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DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

DLNR:OCCL:NF

Correspondence OA-17-96

MEMORANDUM

DEC 12 2016

DEC 23 2016

FILE COPY

To: Mr. Scott Glenn, Director
Office of Environmental Quality Control

From: Suzanne D. Case, Chairperson
Board of Land and Natural Resources

Subject: Draft Environmental Assessment for the Proposed Hawaii Kai Marina Entrance Channel Groin Replacement Project Located at Maunalua Bay, Oahu; Tax Map Key: Seaward of (1) 3-9-008:035

The Department of Land and Natural Resources has reviewed the Draft Environmental Assessment (EA) for the proposed project and anticipates a Finding of No Significant Impact determination. Please publish notice of this project in the **December 23, 2016** issue of the *Environmental Notice*.

We have enclosed the applicant's completed OEQC Bulletin Publication Form, one (1) hard copy of the Draft EA, and one (1) CD with a PDF of the Draft EA. Simultaneous with this letter, a Microsoft Word copy of the OEQC Bulletin Publication Form will be submitted via electronic mail to your office.

Should you have any questions, please contact Natalie Farinholt in the Office of Conservation and Coastal Lands at (808)587-0399 or via email at Natalie.A.Farinholt@Hawaii.gov.

Enclosures: *OEQC Bulletin Publication Form (hard copy)*
One (1) CD with a PDF of the Draft EA
One (1) hard copy of the Draft EA

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#17-275

APPLICANT
PUBLICATION FORM

DEC 23 2016
FILE COPY

Project Name:	Hawaii Kai Marina Entrance Channel Groin Replacement
Project Short Name:	Hawaii Kai Marina Groin Replacement
HRS §343-5 Trigger(s):	Use of state lands – Section 343-5(a)(1), HRS Use of conservation district – Section 343-5(a)(2), HRS
Island(s):	Oahu
Judicial District(s):	Honolulu
TMK(s):	Seaward of (1) 3-9-008:035
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) SMA – Major (pending shoreline certification)
Approving Agency:	Department of Land and Natural Resources Office of Conservation and Coastal Lands
Contact Name, Email, Telephone, Address	Natalie Farinholt, Coastal Lands Program Specialist natalie.a.farinholt@hawaii.gov (808) 587 – 0399 1151 Punchbowl St., Room 131 Honolulu, HI 96813
Applicant:	Hawaii Kai Marina Community Association
Contact Name, Email, Telephone, Address	Beverly Liddle, Marina Manager beverly@hawaiikaimarina.com (808) 396 – 2469 377 Keahole St. D-1C Honolulu, HI 96825
Consultant:	Sea Engineering, Inc.
Contact Name, Email, Telephone, Address	Derek Linsley, Ocean Engineer dlinsley@seaengineering.com (808) 259 – 7966 ext. 21 41-305 Kalanianaole Highway Waimanalo, HI 96795

Status (select one)	**Submittal Requirements**
__X__ DEA-AFNSI	Submit 1) the approving 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 approving 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 approving 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.
____ Act 172-12 EISPN ("Direct to EIS")	Submit 1) the approving 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 approving agency, 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 approving agency, 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 approving agency simultaneously transmits to both the OEQC and the applicant 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	The approving agency simultaneously transmits to both the OEQC and the applicant a notice that it did not make a timely determination on the acceptance or nonacceptance of the applicant's FEIS under Section 343-5(c), HRS, and therefore the applicant's FEIS is deemed accepted as a matter of law.
____ Supplemental EIS Determination	The approving agency simultaneously transmits its notice to both the applicant 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

Provide a description of the proposed action and purpose and need in 200 words or less.

The Hawaii Kai Marina Community Association proposes to replace the existing Hawaii Kai Marina entrance channel temporary sandbag groin with a stable, engineered rock rubble mound revetment and groin. The objective of the proposed project is to reduce the volume of sediment accumulation in the Hawaii Kai Marina entrance channel, thus increasing the time between maintenance dredging operations. The design is a rock rubble mound revetment and groin, a sloping uncemented structure built using boulder size rock. The proposed layout has an L-head configuration. To prevent flanking, the groin stem ties into an existing concrete rubble masonry (CRM) abutment on the Kalanianaole Highway Bridge via a rock rubble mound revetment.

Sand that accumulates on the Portlock Beach side of the groin will be mechanically backpassed to the east end of Portlock Beach, where erosion is threatening the backshore and private properties. This will take place on an as-needed basis (estimated to be approximately every 4 years) when the groin reaches its maximum sediment carrying capacity. Backpassing will be initiated during construction by moving 400 cubic yards of sand that has accumulated since reconstruction of the temporary sandbag groin in 2013.

DRAFT ENVIRONMENTAL ASSESSMENT
HAWAII KAI MARINA ENTRANCE CHANNEL
GROIN REPLACEMENT

Hawaii Kai, Oahu, Hawaii

December 2016

Prepared for:
Hawaii Kai Marina Community Association
377 Keahole St., D-1C
Honolulu, HI 96825

Prepared by:
Sea Engineering, Inc.
Makai Research Pier
Waimanalo, HI 96795

SEI Job No. 25455

ANTICIPATED FINDING OF NO SIGNIFICANT IMPACT (AFONSI) HAWAII KAI MARINA ENTRANCE CHANNEL GROIN REPLACEMENT, HAWAII KAI, OAHU, HAWAII

Approving Agency: Department of Land and Natural Resources
State of Hawaii
1151 Punchbowl Street, Room 131
Honolulu, Hawaii 96813

Proposed Action: The Hawaii Kai Marina entrance channel is located on the south shore of Oahu. The need to halt longshore sediment transport into the entrance channel has been apparent for some time. The marina and entrance channel were originally dredged in 1959, and subsequent maintenance dredging of the entrance channel occurred in 1981, 1985, 1988, 2004 and 2013. The dredging project in 2004 included the construction of a temporary sandbag groin to help stabilize the Portlock shoreline and minimize infilling of the channel. The condition of the temporary groin degraded significantly and it was reconstructed in 2013. Measurements of the beach toe location adjacent to the groin indicate that it is currently at its maximum sediment carrying capacity.

The Hawaii Kai Marina Community Association (HKMCA) proposes to replace the existing temporary entrance channel groin with a stable, engineered rock rubble mound revetment and groin. The objective of the proposed project is to reduce the rate of sediment accumulation in the entrance channel. This will increase the time between maintenance dredging operations necessary to keep the channel navigable.

The proposed action is a rock rubble mound revetment and groin, a sloping uncemented structure built using boulder size rock. The proposed layout has an L-head configuration, with a stem length of 180 feet and a head length of 50 feet. To prevent flanking, the groin stem ties into an existing concrete rubble masonry (CRM) abutment on the Kalanianaole Highway Bridge via a 60-foot long rock rubble mound revetment.

Sand that accumulates on the Portlock Beach side of the groin will be mechanically backpassed to the east end of Portlock Beach, where erosion is threatening the backshore and private properties. This will take place on an as-needed basis (estimated to be approximately every 4 years) when the groin reaches its maximum sediment carrying capacity. Sand backpassing will be initiated during construction by moving 400 cubic yards of sand that has accumulated since reconstruction of the temporary sandbag groin in 2013.

Determination: In accordance with the potential impacts outlined in Section 4 of the Draft Environmental Assessment (DEA), the provisions of Chapter 343 Hawaii Revised Statutes (HRS), and Hawaii Administrative Rules (HAR) §11-200 significance criteria, the Approving Agency, the Department of Land and Natural Resources (DLNR), State of Hawaii, is anticipated to make a Finding Of No Significant Impact (FONSI).

Basis for Determination: The project will not significantly alter or affect shoreline processes, wave-driven currents, circulation patterns, overall water quality, or offshore wave breaking. Construction activities will be designed so as to avoid and minimize impacts to marine biota so

far as practicable, and no long-term impacts to marine biota are anticipated. The new groin will be placed on existing nearshore sand and rubble bottom; thus, there will be no significant loss of marine habitat. Construction Best Management Practices (BMPs) will be used to avoid impacts to protected marine species and habitat. Construction can be expected to result in temporary disruption of beach use and recreational activities, and increased noise and short-term degradation of air quality from the operation of construction equipment. Localized increases in water turbidity may occur in the immediate area of construction activity; however, containment barriers and turbidity screens will be in place to control and minimize the area of impact.

Chapter 343, Hawaii Revised Statutes (HRS), and Hawaii Administrative rules (HAR) §11-200, establish certain categories of action that require the agency processing an applicant's request for approval to prepare an Environmental Assessment. HAR §11-200-11.2 established procedures for determining if an Environmental Assessment (EA) is sufficient or if an Environmental Impact Statement (EIS) should be prepared for actions that may have a significant effect on the environment. HAR §11-200-12 lists the following criteria to be used in making such a determination.

Involves an irrevocable commitment to loss or destruction of any natural or cultural resource.

Implementation of the project will not involve construction on or excavation of land that might contain physical historic or archaeological remains. A fish trap was mapped historically near the entrance channel, but its existence and integrity remains in question. No evidence of the fish trap was encountered during the 2004 and 2013 maintenance dredging and sandbag groin construction. The proposed project is not anticipated to have any significant adverse effect on known practices customarily and traditionally exercised for subsistence, cultural and religious purposes.

Curtails the range of beneficial uses of the environment.

Public access to the project site will be restricted during construction of the proposed action. At the conclusion of construction, access will be reestablished. The proposed action is not anticipated to have any long-term adverse effects on the uses of the environment. Rather, the proposed action will enhance the navigability of the entrance channel, which will maintain the economic, recreational, and commercial use of Hawaii Kai Marina. Sand backpassing will also improve the portions of Portlock Beach, which will improve access along the shoreline.

Conflicts with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 343, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.

The proposed project is consistent with Hawaii's State Environmental Policy as established in Chapter 343(4)(A), HRS, to establish, preserve, and maintain recreation areas, including the shoreline, for public recreational use.

Substantially affects the economic welfare, social welfare, and cultural practices of the community or State.

A navigable entrance channel into the Hawaii Kai Marina is necessary for the dozen businesses that operate from the marina. The proposed action will replace a temporary structure that is expected to degrade and possibly fail in the near future; degradation and failure of the temporary structure will allow sediment to accumulate in the entrance channel at a faster rate, which will cause the channel to narrow and shoal, reducing its navigability and increasing the need for maintenance dredging. The proposed action will help to maintain the economic welfare of businesses that use the marina by helping maintain a navigable entrance channel.

No adverse effects on cultural practices in the project area are anticipated.

Substantially affects public health.

The proposed project will have some temporary, short-term impacts on air, noise, and water quality during construction; however, these will be mitigated to the maximum extent practicable by BMPs and monitoring procedures. The project will not result in any post-construction or long-term effects on public health.

Involves substantial secondary impacts, such as population changes or effects on public facilities.

The project will not alter the existing land use pattern in and around the project site. The proposed project has little or no potential to affect public infrastructure and services. Once completed it will require no water, power, sanitary wastewater collection, or additional emergency services. There are no public facilities located within the affected project area.

Involves a substantial degradation of environmental quality.

Other than temporary, short-term environmental impacts during construction, which are generally not considered significant, the proposed project is not anticipated to result in impacts that could degrade the environmental quality in the project area.

Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions.

