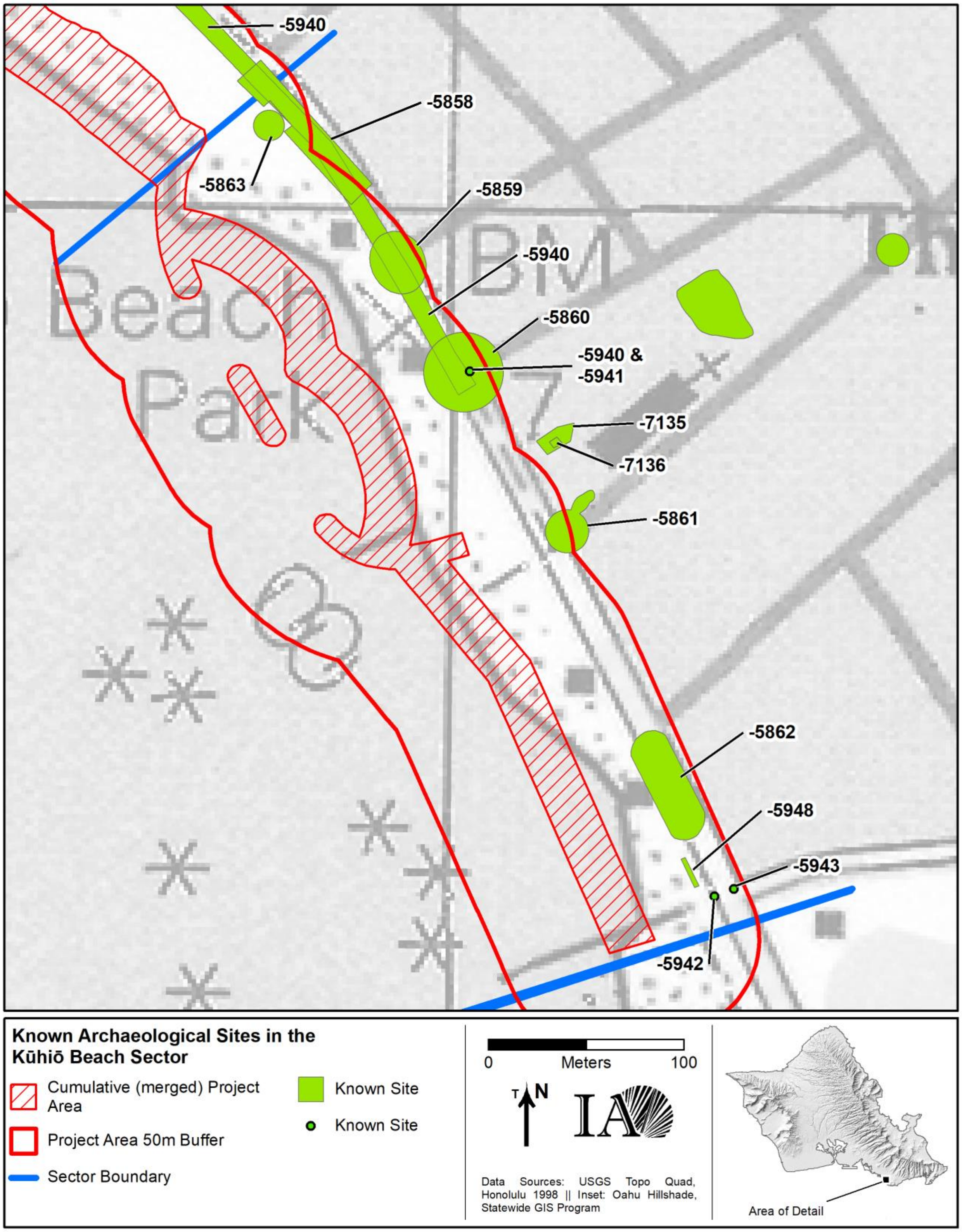
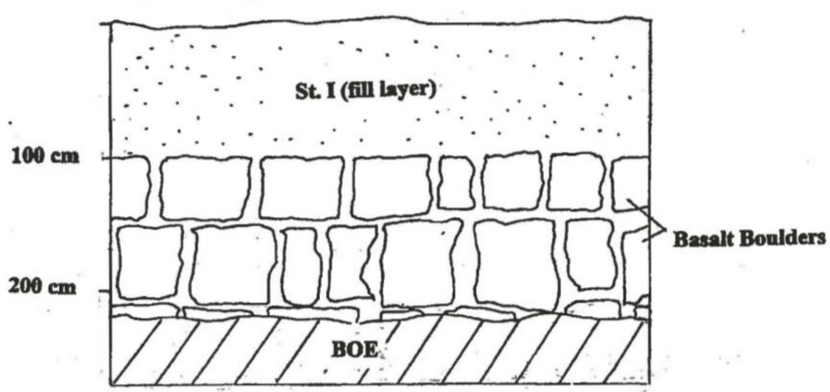


Figure 21. Known archaeological sites within 50 m of the project area, Kūhiō Beach sector.

Table 10. Known Archaeological Sites Within 50 m of the Kūhiō Beach Sector.

SIHP No. (50-80-14-)	Site Description	Reference
5858	8 burials along Kalākaua Avenue between Uluniu and Liliʻuokalani Avenues; buried A-horizon visible in some burials may be extension of Site 5940	Perzinski et al. (2000); Winieski, Perzinski, Shideler et al. (2002); Winieski, Perzinski, Souza et al. (2002)
5859	8 burials near intersection of Kalākaua and Liliʻuokalani Avenues; location of LCA 1433:1, near Queen Liliʻuokalani's beach residence Kealohilani; buried A-horizon visible in some burials may be extension of Site 5940	Perzinski et al. (2000); Winieski, Perzinski, Shideler et al. (2002)
5860	pre-Contact and historical-period deposits, 24 burials near intersection of Kalākaua Avenue and Kealohilani Avenue; buried A-horizon visible in some burials may be extension of Site 5940	Bush et al. (2002); Perzinski et al. (2000); Winieski, Perzinski, Shideler et al. (2002)
5861	7 burials near intersection of Kalākaua and ʻŌhua Avenues, pre-Contact and historical-period features and materials; location of LCA 10677:2; buried A-horizon visible in some burials may be extension of Site 5940	Cleghorn (2001a, 2001b); Perzinski et al. (2000); Winieski, Perzinski, Shideler et al. (2002)
5862	pre-Contact and historical-period deposits; 2 burials along Kalākaua Avenue between Paoakalani and Kapahulu Avenues	Perzinski et al. (2000); Winieski, Perzinski, Shideler et al. (2002); Winieski, Perzinski, Souza et al. (2002)
5863	3 burials at two locations near intersection of Kalākaua and Uluniu Avenues; may be part of Site 5858; 2 additional burials found in the Royal Hawaiian sector	Winieski, Perzinski, Shideler et al. (2002); Winieski, Perzinski, Souza et al. (2002)
5940	very dark-stained sand with diffuse charcoal flecks; contains traditional Hawaiian artifacts, midden, firepits, hearths, other pits; discontinuous, along Kalākaua Avenue between Kaʻiulani and Liliʻuokalani Avenues; burials and other deposits in this area are likely associated with this site; also encountered in the Royal Hawaiian sector	Winieski, Perzinski, Shideler et al. (2002); Winieski, Perzinski, Souza et al. (2002)
5941	historical trash pit overlying Burial 36 of Site 5860	Winieski, Perzinski, Shideler et al. (2002)
5942	remnant of the historical Honolulu Transit light-gauge trolley rail	Winieski, Perzinski, Shideler et al. (2002)
5943	low-energy alluvial sediments associated with now-channelized Muliwai Kuʻekaunahi; near intersection of Kalākaua and Kapahulu Avenues	Winieski, Perzinski, Shideler et al. (2002)
5948	basalt boulder retaining wall exposed near intersection of Kalākaua and Kapahulu Avenues, may be remains of wall built as early as 1890 to protect Waikiki Road (Kalākaua Avenue)	Winieski, Perzinski, Souza et al. (2002)

Figure 29 Photograph of Portion of Historic Sea Wall (State Site 50-80-14-5948), View East.



Stratum	Depth (cm.)	Description
I	0-100	10YR 4/3 sandy clay loam fill

* Profile Reconfigured from Field Notes and Photograph Documentation

Figure 22. Exposed seawall under Kalākaua Avenue (Site 50-80-14-5948). Photograph and profile drawing reproduced from Winieski, Perzinski, Souza et al. (2002:Figure 30).

ROYAL HAWAIIAN SECTOR

The Royal Hawaiian sector is approximately 530 m (1,730 ft.) of shoreline extending from the ‘Ewa basin of the Kūhiō groin complex to the Royal Hawaiian Groin. It lies at an inward curve in the Waikīkī coastline that allows the development of a wide sand beach and sits between two of the three former major stream outlets (Ku‘ekaunahi and ‘Āpuakēhau) that once flowed into the ocean. ‘Āpuakēhau Stream once flowed into the ocean near the northern edge of the sector (near the present location of the Royal Hawaiian Hotel). This sector is adjacent to the core of traditional and historical activity in Waikīkī. It falls within portions of the traditional *‘ili* of Helumoa and Hamohamo.

The Royal Hawaiian sector contains the beachfront of several prominent Waikīkī hotels, including the Royal Hawaiian Hotel and the Moana Surfrider. The southern end of the sector is the Kūhiō Beach Park and the Waikīkī Beach Center, which contains the Honolulu Police Department’s Waikīkī Substation and the Duke Paoa Kahanamoku Statue.

HISTORICAL EVENTS

Notable historical events pertaining to the potential for archaeological resources within the Royal Hawaiian sector are summarized in Table 11. ‘Āpuakēhau Stream was the major outlet of drainages originating in Mānoa and Pālolo Valleys and was the focus of *ali‘i* activity along the Waikīkī shoreline. Waikīkī was the home of O‘ahu ruling chiefs from at least the 1400s, during which Ma‘ilikūkahi moved the political center of O‘ahu to Waikīkī (Nāpōkā 1986:2; Beckwith 1970:383). From that time, it was the residence, either permanently or part-time, of the high *ali‘i*; the mouth of ‘Āpuakēhau Stream was the focal point of chiefly residence.

Around 1783, Maui king Kahekili landed an invasion force at Waikīkī and encamped at ‘Āpuakēhau. After successfully conquering the island, Kahekili established his residence on the bank of ‘Āpuakēhau Stream (Fornander 1919:VI-2:289; Kanahele 1995:79). After some time on Maui and Hawai‘i, Kahekili returned to Waikīkī, where he died in 1794.

In 1795, following the death of Kahekili, Waikīkī was the landing for an invading force led by Kamehameha. Although the invasion was successful, it was not until 1803 that Kamehameha moved permanently to O‘ahu (‘Ī‘ī 1959:16). He established his capital at Waikīkī and set up a residence, named Kūihelani, at Pua‘ali‘ili‘i on the northwest side of ‘Āpuakēhau Stream just inland of the shore (‘Ī‘ī 1959:17; Kanahele 1995:91, 92). The residence would have been between the present-day locations of the Moana and Royal Hawaiian hotels on the west side of ‘Āpuakēhau Stream just inland of the shore (‘Ī‘ī 1959:17; Kanahele 1995:91, 92). ‘Ī‘ī (1959:17) describes the compound, which was surrounded by the houses of his wife Ka‘ahumanu and his retainers:

> Kamehameha’s houses were at Puaaliilii, makai of the old road, and extended as far as the west side of the sands of Apuakehau. Within it was Helumoa, where Ka‘ahumanu *ma* went to while away the time. The king built a stone house there, enclosed by a fence; and Kamalo, Wawae, and their relatives [the Luluka family of John Papa ‘Ī‘ī] were in charge of the royal residence.

During the Māhele, four LCAs were recorded in or adjacent to the shoreline within the Royal Hawaiian sector (Table 12). An *ali‘i* land award for the coastal portion of Hamohamo was made to Keohokālole (LCA 8452:1). Three *kuleana* awards on the shoreline include LCAs 6616:4 and 7597:3 at the east end of the sector, and LCA 1445:1 at the west end (Figure 23); all three are described as house lots in land claims and testimonies. The *mauka* portion of the Royal Hawaiian sector overlaps slightly with the *makai* edge of these awards.

Table 11. Historical Events Pertaining to the Royal Hawaiian Sector.

Year	Event	Reference
1400s	Maʻilikūkahi moved the political center of Oʻahu to Waikīkī	Nāpōkā (1986:2); Beckwith (1970:383)
1500s	ruling chief of Oʻahu Kakūhihewa lived at Ulukou; during his reign, legend of Kalehuawehe and Pīkoi (surfing at what is now called Populars)	Pukui (1983:161-162); Nāpōkā (1986: 2); Kanahele (1995:73)
1600s	Maui chief Kauhi-a-Kama attacked Oʻahu; landed at Waikīkī but was defeated and killed by Oʻahu chief Kaʻihikapu, and then sacrificed at Helumoa Heiau	McAllister (1933:76); Nāpōkā (1986:5); Kanahele (1995:74)
1783	Maui king Kahekili conquered Oʻahu while camping at ʻĀpuakēhau; subsequently established a residence at ʻĀpuakēhau	Fornander (1919:VI-2:289); Kanahele (1995:79)
1794	Kahekili died at his home at Ulukou	--
1803	Kamehameha established his residence Kūihelani at Puaʻaliʻiliʻi	ʻĪʻī (1959:17); Kanahele (1995:91, 92)
ca. 1848	LCAs included an aliʻi award to Keohokālole and three *kuleana* awards	Māhele Book; NT
1859	Liliʻuokalani received the land of Hamohamo from her mother, Keohokālole (who was awarded the land in the Mahele)	Hibbard and Franzen (1986:8)
1866	Kamehameha V purchased property at Helumoa (LCA 1445:1)	Kanahele (1995:132)
1868	Kamehameha V purchased additional property (LCA 228) at Helumoa (inland of LCA 1445:1)	Kanahele (1995:132)
1880	Kalākaua purchased beachfront land at Uluniu and built a house (LCA 6616:4)	Kanahele (1995:133)
1881	James Dodd established the first bathhouse in Waikīkī at Ulukou; called the Long Branch, it was a cottage where bathers could change their clothes for a small charge	Hibbard and Franzen (1986:53); Kanahele (1995:152)
1883	Bernice Pauahi Bishop inherited the lands of Ruth Keʻelikōlani, which included the estate of Kamehameha V (who died in 1872); this included Helumoa, where Bishop and her husband built a house on the former LCA 1445:1	Kanahele (1995:132)
1884	first building constructed at location of present Waikīkī Beach Center; known over the years as Ilaniwai Baths, Wright's Villa, Waikiki Inn, Heinie's Tavern, and Waikiki Tavern	Clark (1977:54); Hibbard and Franzen (1986:51)
1890	240-foot long timber pier on piles constructed off the W.C. Peacock home (at the subsequent location of the Moana Hotel); originally called Peacock Pier and subsequently renamed Moana Pier	Wiegel (2008:21)
1899	Prince Kūhiō inherited his beachside property at Uluniu called Pualeilani from his *hānai* mother Kapiʻolani; this was the location of LCA 6616:4	Kanahele (1995:134)

Year	Event	Reference
1901	Moana Hotel opened, Waikīkī's first major hotel; 230-foot long seawall built in front of hotel	Hibbard and Franzen (1986:58-59); Wiegel (2008:21, 26)
1906	cottage-style Seaside Hotel opened	Hibbard and Franzen (1986:62)
1918	concrete wings added to Moana Hotel, doubling hotel's capacity	Hibbard and Franzen (1986:61)
1918	Prince Kūhiō opened his first Pualeilani home to the public (he moved to Lili'uokalani's Kealohilani property about 1,000 feet to the southeast and built a second Pualeilani home)	Clark (1977:52); Hibbard and Franzen (1986:37)
1925-1926	Royal Hawaiian Hotel built on the site of the former Seaside Hotel; groin built at same time; new seawall built shoreward of old seawall	Wiegel (2008:21, 26)
1927	concrete groin between Moana Hotel and Royal Hawaiian Hotel removed	Wiegel (2008:26)
1930	Royal Hawaiian Groin extended to 368 feet	Wiegel (2008:26)
1931	Moana Pier demolished	Wiegel (2008:21, 26)
1937	Territory acquired Dean's Hotel and Luella Emman's properties to be used for park (present Kūhiō Park)	SSRI (1985:A-15)
1969	21-story Surfrider Hotel opened on the west side of the Moana Hotel	Wiegel (2008:21)

Table 12. LCAs in the Vicinity of the Royal Hawaiian Sector (Based on Bishop 1881).

LCA No.	Grantee	Description/Land Use	Other Reference
1445:1	Kanemakua	house lot	NR Vol. 3, p. 114
6616:4	Nu'uanu	house lot; later site of Pualeilani, Prince Kūhiō's first beach home	NR Vol. 5, p. 382
7597:3	Anederea Kamaukoli	house lot	NR Vol. 5, pp. 413-415
8452	Analea Keohokālole	*ali'i* award of Hamohamo, including coastal strip along length of Royal Hawaiian sector (later inherited by Lili'uokalani)	NR Vol. 5, pp. 567-568

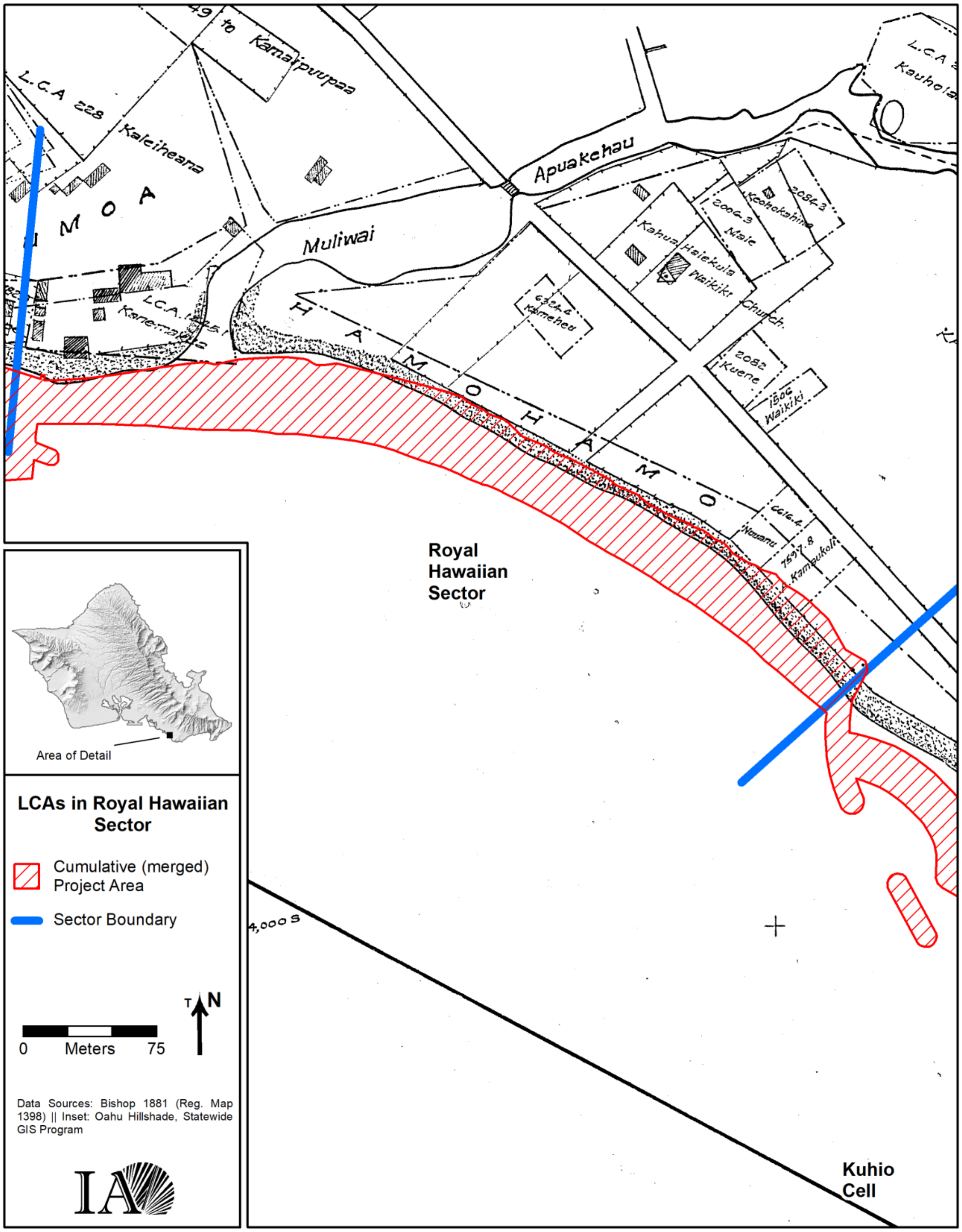


Figure 23. Overlay of Bishop's (1881) map showing LCAs in the Royal Hawaiian sector.

In the 19th century, this area became the beachside retreat for the *aliʻi*. Liliʻuokalani received the land of Hamohamo from her mother, Keohokālole, in 1859. Kamehameha V purchased property, including the former LCA 1445:1 at Helumoa, in 1866 on the northwest side of ʻĀpuakēhau Stream. This land was subsequently bequeathed to Bernice Pauahi Bishop, who built a house on the property. Land was purchased at Uluniu (at the southern end of the Hamohamo coastal strip) by Kalākaua and his wife Kapiʻolani, which was later inherited by Prince Kūhiō. Kūhiō built a home he called Pualeilani (see Kūhiō sector section for a description of Kūhiō's second Pualeilani home, located approximately 300 m to the south)

The ʻĀpuakēhau Stream outlet to the ocean transitioned from the focus of Waikīkī's *aliʻi* residences to the heart of the region's hospitality. The Long Branch Bathhouse, where bathers could change their clothes for a small charge, was established in 1881 at Ulukou (Hibbard and Franzen 1986:53). The first building at the location of the present Waikīkī Beach Center, the Ilaniwai Baths, was built in 1884 (Clark 1977:54; Hibbard and Franzen 1986:53).

In 1901, the first major hotel, the Moana, opened on the grounds of W.C. Peacock's home on the south side of the river (Figure 24). The hotel was originally outfitted with a 300-ft-long pier, originally called Peacock Pier, that was a landmark of the Waikīkī shoreline until it was demolished in 1931 (Wiegel 2008:21) (Photo 8). Two concrete five-story wings were added to the original four-story wooden structure in 1918, doubling the hotel's capacity (Hibbard and Franzen 1986:77). Five years after the establishment of the Moana Hotel, the cottage-style Seaside Hotel opened on Bernice Pauahi's property in Helumoa.

One of the earliest known seawalls in Waikīkī was a 230-foot-long seawall built ca. 1901 in front of the Moana Hotel (Hibbard and Franzen 1986:58-59; Wiegel 2008:21, 26). A concrete groin reportedly built between the Moana Hotel and Royal Hawaiian Hotel at an unknown date had been removed by 1927 (Wiegel 2008:26). The Moana Groin was a concrete wall built into the ocean on the Diamond Head side of ʻĀpuakēhau Stream sometime between 1906 and 1907 (see Photo 8); it was removed in 1927 (Kanahele 1928c; Wiegel 2008:26) (Photo 8).

The 21-story Surfrider Hotel opened on the western side of the Moana Hotel in 1969 (Wiegel 2008:21); the original Moana Hotel has been replaced by a newer building, and the Moana and Surfrider today operate as a single establishment called the Moana Surfrider[8].

Construction of the Royal Hawaiian Hotel on the grounds of the former Seaside Hotel began in 1925 and the hotel opened in 1927. The distinctive six-story building, with its pink-colored stucco concrete façade, contributed to the coastline's growing allure as a glamorous tourist destination. The hotel continues to operate in its original building. According to Hibbard and Franzen (1986:95):

> The 'pink palace' towered over its neighbors and had a majestic aura new to Waikīkī. Sheer massiveness, capped by a central tower that soared 150 feet above the street, enabled the Royal Hawaiian to join the Moana in dominating the beach's palm-filled skyline. Furthermore, its four hundred rooms, each with a bath, balcony, and view of either mountains or ocean, almost doubled the guest capacity of Waikiki.

A second seawall was built shoreward of the old seawall during the construction of the Royal Hawaiian Hotel ca. 1925-1927, and the 170-foot-long Royal Hawaiian Groin was added west of the hotel in 1927. The groin was extended to a length of 368 feet in 1930 and was substantially rebuilt in 2020 (Morrison 2020; Wiegel 2008:21, 26).

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[8] The full name of the hotel is Moana Surfrider, A Westin Resort & Spa, Waikīkī Beach.

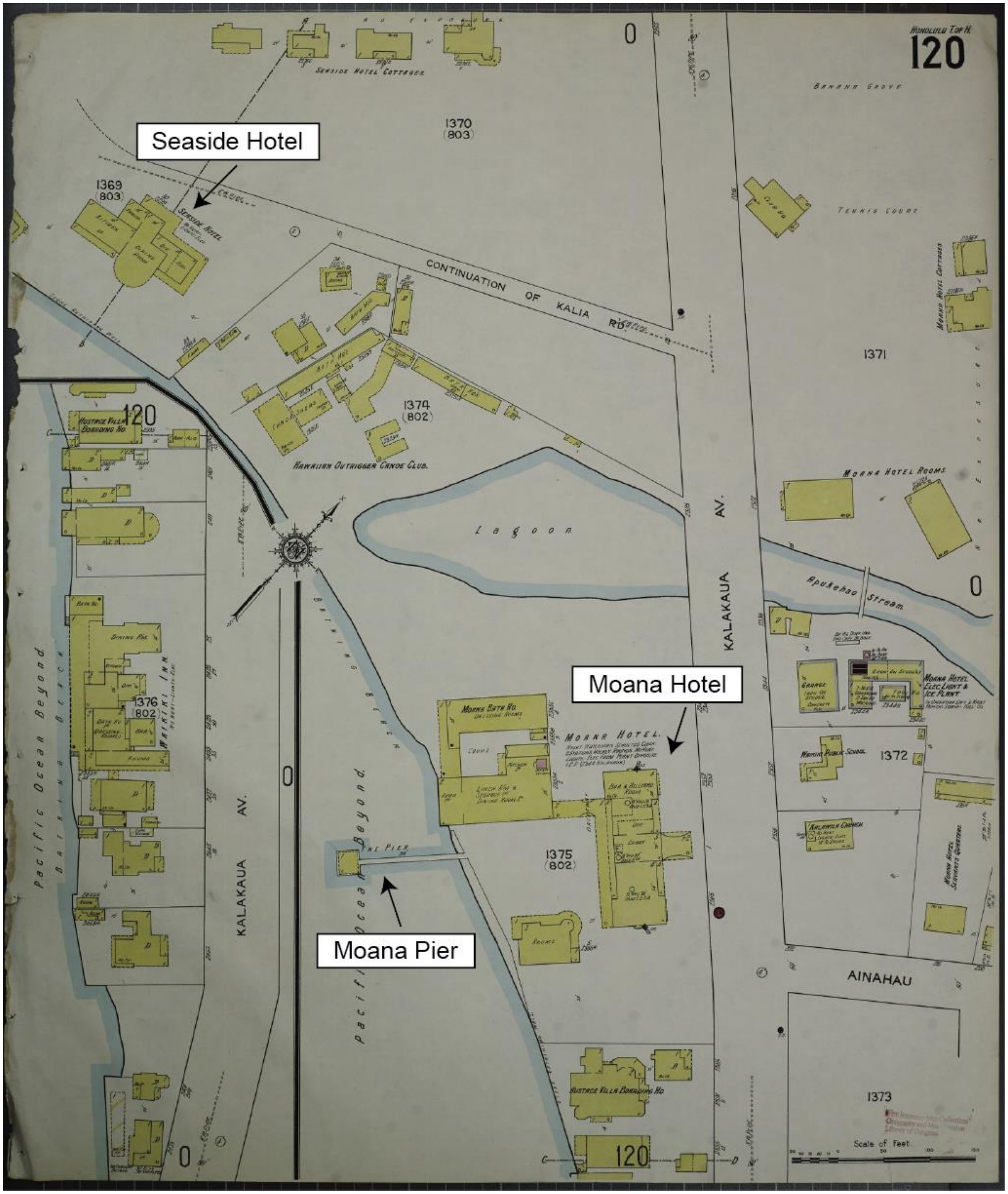

Figure 24. A 1914 Sanborn Fire Insurance map showing the location of the Moana Hotel and pier. The Seaside Hotel is also visible at the upper left.

Photo 8. View of the Moana Groin (foreground) and Moana Pier (midground), taken sometime between 1906 and 1920. Hawai‘i State Archives (Call No. PP115-12-003).

The Waikiki Tavern was operating on the Diamond Head-end of the Royal Hawaiian sector by the 1920s, at which time it was known as the "only place other than hotel dining rooms [along Kalākaua Avenue] where a person could obtain a meal" (Hibbard and Franzen 1986:117). The Waikiki Tavern was demolished in 1960 (Clark 1977:54). Kūhiō Beach Park, which occupies the southern portion of the sector, was dedicated in 1940 (Clark 1977:52).

SHORELINE CHANGES

A comparison of the historical and contemporary shorelines within the Royal Hawaiian sector shows that several shoreline structures were built during the early 20th century (Table 13) and that the beach has expanded considerably since ca. 1880s (Figure 25), especially on the ʻEwa side in front of the Royal Hawaiian Hotel. This sector was the location of the mouth (*muliwai*) of ʻĀpuakēhau Stream. Based on historical photographs, the stream mouth was nearly blocked by sand by the end of the 19th century (e.g., Wiegel 2008:Figure 2); the stream was made obsolete by the construction of the Ala Wai Canal in the 1920s.

The earliest shoreline structures was a seawall built in front of the Moana Hotel in 1901; it was followed by a second seawall in front of the Royal Hawaiian Hotel in 1925-1926. A groin between the Moana and Royal Hawaiian Hotel was demolished in 1927. The Royal Hawaiian Groin, built in 1927, was substantially rebuilt in 2020 but remains a prominent feature of the Waikīkī shoreline.

Table 13. Seawalls and Groins within the Royal Hawaiian Sector.

Year Built	Year Demolished	Description	Length	Location	Reference
1901	Extant?	seawall	230 ft.	in front of Moana Hotel	Hibbard and Franzen (1986:58-59); Wiegel (2008:21, 26)
?	1927	Moana Groin; concrete	?	between Moana Hotel and Royal Hawaiian hotels	Wiegel (2008:26)
1925-1926	Extant	seawall (shoreward of old seawall)	?	in front of Royal Hawaiian Hotel	Wiegel (2008:21, 26)
1927	Extant	Royal Hawaiian Groin	170 ft. (extended to 368 ft. in 1930; substantially rebuilt in 2020)	in front of Royal Hawaiian Hotel	Morrison (2020; Wiegel (2008:21, 26)

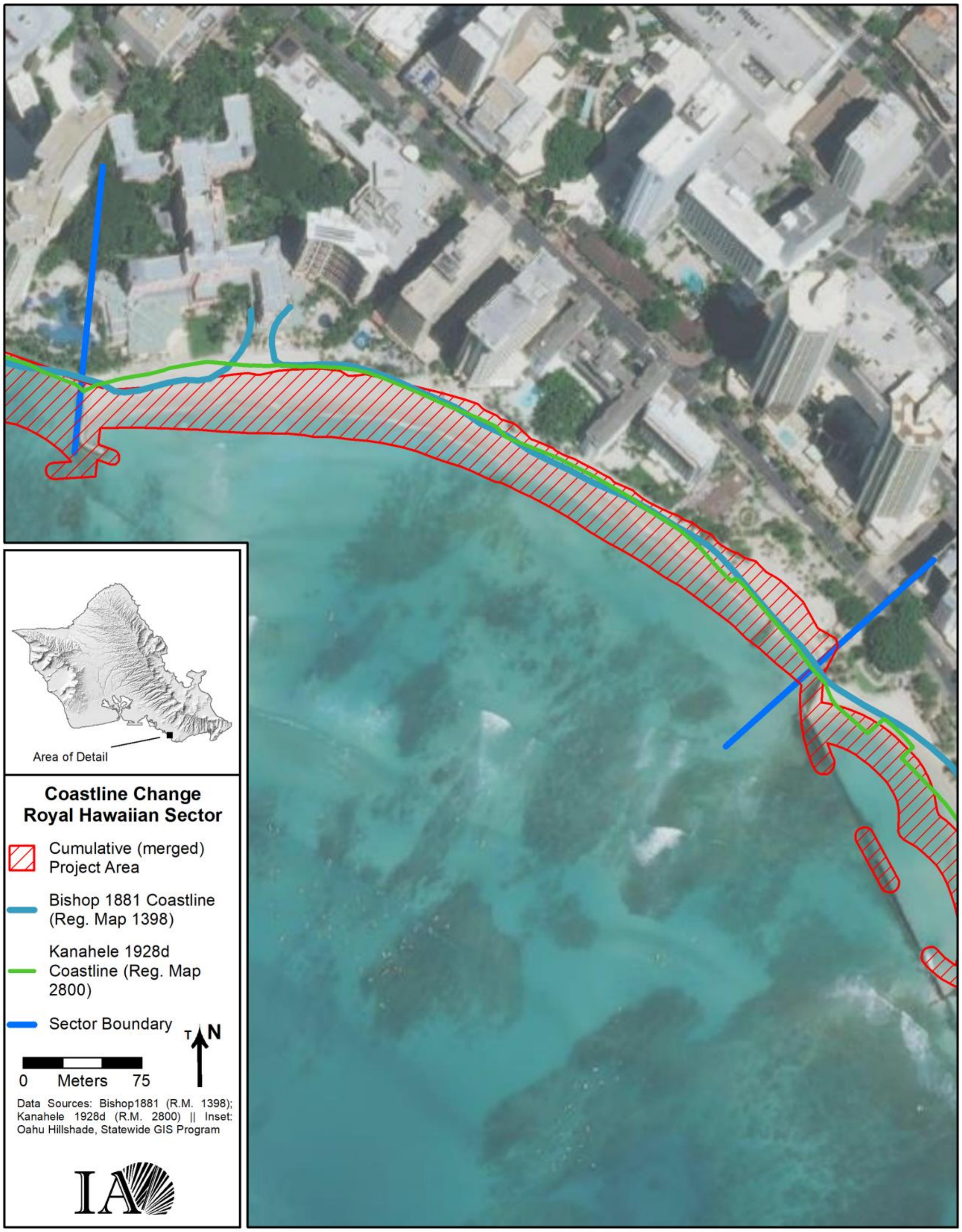

Figure 25. Historical coastlines, Royal Hawaiian sector.

Known Archaeological Sites

One archaeological site overlaps with the Royal Hawaiian sector with two sites and one burial adjacent to the inland margin (Table 14; Figure 26). At least 33 burials have been identified within approximately 50 m of the project area. Twenty-four burials (Site 50-80-14-1974) were identified on the grounds of the Moana Hotel, along with a possible pre-Contact archaeological deposit extending under both wings of the hotel. Site 50-80-14-5863, which contains two burials, overlaps with the sector boundary. This site is within LCA 6616:4, which later became the residence of Kalākaua and Kapiʻolani and which was eventually developed by Prince Kūhiō as his beachside home Pualeilani. Non-burial sites include Site 50-80-14-5940 (an extensive archaeological deposit), Site 50-80-14-7068 (a historical-period archaeological layer), and Site 50-80-14-7069 (a historical-period trash pit). Site 50-80-14-9980 was assigned to numerous *ʻulu maika* collected during the construction of the Royal Hawaiian Hotel (see Kanahele 1995:99).

Investigations by Simons et al. (1991) on the grounds of the Moana Hotel revealed layers of historical-era fill overlying discrete archaeological deposits dating to the post-Contact and pre-Contact periods. Two radiocarbon dates were obtained from the unidentified charcoal recovered from the pre-Contact layer. One sample from an ash lens produced a determination of 350±90 BP, which calibrates to AD 1408-1684, AD 1735-1803, and AD 1930-1950. Another charcoal specimen from an unspecified context produced a determination of 300±130 BP, which calibrates to AD 1424-1895 and AD 1903-1950. Because the Moana Hotel has occupied the site since 1901, the post-1900 probability ranges can be discarded for both dates. Archaeological features included firepits, post molds, unidentified pit features, animal burials (cat), and planting pits. The cat burials were thought to be associated with the Peabody family residence, and the planting pits were associated with early 20th century use of the property.

Burial 3 of Site 50-80-14-5863 was found at the *mauka* edge of the Royal Hawaiian sector, near the Waikīkī Police Station. Burial 3 is a modified human femur fragment moved by grading activities. The femur fragment was found to have been "deeply scored and snapped by a sawing or cutting instrument just below the lesser trochanter at the pectineal line" and thought to have been used in the manufacture of fish hooks (Winieski, Perzinski, and Souza et al. 2002:25). The original location of the femur fragment (prior to disturbance by grading) could not be identified and it was recovered for reburial at a dedicated off-site interment location.

The Moana Hotel, which opened in 1901 on the site of the former W.C. Peabody home as the first major hotel in Waikīkī, has been designated as Site 50-80-14-9901. The Moana Hotel was placed on the National Register of Historic Places (NRHP) in 1972.

Also within this sector is a portion of a buried seawall its Diamond Head end, immediately west of the hula mound. The buried seawall was observed by SHPD staff[9] (Nick Belluzzo, personal communication 2016) and is likely associated with a structure illustrated on Kanahele's (1928c) map of Waikīkī (Photo 9; Figure 27). A recent news article (Davis 2017) identifies the exposed concrete structure as part of the foundation of the Waikiki Tavern.

Helumoa Heiau was placed by Thrum (1906:44) at ʻĀpuakēhau. Based on a field inspection, Hammatt and Shideler (2007c:33) suggest its likely location as "the prominent point just on the Sheraton side of the Royal Hawaiian Hotel."

[9] The wall was examined by SHPD staff in 2016 but does appear to have been assigned an SIHP number.

Table 14. Known Recorded Archaeological Sites Within 50 m the Royal Hawaiian Sector.

SIHP No. (50-80-14-)	Site Description	Reference
1974	24 burials (large cluster in Banyan Court on *makai* side of hotel) plus pre-Contact and historic-period deposits; exposed during renovations of Moana Hotel in 1988; BM Site 50-Oa-A4-27	Simons et al. (1991)
3705	burials eroding from sand dune in front of 1969 Surfrider Hotel, observed in 1964; specific location unknown; BM Site 50-Oa-A4-24	Bishop Museum site files; referenced in Davis (1989:24-25), Groza et al. (2010:54)
5857	1 burial on Kalākaua Avenue between Ka‘iulani and Lili‘uokalani Avenues; falls with Site 5940 deposit	Perzinski et al. (2000); Winieski, Perzinski, Shideler et al. (2002)
5863	2 burials *makai* of Kalākaua Avenue between Ka‘iulani and Uluniu Avenues; location of LCA 6616:4, later the residence of King Kalākaua and eventually Prince Kūhiō who called it Pualeilani; 3 additional burials found in Kūhiō sector	Winieski, Perzinski, Souza et al. (2002)
5940	very dark-stained sand with diffuse charcoal flecks; contains traditional Hawaiian artifacts, midden, firepits, hearths, other pits; discontinuous, along Kalākaua Avenue between Ka‘iulani and Lili‘uokalani Avenues; burials and archaeological deposits in this area are likely associated with this site; also encountered in Kūhiō Beach sector	Winieski, Perzinski, Shideler et al. (2002); Winieski, Perzinski, Souza et al. (2002)
7068	intact historical-period archaeological layer; on north side of Moana Hotel Diamond Head Tower, along Kalākaua Avenue; possibly an extension of Site 5940	Thurman et al. (2009)
7069	historical-period trash pit; just inland of seawall at Moana Hotel Diamond Head Tower	Thurman et al. (2009)
9980	several *‘ulu maika* found during construction of Royal Hawaiian Hotel in 1925, specific locations unknown; possibly associated with the sports field Kahuamokomoko	reported in Kanahele (1995); numerous reports
--	5 burials found during construction of Royal Hawaiian Hotel in October 1923, specific location unknown; "…five individuals from Helumoa, Waikiki, Oahu were collected by Kenneth P. Emory. Museum information indicates they were victims of the 1853 smallpox epidemic" (NPS 1998:4278)	reported in Hammatt and Shideler (2007c:59) and NPS (1998:4278)
--	human mandible fragment identified on grounds of Moana Surfrider Hotel in 1992	Pietrusewsky (1992)
--	portion of historic seawall; buried section extending northwest from inland end of Kūhiō groin complex's ‘Ewa basin; possibly associated with Waikiki Tavern	Nick Belluzzo, personal communication (2016); Davis (2017); Kanahele (1928c)

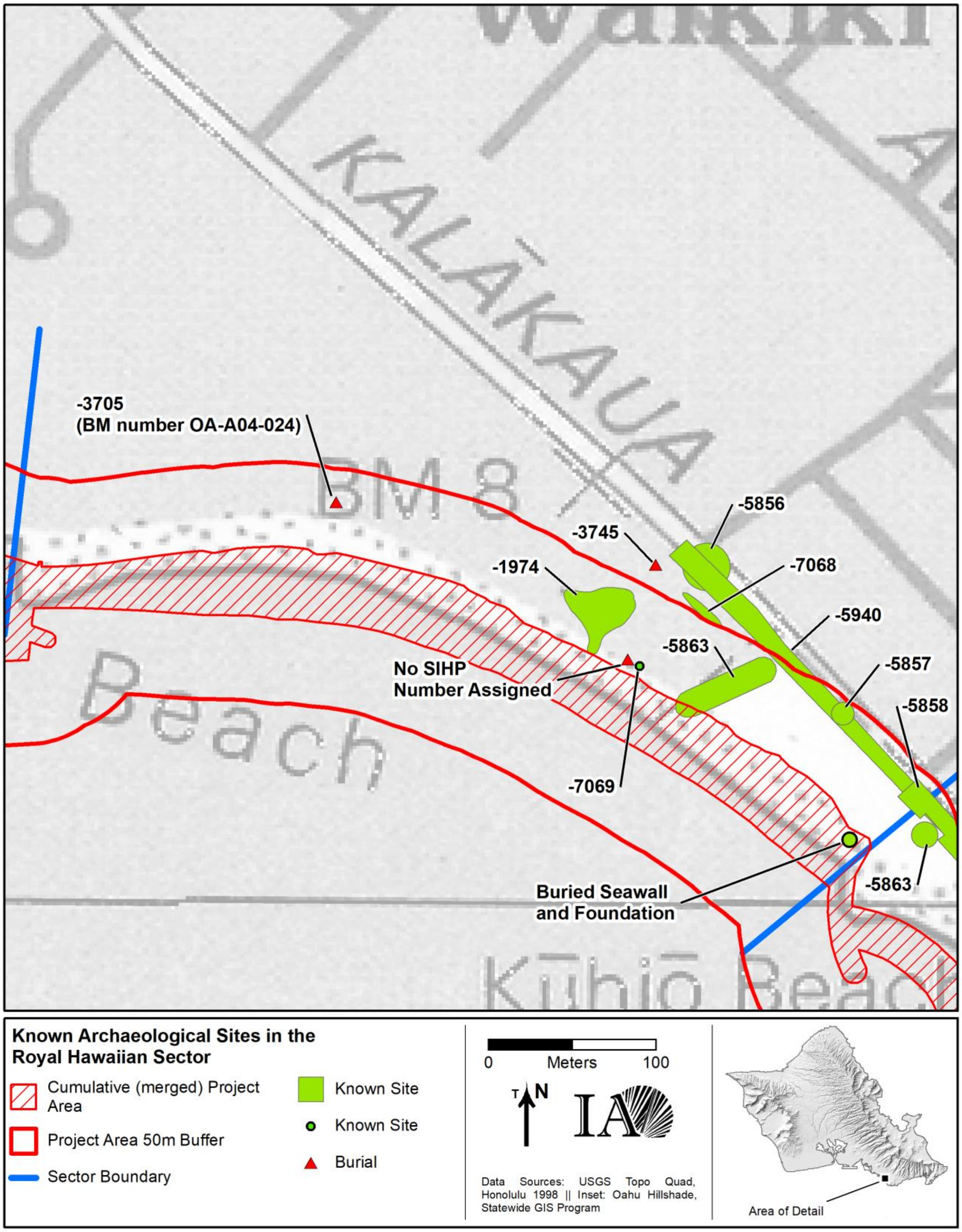

Figure 26. Known archaeological sites within 50 m of the project area, Royal Hawaiian sector.

Photo 9. Buried seawall in beach sand at south end of Royal Hawaiian sector (source: State GIS; photo courtesy of Nick Belluzzo).

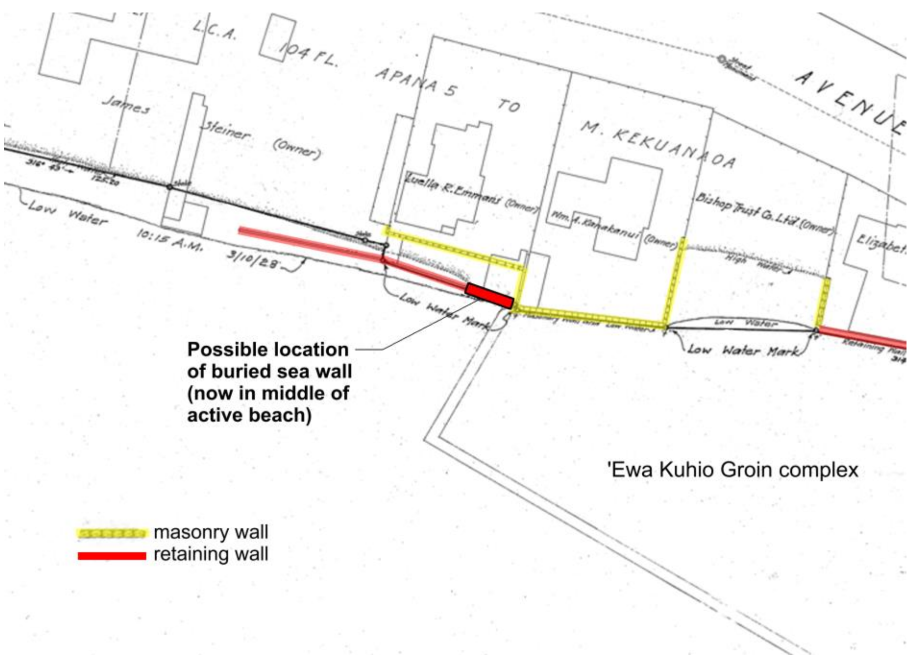

Figure 27. Portion of the Kanahele (1928c) map of Waikīkī, showing the possible location of the wall section exposed in Photo 9.

HALEKŪLANI SECTOR

The Halekūlani sector consists of approximately 440 m (1,450 ft.) of shoreline extending from the Fort DeRussy outfall groin to the Royal Hawaiian groin. This sector includes Halekūlani Beach, formerly known as Gray's Beach. The south-facing shoreline is a mix of seawalls and discontinuous, small, narrow sand beaches that front a fully developed urban landscape. Prior to modern development, the Halekūlani sector lay between two drainages, ʻĀpuakēhau to the east (in the Royal Hawaiian sector) and Kawehewehe to the west (along the boundary with the Fort DeRussy sector). Kawehewehe was the outflow from the large fishpond complex of Kālia, the inland area of present Fort DeRussy. This sector comprises portions of the traditional *ʻili* of Helumoa and Keōmuku.

Like the Royal Hawaiian sector, the Halekūlani sector contains the beachfronts of major Waikīkī hotels. From south to north, the hotels are the Sheraton Waikīkī, the Halekūlani Hotel, and the Outrigger Beach Waikīkī Beach Resort.

HISTORICAL EVENTS

Notable historical events with relevance for archaeological resources within the Halekūlani sector are summarized in Table 15. This sector was immediately ʻEwa of the mouth of ʻĀpuakēhau Stream (within the Royal Hawaiian sector), which served as the seat of the Waikīkī chiefs as early as the mid-1400s.

ʻĪʻī (1959:15) records that the area near the mouth of Kawehewehe Stream became the residence of the Luluka family, of which he was a member, when they moved to Oʻahu in the company of Kamehameha who was preparing for the invasion of Kauaʻi around 1803. ʻĪʻī's uncle was a member of the royal court, and members of the Luluka family were responsible for the royal residence at Puaʻaliʻiliʻi at Helumoa (in the Royal Hawaiian sector).

Twelve LCAs were awarded along the shoreline of the Halekūlani sector (Table 16). An *aliʻi* award of Keōmuku was made to Samuel Kuluwailehua (LCA 1281:1). Unlike the other sectors in the maintenance program, the shoreline within the Halekūlani sector is almost completely encompassed by *kuleana* awards (Figure 28). These awards are primarily house lots, although the Māhele claims indicate farming was also undertaken.[10]

In 1907, a small hotel called the Hau Tree opened in the former home of Robert Lewers. The Hau Tree, which became the Halekūlani in 1917, continued to grow in size and eventually incorporated the neighboring resort property Gray's-By-the-Sea. The Gray's-By-the-Sea boarding house was established by La Vancha Maria Chapin Gray in a two-story house built by Minnie Gilman (Mrs. Joseph A. Gilman) in 1903 and is the source of the name "Gray's Beach" sometimes used for this area (Clark 1977:56). A new Halekūlani Hotel was opened in 1932; the hotel was completely rebuilt in the 1980s to accommodate over 600 rooms.

[10] By the end of the century, however, and in some cases, within 30 years, Hawaiian landowners were gone, replaced by people with names like Brown, Davies, Castle, Lewers, Robinson, Macfarlane, and Damon (Wall 1893).

Table 15. Historical Events Pertaining to the Halekūlani Sector.

Year	Event	Reference
ca. 1400s	area near mouth of ʻĀpuakēhau Stream (Royal Hawaiian sector) becomes chiefly center for Oʻahu rulers	Beckwith (1970:383)
ca. 1803	Kawehewehe became residence of the Luluka family when they moved to Oʻahu as part of Kamehameha's entourage	ʻĪʻī (1959:17)
1912	Gray's by the Sea boarding house established by La Vancha Maria Chapin Gray	Clark (1977:56)
1926-1929	eight groins built between Royal Hawaiian Hotel and Fort DeRussy	Wiegel (2008:26)
1929	Charles Kimball acquired Gray's by the Sea and adjacent land and established Halekūlani Hotel	Clark (1977:56)
1931	new Halekūlani Hotel opened	Hibbard and Franzen (1986:103)
1932	aerial photograph shows five piers or groins	Wiegel (2008:Figure 19)

Table 16. LCAs in the Vicinity of the Halekūlani Sector (from Bishop 1881).

LCA No.	Grantee	Description/Land Use	Other Reference
922	Okuu	house lot	NR Vol. 2, p. 536
1281:1	Samuel Kuluwailehua	*aliʻi* award of Keōmuku, including coconut grove and fishery	NR Vol. 3, p. 54
1379:1	Kapule	fenced house lot with two houses	NR Vol. 3, p. 93
1380	Kahaaheo	taro patch	NR Vol. 3, p. 93
1385	Kaelemakule	house lot	NR Vol. 3, pp. 94-95
1388:1	Kahaleuliuli (also Kahelehulihuli)	house lot and *kula*	NR Vol. 3, p. 95
1508	Kahouluolu (also Kahoouluulu)	house lot	NR Vol. 3, p. 139
1511	Kanae	fenced house lot	NR Vol. 3, p. 140
1512:1	Nalaweha	partly fenced house lot	NR Vol. 3, p. 140
1513:1	Wailehua	fenced house lot	NR Vol. 3, p. 140
1782:3	Kahope	house lot	NR Vol. 3, p. 252
2126	Keoho (also Keaho)	house lot, pond, two rows and some hills of taro, section of irrigation ditch	NR Vol. 3, p. 365

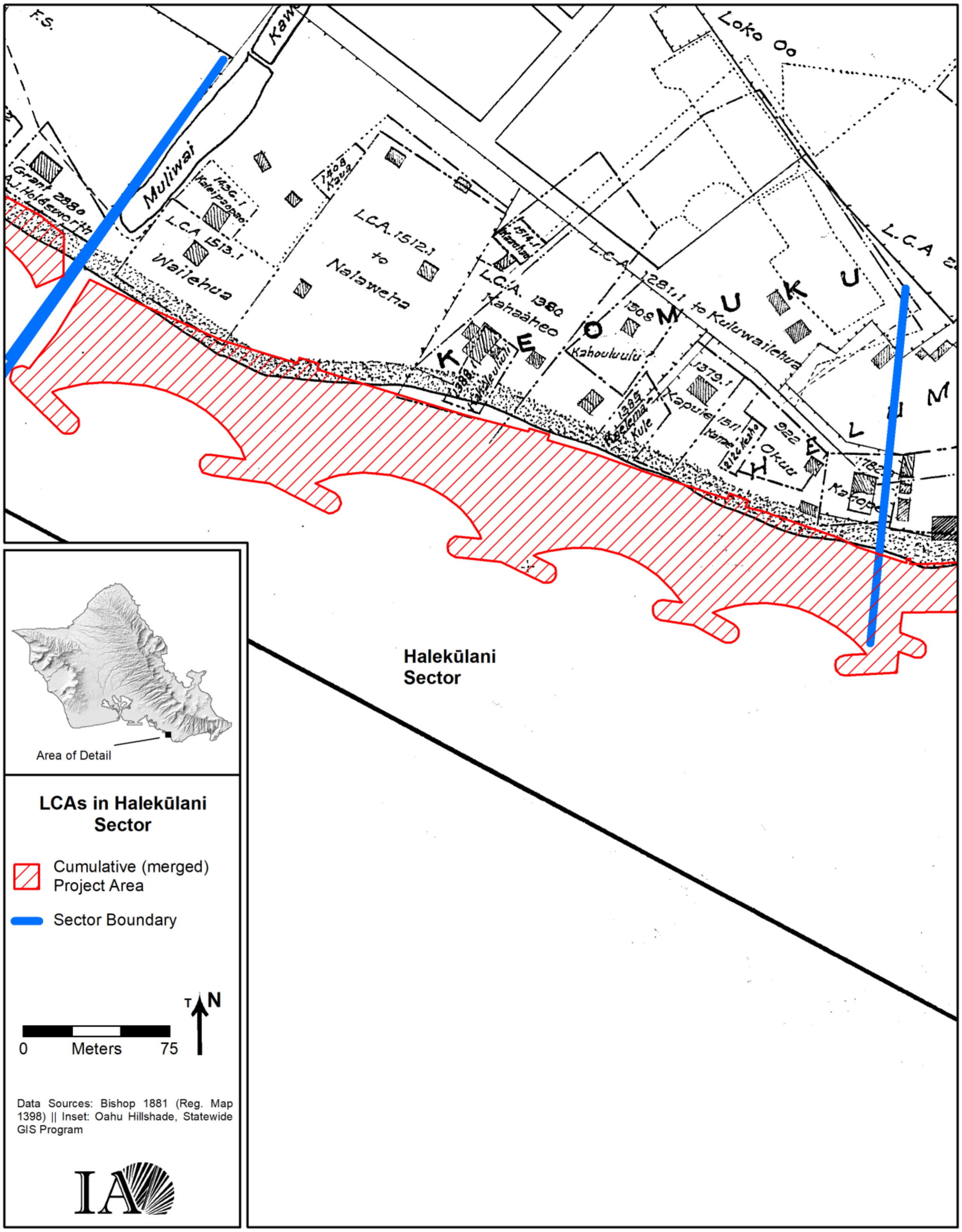

Figure 28. Overlay of Bishop's (1881) map showing LCAs in the Halekūlani sector.

The first seawalls in this vicinity were built in front of the S.C. Wilder home and Gray's By-the-Sea in 1913-1914, and in 1916 a 1,150-foot-long seawall was built along the shoreline in front of Fort DeRussy (Wiegel 2008: 26, Figure 18). The seawalls were constructed after offshore dredging in front of Fort DeRussy reportedly destabilized the coastline (Wiegel 2008:11). Kīna'u Wilder (quoted in Wiegel 2008:11) describes the drastic changes of that period to the shoreline:

> [After the dredging, the] beach at Waikiki was never the same. Instead of the reef holding the sands of the beach and preventing them from being carried out by the changing tides, the sand was swept through the hole in the reef, never to return. What had been a glorious beach – which no other beach on earth could touch – was nothing. Property owners lost anywhere from ten to thirty feet of their frontage. Everyone was forced to put up seawalls to keep from losing their houses as well. Instead of running from the grass right out to the ocean, we had to go down slippery steps to a miserable little strip of sand which, during certain months, was non-existent. At times I could jump from our seawall right into the water…

According to Wiegel (2008:26), eight groins were built "between [the] Royal Hawaiian Hotel and Fort DeRussy" between 1926 and 1929. Four groins are said to have been removed from this area in 1970 (Wiegel 2008:22). An aerial photograph taken in 1932 (Photo 10) shows five groins in the vicinity. The 'Ewa groin may be the original Fort DeRussy Groin at the boundary of the Halekūlani and Fort DeRussy sectors; the original Fort DeRussy Groin, built in 1917, was 70 feet long (Wiegel 2008:22).

Photo 10. A 1932 aerial photograph showing groins along the shoreline of the Halekūlani sector (source: Wiegel 2008:Figure 19).

SHORELINE CHANGES

The Halekūlani sector contains minimal beach, with sections in front of the Sheraton and Halekūlani Hotels fronted by concrete retaining walls. Several shoreline structures were built during the early 20th century (Table 17) and the small beach in front of the Outrigger Reef Resort developed after ca. 1881 (Figure 29). This is the former location of the outlet of a small waterway identified on Bishop's (1882) map as Kawehewehe (Bishop 1882), which may have drained the Kālia fishponds. This waterway, which may have been a small stream or artificial watercourse, may have been filled along with the Kālia fishponds in conjunction with the construction of Fort DeRussy.

Seawalls were built as early as 1914 after dredging offshore of Fort DeRussy initiated nearby beach erosion. Eight groins were built in this vicinity in the 1920s, four of which were removed in 1970.

Table 17. Seawalls and Groins in the Halekūlani Sector.

Year Built	Year Demolished	Description	Length	Location	Reference
1914	Extant?	seawall	290 ft.	in front of S.C. Wilder home and Gray's-By-the-Sea	Wiegel (2008:26)
1914?	Extant?	seawall	430 ft.	in front of Gray's Hotel	Wiegel (2008:26)
1914?	Extant?	seawall	225 ft.	Diamond Head of Gray's Hotel	Wiegel (2008:26)
1926-1929	1970	eight groins; four said to have been removed in 1970	various	between Royal Hawaiian Hotel and Fort DeRussy	Wiegel (2008: 22, 26)

KNOWN ARCHAEOLOGICAL SITES

No archaeological sites are known to be within the Halekūlani sector, with one site abutting a portion of the inland sector boundary (Table 18; Figure 30). Site 50-80-14-9957 was mapped and excavated in 1981-1982 during renovations to the Halekūlani Hotel (Davis 1984). A major portion of the site lies just inland of the seawall at the southwest corner of the hotel property (now occupied by the ʻEwa hotel tower). Murabayashi and Dye (2014:10-11) summarize the results:

> While most of the property was disturbed by recent construction, an area along the beach and an isolated area in the center of the property remained relatively intact. Excavations uncovered 32 features, including human skeletal remains, a dog burial, postholes, trash pits, privies, and several pits. Most of the trash pits contained bottles, ceramics, and metal. Although the area had been heavily disturbed by the recent construction, significant cultural materials dating to the late 1800s remained intact.

Additional archaeological finds include human skeletal remains recovered on the grounds of the Sheraton Waikīkī. The skeletal remains of eight individuals were collected in 1970 (NPS 1998:4282), and a single female "forearm bone" was collected in 1993 (Hammatt and Shideler 2007c:59).

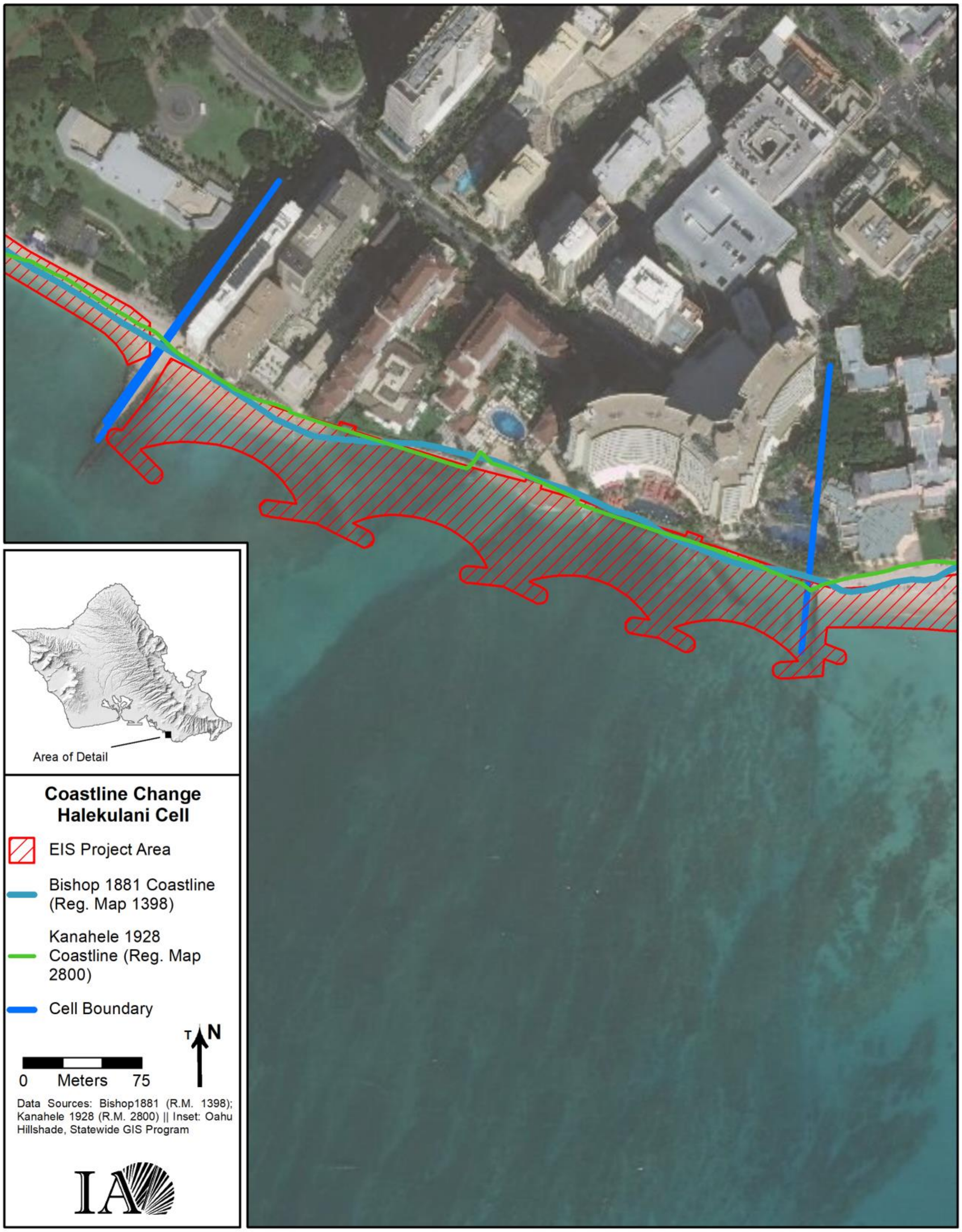

Figure 29. Historical coastlines, Halekūlani sector.

Table 18. Known Archaeological Sites Within 50 m of Halekūlani Sector.

SIHP No. (50-80-14-)	Site Description	Reference
9957	intact archaeological deposit containing animal burials, postholes, trash pits, privies, pits; 4 burials; historical material associated with Robert Lewers residence; site is inland of present seawall (BM Site No. Oa-A4-26)	Davis (1984); Neller (1981)
--	human skeletal remains from eight individuals recovered on the grounds of the Sheraton Waikīkī in 1970 (BM ID No. OA0522)	reported in Hammatt and Shideler (2007c:59) and NPS (1998:4282)
--	human female “forearm bone” recovered on the grounds of the Sheraton Waikīkī Hotel in 1993	reported in Hammatt and Shideler (2007c:59)

FORT DERUSSY SECTOR

The Fort DeRussy sector consists of approximately 510 m (1,680 ft.) of shoreline extending from the Hilton Hawaiian Village pier to the Fort DeRussy outfall groin. The southwest-facing shoreline is a continuous sand beach that fronts a landscaped open space of tended lawn and coconut trees in the Fort DeRussy Armed Forces Recreation Center. Until the early 20th century, Kawehewehe Stream, the outlet for the Kālia fishponds, ran into the sea along the southern edge of this sector. Pi‘inaio Stream entered the sea at a broad delta or estuary approximately 350 m north of the sector, near the southern end of the Ala Wai Boat Harbor. This sector is within the traditional *‘ili* of Kālia.