The proposed project involves replacing the existing temporary groin with a stable, engineered groin. It does not alter the entrance channel depth or width. The groin will allow for future maintenance dredging of the entrance channel; however, it does not require or commit to future larger actions.

Substantially affects a rare, threatened, or endangered species, or its habitat.

The green sea turtle is known to occur, or could reasonably be expected to occur, in the vicinity of the proposed project area. Turtle protection procedures as recommended by the National Marine Fisheries Service (NMFS) will be in place during construction. The waters of Maunalua

Bay are within the Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS), and humpback whales are occasionally seen offshore. The project will not directly affect humpback whales, and sounds generated from groin replacement activities are not anticipated to be substantial enough to cause an acoustic disturbance to protected species in nearshore waters. There have been no documented Hawaiian Monk Seal sightings on Portlock Beach or Maunalua Bay Beach Park. There will be no long-term impacts to rare, threatened, or endangered species.

Detrimentally affects air or water quality or ambient noise levels.

There will be some temporary, short-term impacts to air and water quality and noise levels during construction. However, these impacts will be limited to the construction period and are not considered to be significant. BMP's, water turbidity controls, and a water quality monitoring program will be in effect to help minimize the construction impacts. The contractor will be required to submit a Best Management Practices Plan for approval prior to the start of construction, which will include provisions for reducing air, water, and noise impacts. Once construction is complete there will be no activity or mechanism for further air, water, or noise impacts.

Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.

The project area is located in and adjacent to coastal waters and a tsunami hazard zone. The proposed project will not change the shoreline elevation and will not change the existing tsunami flood hazard. The proposed rock rubble mound structure is designed to withstand extreme wave conditions that may occur during the life of the project.

Substantially affects scenic vista and view planes identified in county or state plans or studies.

The proposed groin replacement will be larger and more visible than the existing temporary sandbag structure. However, the new groin will not substantially alter view planes from Kalanianaole Highway, Portlock Beach, Maunalua Bay Beach Park, or from offshore vessels.

Requires substantial energy consumption.

Other than energy expended during construction operations, the project will require no additional energy consumption.

PROJECT SUMMARY

Project: Hawaii Kai Marina Entrance Channel Groin Replacement

Approving Agency: Department of Land and Natural Resources
State of Hawaii
1151 Punchbowl Street, Room 131
Honolulu, Hawaii 96813
Contact: Sam Lemmo
Phone: (808) 587-0377
Fax: (808) 587-0322
Email: sam.j.lemmo@hawaii.gov

Proposing Organization: Hawaii Kai Marina Community Association
377 Keahole Street, D1-C
Honolulu, HI 96825
Contact: Beverly Liddle, Marina Manager
Phone: (808) 396-2469
Email: beverly@hawaiikaimarina.com

Consultant: Sea Engineering, Inc.
Makai Research Pier
41-305 Kalanianaole Highway
Waimanalo, HI 96744
Contact: Derek Linsley, Coastal Engineer
Phone (808) 259-7966, ext. 21
Email: dlinsley @seaengineering.com

Location: Hawaii Kai, Oahu, Hawaii

Tax Map Keys: Seaward of (1) 3-9-008:035

State Land Use District: Conservation (Resource Subzone)

County Zoning: None

Proposed Action: The Hawaii Kai Marina Community Association (HKMCA) proposes to replace the existing Hawaii Kai Marina entrance channel temporary sandbag groin with a stable, engineered rock rubble mound revetment and groin. The objective of the proposed project is to reduce the volume of sediment accumulation in the Hawaii Kai Marina entrance channel, thus increasing the time between maintenance dredging operations.

The design is a rock rubble mound revetment and groin, a sloping uncemented structure built using boulder size rock. The proposed layout has an L-head configuration. To prevent flanking, the groin

stem ties into an existing concrete rubble masonry (CRM) abutment on the Kalanianaole Highway Bridge via a rock rubble mound revetment.

Sand that accumulates on the Portlock Beach side of the groin will be mechanically backpassed to the east end of Portlock Beach, where erosion is threatening the backshore and private properties. This will take place on an as-needed basis (estimated to be approximately every 4 years) when the groin reaches its maximum sediment carrying capacity. Backpassing will be initiated during construction by moving 400 cubic yards of sand that has accumulated since reconstruction of the temporary sandbag groin in 2013.

The proposed project will not significantly alter overall water quality at the project site. Construction activities will be designed so as to avoid and minimize impacts to marine biota so far as practicable, and no long-term impacts to marine biota are anticipated. The new groin will be placed on existing nearshore sand and rubble bottom; thus, there will be no significant loss of marine habitat. Construction BMPs will be used to avoid impacts to protected marine species. Construction can be expected to result in temporary disruption of beach use and recreational activities, and increased noise and short-term degradation of air quality from the operation of construction equipment. Localized increases in water turbidity may occur in the immediate area of construction activity; however, containment barriers and turbidity screens will be in place to control and minimize the area of impact.

Required Permits & Approvals:

Environmental Assessment and FONSI (Chapter 343, HRS and §11-200, HAR)
Department of the Army Permit (Section 10 and Section 404)
Clean Water Act Section 401 Water Quality Certification
Coastal Zone Management Act Consistency Determination
Conservation District Use Permit
City and County of Honolulu Special Management Area Permit (pending shoreline certification)

Actions Requiring Environmental Assessment: Work within the State Conservation District and within navigable waters of the United States

Anticipated Determination: Finding of No Significant Impact (FONSI)

Estimated Cost: $1,900,000

Time Frame: Construction will begin when the necessary permits and approvals are obtained and a construction contract is awarded, currently estimated for Fall 2018. The construction period is estimated to be 60 to 90 days.

Consulted Organizations/Individuals:

The names of individuals and organizations contacted to provide pre-consultation for the project are summarized below. Those who responded to requests for consultation through Sea Engineering, Inc. or John Clark are indicated by asterisks.

Federal

U.S. Army Corps of Engineers, Honolulu District, Regulatory Branch*
U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office
NOAA, National Marine Fisheries Service, Pacific Islands Regional Office*
U.S. Environmental Protection Agency, Region IX, Pacific Islands Contact Office*
U.S. Coast Guard Sector Honolulu, Waterways Management*

State of Hawaii

Department of Land and Natural Resources
- Office of Conservation and Coastal Lands*
- State Historic Preservation Division
- Division of Boating and Ocean Recreation
Department of Health, Clean Water Branch*
Department of Business, Development, Economics and Tourism, Office of Planning*
Department of Transportation, Harbors Division
Department of Transportation, Highways Division*
Office of Hawaiian Affairs*

City & County of Honolulu

Department of Planning and Permitting

Other

Surfrider Foundation*
Frazier McGilvray (Malama Maunalua)*
Portlock Road Community Association*
Ahu Moku o Oahu – Kona
Hawaiian Civic Club - Maunalua
Marshall and Barbara Rosa (Portlock Residents)*
Mary Dang (Portlock Resident)*
Pua Rochlen (Portlock Resident)*
John Frederick (owner of Fish and Dive Hawaii)*
Cormac O'Carrol (Hawaii Water Sports Center)*
Chris Cramer (Maunalua Fishpond Heritage Center)*
Matt Zimmerman (Island Divers)*
Keone Downing (Save our Surf)*

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1. INTRODUCTION AND SUMMARY

The Hawaii Kai Marina Community Association (HKMCA) proposes to replace the existing Hawaii Kai Marina entrance channel temporary sandbag groin with a stable, engineered rock rubble mound revetment and groin. The objective of the proposed project is to reduce volume of sediment accumulation in the Hawaii Kai Marina entrance channel, thus increasing the time between maintenance dredging operations.

1.1 Project Location and General Site Description

The Hawaii Kai Marina is located on the south shore of Oahu, approximately 12 miles east of Waikiki, and serves over 1,000 registered vessels, including both private and commercial watercraft. The project area is located within the traditional moku (district) of Kona and the ahupuaa of Maunalua. The ahupuaa is the basic Hawaiian land unit, typically reaching from mountains to sea and providing a broad range of resource zones (Pukui and Elbert 1986). Maunalua Ahupuaa is bordered by Niu Ahupuaa to the west and Waimanalo Ahupuaa to the north and spans an area of nearly 9,000 acres. The seaward boundary of the ahupuaa is the shoreline. To the north, the landward boundary of the ahupuaa crosses the uppermost reaches of the Koolau Range. The project is situated near the south central portion of the ahupuaa.

Access into and out of the Hawaii Kai Marina is through the dredged entrance channel that passes under the Kalanianaole Highway Bridge (Figure 1-1). The Hawaii Kai Marina entrance channel provides access to Maunalua Bay. Boats use the channel to reach deeper water for ocean recreational activities including fishing, parasailing, jet skiing, surfing, and scuba diving.

The channel serves as the only viable point of entry for boats into the marina. A 2015 survey measured the entrance channel to be 190 feet in width from west waterline to east waterline. The piers that support the Kalanianaole Highway Bridge divide the entrance channel into four passageways that are between 40 and 45 feet in width. At the time of the survey 130 feet of the channel width (3 passageways) were navigable. The channel was measured to be a maximum of 9.5 feet deep in the westernmost passageway. Historically, a sand spit has grown from the beach on the east side of the entrance channel, restricting boat access into the eastern passageways.

The project site is on the southeast side of the entrance channel, at the northern end of Portlock Beach. A temporary sandbag groin is presently located on the southeast side of the entrance channel (Figure 1-2) and forms the northernmost extent of Portlock Beach. The groin was built in 2013 and replaced a previous temporary sandbag structure that was built in 2004 and had deteriorated to the point where it was no longer functional. The existing sandbag groin holds sand on Portlock Beach and reduces the rate of sediment accumulation in the entrance channel and subsequent growth of the sand spit. The existing sandbag groin parallels the entrance channel and extends approximately 150 feet seaward of the shoreline. The proposed action will replace this temporary structure with a permanent engineered structure.

Figure 1-3 is an aerial image of Oahu that shows the project site location. Figure 1-4 shows the geographic features of Maunalua Bay. Portlock Beach trends northwest-southeast and fronts the residential community of Portlock. The Portlock shoreline consists of a narrow, gently-sloping carbonate sand beach that extends approximately 1,800 feet southeast from the groin. Further south, the beach terminates and the shoreline transitions to seawalls and rock revetments that

protect private residences. Further south the coastal morphology evolves into the seacliffs of Portlock Point, a prominent headland known as "China Walls" that forms the southeast boundary of Maunalua Bay.

Maunalua Bay Beach Park is located west of the Hawaii Kai Marina main entrance channel and extends from the west entrance channel to the main entrance channel, a distance of approximately 2,500 feet. The west entrance channel is inaccessible by boats due to the low clearance under the Maunalua Bridge. The Maunalua Bay Beach Park shoreline is a mixture of coral rubble, mud, and sand. A 600-foot long section of the park is protected by a rock revetment. There are two public boat ramps, with an approach channel that connects with the marina entrance channel to form the Kui Channel. The approach channel that services the boat ramps continues west, parallel to the shoreline, and terminates offshore of Kuliouou Beach Park. Kuliouou Beach is the shoreline west of the Maunalua Bridge. The shoreline is a mud flat overlying an ancient reef morphology.

Paiko Peninsula, west of Kuliouou Beach, is a barrier spit built by sand and rubble transported eastward on the inner reef flat. The spit is separated from land by Paiko Lagoon. Hwang (1981) classified the peninsula as the most unstable coastal feature on Oahu. From 1928 to 1961 the peninsula grew 900 feet to the east. The seaward shoreline of the peninsula is a narrow strip of sand and rubble which is almost submerged at high tide.

Figure 1-1. Hawaii Kai Marina entrance channel and Kalanianaole Highway Bridge (May 20, 2015)

Figure 1-2. Existing temporary sandbag groin (May 20, 2015)

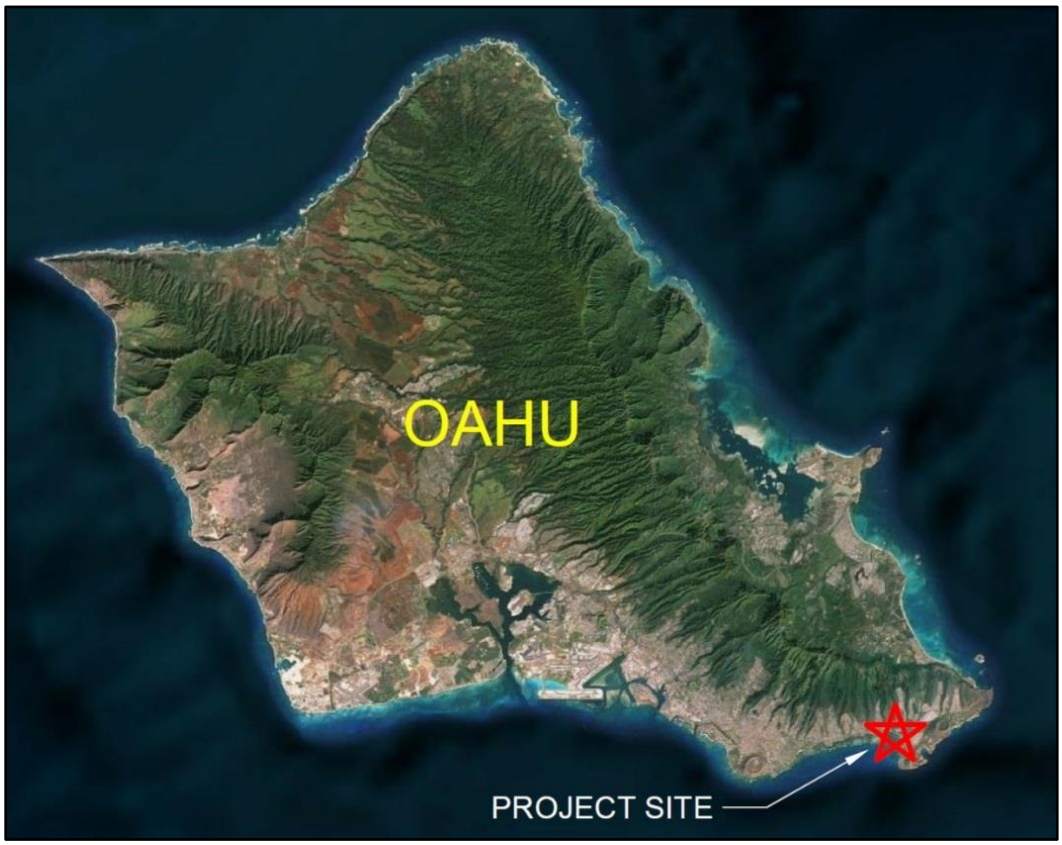

Figure 1-3. Project site location on Oahu (Google Earth)

Figure 1-4. Project site locations in Hawaii Kai, Oahu (Google Earth)

1.2 Project History

The area now occupied by the Hawaii Kai Marina was once a traditional Hawaiian fishpond that also supported vast marshlands (Figure 1-5). The Keahupua-O-Maunalua fishpond was enclosed from the sea by a natural sand berm that is now buried beneath the present-day Kalanianaole Highway. The fishpond was estimated to have been 523 acres in size and was one of the largest traditional Hawaiian fishponds on Oahu.

Significant development and alteration of the area began in 1959 when the marina was dredged by businessman Henry Kaiser. Kaiser chose a *makaha* (opening to the sea) as the location for the main entrance channel into the marina. Construction of the Kalanianaole Highway Bridge and dredging of the 200-foot wide entrance channel were completed in 1969 (Figure 1-6). Additional dredging of the entrance channel occurred in 1981, 1985, 1988, 2004 and 2013 to maintain the channel's navigability. Descriptions of the dredging actions are summarized in Table 1-1.

As the entrance channel shoaled and required maintenance dredging to remain navigable, the shoreline to the southeast began to erode. In a 1989 study, Sea Engineering, Inc. (SEI) found that the Portlock shoreline accreted and migrated approximately 50 feet seaward from 1950 to 1967. Since 1967, however, there has been gradual erosion and shoreline retreat. SEI calculated an erosion rate of approximately -1.5 feet per year from 1974 to 1988. A more recent study by the University of Hawaii Coastal Geology Group (2010) estimated an average erosion rate of approximately -0.5 feet per year from 1967 to 2005 (Figure 1-7). Sand transport along Portlock Beach is predominantly directed to the northwest toward the main entrance channel and is likely responsible for shoaling of the channel.

In 1994, the Hawaii State Legislature passed Act 231, Session Laws of Hawaii 1994, which states "The legislature declares that keeping the entrance to the Hawaii Kai Marina in navigable conditions serves a public purpose because important health, safety, and welfare considerations are involved." State funds were appropriated for the dredging and construction of a temporary sandbag groin on the east side of the entrance channel to retain sand and slow the rate of sand deposition in the channel.

In 2004, the Board of Land and Natural Resources (BLNR) issued a "Perpetual, Non-Exclusive Maintenance Easement" to the Hawaii Kai Marina Community Association for dredging, use, maintenance, and repair of the entrance channel and temporary sandbag groin. This grant included two easement areas: Maintenance Easement A and Maintenance Easement B (see Figure 1-8).

Prior to the 2004 dredging and temporary sandbag groin construction, the entrance channel was 28 feet wide, and three out of the four passageways under the Kalanianaole Highway Bridge were not navigable (Figure 1-6). The dredging activity in 2004 opened up a second passageway for navigation and included the construction of a sandbag groin to reduce the rate of sand infilling in the entrance channel. The condition of the temporary sandbag groin degraded over time, and it was reconstructed in 2013, at which time the entrance channel was also widened to include a third navigable passageway under the bridge. Since being rebuilt, the temporary sandbag groin has effectively trapped sand that would have otherwise been transported into the channel. The three passageways have remained open to navigation since 2013; however, recent topographic surveys indicate that the groin has approached its sediment carrying capacity and sand is beginning to encroach on the third passageway.

Figure 1-8 shows the Kalanianaole Highway Bridge, including the bridge piers and passageways (numbered 1 through 4), as well as the footprint of the existing temporary sandbag groin, maintenance easements, and parcel boundaries.

Table 1-1 Hawaii Kai Marina entrance channel dredging history

Year	Entrance Channel Dredging Event
1959	Initial dredging of Keahupua-O-Maunalua fishpond to near the Hawaii Kai Marina's present configuration; approximate dredging depths of -6 feet MSL in the marina and -8 feet MSL in the entrance channel.
1960	Dredged material used to construct Rim Islands Nos. 1 and 2; these islands were intended to serve as disposal site for future dredging in and around the marina.
1969	Construction of the main entrance channel and Kalanianaole Highway Bridge finishes; bridge gifted to the State of Hawaii.
1977	U.S. Army Corps of Engineers (USACE) issued a maintenance dredging permit; dredging area included the marina and entrance channel.
1981	Marina dredged and sediments disposed of along the Maunalua Bay shoreline between Keahole Bridge and Hawaii Kai Bridge.
1985	Entrance channel dredged from Maunalua Bay into the marina inside the Kalanianaole Highway Bridge using mechanical means from a landward approach.
1988	Dredged sand placed on Portlock Beach from maintenance dredging of the channel between the marina and Maunalua Bridge; approximately 8,000 cubic yards removed to achieve depths to +6 feet mean lower low water (MLLW).
1994	Hawaii State Legislature passed Act 231, recognizing the marina and associated entrance channel as a navigation channel important to public health, safety, and welfare; State funds were appropriated for maintenance dredging efforts.
2004	Hawaii Board of Land and Natural Resources issues Grant for Perpetual Non-Exclusive Maintenance Easement to the HKMCA for dredging, use, maintenance, and repair of the entrance channel and a to-be-constructed temporary sandbag terminal groin.
2004	Dredging of the entrance channel by the Division of Boating and Ocean Resources (DOBOR) opens a second passageway under the Kalanianaole Highway Bridge; sand material placed on Portlock Beach. The project also included construction of an experimental sandbag groin on the east side of the entrance channel to minimize the migration of sediment around the shoreline tip and into the navigation channel.
2013	The HKMCA performed maintenance dredging of the entrance channel and areas in the Hawaii Kai Marina. Entrance channel dredging opened a third passageway under the Kalanianaole Highway Bridge. The project also included rebuilding the temporary sandbag groin at the entrance channel and nourishing Portlock Beach and Maunalua Bay Beach Park with dredged sand.

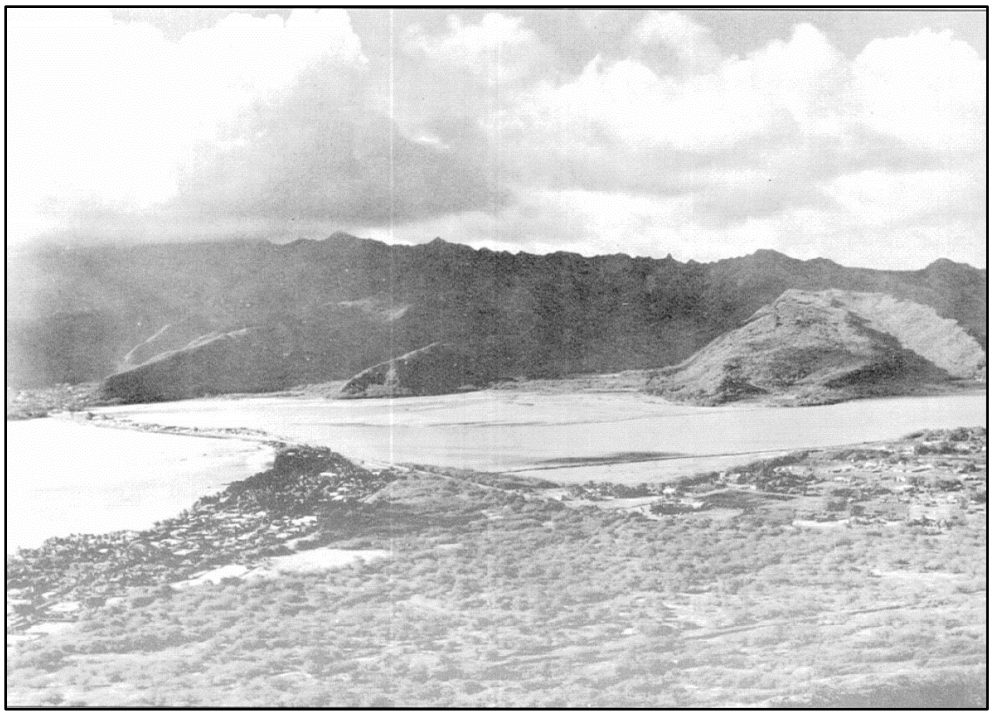

Figure 1-5. Looking across Keahupua-O-Maunalua fishpond from Koko Head (1953)