Today, the Hale Koa Hotel is just inland of the western portion of the sector and the U.S. Army Museum of Hawai‘i, housed in the historic 1914 Battery Randolph, is at the eastern end of the sector. A wide concrete promenade runs along the inland edge of the beach.

HISTORICAL EVENTS

Notable historical events pertaining to the potential for archaeological resources within the Fort DeRussy sector are summarized in Table 19. The shoreline within the Fort DeRussy sector was further removed from the Waikīkī chiefly center at the mouth of ‘Āpuakēhau Stream; nevertheless, this land near Pi‘inaio Stream and the Kālia fishponds was likely associated with noble families.

Like the Halekūlani sector, the Fort DeRussy sector includes portions of Kawehewehe. As noted above, Kawehewehe was known as the residence of the Luluka family, which moved to O‘ahu from Lāhainā with Kamehameha around 1803. The family maintained the royal residence at Pua‘ali‘ili‘i as retainers of Kamehameha (‘Ī‘ī 1959:17).

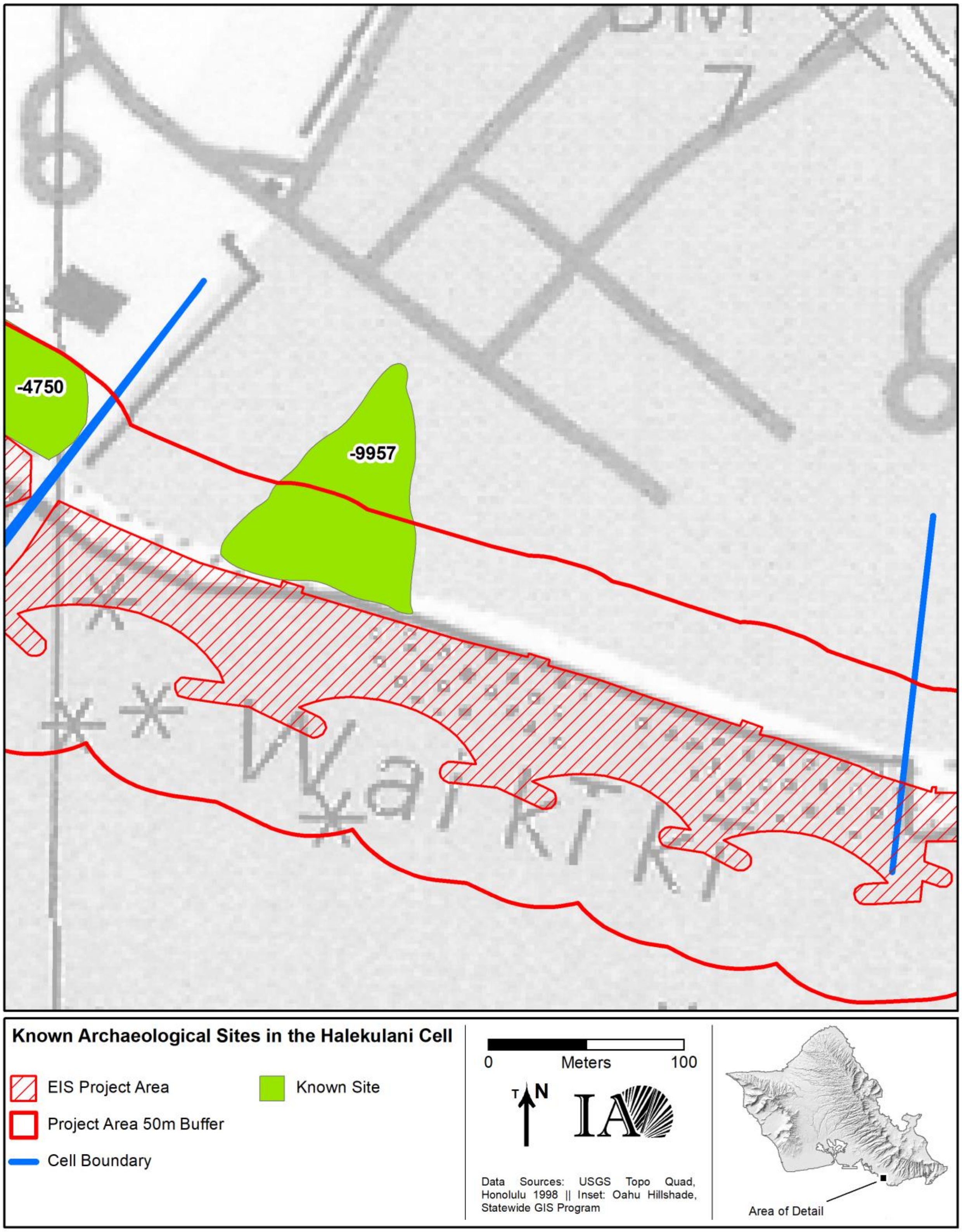

Figure 30. Known archaeological sites within 50 m of the project area, Halekūlani sector.

Table 19. Historical Events Pertaining to the Fort DeRussy Sector.

Year	Event	Reference
ca. 1400s	area near mouth of ʻĀpuakēhau Stream (Royal Hawaiian sector) becomes chiefly center for Oʻahu rulers	Beckwith (1970:383)
ca. 1803	Luluka family established residence at Kawehewehe, when they moved to Oʻahu with Kamehameha; members of family were in charge of the royal residence at Puaʻaliʻiliʻi	ʻĪʻī (1959:17)
1904-1910	U.S. War Department acquired 73 acres of Kalia through purchase, condemnation, and Executive Order	Hibbard and Franzen (1986:79)
1909	Fort DeRussy established; over next two years, Kalia fishponds filled by dredging off-shore reefs and pumping into ponds	Hibbard and Franzen (1986:79); Clark (1977:58)
1910-1914	Batteries Randolph and Dudley constructed as part of Artillery District of Honolulu	Davis (1989:7)
1916	1,150-foot long seawall built along Fort DeRussy shoreline	Wiegel (2008:Figure 18, 26)
1917	70-foot long groin built at east boundary of Fort DeRussy sector	Wiegel (2008:22)
1941	shoreline of Fort DeRussy closed to the public for duration of WWII	Clark (1977:58)
1945	Fort DeRussy beach reopened to public	Clark (1977:58)
1969	Fort DeRussy groin at east boundary lengthened from 70 to 300 feet	Wiegel (2008:22)
1971	rubble-mound groin added to Fort DeRussy groin	Wiegel (2008:22)

During the mid-19th century land division, Kālia, including the large complex of six fishponds inland of the Fort DeRussy sector, was awarded to the high chief Mataio Kekūanaōʻa as LCA 104 FL:6 (Davis 1989:14). Five *kuleana* awards (Table 20) and five land grants (Table 21) were made along the coast (Figure 31). LCA 867:1 to Nihopuu, located at the middle of the sector, was a small house lot at the shore, with separate inland taro patches and an *ʻauwai*; the house lot contained one house surrounded by a wooden fence (Davis 1989:83). LCA 1515:2 to Kaihoolua, seaward of Battery Randolph, was also a fenced house lot (Davis 1989:87). The five land grants were also awarded in the mid-19th century. Grant 2880 to H.J.K. Holdsworth, which is at the southern edge of the sector, overlaps slightly with the project area.

The U.S. Army began to acquire land in the Kālia area in 1904. Extensive dredging of the reef off Fort DeRussy was conducted between 1908 and 1910, with the dredged coral used to infill the Kālia fishponds (Wiegel 2008:10). In 1913, a "deep channel was dredged through the reef in front of Fort DeRussy" to facilitate the arrival of a bargeload of 69-ton guns (Thompson 1985:37). The dredging is said to have contributed significantly to the erosion of beach sand long the Waikīkī shoreline by altering the currents (see discussion in Halekūlani sector section, above).

Battery Randolph was completed and armed by 1914. Battery Dudley, which was adjacent to and northwest of Randolph, was armed in 1916. To protect the remaining beach in front of Fort DeRussy, a 1,150-foot-long seawall was built on the reef in 1916; the area behind the seawall was later infilled with dredged coral to significantly expand the active beach (Wiegel 2008:12). A 70-foot-long box culvert and groin at the Diamond Head edge of the Fort DeRussy sector, originally built in 1917, was lengthened to

300 feet in 1969 and supplemented by a rubble mound groin ca. 1971 (Wiegel 2008:22). Photo 11 is a 1919 aerial image of the batteries and seawall, which is estimated to lie just seaward of the present promenade.

Both batteries were decommissioned in 1944, and Battery Dudley was demolished in 1970 (see Davis 1989:21). Battery Randolph has housed the U.S. Army Museum of Hawai‘i since 1976. The Artillery District of Honolulu (Site 50-80-14-1382), which includes Battery Randolph, was listed on the NRHP in 1984.

Table 20. LCAs in the Vicinity of the Fort DeRussy Sector (from Bishop 1881).

LCA No.	Grantee	Description/Land Use	Other Reference
867:1	Nihopuu	fenced house lot, taro patches, and *‘auwai* (taro patches and *‘auwai* in inland portion)	NR Vol. 3, p. 531
1409:1	Nakoko	partly fenced house lot	NR Vol. 3, pp. 100-102
1410	Paele	unfenced house lot	NR Vol. 3, p. 101
1515:2	Kaihoolua (also Kaihuolua)	house lot, four *lo‘i*, a *kula*, and a fishery	NR Vol. 3, pp. 140-141
2511	Alapai (also Alapa)	house lot and coconut grove	NR Vol. 3, p. 531

Table 21. Land Grants in the Vicinity of the Fort DeRussy Sector (from Bishop 1881).

Grant No.	Grantee	Year	Acres	Other Reference
2607	Francis Spencer	1859	1.4	Vol. 12, pp. 443-444
2636	George McLean	1859	0.4	Vol. 12, pp. 501-502
2739	George McLean*	1860	1.1	Vol. 13, pp. 133-134
2880	H.J.K. Holdsworth**	1862	0.45	Vol. 13, pp. 415-416
2997	Elisha H. Allen	1865	0.88	Vol. 14, pp. 49-50

* Bishop’s (1881) map assigns the grant to “C. Afong/G. Mclean.”

** Bishop’s (1881) map assigns the grant to “R.H. Holdsworth.”

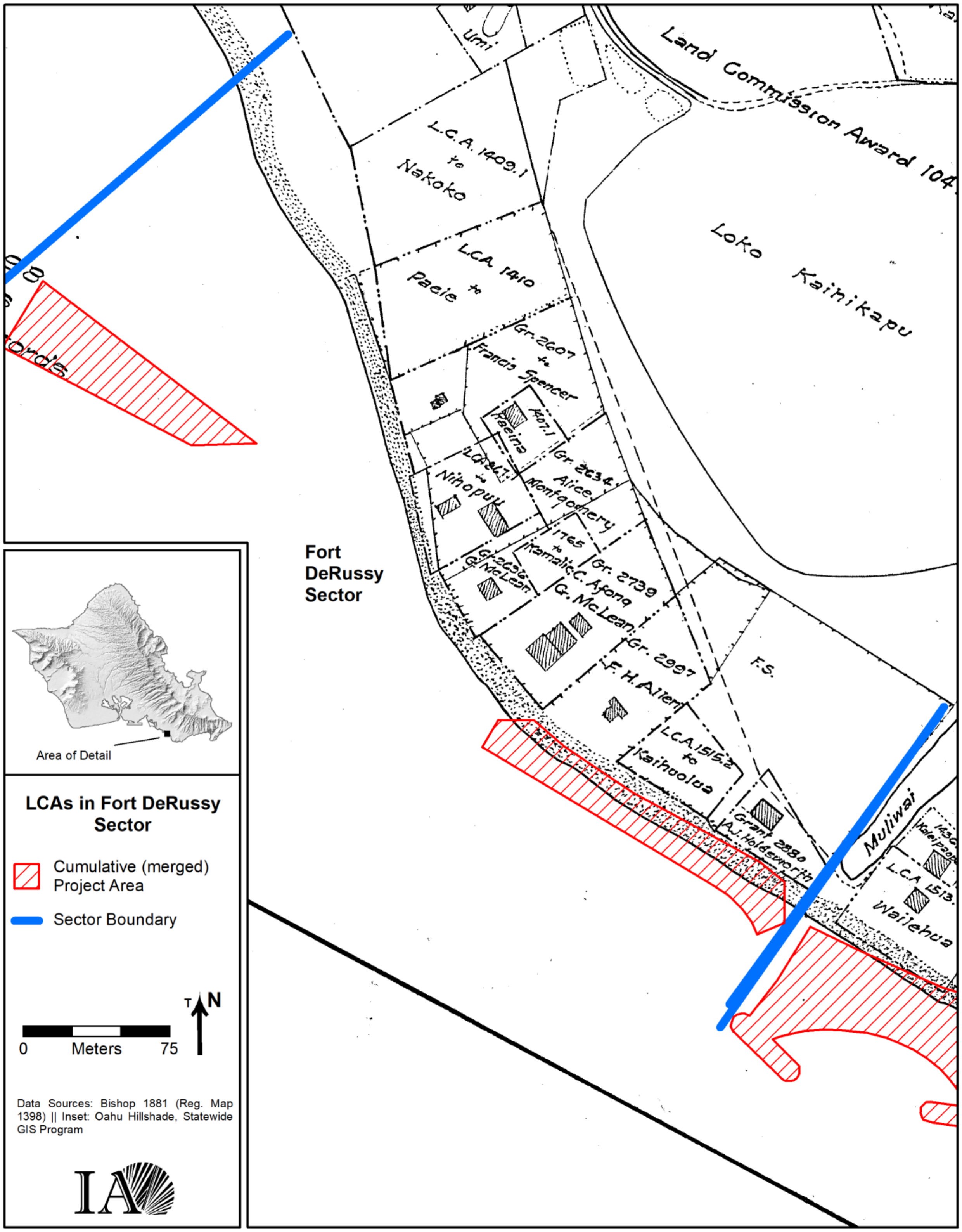

Figure 31. Overlay of Bishop's (1881) map showing LCAs in the Fort DeRussy sector.

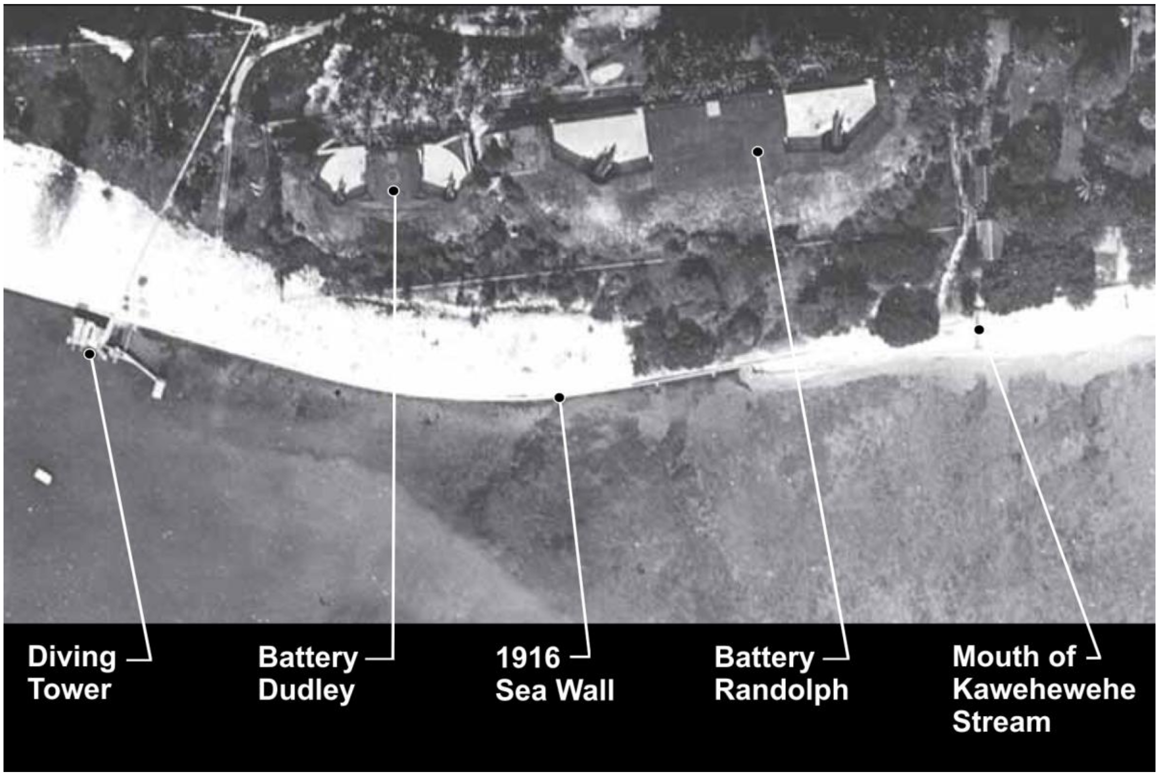

Photo 11. Aerial view of Battery Randolph and Battery Dudley, showing the straight line of the 1916 constructed seawall (source: Wiegel 2008:Figure 15). The diving tower at photo left is at the head of the channel dredged to bring the 69-ton guns to Battery Randolph (Thompson 1980:37).

SHORELINE CHANGES

The Fort DeRussy shoreline is an almost completely constructed beach (Figure 32). A narrow strip of coastal land formerly separated a large complex of fishponds from the ocean; immediately inland of the Fort DeRussy sector was one of the larger ponds, Loko Kaʻihikapu. Bishop's (1881) map of Waikīkī shows that the shoreline at the western boundary of the sector was over 150 m inland of its present location. The outlet of a small waterway identified on Bishop's (1882) map as Kawehewehe was on the Diamond Head boundary of the sector.

Known shore structures in the Fort DeRussy sector are summarized in Table 22. These structures include a seawall built in 1916 and a box culvert and groin built in 1917 (subsequently extended in 1969 and supplemented by a rubble-mound groin in 1971).

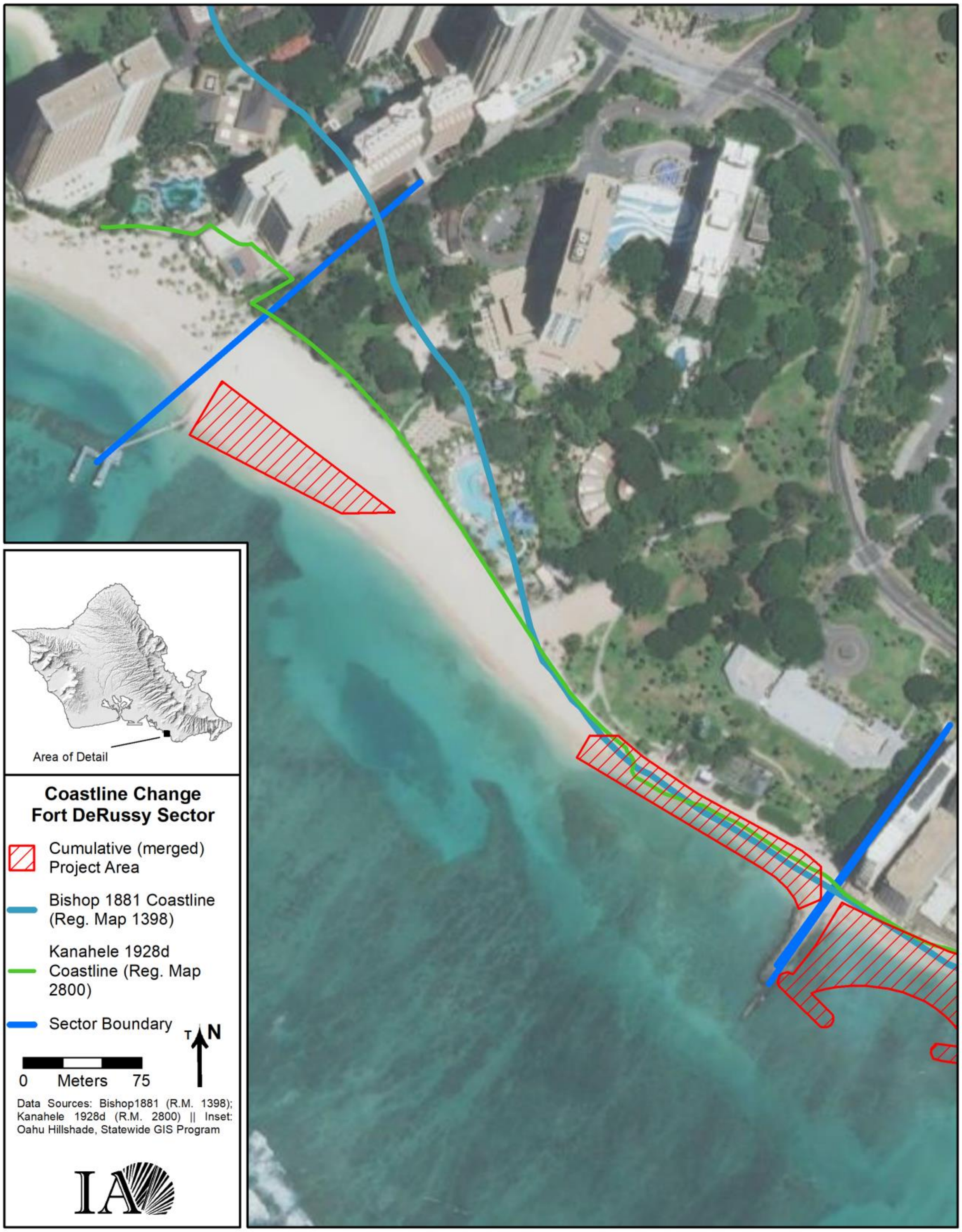

Figure 32. Historical coastlines, Fort DeRussy sector.

Table 22. Seawalls and Groins within the Fort DeRussy Sector.

Year Built	Year Demolished	Description	Length	Location	Reference
1916	Extant	seawall	1,150 ft.	Fort DeRussy	Wiegel (2008:Figure 18, 26)
1917	Extant	box culvert/groin; rubble mound groin added ca. 1971	70 ft. (lengthened to 300 ft. in 1969)	Fort DeRussy	Wiegel (2008:22)

KNOWN ARCHAEOLOGICAL SITES

No archaeological sites have been identified within the Fort DeRussy sector. Site 50-80-14-4570, a multi-component deposit with traditional Hawaiian and historical-period layers (Davis 1989, 1992; Denham and Pantaleo 1997a, 1997b, 1998), is along the inland boundary of the eastern portion of the sector (Figure 33). This site is within LCA 1515:2, awarded to Kaihuoloa, and Grant 2880, purchased by H.J.H. Holdsworth. Davis' (1989) trenches revealed two distinct archaeological layers, the uppermost of which (Layer II) contained an *imu* and other pit features, as well as historical artifacts. Subsequent data recovery documented 40 features, including 24 hearths, 12 pits of unknown function, three post molds, and a historical-period burial pit. Unidentified charcoal from Layer III, the earliest archaeological deposit, produced a radiocarbon determination of 410±50 BP (Beta-31310), which provides a calibrated date of AD 1422-1529 and AD 1546-1635.

BioSystems Analysis, Inc., conducted monitoring and data recovery at Fort DeRussy in association with the realignment of Kālia Road and construction at the Hale Koa Hotel (Denham and Pantaleo 1997a, 1997b, 1998). Site 50-80-14-4570 was assigned to "all non-spatially contiguous features on the former spit" and encompasses numerous pre-Contact-era to historical-era subsurface features dispersed across the Fort DeRussy property (Denham and Pantaleo 1998:I, Figure 4-1), along with Davis' (1989, 1992) previous finds.

BioSystems' Feature 23, a group of five burials, was near the Fort DeRussy sector. The burials appeared to have been previously disturbed by landscaping activities and were associated with both traditional Hawaiian and historical-period artifacts (Denham and Pantaleo 1998:28).

Site 50-80-14-9500 falls outside of the Fort DeRussy sector but is worthy of mention based on its proximity and its ability to inform on the potential for human burials along the Fort DeRussy coastline. This site designation was assigned to six burials encountered during construction of the Hale Koa Hotel in 1976. Five of the burials were identified as pre-Contact or early post-Contact, and one burial immediately beneath a 20th-century pavement was thought possibly to represent a homicide victim (Kimble 1976, cited in Armstrong and Spear 2009:6-7).

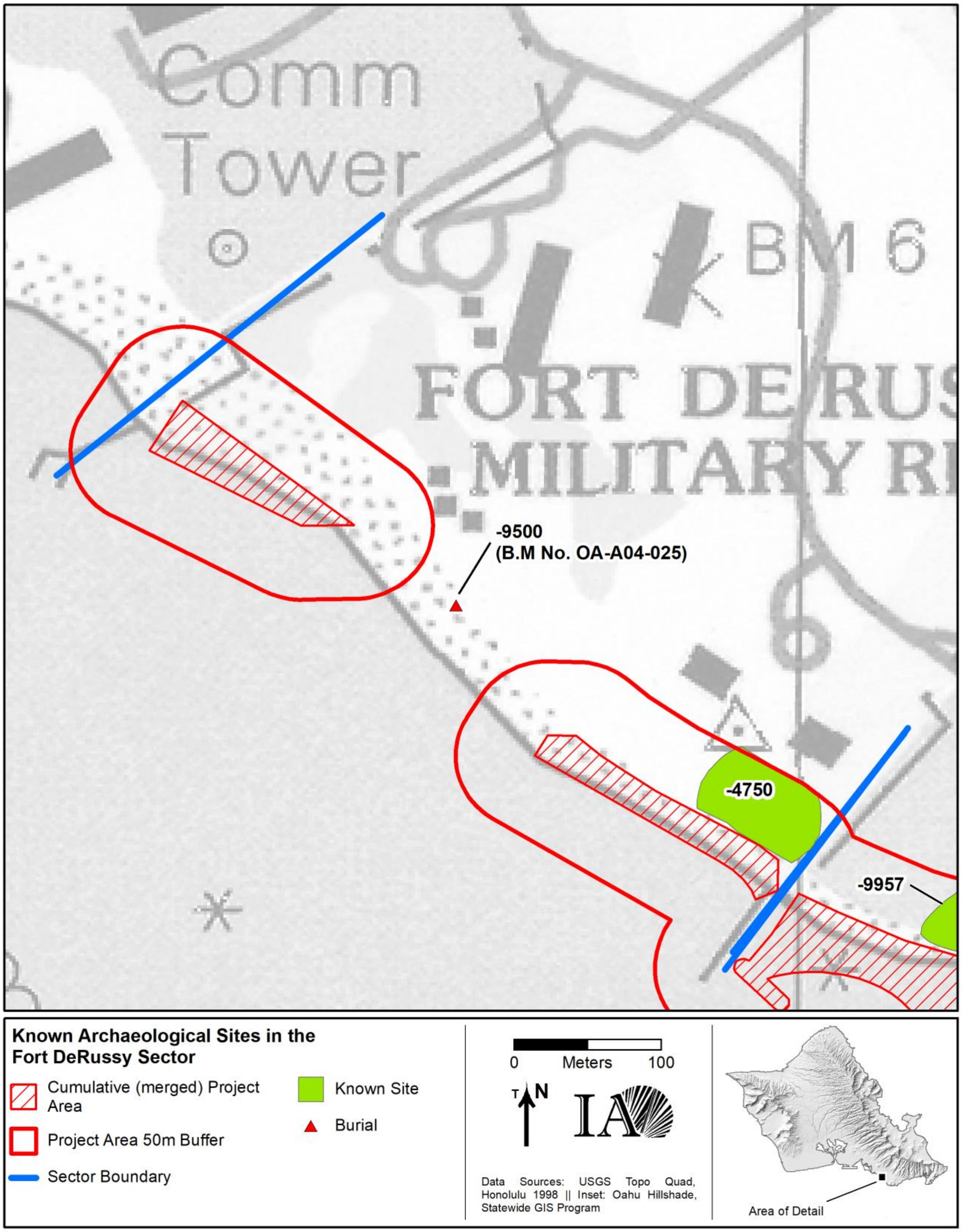

Figure 33. Known archaeological sites within 50 m of the Fort DeRussy sector.

IV. EXPECTATIONS AND RECOMMENDATIONS

This section presents the archaeological expectations and recommendations for each maintenance program sector. Identified archaeological and architectural resources generally lie inland of each sector, although in some cases they are in such close proximity that sites may extend into the active beach zone.

KŪHIŌ BEACH SECTOR

Beach improvement activities are proposed at both basins of the Kūhiō groin complex. In the Diamond Head basin, proposed work includes the addition of approximately 4,500 cubic yards of sand between +5 and -4 feet mean sea level (msl). No alterations to the shore structures are planned. In the ‘Ewa basin, proposed work includes the addition of approximately 4,500 cubic yards of sand between +8 and -3 feet msl, along with the construction of a segmented breakwater partially overlapping the existing 1939 “crib wall” and adjacent shore return structures.

The proposed work in the Diamond Head basin, which consists of sand fill only, will occur *makai* of the ca. 1881 and ca. 1928 coastlines as depicted by Bishop (1881) and Kanahele (1928c), respectively. The location of Site 50-80-14-5948, a retaining wall thought to be the 1890 wall replacing the ca. 1880 bridge/causeway to Kapi‘olani Park, is approximately 27 m *mauka* of the Kūhiō Beach sector. The buried wall is beneath the seaward sidewalk of Kalākaua Avenue, so any intact archaeological deposits would lie inland of this wall and thus, under the roadway. While several archaeological sites, including burials, have been identified along Kalākaua Avenue near the Diamond Head basin, planned project work will be limited to an area of imported beach sand that likely post-dates the 1950s.

Proposed work in the ‘Ewa basin, which includes sand fill and breakwater construction, will also occur *makai* of the ca. 1881 coastline and primarily seaward of the ca. 1928 coastline, although the sand fill area extends *mauka* of a “masonry wall” depicted on Kanahele’s (1928c) map on the north side of the ‘Ewa basin.

RECOMMENDATIONS

Periodic spot-check monitoring is recommended for maintenance work within the Diamond Head basin since all work is within the post-late-19th century shoreline. Scheduled monitoring is recommended during ground-disturbing activities within the historical shorelines within the ‘Ewa basin.

Given the presence of potentially significant existing beach infrastructure, including the Kapahulu Storm Drain/Groin (“The Wall”), “Slippery Wall,” the “crib wall,” and the shore return structures on either side of the crib wall, we recommend historic preservation documentation and evaluations of the existing beach infrastructure prior to commencement of the project.

ROYAL HAWAIIAN SECTOR

Beach improvement activities proposed for the Royal Hawaiian sector include the addition of approximately 25,000 cubic yards of sand fill between +8.5 and -2 feet msl. The proposed work will partially overlap the ca. 1881 and ca. 1928 shorelines as illustrated by Bishop (1881) and Kanahele (1928c).

Any ground disturbance *makai* of the ca. 1881/ca. 1928 shorelines in the Royal Hawaiian sector has the potential encounter cultural deposits or burials. The presence of a partially buried seawall and possible Waikiki Tavern foundation at the Diamond Head end of the Royal Hawaiian sector suggests that intact beach sediments may extend into the *mauka* portion of the project area; as a result, cultural deposits and burials such as those found along Kalākaua Avenue may occur within the beach maintenance and restoration area.

RECOMMENDATIONS

The addition of sand fill is unlikely to result in significant ground disturbance. However, due to the proximity of previously recorded buried deposits and burials, significant traditional places, and chiefly residences, archaeological monitoring is recommended during all work within the historical shorelines.

Given the presence of potentially significant existing beach infrastructure, including the Royal Hawaiian Groin, historic preservation documentation and evaluations of these structures prior to commencement of the project is recommended.

HALEKŪLANI SECTOR

Beach improvement activities proposed for the Halekūlani sector include the addition of approximately 60,000 square yards of sand fill between +8.5 feet and -3 feet msl. The construction of five groins between the Royal Hawaiian Groin and the Fort DeRussy Box Culvert/Groin is also planned. Because the proposed work is expected to occur *makai* of the existing seawalls, shown in a 1932 photograph with no beach on its seaward side, there is a negligible likelihood of archaeological materials in the present active beach.

Given the proximity of cultural deposits and burials associated with Sites 4570 and 9957, ground disturbance *mauka* of the ca. 1881/ca. 1928 shorelines has the potential to encounter cultural deposits or burials. Because the area *makai* of the existing seawall is unlikely to contain beach sand or natural sediments pre-dating the 1930s, project work in this location has little potential to encounter archaeological resources or burials.

RECOMMENDATIONS

The addition of sand fill is unlikely to result in significant ground disturbance. However, due to the proximity of previously recorded buried deposits and burials, significant traditional places, and multiple LCA lots, archaeological monitoring is recommended during all work within the historical shorelines.

Historic preservation documentation and evaluations of the existing five small groins within the Halekūlani sector, as well as the Royal Hawaiian and Fort DeRussy groins, prior to commencement of the project is recommended.

FORT DERUSSY SECTOR

Beach improvement activities proposed for the Fort DeRussy sector include the addition of approximately 1,500 cubic yards of sand fill near the Diamond Head edge. A sand borrow area is proposed at the ‘Ewa end of the sector adjacent to the Hilton Hawaiian Village pier. The proposed project work will be confined to the area *makai* of the Fort DeRussy seawall, which consists of beach constructed during the 20th century.

Any ground disturbance *makai* of the ca. 1881 and ca. 1928 shorelines has the potential to encounter archaeological deposits; Site 50-80-14-4570 at the Diamond Head end of the sector is inland of the present promenade.

RECOMMENDATIONS

The addition of sand fill is unlikely to result in significant ground disturbance. However, due to the proximity of previously recorded buried deposits and burials, archaeological monitoring is recommended during all work within the historical shorelines. No monitoring is recommended for work at the sand borrow area since this is an area of relatively recent sand accretion.

Historic preservation documentation and evaluation of the Fort DeRussy groin prior to commencement of the project is recommended.

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GLOSSARY OF HAWAIIAN WORDS

Hawaiian Spelling	Definition*
ahupuaʻa	land division usually extending from the uplands to the sea, so called because the boundary was marked by a heap (*ahu*) of stones surmounted by an image of a pig (*puaʻa*), or because a pig or other tribute was laid on the altar as tax to the chief
aliʻi	chief, chiefess, officer, ruler, monarch, peer, headman, noble, aristocrat, king, queen, commander
ʻāpana	piece, portion, section; used to refer to a parcel within a Land Commission award
ʻauwai	irrigation ditch
heiau	temple, shrine
ʻili	traditional land unit, a subdivision of an *ahupuaʻa*
imu	underground oven
kuleana	small piece of property, as within an *ahupuaʻa*; right, privilege, concern, title, property, estate, portion, interest, claim, ownership
līpoa	bladelike, branched, brown seaweeds with unique aroma and flavor
loko	pond
makai	toward the sea
mauka	toward the mountain, or inland
muliwai	river, river mouth; poor near mouth of a stream, as behind a sand bar, enlarged by ocean water left there by high tide; estuary
poʻo kanaka	class of sacrificial *heiau* (lit., human head, skull)
ʻulu maika	stone used in *maika* game (a bowling-like game)

* Adapted from Mary K. Pukui and Samuel H. Elbert, 1986, *Hawaiian Dictionary*, University of Hawaii Press, Honolulu.

FINAL PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

Waikīkī Beach Improvement and Maintenance Program

October 2024

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Hawai‘i Department of Land and Natural Resources
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APPENDIX F

Historical Architecture Assessment

Prepared By: International Archaeology, LLC

— Final —

Historical Architecture Overview for the Proposed Waikīkī Beach Improvement and Maintenance Program, Waikīkī Ahupua‘a, Kona District, Island of O‘ahu, Hawai‘i

TMK (1) 2-6-001:002, 003, 004, 008, 012, 013, 015, 017, 018, 019; 2-6-002:005, 006, 017, 026; 2-6-004:005, 006, 007, 008, 009, 010, 012; 2-6-005:001, 006; 2-6-008:029

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INTERNATIONAL ARCHAEOLOGY, LLC

JUNE 2022

— FINAL —

HISTORICAL ARCHITECTURE OVERVIEW FOR THE PROPOSED WAIKĪKĪ BEACH IMPROVEMENT AND MAINTENANCE PROGRAM, WAIKĪKĪ AHUPUA‘A, KONA DISTRICT, ISLAND OF O‘AHU, HAWAI‘I

TMK (1) 2-6-001:002, 003, 004, 008, 012, 013, 015, 017, 018, 019; 2-6-002:005, 006, 017, 026; 2-6-004:005, 006, 007, 008, 009, 010, 012; 2-6-005:001, 006; 2-6-008:029

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ABSTRACT

At the request of Sea Engineering, Inc. (SEI), and on behalf of the Department of Land and Natural Resources (DLNR), Office of Conservation and Coastal Lands, International Archaeology, LLC (IA) prepared a historical architectural overview in support of the proposed Waikīkī Beach Improvement and Maintenance Program. The beach improvement and maintenance program encompasses four areas of Waikīkī Beach—the Kūhiō Beach sector, the Royal Hawaiian sector, the Halekūlani sector, and the Fort DeRussy sector—along the shoreline of Māmala Bay in the Kona District of the Island of O‘ahu, seaward of TMKs (1) 2-6-001:002, 003, 004, 008, 012, 013, 015, 017, 018, 019; 2-6-002:005, 006, 017, 026; 2-6-004:005, 006, 007, 008, 009, 010, 012; 2-6-005:001, 006; and 2-6-008:029. These sectors include portions of the active beach and nearshore marine areas and extend to a maximum of approximately 70 m offshore. The historical architectural overview is a component of the program’s Environmental Impact Statement prepared by SEI for the DLNR. The proposed project includes the construction of new beach stabilization structures and shoreline replenishment primarily using sand recovered from offshore areas.

Each of the maintenance program sectors have one or more potentially significant historical architectural resources. The Kūhiō Beach sector encompasses the Kūhiō groin complex, comprised of the ‘Ewa basin crib wall, Diamond Head basin and “Slippery Wall,” and Kapahulu Storm Drain. Additionally, a buried portion of the 1890 masonry seawall (Site 50-80-14-5948) is present. The Royal Hawaiian Groin, recently rebuilt, a former seawall, and a possible building foundation are within the Royal Hawaiian sector, while the Moana Surfrider and Royal Hawaiian Hotels abut the inland margin of the sector boundary. Five groins presumed to have been built during the early 20th century are within the Halekūlani sector. The Fort DeRussy sector includes the Fort DeRussy Groin; it is believed that at least portions of the 1916 seawall may be present.

Historic American Engineering Records are recommended for the Kūhiō groin complex, the Halekūlani sector groins, and the Fort DeRussy Groin. Architectural or archaeological recording is recommended for the former seawall and possible building foundation exposed in the Royal Hawaiian sector.

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I. INTRODUCTION

At the request of Sea Engineering, Inc. (SEI), and on behalf of the Department of Land and Natural Resources (DLNR), Office of Conservation and Coastal Lands, International Archaeology, LLC (IA) prepared a historical architectural overview in support of the proposed Waikīkī Beach Improvement and Maintenance Program (Figure 1 and Figure 2). The beach improvement and maintenance program encompasses four areas of Waikīkī Beach—the Fort DeRussy Beach sector, the Halekūlani Beach sector, the Royal Hawaiian Beach sector, and the Kūhiō Beach sector—along the shoreline of Māmala Bay in the Kona District of the Island of Oʻahu, seaward of TMKs (1) 2-6-001:002, 003, 004, 008, 012, 013, 015, 017, 018, 019; 2-6-002:005, 006, 017, 026; 2-6-004:005, 006, 007, 008, 009, 010, 012; 2-6-005:001, 006; 2-6-008:029. These sectors include portions of the active beach and nearshore marine areas and extend to a maximum of approximately 70 m offshore. The historical architectural overview is a component of the program's Environmental Impact Statement (EIS) prepared by SEI for the DLNR. The proposed project includes the construction of new beach stabilization structures and shoreline replenishment primarily using sand recovered from offshore areas.

PROJECT AREA DESCRIPTION

Waikīkī Beach is an approximately 3,130-m (10,260-ft.) ocean shoreline along the southwest edge of the Waikīkī neighborhood of Honolulu, extending from a breakwater fronting the Hilton Hawaiian Village Waikīkī Beach Resort to the west to a groin fronting the New Otani (Kaimana) Hotel to the east. Almost the entire length of the beach is armored by seawalls and stabilized by groins that compartmentalize the shoreline into eight individual "littoral cells" or sectors. The Waikīkī Beach Improvement and Maintenance Program will affect four of these sectors (Figure 3 through Figure 7), which are described individually.

1. The Kūhiō Beach sector consists of approximately 460 m (1,500 ft.) of shoreline extending from the ʻEwa (west) groin at Kūhiō Beach Park to the Kapahulu storm drain. The northwestern half of the sector (called the ʻEwa basin here) was created in 1939 (Figure 3); the southeastern half of the sector (called the Diamond Head basin here) was built between 1951 and 1953 (Figure 4). The sector is essentially an enclosed body of water within a set of constructed crib walls and groins. It is at the southern end of the curving and protected portion of the Waikīkī coastline, between two of the three major stream outlets (Kuʻekaunahi and ʻĀpuakēhau) that once flowed into the ocean.

2. The Royal Hawaiian Beach sector consists of approximately 530 m (1,730 ft.) of shoreline extending from the Royal Hawaiian groin to the ʻEwa (west) groin at Kūhiō Beach Park (Figure 5). It lies at an inward curve in the Waikīkī coastline that allows the development of a wide sand beach, and sits between two of the three major stream outlets (Kuʻekaunahi and ʻĀpuakēhau) that once flowed into the ocean. This sector is the core of traditional and historical activity in Waikīkī.

3. The Halekūlani Beach sector consists of approximately 440 m (1,450 ft.) of shoreline extending from the Fort DeRussy outfall groin to the Royal Hawaiian Groin (Figure 6). The south-facing shoreline is a mix of seawalls and discontinuous, small, and narrow sand beaches that front a fully developed urban landscape. The Royal Hawaiian groin was constructed in 1925-1926; the Fort DeRussy groin was built in 1917 and was extended in 1969. The remains of at least five, 10- to 20-m concrete block groins are spaced along the length of the sector.

4. The Fort DeRussy Beach sector consists of approximately 510 m (1,680 ft.) of shoreline extending from the Hilton Hawaiian Village pier to the Fort DeRussy outfall groin (Figure 7). The southwest-facing shoreline is a continuous sand beach that fronts a landscaped open space of tended lawn and coconut trees in the Fort DeRussy Armed Forces Recreation Center. The Hale Koa Hotel is just inland of the western portion of the sector, and the U.S. Army Museum of Hawai‘i, housed in the historic 1914 Battery Randolph, is at the eastern end of the sector. A wide concrete promenade runs along the inland edge of the beach.

THE WAIKĪKĪ BEACH IMPROVEMENT AND MAINTENANCE PROGRAM

The proposed Waikīkī Beach Improvement and Maintenance Program is intended to address the ongoing erosion of the shoreline and frequent flooding of the backshore. Without improvements and follow-up maintenance, sand erosion and rising sea level will likely result in the total loss of Waikīkī Beach by the end of the 21st century. The project's immediate goals are to restore and improve Waikīkī's public beaches, increase beach stability, provide safe access to and along the shoreline, and increase resilience to coastal hazards and sea level rise.

The planned actions and construction methods for each beach sector in the project area are summarized below:

1. For the Kūhiō Beach sector, separate plans are proposed for the ‘Ewa basin (west) and the Diamond Head basin (east):

    a. For the ‘Ewa basin, the existing groins on the east and west ends will be removed and reconstructed to accommodate sea level rise (see Figure 3). The west groin will be approximately 150 feet long with a crest elevation of +7.5 feet mean sea level (msl), and the east groin will be approximately 125 feet long and vary in elevation from +7.5 feet msl at the shoreline to +6 feet msl at the head. A 125-foot-long detached breakwater will be built in the gap between the groins and will be approximately +6 feet msl to match the heads of the groins. Construction equipment and material would be transported to the work area through either the central portion of the park or along the shoreline past the Duke Kahanamoku statue. Demolition and construction will be conducted with an excavator that is supported by a temporary work platform extending from the shore to the breakwater. Sand fill from offshore deposits will be added to the beach after the new structures are completed.

    b. For the Diamond Head basin, existing structures will not be modified, but the beach will be replenished using eroded sand that has settled in a submerged deposit just offshore (see Figure 4). Approximately 4,500 cubic yards will be recovered and spread across the beach, widening the existing shoreline by approximately 18 to 26 feet and reducing the offshore depth of the basin to a uniform bottom elevation of -4 feet msl. The sand will be recovered and redeposited using either a long-reach excavator operating on an excavated sand causeway, or a diver-operated dredge that will pump the sand to an onshore recovery area. A bulldozer and/or skid-steer will spread the sand across the beach.

2. For the Royal Hawaiian Beach sector, sand recovered from deposits directly offshore will be used to widen and replenish the beach (see Figure 5). The beach crest elevation will be increased from about +7 feet above msl to +8.5 feet msl. Approximately 30,000 cubic yards of recovered sand will be required to complete the work. To counter ongoing erosion and shoreline recession, beach nourishment will need to be repeated every eight to 10 years or more frequently if required. The recovered sand will probably be dredged with a submersible pump mounted on a crane barge and

pumped through a bottom-mounted pipeline to a dewatering basin in the Diamond Head basin of Kūhiō Beach Park. After drying, the sand will be stockpiled and transported to Royal Hawaiian Beach, where it will be distributed using bulldozers.

3. For the Halekūlani Beach sector, a new beach with stabilizing groins will be constructed (see Figure 6). Three new sloping rock rubble mound T-head groins will be combined with the existing Fort DeRussy and Royal Hawaiian groins to create four stable beach cells. The groin stems will extend approximately 200 feet seaward from the shoreline and will be of sufficient size to stabilize a +10-foot beach crest elevation. The groin stem crests could also be wide enough (approximately 10 feet) to accommodate construction equipment or a pedestrian walkway. The Halekūlani Channel will be left unobstructed for beach catamaran navigation. In addition, approximately 60,000 cubic yards of sand fill recovered from offshore deposits will be used to create approximately 3.8 acres of new dry beach area. Construction equipment and materials will likely be transported into the area across the east end of Fort DeRussy Beach, which may require construction of a temporary access road from Kalia Road to the beach and a temporary rock rubble mound access berm along the shoreline from Fort DeRussy to the Royal Hawaiian groin.

4. For the Fort DeRussy Beach sector, sand will be transported from an accretion area at the west end of the beach (near the Hilton Pier) to an eroding area at the east end (see Figure 7). The sand will be excavated from the existing beach face extending inshore only as far as necessary to obtain the required amount, estimated to be approximately 1,200 cubic yards. Dump trucks will transport the sand across the beach, and a bulldozer will distribute it across the eroding area. This process will need to be repeated periodically in the future to maintain a stable beach profile.

Construction work will be confined to the active sand portion of Waikīkī Beach and nearshore marine areas up to approximately 200 feet offshore. The work will not extend outside the inland boundary of the active beach, which is defined by any buildings, roads, seawalls, or other types of construction that constrain the sand beach.

The sand required for beach nourishment will be almost exclusively recovered from submerged offshore deposits. In addition to the near-offshore areas mentioned in the descriptions above, sand will be dredged from one or more known deposits further offshore of the south coast of Oʻahu, using submersible slurry pumps, self-contained hydraulic suction dredges, and/or clamshell buckets.

PROPOSED TASKS

This overview presents a review of the historical architecture within and immediately adjacent to the maintenance program sectors based on existing historic architectural literature. It summarizes the history of the built environment of Waikīkī using extant studies and provides detailed discussions of historic buildings and structures based on sources such as government records, government maps, Sanborn Fire Insurance maps, and National Register of Historic Places (NRHP) nomination forms

Research relied on historical architectural reports from the IA library, the State Historic Preservation Division (SHPD) library, and the State Office of Environmental Quality Control (OEQC) online library of environmental assessments and impact statements. Historical maps of Waikīkī were downloaded from the State Land Survey Division online map library, and were also researched at the Hawaiʻi State Archives. A set of five maps of the Waikīkī shoreline from the Ala Wai to Diamond Head (Kanahele 1928a, 1928b, 1928c, 1928d) provide detailed information on the coast as it appeared in 1928. The State Archives was also a source for historical photographs of Waikīkī.

Published works on Waikīkī were a primary resource for background information, most notably (but not limited to) Wiegel (2008) for a history of shoreline changes, Hibbard and Franzen (1986) for a history of the resort area, including a chapter on traditional Hawaiian settlement (Nāpōkā 1986), and Kanahele (1995) for a general history of Waikīkī from pre-Contact times to 1900.

ORGANIZATION OF THE REPORT

This document is organized as follows. Section I is the introduction. Section II provides an overview of the historical architectural resources within and adjacent to the maintenance program sectors. Section III summarizes expectations and historic preservation recommendations for each sector based on the foregoing information. A list of cited references and a glossary of Hawaiian terms used in the text are included at the end of this document.

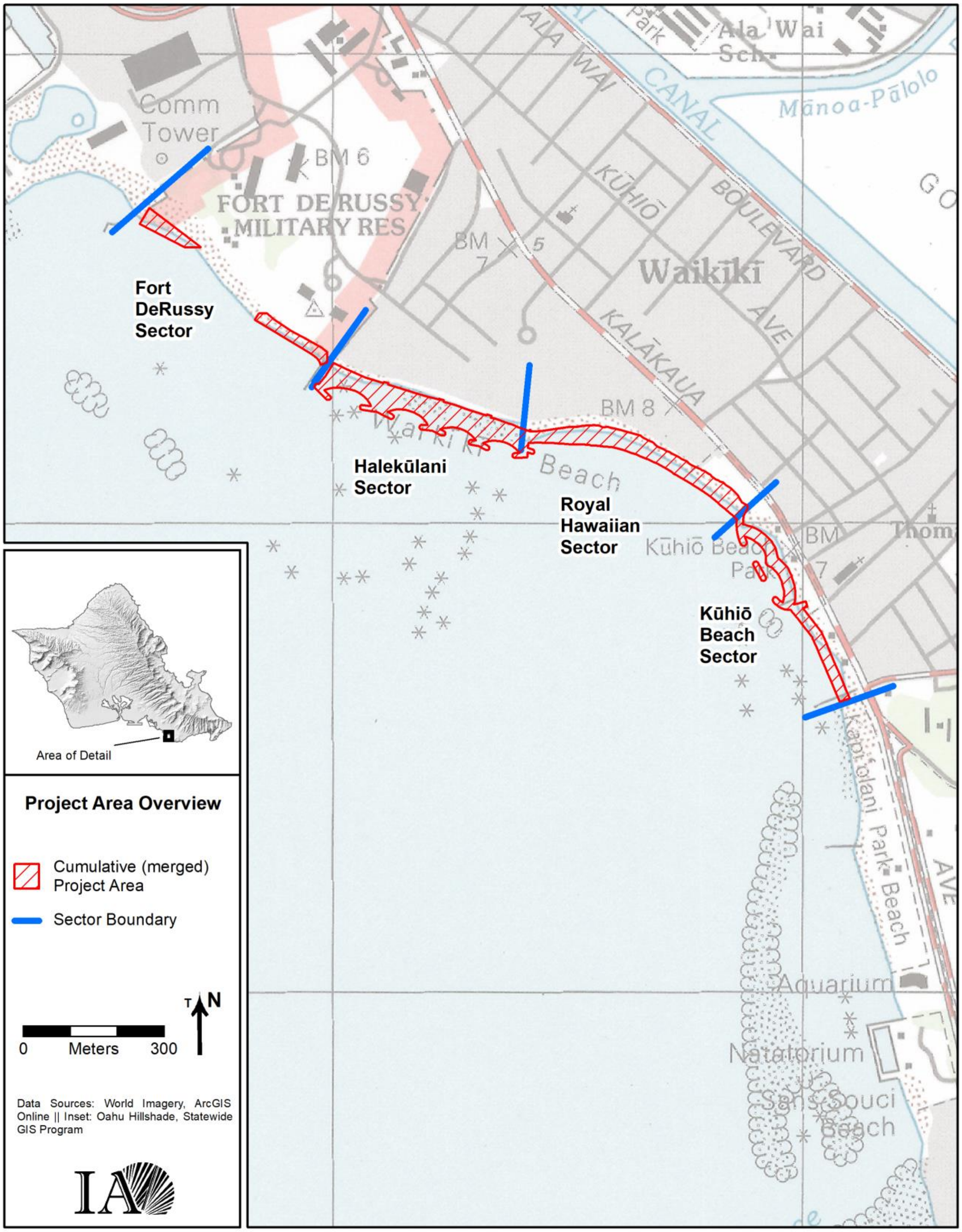


Figure 1. The Waikīkī Beach Improvement and Maintenance Program project area overlaid onto the Honolulu 1998 topographic quadrangle map.

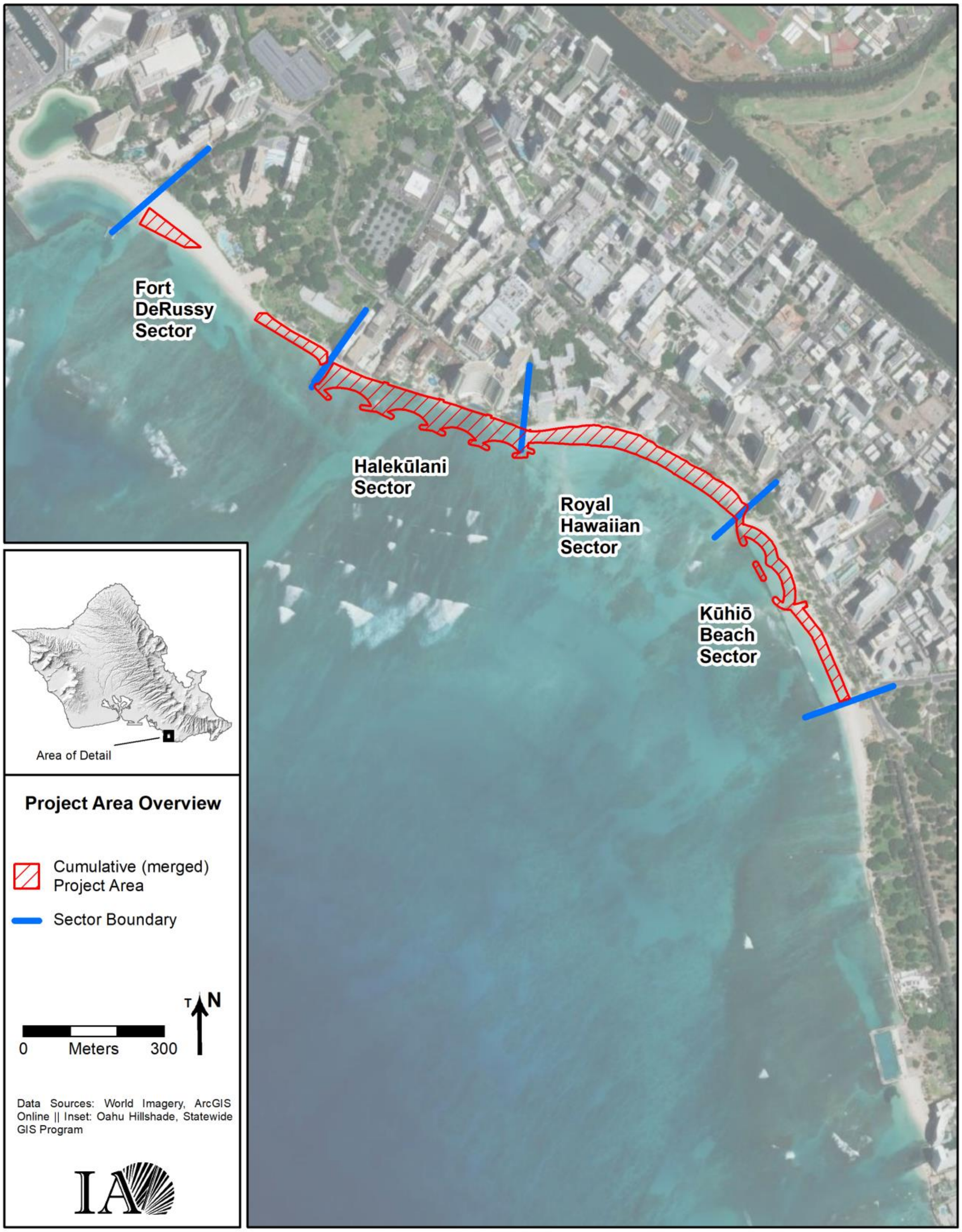


Figure 2. The Waikīkī Beach Improvement and Maintenance Program project area overlaid onto aerial imagery.

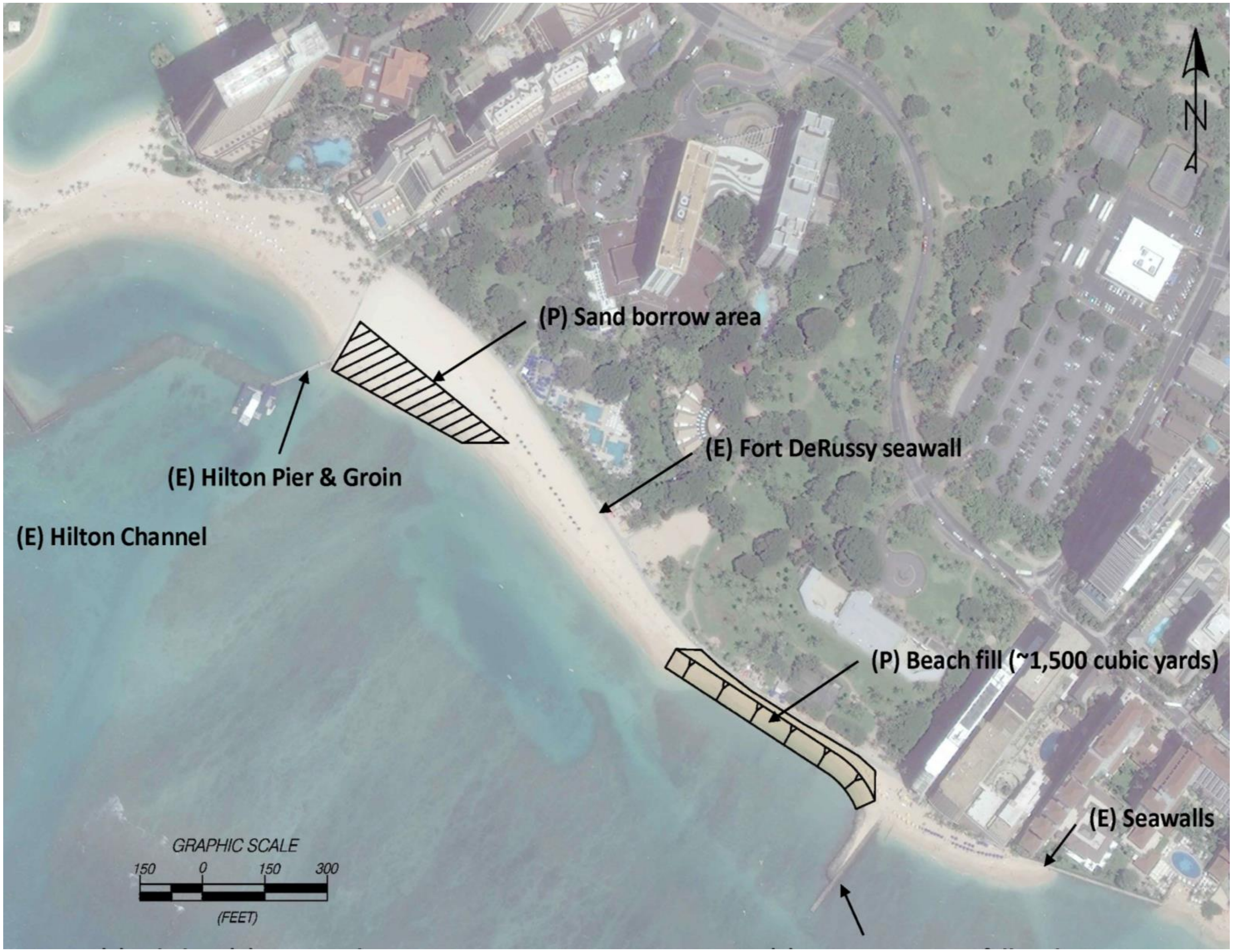


Figure 3. Planned beach improvement activates within the Kūhiō Beach sector, ‘Ewa basin. Image provided by Sea Engineering, Inc.

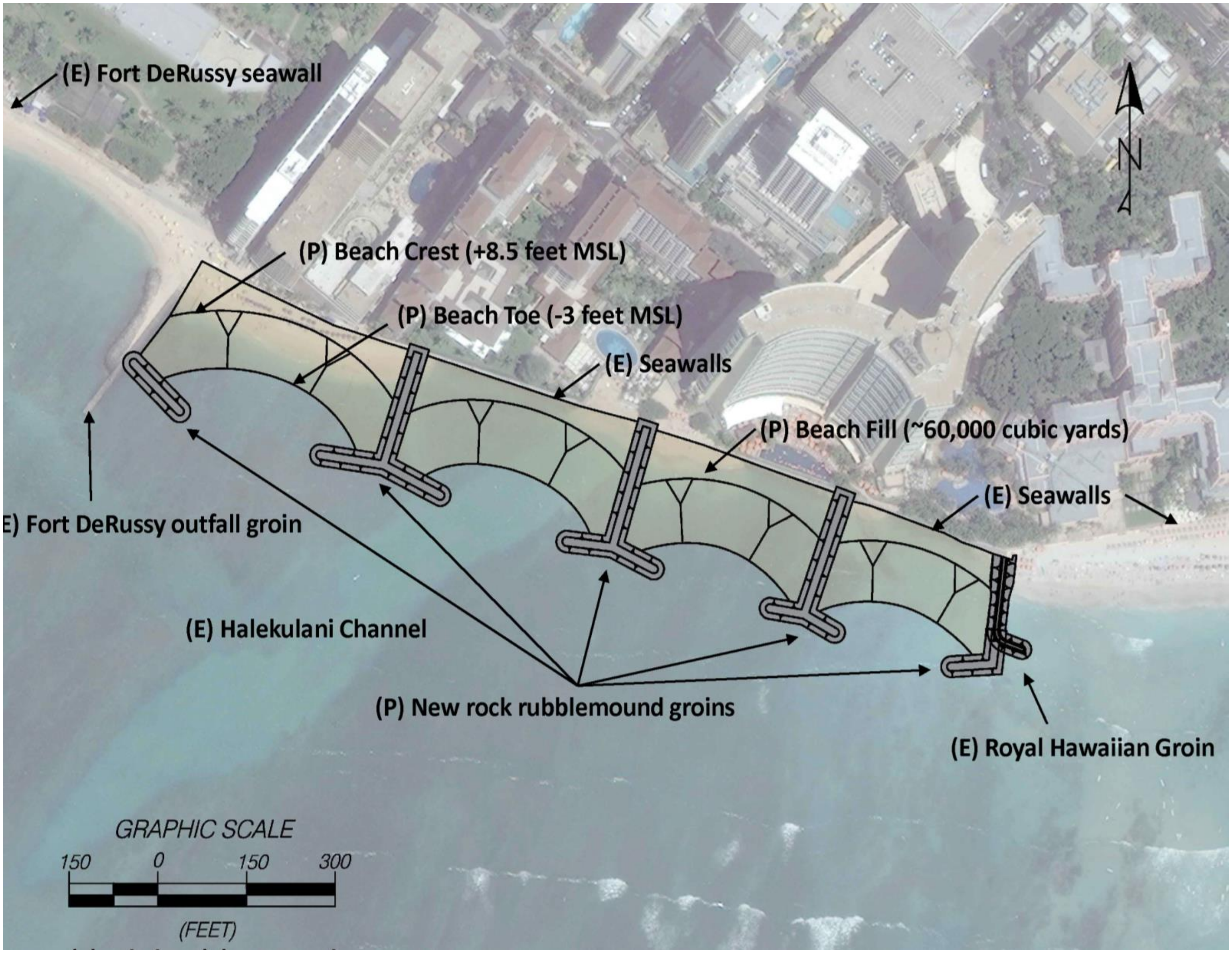


Figure 4. Planned beach improvement activities within the Kūhiō Beach sector, Diamond Head basin. Image provided by Sea Engineering, Inc.