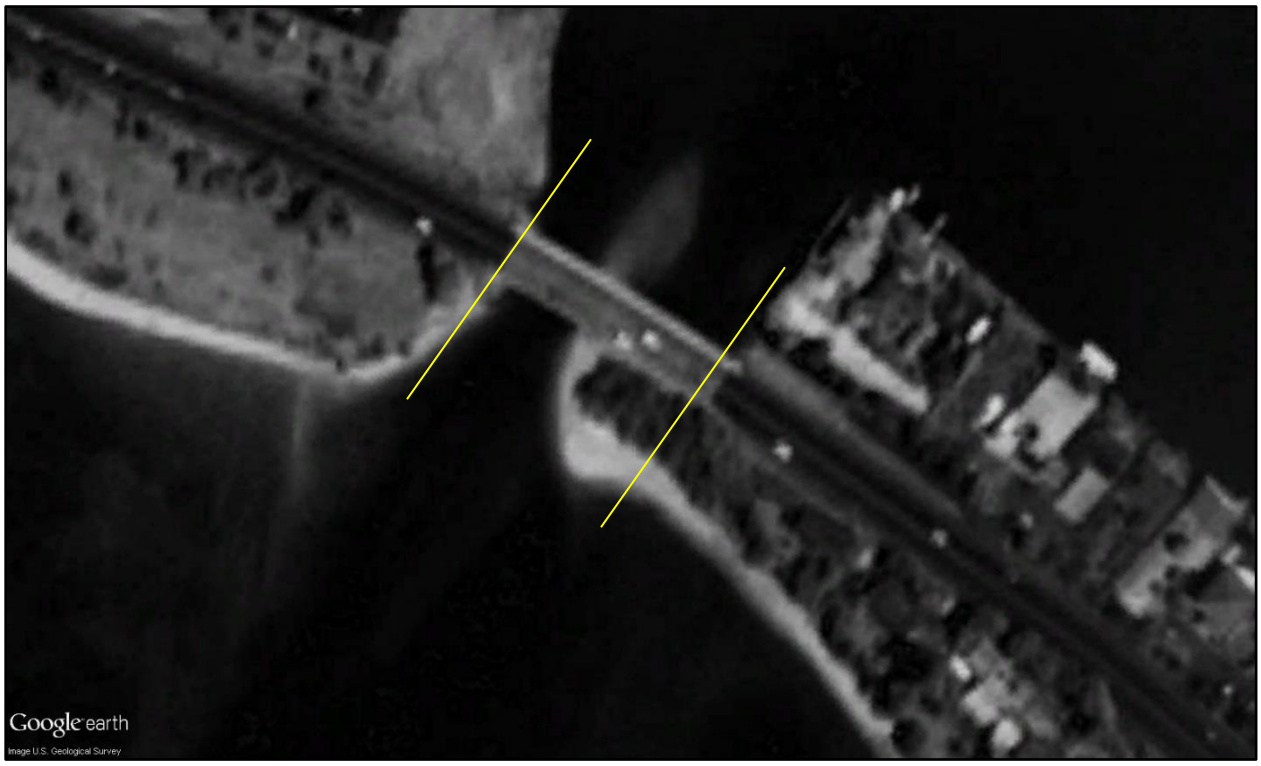

Figure 1-6. 2001 aerial image of the Hawaii Kai Marina entrance channel and sand spit (as-built channel boundaries shown in yellow)

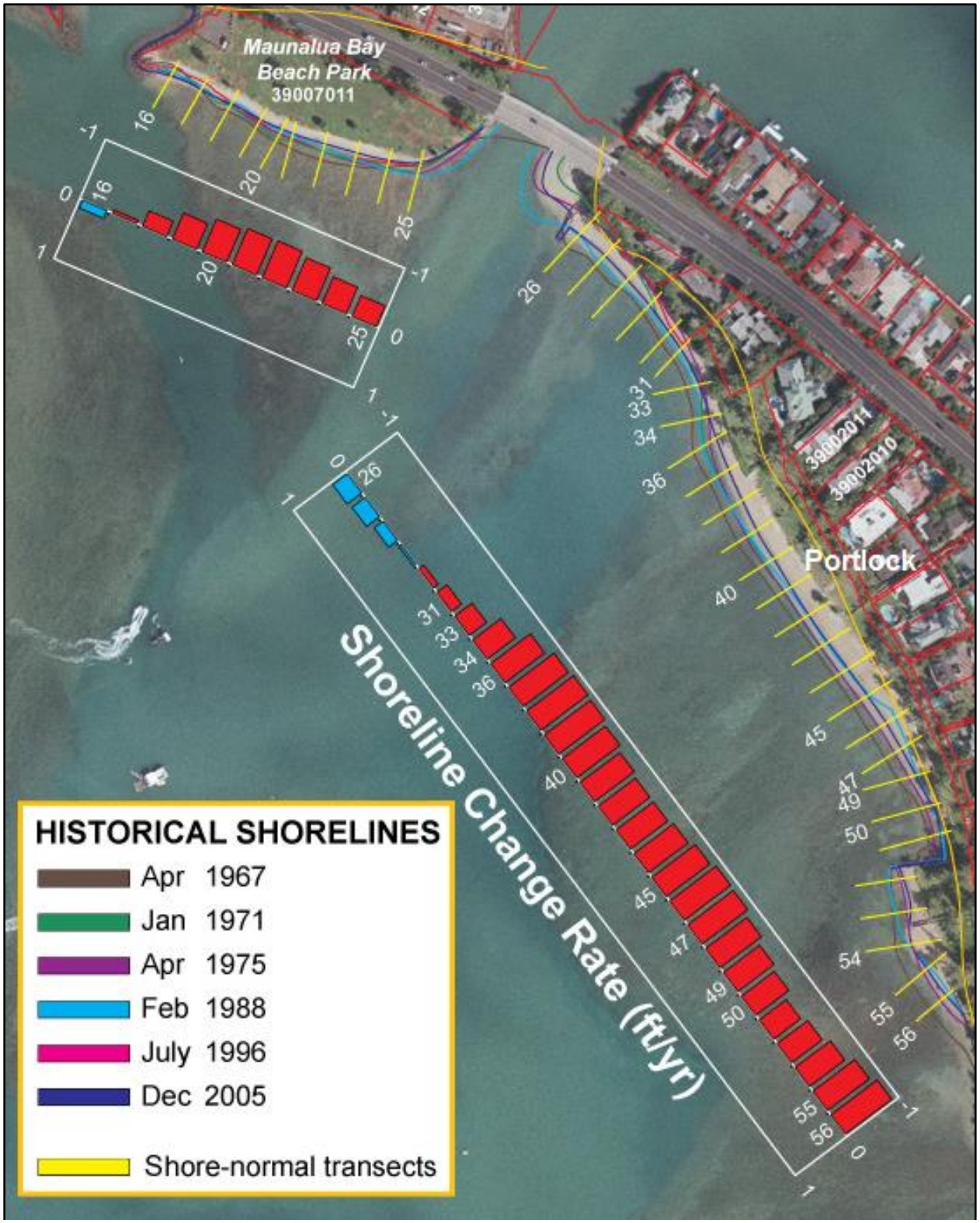

Figure 1-7. Average historical shoreline change rates in feet/year, 1967 through 2005 (University of Hawaii Coastal Geology Group)

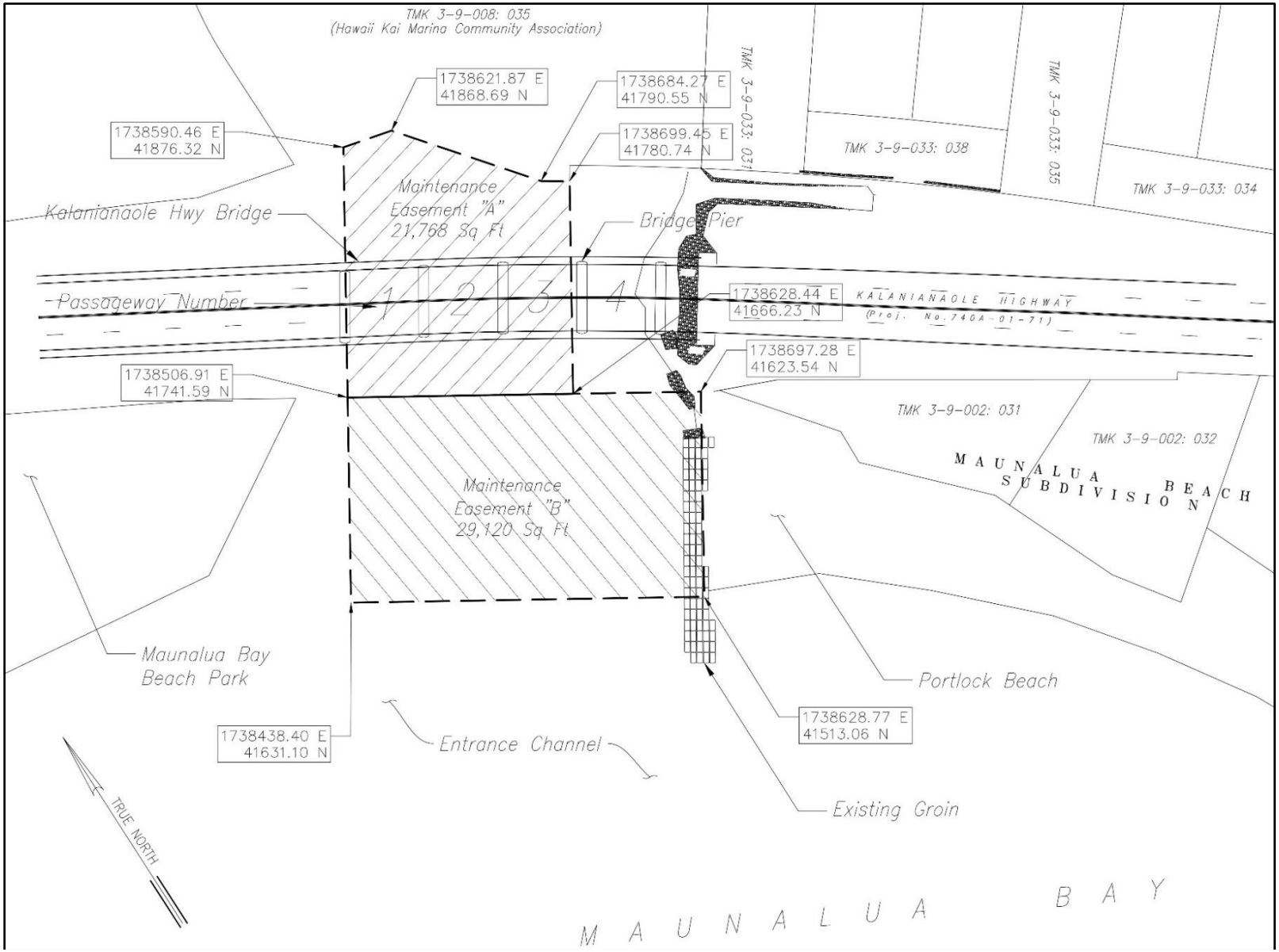

Figure 1-8. TMK and Maintenance Easement map of the project area (coordinates in State Plane HI-3)

1.3 Existing Temporary Sandbag Groin

The Hawaii Kai Marina entrance channel temporary sandbag groin is located on the southeast side of the entrance channel and extends approximately 150 feet offshore from the Portlock shoreline. The sandbag groin was originally built in 2004 as an experimental structure meant to reduce the rate of sediment being transported into the entrance channel. The sandbag groin held sand on Portlock Beach; however, it degraded until it was no longer functional and was reconstructed in 2013.

The temporary sandbag groin has effectively held sand on Portlock Beach that otherwise would have been transported into the entrance channel. Since construction of the temporary groin in 2013, the beach directly adjacent to the groin has increased in width by approximately 15 feet, with an estimated volume of 400 cubic yards of accumulated sediment. Recent survey profiles indicate that the groin is approaching an estimated maximum sediment carrying capacity, as the beach toe (elevation -2 MLLW) is currently located at the seaward end of the groin.

Geotextile sandbag structures are considered to be temporary shore protection. After three years in place, the temporary sandbag groin is beginning to show signs of wear. A 50-foot unprotected gap exists between the Kalanianaole Highway Bridge abutment and the landward termination of the groin. The shoreline in this area has been eroded by wave attack and the sandbag groin has been flanked (Figure 1-9 and Figure 1-10). Waves that affect this area include wind waves, boat wakes, and ocean swell that pass over the fringing reef. The waves have begun to erode a vegetated bank behind the groin, and some trees on this bank are heavily damaged and close to collapse. Flanking of the sandbag groin has also caused a 1 to 2-foot erosion scarp to form on the east side of the landward end of the groin.

Figure 1-9. Erosion and flanking of the landward end of the groin (May 2015)

Figure 1-10. Erosion and flanking as viewed from the Kalanianaole Highway Bridge (May 2015)

1.4 Project Purpose and Objectives

The need to halt the longshore transport and infilling of sediment into the Hawaii Kai Marina entrance channel has been apparent for some time. Dredging of the entrance channel to maintain navigability and replacement of the temporary sandbag groin has been necessary approximately every 10 years. A permanent engineered structure will eliminate the need for maintenance of the temporary sandbag structure and reduce the rate of sediment accumulation in the Hawaii Kai Marina entrance channel.

1.5 Summary Description of the Proposed Action

The proposed project is to replace the temporary sandbag groin at the Hawaii Kai Marina entrance channel with a new engineered structure. A plan view of the preferred design option is shown in Figure 1-11 and consists of a combined rock rubblemound revetment and groin, a sloping uncemented structure built using boulder-size rock. The proposed layout has an L-head configuration with a stem length of 180 feet and a head length of 50 feet. To prevent flanking, the groin stem ties into an existing CRM abutment on the Kalanianaole Highway Bridge via a 60-foot long revetment. Design features include the following:

- The existing temporary sandbag groin will be removed during construction of the new permanent rock rubble mound revetment and groin;
- An impermeable core will prevent transmission of beach sand through the structure;
- The new permanent rock rubble mound revetment and groin will retain an additional 1,600 cubic yards of sediment compared to 2013 post-construction topography, equivalent to an estimated 4 years of accumulated sediment transport.
- When the new groin reaches its maximum sediment carrying capacity, a sand backpassing plan will be initiated that will take sand that has accumulated adjacent to the groin and move it to the east end of Portlock Beach.

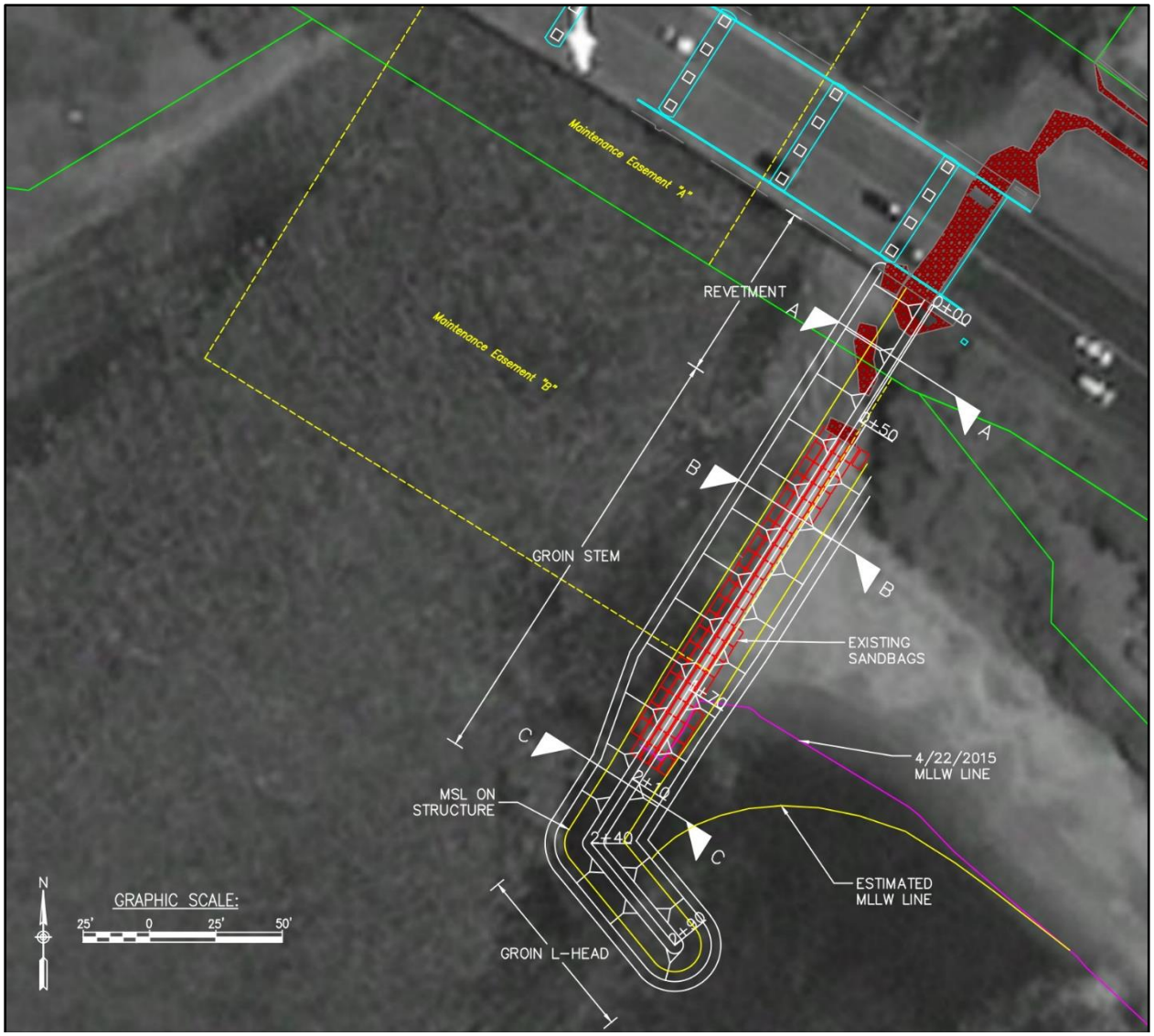

Figure 1-11. Preferred option: plan view of the proposed 290-foot long rock rubble mound revetment and L-head groin

1.6 Alternatives Considered

Three general options exist for future action at the project site:

1. Continue to maintain the temporary sandbag groin structure;
2. Design and build a permanent engineered structure; or
3. No action.

1.6.1 Maintenance of the Existing Temporary Sandbag Groin

The existing temporary sandbag groin was constructed in 2013 and consists of large geotextile sandbags. This type of beach stabilization structure is designed as a temporary solution and is built with the concept of eventual removal. Large geotextile sandbags (e.g. ElcoRock and

Bulklift Sea Bags) like those used in the existing temporary sandbag groin have been used for emergency and temporary shore protection and beach stabilization in Hawaii in recent years. Disadvantages of using sandbags for the construction of shoreline structures include:

- Sandbag structures have few engineering design guidelines;
- Geotextile sandbags have a relatively short lifespan; the sandbags degrade with time and must be replaced.

Maintenance of the existing temporary sandbag groin would likely consist of replacement every 10 years. A typical permanent rock structure would have a project design life of at least 50 years. Though maintaining the existing groin would have a lower principal cost compared with construction of a permanent structure, the long-term costs would be much higher. Furthermore, construction at the project site poses many challenges, most notably access issues, and construction of a sandbag groin faces similar difficulties that construction of a permanent groin would encounter.

1.6.2 Groin Alternatives

Groins are used to reduce longshore sediment transport rates. Impermeable groins act as littoral barriers from the seaward end of the structure to the limit of wave uprush. Accretion takes place on the up-drift side of the structure at a rate equal to that of the littoral transport.

There are many possible types of groin construction materials, including rock, precast concrete armor units, concrete caissons, sheet pile, and timber. Groins and offshore breakwaters intended as permanent beach stabilization structures are typically constructed of stone in the form of sloping rock rubble mound structures designed for site specific wave conditions. A conventional rock rubble mound structure is appropriate for the shoreline and oceanographic conditions at the Hawaii Kai Marina entrance channel.

Some advantages of rock rubble mound structures are:

- They can be used in a variety of water depths
- They can be placed on almost any type of foundation
- Settlement of the structure results in a readjustment of the stones
- Reflected wave action is less than that from a solid or vertical structure

Groin fields, which consist of multiple groins spaced along the shoreline, can reduce sediment transport and stabilize a length of coastline. A single groin, or terminal groin, can be used to prevent sediment from leaving a littoral cell or settling in a channel or other sediment sink.

A single groin located at the existing temporary sandbag groin will reduce sediment transport into the Hawaii Kai Marina entrance channel. Five groin configurations were considered:

1. *Extended Length Groin with L-head (preferred)* – revetment and stem extends 240 feet from the bridge abutment with a 50-foot L-head; shown in Figure 1-11
2. *Existing Length Groin* – revetment and stem extends 200 feet from the bridge abutment (same length of the existing temporary groin); shown in Figure 1-12
3. *Existing Length Groin with L-head* – revetment and stem extends 200 feet from the bridge abutment with a 50-foot L-head; shown in Figure 1-13
4. *Extended Length Groin* – revetment and stem extends 240 feet from the bridge abutment (40 feet longer than the existing temporary groin); shown in Figure 1-14
5. *Maximum Length Groin with L-head* – revetment and stem extends 280 feet from the bridge abutment with a 50-foot L-head; shown in Figure 1-15

Table 1-2 summarizes the groin configurations that were considered. Sediment transport rates along Portlock Beach were estimated to be 400 cubic yards per year to the northwest (see Section 3.1.6). This rate was used to estimate the infill time for each groin configuration. Based on the estimated infill times and relative sizes, the extended length configurations were selected as the most efficient designs. The L-head design is preferred because it promotes wave diffraction on the leeward side of the head. This is desirable for two reasons: 1) it disrupts dangerous rip current formation along the stem of the groin during high wave events, and 2) it increases the sediment holding capacity of the groin. Therefore, the preferred alternative is the *extended length groin with L-head*.

1.6.3 No Action Alternative

The No Action alternative provides a benchmark against which to compare the magnitude of environmental effects of the proposed alternative. It provides a reasonable baseline for assessing the impacts of an action alternative.