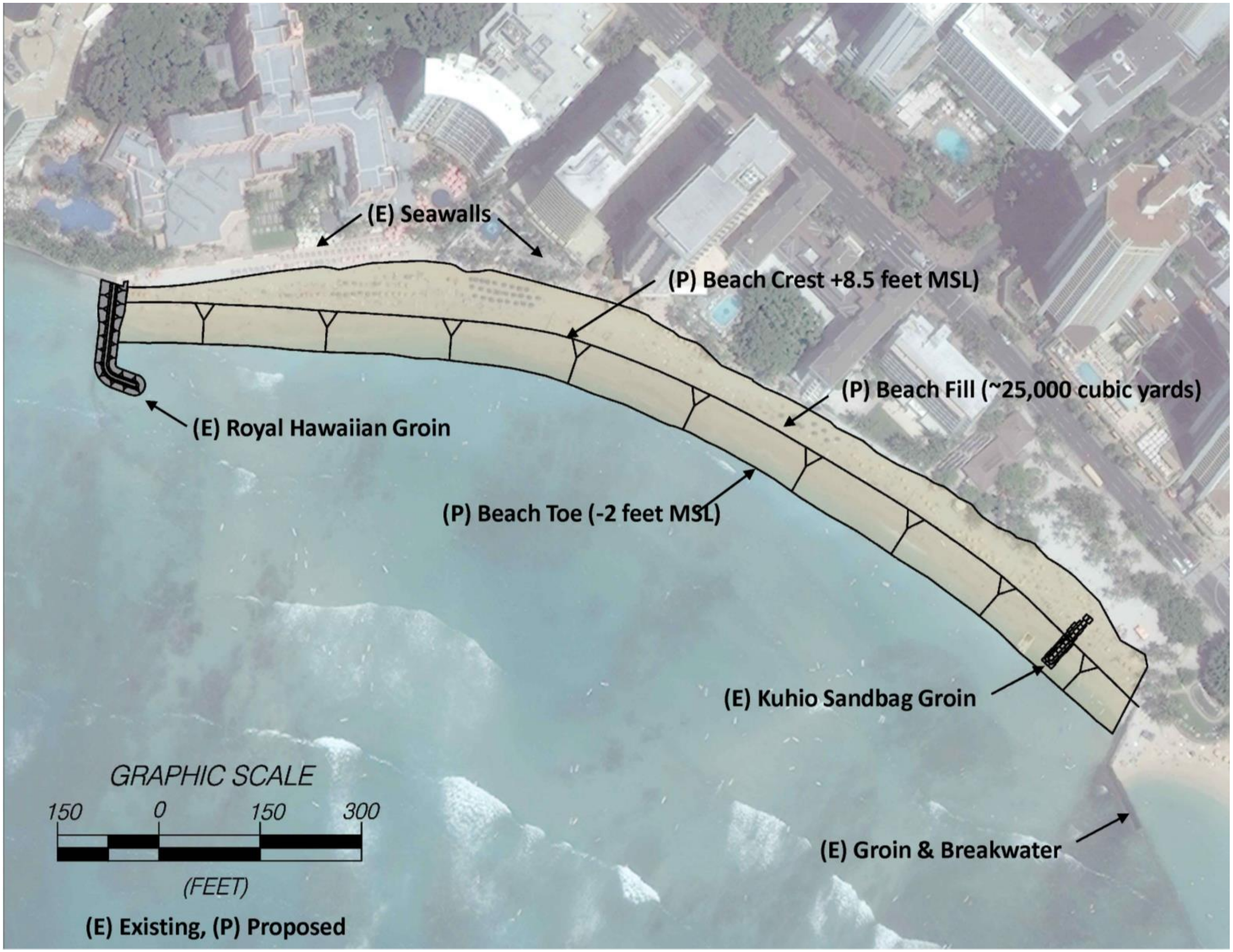


Figure 5. Planned beach improvement activities within the Royal Hawaiian sector. Image provided by Sea Engineering, Inc.

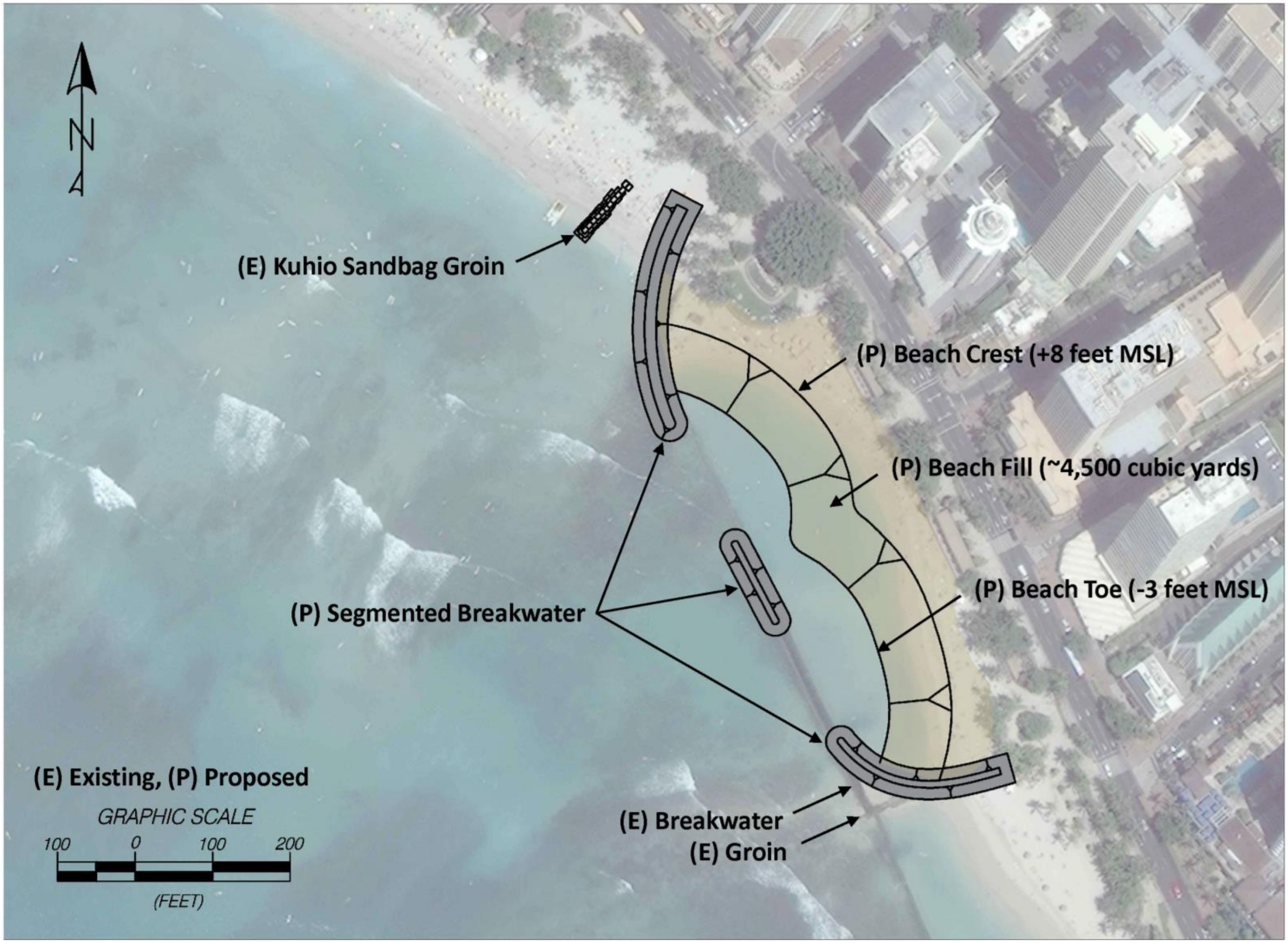


Figure 6. Planned beach improvement activities within the Halekūlani sector. Image provided by Sea Engineering, Inc.

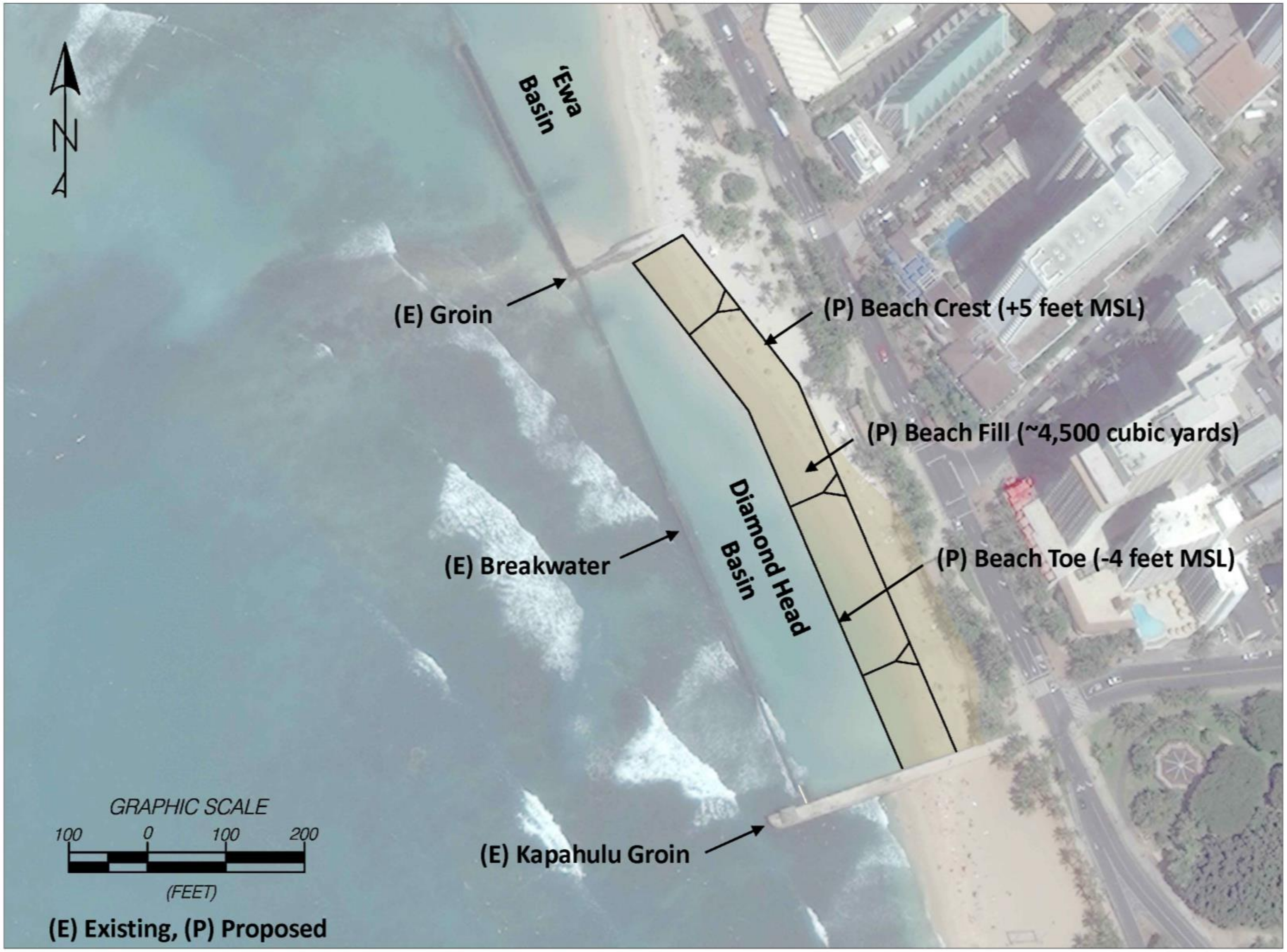


Figure 7. Planned beach improvement activities within the Fort DeRussy sector. Image provided by Sea Engineering, Inc.

II. HISTORICAL ARCHITECTURAL RESOURCES OF THE WAIKĪKĪ SHORELINE

The Waikīkī shoreline has long been noted as a center of traditional Hawaiian activity, and by the late 19th century, it emerged as a prominent resort for the wealthy and a tourist destination. This discussion presents an overview of the historical architectural resources between the Kapahulu Storm Drain and the Hilton Hawaiian Village Pier. A definition of architectural resources is provided, followed by a brief historical background to Waikīkī, an overview of the project area's historical architectural resources, and a discussion of architectural resources within each project sector.

DEFINITION OF HISTORICAL ARCHITECTURAL RESOURCES

The cultural resources of the Waikīkī shoreline are the tangible and intangible references to the area's past. Tangible resources include pre-Contact and historical-period archaeological sites, burials, buildings, and other structures. Intangible resources consist primarily of historically documented places for which no physical evidence remains: royal centers, important streams, named residences and land parcels, and former beach infrastructure features. Archaeological resources are addressed in the project's companion archaeological overview (Moore et al. 2021) with the project's Cultural Impacts Assessment discussing traditions and contemporary activities within the area and community perspectives on the maintenance program (Pacheco and Anae 2021). Table 1 defines the three resource categories and links these categories to federal and state definitions of historic properties under the National Historic Preservation Act (NHPA) and the National Register of Historic Places (NRHP). Table 2 summarizes the NHPA and NRHP categories of historic properties.

The term "historic property" is used sparingly in the present review because it has a specific definition under the NHPA: "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior (36 CFR Part 800.16)." As described in 36 CFR Part 60.4, properties are assessed for significance relative to NRHP eligibility by four criteria:

> (A) are associated with events that have made a significant contribution to the broad patterns of our history;
>
> (B) are associated with the lives of persons significant in our past;
>
> (C) embody distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> (D) have yielded, or may be likely to yield, information important in prehistory or history.

The property must also possess integrity of location, design, setting, materials, workmanship, feeling, and association; integrity is the authenticity of a property's historic identity, evidenced by the survival of physical characteristics that existed during the property's historic or prehistoric period. The State of Hawai'i (Hawai'i Administrative Rules [HAR] §13-284-6) uses similar significance definitions, with the addition of a fifth criterion:

Have an important value to the native Hawaiian people or to another ethnic group of the state due to association with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events, or oral accounts – these associations being important to the groups' history and cultural identity.

Table 1. Cultural Resource Categories in the Waikīkī Beach Improvements Project Area.

Category	Definition	NRHP Category
Archaeological	Physical remains of past human activity. Along the Waikīkī shoreline, these are typically buried deposits formed through traditional Hawaiian pre-Contact and historical period occupation and/or historical period Western or Asian activity. In Waikīkī, archaeological deposits often also contain human skeletal remains, which typically are listed in reports as "burials." The term includes both isolated fragments as well as complete remains in intact burial pits. There are also numerous instances of intact burials or isolated human skeletal remains that are not associated with an archaeological deposit.	site
Architectural	Building, structure, or object dating to the post-Contact historical period. All of the boundary groins and storm drains in the project area are included in this category. In addition, other examples of architectural features include Site 50-80-14-5948, a buried historic seawall that may date to 1890 (Winieski et al. 2002; see Kanahele 1928e) and a buried seawall that extends northwest from the inland end of the ʻEwa basin of the Kūhiō groin complex (no number; SHPD GIS, N. Belluzzo, pers. comm.; see Kanahele 1928c).	building, structure, object
Historical place	Site or location that has been traditionally or historically documented but at which no physical remains are left; divided into three sub-categories: places and place names, mid-19th century land parcels, and former beach infrastructure. An example of a historical place/place name is Hamohamo, which was a land area awarded to Keohokālole in the Mahele and subsequently given to her daughter, the future queen of Hawaiʻi, Liliʻuokalani, in 1859 (Hibbard and Franzen 1986:8); a section of Hamohamo covers almost the entire beach in the Royal Hawaiian sector and a large section of the Kūhiō Beach sector. An example of a mid-19th century land parcel is LCA 1515:2 in the Fort DeRussy sector. An example of former beach infrastructure is Moana Pier, which was built in 1890 and was a landmark of the Waikīkī shoreline for 40 years until its demolition.	site

Table 2. Historic Property Categories under the National Register of Historic Places.

NRHP Category	National Register Definition (NPS 1997)	Working Category and Description	Waikīkī Beach Cultural Resource Category
Building	A building is created principally to shelter any form of human activity, or may be applied to a historically and functionally related unit (e.g., house and barn).	The category includes all standing buildings that retain sufficient integrity to be classified as architectural sites (as opposed to buildings in ruins which are then classed as archaeological sites).	architectural
Structure	A structure is a functional construction made usually for purposes other than human shelter.	A structure is a constructed facility that is not a building or an object; examples are bridges, dams, roads, and fences (a structure in ruins would be categorized as an archaeological site).	architectural
Object	An object is a construction that is primarily artistic in nature or is relatively small in scale and simply constructed. Although it may be, by nature or design, movable, an object is associated with a specific setting or environment.	An object is a material thing of functional, aesthetic, cultural, historical, or scientific value that may be, by nature or design, movable yet related to a specific setting or environment (see 36 CFR Part 65.3). These are often classed as architectural sites.	architectural
Site	A site is the location of a significant event, a prehistoric or historic occupation or activity, or a building or structure (whether standing, ruined, or vanished) where the location itself possesses historic, cultural, or archaeological value regardless of the value of any existing structure.	A site is the physical remains of human activity. This category includes the remains of pre-contact and historical period occupation, as well as the remnants of historical structures that are too deteriorated to be considered as architectural sites. A site can also be a location with no physical remains, such as a traditional or historical place.	archaeological historical place
District	A district possesses a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development.	n/a	architectural*

* Note that the Artillery District of Honolulu (Site 50-80-14-1382), which contains a group of thematically linked buildings, was nominated to the NRHP as a site rather than a district.

HISTORICAL BACKGROUND TO WAIKĪKĪ

When Captain James Cook made landfall in Hawaiʻi in 1778, he found a group of islands ruled by an elite corps of chiefs, served by a multi-layered hierarchy of lower *aliʻi* and a body of *makaʻāinana*. On Oʻahu, Waikīkī was the chiefly center of the southern coast, home to the ruling chief and his subordinate *aliʻi* (Cordy 2002 Nāpōkā 1986. ʻĪʻī (1959:69) writes that the "chiefs like to live at Waikīkī because of the surfing." Houses clustered among the coconut trees on the shoreline from Kālia to the base of Diamond Head. Several large *heiau*, including Helumoa (ʻĀpuakēhau) and Papaʻenaʻena, were the focus of chiefly religious ceremonies.

As early as the 1860s, Waikīkī began to attract foreign residents and beachgoers, especially Americans. In 1873, the region was described by one visitor as "a hamlet of plain cottages, whither the people of Honolulu go to revel in bathing clothes, mosquitoes, and solitude, at odd times of the year" (Bliss 1873:195-196). Kapiʻolani Park in 1877 was originally developed as a private recreational open space amenity for high-end residences at the base of Diamond Head and along the coast (Brown and Monsarrat 1883). Over time, Waikīkī emerged as both a popular residential area and a hub for tourists, with attendant hotels, restaurants, and other establishments. In 1901, the first major hotel, the Moana, opened on the grounds of W.C. Peacock's home on the south side of ʻĀpuakēhau Stream. Five years after the establishment of the Moana Hotel, the cottage-style Seaside Hotel opened on a seaside property that had once belonged to Bernice Pauahi Bishop. In 1925-1926, the iconic Royal Hawaiian Hotel replaced the Seaside; the Royal Hawaiian groin was constructed around this time.

The U.S. Army Corps of Engineers began to acquire land for a military reservation in the area of the Kālia fishponds and along the beach between 1904 and 1908. It was subsequently occupied by a detachment from the 1st Battalion of Engineers from Fort Mason, California. The fort was first referred to as Kalia Military Reservation but was subsequently renamed in honor of Brevet Brigadier General Rene Edward DeRussy (White and Kraus 2007:80). The U.S. Army immediately began to fill the new Fort DeRussy property, including the Kālia fishponds, by dredging material from the offshore reefs (Hibbard and Franzen 1986:79). The fort was home to Batteries Randolph and Dudley between 1914 and 1944.

One of the earliest structures to modify the shoreline was a bridge and causeway built across the mouth of Kuʻekaunahi Stream at the entrance to Kapiʻolani Park. In 1890, a 390-foot-long retaining wall was built to protect Waikiki Road (now Kalākaua Avenue), replacing part of the original bridge and causeway. Many additional seawalls and groins were built in the 1910s and 1920s, after the dredging of a deep channel in the reef off Fort DeRussy reportedly initiated widespread beach erosion (Wiegel 2008:11).

The growth of the tourist industry in the 1950s led to increasing urbanization along the shoreline and throughout Waikīkī. Several major attractions opened in the post-war period, including the Honolulu Zoo (1952), the Waikīkī Aquarium (1955), and the Duke Kahanamoku Beach and Lagoon (1956). Kūhiō Beach Park had opened just prior to World War II, in 1940, and the building of an off-shore seawall created a sheltered area for inexperienced swimmers. The Waikiki Tavern (which included the Waikiki Inn) occupied the lot northwest of the Kūhiō groin complex from the 1920s to the 1950s; it was demolished in 1960 to make way for Waikīkī Beach Center (Clark 1977:54; Hibbard and Franzen 1986:51).

OVERVIEW OF ARCHITECTURAL RESOURCES

Architectural resources within and adjacent to the Waikīkī shoreline project area consist of beach infrastructure (groins and seawalls) and adjacent buildings. These resources (Table 3; Figure 8) are described in more detail in the sections below. The groins (including storm drains) form the boundaries between each of the sectors: Kapahulu Storm Drain/Groin, ‘Ewa Kūhiō Groin, Royal Hawaiian Groin, and Fort DeRussy Groin. They were built at different times, with dates of origin from 1917 (Fort DeRussy) to 1951 (Kapahulu Storm Drain). A complex of shore-parallel seawalls in the Kūhiō Beach sector was built in 1939 and extended in 1953. Estimates of construction dates have been made using historical maps and photographs, as well as references in Waikīkī historical sources (e.g., Clark 1977; Wiegel 2008).

With one exception (Site 50-80-14-5948), these beach infrastructure features have not been recorded in detail nor assigned State Inventory of Historic Places (SIHP) numbers. However, based on age (at least 50 years old) and their relevance to Waikīkī’s history they may be considered historic properties.

Inland of the shoreline maintenance program areas are three important historic buildings, which will not be physically affected by beach improvement activities but warrant mention: Battery Randolph (Site 50-80-14-1382), the Moana Hotel (Site 50-80-14-9901), and the Royal Hawaiian Hotel (no SIHP number). Both Battery Randolph and the Moana Hotel are listed on the NRHP.

Table 3. Architectural Resources near the Waikīkī Beach Improvement and Maintenance Program Sectors.

Site	Comment	Reference	Sector
Kapahulu Storm Drain	355-foot-long Kapahulu Groin built in 1951 as part of beach improvement; groin is referred to as “The Wall”	Clark (1977:53); Wiegel (2008:17)	Kūhiō Beach
“Slippery Wall”	750-foot-long retaining wall built in 1953 on ‘Ewa side of the Kapahulu Storm Drain to keep sand from eroding away	Clark (1977:53); Wiegel (2008:17, 27)	Kūhiō Beach
Kūhiō groin complex, ‘Ewa basin	650-foot-long crib wall built in 1939 about 200 feet from shore (parallel to shore), with shore return structures at each end	Clark (1977); Wiegel (2008:17)	Kūhiō Beach
Site 50-80-14-5948, portion of historical seawall	basalt boulder retaining wall exposed near intersection of Kalākaua and Kapahulu Avenues; may be remains of wall built around 1890 to protect Waikiki Road	Kanahele (1928e); Wiegel (2008:26); Winieski et al. (2002)	Kūhiō Beach
portion of historical seawall	buried section of seawall extending northwest from inland end of the ‘Ewa basin of the Kūhiō groin complex; associated with possible remains of Waikiki Inn foundation	Kanahele (1928c); Nick Belluzzo, pers. comm.	Royal Hawaiian
Royal Hawaiian Hotel	constructed in 1925-1926 on the grounds of the 1906 Seaside Hotel; formerly residence of Charles and Bernice Pauahi Bishop	Hibbard and Franzen (1986); Wiegel (2008)	Royal Hawaiian

Site	Comment	Reference	Sector
Moana Hotel (Site 50-80-14-9901)	first major hotel in Waikīkī, opened in 1901	Hibbard and Franzen (1986); Wiegel (2008)	Royal Hawaiian
Royal Hawaiian Groin	curving groin built in 1927; new seawall in front of hotel built shoreward of old seawall	Kanahele (1928c); Wiegel (2008:21)	Royal Hawaiian
Fort DeRussy Groin	70-foot-long box culvert/groin built in 1917 at east boundary of Fort DeRussy; 1,150-foot-long seawall built in 1916 along Fort DeRussy shoreline	Kanahele (1928b); Wiegel (2008:22, Figures 18, 26)	Fort DeRussy
Battery Randolph (Site 50-80-14-1382)	completed in 1914; part of Artillery District of Honolulu	Clark (1977:58); Wiegel (2008:26)	Fort DeRussy

KŪHIŌ BEACH SECTOR

The Kūhiō Beach sector extends along approximately 460 m (1,500 ft.) of shoreline from the ‘Ewa (west) groin at Kūhiō Beach Park to the Kapahulu Storm Drain. Based on the proximity of Kalākaua Avenue to the shoreline within this sector, there are no major buildings *makai* of the road. The Kūhiō Beach Hula Mound is at the northern end of the sector and an outdoor concession stand is *mauka* of the ‘Ewa Groin Complex.

There are four known historical architectural structures within the Kūhiō Beach sector, all of which are beach stabilization structures (Figure 9): the ‘Ewa Basin of the Kūhiō groin complex built in 1939, the Kapahulu Storm Drain and “Slippery Wall” (forming the Diamond Head Basin of the Kūhiō groin complex) built in 1951-1953, and Site 50-80-14-5948, a buried remnant of the 1890 seawall.

SITE 50-80-14-5948, BURIED SEAWALL

Site 50-80-14-5948 is a buried historical seawall approximately 4 m seaward of the Kalākaua Avenue curb near the intersection of Kalākaua and Kapahulu Avenues (Winieski et al. 2002:55). The top of the 15 m-long wall, which is built of mortared large basalt boulders, was exposed by construction excavation at about 1 m below the surface and the base of the wall, extended below the base of excavation at 2.2 m below surface. Figure 10 is a photograph and profile drawing of the exposed wall. Photo 1 shows a retaining wall at this location in 1931; the wall is also shown on Kanahele’s (1928d) map of Waikīkī beach. The seawall was evaluated as significant under the State of Hawai‘i’s Criterion d[1].

[1] Criterion d under the HAR §13-284-6 requires that a historic property both “possess integrity of location, design, setting, materials, workmanship, feeling and association” and “have yielded, or [be] likely to yield information important in prehistory or history.”

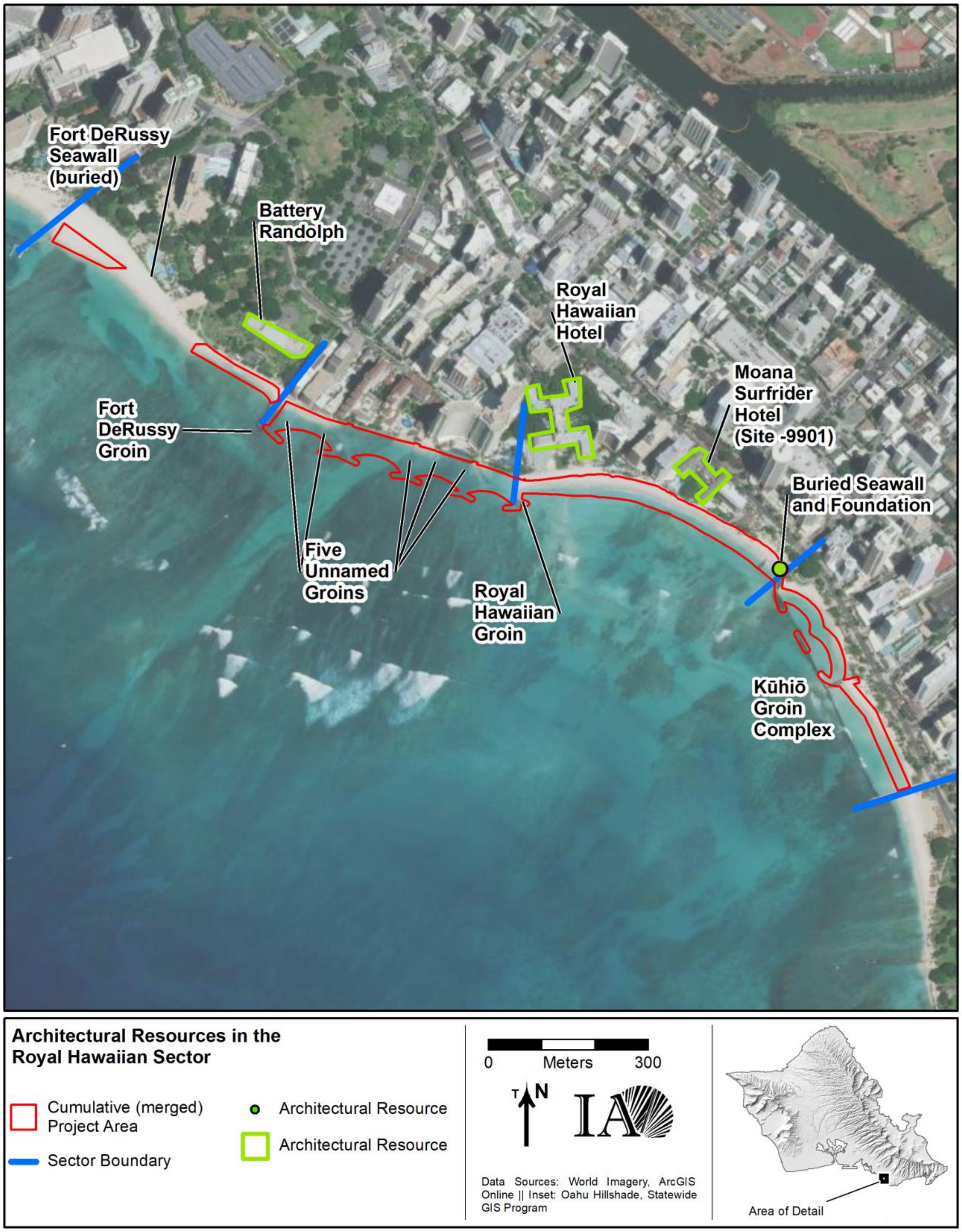


Figure 8. Overview of historical architectural resources near the project area.

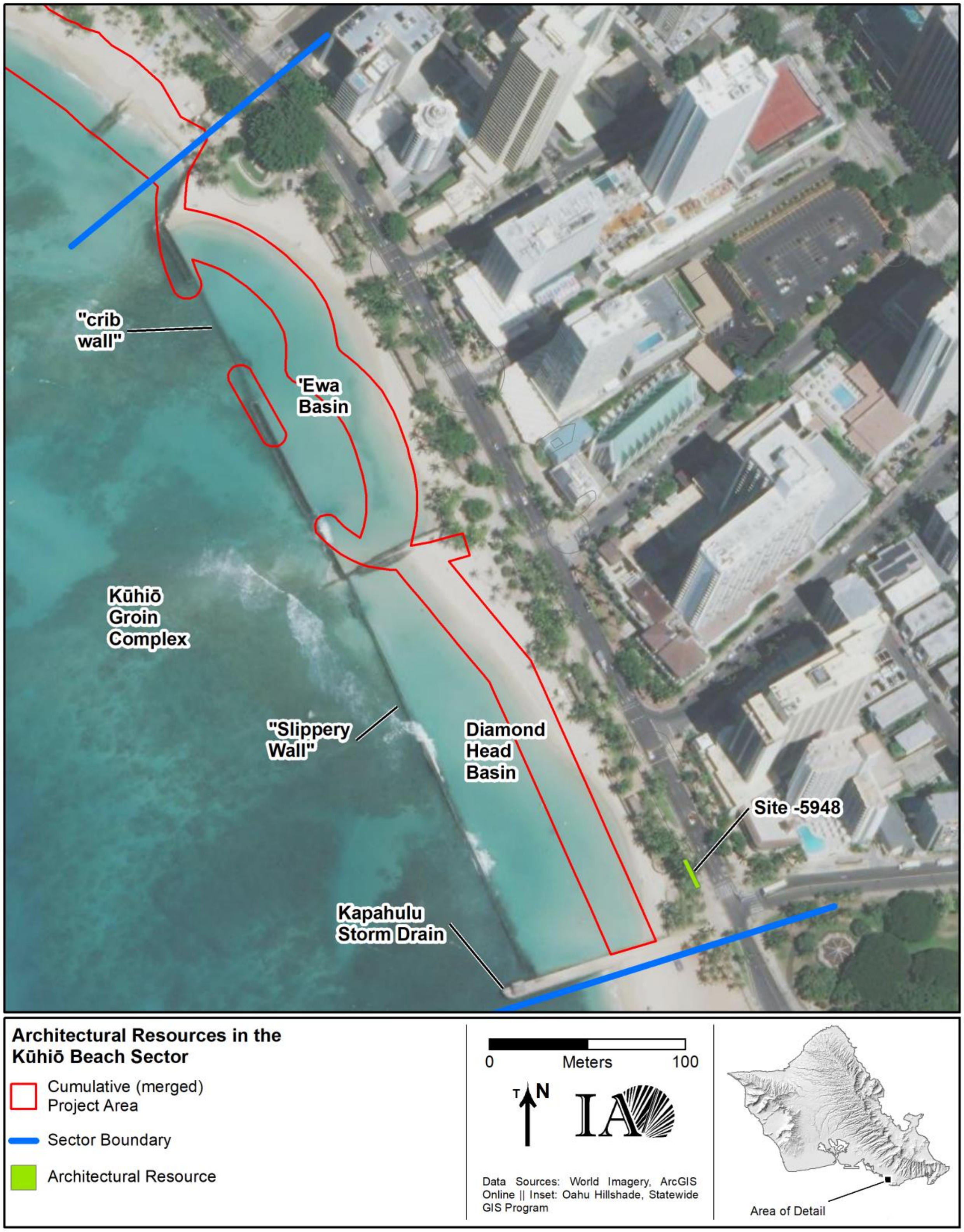
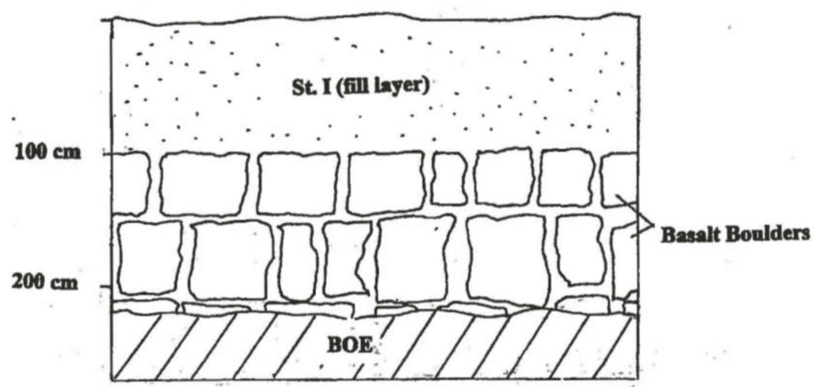


Figure 9. Historical architectural resources in the Kūhiō Beach sector.

Figure 29 Photograph of Portion of Historic Sea Wall (State Site 50-80-14-5948), View East.

Historic Sea Wall Remnant (50-80-14-5948) *



Stratum	Depth (cm.)	Description
I	0-100	10YR 4/3 sandy clay loam fill

*** Profile Reconfigured from Field Notes and Photograph Documentation**

Figure 10. Exposed seawall under Kalākaua Avenue (Site 50-80-14-5948). Photograph and profile drawing reproduced from Winieski et al. (2002:Figure 30).

Photo 1. Aerial view of the Waikīkī shoreline, 1931. The retaining wall protecting Kalākaua Avenue is in the center of the photograph. Source: Hawai‘i State Archives.

KŪHIŌ GROIN COMPLEX (‘EWA BASIN)

In 1939, preparations for the opening of Kūhiō Beach Park in 1940 included the construction of a 650-foot-long breakwater built 200 feet from shore (parallel to shore) along the ‘Ewa end of Kūhiō Beach, with shore return structures at each end of the seawall. The breakwater is known as the “crib wall.” At least 7,000 cubic yards of sand were also placed on the beach around the same time (Wiegel 2008:17).

KŪHIŌ GROIN COMPLEX (DIAMOND HEAD BASIN AND “SLIPPERY WALL”)

In 1953, a 750-foot-long retaining wall was built between the 1939 crib wall and the Kapahulu Storm Drain to keep sand from eroding away. This wall is called “Slippery Wall” because of its slick surface when wet due to the growth of fine seaweed (Clark 1977:53; Wiegel 2008:17, 27). It forms the boundary of the Diamond Head basin of the Kūhiō groin complex. The beach sand along Kūhiō Beach has been supplemented several times, including through off-shore dredging ca. 2000 (Wiegel 2008:19).

KAPAHULU STORM DRAIN

The 355-foot-long Kapahulu Storm Drain was built in 1951 at the end of Kapahulu Avenue. Other improvements included construction of a retaining wall on the Diamond Head side of the Kapahulu Storm Drain and importing sand. The structure is an extension of the storm drain running under Kapahulu Avenue, which discharges storm water at its seaward end. The storm drain/groin, which is still a prominent feature of the Waikīkī Beach shoreline, is commonly referred to as "The Wall" (Clark 1977:53).

ROYAL HAWAIIAN SECTOR

The Royal Hawaiian sector consists of approximately 530 m (1,730 ft.) of shoreline extending from the Royal Hawaiian groin to the ʻEwa (west) groin at Kūhiō Beach Park. This sector contains the beachfront of several prominent Waikīkī hotels, including the Royal Hawaiian Hotel and the Moana Surfrider. Near the southern end of the sector are the Kūhiō Beach Park and the Waikīkī Beach Center, which contains the Honolulu Police Department's Waikīkī Substation and the Duke Paoa Kahanamoku Statue.

The Royal Hawaiian sector contains two beach stabilization structures and has two historic buildings, the Moana Hotel and the Royal Hawaiian Hotel, immediately inland of the sector's northern margin (Figure 11). The beach infrastructure consists of the Royal Hawaiian Groin (built in 1927), which marks the boundary with the Halekūlani sector, and a buried seawall at the southern end of the sector.

ROYAL HAWAIIAN GROIN

The 170-foot-long Royal Hawaiian Groin, which marks the boundary of the Royal Hawaiian and Halekūlani sectors, was built to the west of the Royal Hawaiian Hotel in 1927. The groin was extended to a length of 368 feet in 1930 (Wiegel 2008:21, 26) and substantially rebuilt in 2020. The recent groin expansion included the construction of a 125-foot-long boulder rubble-mound groin overlying a portion of the existing Royal Hawaiian Groin and a 50-foot-long dog-leg to the east (Photo 2). Archaeological monitoring conducted during the groin expansion yielded no significant finds (Morrison 2020).

Photo 2. View of the renovated Royal Hawaiian Groin. Reproduced from Pennybacker (2020:B1).

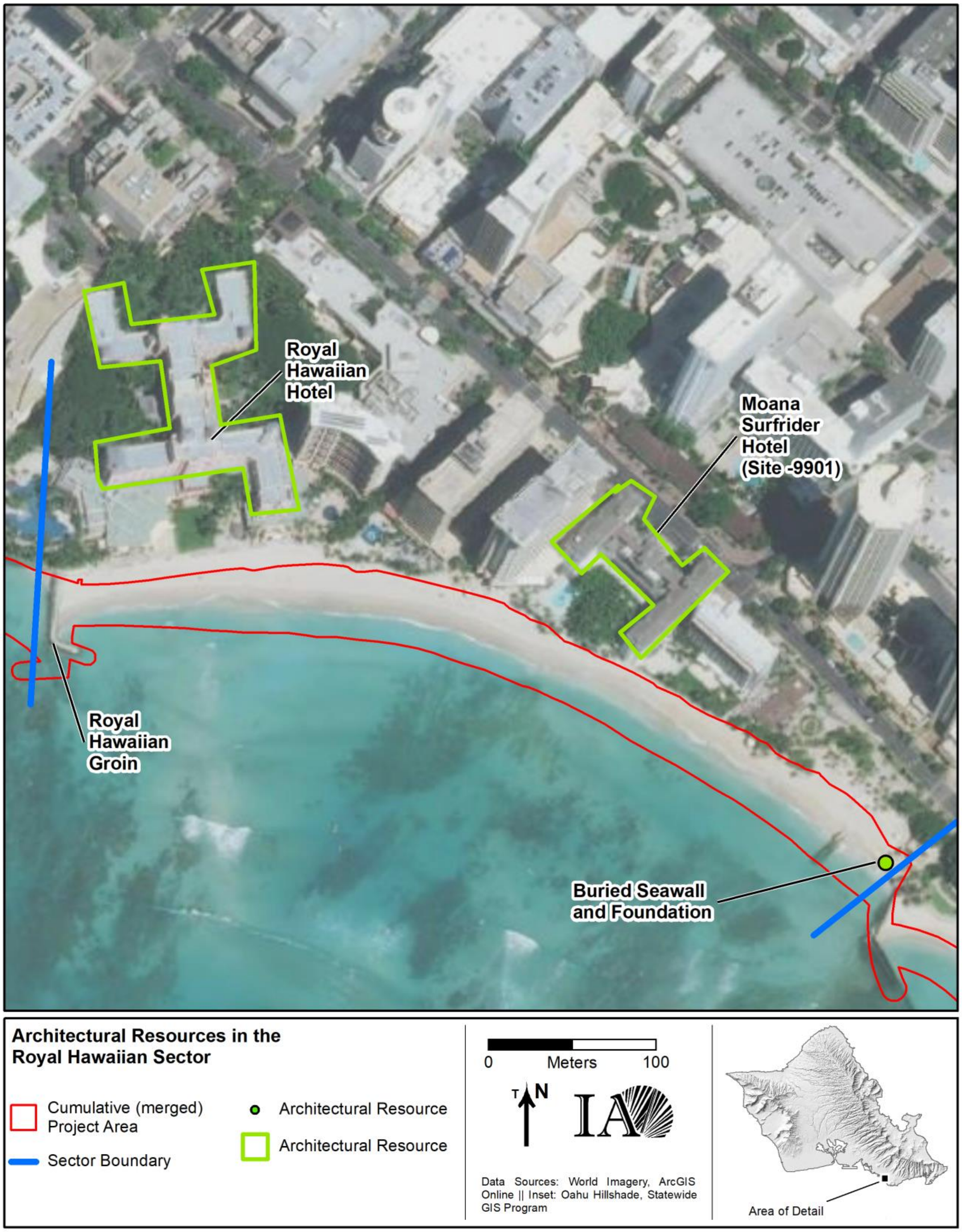


Figure 11. Architectural resources in the Royal Hawaiian sector.

BURIED SEAWALL AND FOUNDATION

A buried concrete slab was examined by SHPD staff in 2013 at the Diamond Head end of the sector, immediately west of the Kūhiō Beach Hula Mound (Nick Belluzzo, personal communication 2017) (Photo 3). Subsequent beach erosion (Photo 4) has exposed a larger portion of the concrete slab, which is in the same location as the Waikīkī Inn (part of the Waikiki Tavern) as shown on a 1950 Sanborn Fire Insurance map (Figure 12). The buildings of the Waikiki Tavern were built in the 1920s and demolished ca. 1960 for the development of Kūhiō Beach Park. A photo of the Waikiki Tavern ca. 1951 is shown in Photo 5. The buried seawall may be associated with a structure illustrated on Kanahele's (1928c) map of Waikīkī (Figure 13).

Photo 3. Buried seawall in beach sand at Diamond Head end of the Royal Hawaiian sector. Photo courtesy of Nick Belluzzo.

Photo 4. Concrete foundation exposed by erosion at the Diamond Head end of the Royal Hawaiian sector, May 17, 2017. Photo courtesy of Matt Bell.

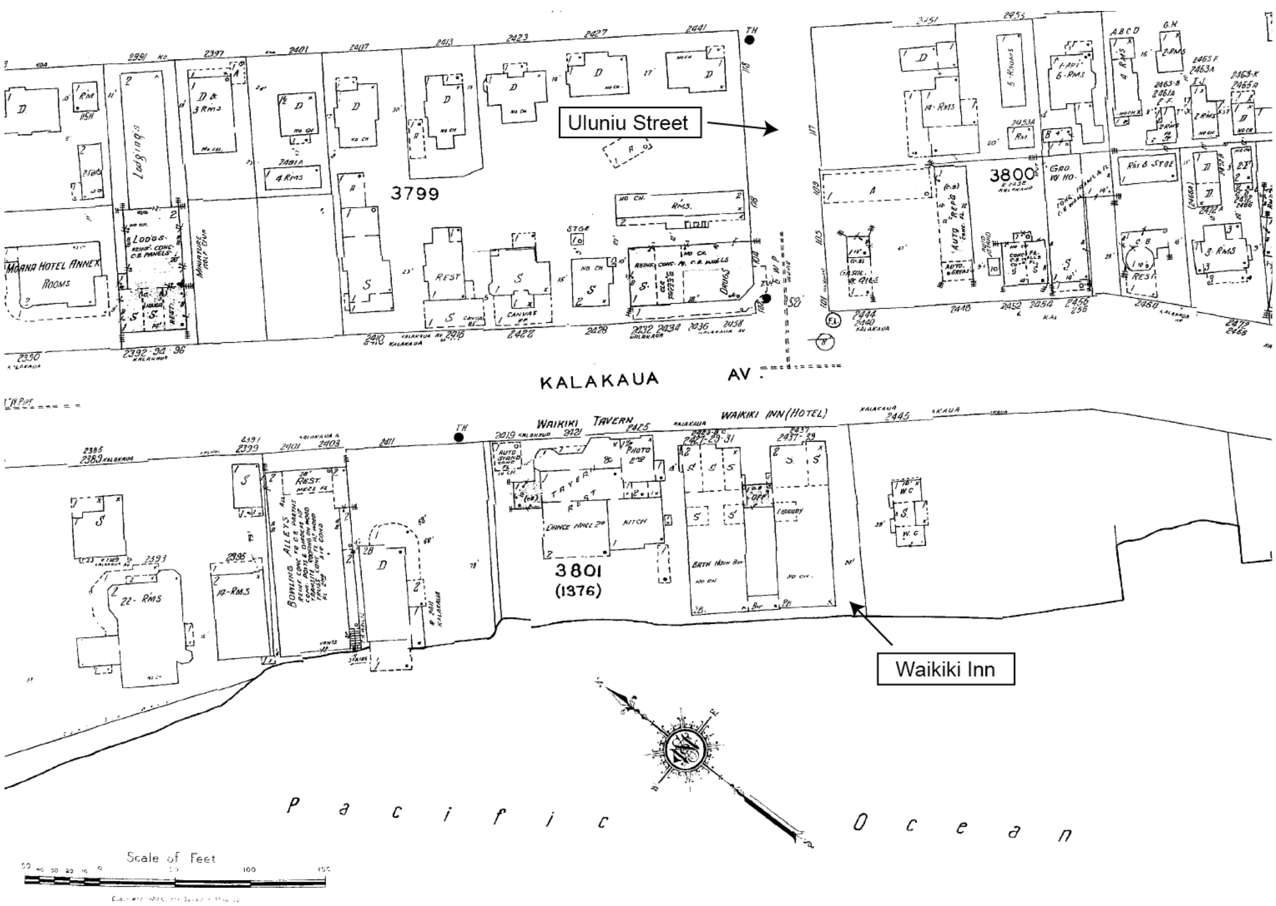


Figure 12. A 1949 Sanborn Fire Insurance map showing the Waikiki Inn (part of the Waikiki Tavern).

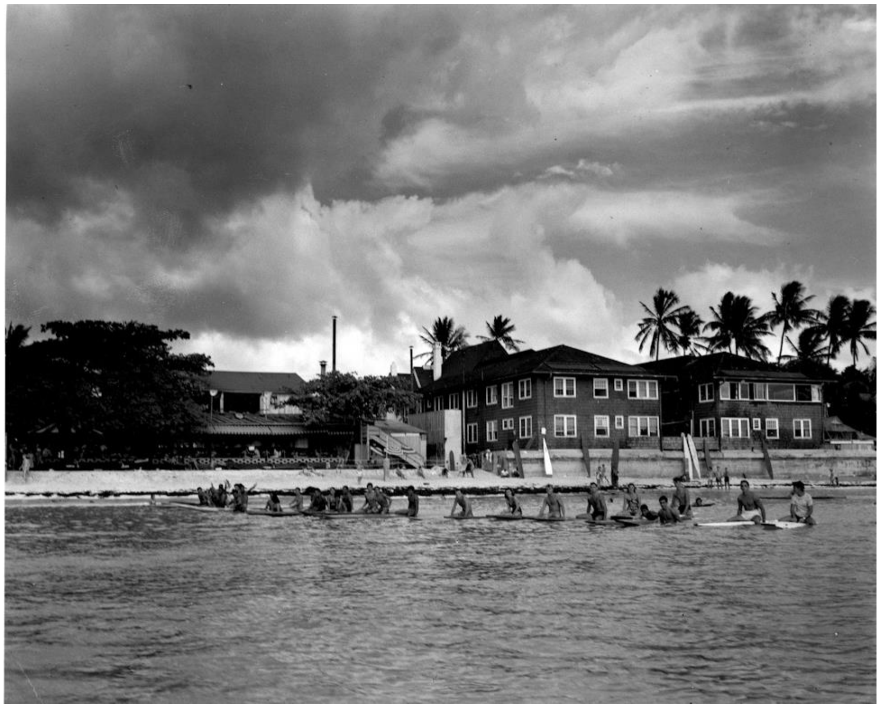


Photo 5. Surfers in front of Waikīkī Beach, ca. 1951. The building at right (containing two separate wings) is the Waikīkī Inn, which was part of the Waikiki Tavern. The building at left was also part of the Waikiki Tavern. Photo courtesy of Ian Lind.

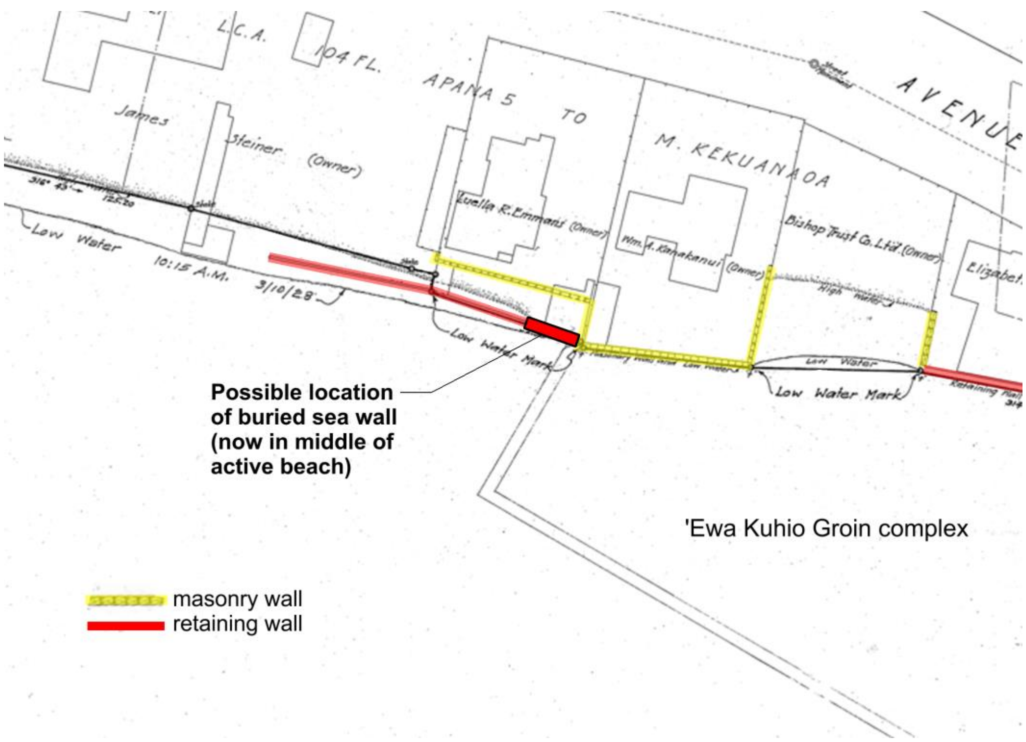


Figure 13. Portion of the Kanahele (1928c) map of Waikīkī showing the possible location of the wall section exposed in Photo 3.

MOANA SURFRIDER HOTEL (SITE 50-80-14-9901)

In 1901, Waikīkī's first major hotel, the Moana, opened on the grounds of W.C. Peacock's former home on the south side of the ʻĀpuakēhau Stream mouth (Photo 6). The Moana Hotel, which was designed by O.G. Traphagen, "features an elaborately designed lobby which extends to open lanais and is open to the Banyan Court and the sea" (Riconda 1972:3). The hotel was outfitted with a 300-foot-long pier, originally called Peacock Pier, that was a landmark of the Waikīkī shoreline until it was demolished in 1931 (Wiegel 2008:21) (Photo 7). The Moana Groin was a concrete wall built into the ocean on the Diamond Head side of ʻĀpuakēhau Stream sometime between 1906 and 1907; it was removed in 1927 (Kanahele 1928c; Wiegel 2008:26). During the early 20th century, the hotel's dining room was built on piles and extended nearly to the water; this dining room has since been removed (Figure 14). Two concrete five-story wings were added onto the original four-story wooden structure in 1918, doubling the hotel's capacity (Hibbard and Franzen 1986:77).

The 21-story Surfrider Hotel opened on the western side of the Moana Hotel in 1969 (Wiegel 2008:21); the Moana and Surfrider today operate as a single establishment known as the Moana Surfrider[2].

The Moana Hotel, which has been designated as Site 50-80-14- 9901, was listed on the NRHP in 1972. According to the NRHP nomination form (Riconda 1972:3):

> The original wooden center structure of the Moana Hotel, built in 1901, is the oldest existing hotel in Waikiki. As such, it deserves recognition as a landmark in Hawaii's tourist industry. The Moana was one of the earliest "high-rise" buildings in Hawaii and was the costliest and most elaborate hotel in the islands. In spite of numerous renovations and changes, it has retained its tropical openness and is a welcome change from the more modern highrises [*sic*] that surround it. The Moana represents an important architectural link in the development of Waikiki.

Photo 6. Moana Hotel, ca. 1905. Hawaiʻi State Archives (Call No. PPWD-10-2-014).

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[2] The hotel's full name is the Moana Surfrider, a Westin Resort & Spa, Waikīkī Beach.

Photo 7. View of Moana Groin and Moana Pier, taken sometime between 1906 and 1920. Hawai‘i State Archives (Call No. PP115-12-003).

ROYAL HAWAIIAN HOTEL

In 1925-1926, the iconic Royal Hawaiian Hotel was built on the grounds of the former Seaside Hotel, and it opened in 1927 (Photo 8). The distinctive six-story building, with its pink stucco concrete façade, contributed to the coastline's growing allure as a glamorous tourist destination. According to Hibbard and Franzen (1986:95):

> The ‘pink palace’ towered over its neighbors and had a majestic aura new to Waikīkī. Sheer massiveness, capped by a central tower that soared 150 feet above the street, enabled the Royal Hawaiian to join the Moana in dominating the beach's palm-filled skyline. Furthermore, its four hundred rooms, each with a bath, balcony, and view of either mountains or ocean, almost doubled the guest capacity of Waikiki.

The Royal Hawaiian Hotel continues to operate in its original building. Although undoubtedly a historically significant structure, it has not been assigned an SIHP number or evaluated in terms of its eligibility for the NRHP.

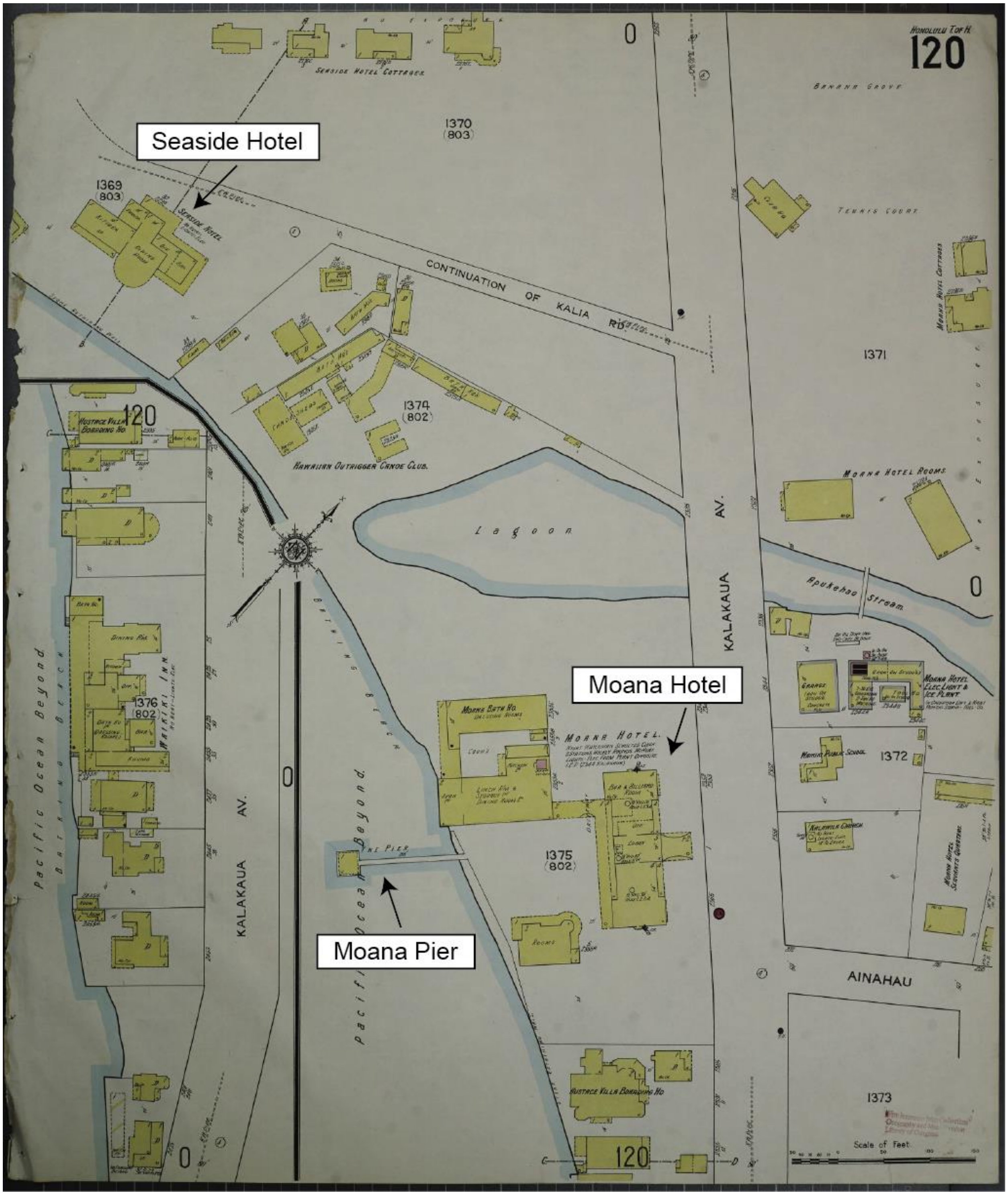

Figure 14. A 1914 Sanborn Fire Insurance map showing the location of the Moana Hotel and pier. In the hotel's early years, the dining room extended over the waterline. The Seaside Hotel is also visible at the upper left.

Photo 8. Royal Hawaiian Hotel, ca. 1928. The Royal Hawaiian Groin is visible to the left of the hotel. University of Hawaiʻi Library (Call No. B-1252).

HALEKŪLANI SECTOR

The Halekūlani Sector covers approximately 440 m (1,450 ft.) of shoreline extending from the Fort DeRussy outfall groin to the Royal Hawaiian Groin. Like the Royal Hawaiian sector, the Halekūlani sector contains the beachfronts of several major Waikīkī hotels. From south to north, the hotels are the Sheraton Waikīkī, the Halekūlani Hotel, and the Outrigger Beach Waikīkī Beach Resort.

Possible historical structures within the Halekūlani sector include five groins of uncertain ages (Figure 15).

UNNAMED GROINS

Five concrete block groins visible in aerial photographs of the Halekūlani sector may be historical structures. Similar groins can be seen in a 1932 aerial photograph (Photo 9). Eight groins were built between the Royal Hawaiian Hotel and Fort DeRussy from 1926 to 1929 (Wiegel 2008:26). Four groins in this area were removed in 1970 (Crane 1972, cited in Wiegel 2008:22).

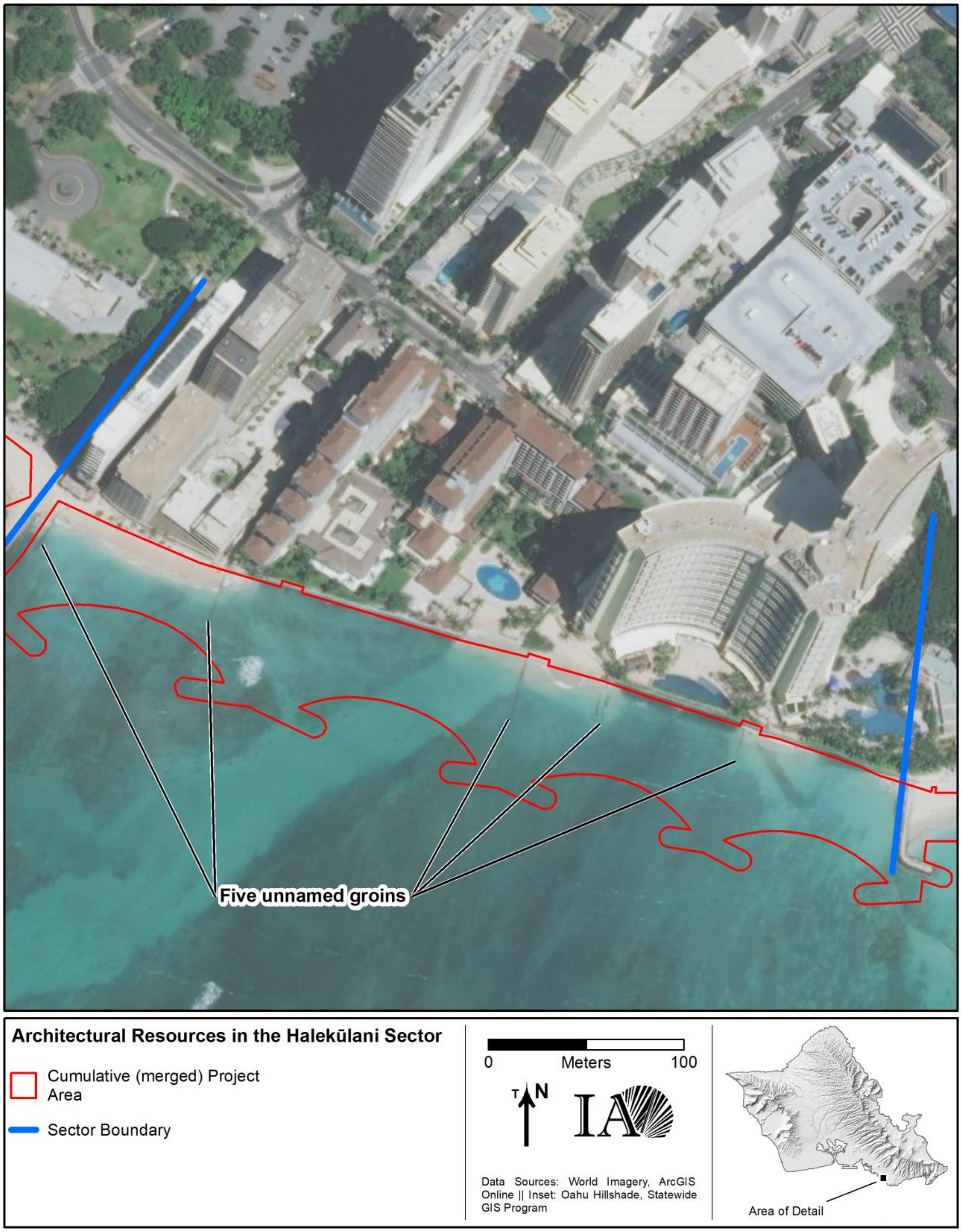

Figure 15. Architectural resources in the Halekūlani Sector.

Photo 9. A 1932 aerial photograph showing groins along the shoreline of the Halekūlani sector. Reproduced from Wiegel 2008:Figure 19.

FORT DERUSSY SECTOR

The Fort DeRussy sector consists of approximately 510 m (1,680 ft.) of shoreline extending from the Hilton Hawaiian Village pier to the Fort DeRussy outfall groin. Today, the Hale Koa Hotel is just inland of the western portion of the sector and the U.S. Army Museum of Hawai‘i, housed in the historic 1914 Battery Randolph, is at the eastern end of the sector. A wide concrete promenade runs along the inland edge of the beach.

The Fort DeRussy sector contains the Fort DeRussy Groin beach control structure with Battery Randolph just inland of the sector's northeastern boundary (Figure 16). A former seawall may also be present.

FORT DERUSSY GROIN

A 70-foot-long box culvert/groin at the Diamond Head end of the sector was built in 1917. The groin was lengthened to 300 feet in 1969 and supplemented by a rubble mound groin ca. 1971 (Wiegel 2008:22). It is unclear whether the existing groin immediately south of the Fort DeRussy Groin is the original 1917 groin, or if the 1917 groin was destroyed or covered during the 1969 extension of the structure.

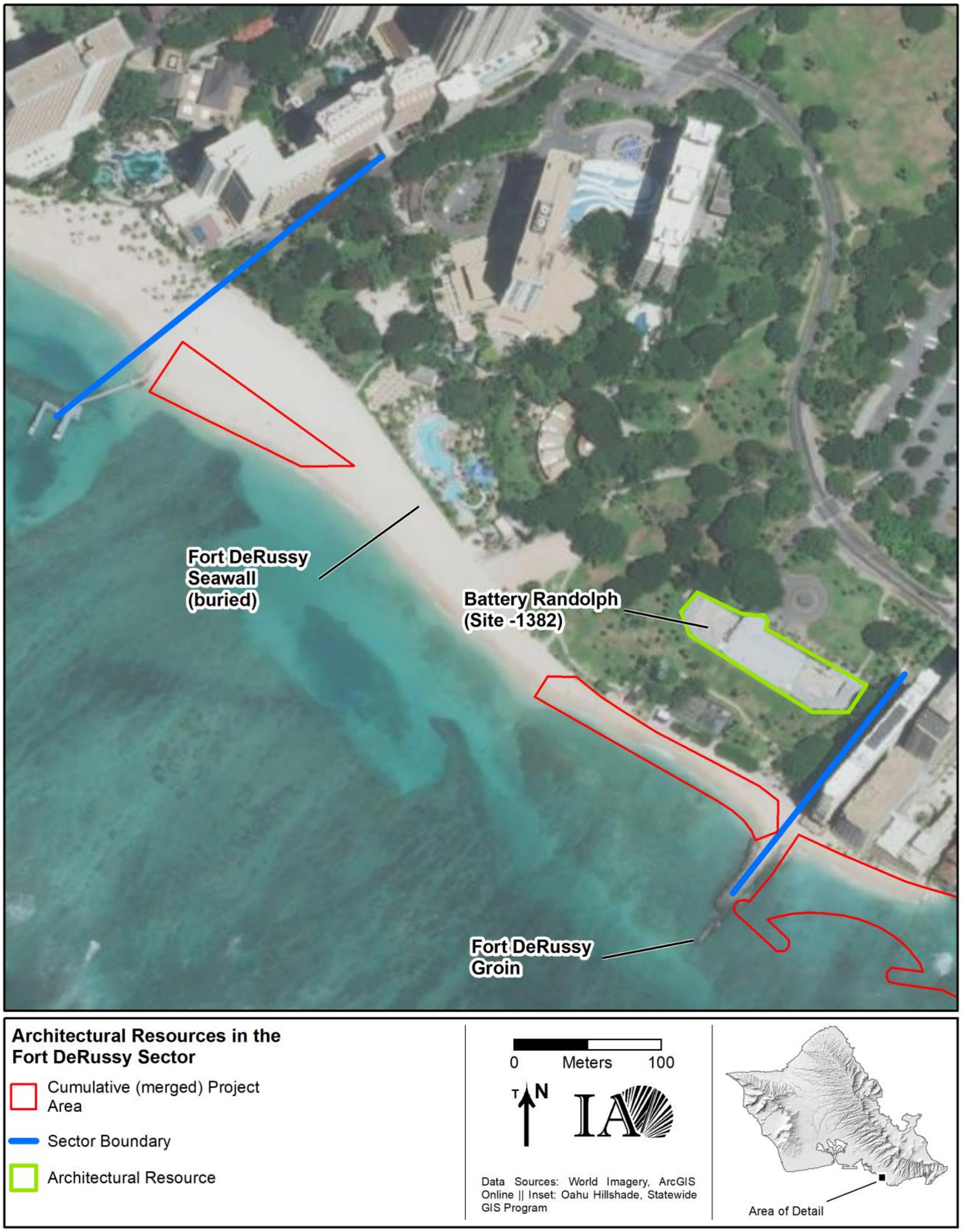

Figure 16. Architectural resources in the Fort DeRussy Sector.

FORT DERUSSY SEAWALL

In 1916, a 1,150-foot-long seawall was built along the entire Fort DeRussy Coast. The seawall was built on the coral reef where there was no sand, and the area behind it was filled with coral rock and rubble dredged from the reef (Wiegel 2008:11). Photo 10 is a 1919 aerial image of the batteries and seawall, which is estimated to lie just seaward of the present promenade.

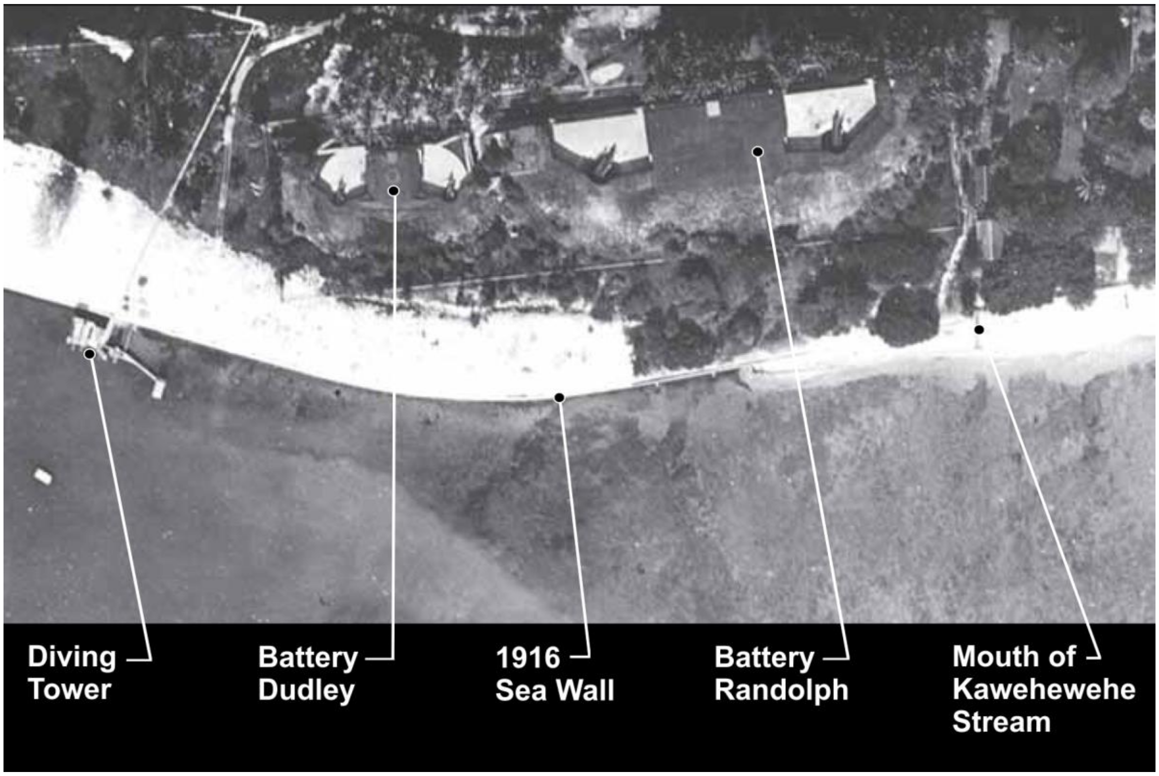

Photo 10. Aerial view of Battery Randolph and Battery Dudley, showing the straight line of the 1916 seawall (reproduced from Wiegel 2008:Figure 15). The diving tower at photo left is at the head of the channel dredged to bring the 14-inch guns to Battery Randolph (Thompson 1980:37).

BATTERY RANDOLPH (SITE 50-80-14-1382)

Construction of Battery Randolph was begun in 1910 by the U.S. Army as part of the Artillery District of Honolulu (later renamed the Headquarters Coast Defense of Oahu) intended to protect the coast of O‘ahu, including Honolulu Harbor. The Artillery District included Forts Armstrong, DeRussy, Kamehameha, and Ruger. Battery Randolph was completed and armed by 1914. Battery Dudley, which was adjacent to and northwest of Battery Randolph, was armed in 1916[3]. A deep channel was cut into the reef to facilitate the installation of two 14-inch guns.

Battery Randolph is built of reinforced concrete, with its design intended to camouflage it from military attack (Photo 11). The appearance of the building is described in its NRHP nomination:

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[3] Battery Dudley was demolished in 1970 (see Davis 1989:21).

> In contrast to the stark, vertical walls of older forts, the new works of reinforced concrete [at Fort DeRussy, including Battery Randolph, and Fort Kamehameha] were designed to blend, so far as possible, into the surrounding landscape. The low profile, massive emplacements all possess concrete frontal walls as much as twenty feet thick behind 30 or more additional feet of earth. The batteries were (and still are) all but invisible and invulnerable from the seaward direction. The permanency of construction is also evident by their present condition (Char 1983:4)

Battery Randolph was deactivated in 1944, and its guns and mounts were removed. Since 1976, the building has housed the U.S. Army Museum of Hawaii. It was entered on the NRHP in 1984 as part of the Artillery District of Honolulu (Site 50-80-14-1382) along with Batteries Selfridge, Jackson, Hawkins, Hawkins Annex, and Hasbrouck at Fort Kamehameha.

Photo 11. Battery Randolph from the ocean, 1961. U.S. Army Engineer District, Honolulu. Reproduced from the Artillery District of Honolulu (Site 1382) NRHP nomination (Char 1983).

III. EXPECTATIONS AND RECOMMENDATIONS

Historical architectural resources within the maintenance program sectors are limited to beach stabilization infrastructure, with one possible exception being a former building foundation. Two historical buildings, the Moana Surfrider and Royal Hawaiian Hotels, and one structure, Battery Randolph, are adjacent to two sectors. The shoreline structures, the oldest of which is a buried 1890 seawall in the Kūhiō Beach sector, are associated with the emergence of Waikīkī as an urban tourist destination. Additionally, the beach infrastructure in the Fort DeRussy sector may be linked thematically to the development of O‘ahu's coastal defense system in the early 20th century. While the historic buildings along the shoreline are outside the area planned for beach improvements, several beach control structures are within the project area and will likely experience impacts from the proposed project.

KŪHIŌ BEACH SECTOR

Beach improvement activities are proposed at both basins of the Kūhiō groin complex. In the Diamond Head Basin, the planned work includes the addition of approximately 4,500 cubic yards of sand between +5 and -4 feet mean sea level (msl). No alterations to the shore structures are planned. In the ‘Ewa Basin, proposed work includes the addition of approximately 4,500 cubic yards of sand between +8 and -3 feet msl and the construction of a segmented breakwater partially overlapping the existing 1939 "crib wall" and adjacent shore return structures.

Beach control structures within the Kūhiō Beach Sector include the Kapahulu Storm Drain ("The Wall"), "Slippery Wall", the "crib wall," and shore return structures on either side of the crib wall. The 1939 crib wall and adjacent shore return structures, which will be partially covered by the proposed addition of a segmented breakwater, have the potential to incur significant impacts.

RECOMMENDATIONS

Preparation of a Historic American Engineering Record (HAER) for the Kūhiō groin complex to mitigate any potential adverse effects caused by the maintenance program is recommended.

ROYAL HAWAIIAN SECTOR

Beach improvement activities proposed for the Royal Hawaiian sector include the addition of approximately 25,000 cubic yards of sand fill between +8.5 and -2 feet msl.

Historic buildings along the shoreline in the Royal Hawaiian Sector include the Moana Surfrider and Royal Hawaiian Hotels; beach control structures comprise the Royal Hawaiian Groin (recently rebuilt), and a buried seawall and foundation. The proposed project work will not result in disturbance to the shoreline hotels, which are behind the active beach. The addition of sand fill is not expected to result in disturbance to the Royal Hawaiian Groin or the possible buried seawall or foundation. The seawall or foundation will likely no longer be visible beneath the sand fill but is unlikely to experience significant impacts.

RECOMMENDATIONS

Historic preservation documentation and review of the remaining portions of the original Royal Hawaiian Groin prior to commencement of the project is recommended. Also recommended is historic preservation documentation and review of the exposed seawall and possible Waikiki Inn/Tavern foundation at the eastern end of the sector.

HALEKŪLANI SECTOR

Beach improvement activities proposed for the Halekūlani sector include the addition of approximately 60,000 square yards of sand fill between +8.5 feet and -3 feet msl. The construction of five groins between the Royal Hawaiian Groin and the Fort DeRussy Box Culvert/Groin is also planned.

The Halekūlani sector contains five groins possibly built between 1926 and 1929, although the northernmost of these may be the 1917 groin built at Fort DeRussy. The proposed construction of several new groins within the Halekūlani sector is likely to result in significant disturbance to the existing groins.

RECOMMENDATIONS

Preparation of a HAER for the existing groins to mitigate any potential adverse effects caused by the maintenance program is recommended.

FORT DERUSSY SECTOR

Beach improvement activities proposed for the Fort DeRussy sector include the addition of approximately 1,500 cubic yards of sand fill near the Diamond Head edge. A sand borrow area is proposed at the ‘Ewa end of the sector adjacent to the Hilton Hawaiian Village pier. The proposed project work will be confined to the area *makai* of the Fort DeRussy seawall, which consists of beach constructed during the 20th century.

The shoreline within the Fort DeRussy sector contains the Fort DeRussy Groin and presumably a now-buried 1917 seawall. The 1914 Battery Randolph is well beyond the active beach and will not be affected by the maintenance program. The Fort DeRussy Groin is at the Diamond Head end of the Fort DeRussy sector, separating it from the Halekūlani sector. Installation of new rock rubble mound groins on the Halekūlani-side of the Fort DeRussy groin may affect this structure.

RECOMMENDATIONS

Preparation of a HAER for the Fort DeRussy Groin to mitigate any potential adverse effects caused by the maintenance program is recommended.

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1928a [map] *Waikiki Beach from Ala Wai (Canal) to Kalakaua Avenue opposite Ohua Avenue, Waikiki, Honolulu, Oahu, T.H.* Scale 40 feet=1 inch. Survey made for Board of Harbor Commissioners of the Territory of Hawaii, as provided for by Act 273, Session Laws of 1927. Government Registered Map 2799, Sheet 1 of 3. On file at Land Division, Department of Land and Natural Resources, State of Hawaiʻi, Honolulu.

1928b [map] *Waikiki Beach from Ala Wai (Canal) to Kalakaua Avenue opposite Ohua Avenue, Waikiki, Honolulu, Oahu, T.H.* Scale 40 feet=1 inch. Survey made for Board of Harbor Commissioners of the Territory of Hawaii, as provided for by Act 273, Session Laws of 1927. Government Registered Map 2799, Sheet 2 of 3. On file at Land Division, Department of Land and Natural Resources, State of Hawai‘i, Honolulu.

1928c [map] *Waikiki Beach from Ala Wai (Canal) to Kalakaua Avenue opposite Ohua Avenue, Waikiki, Honolulu, Oahu, T.H.* Scale 40 feet=1 inch. Survey made for Board of Harbor Commissioners of the Territory of Hawaii, as provided for by Act 273, Session Laws of 1927. Government Registered Map 2799, Sheet 3 of 3. On file at Land Division, Department of Land and Natural Resources, State of Hawai‘i, Honolulu.

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GLOSSARY OF HAWAIIAN WORDS

Hawaiian Spelling*	Definition
ali‘i	chief, chiefess, officer, ruler, monarch, peer, headman, noble, aristocrat, king, queen, commander
heiau	temple, shrine
maka‘āinana	commoner
makai	toward the sea
mauka	toward the mountain, or inland

* Adapted from Mary K. Pukui and Samuel H. Elbert, 1986, *Hawaiian Dictionary*, University of Hawaii Press, Honolulu, unless otherwise noted.

FINAL PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

Waikīkī Beach Improvement and Maintenance Program

October 2024

Prepared for:
Hawai‘i Department of Land and Natural Resources
Office of Conservation and Coastal Lands
1151 Punchbowl Street, Suite 131
Honolulu, Hawai‘i 96813

Partnered with:
Waikīkī Beach Special Improvement District Association
2250 Kalākaua Ave. Suite 315
Honolulu, Hawai‘i 96815

Prepared by:
Sea Engineering, Inc.
Makai Research Pier
41-305 Kalaniana‘ole Hwy
Waimānalo, Hawai‘i 96795

APPENDIX G

EISPN Comments and Responses

Prepared By: Sea Engineering, Inc.

DAVID Y. IGE
GOVERNOR OF
HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

REF:OCCL:SL

Waikīkī EISPN

December 22, 2020

SUBJECT: Environmental Impact Statement Preparation Notice
Waikīkī Beach Improvement and Maintenance Program
Kona District, Island of Oʻahu

Dear Participant:

On behalf of the Department of Land and Natural Resources, the Office of Conservation and Coastal Lands (OCCL) would like to notify you that the Environmental Impact Statement Preparation Notice (EISPN) for the Waikīkī Beach Improvement and Maintenance Program located at Waikīkī Beach, Kona District, Island of Oʻahu, Hawaiʻi will be available for public review and comment from December 23, 2020 to January 22, 2021.

For ease of sharing and to facilitate access, the document can be downloaded on or after December 23, 2020 from the website of the Office of Environmental Quality Control https://health.hawaii.gov/oeqc/ through *The Environmental Notice* December 23, 2020 publication. The deadline for comments is January 22, 2021.

Written comments may be submitted via email or U.S. mail:

Andy Bohlander
Sea Engineering, Inc.
Makai Research Pier
41-305 Kalanianaʻole Hwy.
Waimānalo, HI 96795

OR

Email: waikiki@seaengineering.com

For more information regarding this project go the Office of Conservation and Coastal Lands website at https://dlnr.hawaii.gov/occl/waikiki/ .

Sincerely,

Sam Lemmo, Administrator
Office of Conservation and Coastal Lands

Attachments: Project Area Map
Publication Information

AGENCY
PUBLICATION FORM

Project Name:	Waikīkī Beach Improvement and Maintenance Program
Project Short Name:	Waikīkī Beach Improvement and Maintenance Program
HRS §343-5 Trigger(s):	Use of State lands, Use of Conservation District, Shoreline area, Proposed use in Waikiki
Island(s):	Oʻahu
Judicial District(s):	Honolulu
TMK(s):	Seaward of: (1) 2-6-001:003, (1) 2-6-004:007, (1) 2-6-005:001, (1) 2-6-008:029, (1) 2-6-002:026, (1) 2-6-001:019, (1) 2-6-004:012, (1) 2-6-002:017, (1) 2-6-001:013, (1) 2-6-001:012, (1) 2-6-001:002, (1) 2-6-001:015, (1) 2-6-001:008, (1) 2-6-004:006, (1) 2-6-004:005, (1) 2-6-001:017, (1) 2-6-004:008, (1) 2-6-004:009, (1) 2-6-004:010, (1) 2-6-001:018, (1) 2-6-005:006, (1) 2-6-001:004, (1) 2-6-002:006, (1) 2-6-002:005
Permit(s)/Approval(s):	Conservation District Use Permit Clean Water Act Section 401 Water Quality Certification Coastal Zone Management Act Consistency Determination Department of the Army Permit (Section 10 and Section 404) Special Management Area Permit
Proposing/Determining Agency:	Department of Land and Natural Resources Office of Conservation and Coastal Lands
Contact Name, Email, Telephone, Address	Samuel Lemmo, Administrator sam.j.lemmo@hawaii.gov (808) 587-0377 1151 Punchbowl St., Room 131 Honolulu, HI 96813
Accepting Authority:	Governor, State of Hawaiʻi
Contact Name, Email, Telephone, Address	The Honorable David Y. Ige, Governor (808) 586-0034 http://governor.hawaii.gov/contact-us/contact-the-governor/ Executive Chambers State Capitol 415 South Beretania St. Honolulu, Hawaiʻi 96813
Consultant:	Sea Engineering, Inc.
Contact Name, Email, Telephone, Address	David A. Smith, PhD, PE dsmith@seaengineering.com (808) 259-7966 ext. 30 41-305 Kalanianaole Highway Waimanalo, Hawaiʻi 96795

Status (select one)	**Submittal Requirements**
____ DEA-AFNSI	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEA, and 4) a searchable PDF of the DEA; a 30-day comment period follows from the date of publication in the Notice.
____ FEA-FONSI	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; no comment period follows from publication in the Notice.
____ FEA-EISPN	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; a 30-day comment period follows from the date of publication in the Notice.
_X_ Act 172-12 EISPN (“Direct to EIS”)	Submit 1) the proposing agency notice of determination letter on agency letterhead and 2) this completed OEQC publication form as a Word file; no EA is required and a 30-day comment period follows from the date of publication in the Notice.

____ DEIS	Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEIS, 4) a searchable PDF of the DEIS, and 5) a searchable PDF of the distribution list; a 45-day comment period follows from the date of publication in the Notice.
____ FEIS	Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEIS, 4) a searchable PDF of the FEIS, and 5) a searchable PDF of the distribution list; no comment period follows from publication in the Notice.
____ FEIS Acceptance Determination	The accepting authority simultaneously transmits to both the OEQC and the proposing agency a letter of its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS; no comment period ensues upon publication in the Notice.
____ FEIS Statutory Acceptance	Timely statutory acceptance of the FEIS under Section 343-5(c), HRS, is not applicable to agency actions.
____ Supplemental EIS Determination	The accepting authority simultaneously transmits its notice to both the proposing agency and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is or is not required; no EA is required and no comment period ensues upon publication in the Notice.
____ Withdrawal	Identify the specific document(s) to withdraw and explain in the project summary section.
____ Other	Contact the OEQC if your action is not one of the above items.

Project Summary
Waikīkī Beach extends along the shoreline of Mamala Bay on the south shore of the island of Oʻahu, Hawaiʻi. The beaches of Waikīkī are chronically eroding, and the backshore is frequently flooded, particularly during high tides and high surf events. As the beaches continue to erode, a process that is likely to accelerate as sea levels continue to rise, the shoreline will migrate further landward. Without beach improvements and maintenance, sea level rise is likely to result in total beach loss in Waikīkī before the end of the century. The loss of Waikīkī Beach would result in an annual loss of $2.223 billion in visitor expenditures (Tarui, et al. 2018). Improvements and maintenance are necessary to restore and maintain the beaches of Waikīkī to continue to support Hawaii’s tourism-based economy. The Hawaiʻi Department of Land and Natural Resources proposes beach improvement and maintenance projects in the Fort DeRussy, Halekulani, Royal Hawaiian, and Kūhiō Beach sectors of Waikīkī. Projects would include the construction of new beach stabilization structures, and the recovery of offshore sand and its placement on the shoreline. The objectives of the proposed actions are to restore and improve Waikīkī's public beaches, increase beach stability through improvement and maintenance of shoreline structures, provide safe access to and along the shoreline, and increase resilience to coastal hazards and sea level rise.

WBSIDA Waikiki Beach SPECIAL IMPROVEMENT DISTRICT ASSOCIATION

PROJECT AREA

Waikīkī Beach Improvement and Maintenance Program

Environmental Impact Statement Preparation Notice (EISPN)

Honolulu, Oʻahu, Hawaiʻi

ABC Stores
766 Pohukaina Street
Honolulu, Hawaii 96813-5391
www.abcstores.com

Telephone: (808) 591-2550
Fax: (808) 591-2039
E-mail: mail@abcstores.com

January 07, 2020

TO:
Sam Lemmo, Administrator
Office of Conservation and Coastal Lands
Department of Land and Natural Resources, State of Hawaii
1151 Punchbowl Street, Room 131
Honolulu, Hawaii 96813

FROM:
Paul Kosasa, President CEO
ABC Stores
766 Pohukaina Street
Honolulu, Hawaii 96813

SUBJECT: Environmental Impact Statement Preparation Notice (EISPN) for the Waikīkī Beach Improvement and Maintenance Project. Waikīkī Beach, Oahu

ABC Stores **strongly supports** the proposed beach improvement projects by the Hawaiʻi Department of Land and Natural Resources (DLNR). The DLNR proposes beach improvement and maintenance projects in the Fort DeRussy, Halekulani, Royal Hawaiian, and Kūhiō Beach sectors of Waikīkī. These projects include the construction of new beach stabilization structures, and the recovery of offshore sand and its placement on the shoreline. The objectives of the proposed actions are to restore and improve Waikīkī's public beaches, increase beach stability through improvement and maintenance of shoreline structures, provide safe access to and along the shoreline, and increase resilience to coastal hazards and sea level rise. The proposed actions are intended to maintain the economic, social, aesthetic, recreational, environmental, cultural, and historical qualities of Waikīkī.

Over the past several years, and as recently as November of 2020, Waikiki has experienced record high tides (King Tides) that have exacerbated erosion and flooding. These events have highlighted the impacts of sea level rise on the beaches of Waikīkī. As sea levels continue to rise, beach loss will progressively degrade the recreational, social, cultural, environmental, aesthetic, and economic value of Waikīkī. After nearly 50 years of no new beach stabilization projects in Waikīkī, we are now at a crossroads with a clear and increasingly urgent need to implement maintenance and improvements to the shoreline in order to preserve and protect this unique and highly prized natural resource.

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We strongly support these improvement projects and recognize its urgency. With the combination of beach erosion and King Tides, the backshore is frequently flooded, particularly during high surf events, accelerating damage to backshore infrastructure. Without beach improvements and maintenance, sea level rise is likely to result in total beach loss in Waikīkī before the end of the century and result in an estimated economic loss of $50 million to $150 million per hectare[1]. The loss of Waikīkī Beach alone would result in an annual loss of $2.223 billion in visitor expenditures[1]. Improvements and maintenance like those proposed in the EISPN are necessary to restore and maintain the beaches of Waikīkī to continue to support Hawaii's tourism-based economy.

We offer the following summary of project-specific comments.

1. The proposed beach improvement projects in Waikīkī are essential for the future goal to maintain a viable beach in these areas. Several beachfront areas in Waikīkī are seeing the rapid deterioration of both public and private backshore infrastructure such as groins, seawalls and walkways. This highlights the need to make long-term investments into beach stabilizing structures throughout Waikīkī in addition to more immediate emergency repairs to damaged infrastructure.

2. Climate change impacts including sea-level rise projected by the state of Hawai'i Climate Change Commission indicate significant flooding, wave overtopping and beach erosion in Waikīkī for the coming decades and suggest stakeholders and communities plan for 3.2 feet of sea-level rise now. This project has a strong climate change adaption component that is consistent with the recommendations of the State Climate Commission.

3. Without a stabilizing and energy-buffering beach to protect public and private coastal infrastructure, the WBSIDA anticipates even larger and more expensive structural repair and improvement projects to be required soon to prevent the destruction of threatened coastal structures.

Thank you for the opportunity to provide comments on this project.

[1] Tarui, N., Peng, M., Eversole, D. (2018). *Economic Impact Analysis of the Potential Erosion of Waikīkī Beach*. University of Hawai'i Sea Grant College Program. April 2018.

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

Paul Kosasa, President CEO
ABC Stores
766 Pohukaina Street
Honolulu, Hawaii 96813

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Kosasa:

Thank you for your comment letter dated January 7, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you state that you strongly support the proposed beach improvement and maintenance actions. As the Applicant, the Hawaiʻi Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

We recognize that you provided three project-specific comments, all in support of the proposed actions. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement (DPEIS).

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

DAVID Y. IGE
GOVERNOR

CURT T. OTAGURO
COMPTROLLER

AUDREY HIDANO
DEPUTY COMPTROLLER

(P)21.001

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810-0119

JAN - 7 2020

Mr. Andy Bohlander
Sea Engineering, Inc.
Makai Research Pier
41-305 Kalanianaole Highway
Waimanalo, HI 96795

Dear Mr. Bohlander:

Subject: Environmental Impact Statement Preparation Notice
Waikiki Beach Improvement and Maintenance Program
Kona District, Island of Oahu

Thank you for the opportunity to provide comments on the subject project. The project does not impact any of the Department of Accounting and General Services' projects or existing facilities, and we have no comments to offer at this time.

If you have any questions, your staff may call Mr. David DePonte of the Planning Branch at 586-0492.

Sincerely,

CHRISTINE L. KINIMAKA
Public Works Administrator

DD
c: Mr. Dean Shimomura, DAGS CSD

DAVID Y. IGE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

Christine Kinimaka, Public Works Administrator
Department of Accounting and General Services
State of Hawaii
P.O. Box 119
Honolulu, Hawaii 96810-9119

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Ms. Kinimaka:

Thank you for your comment letter dated January 7, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawaiʻi Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

We acknowledge that the project does not impact any of the Department of Accounting and General Services' projects or existing facilities.

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

Andy Bohlander

From: Bob Fowler <lumbob.tennis@gmail.com>
Sent: Tuesday, January 12, 2021 12:51 PM
To: Andy Bohlander

Why wasn't sea level rise discussed in your article written by Allison Schaefers of the Star Advertiser? We need to spend our money on diverse income other then tourism in these troubling times.

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
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POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

Bob Fowler
lumbob.tennis@gmail.com

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Fowler:

Thank you for your email dated January 12, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your email you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawai‘i Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

Comment: "Why wasn't sea level rise discussed in your article written by Allison Schaefers of the Star Advertiser? We need to spend our money on diverse income other than tourism in these troubling times."

> **Response:** Thank you for your comment**.** The article you referenced in your letter notes that one of the objectives of the Waikīkī Beach Improvement and Maintenance Program is "to increase resilience to coastal hazards and sea level rise".
>
> The Program consists of *beach improvement* actions and *beach maintenance* actions. *Beach improvements* refers to actions that involve adding new sand, adding new structures, and/or modifying existing structures. *Beach maintenance* refers to actions that involve using existing sand or adding sand with no new structures or modification of existing structures.
>
> The proposed beach improvement actions in the Halekūlani beach sector and the ‘Ewa (west) basin of the Kūhiō beach sector are designed to create a stable beach profile. The designs account for 1.5 ft of sea level rise and can be adapted to accommodate up to 2.7 ft of sea level rise. We anticipate that the beaches would be stable and periodic renourishment would not be required.

The proposed beach maintenance action in the Fort DeRussy beach sector is sand backpassing, which would involve recovering existing sand from the accreted area at the west end of the beach and placing it in the eroded area at the east end of the beach. Sand would be excavated from the beach face extending inshore only as far as necessary to obtain the required volume of sand. The proposed action would not require offshore dredging and there would be no increase in the volume of sand in the littoral system. The proposed action is intended to be conducted on a periodic basis and may be adapted as sea levels continue to rise.

The proposed beach maintenance action in the Diamond Head (east) basin of the Kūhiō beach sector is sand pumping, which would involve recovering approximately 4,500 cy of existing sand from within the basin onto the dry beach. The proposed action would not require offshore dredging and there would be no increase in the volume of sand in the basin. The proposed action is intended to be conducted on a periodic basis and may be adapted as sea levels continue to rise.

The proposed beach maintenance action in the Royal Hawaiian beach sector is beach nourishment, which would involve recovering approximately 25,000 cy of sand from the *Canoes/Queens* offshore sand deposit and placing it on the beach. This is the only action proposed that would require periodic renourishment to maintain the beach at its 1985 location. The *Canoes/Queens* offshore sand deposit consists of sand that has eroded from Royal Hawaiian Beach. This sand source has been used in previous beach nourishment projects in 2012 and 2021. Reusing this sand on a periodic basis would not increase in the volume of sand in the littoral system.

For more information about anticipated project lifespans, please see Section 3.3 of the DPEIS. For more information about sea level rise, please see Section 8.3.5 of the DPEIS.

We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement (DPEIS).

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

Andy Bohlander

From: sidney sealine <sidneysealine@yahoo.com>
Sent: Tuesday, January 12, 2021 1:25 PM
To: Andy Bohlander
Subject: Suggestion how to save Waikiki Beach

January 12th 2021

Dear Mr. Bohlander:

I just read your article in today's star advertiser where you solicit suggestions on how to save Waikiki Beach. I am a retired lawyer who has lived in my condo in Waikiki for 10 years. Before that I lived for 14 years in a beachfront apartment in Cancun Mexico.

During my residence in Cancun ... the city and indeed the Yucatan peninsula was struck by a major hurricane named Wilma. It recorded the lowest barometric pressure reading of any hurricane in the history of the Caribbean and it wiped out the formerly magnificent indeed famously magnificent Beach in Cancun.

To restore the beach Cancun hired a company who performed what I consider an absolutely miraculous job of restoring that magnificent beach. Because my unit overlooked the beach I was able to take videos which demonstrate the incredible job they accomplished.

If you are interested let me know and I will forward to you the videos which demonstrate the miracle this company performed. Your job ... if you are sufficiently motivated ... would be to contact the government there in Cancun and find out the name and contact information of the company that restored Cancun's beach after it was destroyed by hurricane Wilma.

If you are truly and sincerely interested you will contact me and if you're not then you won't.

Kind regards.

SIGNED: SIDNEY SEALINE
EMAIL: sidneysealine@yahoo.com
USA CELL PHONE: +1 310 876 9175
USA FAX: 1 206 350 8917
WhatsApp: + 1 310 876 9175

"Carpe diem, quam minimum credula postero." Seize the day, trusting as little as possible in the future." Horace - Odes. 23 B.C."

Andy Bohlander

From: sidney sealine <sidneysealine@yahoo.com>
Sent: Saturday, January 16, 2021 11:59 AM
To: Andy Bohlander
Subject: Re: Suggestion how to save Waikiki Beach

january 16, 2021

i sent you the below email four days ago. it is of great importance to your upcoming project but you never even acknowledged receipt of that letter.

the company was a DUTCH company.

SIGNED: SIDNEY SEALINE
E-MAIL: sidneysealine@yahoo.com
USA CELL PHONE: +1 310 876 9175
USA FAX: + 1 206 350 8917
WhatsApp: +1 310 876 9175
"Carpe diem, quam minimum credula postero." Seize the day, trusting as little as possible in the future. Horace - Odes. 23 B.C.

On Tuesday, January 12, 2021, 01:25:27 PM HST, sidney sealine <sidneysealine@yahoo.com> wrote:

January 12th 2021

Dear Mr. Bohlander:

I just read your article in today's star advertiser where you solicit suggestions on how to save Waikiki Beach. I am a retired lawyer who has lived in my condo in Waikiki for 10 years. Before that I lived for 14 years in a beachfront apartment in Cancun Mexico.

During my residence in Cancun ... the city and indeed the Yucatan peninsula was struck by a major hurricane named Wilma. It recorded the lowest barometric pressure reading of any hurricane in the history of the Caribbean and it wiped out the formerly magnificent indeed famously magnificent Beach in Cancun.

To restore the beach Cancun hired a company who performed what I consider an absolutely miraculous job of restoring that magnificent beach. Because my unit overlooked the beach I was able to take videos which demonstrate the incredible job they accomplished.

If you are interested let me know and I will forward to you the videos which demonstrate the miracle this company performed. Your job ... if you are sufficiently motivated ... would be to contact the government there in Cancun and find out the name and contact information of the company that restored Cancun's beach after it was destroyed by hurricane Wilma.

If you are truly and sincerely interested you will contact me and if you're not then you won't.

Kind regards.

SIGNED: SIDNEY SEALINE
EMAIL: sidneysealine@yahoo.com
USA CELL PHONE: +1 310 876 9175
USA FAX: 1 206 350 8917
WhatsApp: + 1 310 876 9175

"Carpe diem, quam minimum credula postero." Seize the day, trusting as little as possible in the future." Horace - Odes. 23 B.C."

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

Sidney Sealine
sidneysealine@yahoo.com

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Sealine:

Thank you for your emails dated January 12 and 16, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your email you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawaiʻi Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

Comment: "During my residence in Cancun ... the city and indeed the Yucatan peninsula was struck by a major hurricane named Wilma. It recorded the lowest barometric pressure reading of any hurricane in the history of the Caribbean and it wiped out the formerly magnificent indeed famously magnificent Beach in Cancun. To restore the beach Cancun hired a company who performed what I consider an absolutely miraculous job of restoring that magnificent beach. Because my unit overlooked the beach I was able to take videos which demonstrate the incredible job they accomplished. If you are interested let me know and I will forward to you the videos which demonstrate the miracle this company performed. Your job ... if you are sufficiently motivated ... would be to contact the government there in Cancun and find out the name and contact information of the company that restored Cancun's beach after it was destroyed by hurricane Wilma."

> **Response:** Contractor selection is not part of the environmental review process and will be completed after the final designs are completed and the necessary permits are approved. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement (DPEIS).

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

Andy Bohlander

From: Mandy Blake <mblake47@punahou.edu>
Sent: Tuesday, January 12, 2021 1:31 PM
To: Andy Bohlander
Subject: Waikiki Beach

Today's newspaper article on Waikiki beach... does not mention Gray's Beach. Being a keiki o ka aina, I recall walking along the wall that bordered it. Since my neighbor was Ernest Gray, I remember it well. Gray's Beach is pictured/listed in the O'ahu Mapbook, 2004 edition.

I am too old to attend meetings. And not competent with computers (I do try!)

I look forward to a follow-up article in the newspaper. Mahalo, Mandy Bowers

--
Mandy Blake Bowers

DAVID Y. IGE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
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ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

June 4, 2021

Mandy Blake Bowers
mblake47@punahou.edu

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Ms. Blake Bowers:

Thank you for your email dated January 12, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your email you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawaiʻi Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

Comment: **"**Today's newspaper article on Waikiki beach... does not mention Gray's Beach. Being a keiki o ka aina, I recall walking along the wall that bordered it. Since my neighbor was Ernest Gray, I remember it well. Gray's Beach is pictured/listed in the O'ahu Mapbook, 2004 edition. I am too old to attend meetings. And not competent with computers (I do try!). I look forward to a follow-up article in the newspaper."

> **Response:** Thank you for your comment. The Halekūlani beach sector is often referred to as "Gray's Beach" in reference to a boardinghouse called "Gray's by the Sea" that existed at this site in the early 1900's, and the "Gray's Hotel (now the Halekūlani Hotel), which was constructed in 1916.

We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement.

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

Andy Bohlander

From: Bob Hampton <bob@waikikibeachactivities.com>
Sent: Tuesday, January 12, 2021 4:02 PM
To: Andy Bohlander
Subject: Environmental Impact Statement Preparation Notice (EISPN) for the Waikīkī Beach Improvement and Maintenance Project. Waikīkī Beach, Oahu

Aloha Andy:

Waikiki Beach Activities, Ltd. has served Hilton on Waikiki Beach and in Mamala Bay for over 30 years, operating Hilton's full service beach operation and our full service catamarans from the Hilton Pier on Duke Kahanamoku Beach. We have watched first-hand the deterioration of Waikiki Beach due to Sea Level Rise and we know first-hand the immediate need to provide safe access to and along all of Waikiki shoreline and increased resilience to coastal hazards.

Although, no action is proposed at this time for Duke Kahanamoku Beach which is an extremely important part of the Waikiki Beach community it should also be included in all planning for beach improvements such as increased beach stability through improvement and maintenance of shoreline structures.

I first became aware of the gravity of Sea Level Rise (SLR) and its growing impact on islands in the Pacific while attending the International Union of Conservation of Nature Summit (IUCN) held at Hilton Hawaiian Village in September 2016. Governor Ige along with 25 South Pacific nations were there, each telling of how they were adapting to the reality of SLR. From Tahiti to Samoa and Tonga to Cook Island, each of their leaders described the ongoing flooding, erosion and devastation to their beaches as a result of SLR.

Just over a year later, an alarm went off when Hawaii's Attorney General issued a 12-page legal opinion to the Department of Land and Natural Resources confirming that *whenever the high wash of the waves extends onto private property, the boundary line demarking State ownership automatically and without notification adjusts, thereby granting the State ownership of the newly-wetted private property (Oceanfront Hotels).* According to the ruling, the ownership is <u>immediate, permanent and cannot be contested</u>.

Then about four months later, Waikiki was hit by a new and growing phenomenon called *King Tides* that rose up and over Waikiki Beaches spreading onto the surrounding sidewalks, just feet (and in some cases inches) from Oceanfront hotel-owned "private property."

Because the AG's opinion stated that the wash of the waves includes sea level rise, it is now very clear that SLR threatens all of the Oceanfront hotels causing them to possible loss of their title to critical portions of their hotels forcing them to address the question of what to do with their structures that sit on the land that's title now belongs to the state. The answer to this question is clear. For the former owner (Oceanfront hotel) to continue to use their structure they must secure an easement from the State for the land that lies under their hotel improvements. And according to the law the former owner must pay fair market rent for the property they once owned prior to the "Wash of the Waves."

The very big question of how to adapt to SLR and prevent this catastrophe from occurring is before us right now. Because seawalls are unsightly, restrictive and almost impossible to get permitted, the simplest and most cost-effective adaptation solution is to repair our existing groins and build up the height of the beach by way of sand replenishment. This is the best solution for all Oceanfront hotels on Waikiki Beach. DLNR together with the private sector propose to do this now. Doing it now is critical as we are probably only a couple more King Tides from a disastrous "*wash of the waves*."

Adaptation raises the pragmatic question: Where does the funding come from to raise Waikiki Beach? In regard to building a “sand defense” against rising ocean levels, we are looking at inches maybe a foot in height to meet the possible SLR in the next couple of years, maybe even provide protection for the next decade.

The Legislature which is to open this month needs to find State funding and to support the private sector in this all-out effort to adapt to SLR now. Funding now can prevent the possible worst-case scenario of a contentious property rights dispute which is sure to result as outlined in the Attorney General’s December 11, 2017 Opinion to DLNR.

Furthermore, in Deeds and Agreements dating back to the 40s’ and 50s’ between the Territorial Government and the Oceanfront hotels, the Territory, now State, promised the Waikiki Oceanfront hotel owners that the government would “permanently maintain” the newly created Waikiki Beach. Adaptation to SLR requires that the State’s promise be kept now.

Time is of the essence. If we do not adapt to SLR <u>this year</u>, 2021, the Big Story in late 2021-2022 could be**:**

“Some Waikiki Waterfront Hotels have lost their property titles to the State due to Rising Sea Levels. According to the State’s Attorney General and the State Supreme Courts Recent Rulings, ownership by the State is <u>immediate, permanent and cannot be contested</u>. The Oceanfront hotels that lost their property tiles are claiming it is the States fault for failure to protect Waikiki Beach as they promised to do in their prior written agreements.”

Aloha,

Bob Hampton

(808) 479-9947

Chairman, Waikiki Beach Activities, LTD.

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

Mr. Bob Hampton, Chairman
Waikiki Beach Activities, Ltd.
bob@waikikibeachactivities.com

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Hampton:

Thank you for your email dated January 12, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawaiʻi Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

Comment: "Although, no action is proposed at this time for Duke Kahanamoku Beach which is an extremely important part of the Waikiki Beach community it should also be included in all planning for beach improvements such as increased beach stability through improvement and maintenance of shoreline structures."

> **Response:** Selection of the proposed beach improvement and maintenance actions was a primarily stakeholder-driven process. We relied heavily on feedback and direction from the Waikīkī Beach Community Advisory Committee (WBCAC) to identify issues, needs, priorities, and design criteria for beach sector. The sectors that were selected for beach improvement and maintenance actions were identified as the highest priorities by the WBCAC. While the other beach sectors of Waikiki – Duke Kahanamoku, Queens, Kapiʻolani, and Kaimana - were not identified as priorities by the WBCAC, these areas are clearly important and we recognize that, as sea levels continue to rise, beach improvements and/or maintenance may be required in these beach sectors in the future. For more information about the WBCAC and the project selection process, please see Section 2 and Appendix A of the DPEIS.

Comment: "Where does the funding come from to raise Waikiki Beach? In regard to building a "sand defense" against rising ocean levels, we are looking at inches maybe a foot in height to meet the possible SLR in the next couple of years, maybe even provide protection for the next decade. The Legislature which is to open this month needs to find State funding and to support the private sector in this all-out effort to adapt to SLR now."

> **Response:** The proposed actions will be funded by a combination of public and private funds. In 2019, the Hawai'i State Legislature appropriated $8,850,000 to support beach improvement and maintenance projects in Waikīkī with up to $3 million of this support provided by the Waikīkī Beach Special Improvement District Association (WBSDIA). For additional information regarding funding for the proposed beach improvement and maintenance actions, please Section 2.2 of the DPEIS.

Thank you for taking the time to review and comment on the EISPN. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement (DPEIS).

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

January 13, 2021

TO:
Sam Lemmo, Administrator
Office of Conservation and Coastal Lands
Department of Land and Natural Resources, State of Hawaii
1151 Punchbowl Street, Room 131
Honolulu, Hawaii 96813

FROM:
Brett Greenberg, Regional Director
Aqualani Beach & Ocean Recreation

SUBJECT: Environmental Impact Statement Preparation Notice (EISPN) for the Waikīkī Beach Improvement and Maintenance Project. Waikīkī Beach, Oahu

The Aqualani Beach & Ocean Recreation **strongly supports** the proposed beach improvement projects by the Hawaiʻi Department of Land and Natural Resources (DLNR). The DLNR proposes beach improvement and maintenance projects in the Fort DeRussy, Halekulani, Royal Hawaiian, and Kūhiō Beach sectors of Waikīkī. These projects include the construction of new beach stabilization structures, and the recovery of offshore sand and its placement on the shoreline. The objectives of the proposed actions are to restore and improve Waikīkī's public beaches, increase beach stability through improvement and maintenance of shoreline structures, provide safe access to and along the shoreline, and increase resilience to coastal hazards and sea level rise. The proposed actions are intended to maintain the economic, social, aesthetic, recreational, environmental, cultural, and historical qualities of Waikīkī.

Over the past several years, and as recently as November of 2020, Waikiki has experienced record high tides (King Tides) that have exacerbated erosion and flooding. These events have highlighted the impacts of sea level rise on the beaches of Waikīkī. As sea levels continue to rise, beach loss will progressively degrade the recreational, social, cultural, environmental, aesthetic, and economic value of Waikīkī. After nearly 50 years of no new beach stabilization projects in Waikīkī, we are now at a crossroads with a clear and increasingly urgent need to implement maintenance and improvements to the shoreline in order to preserve and protect this unique and highly prized natural resource.

We strongly support these improvement projects and recognize its urgency. With the combination of beach erosion and King Tides, the backshore is frequently flooded, particularly during high surf events, accelerating damage to backshore infrastructure. Without beach improvements and maintenance, sea level rise is likely to result in total beach loss in Waikīkī before the end of the century and result in an estimated economic loss of $50 million to $150 million per hectare[1]. The loss of Waikīkī Beach alone would result in an annual loss of $2.223 billion in visitor expenditures[1]. Improvements and maintenance like those proposed in the EISPN are necessary to restore and maintain the beaches of Waikīkī to continue to support Hawaii's tourism-based economy.

We offer the following summary of project-specific comments.

1. The proposed beach improvement projects in Waikīkī are essential for the future goal to maintain a viable beach in these areas. Several beachfront areas in Waikīkī are seeing the rapid deterioration of both public and private backshore infrastructure such as groins, seawalls and walkways. This highlights the need to make long-term investments into beach stabilizing structures throughout Waikīkī in addition to more immediate emergency repairs to damaged infrastructure.

2. Climate change impacts including sea-level rise projected by the state of Hawai'i Climate Change Commission indicate significant flooding, wave overtopping and beach erosion in Waikīkī for the coming decades and suggest stakeholders and communities plan for 3.2 feet of sea-level rise now. This project has a strong climate change adaption component that is consistent with the recommendations of the State Climate Commission.

3. Without a stabilizing and energy-buffering beach to protect public and private coastal infrastructure, the WBSIDA anticipates even larger and more expensive structural repair and improvement projects to be required soon to prevent the destruction of threatened coastal structures.

Thank you for the opportunity to provide comments on this project.

[1] Tarui, N., Peng, M., Eversole, D. (2018). *Economic Impact Analysis of the Potential Erosion of Waikīkī Beach*. University of Hawai'i Sea Grant College Program. April 2018.

DAVID Y. IGE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

Brett Greenberg, Regional Director
Aqualani Beach & Ocean Recreation
bgreenberg@aqualani.com

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Greenberg:

Thank you for your email dated January 13, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you express your strong support for the proposed beach improvement and maintenance actions. As the Applicant, the Hawaiʻi Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

We recognize that you provided three project-specific comments, all in support of the proposed actions. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement (DPEIS).

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

Waikiki

From: Russell Leong <mr_russ@hotmail.com>
Sent: Thursday, January 14, 2021 9:21 AM
To: Waikiki
Subject: COMMENTS - Waikiki Beach Stabilization Project

1. We should have never gotten rid of the old groin and then spent more money putting a new one back.
2. I am "for" your plan for new groins along Waikiki Beach.
3. Hilton pier also contains a storm drain outfall, termination point is not know.
4. Beach fill area near Fort DeRussy outfall should have plans and specs restrict contractor from placing heavy construction equipment over old box culvert. City condition survey of box culvert showed numerous spalled areas of the box soffit (crown).
5. Design shows a natural beach bottom. Consider widened beaches even more with shore protection of the beach sand. Maybe for one of the coves. See American Samoa for the use of the COE Samoan stone.
6. For any of your rock groins, consider altering the specs for contractors to **place** in lieu of dumping rock. Some of the past COE projects a contractor had a track mounted grinder capable of grinding and shaping the stone to fit in locations of his revetment. I know we try for lowest cost, but if you build it lets make it last and not shift due to large wave events.
7. Last, much of the sand probably has fines (minus 200) which presents a problem with DOH CWB and a 401 WQC. From past projects they have made this an issue about the silt in the newly place sand being suspended in the water column. Consider in your design a portable plant to hydrodynamically remove fines and get the sand gradation you want.
8. Hopefully hotel owners are already planning for their half basements being flooded during king tides and sea level rise.

Russell Leong

Sent from Mail for Windows 10

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

Russell Leong
mr_russ@hotmail.com

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Leong:

Thank you for your email dated January 14, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawai‘i Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

Comment: “Hilton pier also contains a storm drain outfall, termination point is not known.”

> **Response:** The proposed sand backpassing in the Fort DeRussy beach sector will involve recovering a small volume of sand (less than 1,500 cy) from the dry beach east of the Hilton Pier and groin. The sand recovery will be completed using small machinery and no impacts to existing drainage infrastructure are anticipated.

Comment: “Beach fill area near Fort DeRussy outfall should have plans and specs restrict contractor from placing heavy construction equipment over old box culvert. City condition survey of box culvert showed numerous spalled areas of the box soffit (crown).”

> **Response:** No heavy equipment will be operated on or adjacent to the existing box culvert.

Comment: “Design shows a natural beach bottom. Consider widened beaches even more with shore protection of the beach sand. Maybe for one of the coves. See American Samoa for the use of the COE Samoan stone.”

> **Response:** A discussion on concrete armor units is included in Section 5.3.3.1 of the DPEIS, which presents Tribar armor units for shore protection, as well as environmentally-friendly concrete armor units. There is only one installation of

Samoa Stone, that being at Vatia in American Samoa, where Samoa Stone was used as armor for a revetment.

Comment: “For any of your rock groins, consider altering the specs for contractors to place in lieu of dumping rock. Some of the past COE projects a contractor had a track mounted grinder capable of grinding and shaping the stone to fit in locations of his revetment. I know we try for lowest cost, but if you build it lets make it last and not shift due to large wave events.”

Response: The final construction plans and specifications will require special or keyed-and-fit placement, as opposed to random placement, to achieve the required level of interlocking and stability.

Comment: “Last, much of the sand probably has fines (minus 200) which presents a problem with DOH CWB and a 401 WQC. From past projects they have made this an issue about the silt in the newly place sand being suspended in the water column. Consider in your design a portable plant to hydrodynamically remove fines and get the sand gradation you want.”

Response: We acknowledge that sand recovery, transport, and placement operations have the potential to cause turbidity. All of the offshore sand proposed for use in Waikīkī will contain less than 6% fines per DLNR guidelines, and ideally less, in compliance with the State of Hawai‘i guidelines for beach nourishment projects. Appropriate methods for dewatering and removal of fines to mitigate turbidity will be established during the final design and permitting process. All methods will be reviewed and approved by the Hawai‘i Department of Health, Clean Water Branch as part of the Clean Water Act Section 401 Water Quality Certification (WQC) review process. For more information about sand characteristics and quality, please see Sections 3.5 and 8.9 of the DPEIS. For more information about water quality and turbidity, please see Section 8.7 of the DPEIS.

Thank you for taking the time to review and comment on the EISPN. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement.

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

OFFICE OF PLANNING
STATE OF HAWAII

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

DAVID Y. IGE
GOVERNOR

MARY ALICE EVANS
DIRECTOR
OFFICE OF PLANNING

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DTS 202012300952HE

January 14, 2021

Mr. David A. Smith, Ph.D., P.E.
Senior Coastal Engineer
Sea Engineering, Inc.
41-305 Kalanianaole Highway
Waimanalo, Hawaii 96795

Dear Mr. Smith:

Subject: Environmental Impact Statement Preparation Notice for the Waikiki Beach Improvement and Maintenance Program Honolulu, Oahu; Seaward of TMKs: (1) 2-6-001:003, (1) 2-6-004:007, (1) 2-6-005:001, (1) 2-6-008:029, (1) 2-6-002:026, (1) 2-6-001:019, (1) 2-6-004:012, (1) 2-6-002:017, (1) 2-6-001:013, (1) 2-6-001:012, (1) 2-6-001:002, (1) 2-6-001:015, (1) 2-6-001:008, (1) 2-6-004:006, (1) 2-6-004:005, (1) 2-6-001:017, (1) 2-6-004:008, (1) 2-6-004:009, (1) 2-6-004:010, (1) 2-6-001:018, (1) 2-6-005:006, (1) 2-6-001:004, (1) 2-6-002:006, and (1) 2-6-002:005

Thank you for the opportunity to provide comments on the request for agency comments on the Environmental Impact Statement Preparation Notice (EISPN) for the Waikiki Beach Improvements and Maintenance Program. We were notified of this EISPN request for comments via letter dated December 16, 2020.

It is our understanding that the Hawaii Department of Land and Natural Resources (DLNR) proposes beach improvement along the shoreline of Waikiki Beach that include Fort DeRussy, Halekulani, Royal Hawaiian, and Kuhio Beach. The beach improvements would include the construction of new beach stabilization structures, and the recovery of offshore sand and its placement on the shoreline. The objectives of the proposed beach improvements are to restore and improve Waikiki's public beaches, increase beach stability through improvement and maintenance of shoreline structures, provide safe access to and along the shoreline, and increase resilience to coastal hazards and sea level rise.

The Office of Planning (OP) has reviewed the transmitted material and has the following comments to offer:

1. Prohibited Construction of Seawalls Along the Shoreline
   Section 1.1, page 10 of the EISPN states that in 1917, the Hawaii's Board of Harbor

Commissioners prohibited construction of seawalls along the shoreline. The DEIS may provide more information on this seawall prohibition and discuss why the seawall prohibition was widely ignored during that time.

2. <u>Anticipated Project Lifespans</u>
Section 2.3 page 28 of the EISPN discusses anticipated lifespans of the beach improvements. The DEIS should clarify the definition of "anticipated project lifespans" given that the proposed program includes beach nourishment and maintenance, and construction of groins and segmented breakwater structure. For example, whether the lifespans of the proposed actions that will be designed for a nominal 50-year lifespan include beach nourishment and maintenance, or only the proposed groin and breakwater structures.

3. <u>Coastal Zone Management Act (CZMA) federal consistency</u>
Section 8.2, page 152 of the EISPN accurately identifies that the project is subject to a CZMA federal consistency review. The CZMA federal consistency review is separate from the HRS Chapter 343 process. DLNR, or a representative, should contact our office on the policies and procedures that govern CZMA federal consistency reviews.

4. <u>Special Management Area (SMA)</u>
Section 8.3, page 152 of the EISPN acknowledges that the project is subject to SMA use permitting. The DEIS should discuss the activities and stored materials for proposed staging areas that will be located within the SMA. To minimize the potential impacts on ocean and the shoreline area as defined in Hawaii Revised Statutes (HRS) § 205A-41, it is better to locate proposed staging areas outside of the shoreline area. OP recommends that the DLNR consult with the Department of Planning and Permitting, City and County of Honolulu, on the requirement of SMA use and shoreline setbacks.

5. <u>The Hawaii State Planning Act</u>
Pursuant to HAR § 11-200.1-24(d)(6), the DEIS will need to assess the relationship of the proposed action with the provisions of the Hawaii State Planning Act, as found in HRS Chapter 226. The Hawaii State Planning Act, HRS Chapter 226, serves as a guide for long-term development for the State. It provides 1) goals, objectives, and policies; 2) the allocation of resources through planning coordination and implementation efforts; and 3) priority guidelines for the State.

6. <u>Hawaii Coastal Zone Management (CZM) Program</u>
The CZM area is defined as "all lands of the State and the area extending seaward from the shoreline to the limit of the State's police power and management authority, including the U.S. territorial sea" (HRS § 205A-1).

   Pursuant to HAR § 11-200.1-24(d)(6), the DEIS should also contain analysis on the project's consistency with the objectives and supporting policies of the Hawaii CZM Program, HRS

§ 205A-2, as amended. This assessment should include a discussion on public access to recreational resources, and specifically discuss mitigation measures to mitigate potential impacts on public access to ocean and the beach recreation areas from the proposed program.

In implementing the objectives and supporting policies of the Hawaii CZM program, agencies, such as DLNR, shall consider ecological, cultural, historic, esthetic, recreational, scenic, open space values, coastal hazards, and economic development. Compliance with HRS § 205A-2 is an important component for satisfying HRS Chapter 343 requirements.

7. Cumulative Impacts
OP suggests that the DEIS assess and discuss the cumulative impacts from the preferred alternative for each of four beach sectors such as Fort DeRussy Beach Sector, Halekulani Beach Sector, Royal Hawaiian Beach Sector, and Kuhio Beach Sector.

If you have any questions regarding this comment letter, please contact Joshua Hekekia at (808) 587-2845; on SMA use issues please contact Shichao Li at (808) 587-2841; and for CZMA federal consistency, please contact John Nakagawa, at (808) 587-2878.

Sincerely,

Mary Alice Evans

Mary Alice Evans
Director

cc: Sam Lemmo, Administrator, DLNR, Office of Conservation and Coastal Lands

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
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ROBERT K. MASUDA
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AQUATIC RESOURCES
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ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

Mary Alice Evans, Director
Office of Planning
P.O. Box 2359
Honolulu, HI 96804

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Ms. Evans:

Thank you for your comment later dated January 14, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawai‘i Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

Comment: "Prohibited Construction of Seawalls Along the Shoreline - Section 1.1, page 10 of the EISPN states that in 1917, the Hawaii's Board of Harbor Commissioners prohibited construction of seawalls along the shoreline. The DEIS may provide more information on this seawall prohibition and discuss why the seawall prohibition was widely ignored during that time."

> **Response:** Most of the seawalls in Waikīkī were constructed in the late 1800's and early 1900's, prior to Statehood. The DLNR does not have access to data or information related to previous applications or authorizations for seawall construction in Waikīkī; thus, we are unable to opine as to the reasons why the prohibition on seawall construction was not enforced. For information about the history of coastal engineering in Waikīkī, see Sections 2.1, 4.1, 5.1, 6.1, and 7.1 the DPEIS.

Comment: "Anticipated Project Lifespans - Section 2.3 page 28 of the EISPN discusses anticipated lifespans of the beach improvements. The DEIS should clarify the definition of "anticipated project lifespans" given that the proposed program includes beach nourishment and maintenance, and construction of groins and segmented breakwater structure. For example, whether the lifespans of the proposed actions that will be designed for a nominal 50-year lifespan include beach nourishment and maintenance, or only the proposed groin and breakwater structures."

> **Response:** The Waikīkī Beach Improvement and Maintenance Program consists of beach improvement actions and beach maintenance actions. *Beach improvements* refers to actions that involve adding new sand, adding new structures, and/or modifying existing structures. *Beach maintenance* refers to actions that involve using existing sand or adding sand with no new structures or modification of existing structures.
>
> The proposed beach improvement actions in the Halekūlani beach sector and the ʻEwa (west) basin of the Kūhiō beach sector are designed to account for 1.5 ft of sea level rise and can be adapted to accommodate up to 2.7 ft of sea level rise. The proposed beach maintenance actions in the Fort DeRussy and Royal Hawaiian beach sectors and the Diamond Head (east) basin of the Kūhiō beach sector are intended to be conducted on a periodic basis and may be adapted as sea levels continue to rise. For more information about anticipated project lifespans, please see Section 3.3 of the DPEIS.

Comment: "Coastal Zone Management Act (CZMA) federal consistency - Section 8.2, page 152 of the EISPN accurately identifies that the project is subject to a CZMA federal consistency review. The CZMA federal consistency review is separate from the HRS Chapter 343 process. DLNR, or a representative, should contact our office on the policies and procedures that govern CZMA federal consistency reviews."

> **Response:** We acknowledge that the proposed actions are subject to Coastal Zone Management Act (CZMA) federal consistency review. The DLNR will submit formal applications to the Hawaiʻi Office Planning for CZMA federal consistency review during the final design and permitting process.

Comment: "Special Management Area (SMA) - Section 8.3, page 152 of the EISPN acknowledges that the project is subject to SMA use permitting. The DEIS should discuss the activities and stored materials for proposed staging areas that will be located within the SMA. To minimize the potential impacts on ocean and the shoreline area as defined in Hawaii Revised Statutes (HRS) § 205A-41, it is better to locate proposed staging areas outside of the shoreline area. OP recommends that the DLNR consult with the Department of Planning and Permitting, City and County of Honolulu, on the requirement of SMA use and shoreline setbacks."

> **Response:** We acknowledge that the proposed actions are subject to Special Management Area (SMA) use permitting. The DLNR will submit formal applications for any activities in the SMA to the City and County of Honolulu, Department of Planning and Permitting. For information about the relationship of the proposed actions with the provisions of the SMA, please see Section 16.3.4 of the DPEIS.

Comment: "Hawaii State Planning Act - Pursuant to HAR § 11-200.1-24(d)(6), the DEIS will need to assess the relationship of the proposed action with the provisions of the Hawaii State Planning Act, as found in HRS Chapter 226. The Hawaii State Planning Act, HRS Chapter 226, serves as a guide for long term development for the State. It provides 1) goals, objectives, and policies; 2) the allocation of resources through planning coordination and implementation efforts; and 3) priority guidelines for the State."

> **Response:** We acknowledge that the proposed actions are subject to the Hawai'i State Planning Act. For information about the relationship of the proposed actions with the provisions of the Hawai'i State Plan, please see Section 16.2.3 of the DPEIS.

Comment: "Hawaii Coastal Zone Management (CZM) Program - The CZM area is defined as "all lands of the State and the area extending seaward from the shoreline to the limit of the State's police power and management authority, including the U.S. territorial sea" (HRS §205A-1). Pursuant to HAR § 11-200.1-24(d)(6), the DEIS should also contain analysis on the project's consistency with the objectives and supporting policies of the Hawaii CZM Program, HRS § 205A-2, as amended. This assessment should include a discussion on public access to recreational resources, and specifically discuss mitigation measures to mitigate potential impacts on public access to ocean and the beach recreation areas from the proposed program. In implementing the objectives and supporting policies of the Hawaii CZM program, agencies, such as DLNR, shall consider ecological, cultural, historic, esthetic, recreational, scenic, open space values, coastal hazards, and economic development. Compliance with HRS § 205A-2 is an important component for satisfying HRS Chapter 343 requirements."

> **Response:** We acknowledge that the proposed actions should be consistent with the objectives and supporting policies of the Hawaii CZM Program, HRS § 205A-2, as amended. For information about the relationship of the proposed actions with the provisions of HRS § 205A-2, as amended, please see Section 16.2.5 of the DPEIS.