Given the temporary nature of the existing sandbag structure, its effectiveness as a sand retention device is expected to degrade over time. This will eventually result in sand loss along Portlock beach and shoaling of the Hawaii Kai Marina entrance channel. Historical aerial photographs show formation of a sand spit progressing into the entrance channel. Modern sedimentation rates indicate that the sand spit would likely reappear on the Portlock side of the channel should the temporary sandbag groin be compromised.

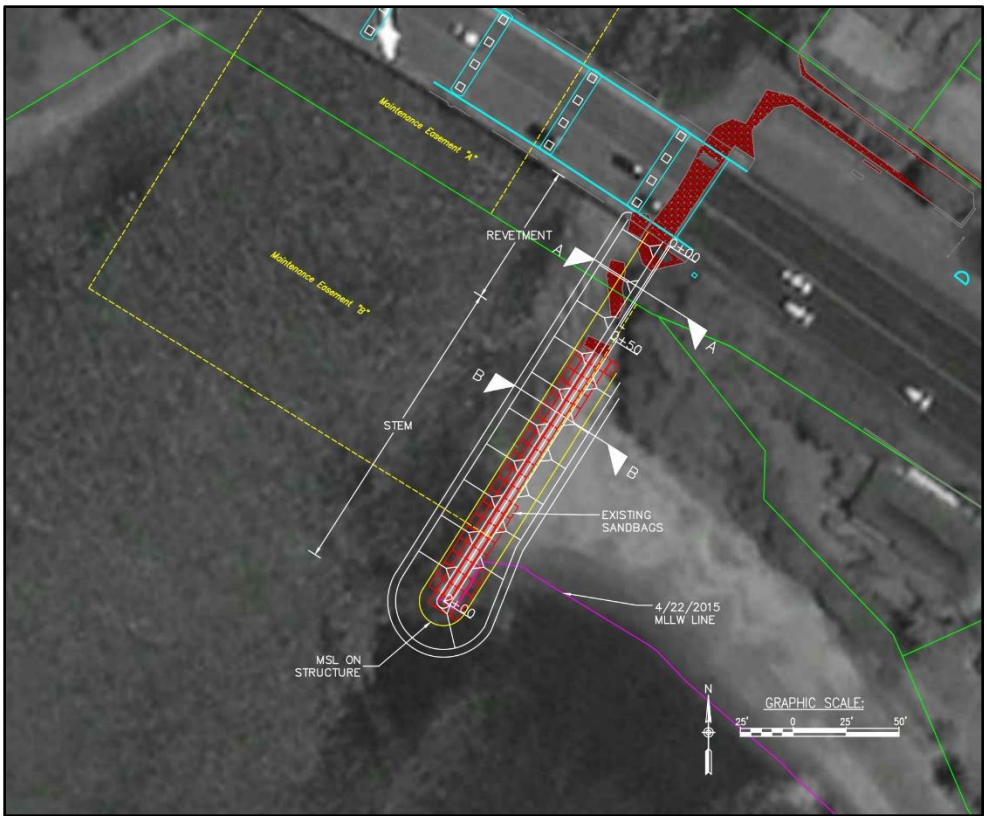

Figure 1-12. Existing length groin configuration

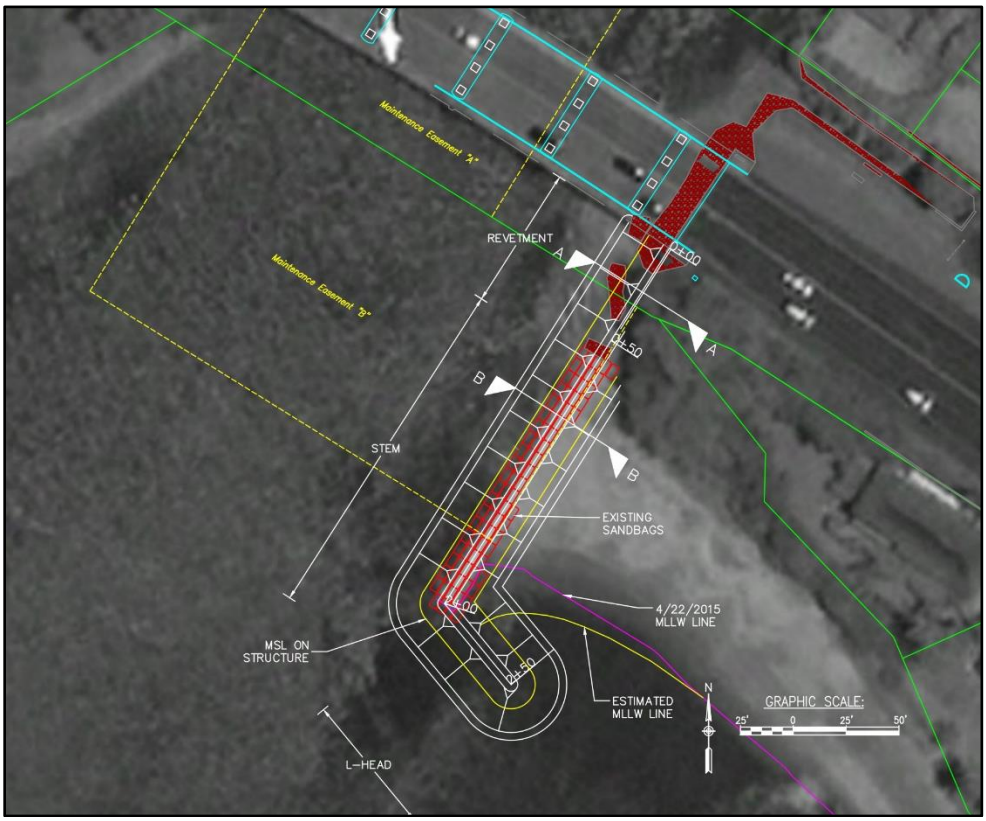

Figure 1-13. Existing length groin with L-head configuration

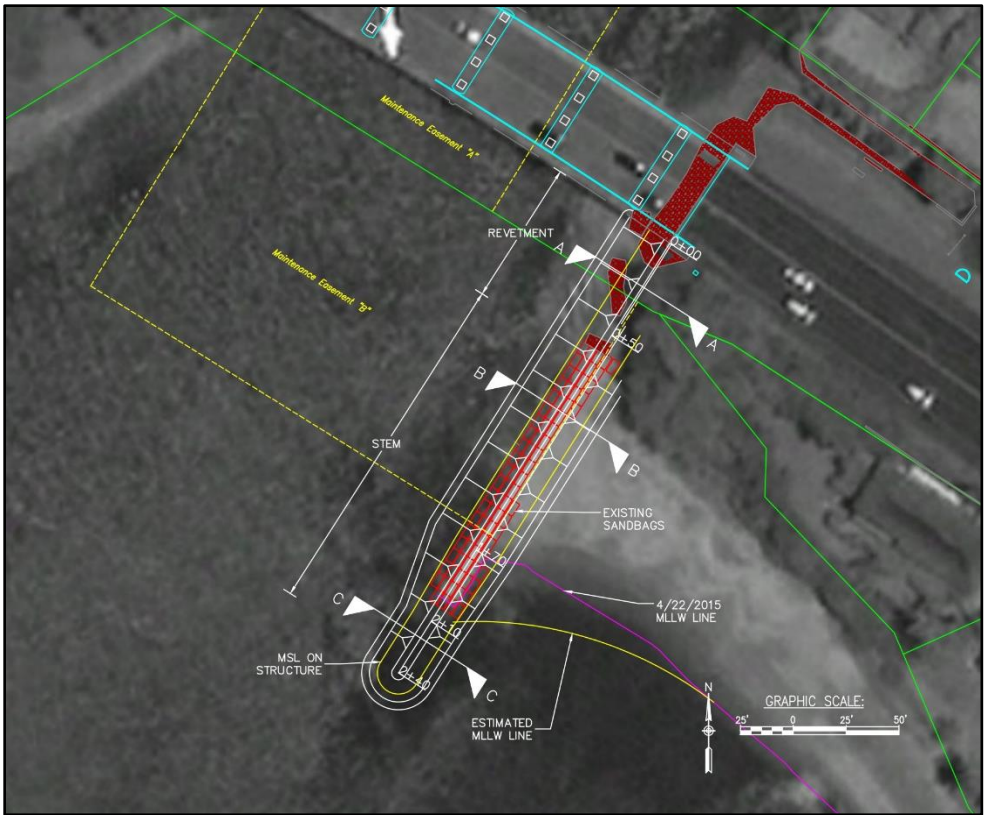

Figure 1-14. Extended length groin configuration

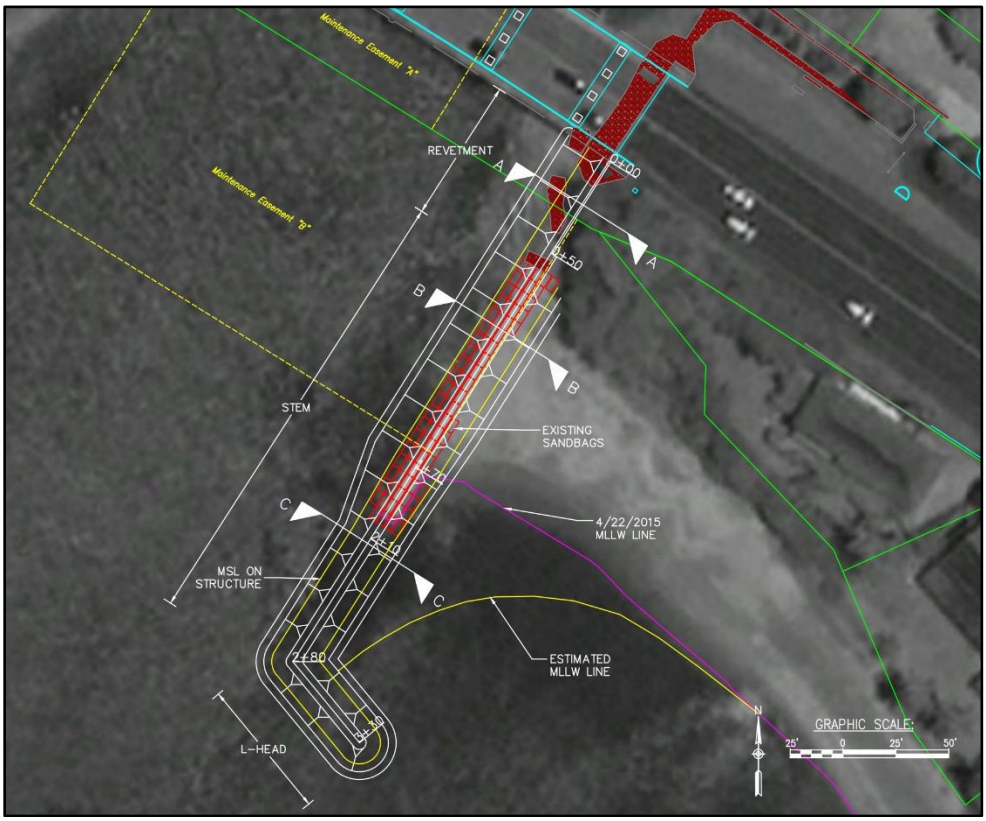

Figure 1-15. Maximum length groin with L-head configuration

Table 1-2. Groin alternatives summary table

Layout	Revetment Length (feet)	Stem Length (feet)	L-Head Length (feet)	Additional Sediment Capacity (cubic yards)	Additional Sediment Capacity (years)
Extended length w/ L-head (preferred)	60	180	50	1,600	4
Existing length	60	140	0	400	1
Existing length w/ L-head	60	140	50	750	2
Extended length	60	180	0	1,400	3.5
Maximum length w/ L-head	60	220	50	1,900	5