Comment: "Cumulative Impacts - OP suggests that the DEIS assess and discuss the cumulative impacts from the preferred alternative for each of four beach sectors such as Fort DeRussy Beach Sector, Halekulani Beach Sector, Royal Hawaiian Beach Sector, and Kuhio Beach Sector."

> **Response:** We acknowledge that the proposed actions have the potential to result in cumulative impacts. The potential impacts of the proposed actions are discussed in Sections 8 and 9 of the DPEIS. The cumulative and secondary impacts of the proposed actions are discussed in Section 10 and Section 11 of the DPEIS, respectively.

Thank you for taking the time to review and comment on the EISPN. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement.

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

January 18, 2021

TO:
Sam Lemmo, Administrator
Office of Conservation and Coastal Lands
Department of Land and Natural Resources, State of Hawaii
1151 Punchbowl Street, Room 131
Honolulu, Hawaii 96813

FROM:
John Clark
P. O Box 25277
Honolulu, HI 96825

SUBJECT: Environmental Impact Statement Preparation Notice (EISPN) for the Waikīkī Beach Improvement and Maintenance Project. Waikīkī Beach, Oahu

I support the proposed beach improvement projects by the Hawai‘i Department of Land and Natural Resources (DLNR). The DLNR proposes beach improvement and maintenance projects in the Fort DeRussy, Halekulani, Royal Hawaiian, and Kūhiō Beach sectors of Waikīkī. These projects include the construction of new beach stabilization structures, and the recovery of offshore sand and its placement on the shoreline. The objectives of the proposed actions are to restore and improve Waikīkī's public beaches, increase beach stability through improvement and maintenance of shoreline structures, provide safe access to and along the shoreline, and increase resilience to coastal hazards and sea level rise. The proposed actions are intended to maintain the economic, social, aesthetic, recreational, environmental, cultural, and historical qualities of Waikīkī.

I offer the following project-specific comments for the Kūhiō Beach Basin Sector.

1. There is a surf break fronting the Ewa Basin that is called Baby Cunha’s. As a young Waikīkī surfer in the 1950s and 1960s, I surfed there often, when other nearby breaks like Queen’s and Canoes were too crowded. It wasn’t as good as the other spots because reflected waves from the concrete breakwater (crib wall) travel seaward into incoming waves, but it was still a viable alternate surf break in Waikīkī.
2. During my personal research of Waikīkī Beach, I learned this surf break was especially popular with young bodysurfers and bodyboarders before the concrete breakwater was constructed. I have a copy of an old movie that shows local children bodysurfing there in the early 1930s.
3. I believe removing sections of the existing concrete breakwater (crib wall) and the construction of the three segmented breakwaters as shown in Figure 6-8 will reduce the

reflected waves and enhance the surf break. I see this project as a once-in-a-lifetime opportunity to restore a historic surf break in the heart of Waikīkī.

4. One final comment. I noticed that the Kapahulu Groin is also variously referred to as the Kapahulu storm drain or outfall. I believe that was its original purpose when it was built in 1951, but I don’t think it transports any storm water today.

Thank you for the opportunity to provide comments on this project.

Me ka mahalo,
John Clark

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

John Clark
P. O. Box 25277
Honolulu, HI 96825

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Clark:

Thank you for your comment later dated January 18, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawai‘i Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

Comment: "I believe removing sections of the existing concrete breakwater (crib wall) and the construction of the three segmented breakwaters as shown in Figure 6-8 will reduce the reflected waves and enhance the surf break. I see this project as a once-in-a-lifetime opportunity to restore a historic surf break in the heart of Waikīkī."

> **Response:** Sea Engineering, Inc. conducted detailed wave modeling to evaluate the potential for the proposed actions to impact waves, currents, and surf sites in Waikīkī. Dredging of offshore sand deposits involves removing sand from the deposits, resulting in a lowering of the bottom elevation or changing the bathymetry. Dredging could occur at the *Ala Moana*, *Canoes/Queens*, or *Hilton* offshore sand deposits. Wave modeling was used to assess the impact of dredging on nearby surf sites.
>
> A wave reflection analysis was also conducted to evaluate the potential for the proposed structures in the Halekūlani and Kūhiō beach sectors to reflect waves that could negatively impact surf sites, primarily in the Halekūlani beach sector. To evaluate potential impacts, wave modeling of the existing conditions and with the proposed structures was performed. Based on the results of the wave modeling, the dredge analysis, and the wave reflection analysis, no significant impacts to waves, currents, or surf sites in Waikīkī are anticipated.

For more information about the wave modeling results and potential impacts to waves, currents, and surf sites, please see Sections 8.2, 8.6 and 9.4.6 of the DPEIS.

Comment: "I noticed that the Kapahulu Groin is also variously referred to as the Kapahulu storm drain or outfall. I believe that was its original purpose when it was built in 1951, but I don't think it transports any storm water today."

Response: We have inquired with the City and County Honolulu, Department of Public Works to confirm whether the Kapahulu storm drain is still active.

Thank you for taking the time to review and comment on the EISPN. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement.

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

WBSIDA Waikīkī Beach SPECIAL IMPROVEMENT DISTRICT ASSOCIATION

January 5, 2020

TO:
Sam Lemmo, Administrator
Office of Conservation and Coastal Lands
Department of Land and Natural Resources, State of Hawaii
1151 Punchbowl Street, Room 131
Honolulu, Hawaii 96813

FROM:
Rick Egged, President
Waikīkī Beach Special Improvement District Association
2250 Kalakaua Ave Suite 315
Honolulu, Hi 96815

SUBJECT: Environmental Impact Statement Preparation Notice (EISPN) for the Waikīkī Beach Improvement and Maintenance Project. Waikīkī Beach, Oahu

The Waikīkī Beach Special Improvement District Association (WBSIDA**) strongly supports** the proposed beach improvement projects by the Hawaiʻi Department of Land and Natural Resources (DLNR). The DLNR proposes beach improvement and maintenance projects in the Fort DeRussy, Halekulani, Royal Hawaiian, and Kūhiō Beach sectors of Waikīkī. These projects include the construction of new beach stabilization structures, and the recovery of offshore sand and its placement on the shoreline. The objectives of the proposed actions are to restore and improve Waikīkī's public beaches, increase beach stability through improvement and maintenance of shoreline structures, provide safe access to and along the shoreline, and increase resilience to coastal hazards and sea level rise. The proposed actions are intended to maintain the economic, social, aesthetic, recreational, environmental, cultural, and historical qualities of Waikīkī.

The history of Waikīkī as a predominantly engineered shoreline is an important environmental rationale for a project of this scale and nature. The beaches of Waikīkī are all manmade, almost entirely composed of imported sand and the current shoreline configuration is largely the result of past construction efforts to widen and stabilize the beaches. Likewise, most of the beaches of Waikīkī are chronically eroding, with frequent backshore flooding, particularly during high tides and high surf events. Over the past several years, and as recently as November of 2020, Waikiki has experienced record high tides (referred to as King Tides) that have exacerbated erosion and flooding. These events have highlighted the impacts of sea level rise on the beaches of Waikīkī. As sea levels continue to rise, beach loss will progressively degrade the recreational, social, cultural, environmental, aesthetic, and economic value of Waikīkī. After nearly 50 years of no new beach stabilization projects in Waikīkī, we are now at a crossroads with a clear and increasingly urgent need to implement maintenance and improvements to the shoreline in order to preserve and protect this unique and highly prized natural resource.

The Hawaiʻi Sea Level Rise Vulnerability and Adaptation Report[1] found that 3.2 feet of sea level rise will have profound impacts on Oʻahu. $12.9 billion in structures and land could be lost; 3,800 structures could be flooded, including hotels and resorts in Waikīkī; over 13,000 residents could be displaced; and nearly 18 miles of major roads could be flooded. The report estimates that Oʻahu will account for an estimated 66% of the total statewide economic losses due to sea level rise. The State recommended that private and public entities in Waikīkī should begin planning for sea level rise adaptation, including beach restoration, to prepare for higher sea levels in the future.

Waikīkī Beach is a globally recognized icon of Hawaiʻi and is the state's largest tourist destination. Waikīkī generates approximately 42% of the state's visitor industry revenue and is responsible for 8% ($5 billion) of the Gross State Product[2]. Beaches are a primary attraction for visitors to Waikīkī and we know that Waikīkī Beach accounts for over $2 billion in annual income for the local economy. However, a 2008 visitor survey found that 12% of visitors would not return to Waikīkī due, in part, to limited beach area and resulting overcrowding[3]. Waikīkī Beach also has tremendous cultural significance as a former playground of Hawaiian royalty and the birthplace of the sport and culture of surfing. The beaches and myriad of world-renowned surf breaks and reef ecosystem located offshore are valuable natural resources that support the culture and lifestyle of Hawaiʻi, and the idyllic image of Waikīkī. Preserving and maintaining these beach resources are of critical importance for the social, cultural, economic and environmental value for Hawaiʻi's communities.

The WBSIDA strongly supports these improvement projects and recognizes its urgency. With the combination of beach erosion and King Tides, the backshore is frequently flooded, particularly during high surf events, accelerating damage to backshore infrastructure. Without beach improvements and maintenance, sea level rise is likely to result in total beach loss in Waikīkī before the end of the century and result in an estimated economic loss of $50 million to $150 million per hectare[1]. The loss of Waikīkī Beach alone would result in an annual loss of $2.223 billion in visitor expenditures[4]. Improvements and maintenance like those proposed in the EISPN are necessary to restore and maintain the beaches of Waikīkī to continue to support Hawaii's tourism-based economy.

---

[1] Hawaiʻi Climate Change Mitigation and Adaptation Commission. 2017. *Hawaiʻi Sea Level Rise Vulnerability and Adaptation Report*. Prepared by Tetra Tech, Inc. and the State of Hawaiʻi Department of Land and Natural Resources, Office of Conservation and Coastal Lands. Page 152-162

[2] http://www.waikikibid.org/

[3] Waikīkī Improvement Association (2008) *Economic Impact Analysis of the Potential Erosion of Waikiki Beach, Final Report*.

[4] Tarui, N., Peng, M., Eversole, D. (2018). *Economic Impact Analysis of the Potential Erosion of Waikīkī Beach*. University of Hawaiʻi Sea Grant College Program. April 2018.

The WBSIDA offers the following summary of project-specific comments.

1. The proposed beach improvement projects in Waikīkī are essential for the future goal to maintain a viable beach in these areas. Several beachfront areas in Waikīkī are seeing the rapid deterioration of both public and private backshore infrastructure such as groins, seawalls and walkways. This highlights the need to make long-term investments into beach stabilizing structures throughout Waikīkī in addition to more immediate emergency repairs to damaged infrastructure.

2. Climate change impacts including sea-level rise projected by the state of Hawai‘i Climate Change Commission indicate significant flooding, wave overtopping and beach erosion in Waikīkī for the coming decades and suggest stakeholders and communities plan for 3.2 feet of sea-level rise now. This project has a strong climate change adaption component that is consistent with the recommendations of the State Climate Commission.

3. A project benefit to cost analysis was completed by the U.S. Army Corps of Engineers in 2002 to determine Federal interest in restoring and improving Waikiki Beach, with a ratio greater than one indicating that benefits exceeded costs[5]. The overall benefit to cost ratio for all of Waikiki was about 6 to 1. The total Waikiki Gross National Product (GNP) contribution to the annual Federal economy is an estimated $3.3 billion. This estimate excludes spending by mainland west coast visitors.

4. The proposed projects are consistent with existing engineering standards and planning studies for Waikiki Beach improvements, and are capable of being implemented as phased or stand-alone projects.

5. The WBSIDA has agreed to provide a partial project match as part of a public-private partnership demonstrating the value and economic importance of this project to the stakeholders and community of Waikīkī.

6. Alternative groin design recommendations, including T-Head groins have been previously assessed and recommended as possible strategies for beach improvements in Waikīkī[6,7]. Other examples such as Iroquois Point at Pearl Harbor demonstrate the successful use of T-head groins in a similar nearshore setting.

7. Without a stabilizing and energy-buffering beach to protect public and private coastal infrastructure, the WBSIDA anticipates even larger and more expensive structural repair

[5] U.S. Army Corps of Engineers (2002). *Waikīkī Beach Erosion Control Reevaluation Report: Island of O‘ahu, Hawai‘i.* Honolulu District.

[6] *Beach and Surf Parameters in Hawaii* (Gerritsen, 1978), *Final Environmental Assessment, Kuhio Beach Improvements* (Noda, 1999), *Independent Evaluation Study of Proposed Kuhio Beach Improvements* (Bodge, 2000)

[7] Sea Engineering, Inc. (2008). *Environmental Assessment / Environmental Impact Statement Preparation Notice for Gray's Beach Restoration Project.* Waikīkī, O‘ahu, Hawai‘i. Prepared for Kyo-ya Hotels & Resorts LP. SEI Job No. 25103. August 2008.

and improvement projects to be required soon to prevent the destruction of threatened coastal structures.

WBSIDA is a 501©3 non-profit which has committed to partially supporting beach improvement projects in the Waikīkī district as a public-private partnership. The WBSIDA looks forward to further developing the project scope in partnership with the DLNR. Thank you for the opportunity to provide comments on this project.

DAVID Y. IGE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

Rick Egged, President
Waikīkī Beach Special Improvement District Association
2250 Kalakaua Ave Suite 315
Honolulu, HI 96815

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Egged:

Thank you for your comment later dated January 5, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you state that you strongly support the proposed beach improvement and maintenance actions. As the Applicant, the Hawai‘i Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

We recognize that you provided seven project-specific comments, all in support of the proposed actions. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement (DPEIS).

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

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January 21, 2021

Mr. Andy Bohlander
Sea Engineering, Inc.
Makai Research Pier
41-305 Kalanianaole Hwy.
Waimanalo, Hawaii 96795

Re: EIS Preparation Notice
Waikiki Beach Improvement and Maintenance Program

Dear Mr. Bohlander:

Thank you for the opportunity to provide comment on the EIS Preparation Notice (EISPN) for the Waikiki Beach Improvement and Maintenance Program.

These comments are submitted on behalf of King Parsons Enterprises, Inc., owner and operator of the catamaran MAITA'I, and Holokai Catamaran, Inc., owner and operator of the catamaran HOLOKAI. MAITA'I and HOLOKAI are among six (6) catamarans which have Revocable Permits (RP) from the State of Hawaii to land and pick up/drop off passengers on Waikiki Beach. MAITA'I's RP site is located on the beach fronting the Sheraton Waikiki. HOLOKAI's RP site is on the beach fronting the Waikiki Reef hotel.

We appreciate the commitment of the State to improve conditions at Waikiki Beach and acknowledge the hard work of Sea Engineering, Inc. in developing this EISPN. However, we have serious concerns regarding the effects of the planned improvements on the navigability and safety of the Halekulani Beach Sector area. These concerns are listed as follows:

1. The T-groins may interfere with the safe navigation of the MAITA'I and HOLOKAI catamarans.

The EISPN indicated that three new T-groins are proposed for the Halekulani Beach Sector which will be located near or over existing and/or relict groins. In addition, the Fort DeRussy outfall groin and Royal Hawaiian groins will be modified. The modification of the Royal Hawaiian groin and construction of the groin immediately to the west of the Royal Hawaiian groin do not appear problematic and will not likely interfere with the operations of the catamarans.

However, the center T-groin that bisects the existing sand beach between the Halekulani and Sheraton hotels will directly impede the navigation of MAITA'I, which accesses its landing area by entering the Halekulani Channel and maneuvering in the starboard direction towards the Sheraton. In addition to blocking access to MAITAI's landing area from the Halekulani Channel, the proposed center groin is too close to the groin immediately to its east. There will be insufficient distance between the two groins for the vessel to safely navigate onto the beach during certain weather and ocean conditions, particularly those which may cause the lateral movement of the vessel.

The groin proposed for the beach fronting Halekulani may also pose problems. Diagrams of the groin appear to depict some encroachment into the Halekulani Channel. In fact, there should be no structure interfering with the channel, which was specifically created as a navigation channel.

The Fort DeRussy outfall groin, as modified, may interfere with HOLOKAI's access to its RP site in front of the Outrigger Reef hotel. The extension eastward of the Fort DeRussy outfall T-groin limits the area within which HOLOKAI can maneuver. There does not appear to be sufficient area between the outfall groin and the groin immediately to the east to permit the safe operation of the vessel.

We believe that the Halekulani Channel and beach area fronting the Outrigger, Halekulani and Sheraton hotels should be optimized for navigation and beach catamaran operations. Creating a safe environment for catamaran operations also serves to increase safety for swimmers, surfers and other beach users. Options for consideration may include removal of the center groin and reconfiguration of the adjacent groins.

2. The EISPN does not address a linear concrete structure which stretches across the west "pocket beach" in front of the Sheraton.

In recent years a semi-exposed linear concrete structure, which may have been a walkway or a wall, began appearing on the beach fronting the Sheraton. (See photographs attached hereto). Interestingly, the structure may be visible in the 1949 photograph of the area on page 58 of the EISPN. Today, the structure stretches across the beach and comes dangerously close to MAITAI's permit site and beach anchor. It clearly poses a hazard to the vessel, passengers and crew, as well to beachgoers traversing the area. Due to the clear dangers posed by the structure, it should be removed.

3. The old submerged groins are potentially hazardous and should be evaluated for possible removal.

The EISPN depicts multiple old groins which are submerged or partially submerged in the waters off the Halekulani Sector. To the extent any of these old groins will not be used for the construction of new groins, we suggest they be inspected and evaluated for any hazards they may pose to the public and vessels in navigation. If the old groins are found to be dangerous, we recommend they be removed when work is done on the Halekulani Sector.

4. To the extent that reducing the number of groins will affect the longevity of sand deposits on the beach, we suggest that periodic sand replenishment be factored into the long-term management of the Halekulani Sector.

The Halekulani Sector appears particularly susceptible to coastal erosion and loss of sand deposits. In the event that reducing the number of T-groins renders the area more vulnerable to the loss of sand, we recommend that regular beach nourishment, such as anticipated for the Royal Hawaiian Beach Sector, be taken into consideration.

5. The slope of the beach is also important for the safe navigation and landing of the vessels.

We hope that consideration will also be given to the slope of the beach as it affects the safe landing of catamarans. We therefore request information on the projected slope of the beach after sand placement.

Pursuant to the terms of its commercial use permits, MAITA'I and HOLOKAI are required to navigate in and out of the Halekulani Channel. Over the years, MAITA'I and HOLOKAI have experienced significant and ongoing difficulties accessing their RP sites due to rising sea levels and continued coastal erosion. As the result of increasingly unsafe conditions along the Halekulani Sector, both vessels have been forced to find temporary alternate landing areas, including Fort DeRussy beach.

In order to fully convey the situation faced by the catamarans, we believe it is important that a site visitation with all interested parties, including Sea Engineering, the Waikiki Improvement Association and DLNR be conducted in the near future. This site inspection can be accomplished prior to or during consideration of the comments and recommendations made herein.

As we will need to ascertain the distance between T-groins to more precisely evaluate the navigability of the area, we also ask that markers be placed where the proposed groins are to be constructed. This can be accomplished at our site meeting.

Thank you for the opportunity to provide comment to the EISPN. We welcome further discussion regarding this project of vital importance to the future of Waikiki and the State of Hawaii.

Sincerely,

/s/ Cynthia A. Farias

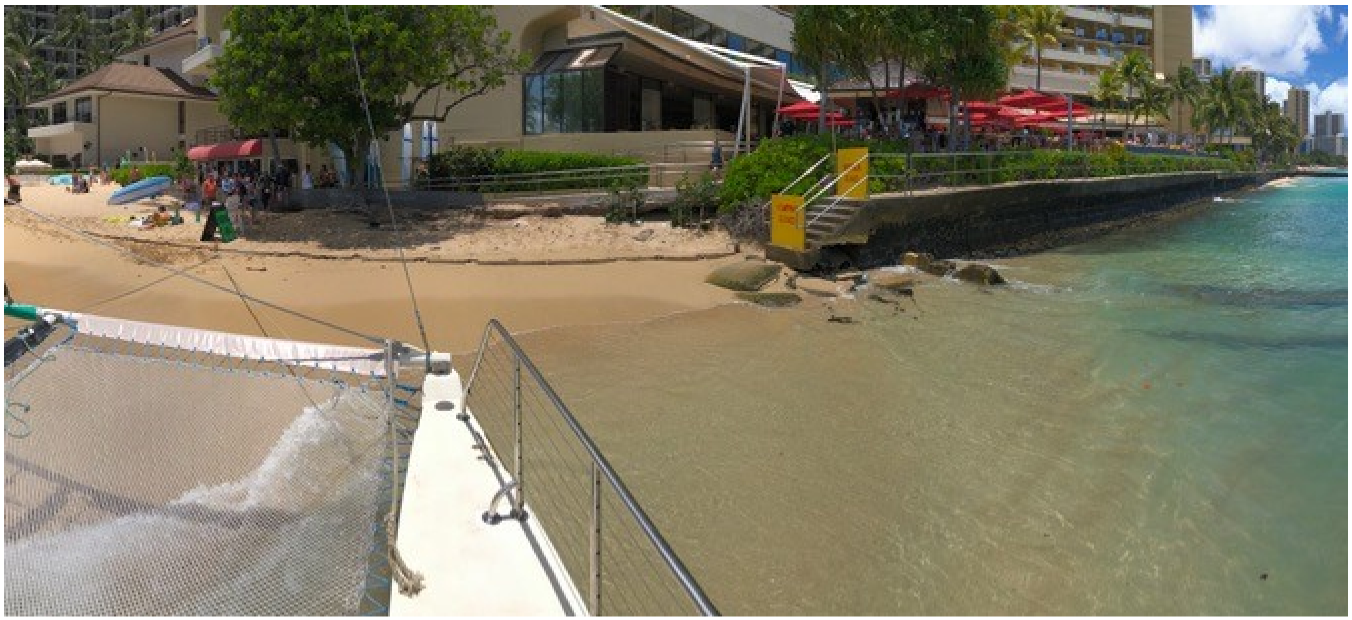
CYNTHIA A. FARIAS
COX WOOTTON LERNER GRIFFIN
& HANSEN

Enclosures

cc: George Parsons
King Parsons Enterprises, Inc.

Soo Stover
Richard Stover
Holokai Catamaran, Inc.

Attachment 1 Close up of steps and concrete structure (taken before hotel closure)



Attachment 2 Gray's beach with closed walkway and concrete structure (taken before hotel closure)

Attachment 3 concrete structure

Attachment 4 - Beach Hazard

Attachment 5 Anchor and mooring taken before hotel shutdown

Attachment 6 Exposed concrete close to dead-man anchor

DAVID Y. IGE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

Ms. Cynthia Farias
Cox Wootton Lerner Griffin & Hansen LLP
841 Bishop Street, Suite 1099
Honolulu, HI 96813

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Ms. Farias:

Thank you for your comment letter dated January 21, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you summarized your consideration of and comments for the proposed actions. We understand that these comments were submitted on behalf of King Parsons Enterprises, Inc., owner and operator of the catamaran Maitaʻi, and Holokai Catamaran, Inc., owner and operator of the catamaran Holokai. As the Applicant, the Hawaiʻi Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

Comment: “The T-groins may interfere with the safe navigation of the Maitaʻi and Holokai catamarans.”

> **Response:** The proposed action in the Halekūlani beach sector is not anticipated to have any negative impacts on catamaran operations. The minimum beach crest width at its narrowest point midway between the groins would be about 20 to 30 ft, and the beach slope would be 1V:8H (vertical to horizontal). Maintaining a stable beach with a gentler slope will provide additional space for the catamarans to tie up and safely load and offload guests. The Halekūlani Channel would remain unobstructed to allow for safe navigation. The groin stem length (distance seaward from the shoreline) would be up to about 200 ft and the gaps between the groin heads would be approximately 200 ft wide.
>
> The catamarans are approximately 45 ft long and 25ft wide, so the gaps between the groin heads should be sufficiently wide to provide safe ingress and egress for catamaran access to/from the shoreline. The current travel path for the

catamarans would shift slightly to the west to align with the gap between the groins on either side of the Halekūlani Channel. The new beach and groins would also eliminate the seasonal erosion that forces the catamarans to relocate their operations to the Fort DeRussy beach sector. Thus, no negative impacts to navigation or catamaran operations are anticipated.

For information regarding potential impacts to navigation and catamarans, please see Sections 5.3.1, 9.4.4.3, and 9.4.6 of the DPEIS.

Comment: "The EISPN does not address a linear concrete structure which stretches across the west "pocket beach" in front of the Sheraton." and "The old submerged groins are potentially hazardous and should be evaluated for possible removal."

Response: There are several remnant structures along the Halekūlani beach sector shoreline. These structures are low elevation and are expected to be removed or buried with sand as part of the proposed action.

Comment: "To the extent that reducing the number of groins will affect the longevity of sand deposits on the beach, we suggest that periodic sand replenishment be factored into the long-term management of the Halekulani Sector."

Response: The proposed groins are designed to stabilize the beach to mitigate erosion and create a stable beach profile. The groins are designed to account for 1.5 ft of sea level rise and can be adapted in the future to accommodate up to 2.7 ft of sea level rise.

We evaluated the alternative of beach nourishment without stabilizing structures in the Halekūlani beach sector. This would involve recovering approximately 40,000 cy of sand from offshore and placing it along the shoreline. Based on the projected erosion rates in the Halekūlani beach sector, the beach would need to be renourished every 5 years. Due to the combination of nearshore wave patterns, seawalls, and the Halekūlani Channel, it is possible that the beach could erode more rapidly, in which case renourishment would need to be conducted more frequently. While beach nourishment without stabilizing structures is technically feasible, it is not being proposed due to the cumulative impacts associated with periodic dredging and renourishment. Furthermore, beach nourishment may not be a viable long-term solution due the limited volume of compatible offshore sand to support periodic renourishment. For more information about this alternative, please see Sections 5.4.1 and 10.2 of the DPEIS.

Comment: "The slope of the beach is also important for the safe navigation and landing of the vessels."

Response: The minimum beach crest width at its narrowest point midway between the groins would be about 20 to 30 ft, and the beach slope would be

1V:8H (vertical to horizontal). Maintaining a stable beach with a gentler slope will provide additional space for the catamarans to tie up and safely load and offload guests. The Halekūlani Channel would remain unobstructed to allow for safe navigation. For additional information, please see Sections 5.4.1 and 10.2 of the DPEIS.

Comment: "In order to fully convey the situation faced by the catamarans, we believe it is important that a site visitation with all interested parties, including Sea Engineering, the Waikiki Improvement Association and DLNR be conducted in the near future. This site inspection can be accomplished prior to or during consideration of the comments and recommendations made herein. As we will need to ascertain the distance between T-groins to more precisely evaluate the navigability of the area, we also ask that markers be placed where the proposed groins are to be constructed. This can be accomplished at our site meeting."

Response: A site visit was conducted on February 10, 2021 with representatives from the catamaran operations, WBSIDA, and Sea Engineering, Inc. to discuss the proposed action and the locations of the groins. Sea Engineering, Inc. also provided the catamaran operators with GPS coordinates for the groins to further evaluate potential impacts to navigation.

Thank you for taking the time to review and comment on the EISPN. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement.

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

January 20, 2021

To: Sam Lemmo, Administrator
Office of Conservation and Coastal Lands
Department of Land and Natural Resources, State of Hawaii
1151 Punchbowl Street, Room 131
Honolulu, Hawaii 96813

From: Keone Downing
Save Our Surf
3017 Waialae Ave.
Honolulu, Hawaii 96816

Subject: Environmental Impact Statement Preparation Notice (EISPN) for the Waikīkī Beach Improvement and Maintenance Project. Waikīkī Beach, Oahu

EISPN Project Summary

Waikīkī Beach extends along the shoreline of Mamala Bay on the south shore of the island of O‘ahu, Hawai‘i. The beaches of Waikīkī are chronically eroding, and the backshore is frequently flooded, particularly during high tides and high surf events. As the beaches continue to erode, a process that is likely to accelerate as sea levels continue to rise, the shoreline will migrate further landward. Without beach improvements and maintenance, sea level rise is likely to result in total beach loss in Waikīkī before the end of the century.

The loss of Waikīkī Beach would result in an annual loss of $2.223 billion in visitor expenditures (Tarui, et al. 2018). Improvements and maintenance are necessary to restore and maintain the beaches of Waikīkī to continue to support Hawaii's tourism-based economy. The State of Hawai‘i Department of Land and Natural Resources proposes beach improvement and maintenance projects in the Fort DeRussy, Halekulani, Royal Hawaiian, and Kūhiō Beach sectors of Waikīkī. Projects would include the construction of new beach stabilization structures, and the recovery of offshore sand and its placement on the shoreline.

The objectives of the proposed actions are to restore and improve Waikīkī's public beaches, increase beach stability through improvement and maintenance of shoreline structures, provide safe access to and along the shoreline, and increase resilience to coastal hazards and sea level rise.

Thank you for bringing this notice of the Waikīkī Beach environmental study preparation notice to our attention, so we can address general community needs and issues.

Save Our Surf (SOS) Questions

1. Why does the EIS stop short of addressing loss of sand at both ends of adjacent local beaches such as Duke Kahanamoku Beach and Kapiolani Park?

Why was the beaches which are used mostly by our local community not addressed at this time.

While restoration of the beach is beneficial in general, we believe the economic loss to Waikiki is incorrect. In 2019, with very little beach available to the public, there were still over 10.4 million visitors.

2. There are some concerns about the designs proposed in the EIS: T-head groins, beach fill, modification to one swim basin, which date back over 20 years ago. Why is a design from 20 years ago being considered?

   One design done by Noda and Associates is an example. At the time the design was deemed needing a second opinion by DLNR through the Office of Conservation and Coastal Lands (OCCL). In 2000 OCCL hired a firm from Florida, Olsen Associates, to study the plan. Olsen developed their own plan which was a new design, three T-Head groins. Sam Lemmo, in an article written by Treena Shapiro, said "his staff should focus energy on the Olsen design because it seems more of an optimal solution for Waikiki. We believe that it will stabilize the beach better". Now 20 years later OCCL, Sea Engineering, and WBSIDA is choosing a design similar to Noda and Associates. Would like to know why?

3. Has DLNR looked at new designs using new materials since technology and science allowed for development of better materials from 20 years ago. What is the outcome of the research?

4. SOS would like to ask for a comprehensive study on the effectiveness of historic and recent shoreline structures that OCCL and Sea Engineering have done in addressing erosion trends. Would like the study to include two projects: A. Sandbag groin by the Duke Kahanamoku statue, B. Royal Groin

5. Is there a study on the short and long-term impacts of the project on reef health and impacts to endangered sea turtles (fronting the Sheraton and Halekulani hotels)?

6. SOS would like a comprehensive analysis of the impacts to all surfing waves in Waikiki using advanced modeling tools for a variety of rideable wave conditions. In the Halekulani Sheraton section, building and placement of these groins will create adverse actions to surf breaks such as Populars, Paradise, and Threes, to name a few, especially as sea levels rise. SOS believes by channelizing the lateral movement of water and sand these structures will change the currents as it exist today.

7. Does the State have a comprehensive plan on the cause and effects of littoral cells and solutions that addresses armoring?

Thank you for the opportunity to submit comments and questions on this project.

Keone Downing

Save Our Surf

DAVID Y. IGE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
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CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

June 4, 2021

Keone Downing
Save Our Surf
3017 Waialae Ave.
Honolulu, Hawaii 96816

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Downing:

Thank you for your comment letter dated January 20, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawai‘i Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

Comment: "Why does the EIS stop short of addressing loss of sand at both ends of adjacent local beaches such as Duke Kahanamoku Beach and Kapiolani Park? Why was the beaches which are used mostly by our local community not addressed at this time? While restoration of the beach is beneficial in general, we believe the economic loss to Waikiki is incorrect. In 2019, with very little beach available to the public, there were still over 10.4 million visitors."

> **Response:** Selection of the proposed beach improvement and maintenance actions was a primarily stakeholder-driven process. We relied heavily on feedback and direction from the Waikīkī Beach Community Advisory Committee (WBCAC) to identify issues, needs, priorities, and design criteria for beach sector. The sectors that were selected for beach improvement and maintenance actions were identified as the highest priorities by the WBCAC. While the other beach sectors of Waikīkī – Duke Kahanamoku, Queens, Kapi‘olani, and Kaimana - were not identified as priorities by the WBCAC, these areas are clearly important and we recognize that, as sea levels continue to rise, beach improvements and/or maintenance may be required in these beach sectors in the future. For more information about the WBCAC and the project selection process, please see Sections 2.4 and 2.6 and Appendix A of the DPEIS.

Comment: “There are some concerns about the designs proposed in the EIS: T-head groins,beach fill, modification to one swim basin, which date back over 20 years ago. Why is a design from 20 years ago being considered? One design done by Noda and Associates is an example. At the time the design was deemed needing a second opinion by DLNR through the Office of Conservation and Coastal Lands (OCCL). In 2000 OCCL hired a firm from Florida, Olsen Associates, to study the plan. Olsen developed their own plan which was a new design, three T-Head groins. Sam Lemmo, in an article written by Treena Shapiro, said "his staff should focus energy on the Olsen design because it seems more of an optimal solution for Waikiki. We believe that it will stabilize the beach better". Now 20 years later OCCL, Sea Engineering, and WBSIDA is choosing a design similar to Noda and Associates. Would like to know why?”

> **Response:** The existing beach, groin, and breakwater system in the Kūhiō beach sector is a relatively simple engineered environment that can be engineered and reconfigured in multiple different ways to produce many different outcomes. In this case, the proposed beach improvement and maintenance actions were specifically designed to address issues and priorities that were identified by the Waikīkī Beach Community Advisory Committee (WBCAC) (see Sections 2.4 and 2.6 and Appendix A of the DPEIS).
>
> The WBCAC determined that the highest priority for the Kūhiō beach sector Diamond Head (east) basin was to maintain calm and shallow water uses and beach-ocean interaction (e.g., swimming, bathing). The WBCAC determined that the preferred action is limited to periodic beach maintenance with no structural modifications.
>
> The WBCAC determined that the highest priorities for the Kūhiō beach sector ‘Ewa (west) basin are to maintain a moderately-energetic wave environment, maintain ocean access, reduce sand loss through the breakwater channel, and stabilize seasonal beach dynamics. The WBCAC determined that the preferred action is beach nourishment with a segmented breakwater. The proposed action is different from the Noda design and more consistent with the Bodge design. The WBCAC also determined that the proposed action should be designed to mitigate chronic and seasonal erosion on the west side of the ‘Ewa (west) groin. To achieve this objective, a recessed head is proposed to be added to the ‘Ewa (west) groin to improve beach stability in this area. For additional information, please see Section 7.3 of the DPEIS.

Comment: “Has DLNR looked at new designs using new materials since technology and science allowed for development of better materials from 20 years ago. What is the outcome of the research?

> **Response:** We evaluated various options for alternative armor units (see Section 5.3.3.1 of the DPEIS). One of the primary objectives identified by the WBCAC was to maintain a cultural/historical sense of place and preserve open beach and view planes. As a result, the proposed actions are designed to minimize impacts

to the existing appearance, character, and view planes along Waikīkī Beach. For this reason, we have proposed the use of basalt armor stone, which is similar in size, color, texture, and appearance to the existing groins and breakwater system in Waikīkī.

Comment: "SOS would like to ask for a comprehensive study on the effectiveness of historic and recent shoreline structures that OCCL and Sea Engineering have done in addressing erosion trends. Would like the study to include two projects: A. Sandbag groin by the Duke Kahanamoku statue, B. Royal Groin."

Response: The University of Hawaii Coastal Geology Group (UHCGG) has and is continuing to conduct periodic monitoring of the Kūhiō Sandbag Groin. Initial findings based on approximately one year of survey data indicate that the groin is functioning as intended. The efficacy of the groin is evident by significant sand buildup on the Diamond Head (east) side of the structure throughout the year, indicating that longshore transport was altered as intended to mitigate extreme erosion at this section of beach. Sediment capture by the groin has not resulted in significant erosion on the ʻEwa (west) side of the structure, which would be evidenced by sediment depletion and flanking directly adjacent to the structure.

Overall, one year following completion the structural integrity and efficacy of the groin structure has been confirmed. No adverse effects of the project have been observed. No significant deficiencies with the ElcoRock sandbags and/or the overall groin performance have been observed. We will continue to monitor the structure throughout the coming year. The effectiveness or need for the structure will be further evaluated after we accomplish improvements to the ʻEwa (west) basin in the Kūhiō beach sector. For additional information about the Kūhiō Sandbag Groin, please see Sections 2.6, 6.1, and 8.5.3 of the DPEIS.

The Royal Hawaiian Groin Replacement project was completed in August 2020. The project proponents, consultants, and contractors routinely observe the shoreline conditions in this area to evaluate the performance of the structure. Initial observations indicate that the groin is performing its primary function to stabilize the beach on the Diamond Head (east) side of the groin. The beach in this area is currently wider than it was pre-construction, and the shoreline has naturally taken the arc-shape anticipated from the groin design. For additional information about the Royal Hawaiian Groin, please see Sections 2.6, 6.1, and 8.5.3 of the DPEIS.

Comment: "Is there a study on the short and long-term impacts of the project on reef health and impacts to endangered sea turtles (fronting the Sheraton and Halekulani hotels)?"

Response: We acknowledge that the proposed action in the Halekūlani beach sector has the potential to affect marine habitat and protected species. Sea turtle disturbance would be limited to within about a 130-ft radius of the sand recovery areas. Turtles would be expected to move away from the disturbance, and as the impact areas are relatively small and the seafloor is primarily sandy, dredging is not anticipated to have any significant effect on turtle foraging. The groins and sand fill will bury a portion of the existing subtidal environment of primarily low relief sand, rubble, and limestone. Ecological services of reef flat habitat will be lost within the project footprint (sand and groins) but is anticipated to recover over time as the benthic community re-establishes.

Best Management Practices (BMPs), as typically recommended by the National Marine Fisheries Service (NMFS), will be adhered to during construction of the proposed actions to avoid or minimize impacts to marine habitat protected species. A biological and water quality monitoring program will be implemented to enhance control over potential construction impacts. We anticipate that marine species will repopulate from surrounding habitat after construction is completed and sessile organisms will colonize new hard surfaces.

We also acknowledge that the proposed action in the Halekūlani beach sector has the potential to affect corals. AECOS (2021) found that coral assemblages in Waikīkī are limited by availability of stable hard bottom, silt cover, competition with algae, and freshwater influence among other factors. At the Halekūlani beach sector, overall coral cover at the proposed groin locations is very low (mean of 0.1 colony/m^2). In general, coral colonies here are small, with 64% being less than 10 cm in diameter. The lack of large coral heads is evidence that this area is not particularly favorable to coral growth.

We anticipate that the proposed structures will provide stable, hard bottom for coral settlement and possibly calmer waters for coral development; however, coral assemblage development may be compromised by competition for space, freshwater influence, sediment transport, and heavy utilization of the nearshore by the human population.

Based on the limited amount of coral in the Halekūlani beach sector, the proposed actions are not anticipated to significantly affect corals. Measures proposed to be exercised to protect corals during construction include:

- Locating and marking significant corals in the vicinity of the sand recovery areas;
- Identifying pipeline route corridors to minimize the potential for damage to coral and other benthic fauna; and
- Transplanting corals, as necessary and where practicable, to relocate them from the construction site, particularly along the pipeline route.

For more information about potential impacts to marine habitat and protected species in the Halekūlani beach sector, habitat, please see Sections 8.10, 8.11, 8.12, 10.2, and 11.2 and Appendix C of the DPEIS.

Comment: "SOS would like a comprehensive analysis of the impacts to all surfing waves in Waikiki using advanced modeling tools for a variety of rideable wave conditions. In the Halekulani Sheraton section, building and placement of these groins will create adverse actions to surf breaks such as Populars, Paradise, and Threes, to name a few, especially as sea levels rise. SOS believes by channelizing the lateral movement of water and sand these structures will change the currents as it exists today."

> **Response:** We acknowledge your concerns regarding the potential for the proposed actions to impact surf sites in Waikīkī. Sea Engineering, Inc. conducted detailed wave modeling to evaluate the potential for the proposed actions to impact waves, currents, and surf sites in Waikīkī. Dredging of offshore sand deposits involves removing sand from the deposits, resulting in a lowering of the bottom elevation or changing the bathymetry. Dredging could occur at the *Ala Moana*, *Canoes/Queens*, or *Hilton* offshore sand deposits. Wave modeling was used to assess the impact of dredging on nearby surf sites.
>
> A wave reflection analysis was also conducted to evaluate the potential for the proposed structures in the Halekūlani and Kūhiō beach sectors to reflect waves that could negatively impact surf sites, primarily in the Halekūlani beach sector. To evaluate potential impacts, wave modeling of the existing conditions and with the proposed structures was performed. Based on the results of the wave modeling, the dredge analysis, and the wave reflection analysis, no significant impacts to waves, currents, or surf sites in Waikīkī are anticipated.
>
> For more information about the wave modeling results and potential impacts to waves, currents, and surf sites, please see Sections 8.2, 8.6 and 9.4.6 of the DPEIS.

Comment: "Does the State have a comprehensive plan on the cause and effects of littoral cells and solutions that addresses armoring?"

> **Response:** The littoral cells (beach sectors) of Waikīkī were evaluated and defined by Miller et.al. (2003). The littoral cells are primarily defined by the presence of engineered structures including groins, breakwaters, storm drains, and seawalls. Almost the entire length of the Waikīkī shoreline is armored by seawalls, most of which were constructed in the late 1800's and early 1900's. To our knowledge, that last seawall was constructed in Waikīkī nearly a century ago. The DLNR does not regulate land uses mauka (landward) of the shoreline in Waikīkī. Responsibility for regulation and permitting rests with the City and County of Honolulu. Furthermore, the existing seawalls are privately-owned structures and are located outside of the Conservation District.

Thank you for taking the time to review and comment on the EISPN. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement.

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

January 21, 2021

Surfrider Foundation Oahu Chapter
PO Box 283092
Honolulu HI 96828

Andy Bohlander
Sea Engineering
abohlander@seaengineering.com

Aloha,

This letter is in response to the EISPN for the proposed Waikiki Beach Improvement and Maintenance Project. The project aims to restore a continuous beach along the hotel areas of Waikiki. It involves construction of several new groin structures to maintain beach sand where there has been none. The plan will also modify existing coastal structures near Dukes surf break.

Since the proposed project is in close proximity to famous surf breaks and is along a very popular shoreline for visitors and residents to enjoy the ocean, Surfrider Foundation has a strong interest in this proposed project. While restoration of the beach may be beneficial in many ways, our community has several questions that may be addressed in the EIS:

1. What is the impact of the proposed project (structures, sand placement, dredging, etc.) on the adjacent beaches, shorelines and offshore resources in the project vicinity?
2. What are the short- and long-term impacts to water quality, beach sand quality, reef health, surf breaks and near-shore ocean currents?
3. What is the potential to add affordable public parking (for multi-modal forms of transportation) for local residents and surfers (with long surfboards or other watercraft) in close proximity to the maintained beach area?
4. Can additional beach access locations be added near the maintained beach areas (e.g., between hotels)?
5. What are the advantages and disadvantages of various design options for the proposed plans?
6. How much public money was spent on planning and maintaining Waikiki beach in the last several decades? How does this compare to other beaches in the state?
7. Assuming resources are limited, what are the socio-economic impacts of maintaining Waikiki beach over other areas?
8. How will projected sea level rise influence the feasibility of maintaining Waikiki Beach as proposed?
9. How has the beach responded to the recently installed sandbag groin? Will this structure be removed or modified?
10. What are the impacts of the recently modified Royal Hawaiian groin?

Surfrider suggests that the proposed management framework for this EIS be expanded to address comprehensive community concerns as we have for over a decade of planned discreet improvements. The plan ends at the hotels and does not go on to adjacent local beaches at either end such as at

Kahanamoku Beach and Kapiolani Park Beach, where beach loss is severe and usage by local residents is high. We advocate for a comprehensive approach to improve and maintain all of the Waikiki shoreline for residents and visitors alike.

The Surfrider Foundation is greatly concerned about public beach access and coastal zone resources island-wide. Many of our beaches are at great risk due to erosion and development pressures, and our members have been advocates for protecting these areas for the enjoyment of all people and wildlife (i.e., Sunset Beach, Mokuleia, Wawamalu, Waimanalo, Lanikai, Diamond Head, Ewa, East Oahu, etc.). While we agree that Waikiki Beach is important to maintain, limited public resources must also be allocated to help mitigate erosion and sea level rise problems state-wide. We encourage the government to develop a comprehensive beach management strategy for all of our disappearing shorelines. This EIS may include a suggested framework to help the government allocate limited resources between Waikiki and other priority coastal areas in critical need of maintenance and restoration.

We appreciate your consideration.

Mahalo,

Doorae Shin

Doorae Shin
Surfrider Foundation Oahu Chapter Coordinator

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

Ms. Doorae Shin
Surfrider Foundation Oahu Chapter
PO Box 283092
Honolulu HI 96828

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Ms. Shin:

Thank you for sending your comment letter for the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawaiʻi Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

Comment: “What is the impact of the proposed project (structures, sand placement, dredging, etc.) on the adjacent beaches, shorelines and offshore resources in the project vicinity? What are the short- and long-term impacts to water quality, beach sand quality, reef health, surf breaks and near-shore ocean currents?”

> **Response:** We acknowledge that the proposed actions have the potential to result in a variety of short and long-term impacts. Based on previous projects in Waikīkī, we anticipate that the proposed actions will result in some short-term impacts that will be temporary in nature; however, no negative long-term impacts are anticipated. Industry-standard Best Management Practices (BMPs) will be utilized to avoid and minimize potential impacts to the maximum extent practicable. The potential impacts of the proposed actions are discussed in Sections 8 and 9 of the DPEIS. The cumulative and secondary impacts of the proposed actions are discussed in Sections 10 and 11 of the DPEIS, respectively.

Comment: “What is the potential to add affordable public parking (for multi-modal forms of transportation) for local residents and surfers (with long surfboards or other watercraft) in close proximity to the maintained beach area?”

> **Response:** The DLNR does not regulate land uses mauka (landward) of the shoreline in Waikīkī. Responsibility for managing transportation and parking in Waikīkī rests with the City and County of Honolulu, Department of Transportation Services.

Comment: "Can additional beach access locations be added near the maintained beach areas (e.g., between hotels)?"

> **Response:** The DLNR is the lead agency with authority for maintaining *lateral* public access along Hawaii's shorelines. The right of access to Hawaii's shorelines includes the right of transit along the shoreline and within beach transit corridors. *Beach transit corridors* are defined as the areas extending seaward of the shoreline and these areas are considered public property (HRS §115-5, HRS §205A-1). The DLNR does not regulate land uses mauka (landward) of the shoreline in Waikīkī. Responsibility for maintaining *perpendicular* public access to Hawaii's shorelines rests with the City and County of Honolulu.

Comment: "What are the advantages and disadvantages of various design options for the proposed plans?"

> **Response:** We evaluated various alternatives for each beach sector. The advantages and disadvantages of these alternatives are discussed in Sections 3.4, 4.4, 5.4, 6.4, 7.4, 7.6, 10, and 11 of the DPEIS.

Comment: "How much public money was spent on planning and maintaining Waikiki beach in the last several decades? How does this compare to other beaches in the state?"

> **Response:** Hawai‘i has over 750 miles of coastline. There are approximately 24 miles of safe, clean, accessible, and generally suitable-for-swimming sandy beaches across the six main Hawaiian Islands and 184 additional miles of sandy shoreline in the state (Kaiser et al., 1998). Due to funding and staffing limitations, the DLNR seeks to strategically fund beach improvement and maintenance projects that have the broadest and most direct positive impacts to the citizens and the economy of the State of Hawai‘i.
>
> Over the past decade, the DLNR has funded five beach improvement and maintenance projects in Waikīkī with a total cost of approximately $10 million. The DLNR is also funding the Kā‘anapali Beach Restoration and Berm Enhancement project at Kā‘anapali Beach on the Island of Maui with a total cost of approximately $11 million. These projects have been prioritized because Waikīkī and Kā‘anapali are critical components of the economies of the State of Hawai‘i, City and County of Honolulu, and County of Maui. We are currently evaluating options to support beach restoration projects at Hale‘iwa and Punalu‘u

on the Island of Oʻahu. These later projects would be conducted in partnerships with the City and County of Honolulu and the Federal government.

The DLNR has also invested over $1 million in funding and in-kind staff support to develop the Small-scale Beach Nourishment (SSBN) and Small-scale Beach Restoration (SSBR) programs. These programs are intended to consolidate and streamline the regulatory process to make beach improvement and maintenance projects more feasible and cost effective for individuals, communities, and public agencies that handle beach sand. It is important to note that, while beach restoration is generally a preferred alternative, it not practicable or feasible at many locations in Hawaiʻi.

Comment: "Assuming resources are limited, what are the socio-economic impacts of maintaining Waikiki beach over other areas?"

Response: Waikīkī is a critical component of Hawaii's tourism-based economy. The Waikīkī economy generates jobs and tax revenue that benefit everyone in the State of Hawaiʻi. The beach and its culture are major amenities that help maintain Oʻahu and Waikīkī as an attractive visitor destination. The socioeconomic impacts of not maintaining Waikīkī Beach would likely have a negative impact on all citizens of the State of Hawaiʻi. The economic impacts of beach loss in Waikīkī are discussed in Sections 1, 2.2, 3.4, 3.4, 9.1, 9.1, 10, and 11 of the DPEIS.

Comment: "How will projected sea level rise influence the feasibility of maintaining Waikiki Beach as proposed?"

Response: The Waikīkī Beach Improvement and Maintenance Program consists of *beach improvement* actions and *beach maintenance* actions. *Beach improvements* refers to actions that involve adding new sand, adding new structures, and/or modifying existing structures. *Beach maintenance* refers to actions that involve using existing sand or adding sand with no new structures or modification of existing structures.

The proposed beach improvement actions in the Halekūlani beach sector and the ʻEwa (west) basin of the Kūhiō beach sector are designed to create a stable beach profile. The designs account for 1.5 ft of sea level rise and can be adapted to accommodate up to 2.7 ft of sea level rise. We anticipate that the beaches would be stable and periodic renourishment would not be required.

The proposed beach maintenance action in the Fort DeRussy beach sector is sand backpassing, which would involve recovering existing sand from the accreted area at the west end of the beach and placing it in the eroded area at the east end of the beach. Sand would be excavated from the beach face extending inshore only as far as necessary to obtain the required volume of sand. The proposed action would not require offshore dredging and there would be no increase in the volume of sand in the littoral system. The proposed action is intended to be conducted on a periodic basis and may be adapted as sea levels continue to rise.

The proposed beach maintenance action in the Diamond Head (east) basin of the Kūhiō beach sector is sand pumping, which would involve recovering approximately 4,500 cy of existing sand from within the basin onto the dry beach. The proposed action would not require offshore dredging and there would be no increase in the volume of sand in the basin. The proposed action is intended to be conducted on a periodic basis and may be adapted as sea levels continue to rise.

The proposed beach maintenance action in the Royal Hawaiian beach sector is beach nourishment, which would involve recovering approximately 25,000 cy of sand from the *Canoes/Queens* offshore sand deposit and placing it on the beach. This is the only action proposed that would require periodic renourishment to maintain the beach at its 1985 location. The *Canoes/Queens* offshore sand deposit consists of sand that has eroded from Royal Hawaiian Beach. This sand source has been used in previous beach nourishment projects in 2012 and 2021. Reusing this sand on a periodic basis would not increase in the volume of sand in the littoral system.

For more information about anticipated project lifespans, please see Section 3.3 of the DPEIS. For more information about sea level rise, please see Section 8.3.5 of the DPEIS.

Comment: “How has the beach responded to the recently installed sandbag groin? Will this structure be removed or modified?”

Response: The University of Hawaii Coastal Geology Group (UHCGG) has and is continuing to conduct periodic monitoring of the Kūhiō Sandbag Groin. Initial findings based on approximately one year of survey data indicate that the groin is functioning as intended. The efficacy of the groin is evident by significant sand buildup on the Diamond Head (east) side of the structure throughout the year, indicating that longshore transport was altered as intended to mitigate extreme erosion at this section of beach. Sediment capture by the groin has not resulted in significant erosion on the ‘Ewa (west) side of the structure, which would be evidenced by sediment depletion and flanking directly adjacent to the structure.

Overall, one year following completion the structural integrity and efficacy of the groin structure has been confirmed. No adverse effects of the project have been observed. No significant deficiencies with the ElcoRock sandbags and/or the overall groin performance have been observed. We will continue to monitor the structure throughout the coming year. The effectiveness or need for the structure will be further evaluated after we accomplish improvements to the ‘Ewa (west) basin in the Kūhiō beach sector. For additional information about the Kūhiō Sandbag Groin, please see Sections 2.6, 6.1, and 8.5.3 of the DPEIS.

Comment: "What are the impacts of the recently modified Royal Hawaiian groin?"

Response: The Royal Hawaiian Groin Replacement project was completed in August 2020. The project proponents, consultants, and contractors routinely observe the shoreline conditions in this area to evaluate the performance of the structure. Initial observations indicate that the groin is performing its primary function to stabilize the beach on the Diamond Head (east) side of the groin. The beach in this area is currently wider than it was pre-construction, and the shoreline has naturally taken the arc-shape anticipated from the groin design. For additional information about the Royal Hawaiian Groin, please see Sections 2.6, 6.1, and 8.5.3 of the DPEIS.

Comment: "Surfrider suggests that the proposed management framework for this EIS be expanded to address comprehensive community concerns as we have for over a decade of planned discreet improvements. The plan ends at the hotels and does not go on to adjacent local beaches at either end such as at Kahanamoku Beach and Kapiolani Park Beach, where beach loss is severe and usage by local residents is high. We advocate for a comprehensive approach to improve and maintain all of the Waikiki shoreline for residents and visitors alike."

Response: Selection of the proposed beach improvement and maintenance actions was a primarily stakeholder-driven process. We relied heavily on feedback and direction from the Waikīkī Beach Community Advisory Committee (WBCAC) to identify issues, needs, priorities, and design criteria for beach sector. The sectors that were selected for beach improvement and maintenance actions were identified as the highest priorities by the WBCAC. While the other beach sectors of Waikīkī – Duke Kahanamoku, Queens, Kapiʻolani, and Kaimana - were not identified as priorities by the WBCAC, these areas are clearly important and we recognize that, as sea levels continue to rise, beach improvements and/or maintenance may be required in these beach sectors in the future. For more information about the WBCAC and the project selection process, please see Section 2 and Appendix A of the DPEIS.

Comment: "The Surfrider Foundation is greatly concerned about public beach access and coastal zone resources island-wide. Many of our beaches are at great risk due to erosion and development pressures, and our members have been advocates for protecting these areas for the enjoyment of all people and wildlife (i.e., Sunset Beach, Mokuleia, Wawamalu, Waimanalo, Lanikai, Diamond Head, Ewa, East Oahu, etc.). While we agree that Waikiki Beach is important to maintain, limited public resources must also be allocated to help mitigate erosion and sea level rise problems state-wide. We encourage the government to develop a comprehensive beach management strategy for all of our disappearing shorelines. This EIS may include a suggested framework to help the government allocate limited resources between Waikiki and other priority coastal areas in critical need of maintenance and restoration."

Response: We appreciate your recognition of the need to develop a comprehensive beach management strategy for all of the shorelines of Hawaiʻi. Unfortunately, we do not have sufficient funding and staff resources to develop such plans and strategies. However, towards this end, we have developed the Small-scale Beach Nourishment (SSBN) and Small-scale Beach Restoration (SSBR) programs to facilitate proactive beach management state-wide.

We also completed the *Hawaiʻi Sea Level Rise Vulnerability and Adaptation Report* in December 2017. The report provides specific recommendations to protect Hawaii's beaches including:

- Amend the State Legacy Lands Act to set aside funding for preserving priority coastal lands and use of a variety of practices and tools to enable legacy beaches to persist.
- Conduct a state-wide assessment of legacy beach conservation priorities.
- Establish a "willing seller" program to move development away from legacy beaches.
- Develop public-private partnerships for coastal land acquisition, beach management, and reef protection

We have also been instrumental, as has The Surfrider Foundation, in promoting and supporting legislation to improve shoreline management in Hawaiʻi, including requiring mandatory disclosure for private properties and public offerings located in areas with potential exposure to sea level rise, exploring the use of transfer of development rights and purchase of development rights programs that facilitate managed retreat and legacy beach preservation, prohibiting driving vehicles on beaches, increasing shoreline setbacks for coastal development, and increasing penalties for activities that harm beaches.

Thank you for taking the time to review and comment on the EISPN. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement.

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

Andy Bohlander

From:	Douglas Meller <douglasmeller@gmail.com>
Sent:	Friday, January 22, 2021 12:34 AM
To:	Lemmo, Sam J; Waikiki; Andy Bohlander; David Smith; Dolan Eversole
Subject:	January 21, 2021 Comments on EISPN for Waikiki Beach Improvement and Maintenance Program
Attachments:	1-21-21 Douglas Meller Comments on Waikiki Beach Improvement EISPN.pdf; 1982-03-OA-REIS-KALIA-RD-RELIEF-DRAINAGE.pdf; 6-17-16 email to DLNR re illegal beach fences.pdf; Title 13 Chapter 255, HAR - prohibitions on business operations on Waikiki Beach.pdf; 10-9-18 DPP letter re SMA & SV requirements for commercial uses of state shoreline property.pdf; 3-12-19 Waikiki Shore NOV.pdf; 3-1-13 email with DLNR staff re commercial storage on Waikiki Beach.pdf; 12-20-16 DLNR Waikiki-Beach-User-Conflict-Rpt.pdf; 3-6-19 Sen. Morikawa letter to DLNR - CASE, SUZANNE 2019-03-06.pdf

Department of Land and Natural Resources
Office of Conservation and Coastal Lands
Attention: Samuel Lemmo, Administrator
email: sam.j.lemmo@hawaii.gov

Sea Engineering, Inc.
Attention: Andy Bohlander and David A. Smith, PhD, PE
email: waikiki@seaengineering.com
abohlander@seaengineering.com
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Dolan Eversole
UH Sea Grant College Program
Waikiki Beach Management Coordinator
email: eversole@hawaii.edu

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT (EIS) PREPARATION NOTICE
WAIKIKI BEACH IMPROVEMENT AND MAINTENANCE PROGRAM

I support the EIS Preparation Notice proposals to widen, stabilize, and maintain Waikiki Beach. I also support the "optional" proposal for construction of an ADA-compliant beach walkway between the Royal Hawaiian groin and the existing Fort DeRussy beach walkway.

If only limited funding were available, my priority would be to relocate accreted sand from the west end to the eroding east end of Fort DeRussy Beach. If sufficient funding were available, my next priority would be to widen/construct/stabilize a continuous beach between the Royal Hawaiian groin and Kalia Road Relief Drain.

Apart from my priorities for beach improvements, I request that the Draft EIS address my following comments which concern acquisition of private littoral rights, regulation of development, and regulation of commercial use of the beach.

ACQUISITION OF PRIVATE LITTORAL RIGHTS

I recommend that the Draft EIS propose use of eminent domain to acquire all private littoral rights between the Royal Hawaiian Hotel groin and Fort DeRussy. In 1928-1929, the Territory of Hawaii executed beach-widening agreements which authorized property owners abutting this section of beach to install portable fences to privatize, and prevent the public from using, part of any significant public beach widening. During the 1970s and 1980s, Federal and State initiatives to widen this section of beach failed because abutting property owners refused to voluntarily quitclaim private littoral rights established under the 1928-1929 beach widening agreements. Private littoral rights established under the Territorial agreements might also preclude construction of a continuous beach walkway as proposed in the EIS Preparation Notice. More Information and references are provided in the attached pdf file for Kalia Road Relief Drain Revised EIS.

I also recommend that the Draft EIS propose use of eminent domain to acquire private littoral rights makai of the existing "Line A" under the 1965 SurfRider-Royal Hawaiian Sector Beach Agreement. The 1965 Agreement includes exhibits which designate a "Line A" and a "Line B" over the beach between the eastern end of the Moana Surfrider and the western end of the Royal Hawaiian. "Line A" is mauka of and not parallel to "Line B". The 1965 Agreement provides that the beach mauka of "Line A" is privately owned and not subject to a public easement; the beach between "Line A" and "Line B" is privately owned and subject to a public easement for public recreational use; and any beach constructed or accreted makai of "Line B" is publicly owned. Under the 1965 Agreement, abutting property owners are allowed to install portable fences and signs to exclude the public from private property mauka of "Line A", but are prohibited from any kind of commercial activity on the beach subject to public easement. Item 9 of the 1965 SurfRider-Royal Hawaiian Sector Beach Agreement explicitly requires that

> *The State will not conduct or permit any commercial activity of any kind on the public beach in the SurfRider-Royal Hawaiian Sector of Waikiki Beach, including … the area … subject to public easement…. The Owners [of the beach subject to public easement and abutting property] will not conduct or permit any commercial activity of any kind on the area … subject to public easement….*

As recently as June 2016, as explained in an attached 6/17/16 email pdf file, both Moana Surfrider and Royal Hawaiian beach fences were located makai of "Line A" and improperly reserved part of the public easement for exclusive commercial use by hotel patrons. Although commercial activity has been prohibited for more than half a century, hotel beach concessions still routinely place unrented commercial beach chairs and umbrellas on the beach makai of "Line A". Tourists intermittently rent the stored commercial equipment. The beach concessions use kiosks located mauka of "Line A" to collect payment for rental of their commercial equipment.

SHORELINE-RELATED LAND USE REGULATION

State law and DLNR rules require public notice on applications for shoreline certification, establish procedures for public comment, and authorize appeals of proposed DLNR determinations of the shoreline. **<u>I request that the Draft EIS describe any informal procedures used to determine the shoreline when property owners request emergency permits to protect their property from beach retreat.</u>**

DLNR certification of a shoreline survey determines the makai boundary of the City special management area (SMA) and usually determines the makai boundary of the City shoreline setback area. The City regulates development within the SMA with SMA permits, and the City regulates development within the shoreline setback area with shoreline variances. State law and City ordinance require public hearings on applications for both SMA permits and shoreline variances.

State law requires SMA permits prior to other permits to authorize development which straddles the shoreline.

> ***§205A-29 Special management area use permit procedure.*** *. . .*
> *(b) No agency authorized to issue permits pertaining to any development within the special management area shall authorize any development unless approval is first received in accordance with the procedures adopted pursuant to this part….*

After-the-fact permit applications for development which straddles the shoreline often result in a regulatory quagmire. The City requires shoreline certification before accepting an application for a SMA permit or a shoreline variance. DLNR rules prohibit shoreline certification when the inland wash of waves is affected by development which requires but has not obtained either a shoreline variance or a SMA permit. And State law provides that when the inland wash of waves is affected by development which requires after-the-fact permits, the shoreline setback area extends makai of the shoreline.

> ***§205A-41 Definitions.*** *. . .*
> *"Shoreline area" shall include all of the land area between the shoreline and the shoreline setback line . . .; provided that if the highest annual wash of the waves is fixed or significantly affected by a structure that has not received all permits and approvals required by law or if any part of any structure in violation of this part extends seaward of the shoreline, then the term "shoreline area" shall include the entire structure.*

I request that the Draft EIS address whether certification of the shoreline further makai after beach widening would include more of the beach within the SMA. The EIS Preparation Notice proposes that the DLNR apply for certification of a shoreline survey and obtain permits to widen Waikiki Beach. After the beach is widened, waves would not wash as far inland. DLNR rules and court rulings require certification of the shoreline at the farthest inland wash of waves. Hence, an application for shoreline certification after the beach is widened would likely result in certification of the shoreline further makai than prior to beach widening.

I request that the Draft EIS address whether a SMA permit is required for placement/storage of commercial beach chairs and umbrellas within the SMA. Attached pdf files for a 10/9/18 City DPP letter and a 3/12/19 City DPP Notice of Violation concern SMA permit requirements for placement/storage of other kinds of portable commercial equipment within the SMA.

I request that the Draft EIS address whether certification of the shoreline further makai after beach widening might allow development closer to the beach. The shoreline setback area is 40 feet wide. After beach widening, If the shoreline is certified further makai, then more of the beach would be within the shoreline setback area and less property mauka of the beach would be within the shoreline setback area.

I request that the Draft EIS address whether certification of the shoreline further makai after beach widening would relocate the boundary between the Conservation District and the Urban District. I suggest that the Draft EIS include a declaratory ruling from the State Land Use Commission. Land Use Commission rules imply that shoreline certification normally determines the boundary between the Conservation District and the Urban District in Waikiki. However, the Reef Runway precedent implies that the Conservation District boundary might not be amended when development relocates the shoreline. (Construction of the Honolulu International Airport Reef Runway relocated the shoreline further makai. However, the Reef Runway remained within the Conservation District until the State Land Use Commission approved the State's petition to reclassify the property from the Conservation District to the Urban District.)

I request that the Draft EIS address whether certification of the shoreline further makai after beach widening would relocate the makai boundary of City resort zoning for any private Waikiki shoreline property. Zoning district boundaries are set by City ordinance. Where the beach is owned by abutting resort property, shifting the City resort zoning district boundary further makai (onto the beach) could increase both the maximum permitted building floor area and market value of abutting resort property. However, if the DLNR acquired private littoral rights prior to beach widening, it would be irrelevant whether part of the beach was rezoned for resort use.

ILLEGAL COMMERCIAL BEACH USES

I request that the Draft EIS include maps and text which explain where the commercial placement/storage of unrented commercial beach chairs and umbrellas is currently illegal on Waikiki Beach. I also request that the Draft EIS include maps and text which address DLNR regulation of commercial beach use after beach widening. I have attached several pdf files which provide background information concerning DLNR regulation of commercial beach use in Waikiki.

Hawaii Administrative Rules Title 13 Subtitle 11 Part III Chapter 255 prohibits placement or storage of unrented commercial beach chairs on the public beach easement makai of the Moana Surfrider, Outrigger, and Royal Hawaiian hotels.

> *§13-255-6 Waikiki Beach uses and activities; restrictions. . . .*
>
> *(c) Storage, parking, and display prohibited. No person shall store, park, moor, place, or display any thing or personal property on or at Waikiki Beach for the purpose of engaging in, conducting, transacting, or soliciting business of any kind; provided that an outrigger canoe or sailing catamaran registered by the department pursuant to Hawaii ocean waters and shores rules may be placed, moored, or anchored below the mean high water mark. . . .*

The following 12/29/20 picture, used for a 1/4/21 Star Advertiser article, shows unrented commercial beach chairs and umbrellas which were illegally placed/stored on the public beach easement makai of the Outrigger Hotel.

The following 1/18/19 pictures show unrented commercial beach chairs and umbrellas which were illegally placed/stored on the public beach easement makai of the Royal Hawaiian Hotel.

The DLNR has not authorized any concession or other commercial use of the State-owned beach makai of the Waikiki Shore Condominium or the State-owned beach makai of Fort DeRussy. However, the following 9/6/19 picture shows unrented commercial beach chairs and umbrellas which were illegally placed/stored on both the State-owned beach makai of the Waikiki Shore Condominium and the State-owned beach makai of Fort DeRussy. The red line on this picture is the Waikiki Shore Condominium's 10/15/19 certified shoreline.

I look forward to reviewing the Draft EIS.

9 PDF ATTACHMENTS

Douglas Meller
email: douglasmeller@gmail.com

January 21, 2021

Department of Land and Natural Resources
Office of Conservation and Coastal Lands
Attention: Samuel Lemmo, Administrator
email: sam.j.lemmo@hawaii.gov

Sea Engineering, Inc.
Attention: Andy Bohlander and David A. Smith, PhD, PE
email: waikiki@seaengineering.com
abohlander@seaengineering.com
dsmith@seaengineering.com

Dolan Eversole
UH Sea Grant College Program
Waikiki Beach Management Coordinator
email: eversole@hawaii.edu

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT (EIS) PREPARATION NOTICE
WAIKIKI BEACH IMPROVEMENT AND MAINTENANCE PROGRAM

I support the EIS Preparation Notice proposals to widen, stabilize, and maintain Waikiki Beach. I also support the “optional” proposal for construction of an ADA-compliant beach walkway between the Royal Hawaiian groin and the existing Fort DeRussy beach walkway.

If only limited funding were available, my priority would be to relocate accreted sand from the west end to the eroding east end of Fort DeRussy Beach. If sufficient funding were available, my next priority would be to widen/construct/stabilize a continuous beach between the Royal Hawaiian groin and Kalia Road Relief Drain.

Apart from my priorities for beach improvements, I request that the Draft EIS address my following comments which concern acquisition of private littoral rights, regulation of development, and regulation of commercial use of the beach.

ACQUISITION OF PRIVATE LITTORAL RIGHTS

I recommend that the Draft EIS propose use of eminent domain to acquire all private littoral rights between the Royal Hawaiian Hotel groin and Fort DeRussy. In 1928-1929, the Territory of Hawaii executed beach-widening agreements which authorized property owners abutting this section of beach to install portable fences to privatize, and prevent the public from using, part of any significant public beach widening. During the 1970s and 1980s, Federal and State initiatives to widen this section of beach failed because abutting property owners refused to voluntarily quitclaim private littoral rights established under the 1928-1929 beach widening agreements. Private littoral rights established under the Territorial agreements might also preclude construction of a continuous beach walkway as proposed in the EIS Preparation Notice. More Information and references are provided in the attached pdf file for Kalia Road Relief Drain Revised EIS.

I also recommend that the Draft EIS propose use of eminent domain to acquire private littoral rights makai of the existing "Line A" under the 1965 SurfRider-Royal Hawaiian Sector Beach Agreement. The 1965 Agreement includes exhibits which designate a "Line A" and a "Line B" over the beach between the eastern end of the Moana Surfrider and the western end of the Royal Hawaiian. "Line A" is mauka of and not parallel to "Line B".   The 1965 Agreement provides that the beach mauka of "Line A" is privately owned and not subject to a public easement; the beach between "Line A" and "Line B" is privately owned and subject to a public easement for public recreational use; and any beach constructed or accreted makai of "Line B" is publicly owned. Under the 1965 Agreement, abutting property owners are allowed to install portable fences and signs to exclude the public from private property mauka of "Line A", but are prohibited from any kind of commercial activity on the beach subject to public easement. Item 9 of the 1965 SurfRider-Royal Hawaiian Sector Beach Agreement explicitly requires that

> *The State will not conduct or permit any commercial activity of any kind on the public beach in the SurfRider-Royal Hawaiian Sector of Waikiki Beach, including … the area … subject to public easement…. The Owners [of the beach subject to public easement and abutting property] will not conduct or permit any commercial activity of any kind on the area … subject to public easement….*

As recently as June 2016, as explained in an attached 6/17/16 email pdf file, both Moana Surfrider and Royal Hawaiian beach fences were located makai of "Line A" and improperly reserved part of the public easement for exclusive commercial use by hotel patrons. Although commercial activity has been prohibited for more than half a century, hotel beach concessions still routinely place unrented commercial beach chairs and umbrellas on the beach makai of "Line A". Tourists intermittently rent the stored commercial equipment. The beach concessions use kiosks located mauka of "Line A" to collect payment for rental of their commercial equipment.

SHORELINE-RELATED LAND USE REGULATION

State law and DLNR rules require public notice on applications for shoreline certification, establish procedures for public comment, and authorize appeals of proposed DLNR determinations of the shoreline. **I request that the Draft EIS describe any informal procedures used to determine the shoreline when property owners request emergency permits to protect their property from beach retreat.**

DLNR certification of a shoreline survey determines the makai boundary of the City special management area (SMA) and usually determines the makai boundary of the City shoreline setback area. The City regulates development within the SMA with SMA permits, and the City regulates development within the shoreline setback area with shoreline variances. State law and City ordinance require public hearings on applications for both SMA permits and shoreline variances.

State law requires SMA permits prior to other permits to authorize development which straddles the shoreline.

> ***§205A-29 Special management area use permit procedure.*** *. . .*
> *(b) No agency authorized to issue permits pertaining to any development within the special management area shall authorize any development unless approval is first received in accordance with the procedures adopted pursuant to this part….*

After-the-fact permit applications for development which straddles the shoreline often result in a regulatory quagmire. The City requires shoreline certification before accepting an application for a SMA permit or a shoreline variance. DLNR rules prohibit shoreline certification when the inland wash of waves is affected by development which requires but has not obtained either a shoreline variance or a SMA permit. And State law provides that when the inland wash of waves is affected by development which requires after-the-fact permits, the shoreline setback area extends makai of the shoreline.

> ***§205A-41 Definitions.*** *. . .*
> *"Shoreline area" shall include all of the land area between the shoreline and the shoreline setback line . . .; provided that if the highest annual wash of the waves is fixed or significantly affected by a structure that has not received all permits and approvals required by law or if any part of any structure in violation of this part extends seaward of the shoreline, then the term "shoreline area" shall include the entire structure.*

I request that the Draft EIS address whether certification of the shoreline further makai after beach widening would include more of the beach within the SMA. The EIS Preparation Notice proposes that the DLNR apply for certification of a shoreline survey and obtain permits to widen Waikiki Beach. After the beach is widened, waves would not wash as far inland. DLNR rules and court rulings require certification of the shoreline at the farthest inland wash of waves. Hence, an application for shoreline certification after the beach is widened would likely result in certification of the shoreline further makai than prior to beach widening.

I request that the Draft EIS address whether a SMA permit is required for placement/storage of commercial beach chairs and umbrellas within the SMA. Attached pdf files for a 10/9/18 City DPP letter and a 3/12/19 City DPP Notice of Violation concern SMA permit requirements for placement/storage of other kinds of portable commercial equipment within the SMA.

I request that the Draft EIS address whether certification of the shoreline further makai after beach widening might allow development closer to the beach. The shoreline setback area is 40 feet wide. After beach widening, If the shoreline is certified further makai, then more of the beach would be within the shoreline setback area and less property mauka of the beach would be within the shoreline setback area.

I request that the Draft EIS address whether certification of the shoreline further makai after beach widening would relocate the boundary between the Conservation District and the Urban District. I suggest that the Draft EIS include a declaratory ruling from the State Land Use Commission. Land Use Commission rules imply that shoreline certification normally determines the boundary between the Conservation District and the Urban District in Waikiki. However, the Reef Runway precedent implies that the Conservation District boundary might not be amended when development relocates the shoreline. (Construction of the Honolulu International Airport Reef Runway relocated the shoreline further makai. However, the Reef Runway remained within the Conservation District until the State Land Use Commission approved the State's petition to reclassify the property from the Conservation District to the Urban District.)

I request that the Draft EIS address whether certification of the shoreline further makai after beach widening would relocate the makai boundary of City resort zoning for any private Waikiki shoreline property. Zoning district boundaries are set by City ordinance. Where the beach is owned by abutting resort property, shifting the City resort zoning district boundary further makai (onto the beach) could increase both the maximum permitted building floor area and market value of abutting resort property. However, if the DLNR acquired private littoral rights prior to beach widening, it would be irrelevant whether part of the beach was rezoned for resort use.

ILLEGAL COMMERCIAL BEACH USES

I request that the Draft EIS include maps and text which explain where the commercial placement/storage of unrented commercial beach chairs and umbrellas is currently illegal on Waikiki Beach. I also request that the Draft EIS include maps and text which address DLNR regulation of commercial beach use after beach widening. I have attached several pdf files which provide background information concerning DLNR regulation of commercial beach use in Waikiki.

Hawaii Administrative Rules Title 13 Subtitle 11 Part III Chapter 255 prohibits placement or storage of unrented commercial beach chairs on the public beach easement makai of the Moana Surfrider, Outrigger, and Royal Hawaiian hotels.

> *§13-255-6 Waikiki Beach uses and activities; restrictions. . . .*
>
> *(c) Storage, parking, and display prohibited. No person shall store, park, moor, place, or display any thing or personal property on or at Waikiki Beach for the purpose of*

engaging in, conducting, transacting, or soliciting business of any kind; provided that an outrigger canoe or sailing catamaran registered by the department pursuant to Hawaii ocean waters and shores rules may be placed, moored, or anchored below the mean high water mark. . . .

The following 12/29/20 picture, used for a 1/4/21 Star Advertiser article, shows unrented commercial beach chairs and umbrellas which were illegally placed/stored on the public beach easement makai of the Outrigger Hotel.

The following 1/18/19 pictures show unrented commercial beach chairs and umbrellas which were illegally placed/stored on the public beach easement makai of the Royal Hawaiian Hotel.

The DLNR has not authorized any concession or other commercial use of the State-owned beach makai of the Waikiki Shore Condominium or the State-owned beach makai of Fort DeRussy. However, the following 9/6/19 picture shows unrented commercial beach chairs and umbrellas which were illegally placed/stored on both the State-owned beach makai of the Waikiki Shore Condominium and the State-owned beach makai of Fort DeRussy. The red line on this picture is the Waikiki Shore Condominium's 10/15/19 certified shoreline.

I look forward to reviewing the Draft EIS.

Douglas Meller

ATTACHMENTS

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

Mr. Douglas Meller
douglasmeller@gmail.com

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Meller:

Thank you for your email dated January 22, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your email you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawaiʻi Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

We appreciate your support for the overall objectives of the Program to widen, stabilize, and maintain Waikīkī Beach. We also appreciate your prioritized list of sub-projects to be initiated sequentially as part of the overall Program.

Your letter also included requests for additional content to be provided in the Draft Programmatic Environmental Impact Statement (DPEIS) for the Program. Responses to these requests are included below:

- Regarding your request that the DPEIS propose the use of eminent domain to acquire property rights for several sections of Waikīkī Beach, EIS documents are not appropriate tools in which to exercise actions such as eminent domain.

- Regarding your request that the DPEIS describe any informal procedures used to determine the shoreline when emergency permit requests are made, we would like to clarify that there are no informal procedures for doing so. The State only follows formal procedures for situations in which a property owner requests an emergency permit. Such requests and land uses are regulated and enforced according to Hawaiʻi Administrative Rules (HAR) §13-5-35 Emergency Permits.

- Regarding your questions on the process of shoreline certification conducted as part of beach nourishment projects, as with all nourishment projects conducted within the State of Hawaiʻi, beach restoration projects may not be used to move a regulatory boundary or a land ownership boundary in a seaward direction.

- Regarding your question about SMA permit requirements for placement/storage of commercial beach chairs and umbrellas within the SMA, this is a matter to be determined by the City and County of Honolulu if those land uses are located within their jurisdiction. Long term storage of such elements is not allowed seaward of the shoreline. Management of commercial beach concessions and issues related to “presetting” will continue to be controlled so as not to infringe upon the general public’s right to use and enjoy Waikīkī Beach.

Thank you for taking the time to review and comment on the EISPN. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement.

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 768-8000 • FAX: (808) 768-6041
DEPT. WEB SITE: www.honoluludpp.org • CITY WEB SITE: www.honolulu.gov

January 22, 2021 2020/ELOG-2557(ST)

SENT VIA EMAIL

Mr. David A. Smith
waikiki@seaengineering.com

Subject: Waikiki Beach Improvement and Maintenance Project
Environmental Impact Statement (EIS) Preparation Notice
State Department of Land and Natural Resources
Office of Conservation and Coastal Lands
Tax Map Keys various

It is the Department of Planning and Permitting understanding that the proposed beach improvement and maintenance (Project) is the second phase of the 2012 Waikiki Beach Maintenance Project, and involves the placement of approximately 20,000 cubic yards of sand extracted from locations off-shore and placed along various stretches of Waikiki Beach.

We note that most of the Project involves work makai of the regulatory shoreline, and therefore beyond the Special Management Area regulated by the City pursuant to Chapter 25, Revised Ordinances of Honolulu (ROH), or within the Shoreline Setback established by Chapter 23, ROH. However, we will reserve further comment until the Draft EIS is available for review.

Should you have any questions, please contact Steve Tagawa, of our Land Use Approvals Branch, at 768-8024.

Very truly yours,

FOR

Dean Uchida
Director Designate

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

Dean Uchida, Director
Department of Planning and Permitting
City and County of Honolulu
650 South King Street, 7th Floor
Honolulu, HI 96813

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Uchida:

Thank you for your comment later dated January 22, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawaiʻi Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

Comment: "We note that most of the Project involves work makai of the regulatory shoreline, and therefore beyond the Special Management Area regulated by the City pursuant to Chapter 25, Revised Ordinances of Honolulu (ROH), or within the Shoreline Setback established by Chapter 23, ROH. However, we will reserve further comment until the Draft EIS is available for review."

> **Response:** We acknowledge that the proposed beach improvement and maintenance actions are subject to Special Management Area (SMA) use permitting. The DLNR will submit formal applications for any activities in the SMA to the City and County of Honolulu, Department of Planning and Permitting. For information about the relationship of the proposed actions with the provisions of the SMA, please see Section 16.3.4 of the DPEIS.

Thank you for taking the time to review and comment on the EISPN. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement.

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

January 22, 2021

The National Marine Fisheries Service, Pacific Islands Regional Office (PIRO) received a request from the Department of Land and Natural Resources, Division of Conservation and Coastal Lands (DLNR OCCL) for comments on the Environmental Impact Statement Preparation Notice (EISPN) for the Waikīkī Beach Improvement and Maintenance Program. Our comments are provided below and are intended to help the DLNR OCCL comply with the essential fish habitat (EFH) provision of the Magnuson-Stevens Fishery Conservation and Management Act (MSA; Section 305(b)(2) as described by 50 CFR 600.920), which will presumably be required as part of the U.S. Army Corps of Engineers, Honolulu District, Regulatory Branch's (hereafter, USACE; cc'd here) permitting process. These comments do not fulfill any federal responsibilities and this response does not constitute an EFH consultation. Compliance with the EFH provisions of the MSA can also be achieved through pursuance to the Fish and Wildlife Coordination Act (FWCA, 16 U.S.C. 661-666c). For all questions related to consultations with us in the future, please contact us through the email address EFHESAconsult@noaa.gov.

Project Description

The DLNR OCCL proposes multiple beach nourishment and coastal improvement construction projects on Waikīkī Beach, O'ahu, Hawai'i at the Fort DeRussy, Halekulani, Royal Hawaiian, and Kuhio Beach sectors including beach stabilization structures, recovery of offshore sand, and placement of sand on the shoreline. The purpose of the proposed actions are to increase beach stability, provide safe access to the shoreline, and increase resilience to coastal hazards and sea level rise. More specifically, the project proposes these actions at four beach sectors in Waikīkī:

1. **Fort DeRussy Beach** – Along a 1,680 foot stretch of shoreline, the DLNR OCCL proposes to transport 1,200 cubic yards of sand from an accreted area at the west end of the beach, and move it to the east end of the beach. The action would not require in-water work, but rather excavators, front-end loaders, and dump trucks would transport the sand from the borrow site to the placement site.
2. **Halekulani Beach** – Along the 1,450 foot-long shoreline, DLNR OCCL proposes to construct a series of five groins and placing 60,000 cubic yards of sand fill from a dredge recovery area. Due to challenges accessing the beach in this area, these actions may require the use an ocean-based barge and/or construction of a temporary rubblemound construction access berm.
3. **Royal Hawaiian Beach** – This shoreline is approximately 1,730 feet long and DLNR OCCL proposes to place 20,000 cubic yards of sand from an offshore collection site. Construction methodology would be similar to the 2012 Waikīkī Beach Maintenance I project with sand being dredged using a submersible pump mounted on a crane barge. Sand would be stockpiled in the Diamond Head basin of Kuhio Beach Park until it is placed with dump trucks onto the beach. This section of beach includes the newly constructed Royal Hawaiian Groin as well as the Kuhio sandbag groin.
4. **Kuhio Beach** – Along this 1,500 foot shoreline, DLNR OCCL proposes to conduct beach nourishment and structural improvements to two rock basins. The Ewa Basin would be

removed and reconstructed into three distinct breakwaters to account for sea level rise and wave energy. Underlayer and possibly armor stones would be placed to form a work platform for an excavator. In the Diamond Head basin, no structural modifications would occur but a sand causeway may be constructed to support an excavator for sand delivery. An alternative would be a diver-operated dredge, which would entail a dredge pump and a 100 foot hose. In each basin, 4,500 cubic yards of sand would be placed on the shoreline, in the Ewa Beach basin sand would be from a dredged location and in the Diamond Head basin the sand would be excavated or dredged from the basin itself.

PIRO Habitat Mandates

Magnuson Stevens Fishery Conservation and Management Act

A consultation with NMFS is required when a federal agency conducts, funds, or permits work that may adversely affect EFH (Section 305(b)(2) as described by 50 CFR 600.920). The EFH consultation process entails the federal action agency contacting NMFS and providing an EFH assessment (EFHA), which contains key information: a description of the proposed action, a determination from the federal agency as to how the action will affect EFH, an assessment of those adverse effects, and proposed ways to mitigate for the adverse effects, if applicable. An adverse effect to EFH is anything that reduces the quality and or quality of EFH. It may include direct, indirect, and site specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of an action. NMFS will then review the EFHA and may provide conservation recommendations to avoid, minimize, offset for or otherwise mitigate expected adverse effects.

EFH consultations are scalable and commensurate to the severity and type of adverse effects to EFH. The greater the adverse effect, the greater the scrutiny in making a determination. As the order of effect increases, qualitative, semi-quantitative, and quantitative EFH Assessments are appropriate, sequentially. Often, once EFH resources need to be quantified, PIRO is likely to request an “expanded” EFH consultation as opposed to “abbreviated” (50 CFR 600.920(h)(i)), unless sufficient quantification of unavoidable losses has been provided.

In the main Hawaiian Islands, EFH has been designated in the marine water column from the surface to a depth of 1,000 meters (m), from the shoreline to the outer boundary of the Exclusive Economic Zone (200 nautical miles), and the seafloor from the shoreline out to a depth of 700 m. These waters and submerged lands are designated as EFH because they support various life stages for the management unit species (MUS) identified under the Western Pacific Fishery Management Council’s, Pelagic and Hawaiʻi Archipelago Fishery Ecosystem Plans. The MUS and life stages found in these waters include: eggs, larvae, juveniles, and adults of Bottomfish MUS; eggs, larvae, juveniles, and adults of Crustacean MUS; and eggs, larvae, juveniles, and adults of Pelagic MUS. Specific types of habitat considered as EFH include coral reefs, patch reefs, hard substrate, seagrass beds, soft substrate, artificial or man-made structures, mangrove, lagoon, estuarine, surge zone, deep-slope terraces and pelagic/open ocean.

For clarity, federal agencies may incorporate the EFHA into documents prepared for other purposes, such as Endangered Species Act Biological Assessments, National Environmental Policy Act documents, etc. If an EFHA is contained in another document, it must still include all of the mandatory contents as per the EFH guidelines. It must also be clearly identified in the table of contents and text of the document as an EFHA. Alternatively, an EFHA may incorporate by reference other relevant environmental assessment documents that have already been completed. The referenced document must be provided to NMFS with the EFHA.

The EFHA process can also be combined with existing environmental consultation and review processes. The EFH guidelines at 50 CFR 600.920(f) enable federal action agencies to use existing consultation or environmental review procedures to satisfy the MSA consultation requirements if the procedures meet the following criteria: 1) the existing process must provide NMFS with timely notification of actions that may adversely affect EFH; 2) notification must include an assessment of the proposed action’s impacts on EFH that meet the requirements for EFHA discussed in section 600.920(e); and 3) NMFS must have made a finding pursuant to section 600.920(f)(3) that the existing process satisfies the requirements of section 305(b)(2) of the MSA. For the purposes of this beach nourishment proposed action, the EFHA should be integrated with the FWCA (see below) coordination process. In situations where a Federal action may adversely affect designated EFH for federally managed fisheries, EFH Conservation Recommendations can be considered within the FWCA reporting recommendations.

Fish and Wildlife Coordination Act

The FWCA (16 U.S.C. 661-666c) mandates that wildlife, including fish, receive equal consideration and be coordinated with other aspects of water resource development. This is accomplished through consultation with NMFS, the U.S. Fish and Wildlife Service (USFWS), and appropriate state agencies whenever any body of water is proposed to be modified in any way and a Federal permit or license is required. These agencies determine the possible harm to fish and wildlife resources, the measures needed to both prevent the damage to and loss of these resources, and the measures needed to develop and improve the resources, in connection with water resource development. NMFS, the USFWS, and state agencies submit comments to Federal licensing and permitting agencies on the potential harm to living marine resources caused by the proposed water development project, and recommendations to prevent harm (NMFS 2004). In all, the FWCA compliance process includes the following four steps: consultation (notice of initiation); reporting (e.g., field surveys and summary reports) and recommendations to protect, mitigate, and restore natural resources; Action agency consideration of recommendations, and Action agency implementation of recommendations.

NMFS Concerns

Concern #1 - Cumulative Impacts of Beach Maintenance: NMFS is concerned about the cumulative impacts of multiple and repeated beach nourishment and coastal construction projects on EFH within and surrounding the project area. NMFS has recently consulted on and provided conservation recommendations for several of the previous beach maintenance projects in

Waikīkī including Waikīkī Beach Maintenance I, the Kuhio sandbag groin, and the Royal Hawaiian groin replacement. In addition, NMFS consulted on the nearby Ala Moana Beach Park Beach Nourishment project in April 2020 (POH-2019-00194). The EISPN indicates that the proposed actions are part of a larger Waikīkī Beach Management Plan and Hoʻomau ʻO Waikīkī Kahakai, which lays out guidance for beach management, improvement, and maintenance projects in Waikīkī. As the lifespan of the proposed work is stated to be about 50 years, the intention is to continue beach maintenance project in phases over time. Cumulative impacts of continuous beach maintenance projects in Waikīkī should be addressed and described in the EFHA pursuant to 50 CFR 600.910(a) and 600.920(e)(3)(ii).

Concern #2 - Sediment Modelling: Data and evaluation of marine currents, water flow, and sediment plume modelling are recommended near sand donor sites to justify final locations and clarify potential adverse effects to EFH from sediment resuspension and deposition during dredge operations and after beach nourishment. The modelling effort should also include and consider the following areas: the groin footprints, between the groins, offshore of the groins, and offshore sand borrow areas. NMFS is concerned that sediment deposition may occur over sensitive and hard-to-replace hard-bottom habitat, corals, or submerged aquatic vegetation (e.g., seagrass) during dredging activities at borrow sites and after during and after beach nourishment. Completing the modelling effort and including it in the Draft EIS and EFHA would help reduce uncertainty and better inform conservation recommendations. If there is a high probability that sediment resuspension and deposition will occur over sensitive and hard-to-replace hard-bottom habitat, corals, and submerged aquatic vegetation, these areas should be prioritized survey areas both before and after construction.

Concern #3 - Dredge Methods: The 2012 dredging in Waikīkī resulted in the leaching and resuspension of micrytic calcium carbonate. The Ala Moana Beach Nourishment consultation from the USACE suggested that the dredge method from 2012, which included the pumping of sand through small diameter hoses, resulted in the mechanical breakdown of sand sized particles resulting in portion that was much smaller (e.g., <4 microns). The DLNR OCCL should ensure that the dredging methods avoid duplicating the same method that may have resulted in the enhanced presence of micrytic calcium carbonate in 2012.

Concern #4 - Final locations, composition, and surrounding habitats of sand collection sites: Several sand collection site options were described in the EISPN. NMFS is concerned about the lack of information about sand collection sites as the final decision will affect the EFH adverse effect and stressor analyses. Descriptions of the final locations should include sand composition and grain size, species and size classes for any adjacent coral or area of seagrass resources, presence or absence of invasive species, and the oceanographic setting. Marine resource survey assessments should be conducted over and along both hard and soft bottom (e.g., sand, unconsolidated sediment, etc.) substrate; however, surveys should ensure that ensure that coral and seagrass habitats are prioritized and that surveys and data are statistically powerful.

Concern #5 Uncertainty of distribution of coral and seagrass throughout the project area: Quantitative resource survey assessments are described in the EISPN and will be included in the

Draft EIS and EFHA. Without this information, NMFS would be concerned about the lack of information on how project activities could affect habitat-forming EFH resources. If high uncertainty remains, NMFS must assume habitat-forming resources will be adversely affected by the project activities. The assumption would be that adverse effects may require coral and/or seagrass transplantation minimization and if there could be unavoidable loss, then offset measures to compensate for those losses must be in place.

Concern #6 Use of geotextile sandbags: NMFS is also concerned about the existing Kuhio Sandbag groin and the continued use of geotextile sandbags. It was unclear in the EISPN if the sandbags will be removed, left in place, or buried during future beach nourishment. As they were intended as a short-term solution to coastal erosion, the EFHA should detail plans for the sandbags and their future lifespan.

Concern #7 Additional adverse effects to EFH: Finally, NMFS is concerned that there are a variety of adverse effects from stressors on EFH that have not been fully considered in the EISPN. Short-term, long-term to permanent, and cumulative adverse effects to EFH may occur from the preferred alternative due to physical damage, sedimentation and turbidity, introduction of invasive species, and nutrients and chemical contamination.

Stressor Effects

<u>Physical Damage:</u> Direct contact to EFH resources (e.g., corals, submerged aquatic vegetation, hardbottom habitat) from removal of existing structures, construction equipment and materials, as well as from installation activities, can lead to permanent and lesser adverse effects. The level of these adverse effects (i.e., short-term, long-term to permanent, and cumulative) will depend on the density and extent of EFH resources present and the dredge and/or sediment retention designs that are chosen. For example, the 2012 Waikīkī Beach Nourishment and Dredging Project resulted in physical damage to the fossil limestone reef rock bordering sand borrow areas that were dredged. Due to this stressor, a variety of measures to avoid and minimize physical damage to EFH may be needed to reduce unavoidable losses. Overall, steps should be taken during dredging and sand transport to avoid and minimize physical damage to corals and submerged aquatic vegetation. Dredging equipment and turbidity control measures should consider wave energy and provide appreciable buffer space between construction equipment and nearby EFH resources.

<u>Sedimentation and Turbidity:</u> Enhanced sedimentation and turbidity may occur from dredging at borrow areas (e.g., pump heads causing re-distribution and settlement of fine sediment), land-based beach filling activities, after-the-fact leaching of micritic calcium carbonate from beach fill, and sediment resuspension from groins if they alter local hydrodynamics.

<u>Nutrients and Chemical Contamination:</u> Adverse effects of increased nutrients and chemical contamination may occur during dredging from borrow areas and after beach fill is placed due to release of sediment-bound nutrients and chemical contaminants. The latter may also occur from leaking construction equipment and introduction of treated materials into the marine

environment. Sediment chemical analysis will be helpful to help better understand potential impacts.

Invasive Species: There is a concern that there would be an increased risk of spreading invasive species, which have been detected around at least one proposed sand collection site. *A. erecta* is an invasive species observed in Honolulu Harbor in 2014 (Wade et al. 2018) and patches of *A. erecta* have been observed near the Ala Moana dredging site; there is an increased risk of spreading this species through project activities if they are not deterred through avoidance measures and contingency planning. Invasive species rapidly increase in abundance to the point that they come to dominate their new environment, creating adverse ecological effects to other species of the ecosystem and the functions and services it may provide (Goldberg and Wilkinson 2004). Invasive species can decrease species diversity, change trophic structure, and diminish physical structure, but adverse effects are highly variable and species-specific.

EFH Assessment Content
An EFHA should be included for the upcoming EFH consultation, and specific content should be considered for inclusion to inform an EFH determination and the EFH effects analysis. If a USACE permit is required, the USACE would be the lead federal action agency responsible for developing the EFHA. As described in the EISPN, before the USACE permit application process is initiated, we recommend that quantitative marine resource survey assessments, new sediment modeling, robust sediment testing, and water quality monitoring are conducted; in addition, we recommend that your water quality monitoring plan include assessments before (e.g., baseline), during, and after construction activities (see below). The EFHA should consider the full suite of potential stressors to habitat forming EFH. Below we provide details related to these concerns and guidance on how these issues can be resolved through continued early coordination. In addition, we provide an Enclosure at the end of this letter with specific avoidance and minimization measures that would be applicable to the project.

Mitigation and Unavoidable Loss

If the proposed activities will adversely affect EFH, various forms of mitigation (e.g., avoidance, minimization, and compensation to offset losses; see FR 85 43350 and CEQ 2011 Guidance) may be required, including the potential transplantation of corals and seagrass. In such cases, a minimization plan with post-transplantation monitoring for survivability should be included in the EFHA for evaluation. If unavoidable loss is expected due to proposed activities, these losses should be quantified and a plan to offset the losses of ecosystem services should be included in the EFHA. Information on the species; abundance, size and total area lost; and locations should be included in the offset plan. NMFS also recommends a habitat suitability analysis for any transplantation site.

Quantitative Resource Survey Assessments
We recommend that you conduct preliminary, quantitative benthic marine survey assessments of the entire project footprint area within the littoral cell—hard and soft bottom, groin footprints,

between groins, offshore of the groins, where sediment models predict deposition, and offshore sand borrow areas—before an EFH consultation is initiated. The level of complexity of surveys will scale proportionally with the extent of habitat forming EFH resources (e.g., corals and submerged aquatic vegetation) that may suffer adverse effects (i.e., direct, indirect, and cumulative). Contingencies should be designed to accommodate analyses that require greater replication and higher statistical power to avoid the need to obtain higher resolution data. Hard-bottom and areas with habitat forming EFH should be prioritized over soft bottom substrate, though it will be important to characterize the latter. Post-action monitoring plans would reduce uncertainty during potential EFH offset determinations. Completing the survey work and including it in the Draft EIS and EFHA would help reduce uncertainty and better inform EFH conservation recommendations and any potential offset determinations for unavoidable loss. NMFS is ready and willing to provide assistance to further refine and clarify the types and complexity of survey information to potentially include for any EFH consultation.

Sediment Modeling

Sediment modeling is recommended to predict how the preferred alternative may adversely affect EFH substrate (e.g., hard and soft bottom), habitat forming EFH (e.g., corals and submerged aquatic vegetation), and water column EFH. Modeling should consider how T-groins may alter sediment deposition over time. We are particularly concerned about redistribution and settling of fine sediment including limestone mud (i.e., microcrystalline calcium carbonate <4 microns in diameter) that may leach from beach fill and smother habitat forming EFH that may be nearby. The modelling effort should include and consider the following areas: the groin footprints, between the groins, offshore of the groins, sand nourishment areas, and offshore sand borrow areas. If there is a high probability that sediment deposition will occur over sensitive and hard-to-replace hard-bottom habitat, corals, and submerged aquatic vegetation, these areas should be prioritized survey areas both before and after construction. Completing the modelling effort and including it in the Draft EIS and EFHA would help reduce uncertainty and better inform EFH If there is a high probability that sediment deposition will occur over sensitive and hard-to-replace hard-bottom habitat, corals, and submerged aquatic vegetation, these areas should be prioritized survey areas both before and after construction.

Sediment Testing

Sediment testing should be robust and specific; it should be done before sediment is collected from borrow sites and after it is deposited on beaches. The latter would help minimize the potential resuspension of micrytic calcium carbonate by informing contingency planning and sedimentation control measures. Information about sediment chemistry, nutrient content, and other chemical characterization should be considered for both bulk samples (i.e., all size fractions) and within each size fraction or sediment class (e.g., mud, silt, fine sand, sand, etc.). This would be helpful because smaller size fractions that include silt and mud classes typically retain higher organic carbon content and are more detrimental to habitat forming EFH than those sediment types with larger sizes. In addition, micrytic calcium carbonate is more difficult for hard corals to clear off of their tissue, and can result in mortality. This information should also be considered for inclusion in the Draft EIS and EFHA to inform conservation recommendations and potential offset determinations. Completing the sediment testing effort and including it in the Draft EIS and EFHA would help reduce uncertainty and better inform EFH conservation recommendations and any offset determinations.

Water Quality Monitoring

Robust water quality monitoring (e.g., turbidity, sedimentation rates, nutrients, dissolved oxygen, etc.) would be helpful to assess conditions before (i.e., baseline), during, and after beach restoration activities. These activities should be informed by the sediment modeling and daily tide and current velocity predictions (https://www.pacioos.hawaii.edu/voyager/) to select sampling locations. Special attention and consideration should be placed on collecting turbidity and sedimentation rate information at areas where there are habitat forming EFH resources, including corals and submerged aquatic vegetation (e.g., seagrass). For other criteria needed for beach restoration projects, NMFS would defer to the requirements of the Environmental Protection Agency (EPA) delegated through the state of Hawaiʻi, Department of Health, Clean Water Branch's (DOH), 401 Water Quality Certification (WQC), Applicable Monitoring and Assessment Plans (AMAP). Completing the water quality monitoring planning effort and including it in the Draft EIS and EFHA would help reduce uncertainty and better inform EFH conservation recommendations and any offset determinations.

Summary

We greatly appreciate your early EFH coordination and the opportunity to provide comments on the EISPN. In summary, we expect that the proposed beach restoration project may have short-term, long-term to permanent, and cumulative adverse effects to EFH. Depending on the final results of additional data gathering and monitoring, the preferred alternative may result in unavoidable loss of EFH, which would require offset considerations. The prospective EFH consultation led by the USACE would be better informed with a description of cumulative impacts, sediment modelling data, description of dredge methods, final locations and information about sand collection areas, maps of coral and/or seagrass areas, details on the use of geotextile sandbags, and outlining additional impacts including physical damage, sedimentation, increased nutrients, and invasive species. We have described the stressor impacts to EFH from the proposed activities and have provided guidance on the EFH consultation process and mandatory content needed to include in an EFHA. In the Enclosure at the end of this email, we also provide specific avoidance and minimization recommendations by stressor-type.

For all additional questions related to consultations with us (e.g., EFH, and FWCA) in the future, please contact us through the email address: EFHESAconsult@noaa.gov and for FWCA contact Steve Kolinski (steve.kolinski@noaa.gov).

References

Council on Environmental Quality. 2011. Appropriate Use of Mitigation and Monitoring and Clarifying the Appropriate Use of Mitigated Findings of No Significant Impact.

Goldberg, J. and Wilkinson, C., 2004. Global threats to coral reefs: coral bleaching, global climate change, disease, predator plagues and invasive species. *Status of coral reefs of the world*, *2004*, pp.67-92.

Wade, R.M., Spalding, H.L., Peyton, K.A., Foster, K., Sauvage, T., Ross, M. and Sherwood, A.R., 2018. A new record of Avrainvillea cf. erecta (Berkeley) A. Gepp & ES Gepp (Bryopsidales, Chlorophyta) from urbanized estuaries in the Hawaiian Islands. *Biodiversity data journal*, (6).

Enclosure

Recommended Avoidance and Minimization Measures

Below is a list of avoidance and minimization measures that you could anticipate to include in your Draft EISPN potential EFHA during EFH consultation.

Physical Damage

1. Restrict all physical contact with the bottom to unconsolidated sediments devoid of coral and seagrass.
2. Work platforms should be selected based on the following preferential hierarchy:
   a. conduct all work from land;
   b. use a barge with auto-positioning systems where thrusters will not cause increased turbidity;
   c. anchor barges to (1) shoreline infrastructure; (2) nearby existing moorings; (3) anchors or spuds in/on sand only (as possible, have SCUBA divers lay anchors by hand in sand areas).
3. Prior to mobilizing, ensure all construction equipment, ballast, and vessel hulls do not pose a risk of introducing new invasive species and will not increase abundance of those invasive species present at the project location.
4. Minimize physical contact by divers and construction related tools, equipment, and materials with live benthic organisms, regardless of size, especially corals and seagrass.
5. Prevent trash and debris from entering the marine environment through the use of nets or barriers.
6. Relocate infrastructure materials (e.g., riprap, piles, boulders) that are colonized with benthic communities according to an approved relocation plan. Approved plans must ensure corals are moved to adjacent area(s) with similar habitat conditions, onto suitable substrates, using reliable attachment methods, in similar orientations. Monitoring is not required. If infrastructure materials (e.g. riprap, piles, boulders) that are colonized with benthic communities will be removed or destroyed as part of permitted activities, relocate these materials to an appropriate receiving site.
7. Have a qualified marine biologist identify and relocate hard corals that would be otherwise lost to project activities and which can be logistically moved according to an approved relocation plan. Approved plans must ensure corals are moved to adjacent area(s) with similar habitat conditions, onto suitable substrates, using reliable attachment methods, in similar orientations; and corals must be monitored for success (more frequently at the beginning, and for a duration of no less than 2 years). To provide accountability reference corals or a reference reef site should

also be monitored concurrently to compare observed changes.
8. Ensure that new structures minimize shading impacts to marine habitats. Incorporate measures that increase the ambient light transmission under structures. Some of these measures include: maximizing the height of the structure and minimizing the width of the structure to decrease shade footprint; grated decking material; using the fewest number of pilings necessary to support the structures to allow light into under-pier areas and minimize impacts to the substrate; and aligning the boardwalk in a north-south orientation for the path of the sun to cross perpendicular to the length of the structure and reduce the duration of shading
9. Perform pre-deployment reconnaissance (e.g., divers, drop cameras) to ensure that all anchors are set on hard or sandy bottom devoid of corals and seagrass and that chosen anchor locations take into consideration damage that could occur from the anchor chain if the vessel swings due to currents or tides.
10. Require a long-term maintenance plan for gear, instrumentation, and equipment to prevent failures that lead to permanent adverse effects to EFH (e.g., vessel groundings).
11. Ensure structures are properly weighted to prevent movement from currents or waves and implement a maintenance plan to ensure integrity over time.
12. Lower utility lines or cables and maneuver the placement in a controlled manner using SCUBA in order to avoid all coral resources, when practicable.
13. Develop a Wave and Storm Contingency Plan for construction materials and equipment.
14. Develop a monitoring plan to consistently assess the condition of groin materials as well as a contingency plan if the condition is endangering EFH.

<u>Sedimentation and Turbidity</u>

1. Conduct intertidal work at low and or slack tide.
2. Conduct work during calm sea states; stop work during high surf, winds, and currents.
3. Perform work outside of the main coral spawning period in summer (May to August) to minimize sedimentation and turbidity effects to coral eggs and larvae in the area. Peak spawning periods vary by species and geography, and are based on best available science.
4. If appropriate, consider using cofferdams to dewater the project impact site.
5. Install sediment, turbidity, and/or pneumatic curtains, and use real-time monitoring (automated or manual) for barges and dredge vessels to detect failure and implement stop-work processes if pre-determined project thresholds are reached (use standards from Clean Water Act 401 water quality certification). In areas of soft sediment, consider partial length turbidity curtains in order to reduce resuspension of sediment during high winds and currents.
6. Use soft and/or natural engineering solutions to maintain/restore natural flow volumes and velocity.
7. Minimize disturbances to stream banks, and place abutments outside of the floodplain whenever possible. Seek to maintain baseline water flow volume and velocity within the system.
8. Utilize environmental clamshell buckets for mechanical dredging.
9. Design the nourishment activities to maintain or replicate natural stream channel and flow conditions to the greatest extent practicable.
10. Revegetate shoreline areas with appropriate native species and fully stabilize disturbed

upland areas prior to removing silt fences and erosion prevention measures.

Chemical Contamination

1. Conduct work during the dry season when possible; stop work during storms or heavy rains. Neutralize or treat contaminated sediments and/or waters prior to release from the project site.
2. Inspect all equipment prior to beginning work each day to ensure the equipment is in good working condition, and there are no contaminant (oil, fuel, etc.) leaks.
3. All equipment found to be leaking contaminants must be removed from service until repaired.
4. All fueling or repairs to equipment must be done in a location with the appropriate controls that prevents the introduction of contaminants to marine environment.
5. Prevent discharges of chemicals and other fluids dissimilar from seawater into the water column.
6. Use materials that are nontoxic to aquatic organisms, such as untreated wood, concrete, or steel (avoid pressure treated lumber).
7. Use diffusers on the end of subtidal discharge pipes to minimize impacts from discharges.
8. Prevent bentonite drilling fluid from contacting live benthic organisms.

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June 4, 2021

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SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Dr. Chung:

Thank you for your comment letter dated January 22, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawaiʻi Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

We acknowledge that the proposed actions are subject to the provisions and requirements of the Magnuson Stevens Fishery Conservation and Management Act (MSA) (Section 305(b)(2) as described by 50 CFR 600.920) and the Fish and Wildlife Coordination Act (FWCA) (16 U.S.C. 661-666c). We will conduct formal consultations with the NOAA National Marine Fisheries Services (NMFS) and the U.S. Fish and Wildlife Service (USFWS) during the final design and permitting process to ensure compliance with the Essential Fish Habitat (EFH) provisions of the MSA and the FWCA.

Comment: "Concern #1 - Cumulative Impacts of Beach Maintenance: NMFS is concerned about the cumulative impacts of multiple and repeated beach nourishment and coastal construction projects on EFH within and surrounding the project area. NMFS has recently consulted on and provided conservation recommendations for several of the previous beach maintenance projects in Waikīkī including Waikīkī Beach Maintenance I, the Kuhio sandbag groin, and the Royal Hawaiian groin replacement. In addition, NMFS consulted on the nearby Ala Moana Regional Park Beach Nourishment project in April 2020 (POH-2019-00194). The EISPN indicates that the proposed actions are part of a larger Waikīkī Beach Management Plan and Hoʻomau ʻO Waikīkī Kahakai, which lays out guidance for beach management, improvement, and maintenance projects in Waikīkī. As the lifespan of the proposed work is stated to be about 50 years, the intention is to continue beach maintenance projects in phases over time. Cumulative impacts of continuous beach maintenance projects in Waikīkī should be addressed and described in the EFHA pursuant to 50 CFR 600.910(a) and 600.920(e)(3)(ii)."

Response: The Waikīkī Beach Improvement and Maintenance Program consists of *beach improvement* actions and *beach maintenance* actions. *Beach improvements* refers to actions that involve adding new sand, adding new structures, and/or modifying existing structures. *Beach maintenance* refers to actions that involve using existing sand or adding sand with no new structures or modification of existing structures.

The proposed *beach improvement* actions in the Halekūlani beach sector and the ʻEwa (west) basin of the Kūhiō beach sector are designed to create a stable beach profile. The designs account for 1.5 ft of sea level rise and can be adapted to accommodate up to 2.7 ft of sea level rise. We anticipate that the beaches would be stable and periodic renourishment would not be required.

The proposed *beach maintenance* action in the Fort DeRussy beach sector is sand backpassing, which would involve recovering existing sand from the accreted area at the west end of the beach and placing it in the eroded area at the east end of the beach. Sand would be excavated from the beach face extending inshore only as far as necessary to obtain the required volume of sand. The proposed action would not require offshore dredging and there would be no increase in the volume of sand in the littoral system.

The proposed *beach maintenance* action in the Diamond Head (east) basin of the Kūhiō beach sector is sand pumping, which would involve recovering approximately 4,500 cy of existing sand from within the basin onto the dry beach. The proposed action would not require offshore dredging and there would be no increase in the volume of sand in the basin.

The proposed *beach maintenance* action in the Royal Hawaiian beach sector is beach nourishment, which would involve recovering approximately 25,000 cy of sand from the *Canoes/Queens* offshore sand deposit and placing it on the beach. This is the only action proposed that would require periodic renourishment to maintain the beach at its 1985 location. The *Canoes/Queens* offshore sand deposit has been used in previous beach nourishment projects in Waikīkī in 2012 and 2021. Reusing this sand on a periodic basis would not increase in the volume of sand in the littoral system.

For more information about anticipated project lifespans, please see Section 3.3 of the DPEIS. For more information about the potential impacts of the proposed actions, please see Sections 8 and 9 of the DPEIS. For more information about the cumulative and secondary impacts of the proposed actions, please see Sections 10 and 11 of the DPEIS, respectively.

Comment: "Concern #2 - Sediment Modelling: Data and evaluation of marine currents, water flow, and sediment plume modelling are recommended near sand donor sites to justify final locations and clarify potential adverse effects to EFH from sediment resuspension and deposition during dredge operations and after beach nourishment. The modelling effort should also include and consider the following areas: the groin footprints, between the groins, offshore of the groins, and offshore sand borrow areas. NMFS is concerned that sediment deposition may occur over sensitive and hard-to-replace hard-bottom habitat, corals, or submerged aquatic vegetation (e.g., seagrass) during dredging activities at borrow sites and after during and after beach nourishment. Completing the modelling effort and including it in the Draft EIS and EFHA would help reduce uncertainty and better inform conservation recommendations. If there is a high probability that sediment resuspension and deposition will occur over sensitive and hard-to-replace hard-bottom habitat, corals, and submerged aquatic vegetation, these areas should be prioritized survey areas both before and after construction."

> **Response:** We acknowledge that dredging operations have the potential to impact benthic habitat in the vicinity of the sand recovery areas. Sea Engineering, Inc. conducted analytical modeling to evaluate the potential impacts of sedimentation on benthic habitat resulting from clamshell dredging for the *Ala Moana* and *Hilton* offshore sand deposits. (see Figure 1 and Figure 2). The modeling results indicate that there would be no anticipated impacts to benthic habitat in the vicinity of the sand recovery areas. For more information about the modeling results and potential impacts to benthic habitat, please see Section 8.10.1 of the DPEIS.
>
> We have not conducted analytical modeling to evaluate the potential impacts of sedimentation on benthic habitat resulting from dredging activities for the *Canoes/Queens* offshore sand deposit. This deposit has been used in previous beach nourishment projects in 2012 and 2021. Sand recovery for those projects was accomplished using a hydraulic suction dredge and pumping the sand through a high-density polyethylene (HDPE) pipe to a dewatering basin in the Diamond Head (east) basin of Kūhiō Beach Park. When compared to clamshell dredging, hydraulic suction dredging significantly reduces the potential for sedimentation that could impact benthic habitat.
>
> Sea Engineering, Inc. also conducted detailed wave modeling to evaluate the potential for the proposed actions to impact waves, currents, and surf sites in Waikīkī. Dredging of offshore sand deposits involves removing sand from the deposits, resulting in a lowering of the bottom elevation or changing the bathymetry. Dredging could occur at the *Ala Moana*, *Canoes/Queens*, or *Hilton* offshore sand deposits. Wave modeling was used to assess the impact of dredging on waves, currents, and nearby surf sites.

A wave reflection analysis was also conducted to evaluate the potential for the proposed structures in the Halekūlani and Kūhiō beach sectors to reflect waves that could negatively impact surf sites, primarily in the Halekūlani beach sector. To evaluate potential impacts, wave modeling of the existing conditions and with the proposed structures was performed. Based on the results of the wave modeling, the dredge analysis, and the wave reflection analysis, no significant impacts to waves, currents, or surf sites in Waikīkī are anticipated.

For more information about the wave modeling results and potential impacts to waves, currents, and surf sites, please see Sections 8.2, 8.6 and 9.4.6 of the DPEIS.

Comment: "Concern #3 - Dredge Methods: The 2012 dredging in Waikīkī resulted in the leaching and resuspension of micrytic calcium carbonate. The Ala Moana Beach Nourishment consultation from the USACE suggested that the dredge method from 2012, which included the pumping of sand through small diameter hoses, resulted in the mechanical breakdown of sand sized particles resulting in portion that was much smaller (e.g., <4 microns). The DLNR OCCL should ensure that the dredging methods avoid duplicating the same method that may have resulted in the enhanced presence of micrytic calcium carbonate in 2012."

Response: We acknowledge that sand recovery, transport, and placement operations have the potential to cause turbidity. The cause of the turbidity generated during the 2012 Waikīkī Beach Maintenance I project has not been positively identified. The ongoing 2021 Waikīkī Beach Maintenance II project includes sampling and analysis of sand from the dredging and stockpile sites to help determine the cause of the turbidity. That sampling is ongoing and results are not yet available. For more information regarding dredging methods, please see Section 3.6 of the DPEIS.

Comment: "Concern #4 - Final locations, composition, and surrounding habitats of sand collection sites: Several sand collection site options were described in the EISPN. NMFS is concerned about the lack of information about sand collection sites as the final decision will affect the EFH adverse effect and stressor analyses. Descriptions of the final locations should include sand composition and grain size, species and size classes for any adjacent coral or area of seagrass resources, presence or absence of invasive species, and the oceanographic setting. Marine resource survey assessments should be conducted over and along both hard and soft bottom (e.g., sand, unconsolidated sediment, etc.) substrate; however, surveys should ensure that ensure that coral and seagrass habitats are prioritized and that surveys and data are statistically powerful."

Response: We acknowledge that the proposed actions have the potential to impact benthic habitat in the vicinity of the sand recovery areas. For information regarding the potential offshore sand recovery areas, please see Section 3.5.3 of the DPEIS. Final selection of the sand recovery areas will be based on comments received on the DPEIS and formal consultations with various agencies during the permitting process. We acknowledge that additional quantitative resource surveys may be required pursuant to the formal ESA-EFH consultations, which will be conducted during the permitting process.

Comment: "Concern #5 Uncertainty of distribution of coral and seagrass throughout the project area: Quantitative resource survey assessments are described in the EISPN and will be included in the Draft EIS and EFHA. Without this information, NMFS would be concerned about the lack of information on how project activities could affect habitat-forming EFH resources. If high uncertainty remains, NMFS must assume habitat-forming resources will be adversely affected by the project activities. The assumption would be that adverse effects may require coral and/or seagrass transplantation minimization and if there could be unavoidable loss, then offset measures to compensate for those losses must be in place."

Response: We acknowledge that the proposed actions have the potential to impact habitat-forming resources. A Marine Biological and Water Quality Assessment was conducted by AECOS (April 2021) and is included as Appendix C of the DPEIS. For additional information about the marine biological environment, see Section 8.10, 8.11, and 8.12 of the DPEIS. We acknowledge that additional quantitative resource surveys may be required pursuant to the formal ESA-EFH consultations, which will be conducted during the permitting process.

Comment: "Concern #6 Use of geotextile sandbags: NMFS is also concerned about the existing Kuhio Sandbag groin and the continued use of geotextile sandbags. It was unclear in the EISPN if the sandbags will be removed, left in place, or buried during future beach nourishment. As they were intended as a short-term solution to coastal erosion, the EFHA should detail plans for the sandbags and their future lifespan."

Response: We acknowledge your concerns regarding the use of geotextile sandbags. The University of Hawaii Coastal Geology Group has and is continuing to conduct periodic monitoring of the Kūhiō Sandbag Groin. Initial findings based on approximately one year of survey data indicate that the groin is functioning as intended. The efficacy of the groin is evident by significant sand buildup on the Diamond Head (east) side of the structure throughout the year, indicating that longshore transport was altered as intended to mitigate extreme erosion at this section of beach. Sediment capture by the groin has not resulted in significant erosion on the ʻEwa (west) side of the structure, which would be evidenced by sediment depletion and flanking directly adjacent to the structure.

Overall, one year following completion the structural integrity and efficacy of the groin structure has been confirmed. No adverse effects of the project have been observed. No significant deficiencies with the ElcoRock sandbags and/or the overall groin performance have been observed. We will continue to monitor the structure throughout the coming year. The effectiveness or need for the structure will be further evaluated after we accomplish improvements to the ‘Ewa (west) basin in the Kūhiō beach sector. For additional information about the Kūhiō Sandbag Groin, please see Sections 2.6, 6.1, and 8.5.3 of the DPEIS.

Comment: "*Stressor Effects:* Physical Damage: Direct contact to EFH resources (e.g., corals, submerged aquatic vegetation, hardbottom habitat) from removal of existing structures, construction equipment and materials, as well as from installation activities, can lead to permanent and lesser adverse effects. The level of these adverse effects (i.e., short-term, long-term to permanent, and cumulative) will depend on the density and extent of EFH resources present and the dredge and/or sediment retention designs that are chosen. For example, the 2012 Waikīkī Beach Nourishment and Dredging Project resulted in physical damage to the fossil limestone reef rock bordering sand borrow areas that were dredged. Due to this stressor, a variety of measures to avoid and minimize physical damage to EFH may be needed to reduce unavoidable losses. Overall, steps should be taken during dredging and sand transport to avoid and minimize physical damage to corals and submerged aquatic vegetation. Dredging equipment and turbidity control measures should consider wave energy and provide appreciable buffer space between construction equipment and nearby EFH resources."

> **Response:** We acknowledge that the proposed actions have the potential to impact EFH resources. For information about potential impacts and mitigation measures to EFH, please see Section 8.11 of the DPEIS. We acknowledge that additional mitigation measures and/or Best Management Practices may be required pursuant to the formal EFH consultation, which will be conducted during the permitting process.

Comment: "*Stressor Effects:* Sedimentation and Turbidity: Enhanced sedimentation and turbidity may occur from dredging at borrow areas (e.g., pump heads causing re-distribution and settlement of fine sediment), land-based beach filling activities, after-the-fact leaching of micritic calcium carbonate from beach fill, and sediment resuspension from groins if they alter local hydrodynamics.

> **Response:** We acknowledge that sand recovery, transport, and placement operations have the potential to cause turbidity. All of the offshore sand proposed for use in Waikīkī will contain less than 6% fines per DLNR guidelines, and ideally less, in compliance with the State of Hawai‘i guidelines for beach nourishment projects. Appropriate methods for dewatering and removal of fines to mitigate turbidity will be established during the final design and permitting process. All methods will be reviewed and approved by the Hawai‘i Department of Health, Clean Water Branch as part of the Clean Water Act Section 401 Water Quality Certification (WQC) review process. For more information about sand characteristics and quality, please see Sections 3.5, 4.3.2, 5.3.2, 6.3.2, 7.3.2, and 7.5.2 of the DPEIS. For more information about water quality and turbidity, please see Section 8.8 of the DPEIS.

Sea Engineering, Inc. conducted analytical modeling to evaluate the potential impacts of sedimentation on benthic habitat resulting from clamshell dredging for the *Ala Moana* and *Hilton* offshore sand deposits. (see Figure 1 and Figure 2). The modeling results indicate that there would be no anticipated impacts to benthic habitat in the vicinity of the sand recovery areas. For more information about the modeling results and potential impacts to benthic habitat, please see Section 8.10.1 of the DPEIS.

Comment: "*Stressor Effects:* Nutrients and Chemical Contamination: Adverse effects of increased nutrients and chemical contamination may occur during dredging from borrow areas and after beach fill is placed due to release of sediment-bound nutrients and chemical contaminants. The latter may also occur from leaking construction equipment and introduction of treated materials into the marine environment. Sediment chemical analysis will be helpful to help better understand potential impacts."

Response: We acknowledge your concerns regarding the potential for increased nutrients and chemical contamination associated with sand recovery, transport, and placement operations. The *Ala Moana* offshore sand deposit was tested for contaminants for the City and County of Honolulu's Ala Moana Regional Park beach nourishment project. The State of Hawai'i Department of Health concluded that the sand was satisfactory for beach nourishment. There have been no recent events to indicate that the other offshore sand deposits would be contaminated. Best Management Practices (BMPs) will be in place to limit the potential impacts of equipment on the ocean environment.

Comment: "*Stressor Effects:* Invasive Species*:* There is a concern that there would be an increased risk of spreading invasive species, which have been detected around at least one proposed sand collection site. A. erecta is an invasive species observed in Honolulu Harbor in 2014 (Wade et al. 2018) and patches of A. erecta have been observed near the Ala Moana dredging site; there is an increased risk of spreading this species through project activities if they are not deterred through avoidance measures and contingency planning. Invasive species rapidly increase in abundance to the point that they come to dominate their new environment, creating adverse ecological effects to other species of the ecosystem and the functions and services it may provide (Goldberg and Wilkinson 2004). Invasive species can decrease species diversity, change trophic structure, and diminish physical structure, but adverse effects are highly variable and species-specific."

Response: We acknowledge your concerns regarding the potential for the proposed actions to increase the spread of invasive species. Areas where A. erecta have been observed will be identified and avoided during sand recovery operations. We also note that two common algae species found in Waikīkī are non-native and invasive: *A. spicifera* and *G. salicornia*. These species are widespread off the shores of the Hawaiian Islands and *A. spicifera* is a food favored by green sea turtle. The proposed groin structures in the Halekulani beach sector are not anticipated to affect species introductions to Hawaiʻi but may serve as habitat for existing introduced species. Future monitoring events will note any changes in the distribution of *A. spicifera* and other invasive species in Waikīkī.

Comment: "*EFH Assessment:* An EFHA should be included for the upcoming EFH consultation, and specific content should be considered for inclusion to inform an EFH determination and the EFH effects analysis. If a USACE permit is required, the USACE would be the lead federal action agency responsible for developing the EFHA. As described in the EISPN, before the USACE permit application process is initiated, we recommend that quantitative marine resource survey assessments, new sediment modeling, robust sediment testing, and water quality monitoring are conducted; in addition, we recommend that your water quality monitoring plan include assessments before (e.g., baseline), during, and after construction activities (see below). The EFHA should consider the full suite of potential stressors to habitat forming EFH. Below we provide details related to these concerns and guidance on how these issues can be resolved through continued early coordination. In addition, we provide an Enclosure at the end of this letter with specific avoidance and minimization measures that would be applicable to the project."

Response: We acknowledge that an EFHA will be required during the formal EFH consultation. We will ensure that the ESFA addresses the stressors identified in your comment letter. We further acknowledge that additional mitigation measures and/or Best Management Practices may be required pursuant to the formal EFH consultation, which will be conducted during the permitting process.

Thank you for taking the time to review and comment on the EISPN. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement.

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

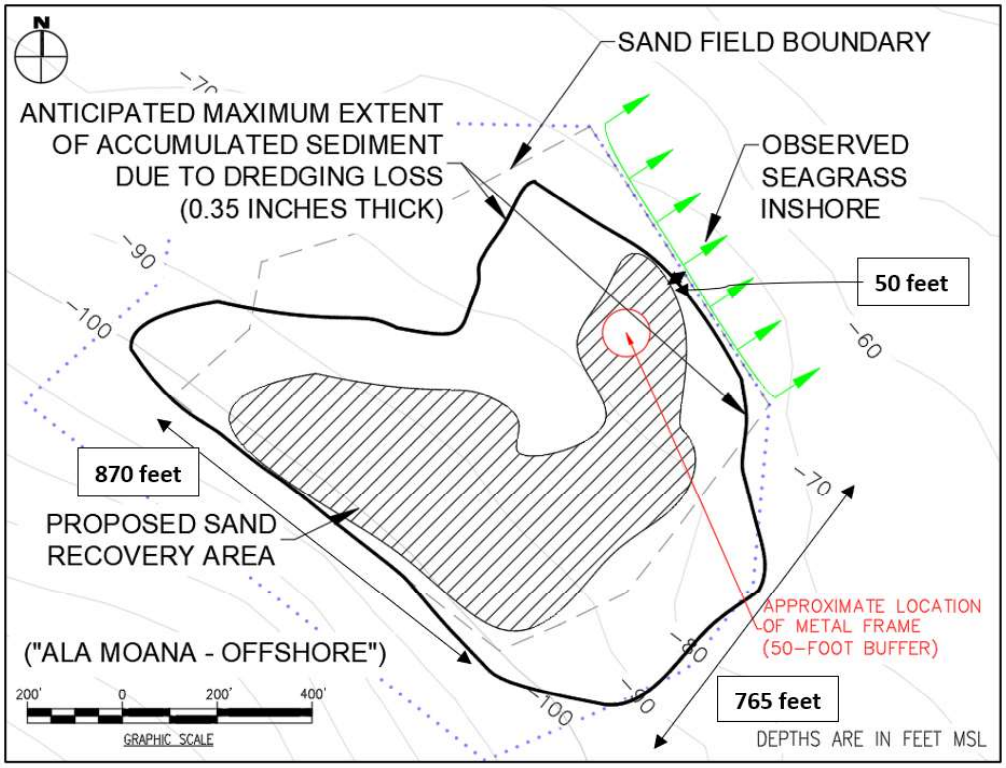

Figure 1 Sediment plume modeling results for *Ala Moana* offshore sand deposit

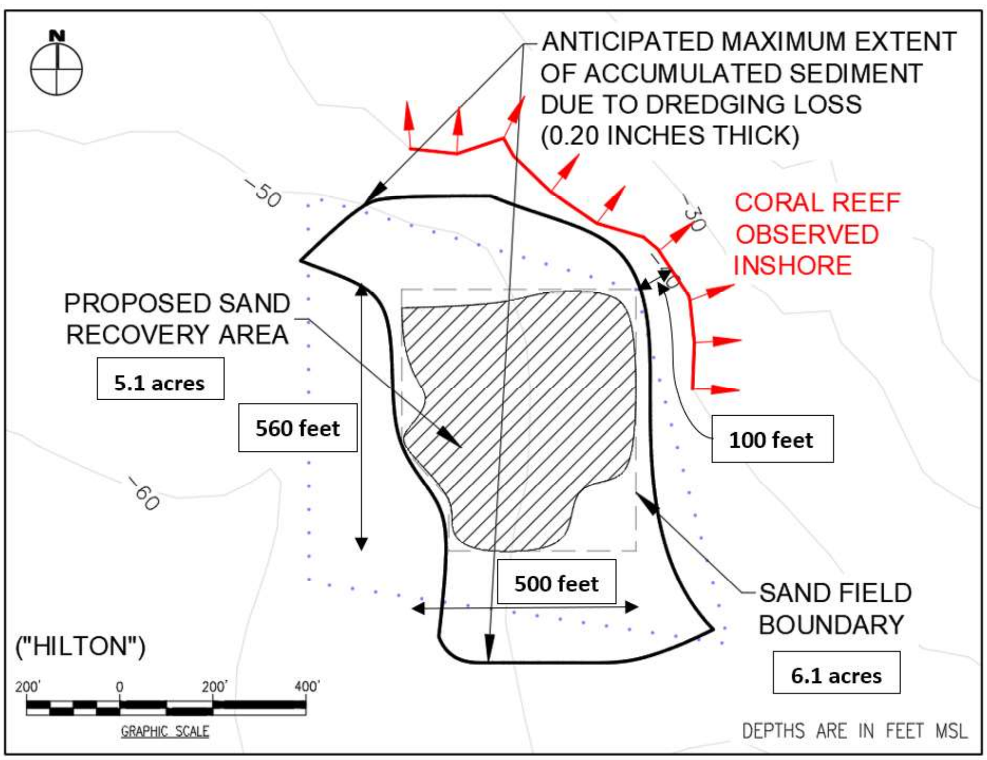

Figure 2 Sediment plume modeling results for *Hilton* offshore sand deposit

QUEEN EMMA LAND COMPANY

1301 Punchbowl St. ▪ Honolulu, HI 96813 ▪ Ph: 808-691-5900 ▪ Fax: 808-691-5946▪ www.queens.org

January 22, 2021

Mr. Andy Bohlander (via email: waikiki@seaengineering.com)
Sea Engineering, Inc.
Makai Research Pier
41-305 Kalaniana`ole Highway
Waimanalo, HI 96795

SUBJECT: Environmental Impact Statement Preparation Notice (EISPN) for the Waikiki Beach Improvement and Maintenance Project, Waikiki Beach, Oahu

Aloha,

The Queen Emma Land Company is pleased to submit this letter which supports the efforts of the State of Hawaii's Department of Land and Natural Resources (DLNR) to preserve and enhance iconic Waikiki Beach as set forth in DLNR's Waikiki Beach Improvement and Maintenance Program described in the Environmental Impact Statement Preparation Notice dated December 2020.