1.7 Required Federal, State, and County Approvals, and Applicable Regulatory Requirements

A detailed discussion on the permitting and regulatory requirements for the proposed action is presented in Section 6. A summary of potential permitting requirements for the proposed action includes the following:

City and County of Honolulu

- Special Management Area (SMA-Major or SMA-Minor, pending shoreline certification)

State of Hawaii

- Conservation District Use Permit (DLNR-OCCL)
- Coastal Zone Management Consistency Review (DBEDT, Office of Planning, CZM Program)
- Clean Water Act, Section 401 Water Quality Certification (DOH-CWB)

Federal

- Section 10, Work in Navigable Waters of the U.S. (U.S. Army Corps of Engineers)
- Section 404, Clean Water Act, for Fill in Waters of the U.S. (U.S. Army Corps of Engineers)
- Other Federal laws that may affect the project, including:
    a. Archaeological and Historic Preservation Act (16 USC § 469a-1);
    b. National Historic Preservation Act (NHPA) of 1966 (16 USC § 470(f));
    c. Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 (25 USC § 3001);
    d. Clean Air Act (42 USC § 7506(C));
    e. Coastal Zone Management Act (16 USC § 1456(C) (1));
    f. Endangered Species Act (16 U.S.C. 1536(A) (2) and (4));

g. Fish and Wildlife Coordination Act (FWCA) of 1934, as amended (16 USC §§ 661-666[C] et seq.);
h. Magnuson-Stevens Fishery Conservation and Management Act (16 USC § 1801 et seq.);
i. Marine Mammal Protection Act (MMPA) of 1972, as amended (16 USC §§ 1361-1421(H) et seq.);
j. EO 13089, Coral Reef Protection (63 FR 32701)

2. DETAILED DESCRIPTION OF THE PROPOSED ACTION

2.1 General Description of the Groin Plan

A conventional rock rubble mound structure is recommended for the new groin. Stone, sized according to the design wave conditions, is typically used for groin construction when the required size and quantities are available. Stone design and construction is tried and proven, with a long history of testing and structure performance monitoring. In addition, a sloping rock rubble mound structure dissipates wave energy and reduces wave reflection, a desirable design feature for the busy Hawaii Kai Marina entrance channel.

The proposed structure combines a 60-foot rock rubble mound revetment with a 230-foot rock L-head groin (Figure 1-11). The groin root ties into the Kalanianaole Highway Bridge concrete rubble masonry (CRM) abutment via the revetment. The revetment is necessary to prevent erosion of the shoreline and flanking of the structure. The centerline of the groin stem will be located along the centerline of the existing temporary sandbag groin and will extend approximately 240 feet seaward from the bridge. The groin has a 50-foot "L" head extending east at an approximate 108º angle from the end of the groin stem to increase the sediment carrying capacity of the beach and reduce the potential for dangerous rip current formation along the stem.

The proposed layout will retain an additional 1,600 cubic yards of sand in comparison with the post-construction topography from 2013. Waves that interact with the structure will diffract and spread into the shadow zone created by the L-head. The new shoreline will align with the diffraction pattern of the waves. The wave patterns and shoreline alignment were calculated using the Bouss-2D and MEPBAY numerical models. The predicted shoreline is shown in Figure 1-11 using an estimation of the MLLW line at the structure when the groin has reached its maximum sediment carrying capacity. The maximum carrying capacity with this layout will increase the dry beach width by approximately 50 feet directly adjacent to the groin stem.

The crest elevation of the proposed revetment is +6.0 feet MLLW. The crest elevation of the groin is +6.0 feet on the stem sloping down to +5.0 feet at the offshore end of the groin. The side slope of the groin and the revetment is 1 vertical to 1.5 horizontal (1V:1.5H), and the nominal armor stone size is 1,000 lbs with a one-stone layer thickness of 1.8 feet. Section views of the proposed groin over existing ground levels are shown in Figure 2-2.

The proposed action includes a 400 cubic yard backpassing plan that will be initiated during construction. Sand that has been retained on Portlock Beach by the existing temporary sandbag groin will be moved to the southeast end of Portlock Beach where erosion is threatening the backshore and private property. The 400 cubic yard figure is equivalent to approximately one year of sediment transport and is the volume that has accumulated since reconstruction of the temporary sandbag groin in 2013.

Approximately 1,600 cubic yards of sand is expected to accumulate on the Portlock side of the proposed groin. The sand backpassing plan can be expanded to return the beach on the Portlock side of the structure to its pre-construction condition, using the accumulated sand to restore eroded areas on the eastern end of the beach. This process would be repeated approximately every 4 years.

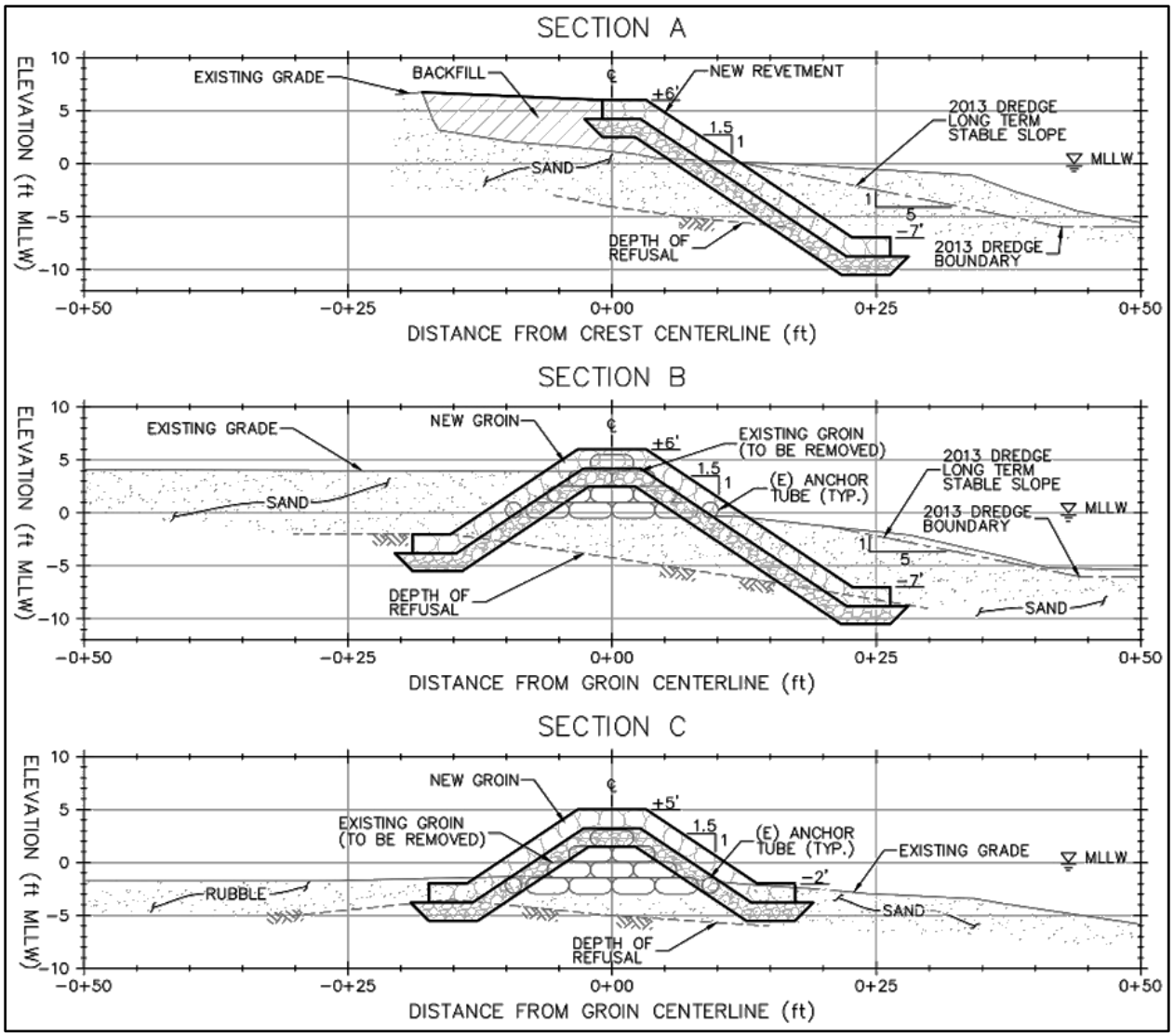

Figure 2-1. Section views showing proposed groin over the existing topography

2.2 Groin Design Considerations

The groin design is based on methodology contained in the Shore Protection Manual (1984), the Coastal Engineering Manual (2006), and the Coastal Engineering Design & Analysis System (CEDAS), all of which are based on research by the U.S. Army Corps of Engineers, Coastal Engineering Research Center (CERC).

2.2.1 Design Wave Conditions

The project site is exposed to the following wave types:

- Prevailing trade wind- waves generated from the northeast which refract and diffract around Portlock Point;
- Summer season south swell generated by southern hemisphere winter storms;

- Southeast trade wind swell generated by southern hemisphere trade winds;
- Kona storm waves from the west and southwest generated by low pressure systems passing near the islands.

The project site is also exposed to extreme wave events such as hurricanes and tsunamis. While infrequent in Hawaii, hurricane conditions are a prudent design consideration for permanent coastal structures. Hawaii Kai receives minimal wave energy from North Pacific swell due to island shadowing.

Two offshore wave conditions were used in the structural design of the proposed groin: hurricane waves and a semi-annual south swell. A model simulating a close approach of Hurricane Iniki (1992) was used to determine the armor stone size of the structure. This scenario results in an offshore significant wave height[1] of 27 feet and a peak wave period of 12 seconds. A semi-annual south swell event was used to design the crest height of the structure. Semi-annual conditions are described as an above-average high-energy wave event, or deepwater conditions that are expected offshore of the project site twice per year on average. The semi-annual south swell has an offshore significant wave height of 4 feet and a peak wave period of 16 seconds. Offshore wave conditions are covered in depth in Section 3.1.5.

2.2.2 Nearshore Wave Heights

As deepwater waves propagate toward shore, they begin to encounter and are transformed by the ocean bottom. Two numerical wave models were used to estimate the wave transformation. The Simulating Waves Nearshore (SWAN) model was used to transform waves from deep water to the project site. For prevailing and semi-annual conditions, the results of the SWAN model were used as input for a detailed, shallow water Boussinesq-type wave model called Bouss2D. For the closely-approaching hurricane condition, nearshore wave heights were modeled using only SWAN.

The numerical wave model results indicate that the project site is well-sheltered from approaching waves by the offshore fringing reef, and the deepwater wave energy is significantly dissipated by wave breaking as it approaches the shore. For the closely approaching hurricane event, the numerical wave models predicted a significant wave height of 2.2 feet at the head of the proposed structure. For the semi-annual south swell, the significant wave height was 1.0 feet at the head of the proposed structure. Table 2-1 summarizes the wave and water level conditions for the two design scenarios.

[1] Significant wave height (H_s) is defined as the average of the largest 1/3rd of wave heights and is also noted as $H_{1/3}$. $H_{1/10}$ is the average of the highest 10% of wave heights.