As the owner of 18 acres of heritage land in Waikiki including the site underlying the Outrigger Waikiki Beach Resort which comprises a portion of the Royal Hawaiian Beach Sector of Waikiki Beach, the long term viability of this historic, economic and cultural resource is vital to Hawaii and to support the critical mission of The Queen's Health Systems, which is to provide, in perpetuity, quality health care services to improve the well-being of Native Hawaiians and all of the people of Hawaii. The importance of the income generated by these lands has never been more evident during this COVID-impacted time.

We have all seen the impact of changing weather patterns and king tides. As chronic erosion and flooding from the impact of sea level rise increases, Waikiki Beach serves as more than a scenic or recreational amenity, but as the natural buffer to protect oceanfront and landward assets. We are relying on DLNR and others with relevant expertise to research and select the appropriate technology and engineering needed to achieve the goal of stabilizing, restoring, preserving and enhancing Waikiki Beach for the benefit of all.

Mahalo for the opportunity to provide comments on this important project.

Sincerely,

Eric K. Martinson
President

Bruce Nakaoka
Vice President

cc: Sam Lemmo, Administrator
Office of Conservation and Coastal Lands

DAVID Y. IGE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

June 4, 2021

Eric K. Martinson, President
Bruce Nakaoka, Vice President
Queen Emma Land Company
1301 Punchbowl Street
Honolulu, HI 96813

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Martinson and Mr. Nakaoka:

Thank you for your comment later dated January 22, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawaiʻi Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

We recognize that you provided two project-specific comments, both in support of the proposed actions. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement (DPEIS).

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

HSBPA

HAWAII SHORE & BEACH PRESERVATION ASSOCIATION

January 22, 2021

Samuel J. Lemmo, Administrator
Department of Land and Natural Resources
Office of Conservation and Coastal Lands
1151 Punchbowl Street, Room 131
Honolulu, HI 96813

Aloha Mr. Lemmo,

On behalf of the Board of Directors and Members of the Hawai‘i Chapter of the American Shore and Beach Preservation Association (ASBPA) we are providing this letter of support for the Waikīkī Beach Improvement and Maintenance Project as proposed by the Department of Land and Natural Resources (DLNR).

The DLNR proposes beach improvement and maintenance projects in the Fort DeRussy, Halekulani, Royal Hawaiian, and Kūhiō Beach Sectors of Waikīkī. These projects include the construction of new beach stabilization structures and the recovery of offshore sand and its placement on the shoreline. The objectives of the proposed actions are to restore and improve Waikiki's public beaches, increase beach stability through improvement and maintenance of shoreline structures, provide safe access to and along the shoreline, and increase resilience to coastal hazards and sea level rise. The proposed actions are intended to maintain the economic, social, aesthetic, recreational, environmental, cultural, and historical qualities of Waikīkī.

Specifically, we support the tailoring of solutions for each unique beach cell at Waikīkī. Sand backpassing is proposed in the Fort DeRussy Beach Sector to move sand from one end of the cell to the other end where it is needed. T-head groins with beach fill is proposed in the Halekulani Beach Sector to stabilize the chronically eroding beach and retain sand longer. Ongoing beach nourishment is proposed in the Royal Hawaiian Beach Sector to mitigate chronic erosion. Beach nourishment with a segmented breakwater is proposed in the Kūhiō-Eva Beach Sector, while beach maintenance is proposed in the Kūhiō-Diamond Head Beach Sector. This project clearly demonstrates that there is no “One-Size-Fits-All” solution for preserving beaches.

ASBPA recognizes the need for, and endorses the concept of, resilient coastal systems to increase the sustainability of coastal communities. Beaches are nature’s way of dividing the land from the sea. Preservation of beaches using beach management, maintenance, and stabilization methods, such as those identified within the Waikīkī Beach Improvement and Maintenance Project, replicate natural systems that attenuate wave energy and support coastal resilience. The proposed beach improvement and maintenance program serves as a great demonstration project that showcases possible solutions to the coastal erosion challenges facing much of the state’s coastline; we applaud the DLNR for their involvement and look forward to the possibility of continuing this programmatic support at other beaches within the state.

We have reviewed the Environmental Impact Statement Preparation Notice (EISPN) and find that the beach improvement and maintenance plan is consistent with the coastal preservation principles and policies of the state and represents a holistic approach to enhance coastal resilience for Waikīkī. Although we support the proposed actions identified in the EISPN, we have identified several items that we would like to see more fully addressed within the Environmental Impact Statement (EIS). These additional items for consideration include the following:

- Identify and examine opportunities to incorporate vegetation and other natural elements into the proposed actions. For example, there may be opportunities in the Halekulani sector as part of the beach promenade option.

- Identify opportunities to integrate protection from extreme events into the proposed actions. For example, the proposed beach promenade in the Halekulani sector may serve a dual purpose of lateral access and backshore storm protection.

- Incorporate multiple purposes and functions where possible in the assessment and design of structures. For example, the groins and breakwaters proposed may also serve as fishing or viewing platforms with crowd-sourced shoreline monitoring stations.

- We recommend that the EIS clearly disclose the various layouts and alternatives examined for each beach sector and the benefits of the proposed actions over these alternatives.

- We recommend that the impacts on adjacent beaches outside the project boundary be examined and incorporated into the EIS. Specifically, we recommend that both individual project components and combined or cumulative impacts of all project components be examined and discussed within the EIS.

- We recommend that the EIS clarify why the proposed beach sectors were selected and limited to the center of Waikiki. For example, the Duke Kahanamoku, Queens, Kapiolani, and Kaimana Beach Sectors did not include project components.

The Hawaiʻi Shore and Beach Preservation Association (HSBPA, http://asbpa.org/hawaii/) is an organization of private sector, academic, and government professionals, students, and local community members dedicated to the preservation, restoration, and sustainable use of Hawaii's beaches and coastal environments. As the Hawaiʻi Chapter of the ASBPA, we are dedicated to preserving, protecting, and restoring Hawaii's coasts by merging science with public policy. All board and general members involved with the referenced project recused themselves from developing this letter (i.e. Andy Bohlander, Chris Conger, Dolan Eversole, Shellie Habel, and Brad Romine).

Sincerely,

Andrew Wycklendt
President, Hawaiʻi Shore and Beach Preservation Association

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
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DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
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CONSERVATION AND RESOURCES ENFORCEMENT
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HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

Andrew Wycklendt, President
Hawaiʻi Shore and Beach Preservation Association
Andrew.Wycklendt@aptim.com

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Wycklendt:

Thank you for sending your comment letter dated January 22, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawaiʻi Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

Comment: "Identify and examine opportunities to incorporate vegetation and other natural elements into the proposed actions. For example, there may be opportunities in the Halekulani sector as part of the beach promenade option."

> **Response:** We acknowledge that aesthetics is an important consideration. Waikīkī is a heavily used area and there is little to no existing vegetation makai (seaward) of the shoreline. Almost the entire length of the Waikiki shoreline is armored by seawalls, so any vegetation would need to be located on the beaches. Promoting vegetation growth makai (seaward) of the shoreline would reduce recreational dry beach area and inhibit lateral shoreline access, which is already limited in many areas of Waikīkī.
>
> The DLNR is the lead agency with authority for maintaining *lateral* public access along Hawaii's shorelines. The right of access to Hawaii's shorelines includes the right of transit along the shoreline and within beach transit corridors. *Beach transit corridors* are defined as the areas extending seaward of the shoreline and these areas are considered public property (HRS §115-5, HRS §205A-1). Promoting vegetation growth over the dry beach area in Waikīkī This would

contradict the objectives of the Program and the objectives of HRS §115-5 and HRS §205A-1.

Comment: "Identify opportunities to integrate protection from extreme events into the proposed actions. For example, the proposed beach promenade in the Halekulani sector may serve a dual purpose of lateral access and backshore storm protection."

> **Response:** The proposed actions are intended to mitigate the impacts of wave overtopping and flooding by increasing dry beach width and elevation, which will provide a protective buffer between the ocean and the existing backshore infrastructure. This will increase the wave energy dissipating properties of the beaches and decrease the landward extent of wave runup, reducing the susceptibility to backshore flooding during large swell and high tide events. For more information about coastal hazards, please see Section 8.4 of the DPEIS.

Comment: "Incorporate multiple purposes and functions where possible in the assessment and design of structures. For example, the groins and breakwaters proposed may also serve as fishing or viewing platforms with crowd-sourced shoreline monitoring stations."

> **Response:** The proposed actions are intended to support a broad array of existing and potential future uses in Waikīkī. Supporting additional uses was not identified as a priority or design criteria by the Waikīkī Beach Community Advisory Committee (WBCAC); thus, they are not incorporated into the designs for the proposed actions. Options to incorporate additional purposes and functions in the designs may be further considered and in the final design and permitting phase.

Comment: "We recommend that the EIS clearly disclose the various layouts and alternatives examined for each beach sector and the benefits of the proposed actions over these alternatives."

> **Response:** We evaluated various alternatives for each beach sector. For a discussion of alternatives, please see Sections 3.4, 4.4, 5.4, 6.4, 7.4, and 7.6 of the DPEIS.

Comment: "We recommend that the impacts on adjacent beaches outside the project boundary be examined and incorporated into the EIS. Specifically, we recommend that both individual project components and combined or cumulative impacts of all project components be examined and discussed within the EIS."

> **Response:** Beach improvement and maintenance actions are proposed in four beach sectors that span approximately 6,360 ft of shoreline in Waikīkī. The beach sectors are compartmentalized by structures including seawalls, groins, breakwaters, and storm drains. The east end of the project area is bounded by the Hilton Pier groin, which separates the Duke Kahanamoku and Fort DeRussy

beach sectors. The east end of the project area is bounded by the Kapahulu storm drain/groin, which separates the Kūhiō and Queens beach sectors. The beach sectors are discrete units that are semi-contained with limited sediment transport between adjacent sectors. As a result, no significant impacts to adjacent beaches beyond the four selected beach sectors are anticipated. For a more detailed discussion of the beach sectors, please see Section 2.5 and 2.6 of the DPEIS.

We acknowledge that the proposed beach improvement and maintenance actions have the potential to result in cumulative impacts. The potential impacts and of the proposed actions are discussed in Sections 8 and 9 of the DPEIS. The cumulative and secondary impacts of the proposed actions are discussed in Sections 10 and 11 of the DPEIS, respectively.

Comment: “We recommend that the EIS clarify why the proposed beach sectors were selected and limited to the center of Waikiki. For example, the Duke Kahanamoku, Queens, Kapiolani, and Kaimana Beach Sectors did not include project components.”

Response: Selection of the proposed beach improvement and maintenance actions was a primarily stakeholder-driven process. We relied heavily on feedback and direction from the Waikīkī Beach Community Advisory Committee (WBCAC) to identify issues, needs, priorities, and design criteria for beach sector. The sectors that were selected for beach improvement and maintenance actions were identified as the highest priorities by the WBCAC. While the other beach sectors of Waikīkī – Duke Kahanamoku, Queens, Kapi‘olani, and Kaimana - were not identified as priorities by the WBCAC, these areas are clearly important and we recognize that, as sea levels continue to rise, beach improvements and/or maintenance may be required in these beach sectors in the future. For more information about the WBCAC and the project selection process, please see Sections 2.4 and 2.6 and Appendix A of the DPEIS.

Thank you for taking the time to review and comment on the EISPN. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement.

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

G70

111 S. King Street
Suite 170
Honolulu, HI 96813
808.523.5866
www.g70.design

22 January 2021

Dr. David Smith, Project Manager
Sea Engineering, Inc.
41-305 Kalanianaʻole Highway
Waimānalo, HI 96795
waikiki@seaengineering.com

Subject: Comment Letter on EIS Preparation Notice
Waikīkī Beach Improvement and Maintenance Program
Request for Inclusion of Duke Kahanamoku Beach Fronting Hilton Hawaiian Village

On behalf of Hilton Hawaiian Village LLC and its parent company, Park Hotels & Resorts, Inc., owners of the Hilton Hawaiian Village resort, G70 is providing comments on the Environmental Impact Statement Preparation Notice (EISPN) published on December 23, 2020.

Duke Kahanamoku Beach is the shoreline sector at the western end of Waikīkī Beach fronting Hilton Hawaiian Village, as shown in the attached Figure 1-2 from the subject EISPN. This 1,100 ft sector of Waikīkī Beach is enjoyed by the general public and resort visitors. The future health and integrity of this beach is important to our community and visitors to the Village.

Without making any financial commitment at this time, we ask that you consider including the beach fronting Hilton Hawaiian Village in the Environmental Impact Statement for the Waikīkī Beach Improvement and Maintenance Program, and for the beach nourishment and restoration project. Please address consideration of potential future actions to enhance and support the Duke Kahanamoku Beach Sector in the DLNR project and EIS studies. We see this of particular importance since actions are planned for the adjacent Fort DeRussy Sector of Waikīkī Beach.

Thank you for considering this comment letter and our request, on behalf of the owner of Hilton Hawaiian Village, for inclusion of Duke Kahanamoku Beach in the DLNR EIS. Please contact me at 808-351-4200 if you have questions or require additional information.

Sincerely,

GROUP 70 INTERNATIONAL, INC. (dba G70)

JEFFREY H. OVERTON, AICP, LEED-AP
Principal

Attachment

cc: Sam Lemmo, DLNR OCCL
Debbie Bishop, Hilton Hawaiian Village
Carl Mayfield, Park Hotels & Resorts
Duane Fisher, Esq., Starn O'Toole Marcus & Fisher

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

Jeffrey H. Overton
Group 70 International
111 S. King Street, Suite 170
Honolulu, HI 96813

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Overton:

Thank you for your comment letter dated January 22, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). We understand that your letter was submitted on behalf of Hilton Hawaiian Village LLC and its parent company, Park Hotels & Resorts, Inc., owners of the Hilton Hawaiian Village resort.
In your letter you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawaiʻi Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

Comment: "Duke Kahanamoku Beach is the shoreline sector at the western end of Waikīkī Beach fronting Hilton Hawaiian Village, as shown in the attached Figure 1-2 from the subject EISPN. This 1,100 ft sector of Waikīkī Beach is enjoyed by the general public and resort visitors. The future health and integrity of this beach is important to our community and visitors to the Village. Without making any financial commitment at this time, we ask that you consider including the beach fronting Hilton Hawaiian Village in the Environmental Impact Statement for the Waikīkī Beach Improvement and Maintenance Program, and for the beach nourishment and restoration project. Please address consideration of potential future actions to enhance and support the Duke Kahanamoku Beach Sector in the DLNR project and EIS studies. We see this of particular importance since actions are planned for the adjacent Fort DeRussy Sector of Waikīkī Beach."

> **Response:** Selection of the proposed beach improvement and maintenance actions was a primarily stakeholder-driven process. We relied heavily on feedback and direction from the Waikīkī Beach Community Advisory Committee (WBCAC) to identify issues, needs, priorities, and design criteria for beach

sector. The sectors that were selected for beach improvement and maintenance actions were identified as the highest priorities by the WBCAC. While the Duke Kahanamoku beach sector was not identified as a high priority by the WBCAC, this area of Waikīkī is clearly important and we recognize that, as sea levels continue to rise, beach improvements and/or maintenance may be required in these beach sectors in the future. For more information about the WBCAC and the project selection process, please see Section 2 and Appendix A of the DPEIS.

Thank you for taking the time to review and comment on the EISPN. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement.

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

Andy Bohlander

From: Andy Bohlander
Sent: Friday, January 22, 2021 2:53 PM
To: Waikiki
Subject: FW: Waikiki Beach restoration

From: Richard Criley <criley6814@gmail.com>
Sent: Friday, January 22, 2021 2:21 PM
To: Andy Bohlander <abohlander@seaengineering.com>
Subject: Waikiki Beach restoration

May I just put in a plea to restore the sandy beach that used to exist in front of the Barefoot Cafe at Queens Surf beach.   It has been washed away due to a combination of king tides and currents changed by sand mining out from the main Waikiki Beach and the new groin near the Royal Hawaiian hotel. In February 2020, the ramp leading down to the beach was damaged by the surf and this month the ramp and adjoining rock wall were removed.
I know this is not part of the planning for the tourist beach area, but tourists did come to this beach and it has been a quieter beach for us locals, as well. Photos going back a couple decades show that a decent beach did exist there.

Richard Criley
criley6814@gmail.com

Queens Surf beach in 2000.

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

Richard Criley
criley6814@gmail.com

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Criley:

Thank you for your email dated January 22, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawai‘i Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

Comment: “May I just put in a plea to restore the sandy beach that used to exist in front of the Barefoot Cafe at Queens Surf beach. It has been washed away due to a combination of king tides and currents changed by sand mining out from the main Waikiki Beach and the new groin near the Royal Hawaiian hotel. In February 2020, the ramp leading down to the beach was damaged by the surf and this month the ramp and adjoining rock wall were removed. I know this is not part of the planning for the tourist beach area, but tourists did come to this beach and it has been a quieter beach for us locals, as well. Photos going back a couple decades show that a decent beach did exist there.”

> **Response:** Selection of the proposed beach improvement and maintenance actions was a primarily stakeholder-driven process. We relied heavily on feedback and direction from the Waikīkī Beach Community Advisory Committee (WBCAC) to identify issues, needs, priorities, and design criteria for beach sector. The sectors that were selected for beach improvement and maintenance actions were identified as the highest priorities by the WBCAC. While the Queens beach sector was not identified as a priority by the WBCAC, it is clearly an important part of Waikīkī and we recognize that, as sea levels continue to rise, beach improvements and/or maintenance may be required in the Queens beach sector in the future. For more information about the WBCAC and the project selection process, please see Section 2 and Appendix A of the DPEIS.

Thank you for taking the time to review and comment on the EISPN. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement.

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

Mark A. Robinson Trusts
J.L.P. Robinson LLC

1100 ALAKEA STREET, SUITE 600 ▪ HONOLULU, HAWAII 96813
PHONE (808) 440-2730 ▪ FAX (808) 440-2710

January 22, 2021

Sea Engineering, Inc. waikiki@seaengineering.com
David A. Smith
41-305 Kalanianaole Highway
Waimanalo, Hawaii 96795

Department of Land and
Natural Resources
1151 Punchbowl St., Room 131
Honolulu, HI 96813
Attention Sam Lemmo Sam.j.lemmo@hawaii.gov

Re: Waikiki Beach Improvement and Maintenance Program
Comments to Environmental Impact Statement Preparation Notice ("EISPN")

Gentlemen:

The Mark Robinson Trusts and J.L.P. Robinson LLC (collectively "Owners") are the majority fee owners of Tax Map Keys (1) 2-5-004-005 and (1) 2-6-002-026. These properties underlie portions of the Halekulani Hotel and the Sheraton Waikiki Beach Resort Hotel and are located in the Halekulani Beach Sector.

The proposed conceptual Waikiki Beach Improvement and Maintenance Program ("Program") to restore and maintain the beaches of Waikiki is welcomed and long overdue. The Owners support restoration and improvement to the beaches, increase beach stability through improvement and maintenance of shoreline structures, safe access to and along the shoreline and increase resilience to coastal hazards and sea level rise.

Owners have no comment to the scope of the EISPN at this time. We look forward, with great interest, to receiving the Environmental Impact Statement for this Program.

J.L.P. Robinson LLC

By

William Rhett Taber
Its Executive Director

Mark A. Robinson Trusts Trustees

William Rhett Taber, Trustee

Allan Zawtocki, Trustee

James E. Hallstrom, Jr., Trustee

DAVID Y. IGE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

William Rhett Taber, Executive Director
J.L.P. Robinson LLC
1100 Alakea Street, Suite 600
Honolulu, HI 96813

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Taber:

Thank you for your comment letter dated January 22, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). We understand that your letter was submitted on behalf of the Mark Robinson Trusts and J.L.P Robinson LLC (collectively “Owners”) who are the majority fee owners of Tax Map Keys (1) 2-5-003:005 and (1) 2-6-002:026. In your letter you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawai‘i Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

We recognize that you provided comments in support of the proposed actions. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement (DPEIS).

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

Little Environments PLLC
Engineers & Environmental Consultants

22 January 2021

To: Sea Engineering/DLNR
Office of Conservation and Coastal Lands
1151 Punchbowl St, Rm 131
Honolulu Hawai'i, 96813

From: Joseph Little PE
Little Environments PLLC
PO Box 6388
Raleigh, NC 27628

Subject: Response and Comment on Environmental Impact Statement Preparation Notice
Respond by Date 22 Jan 2021. (2 pages)

To Whom it May concern,

It was a pleasure to observe the presentation of the EISPN for Waikiki improvements by Andy Bolander and introduced by Sam Lemmo. The work and consideration that has gone into this is extensive. It is no simple task to compile an analysis or provide a statement on an area with such rich and outstanding history and significance. It was one of the best virtual consultations I have observed.

I put forward the following comments as testimony:

In a statistical multi-dimensional dynamic environment we need to acknowledge that we don't know everything deterministically until it has been measured precisely or with allowance for error or future variance. While the satellite generated patterns and analysis are good, acknowledging the need and potential for future calibration of the structures, nourishment, and beach deposits would provide an opportunity for optimizing the performance of the overall project. Wave monitoring buoys have come a long way over the last 10 years to the point where they are as affordable as a nice computer. It is recommended that bouys be deployed before, during, and after the projects so that principles of adaptive management can allow for better and more economic management of the beach nourishment and the long term performance of the project.

Many onshore-offshore structures are prescribed or considered in this approach. Given the nearshore depts of Waikiki are relatively shallow, opportunity exists to evaluate other options such as near shore artificially stabilized shoals and artificially stabilized natural reefs.

Net environmental impacts may be prudent to consider as alternatives in the execution of improving the already engineered beach area. An example of such is considering the displacement of marine life by a structure for a structure that supports more marine life or marine habitat. Ultimately this would be a net positive environmental impact. The "touching nothing" approach due to various environmental sensitivities and fear of negative environmental recourse completely disregards the reliance in our ability as humans to be environmental stewards in our built environment.

Back passing is referred to in the EISPN. The type of duration of back passing is not elaborated on. In some parts of the world, permanent back passing is implemented via the installation of permanent infrastructure that is maintained to adapt and react to discrete events and one off shifts in sand without having to mobilize and demobilize significant equipment that disrupts the use of the beach. One example of this is Noosa Beach, just north of Brisbane Australia. It is recommended that permanent back-passing infrastructure be considered and evaluated for portions of the Waikiki Beach improvements. If it can be carried out in other parts of the world economically and effectively with silica sand, it can be executed successfully with carbonate or manufactured carbonate sand.

Given the cultural significant of this site in relation to surfing and the history of surfing around the world, it is recommended that consideration of various surf breaks at this site and the impact on these surf breaks be considered. Additionally principles of access and egress for surfing and other existing ocean recreational activities should be discussed and considered in the interest of public safety.

Best Regards in The Interest of the Future of our Coastlines,

Joseph Little PE
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JOSEPH M. LITTLE
22 Jan 2021
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ENGINEER
No. PE-18050
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DAVID Y. IGE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

Joseph Little, PE
Little Environments PLLC
P.O. Box 6388
Raleigh, NC 27628

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Little:

Thank you for your comment letter dated January 22, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawaiʻi Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

We acknowledge that you provided four project-specific comments:

Comment: "It is recommended that buoys be deployed before, during, and after the projects so that the principles of adaptive management can allow for better and more economic management of the beach nourishment and the long term performance of the project".

> **Response:** We appreciate your suggestion to utilize wave monitoring buoys for monitoring purposes to support adaptive management. We will consider this option during the final design and permitting phase when monitoring protocols are established.

Comment: "Many onshore-offshore structures are prescribed or considered in this approach. Given the nearshore depths of Waikiki are relatively shallow, opportunity exists to evaluate other options such as near shore artificially stabilized shoals and artificially stabilized natural reefs".

> **Response:** We appreciate your suggestion to evaluate additional the potential application of artificially stabilized shoals and artificially stabilized natural reefs in Waikīkī. Selection of the proposed beach improvement and maintenance actions

was a primarily stakeholder-driven process. We relied heavily on feedback and direction from the Waikīkī Beach Community Advisory Committee (WBCAC) to identify issues, needs, priorities, and design criteria for beach sector. One of the primary objectives identified by the WBCAC was to prevent any potential impacts to surf sites in Waikīkī. In recognition of concerns that have been expressed regarding potential impacts on surfing waves and ocean recreational, the proposed actions are designed to remain within the existing footprint of the shoreline as much as possible. We feel that the proposed actions are capable of achieving the program objectives without having to install new structures further offshore.

Comment: "It is recommended that permanent backpassing infrastructure be considered and evaluated for portions of the Waikiki Beach Improvements."

Response: The proposed sand backpassing in the Fort DeRussy beach sector is a small-scale beach maintenance effort. Small equipment will be utilized to recover and place a nominal volume of sand (less than 1,500 cy). We feel that the magnitude of the proposed sand backpassing is not significant enough to warrant construction of permanent backpassing infrastructure. For additional information about the proposed action in the Fort DeRussy beach sector, please see Section 4 of the DPEIS.

Comment: It is recommended that consideration of various surf breaks at the site and the impact on these surf breaks be considered. Additionally, principles of access and egress for surfing and other existing ocean recreational activities should be discussed and considered in the interest of public safety.

Response: We acknowledge your concerns regarding the potential for the proposed actions to impact surf sites in Waikīkī. Sea Engineering, Inc. conducted detailed wave modeling to evaluate the potential for the proposed actions to impact waves, currents, and surf sites in Waikīkī. Dredging of offshore sand deposits involves removing sand from the deposits, resulting in a lowering of the bottom elevation or changing the bathymetry. Dredging could occur at the *Ala Moana*, *Canoes/Queens*, or *Hilton* offshore sand deposits. Wave modeling was used to assess the impact of dredging on nearby surf sites.

A wave reflection analysis was also conducted to evaluate the potential for the proposed structures in the Halekūlani and Kūhiō beach sectors to reflect waves that could negatively impact surf sites, primarily in the Halekūlani beach sector. To evaluate potential impacts, wave modeling of the existing conditions and with the proposed structures was performed. Based on the results of the wave modeling, the dredge analysis, and the wave reflection analysis, no significant impacts to waves, currents, or surf sites in Waikīkī are anticipated.

For more information about the wave modeling results and potential impacts to waves, currents, and surf sites, please see Sections 8.2, 8.6 and 9.4.6 of the DPEIS.

Thank you for taking the time to review and comment on the EISPN. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement.

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

January 22, 2021

TO:
David A. Smith, PhD, PE
dsmith@seaengineering.com
Sea Engineering, Inc.
41-305 Kalanianaole Highway
Waimanalo, HI 96795

FROM:
Cyrus I. Oda
coda@kyo-yaco.com
Kyo-ya Hotels & Resorts, LP
2255 Kalakaua Ave.
Honolulu, HI 96815

SUBJECT: Environmental Impact Statement Preparation Notice ("EISPN") for the Waikīkī Beach Improvement and Maintenance Program. Waikīkī Beach, Oahu

Kyo-ya Hotels & Resorts, LP **supports in concept** the beach improvement program proposed by the Hawai'i Department of Land and Natural Resources ("***DLNR***") and outlined in the EISPN.

As a family-owned company, Kyo-ya Hotels & Resorts, LP has been doing business in Hawaii since 1961. We are the steward of five major hotel properties in Hawaii- **Sheraton Waikiki Hotel, The Royal Hawaiian Hotel, Moana Surfrider Hotel, Sheraton Princess Kaiulani Hotel, and Sheraton Maui Hotel.**

Over the past several years, and as recently as November of 2020, Waikīkī has experienced record high tides ("***King Tides***") that have exacerbated erosion and flooding. These events have highlighted the impacts of sea level rise on the beaches of Waikīkī. As sea levels continue to rise, beach loss will progressively degrade the recreational, social, cultural, environmental, aesthetic, and economic value of Waikīkī. After nearly 50 years without new beach stabilization projects in Waikīkī, we are now at a crossroads with a clear and increasingly urgent need to implement maintenance and improvements to preserve and protect the shoreline.

We are encouraged by the DLNR's desire to address chronic erosion, flooding, limited lateral shoreline access, and other public health and safety problems impacting Waikīkī Beach. The proposed long term and comprehensive solution aids the survival and resilience of Waikīkī Beach into the future. We are also encouraged by DLNR's willingness to collaborate with the community stakeholders through the Waikiki Beach Special Improvement District Association ("***WBSIDA***") and Waikiki Beach Community Advisory Committee ("***WBCAC***"). Collaboration at this early stage in the planning process identifies and establishes the program's priorities and objectives, and guides the development of the proposed beach improvement and maintenance actions.

We support this improvement program in concept and recognize its urgency. With the combination of beach erosion and King Tides, the backshore is frequently flooded, particularly during high surf events, accelerating damage to backshore infrastructure. Without beach improvements and maintenance, sea level rise is likely to result in total beach loss in Waikīkī before the end of the century and result in an estimated economic loss of $50 million to $150 million per hectare.[1] The loss of Waikīkī Beach alone would result in an annual loss of $2.223 billion in visitor expenditures.[1] Improvements and maintenance proposed in the EISPN is necessary to restore and maintain the beaches of Waikīkī to continue to support Hawaii's economy.

We offer the following summary of project-specific comments in response to the published EISPN for the Waikīkī Beach Improvement and Maintenance Program.

1. <u>1928 Waikīkī Beach Reclamation Agreement</u>
   In its discussion of the 1928 Waikīkī Beach Reclamation Agreement, Section 1.1 on page 11 of the EISPN states (and Section 7.1 on page 102 of the EISPN is substantially the same),

   > *The agreement provided that the Territory of Hawai'i would build a beach seaward from the* ***existing high water mark*** *and that title of the newly created beach would be vested by the abutting landowners. The Territory of Hawai'i and private landowners further agreed that no new structures would be built on the beach in Waikīkī. The private landowners agreed to provide a 75-foot-wide public easement along the beach measured from the* ***new mean high water mark****. (Emphasis added.)*

   To eliminate ambiguity, we request that references to the high water mark in connection with the 1928 Waikīkī Beach Reclamation Agreement be clarified. The reference to the "**existing high water mark**" should be changed to the "**then-existing mean high water mark**" and the reference to the "**new mean high water mark**" should be changed to the "**then-existing mean high water mark**" which is defined in metes and bounds in <u>Exhibit A</u> to the 1928 Waikīkī Beach Reclamation Agreement.

2. <u>Stream</u>
   In reviewing the EISPN, we are pleased to see that page 60 of the EISPN acknowledges the determination by the WBCAC that a highest priority for Halekulani Beach sector is to

[1] Tarui, N., Peng, M., Eversole, D. (2018). *Economic Impact Analysis of the Potential Erosion of Waikīkī Beach.* University of Hawai'i Sea Grant College Program. April 2018.

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"Preserve submarine groundwater discharge at Halekulani Channel (Kawehewehe)." We are in agreement with this identified priority.

3. Access Path

Section 4.4 on page 65 of the EISPN states, "There are two narrow walkways that provide **public access** to the shoreline: one between the Halekulani and Sheraton Waikīkī hotels, extending from Kalia Road to the small pocket beaches between the hotels and another between the Halekulani Hotel and Outrigger Reef Waikīkī Beach Resort." (Emphasis added.)

Please be advised that there is no easement for public access between the Halekulani Hotel and Sheraton Waikiki Hotel. To eliminate confusion, we request that future references to this pathway describe "a privately owned pathway where access by the public is presently allowed."

4. Groin and Walkway Design

We are pleased to see in Section 7.11 on page 149 of the EISPN that "[t]he potential impacts of the proposed actions on scenic and aesthetic resources in Waikīkī will be discussed in the Draft Environmental Impact Statement (DEIS)." The appearance of the walkway and groins involved in this project are of particular interest. We would appreciate additional detail and renderings, including those looking seaward from each of the shoreline properties from a normal human height viewpoint, being provided in the DEIS so that we may have the opportunity for further evaluation and comment.

5. TMK Correction

Table 7-1 on page 100 of the EISPN references TMK (1) 2-6-002:**026** as being owned by Kyo-ya Resorts & Hotels, LP. (Emphasis added.) We request that the tax map key number for that parcel owned by Kyo-ya Resorts & Hotels, LP be corrected in future project documents. The correct TMK number is (1) 2-6-002:**006**.

6. Name Corrections

The EISPN variously references the "Moana Surfrider Hotel," the "Westin Moana Surfrider," the "Moana Hotel" and the "Moana Surfrider." The EISPN also references the "Sheraton Waikīkī Hotel," the "Sheraton Waikīkī hotel," and the "Sheraton Waikīkī Beach Resort Hotel" on page 52.

We request that the correct name of "Moana Surfrider Hotel" be used in future project documents. In addition, please be aware that the proper name of the Sheraton Waikiki Hotel does not use Hawaiian diacritical marks. We therefore request that the name be corrected to read "Sheraton Waikiki Hotel" in future project documents.

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7. Caption Correction
   Bottom right corner image in Figure 4-6 on page 61 of the EISPN references "Sink holes landward of Sheraton seawall." We request that the caption reads "Sink holes landward of Halekulani seawall".

Thank you for the opportunity to provide comments on this important project. Again, Kyo-ya Hotels & Reosrts, LP **supports in concept** the beach improvement program proposed by the DLNR and outlined in the EISPN.

Sincerely

Cyrus I. Oda
Senior Vice President and Treasurer

Copy via mail:

Sam Lemmo, Administrator
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CONSERVATION AND RESOURCES ENFORCEMENT
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June 4, 2021

Cyrus I. Oda
Kyo-ya Hotels and Resorts, LP
2255 Kalakaua Ave.
Honolulu, HI 96815

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Oda:

Thank you for your comment letter dated January 22, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawai‘i Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

Comment: "1928 Waikīkī Beach Reclamation Agreement: In its discussion of the 1928 Waikīkī Beach Reclamation Agreement, Section 1.1 on page 11 of the EISPN states (and Section 7.1 on page 102 of the EISPN is substantially the same),

> *The agreement provided by the Territory of Hawai‘i would build a beach seaward from the **existing high water mark** and that title of the newly created beach would be vested by the abutting landowners. The Territory of Hawai‘i and private landowners further agreed that no new structures would be built on the beach in Waikiki. The private landowners agreed to provide a 75-foot-wide public easement along the beach measured from the **new mean high water mark**. (Emphasis added.)*

To eliminate ambiguity, we request that references to the high water mark in connection with the 1928 Waikīkī Beach Reclamation Agreement be clarified. The reference to the "**existing high water mark"** should be changed to the "**then-existing high water mark**" and reference to the "**new mean high water mark**" should be changed to "**then-existing mean high water mark**" which is defined in metes and bounds in Exhibit A to the 1928 Waikīkī Beach Reclamation Agreement."

Response: Thank you for your comment. Your concerns have been noted.

Comment: "Stream: In reviewing the EISPN, we are pleased to see that page 60 of the EISPN acknowledges the determination by the WBCAC that a highest priority for Halekulani Beach sector is to "Preserve submarine groundwater discharge at Halekulani Channel (Kawehewehe)." We are in agreement with this identified priority".

Response: The proposed action in the Halekūlani beach sector is not anticipated to have any negative impacts on submarine groundwater discharge. Dredging of the Ala Wai canal may have intercepted the shallow groundwater conduits so in general, in comparison to pre-development, submarine groundwater discharge has decreased because of that. The proposed action does not include shore parallel structures penetrating to depths that would prevent submarine groundwater discharge, including tidal pumping. Sand would not be a barrier to flow, it would just make the seepage more diffuse, so submarine groundwater discharge would not be significantly altered. Any submarine groundwater discharge in this area would continue to flow to the ocean with placement of groins and sand, and the sand may provide some filtration. For additional information about Kawehewehe, please see Section 9.2 of the DPEIS.

Comment: "Access path: Section 4.4 on page 65 of the EISPN states, "There are two narrow walkways that provide **public access** to the shoreline: one between the Halekulani and Sheraton Waikiki hotels, extending from Kalia Road to the small pocket beaches between the hotels and another between the Halekulani Hotel and Outrigger Reef Waikiki Beach Resort." (Emphasis added.). Please be advised that there is no easement for public access between the Halekulani Hotel and Sheraton Waikiki Hotel. To eliminate confusion, we request that future references to this pathway describe "a privately owned pathway where access by the public is presently allowed."

Response: We appreciate clarification of the ownership status of the existing walkway. Per your request, all references to the walkway have been corrected accordingly and are now referred to as "a privately owned pathway where access by the public is presently allowed."

Comment: "Groin and Walkway Design: We are pleased to see in Section 7.11 on page 149 of the EISPN that "[t]he potential impacts of the proposed actions on scenic and aesthetic resources in Waikiki will be discussed in the Draft Environmental Impact Statement (DEIS)." The appearance of the walkway and groins involved in this project are of particular interest. We would appreciate additional detail and renderings, including those looking seaward from each of the shoreline properties from a normal human height viewpoint, being provided in the DEIS so that we may have the opportunity for further evaluation and comment".

Response: We prepared conceptual renderings for each of the proposed actions. The renderings for the proposed action in the Halekūlani beach sector are shown in Section 3.2 and 5.3.1 of the DPEIS. We selected viewpoints that provide realistic perspectives of the proposed actions as they relate to the individual and adjacent beach sectors. We also previously developed ground-level renderings for the Hawaii Kai Entrance Channel Groin and Royal Hawaiian Groin Replacement projects, which are similar to the groins being proposed in the Halekūlani beach sector (see Figure 1 and Figure 2). We hope that you find these renderings to be helpful and informative.

Comment: "TMK Correction: Table 7-1 on page 100 of the EISPN references TMK (1) 2-6-002:**026** as being owned by Kyo-ya Resorts & Hotels LP. (Emphasis added.) We request that the tax map key number for that parcel owned by Kyo-ya Resorts & Hotel, LP be corrected in future project documents. The correct TMK number is (1) 2-6-002:**006**."

Response: We appreciate clarification of the correct tax map key number for the subject property. Per your request, all references to the subject property Tax Map Key number have been corrected accordingly and are now referred to as "(1) 2-6-002:006".

Comment: "Name Corrections: The EISPN variously references the "Moana Surfrider Hotel", the "Westin Moana Surfrider", the "Moana Hotel" and the "Moana Surfrider." The EISPN also references the "Sheraton Waikiki Hotel," the "Sheraton Waikiki hotel", and the "Sheraton Waikiki Beach Resort Hotel" on page 52. We request that the correct name of the "Moana Surfrider Hotel" be used in future project documents. In addition, please be aware that the proper name of the Sheraton Waikiki Hotel does not use Hawaiian diacritical marks. We therefore request that the name be corrected to read "Sheraton Waikiki Hotel" in future project documents."

Response: We appreciate clarification of the correct names for the subject properties. Per your request, all references to the subject property names have been corrected accordingly.

Comment: "Caption Correction: Bottom right corner image in Figure 4-6 on page 61 of the EISPN references "Sink holes landward of Sheraton seawall." We request that the caption reads "Sink holes landward of Halekulani seawall".

Response: Per your request, the subject figure caption has been corrected accordingly and now reads "Sinkholes landward of seawall at Halekūlani Hotel".

Thank you for taking the time to review and comment on the EISPN. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement.

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

Figure 1: Conceptual rendering of T-head groin for Royal Hawaiian Groin

Figure 2: Conceptual rendering of L-head groin for Hawaii Kai Entrance Channel

WAIKIKI NEIGHBORHOOD BOARD NO. 09

c/o NEIGHBORHOOD COMMISSION OFFICE •
TEL: (808) 768-3710 INTERNET: www1.honolulu.gov/nco

January 22, 2021

Department of Land and Natural Resources
Office of Conservation and Coastal Lands
Attn: Sam Lemmo
1151 Punchbowl Street, Room 131
Honolulu, HI 96813

Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, HI 96813

David A. Smith, PhD, PE
Sea Engineering, Inc
41-305 Kalanianaole Highway
Waimanalo, HI 96795

Re: Environmental Impact Statement Preparation Notice- Waikiki Beach Improvement and Maintenance Program

Thank you for circulating the Environmental Impact Statement Preparation Notice (EISPN) for the proposed project described above. The Waikiki community appreciates the Waikiki Beach Special Improvement District Association members' financial and professional commitment to rehabilitating Waikiki Beach, improving the beach connection to the adjacent built environment, and planning for climate change and sea level rise.

Our community understands that these investments, while costly, time-consuming and disruptive at times, are crucial to ensuring Waikiki Beach remains a preferred global visitor destination, an integral neighborhood of choice in Hawaii, and an economic engine for the State as a whole. Most importantly, these improvements will enhance the beach experience for the enjoyment of residents and visitors alike, for generations to come.

In the draft Environmental Impact Statement please ensure the following topics are included with a robust analysis and discussion for each.

Section 1.6
While eight beach sectors are mentioned as having been considered for analysis in the EIS, elaborate on why the specific four sectors were selected for analysis and more importantly, why the others were not. While we understand the Proposed Action's focus would naturally be on beaches fronting lodging properties in Waikiki, shorelines do not fully operate independently as hydrologic, shoreline systems. There are visible erosion, seawall collapse and infrastructure damage currently present along Sectors F,G and H and the community will inquire about these during the EIS process. Summarize the criteria from which alternatives were selected and how the four beach sectors selected interact with each other from a hydrological and littoral perspective.

Section 2.5
In the past, use of inappropriate sand sources to replenish beaches in Hawaii has occurred. While current sand sourcing protocols are robust, ensure the EIS continues the dialogue of why appropriate sand selection is so important to successful project implementation.

Chapters 3 through 6
Various groins and other in-water infrastructure concepts are being proposed for many of the project sectors. Explain how this infrastructure may or may not impact surf breaks, waves and other ocean and shoreline processes. The specific concern will be among the surfing community that uses the area.

Explain the equipment to be used for implementation of the Proposed Action and if there are any new technologies or equipment being considered to reduce the disruption at project sites and/or reduce the time to implement said projects.

Section 7.1
The presence of federal lands abutting the shoreline at the Fort DeRussy Beach Sector poses unique challenges and opportunities. In the EIS, discuss U.S. Army consultation for this project, Fort DeRussy Master Plans that may inform beach management projects, and if there are any opportunities being considered with the U.S. government for cost-sharing, direct funding or technical expertise and other resources, to assist the State in implementing various features of the Proposed Action.

The community is looking forward to reviewing how this project complies with/helps implement the full range of plans and policies applicable to Waikiki. Most importantly, the EIS analysis should specifically discuss the Proposed Action's compliance with resilience, climate change, shoreline and sea level rise policies, regulations, laws and directives approved recently at both the Hawaii State and City and County of Honolulu, level.

Again, thank you for engaging with the Waikiki community and we look forward to continued dialogue, a review of the Draft EIS, and a subsequent successful and expeditious implementation of the Proposed Action.

Sincerely,

Jeff Merz AICP, LEED AP
Waikiki Neighborhood Board
Development Review

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
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June 4, 2021

Jeff Merz, AICP, LEED AP
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Honolulu, HI 96815

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Merz:

Thank you for your comment letter dated January 22, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawai‘i Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

Comment: “While eight beach sectors are mentioned as having been considered for analysis in the EIS, elaborate on why the specific four sectors were selected for analysis and more importantly, why others were not.”

> **Response:** Selection of the proposed beach improvement and maintenance actions was a primarily stakeholder-driven process. We relied heavily on feedback and direction from the Waikīkī Beach Community Advisory Committee (WBCAC) to identify issues, needs, priorities, and design criteria for beach sector. The sectors that were selected for beach improvement and maintenance actions were identified as the highest priorities by the WBCAC. While the other beach sectors of Waikīkī – Duke Kahanamoku, Queens, Kapi‘olani, and Kaimana - were not identified as priorities by the WBCAC, these areas are clearly important and we recognize that, as sea levels continue to rise, beach improvements and/or maintenance may be required in these beach sectors in the future. For more information about the WBCAC and the project selection process, please see Sections 2.4 and 2.6 and Appendix A of the DPEIS.

Comment: “In the past, use of inappropriate sand sources to replenish beaches in Hawaii has occurred. While current sand sourcing protocols are robust, ensure the EIS continues the dialogue of why appropriate sand selection is so important to successful project implementation."

Response: We acknowledge that sand recovery, transport, and placement operations have the potential to cause turbidity. All of the offshore sand proposed for use in Waikīkī will contain less than 6% fines per DLNR guidelines, and ideally less, in compliance with the State of Hawaiʻi guidelines for beach nourishment projects. Appropriate methods for dewatering and removal of fines to mitigate turbidity will be established during the final design and permitting process. All methods will be reviewed and approved by the Hawaiʻi Department of Health, Clean Water Branch as part of the Clean Water Act Section 401 Water Quality Certification (WQC) review process. For more information about sand characteristics and quality, please see Section 3.5 of the DPEIS. For more information about water quality and turbidity, please see Section 8.7 of the DPEIS.

Comment: "Various groins and other in-water infrastructure concepts are being proposed for many of the project sectors. Explain how this infrastructure may or may not impact surf breaks, waves and other ocean and shoreline processes. The specific concerns will be among the surfing community that uses the area."

Response: Sea Engineering, Inc. conducted analytical modeling to evaluate the potential for the proposed actions to impact waves, currents, and surf sites in Waikīkī. Dredging of offshore sand deposits involves removing sand from the deposits, resulting in a lowering of the bottom elevation or changing the bathymetry. Dredging could occur at the Ala Moana, Canoes/Queens, or Hilton offshore sand deposits. Wave modeling was used to assess the impact of dredging on waves, currents, and nearby surf sites.

A wave reflection analysis was also conducted to evaluate the potential for the proposed structures in the Halekūlani and Kūhiō beach sectors to reflect waves that could negatively impact surf sites, primarily in the Halekūlani beach sector. To evaluate potential impacts, wave modeling of the existing conditions and with the proposed structures was performed. Based on the results of the wave modeling, the dredge analysis, and the wave reflection analysis, no significant impacts to waves, currents, or surf sites in Waikīkī are anticipated.

For more information about the wave modeling results and potential impacts to waves, currents, and surf sites, please see Sections 8.2, 8.6 and 9.4.6 of the DPEIS.

Comment: "The presence of federal lands abutting the shoreline at the Fort DeRussy beach sector poses unique challenges and opportunities. In the EIS, discuss U.S. Army consultation for this project, Fort DeRussy Master Plans that may inform beach management projects, and if there are any opportunities being considered with the U.S.

government for cost sharing, direct funding or technical expertise and other resources, to assist the State in implementing various features of the Proposed Action."

Response: The U.S. Army Corps of Engineers conducted a study in 2009 and concluded that sand backpassing was the preferred solution to address erosion at the east end of the Fort DeRussy beach sector. The project proponents agree with the U.S. Army Corps of Engineers findings and recommendations. A formal consultation with the U.S. Army Corps of Engineers will be conducted during the final design and permitting process.

Comment: "Most importantly, the EIS analysis should specifically discuss the Proposed Action's compliance with resilience, climate change, shoreline and sea level rise policies, regulations, laws and directives approved recently at both the Hawaii State and City and County of Honolulu, level."

Response: We acknowledge and agree that the proposed beach improvement and maintenance actions must comply with existing policies, regulations, laws and directives relating to resilience, climate change, shoreline and sea level rise. For information about the relationship of the proposed actions with the existing policies, regulations, laws and directives, please see Section 16 of the DPEIS.

Thank you for taking the time to review and comment on the EISPN. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement (DPEIS).

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

Jan 20, 2021

Comments pertaining to

ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE
Waikīkī Beach Improvement and Maintenance Program
December 2020

Hawaiʻi Department of Land and Natural Resources
Office of Conservation and Coastal Lands
1151 Punchbowl Street, Suite 131
Honolulu, Hawaiʻi 96813

Comments by Dennis Furukawa, Honolulu

PROJECT OBJECTIVES
According the EIS Preparation Notice dated December 2020, the primary objectives of the proposed actions are as follows:

- **Restore and improve Waikiki's public beaches.**

  Renourishment activities are applicable to that objective and are not a subject of these comments, however significant environmental impacts are likely.
- **Increase beach stability through improvement and maintenance of shoreline structures.**

  Those portions of the proposed project that involve the improvement and maintenance of EXISTING shoreline structures is not a subject of these comments.
- **Provide safe access to and along the shoreline.**

  These comments pertain in part to these objectives.
- **Increase resilience to coastal hazards and sea level rise.**

  These comments pertain in part to these objectives.

Comments by Dennis Furukawa:

1. Regarding the portion fronting Halekulani and Sheraton hotels (Halekulani Beach Sector) referred to herein in this document as the "subject shoreline":
    a. That portion of subject waterfront has never had a significant sandy beach, except that portion known as Grays Beach, and is currently fronted by seawalls (see Exhibit A-2). Therefore any placement of beach sand, boulders etc would not constitute "replenishment" but rather be new fill, and be subject to The Clean Water Act Section 404, and be subject environmental review.
    b. Likely significant environmental impacts of placing new fill:
        i. The nearshore waters (those within 50 yards of the existing seawalls) directly fronting the subject properties are known to be habitat for a large number of sea turtles, who can be

observed feeding and swimming in that area in particular, as it is not currently popular as a surfing or swimming area. In contrast, the nearshore waters directly in front of the Royal Hawaiian and Moana Surfrider hotels are largely devoid of turtles or fish, as the water quality is poor due to the large numbers of swimmers and surfers causing turbulence, walking on coral and disturbing sand, and introducing waterborne pollutants (urine, sunscreen, rubbish, fragrances, hormones, noise etc.).

ii. The proposed T-shaped groins (see Exhibit A-1) will alter the flow of water and sand, and will likely adversely affect the popular surf spots (Popular's, Paradise, and Three's) by establishing new structures that will reflect wave energy, and alter the seafloor contours through sand migration and the smothering of coral reefs.

iii. The establishment of beach where people will congregate will increase the amount of waterborne pollutants (urine, sunscreen, rubbish, fragrances, hormones, noise etc.), resulting in the loss of suitable habitat for the aquatic life.

iv. No facilities are planned for the subject shoreline, namely any restrooms, showers, rubbish cans, or lifeguard towers. These are essential facilities, as the beach users can be expected to try using facilities in the Sheraton or Halekulani hotels, which is almost certain to create problems with hotel management and guests. Note that beach showers are a significant source of pollutants, and should not be located where they drain directly into the ocean or groundwater.

c. Pedestrian access issues

i. The proposed design (Exhibit A-1) makes no mention of how pedestrians will be accommodated between Ft. DeRussy and Royal Hawaiian beaches. Sand is not an accessible pathway, and T-groins themselves are barriers.

ii. Prior to the closure of the walkways fronting the Halekulani and the Shereton hotels, pedestrians were afforded views directly down into the water, where many locals and visitors alike were able to view turtles and fish, even the occasional shark. That walkway was the only spot in along the main Waikiki waterfront where such viewing was possible, especially for disabled persons (the groins and rock jetties are not accessible and are subject to overtopping by waves). Placing a beach there would eliminate that unique resource.

iii. Accessible pathways:

1. The existing walkways are too narrow to permit two-way pedestrian traffic, and should be increased in width to a minimum of 10" clear width to meet the spirit of

accessible pathways laws and allow groups of pedestrians the ability to pass one another.

2. Access to the waterfront does not currently meet the American Disability Act, and must be provided, as the improvements are public in nature, using public funds.

d. Sea level rise:
   i. As oceans rise, the proposed beaches will erode more rapidly each year. The beaches will require increasing amounts of sand to be placed in order to maintain dry sand. In order for that to happen a foundation of sand will need to be maintained and expanded, each time increasing the environmental impacts of placing the sand there in the first place.
   ii. The seawalls that currently front the Halekulani and Sheraton hotels are not subjects of the proposed projects, however they are in a degraded condition, and are integral to the objective of providing pedestrian access between the Ft. DeRussy and Royal Hawaiian beaches. At some point those seawalls will be too low to prevent overtopping of waves, as is already apparent at Grays Beach, where the sand is already piling 3'-4' above the Hau Tree Terrace lawn and patio elevations.
   iii. Sandbags have been placed at the Sheraton's beach services concessions to allow the sand to build up higher than the paved areas and walkways leading to Kalia St. Therefore it would be better to rebuild the seawalls as a more practical response to rising sea levels.
   iv. The design of the T-groins was proposed years ago (draft April 2000) as part of recommendations for beach improvements. As part of that proposal hydrodynamic modeling was not done, and so far the only information that has been presented appears to be based upon the opinions of the project proposers. Considering that the subject waterfront is such a critical resource for the State and the County's economy, physical modeling the proposed designs is essential to prevent unintended consequences, especially as sea levels rise.

2. Regarding the portion of the shoreline between Halekulani and Ft. DeRussy, which is referred to herein as the "Outrigger shoreline", and differs from the subject shoreline in the following respects:
   i. Sandy beach has been present for many decades;
   ii. Shoreline properties are not fronted by seawalls;
   iii. Paved shoreline pathways have never been in place.
   iv. Buildings are closer to the shoreline

   a. Because of the above points it may make more sense to treat the Outrigger shoreline as a part of the Ft. DeRussy shoreline than the subject shoreline.
   b. Likely environmental impacts of placing new fill:

i. The top of pavement elevation of the walkway dividing Ft. DeRussy and the Aston Waikiki Shore was measured at 40" above the water level at the storm drain grates in that walkway. The existing beach sand at the makai edge of pavement is higher than the walkway by over one foot currently. Waves already overtop the sand and wash down the walkway during high tides and moderately large swells.

ii. As the beach fill responds to currents and waves, the slope of the resulting beach will steepen (as evidences by the steep slopes at the Moana shoreline, and increase backwash towards the Three's surfbreak.

c. Pedestrian access issues:

i. in order to provide ADA accessible travel in front of the Outrigger, a concrete sidewalk supported by a retaining wall foundation would be ideal, thus providing both access and protection. Therefore it would seem that it is an opportunity to construct the pathway as part of protecting the Outrigger's shoreline.

ii. Walkways leading from Saratoga St. to the shoreline are ADA accessible, so making the shoreline pathway accessible is a simple matter.

d. Sea level rise:

i. Due to the location of Outrigger, waves already break against the makai exterior walls of the hotel. As sea levels rise, sand placed in front of the hotel will not stop wave action from washing the sand away, as evidenced by sandbags placed at the Moana Surfrider's Banyan Tree Terrace, and at Grays Beach access walkway. The seaward wall of the Outrigger will reflect wave energy back towards the sea taking the sand with it.

ii. In recognition of the fact that waves already wash down the walkways leading to Kalia St, pushing sand inland, alternatives to beach renourishment should be prioritized.

3. Alternative proposal

a. In the Project Objectives in this paper's introduction, objective #3 is "Providing safe access to and along the shoreline." As this access is not discussed in the EIS Preparation Notice, I am proposing an alternative design that seeks to address that objective. In addition, my proposed alternative design is intended to address all of the Project Objectives 1-4.

b. Alternative Project Description (see Exhibits B-1 through B-5)

i. Access

1. The project would focus on reestablishing public access to the shoreline by creating an ADA accessible pathway by improving the existing pathways fronting the Halekulani and Sheraton hotels. A new 10' walkway

would cantilever over the water at the same elevation of that fronting the Sheraton (approx. +7' MSL) supported by new stone buttresses placed perpendicular to the existing seawall (see Exhibit B-1). The walkway structure would span between the existing Royal Hawaiian groin to Grays beach, and from Gray's beach to the Outrigger shoreline.

2. The walkway would be constructed as a horizontal tubular truss, fabricated from corrosion-resistant materials, and finished with a pedestrian traffic surface, and fitted with guardrails that minimize visual obstruction, and are also corrosion resistant (see Exhibit B-2). The walkway would tie into the Sheraton's pool deck pathways on the east end, and the Grays beach access pathway, and continue westward along the Halekulani shoreline frontage.
3. At the Outrigger shoreline, a walkway that also acts as a seawall (no illustration provided) would be placed against the hotel seaward wall with a walkway elevation higher than the existing aforementioned walkways accessing Kalia St.

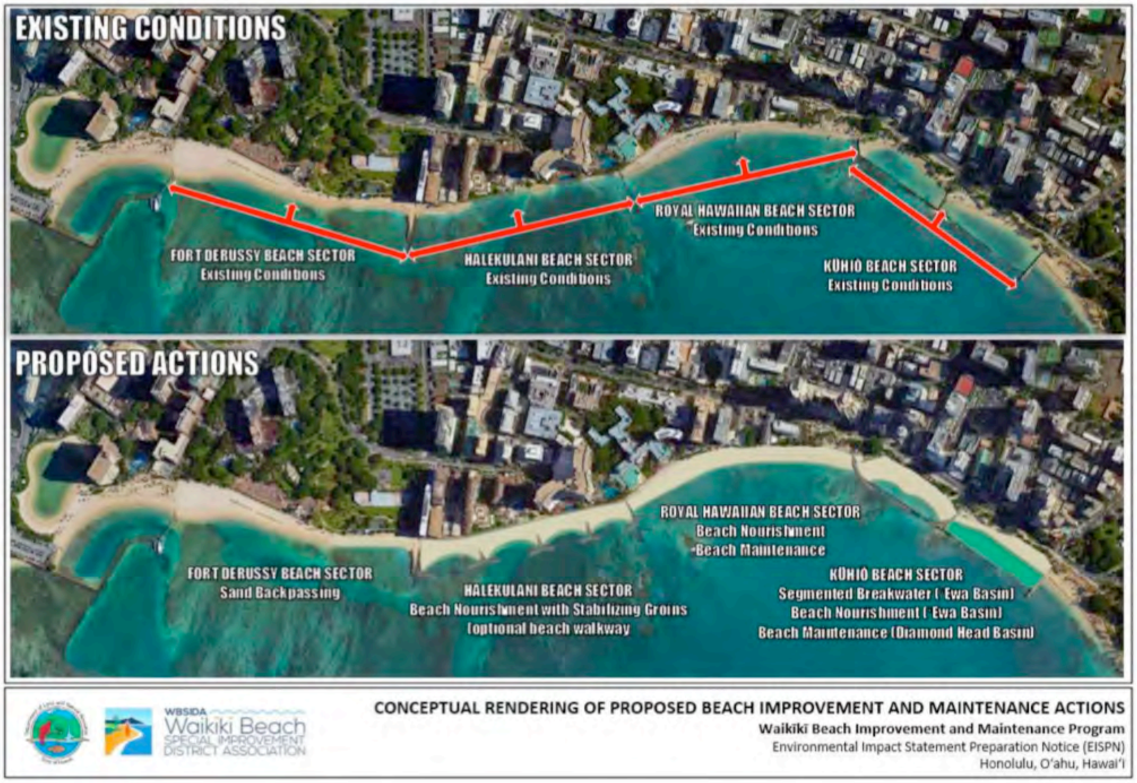
ii. Seawall protection

1. The walkway structure would be engineered to mount equipment that would reduce the energy of wave action. The equipment could be used to absorb wave energy and convert it into electric or thermal energy. The energy produced could be used for operating pumps (such as to reduce water levels in the storm drains) or lighting along the walkways and shoreline parks.
2. The energy-conversion technologies (ECTs) would be mounted below the walkway and remain largely unseen except from beyond the shoreline, and placed close to the seawalls to minimize intrusion into the ocean. The devices must not introduce threats to marine life or be an attractive nuisance for children and tourists. The ECTs must be virtually silent, quiet on land and in the water.
3. Possible technologies include piezoelectric elements, geared levers, pneumatics, or others. Repairs and upgrades to the ECTs would be simple as the entire array of equipment would be accessible from the walkway. No element of the ECTs would be founded or mounted in seafloor or reef, and clearance from reef or seafloor would be a minimum of 12", with large enough spaces to allow the passing of large sea turtles below

and beside the devices. Electric cables or pneumatic hoses would be mounted on the underside of the walkway.

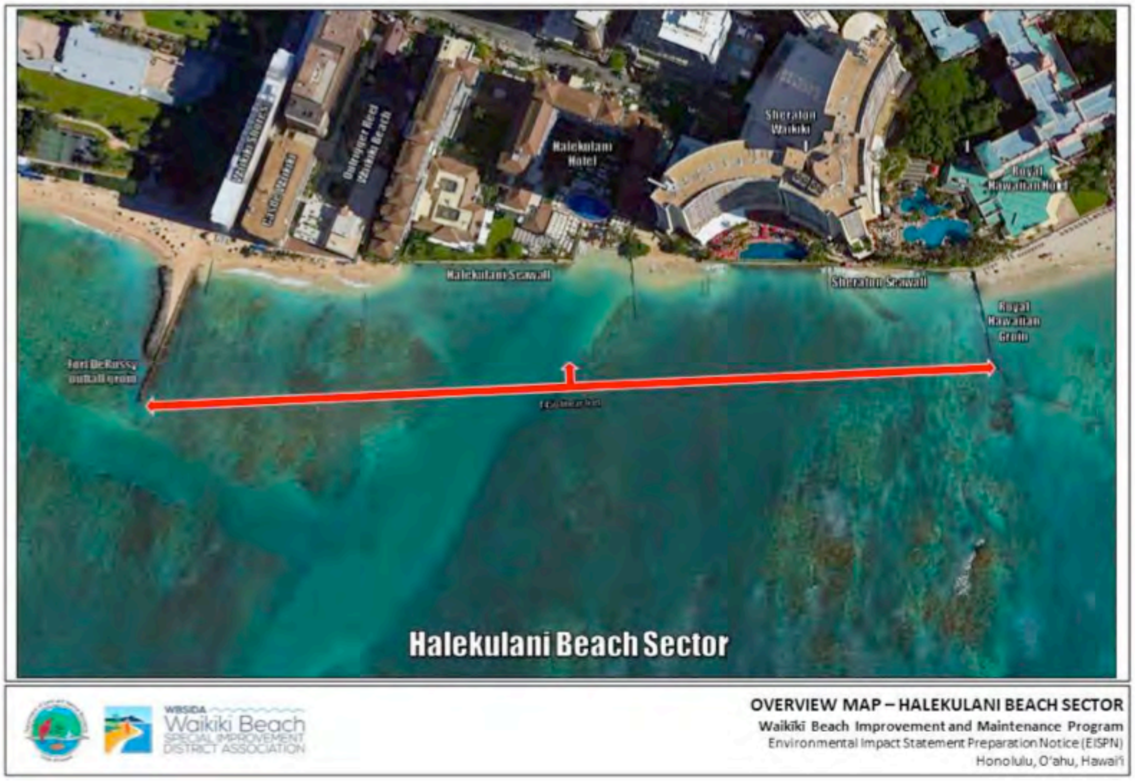
iii. Sea level rise
    1. Mounted at the elevation of the existing walkway (+7' MSL) at the Sheraton, the walkway and the seawall protection + ECTs should have a long useful lifetime, as it should be high enough to accommodate over 12" of sea level rise.

Exhibit A-1



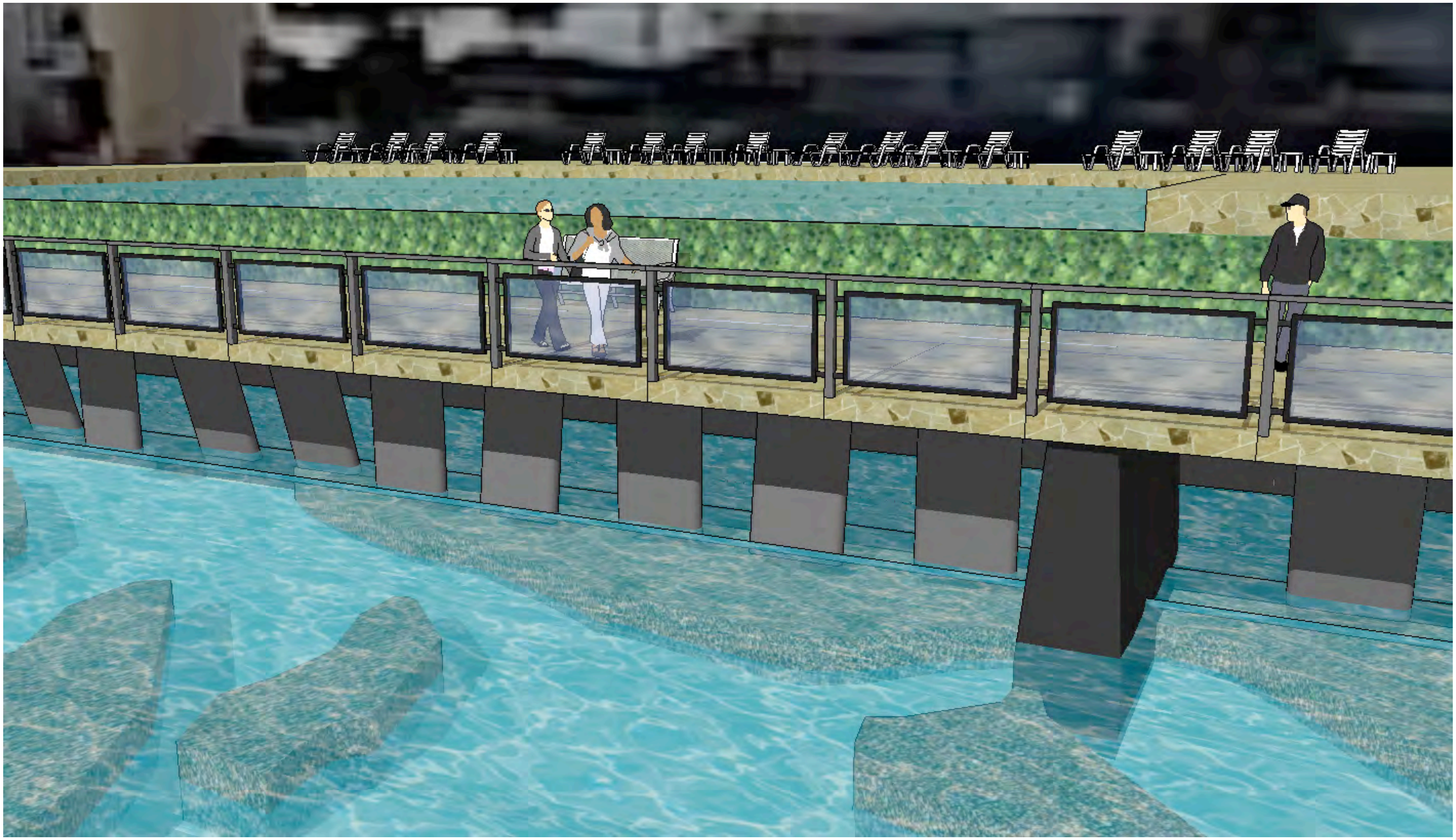
Proposed improvements

Exhibit A-2



Existing Conditions

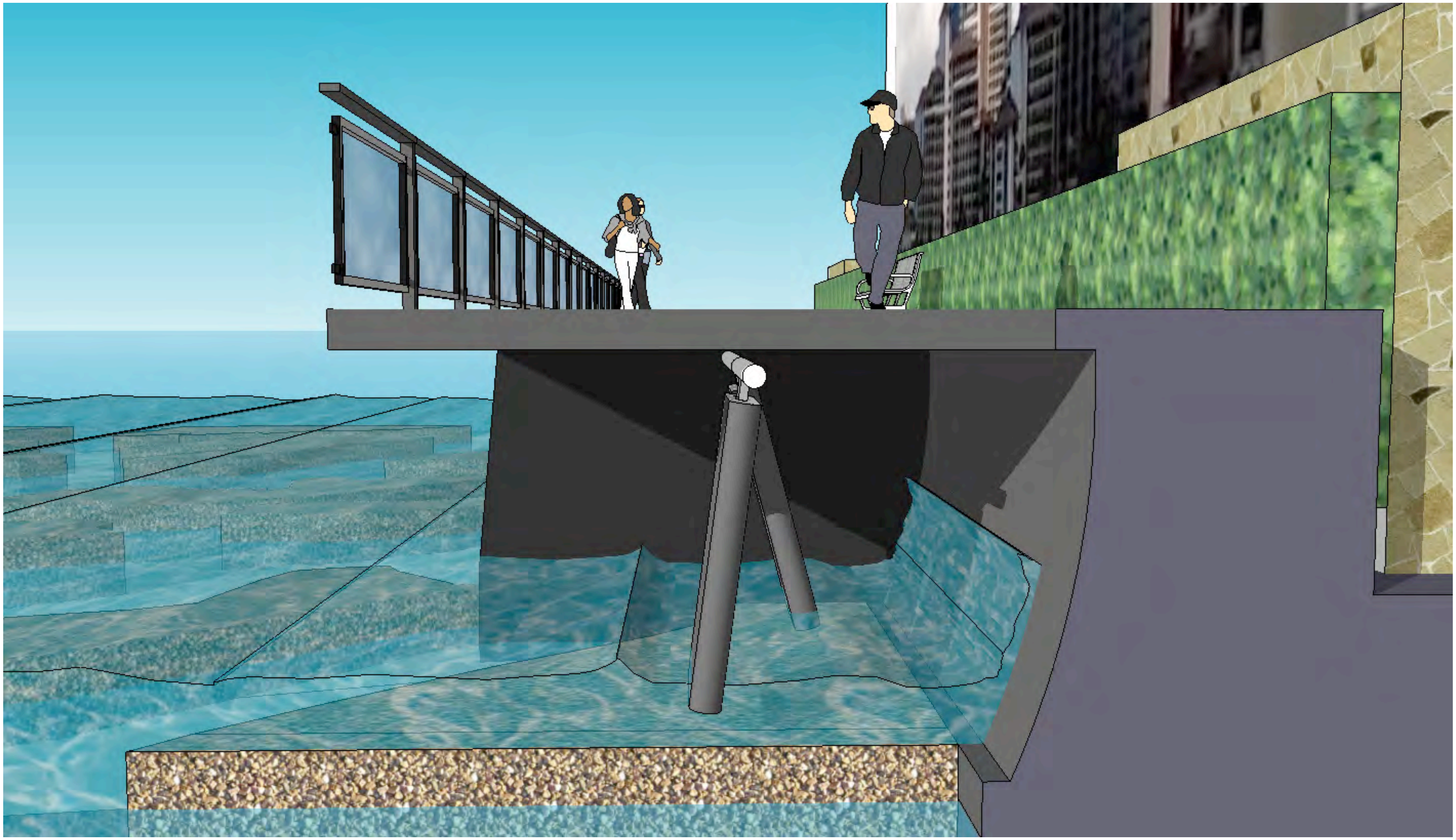
Exhibit B-1



Sheraton Shoreline Walkway Conceptual Rendering
Walkway with energy-conversion devices below

WAIKĪKĪ BEACH IMPROVEMENT AND MAINTENANCE PROGRAM
Comments and illustrations by Dennis Furukawa

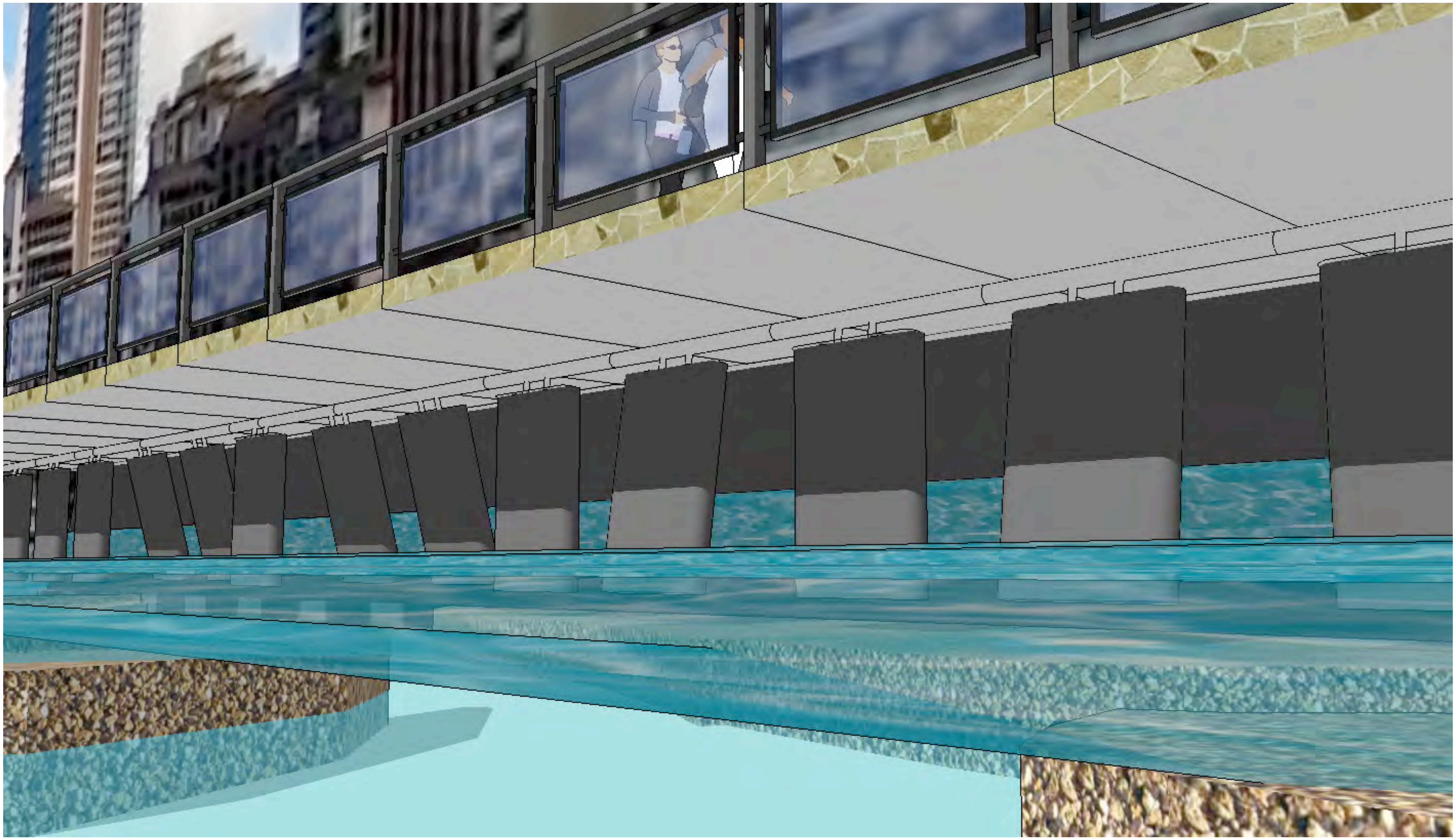
Exhibit B-2



Sheraton Shoreline Walkway Conceptual Rendering
Section through walkway, energy-conversion devices
that absorb wave energy below.

WAIKĪKĪ BEACH IMPROVEMENT AND MAINTENANCE PROGRAM
Comments and illustrations by Dennis Furukawa

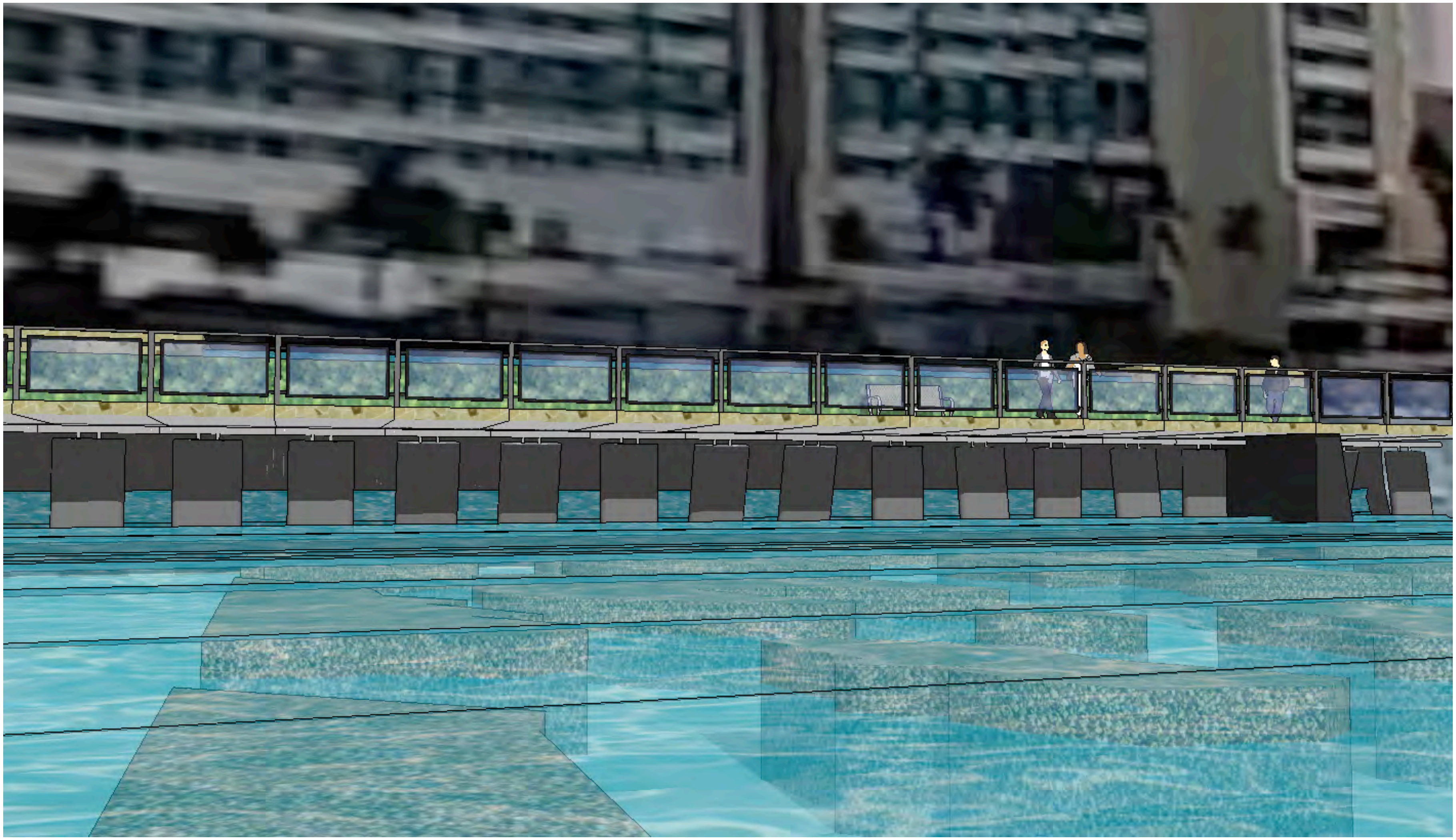
Exhibit B-3



Sheraton Shoreline Walkway Conceptual Rendering

WAIKĪKĪ BEACH IMPROVEMENT AND MAINTENANCE PROGRAM
Comments and illustrations by Dennis Furukawa

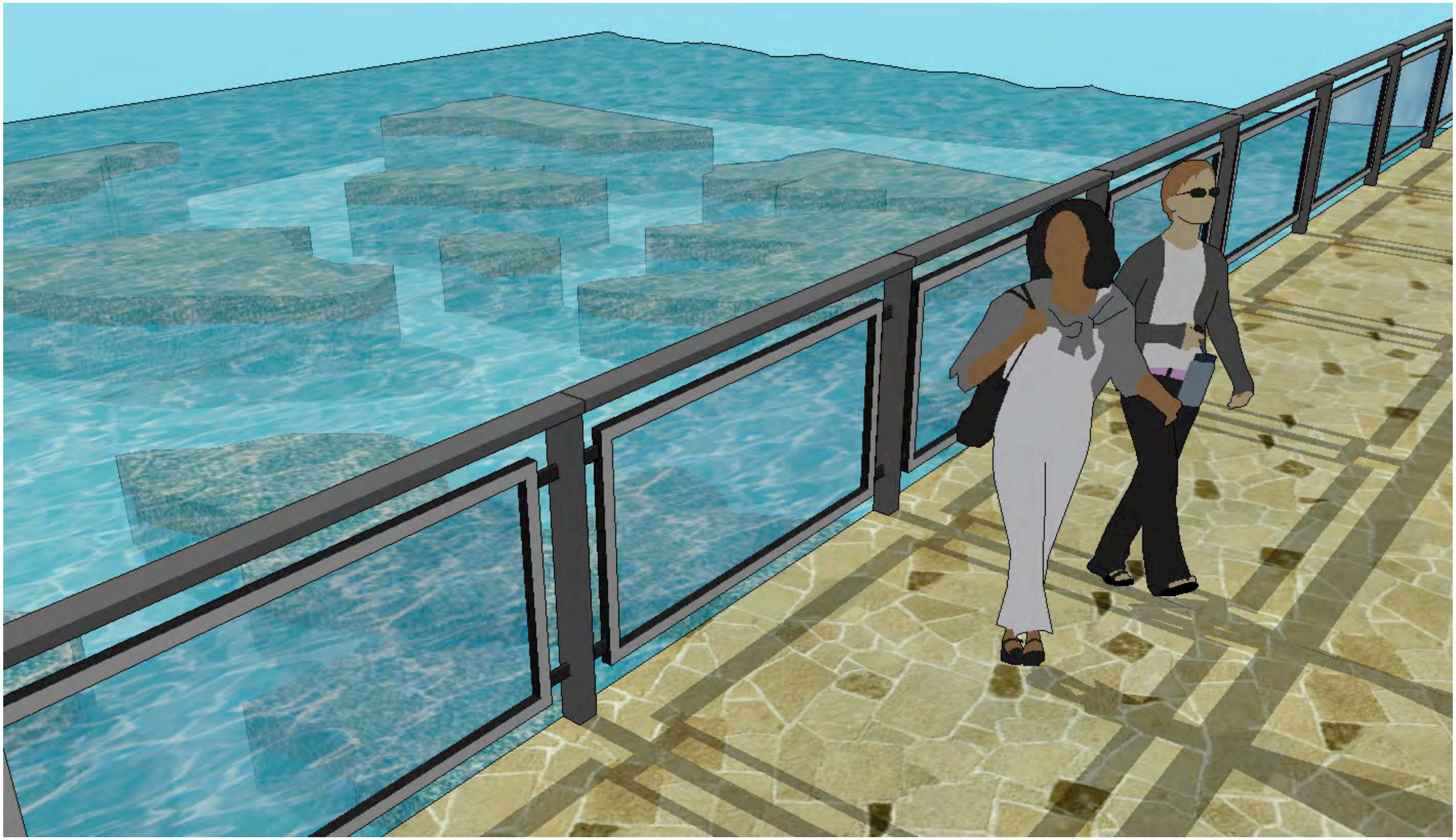
Exhibit B-4



Sheraton Shoreline Walkway Conceptual Rendering

WAIKĪKĪ BEACH IMPROVEMENT AND MAINTENANCE PROGRAM
Comments and illustrations by Dennis Furukawa

Exhibit B-5



Sheraton Shoreline Walkway Conceptual Rendering
Offers views of reef and marine sea life.

WAIKĪKĪ BEACH IMPROVEMENT AND MAINTENANCE PROGRAM
Comments and illustrations by Dennis Furukawa

End of document

By:
Dennis Furukawa
435 Seaside Ave. #1608
Honolulu, Hawai`i 96815

email: rgp.dennis@gmail.com
ph. 415.860.2388

DAVID Y. IGE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

Dennis Furukawa
435 Seaside Ave., #1608
Honolulu, HI 96815

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Furukawa:

Thank you for your comment letter dated January 22, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawaiʻi Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

Comment:

1. Regarding the portion fronting Halekulani and Sheraton hotels (Halekulani Beach Sector) referred to herein in this document as the "subject shoreline":
   a. "That portion of subject waterfront has never had a significant sandy beach, except that portion known as Grays Beach, and is currently fronted by seawalls (see Exhibit A-2). Therefore, any placement of beach sand, boulders etc. would not constitute "replenishment" but rather be new fill, and be subject to The Clean Water Act Section 404, and be subject environmental review."

      Response: We acknowledge that the proposed action in the Halekūlani beach sector will require a Clean Water Act Section 404 permit. For additional information about requirements of the Clean Water Act, please see Section 16.1.2 of the DPEIS.

   b. "Likely significant environmental impacts of placing new fill:
      i. "The nearshore waters (those within 50 yards of the existing seawalls) directly fronting the subject properties are known to be habitat for a large number of sea turtles, who can be observed feeding and swimming in that area in particular, as it is not currently popular as a surfing or swimming area. In contrast, the nearshore

waters directly in front of the Royal Hawaiian and Moana Surfrider hotels are largely devoid of turtles or fish, as the water quality is poor due to the large numbers of swimmers and surfers causing turbulence, walking on coral and disturbing sand, and introducing waterborne pollutants (urine, sunscreen, rubbish, fragrances, hormones, noise etc.)."

Response: We acknowledge that the proposed beach improvement and maintenance actions have the potential to affect marine habitat and protected species. Sea turtle disturbance would be limited to within about a 130-ft radius of the sand recovery areas. Turtles would be expected to move away from the disturbance, and as the impact areas are relatively small and the seafloor is primarily sandy, it is not anticipated to have any significant effect on turtle foraging. The groins and sand fill will bury a portion of the existing subtidal environment of primarily low relief sand, rubble, and limestone. Ecological services of reef flat habitat will be lost within the project footprint (sand and groins) but are anticipated to recover over time as the benthic community re-establishes.

Best Management Practices (BMPs), as typically recommended by the National Marine Fisheries Service (NMFS), will be adhered to during construction of the proposed actions to avoid or minimize impacts to marine habitat protected species. A biological and water quality monitoring program will be implemented to enhance control over potential construction impacts. We anticipate that marine species will repopulate from surrounding habitat after construction is completed and sessile organisms will colonize new hard surfaces.

We also acknowledge that the proposed actions have the potential to affect corals. AECOS (2021) found that coral assemblages in Waikīkī are limited by availability of stable hard bottom, silt cover, competition with algae, and freshwater influence among other factors. No corals were observed in the Royal Hawaiian Beach Sector, and one colony was observed in the Fort DeRussy beach sector. At the Kuhio beach sector (‘Ewa (west) Basin), no colonies were observed on the breakwater and groin structures. At the Halekūlani beach sector, overall coral cover at the proposed groin locations is very low (mean of 0.1 colony/m^2). In general, coral colonies here are small, with 64% being less than 10 cm in diameter. The lack of large coral heads is evidence that this area is not particularly favorable to coral growth.

We anticipate that the proposed structures will provide stable, hard bottom for coral settlement and possibly calmer waters for coral development; however, coral assemblage development may be compromised by competition for space, freshwater influence, sediment transport, and heavy utilization of the nearshore by the human population.

Measures proposed to be exercised to protect corals during construction activities include:

- Locating and marking significant corals in the vicinity of the sand recovery areas;
- Identifying pipeline route corridors to minimize the potential for damage to coral and other benthic fauna; and
- Transplanting corals, as necessary and where practicable, to relocate them from the construction site, particularly along the pipeline route.

For more information about potential impacts to marine habitat and protected species, habitat, please see Sections 8.10, 8.11, 8.12, 10, and 11 and Appendix C of the DPEIS.

ii. “The proposed T-shaped groins (see Exhibit A-1) will alter the flow of water and sand, and will likely adversely affect the popular surf spots (Popular’s, Paradise, and Three’s) by establishing new structures that will reflect wave energy, and alter the seafloor contours through sand migration and the smothering of coral reefs.”

Response: We acknowledge your concerns regarding the potential for the proposed actions to impact surf sites in Waikīkī. Sea Engineering, Inc. conducted detailed wave modeling to evaluate the potential for the proposed actions to impact waves, currents, and surf sites in Waikīkī. Dredging of offshore sand deposits involves removing sand from the deposits, resulting in a lowering of the bottom elevation or changing the bathymetry. Dredging could occur at the *Ala Moana*, *Canoes/Queens*, or *Hilton* offshore sand deposits. Wave modeling was used to assess the impact of dredging on nearby surf sites.

A wave reflection analysis was also conducted to evaluate the potential for the proposed structures in the Halekūlani and Kūhiō beach sectors to reflect waves that could negatively impact surf sites, primarily in the Halekūlani beach sector. To evaluate potential impacts, wave modeling of the existing conditions and with the proposed structures was performed. Based on the results of the wave modeling, the dredge analysis, and the wave reflection analysis, no significant impacts to waves, currents, or surf sites in Waikīkī are anticipated.

For more information about the wave modeling results and potential impacts to waves, currents, and surf sites, please see Sections 8.2, 8.6 and 9.4.6 of the DPEIS.

iii. “The establishment of beach where people will congregate will increase the amount of waterborne pollutants (urine, sunscreen, rubbish, fragrances, hormones, noise etc.), resulting in the loss of suitable habitat for the aquatic life.”

Response: We acknowledge the potential for beach users to generate waterborne pollutants. The number of annual visitors to Hawaiʻi has steadily increased since the 1970’s. The total number of Oʻahu visitors increased by 18.5% between 2007 and 2016, and the State of Hawaiʻi set a new record in 2019 with 10.4 million visitors. The intent of the proposed action in the Halekūlani beach sector is to create a stable beach to improve lateral shoreline access and support ongoing recreational uses in Waikīkī. Increasing dry beach area will provide additional space to accommodate the ever-growing number of beach users in Waikīkī. Providing additional space for beach users could potentially make the discharge of waterborne pollutants more diffuse.

iv. “No facilities are planned for the subject shoreline, namely any restrooms, showers, rubbish cans, or lifeguard towers. These are essential facilities, as the beach users can be expected to try using facilities in the Sheraton or Halekulani hotels, which is almost certain to create problems with hotel management and guests. Note that beach showers are a significant source of pollutants, and should not be located where they drain directly into the ocean or groundwater.”

Response: The DLNR does not regulate land uses mauka (landward) of the shoreline in Waikīkī. The amenities you refer to – restrooms, showers, rubbish cans, and lifeguard towers – are the responsibility of the City and County of Honolulu and private landowners in Waikīkī.

c. Pedestrian access issues

i. “The proposed design (Exhibit A-1) makes no mention of how pedestrians will be accommodated between Ft. DeRussy and Royal Hawaiian beaches. Sand is not an accessible pathway, and T-groins themselves are barriers.”

ii. “Prior to the closure of the walkways fronting the Halekulani and the Shereton hotels, pedestrians were afforded views directly down into the water, where many locals and visitors alike were able to view turtles and fish, even the occasional shark. That walkway was the only spot in along the main Waikiki waterfront where such viewing was possible, especially for disabled persons (the groins and rock jetties are not accessible and are subject to overtopping by waves). Placing a beach there would eliminate that unique resource."

iii. Accessible pathways:
   1. "The existing walkways are too narrow to permit two way pedestrian traffic, and should be increased in width to a minimum of 10" clear width to meet the spirit of accessible pathways laws and allow groups of pedestrians the ability to pass one another."
   2. "Access to the waterfront does not currently meet the American Disability Act, and must be provided, as the improvements are public in nature, using public funds."

Response: Creating a new beach in the Halekūlani beach sector will enhance lateral shoreline access in Waikīkī. We are also evaluating options to incorporate a beach walkway into the overall design and will continue looking into matter in the DPEIS. We will be consulting with the Hawaiʻi Disability and Communication Access Board (DCAB). We acknowledge your concerns regarding potential impacts to existing view planes along the shoreline. We feel that the proposed actions will expand and enhance view planes in Waikīkī.

d. Sea Level Rise
   i. "As oceans rise, the proposed beaches will erode more rapidly each year. The beaches will require increasing amounts of sand to be placed in order to maintain dry sand. In order for that to happen a foundation of sand will need to be maintained and expanded, each time increasing the environmental impacts of placing the sand there in the first place."

Response: The Waikīkī Beach Improvement and Maintenance Program consists of *beach improvement* actions and *beach maintenance* actions. *Beach improvements* refers to actions that involve adding new sand, adding new structures, and/or modifying existing structures. *Beach maintenance* refers to actions that involve using existing sand or adding sand with no new structures or modification of existing structures.

The proposed *beach improvement* actions in the Halekūlani beach sector and the ʻEwa (west) basin of the Kūhiō beach sector are designed to create a stable beach profile. The designs account for 1.5 ft of sea level rise and can be adapted to accommodate up to 2.7 ft of sea level rise. We anticipate that the beaches would be stable and periodic renourishment would not be required.

The proposed *beach maintenance* action in the Fort DeRussy beach sector is sand backpassing, which would involve recovering existing sand from the accreted area at the west end of the beach and placing it in the eroded area at the east end of the beach. Sand would be excavated from the beach face extending inshore only as far as necessary to obtain the required volume of sand. The proposed action would not require offshore dredging and there would be no increase in the volume of sand in the littoral system.

The proposed *beach maintenance* action in the Diamond Head (east) basin of the Kūhiō beach sector is sand pumping, which would involve recovering approximately 4,500 cy of existing sand from within the basin onto the dry beach. The proposed action would not require offshore dredging and there would be no increase in the volume of sand in the basin.

The proposed *beach maintenance* action in the Royal Hawaiian beach sector is beach nourishment, which would involve recovering approximately 25,000 cy of sand from the *Canoes/Queens* offshore sand deposit and placing it on the beach. This is the only action proposed that would require periodic renourishment to maintain the beach at its 1985 location. The *Canoes/Queens* offshore sand deposit consists of sand that has eroded from Royal Hawaiian Beach. This sand source has been used in previous beach nourishment projects in 2012 and 2021. Reusing this sand on a periodic basis would not increase in the volume of sand in the littoral system.

For more information about anticipated project lifespans, please see Section 3.3 of the DPEIS. The potential impacts of the proposed actions are discussed in Sections 8 and 9 of the DPEIS. The cumulative and secondary impacts of the proposed actions are discussed in Sections 10 and 11 of the DPEIS, respectively.

ii. "The seawalls that currently front the Halekulani and Sheraton hotels are not subjects of the proposed projects, however they are in a degraded condition, and are integral to the objective of providing pedestrian access between the Ft. DeRussy and Royal Hawaiian beaches. At some point those seawalls will be too low to prevent overtopping of waves, as is already apparent at Grays Beach, where the sand is already piling 3'-4' above the Hau Tree Terrace lawn and patio elevations."

Response: The DLNR does not regulate land uses mauka (landward) of the shoreline in Waikīkī. Responsibility for regulation and permitting rests with the City and County of Honolulu.

Furthermore, the existing seawalls are privately-owned structures and are located outside of the Conservation District.

iii. "Sandbags have been placed at the Sheraton's beach services concessions to allow the sand to build up higher than the paved areas and walkways leading to Kalia St. Therefore it would be better to rebuild the seawalls as a more practical response to rising sea levels."

Response: The DLNR does not regulate land uses mauka (landward) of the shoreline in Waikīkī. Responsibility for regulation and permitting rests with the City and County of Honolulu. Furthermore, the existing seawalls are privately-owned structures and are located outside of the Conservation District.

iv. "The design of the T-groins was proposed years ago (draft April 2000) as part of recommendations for beach improvements. As part of that proposal hydrodynamic modeling was not done, and so far the only information that has been presented appears to be based upon the opinions of the project proposers. Considering that the subject waterfront is such a critical resource for the State and the County's economy, physical modeling the proposed designs is essential to prevent unintended consequences, especially as sea levels rise."

Response: Please see previous response to comment 1.b.ii regarding the detailed wave modeling that was conducted to evaluate the potential for the proposed actions to impact waves, currents, and surf sites in Waikīkī.

2. Regarding the portion of the shoreline between Halekulani and Ft. DeRussy, which is referred to herein as the "Outrigger shoreline", and differs from the subject shoreline in the following respects:
   i. "Sandy beach has been present for many decades;
   ii. Shoreline properties are not fronted by seawalls;
   iii. Paved shoreline pathways have never been in place.
   iv. Buildings are closer to the shoreline"
   a. "Because of the above points it may make more sense to treat the Outrigger shoreline as a part of the Ft. DeRussy shoreline than the subject shoreline."

      Response: We acknowledge the differences you note between the east and west ends of the Halekūlani beach sector. We defined the beach sector based on the physical processes and structures that affect beach stability along this portion of the shoreline. For more information about how the beach sector boundaries were determined, please see Section 2.5 of the DPEIS.

b. Likely environmental impacts of placing new fill:

i. "The top of pavement elevation of the walkway dividing Ft. DeRussy and the Aston Waikiki Shore was measured at 40" above the water level at the storm drain grates in that walkway. The existing beach sand at the makai edge of pavement is higher than the walkway by over one foot currently. Waves already overtop the sand and wash down the walkway during high tides and moderately large swells."

Response: Increasing dry beach width and elevation at the east end of the Fort DeRussy beach sector is anticipated to dissipate wave energy and reduce the frequency of wave inundation in this area. We acknowledge that, as sea levels continue to rise, additional actions may be required to address wave inundation in this area.

ii. "As the beach fill responds to currents and waves, the slope of the resulting beach will steepen (as evidences by the steep slopes at the Moana shoreline, and increase backwash towards the Three's surfbreak."

Response: Please see previous response to comment 1.b.ii regarding the detailed wave modeling that was conducted to evaluate the potential for the proposed actions to impact waves, currents, and surf sites in Waikīkī.

c. Pedestrian access issues:

i. "in order to provide ADA accessible travel in front of the Outrigger, a concrete sidewalk supported by a retaining wall foundation would be ideal, thus providing both access and protection. Therefore it would seem that it is an opportunity to construct the pathway as part of protecting the Outrigger's shoreline."

ii. "Walkways leading from Saratoga St. to the shoreline are ADA accessible, so making the shoreline pathway accessible is a simple matter."

Response: Creating a new beach in the Halekūlani beach sector would enhance lateral shoreline access in Waikīkī. We are also evaluating options to incorporate a beach walkway into the overall design and will continue looking into this matter in the DPEIS. We will be consulting with the Hawaiʻi Disability and Communication Access Board (DCAB).

d. Sea level rise:

i. "Due to the location of Outrigger, waves already break against the makai exterior walls of the hotel. As sea levels rise, sand placed in front of the hotel will not stop wave action from washing the sand away, as evidenced by sandbags placed at the Moana Surfrider's Banyan Tree Terrace, and at Grays Beach access walkway. The seaward wall of the Outrigger will reflect wave energy back towards the sea taking the sand with it."

ii. "In recognition of the fact that waves already wash down the walkways leading to Kalia St, pushing sand inland, alternatives to beach renourishment should be prioritized."

Response: Increasing dry beach width and elevation in the Halekūlani beach sector is anticipated to dissipate wave energy and reduce the frequency of wave inundation in this area. We do not anticipate that the existing seawalls and buildings will be exposed to wave action. Furthermore, the proposed T-head groins and sand fill are designed to be stable. A similar design was implemented at Iroquois Point, Oʻahu in 2013. We note that the beach at Iroquois Point has been stable since that time and the existing structures in the backshore have not been exposed to wave action.

3. Alternative proposal
   a. "In the Project Objectives in this paper's introduction, objective #3 is "Providing safe access to and along the shoreline." As this access is not discussed in the EIS Preparation Notice, I am proposing an alternative design that seeks to address that objective. In addition, my proposed alternative design is intended to address all of the Project Objectives 1-4.
   b. "Alternative Project Description (see Exhibits B-1 through B-5)
      i. Access
         1. The project would focus on reestablishing public access to the shoreline by creating an ADA accessible pathway by improving the existing pathways fronting the Halekulani and Sheraton hotels. A new 10' walkway would cantilever over the water at the same elevation of that fronting the Sheraton (approx. +7' MSL) supported by new stone buttresses placed perpendicular to the existing seawall (see Exhibit B-1). The walkway structure would span between the existing Royal Hawaiian groin to Grays beach, and from Gray's beach to the Outrigger shoreline.
         2. The walkway would be constructed as a horizontal tubular truss, fabricated from corrosion-resistant materials, and finished with a pedestrian traffic surface, and fitted with guardrails that minimize visual obstruction, and are also corrosion resistant (see Exhibit B-2). The walkway would tie into the Sheraton's pool deck pathways on the east end, and the Grays beach access pathway, and continue westward along the Halekulani shoreline frontage.

3. At the Outrigger shoreline, a walkway that also acts as a seawall (no illustration provided) would be placed against the hotel seaward wall with a walkway elevation higher than the existing aforementioned walkways accessing Kalia St."

ii. "Seawall protection
   1. The walkway structure would be engineered to mount equipment that would reduce the energy of wave action. The equipment could be used to absorb wave energy and convert it into electric or thermal energy. The energy produced could be used for operating pumps (such as to reduce water levels in the storm drains) or lighting along the walkways and shoreline parks.
   2. The energy-conversion technologies (ECTs) would be mounted below the walkway and remain largely unseen except from beyond the shoreline, and placed close to the seawalls to minimize intrusion into the ocean. The devices must not introduce threats to marine life or be an attractive nuisance for children and tourists. The ECTs must be virtually silent, quiet on land and in the water.
   3. Possible technologies include piezoelectric elements, geared levers, pneumatics, or others. Repairs and upgrades to the ECTs would be simple as the entire array of equipment would be accessible from the walkway. No element of the ECTs would be founded or mounted in seafloor or reef, and clearance from reef or seafloor would be a minimum of 12", with large enough spaces to allow the passing of large sea turtles below and beside the devices. Electric cables or pneumatic hoses would be mounted on the underside of the walkway."

iii. "Sea level rise
   1. Mounted at the elevation of the existing walkway (+7' MSL) at the Sheraton, the walkway and the seawall protection + ECTs should have a long useful lifetime, as it should be high enough to accommodate over 12" of sea level rise."

Response: Thank you for suggesting an additional alternative for the Halekūlani beach sector. We appreciate the time and effort you put into describing the alternative and the renderings you developed. We note that this alternative would require removal of the existing seawalls. The DLNR does not regulate land uses mauka (landward) of the shoreline in Waikīkī. Responsibility for regulation and permitting rests with the City and County of Honolulu. Furthermore, the existing seawalls are privately-owned structures and are located outside of the Conservation District.

The alternative you propose has the potential to provide safe lateral access along the shoreline. However, we have concerns about potential risks to public health, safety, and welfare if ocean users and/or marine species were to enter the area under the walkway. Furthermore, the alternative you propose would not achieve the program objectives to restore and improve the beaches and increase beach stability in Waikīkī. The proposed beach improvement action in the Halekūlani beach sector is designed to account for 1.5 ft of sea level rise and can be adapted in the future to accommodate up to 2.7 ft of sea level rise.

Thank you for taking the time to review and comment on the EISPN. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement.

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

Waikiki Shore AOAO, Inc.

2161 Kalia Road
Honolulu, HI 96815
(808) 923-7245
aoao@waikikishoreapts.com

January 21, 2021

TO:
Sam Lemmo, Administrator
Office of Conservation and Coastal Lands
Department of Land and Natural Resources, State of Hawaii
1151 Punchbowl Street, Room 131
Honolulu, Hawaii 96813

David Smith, Ph.D., P.E.
Sea Engineering, Inc.
Makai Research Pier
41- 305 Kalaniana'ole Highway
Waimanalo, Hawaii 96795

FROM:
Waikiki Shore Apartments Board of Directors and General Manager
2161 Kalia Road
Honolulu, Hawaii 96815

SUBJECT: Environmental Impact Statement Preparation Notice (EISPN) for the Waikīkī Beach Improvement and Maintenance Program, Waikīkī Beach, Oahu

The Waikiki Shore Apartments Board of Directors and General Manager **strongly supports** the proposed Waikīkī Beach Improvement and Maintenance Program by the Hawaiʻi Department of Land and Natural Resources (DLNR). In fact, we have become increasingly more involved in discussions with neighboring property managers and business owners about the degradation of Waikiki Beach due to these erosion and flooding problems, as they are increasing in severity. It is apparent that the remedies require government intervention, and we thank you for this important proposed program to save Waikiki Beach.

Over the past several years, and as recently as November of 2020, Waikiki has experienced record high tides (King Tides) that have exacerbated erosion and flooding. These events have highlighted the impacts of sea level rise on the beaches of Waikīkī. As sea levels continue to rise, beach loss will progressively degrade the recreational, social, cultural, environmental, aesthetic, and economic value of Waikīkī. After nearly 50 years of no new beach stabilization projects in Waikīkī, we are now at a crossroads with a clear and increasingly urgent need to implement maintenance and improvements to the shoreline in order to preserve and protect this unique and highly prized natural resource.

We cannot over emphasize the importance of these improvement projects and or their urgency. With the combination of beach erosion and King Tides, the backshore is frequently flooded, particularly during high surf events, accelerating damage to backshore infrastructure. Without beach improvements and maintenance, sea level rise is likely to result in total beach loss in Waikīkī before the end of the century and result in an estimated economic loss of $50 million to $150 million per hectare[1]. The loss of Waikīkī Beach alone would result in an annual loss of $2.223 billion in visitor expenditures[1]. Improvements and maintenance like those proposed in the EISPN are necessary to restore and maintain the beaches of Waikīkī to continue to support Hawaii's tourism-based economy.

We offer the following summary of project-specific comments.

1. The proposed beach improvement projects in Waikīkī are essential for the future goal to maintain a viable beach in these areas. Several beachfront areas in Waikīkī are seeing the rapid deterioration of both public and private backshore infrastructure such as groins, seawalls and walkways. This highlights the need to make long-term investments into beach stabilizing structures throughout Waikīkī in addition to more immediate emergency repairs to damaged infrastructure.

---

[1] Tarui, N., Peng, M., Eversole, D. (2018). *Economic Impact Analysis of the Potential Erosion of Waikīkī Beach*. University of Hawai'i Sea Grant College Program. April 2018.

2. Climate change impacts including sea-level rise projected by the state of Hawai'i Climate Change Commission indicate significant flooding, wave overtopping and beach erosion in Waikīkī for the coming decades and suggest stakeholders and communities plan for 3.2 feet of sea-level rise now. This project has a strong climate change adaption component that is consistent with the recommendations of the State Climate Commission.

3. Without a stabilizing and energy-buffering beach to protect public and private coastal infrastructure, the WBSIDA anticipates even larger and more expensive structural repair and improvement projects to be required soon to prevent the destruction of threatened coastal structures.

Sincerely,

Bob Warren, President, Board of Directors of Waikiki Shore Apartments

Randy Ahlo, General Manager, Waikiki Shore Apartments

CC:
Office of the Mayor, Rick Blangiardi, 530 South King Street, Room 300, Honolulu, HI 96813
Office of the Mayor, Sam Moku, 530 South King Street, Room 300, Honolulu, HI 96813
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Halekulani Corporation, Patricia Tam, 2199 Kalia Road, Honolulu, HI 96815
Outrigger Reef Waikiki Beach Resort, Carly Clement, carly.clement@outrigger.com

CC:
Outrigger Hospitality Group, Bob Berges, bob.berges@outrigger.com
Embassy Suites by Hilton, Simeon Miranda, simeon.miranda@embassysuiteswaikiki.com
Hilton Grand Vacations, Robert Ishihara, Robert.ishihara@hgv.com

DAVID Y. IGE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

June 4, 2021

Bob Warren, President
Randy Ahlo, General Manager
Waikiki Shore Apartments
2161 Kalia Road
Honolulu, HI 96815

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Warren and Mr. Ahlo:

Thank you for your comment letter dated January 22, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you state that you strongly support the proposed beach improvement and maintenance actions. As the Applicant, the Hawaiʻi Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

We recognize that you provided three project-specific comments, all in support of the proposed actions. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement (DPEIS).

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 11TH FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8480 • Fax: (808) 768-4567
Web site: www.honolulu.gov

RICK BLANGIARDI
MAYOR

ALEX KOZLOV, P.E.
DIRECTOR DESIGNATE

HAKU MILLES, P.E.
DEPUTY DIRECTOR

January 28, 2021

SENT VIA EMAIL

Mr. Andy Bohlander
waikiki@seaengineering.com

Dear Mr. Bohlander,

Subject: Environmental Impact Statement Preparation Notice
Waikiki Beach Improvement and Maintenance Program
Kona District, Island of Oahu

Thank you for the opportunity to review and comment. The Department of Design and Construction's Facilities Division has the following comment.

> The proposed project to restore and stabilize these severely eroded beaches will allow the reopening of 141A and improve conditions at existing lifeguard stands. These City improvements have all been severely impacted by the loss of beach area. We fully support this project as the major benefits it will provide to existing City facilities.

Should you have any further questions, please contact me at 768-8480.

Sincerely,

For Alex Kozlov, P.E.
Director

AK:cf (836346)

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2021

Alex Kozlov, P.E.
Department of Design and Construction
City and County of Honolulu
650 South King Street, 11th Floor
Honolulu, HI 96813

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Kozlov:

Thank you for your comment later dated January 28, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you summarized your consideration of and comments for the proposed actions. As the Applicant, the Hawaiʻi Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

We recognize that you provided comments in support of the proposed actions. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement (DPEIS).

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

OUTRIGGER®
HOSPITALITY GROUP

January 5, 2021

TO:
Sam Lemmo, Administrator
Office of Conservation and Coastal Lands
Department of Land and Natural Resources, State of Hawaii
1151 Punchbowl Street, Room 131
Honolulu, Hawaii 96813

FROM:
Mike Shaff, Vice President Hotel Operations - Hawaii/Guam
Outrigger Hotels Hawaii
2375 Kuhio Avenue
Honolulu, Hawaii 96815

SUBJECT: Environmental Impact Statement Preparation Notice (EISPN) for the Waikīkī Beach Improvement and Maintenance Project. Waikīkī Beach, Oahu

Outrigger Hotels Hawaii **strongly supports** the proposed beach improvement projects by the Hawai'i Department of Land and Natural Resources (DLNR), including the construction of new beach stabilization structures and replenishing the shoreline between Fort DeRussy and Kūhiō beach sectors of Waikīkī. These projects are intended to restore and improve Waikīkī's public beaches, increase beach stability through improvement and maintenance of shoreline structures, provide safe access to and along the shoreline, and increase resilience to coastal hazards and sea level rise. The proposed actions are intended to maintain the economic, social, aesthetic, recreational, environmental, cultural, and historical qualities of Waikīkī.

As sea levels continue to rise, beach loss will progressively degrade the recreational, social, cultural, environmental, aesthetic, and economic value of Waikīkī unless something is done soon. After nearly 50 years of no new beach stabilization projects in Waikīkī, we are now at a crossroads with a clear and increasingly urgent need to implement maintenance and improvements to the shoreline in order to preserve and protect this unique and highly prized natural resource.

We strongly support these improvement projects and recognize its urgency. With the combination of beach erosion and King Tides, the backshore is frequently flooded, particularly during high surf events, accelerating damage to backshore infrastructure. Without beach improvements and maintenance, sea level rise is likely to result in total beach loss in Waikīkī before the end of the century and result in an estimated economic loss of $50 million to $150 million per hectare[1]. The loss of Waikīkī Beach alone would result in an annual loss of $2.223 billion in visitor expenditures[1]. Improvements and maintenance like those proposed in the EISPN are necessary to restore and maintain the beaches of Waikīkī to continue to support Hawaii's tourism-based economy.

We offer the following summary:

1. Outrigger's DNA is built on caring for the guest, the host, and the place. As a premier beach resort brand, our link to the ocean and shoreline is unbreakable and we see its stewardship as a responsibility that's deeply aligned with caring for the place.

2. Over the years, Outrigger has partnered with other organizations that share the same ideals, such as the Waikiki Aquarium, NOAA (National Oceanic and Atmospheric Administration), Sustainable Coastlines, Surfrider Foundation and PacIOOS (Pacific Islands Ocean Observing System). In 2014, Outrigger formally created an environmental platform, called OZONE (Outrigger's ZONE), as a global conservation initiative centered on coral health and resiliency in the world's oceans, with special focus on the waters that surround the iconic beach destinations of Outrigger Resorts around the world, including Waikīkī.

3. The proposed beach improvement projects in Waikīkī are essential for the future goal to maintain a viable beach in these areas. Several beachfront areas in Waikīkī are seeing the rapid deterioration of both public and private backshore infrastructure such as groins, seawalls and walkways. This highlights the need to make long-term investments into beach stabilizing structures throughout Waikīkī in addition to more immediate emergency repairs to damaged infrastructure.

4. Climate change impacts including sea-level rise projected by the state of Hawai'i Climate Change Commission indicate significant flooding, wave overtopping and beach erosion in Waikīkī for the coming decades and suggest stakeholders and communities plan for 3.2 feet of sea-level rise now. This project has a strong climate change adaption component that is consistent with the recommendations of the State Climate Commission.

5. Without a stabilizing and energy-buffering beach to protect public and private coastal infrastructure, the WBSIDA anticipates even larger and more expensive structural repair and improvement projects to be required soon to prevent the destruction of threatened coastal structures.

Thank you for the opportunity to provide comments on this project.

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[1] Tarui, N., Peng, M., Eversole, D. (2018). *Economic Impact Analysis of the Potential Erosion of Waikīkī Beach.* University of Hawai'i Sea Grant College Program. April 2018.

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
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ROBERT K. MASUDA
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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
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HONOLULU, HAWAII 96809

June 4, 2021

Mike Schaff, Vice President Hotel Operations – Hawaii/Guam
Outrigger Hotels Hawaii
2375 Kuhio Avenue
Honolulu, HI 96815

SUBJECT: Response to Environmental Impact Statement Preparation Notice (EISPN) Comment Letter on the Waikīkī Beach Improvement and Maintenance Program

Dear Mr. Schaff:

Thank you for your comment later dated January 5, 2021 regarding the Waikīkī Beach Improvement and Maintenance Program Environmental Impact Statement Preparation Notice (EISPN). In your letter you state that you strongly support the proposed beach improvement and maintenance actions. As the Applicant, the Hawai‘i Department of Land and Natural Resources (DLNR) is pleased to provide the following responses to your comments.

We recognize that you provided five project-specific comments, all in support of the proposed actions. We look forward to any additional comments you may have on the Draft Programmatic Environmental Impact Statement (DPEIS).

Should you have any questions pertaining to this letter, please contact Sam Lemmo, Administrator of the DLNR Office of Conservation and Coastal Lands at 808-587-0377.

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

FINAL PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

Waikīkī Beach Improvement and Maintenance Program

October 2024

Prepared for:
Hawai‘i Department of Land and Natural Resources
Office of Conservation and Coastal Lands
1151 Punchbowl Street, Suite 131
Honolulu, Hawai‘i 96813

Partnered with:
Waikīkī Beach Special Improvement District Association
2250 Kalākaua Ave. Suite 315
Honolulu, Hawai‘i 96815

Prepared by:
Sea Engineering, Inc.
Makai Research Pier
41-305 Kalaniana‘ole Hwy
Waimānalo, Hawai‘i 96795

APPENDIX H

EIS Public Scoping Meeting Summary

Prepared By: Sea Engineering, Inc.

Waikīkī Beach Improvement and Maintenance Program

EIS PUBLIC SCOPING MEETING

Pursuant to Chapter §11-200.1-23(d), Hawai‘i Administrative Rules (HAR), no fewer than one EIS public scoping meeting addressing the scope of the draft EIS shall be held on the island or islands most affected by the proposed action, within the public review and comment period in subsection (c). The EIS public scoping meeting shall include a separate portion reserved for oral public comments and that portion of the EIS public scoping meeting shall be audio recorded. Pursuant to Chapter §11-200.1-24(s)(4), HAR, this document provides a summary of the EISPN public scoping meeting, including a copy of the meeting announcement and a written general summary of the oral comments made.

A public scoping meeting was held during the EISPN 30-day public comment period. The purpose of the public scoping meeting was to provide agencies, citizen groups, and the public with an opportunity to assist the proposing agency in determining the range of actions, alternatives, impacts, and proposed mitigation measures to be considered in the Draft Programmatic Environmental Impact Statement (DPEIS) and the significant issues to be analyzed in depth in the DPEIS. The public scoping meeting included a separate portion reserved for oral comments and that portion of the public scoping meeting was audio recorded.

MEETING SUMMARY

Date:	January 7, 2021
Time:	2pm to 5pm
Location:	Virtual

The meeting link was made available to the public via press release on December 24, 2020.
https://zoom.us/j/94554967228

The video recording of the EIS public scoping meeting is available at:
https://www.youtube.com/watch?v=1hd0iLCCqp4&t=2348s

The audio recording of the EIS public scoping meeting is available at:
https://seaengineering-my.sharepoint.com/:u:/p/abohlander/ESvYYRGZsWlKvC4oin2auI4BSujKI3yFjODag8vMxebDGQ?e=TBfddh

Additional information about the EIS was provided on the project website at:
https://dlnr.hawaii.gov/occl/waikiki/

SUMMARY OF ORAL COMMENTS RECEIVED

Valerie Haney

- Snowbird of Waikīkī Shores for many years.
- Expressed excitement that the program has come to this point.
- Wholeheartedly agree with the program.
- Sad to see degradation of Waikīkī Beach which has been occurring for many years.
- First comprehensive beach plan she has seen, situation is critical.
- Maintenance and improvement program is mandatory if we want to save Waikīkī Beach.

Vaneeta Acson

- Author of "Waikīkī: Nine Walks Through Time"
- When original 1983 version was published, she could walk along the beach in Waikīkī.
- When updated 2003 version was published, she could barely walk along the beach.
- Expressed that this program is of the utmost importance.
- Offered to join a committee to help.

Mike Shaff

- Vice President, Hotel Operations Waikīkī & Guam at Outrigger Hotels & Resorts
- Outrigger is excited about the program and strongly supports it.
- Beaches are vital part of Waikīkī as a destination.
- Outrigger has 2 beachfront properties in Waikīkī.
- Infrastructure issues include aging structures and sinkholes.
- No continuous access along Waikīkī Beach.
- Not safe to traverse the beach in the Halekūlani beach sector during King Tides.
- Not having beaches would be problematic for the economy.

Cynthia Farias

- Attorney with Cox Wootton Lerner.
- Asked if a copy of the presentation would be made available to the public.

Making Hawai`i a Great Place to Live!

Department of Land and Natural Resources

Ka ʻOihana Kumuwaiwai ʻĀina

12/24/20-EISPN SCOPING MEETING FOR THE WAIKĪKĪ BEACH IMPROVEMENT AND MAINTENANCE PROGRAM

Posted on Dec 24, 2020 in Main, Media, News Releases, OCCL

DEPARTMENT OF LAND AND NATURAL RESOURCES
News Release

DAVID Y. IGE GOVERNOR	**SUZANNE D. CASE** CHAIRPERSON

For Immediate News Release: December 24, 2020

EISPN SCOPING MEETING FOR THE WAIKĪKĪ BEACH IMPROVEMENT AND MAINTENANCE PROGRAM

(Honolulu) – The beaches of Waikīkī are chronically eroding, and the backshore is frequently flooded, particularly during high tides and high surf events. Without beach improvements and maintenance, sea level rise is likely to result in total beach loss in Waikīkī long before the end of the century. The DLNR Office of Conservation and Coastal Lands (OCCL) will be holding a virtual scoping meeting next month regarding the Environmental Impact Statement Preparation Notice (EISPN) for the Waikīkī Beach Improvement and Maintenance Program.

Improvements and maintenance are necessary to restore and maintain the beaches of Waikīkī to continue to support Hawaii's tourism-based economy. The DLNR proposes beach improvement and maintenance projects in the Fort DeRussy, Halekulani, Royal Hawaiian, and Kūhiō Beach sectors of Waikīkī. Projects would include the construction of new beach stabilization structures, and the recovery of offshore sand and its placement on the shoreline. The objectives of the proposed actions are to restore and improve Waikīkī's community beaches, increase beach stability through improvement and maintenance of shoreline structures, provide safe access to and along the shoreline, and increase resilience to coastal hazards and sea level rise.

The EISPN for this project has been published in the Office of Environmental Quality Control's, *The Environmental Notice,* since yesterday, December 23, 2020 and comments are currently being solicited until January 22, 2021. Comments may be emailed to: waikiki@seaengineering.com .

The scoping meeting for the EISPN is on January 7, 2021 and will commence at 2:00 pm.

The webinar link is: https://zoom.us/j/94554967228

For further information, contact the Office of Conservation and Coastal Lands at (808) 587-0377.

# # #

For more information regarding this project: https://dlnr.hawaii.gov/occl/waikiki/

Media contact:

AJ McWhorter
Communications Specialist
Hawai'i Department of Land and Natural Resources
dlnr.comms@hawaii.gov
808-587-0396 (Communications Office)

DAVID Y. IGE
GOVERNOR OF
HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
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CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

REF:OCCL:SL

Waikīkī EISPN

December 22, 2020

SUBJECT: Environmental Impact Statement Preparation Notice
Waikīkī Beach Improvement and Maintenance Program
Kona District, Island of Oʻahu

Dear Participant:

On behalf of the Department of Land and Natural Resources, the Office of Conservation and Coastal Lands (OCCL) would like to notify you that the Environmental Impact Statement Preparation Notice (EISPN) for the Waikīkī Beach Improvement and Maintenance Program located at Waikīkī Beach, Kona District, Island of Oʻahu, Hawaiʻi will be available for public review and comment from December 23, 2020 to January 22, 2021.

For ease of sharing and to facilitate access, the document can be downloaded on or after December 23, 2020 from the website of the Office of Environmental Quality Control https://health.hawaii.gov/oeqc/ through *The Environmental Notice* December 23, 2020 publication. The deadline for comments is January 22, 2021.

Written comments may be submitted via email or U.S. mail:

Andy Bohlander
Sea Engineering, Inc.
Makai Research Pier
41-305 Kalanianaʻole Hwy.
Waimānalo, HI 96795

OR

Email: waikiki@seaengineering.com

For more information regarding this project go the Office of Conservation and Coastal Lands website at https://dlnr.hawaii.gov/occl/waikiki/ .

~~Sincerely,~~

Sam Lemmo, Administrator
Office of Conservation and Coastal Lands

Attachments: Project Area Map
Publication Information

AGENCY
PUBLICATION FORM

Project Name:	Waikīkī Beach Improvement and Maintenance Program
Project Short Name:	Waikīkī Beach Improvement and Maintenance Program
HRS §343-5 Trigger(s):	Use of State lands, Use of Conservation District, Shoreline area, Proposed use in Waikiki
Island(s):	O'ahu
Judicial District(s):	Honolulu
TMK(s):	Seaward of: (1) 2-6-001:003, (1) 2-6-004:007, (1) 2-6-005:001, (1) 2-6-008:029, (1) 2-6-002:026, (1) 2-6-001:019, (1) 2-6-004:012, (1) 2-6-002:017, (1) 2-6-001:013, (1) 2-6-001:012, (1) 2-6-001:002, (1) 2-6-001:015, (1) 2-6-001:008, (1) 2-6-004:006, (1) 2-6-004:005, (1) 2-6-001:017, (1) 2-6-004:008, (1) 2-6-004:009, (1) 2-6-004:010, (1) 2-6-001:018, (1) 2-6-005:006, (1) 2-6-001:004, (1) 2-6-002:006, (1) 2-6-002:005
Permit(s)/Approval(s):	Conservation District Use Permit Clean Water Act Section 401 Water Quality Certification Coastal Zone Management Act Consistency Determination Department of the Army Permit (Section 10 and Section 404) Special Management Area Permit
Proposing/Determining Agency:	Department of Land and Natural Resources Office of Conservation and Coastal Lands
Contact Name, Email, Telephone, Address	Samuel Lemmo, Administrator sam.j.lemmo@hawaii.gov (808) 587-0377 1151 Punchbowl St., Room 131 Honolulu, HI 96813
Accepting Authority:	Governor, State of Hawai'i
Contact Name, Email, Telephone, Address	The Honorable David Y. lge, Governor (808) 586-0034 http://governor.hawaii.gov/contact-us/contact-the-governor/ Executive Chambers State Capitol 415 South Beretania St. Honolulu, Hawai'i 96813
Consultant:	Sea Engineering, Inc.
Contact Name, Email, Telephone, Address	David A. Smith, PhD, PE dsmith@seaengineering.com (808) 259-7966 ext. 30 41-305 Kalanianaole Highway Waimanalo, Hawai'i 96795

Status (select one)	**Submittal Requirements**
____ DEA-AFNSI	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEA, and 4) a searchable PDF of the DEA; a 30-day comment period follows from the date of publication in the Notice.
____ FEA-FONSI	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; no comment period follows from publication in the Notice.
____ FEA-EISPN	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; a 30-day comment period follows from the date of publication in the Notice.
_X_ Act 172-12 EISPN ("Direct to EIS")	Submit 1) the proposing agency notice of determination letter on agency letterhead and 2) this completed OEQC publication form as a Word file; no EA is required and a 30-day comment period follows from the date of publication in the Notice.

____ DEIS	Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEIS, 4) a searchable PDF of the DEIS, and 5) a searchable PDF of the distribution list; a 45-day comment period follows from the date of publication in the Notice.
____ FEIS	Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEIS, 4) a searchable PDF of the FEIS, and 5) a searchable PDF of the distribution list; no comment period follows from publication in the Notice.
____ FEIS Acceptance Determination	The accepting authority simultaneously transmits to both the OEQC and the proposing agency a letter of its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS; no comment period ensues upon publication in the Notice.
____ FEIS Statutory Acceptance	Timely statutory acceptance of the FEIS under Section 343-5(c), HRS, is not applicable to agency actions.
____ Supplemental EIS Determination	The accepting authority simultaneously transmits its notice to both the proposing agency and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is or is not required; no EA is required and no comment period ensues upon publication in the Notice.
____ Withdrawal	Identify the specific document(s) to withdraw and explain in the project summary section.
____ Other	Contact the OEQC if your action is not one of the above items.

Project Summary

Waikīkī Beach extends along the shoreline of Mamala Bay on the south shore of the island of Oʻahu, Hawaiʻi. The beaches of Waikīkī are chronically eroding, and the backshore is frequently flooded, particularly during high tides and high surf events. As the beaches continue to erode, a process that is likely to accelerate as sea levels continue to rise, the shoreline will migrate further landward. Without beach improvements and maintenance, sea level rise is likely to result in total beach loss in Waikīkī before the end of the century. The loss of Waikīkī Beach would result in an annual loss of $2.223 billion in visitor expenditures (Tarui, et al. 2018). Improvements and maintenance are necessary to restore and maintain the beaches of Waikīkī to continue to support Hawaii's tourism-based economy. The Hawaiʻi Department of Land and Natural Resources proposes beach improvement and maintenance projects in the Fort DeRussy, Halekulani, Royal Hawaiian, and Kūhiō Beach sectors of Waikīkī. Projects would include the construction of new beach stabilization structures, and the recovery of offshore sand and its placement on the shoreline. The objectives of the proposed actions are to restore and improve Waikīkī's public beaches, increase beach stability through improvement and maintenance of shoreline structures, provide safe access to and along the shoreline, and increase resilience to coastal hazards and sea level rise.

WBSIDA Waikīkī Beach SPECIAL IMPROVEMENT DISTRICT ASSOCIATION

PROJECT AREA

Waikīkī Beach Improvement and Maintenance Program

Environmental Impact Statement Preparation Notice (EISPN)

Honolulu, O'ahu, Hawai'i