Table 2-1. Design wave heights

	Semi-annual South Swell	Model Hurricane
Deepwater Wave Parameters		
H_s (feet)	4	27
T_p (sec)	16	12
Direction (°TN)	195	186
Nearshore Design Wave Height (from Bouss2D/SWAN)		
H_s or $H_{1/3}$ (feet)	1	2.2
$H_{1/10}$ (feet)	1.3	2.8

2.2.3 Rock Rubble Mound Revetment Design Analysis

<u>Armor Stone Size</u>

Armor stone size is based on the design wave height, $H_{1/10}$, at the structure during the closely-approaching hurricane event. This wave height was modeled to be 2.8 feet. The required armor stone weight for stability under the design wave height is given by the Hudson Formula (USACE, 1984/2006):

$$W = \frac{w_r H_{1/10}^{\ 3}}{K_D (S_r - 1)^3 \cot\theta}$$

where:

W = weight in pounds of an individual armor stone
w_r = unit weight of the stone, 160 lb/feet^3
$H_{1/10}$ = wave height, 2.8 feet
K_D = armor stone stability coefficient, 2
S_r = specific gravity of the stone relative to seawater, 2.5
$\cot\theta$ = cotangent of the groin side slope, 1.5

The armor layer is typically two stone diameters in thickness. However, adjustment can be made for single stone layer design. The stone weight is increased by 30% and the stones are keyed and fitted for maximum stability.

The suggested armor stone weight using the Hudson Formula for single stone armor layer is 450 lbs with a corresponding nominal diameter of approximately 1.4 feet. This armor stone size is small enough that stones can potentially be disturbed or displaced by persons walking on the structure. A minimum suggested armor stone median weight is 1,000 lbs with a corresponding nominal diameter of approximately 1.85 feet. A range of ±25% of the median weight is typically utilized, which yields a stone weight range of 750 to 1,250 lbs.

Underlayer Stone

Underlayer stone is sized at approximately 1/10 the armor stone weight, resulting in underlayer stone size between 75 and 125 lbs. The nominal diameter for this stone weight is 0.85 feet. The underlayer sizing is important to provide porosity for energy dissipation, to achieve interlocking between the armor and underlayer, and to ensure that the underlayer material cannot be removed through voids in the armor layer. The underlayer stone should be placed in a layer two stone-widths thick, or 1.7 feet.

Core Material

Coralline gravel will be used to make an impermeable structure core.

A summary of the groin material specifications is shown in Table 2-2.

Table 2-2. Groin material specifications

	Armor	Underlayer	Core
Nominal Weight	1,000 lbs	100 lbs	N/A
Weight Range	750 to 1,250 lbs	75 to 125 lbs	N/A
Nominal Diameter	1.85 feet	0.85 feet	Gravel
Layer Thickness	1.85 feet	1.7 feet	Varies

Crest Elevation and Width

The elevation of the groin crest determines the amount of wave overtopping that will occur during selected wave conditions. Wave runup determines the beach crest elevation and, for design of a beach stabilization structure, it is reasonable to design for minimal overtopping during high tide and semi-annual wave conditions. Wave runup was calculated using CEDAS Automated Coastal Engineering System (ACES). Assuming a total water depth seaward of the groin head of 3.5 feet, runup on the rough and permeable groin face is +3.4 feet MLLW. Including the possible future sea level change of +0.7 feet, a crest elevation of +5.0 feet above MLLW will prevent overtopping during typically semi-annual wave conditions. The crest elevation of the revetment and first 80 feet of the groin should be +6.0 feet, 1 foot higher than the offshore section, to prevent sediment transport over or through the groin. This height will eliminate overtopping during semi-annual conditions. A crest width equal to two armor stone diameters, or 3.6 feet, is used to ensure revetment crest stability. A crest width equal to three stone diameters, or 5.4 feet, will ensure crest stability along the groin stem and L-head.

Toe Elevation

The substrate under the groin footprint is loose sand/cobble, thus the groin will require an extended toe for scour protection. A 2-stone width (3.6 feet) scour apron is provided for all sections of the groin. The elevation of the top of the scour apron will be -7 feet MLLW on the channel side of the groin. This will allow for dredging of the entrance channel to the 1969 configuration without compromising the structure[2]. The scour apron at the L-head and on the Portlock side of the groin will be -2 feet MLLW.

[2] Note: dredging of the entrance channel beyond what is required to place the structure's foundation is not included in this project

Groin Cross-sections

The revetment section of the structure (Section A) is shown in Figure 2-2 and extends 60 feet seaward from the Kalanianaole Highway Bridge. The revetment then transitions into the groin stem (Section B, Figure 2-3). The revetment and first 90 feet of the groin have a crest elevation of +6 feet. Between 150 and 190 feet from the bridge, the crest elevation transitions from +6 feet to +5 feet. The remainder of the groin stem and L-head have a crest elevation of + 5 feet, with the design cross-section shown in Figure 2-4 (Section C).

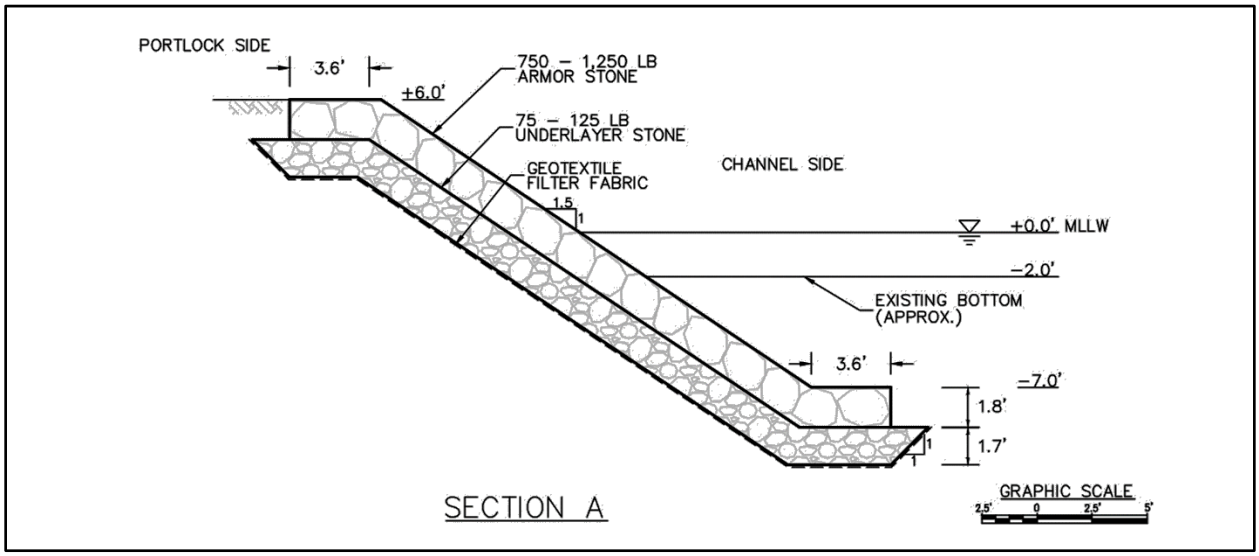

Figure 2-2. Section A detail (revetment)

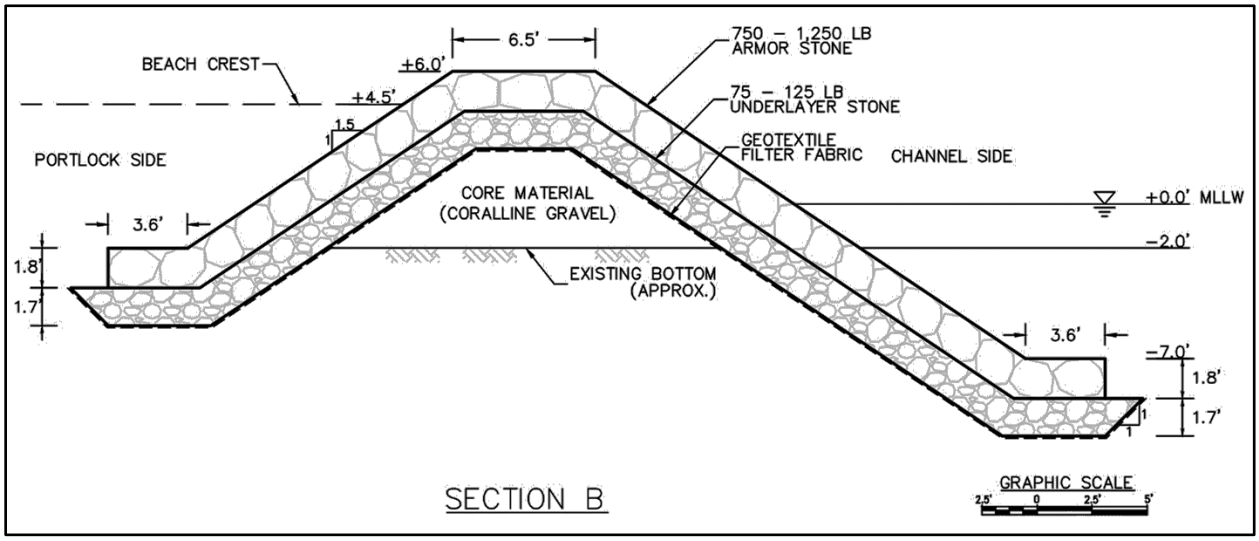

Figure 2-3. Section B detail (groin stem)

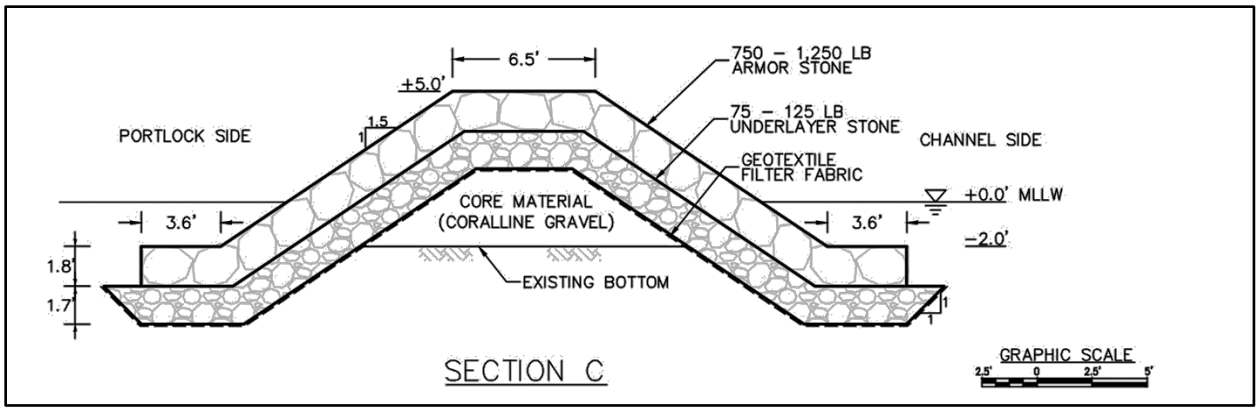

Figure 2-4. Section C detail (groin stem and L-head)

2.2.4 Sand Backpassing

Sand backpassing is the process of harvesting sand from areas of accretion, and placing it in areas of erosion. Sediment backpassing counters the natural migration of sediment, and is an efficient strategy to manage limited sand resources. Sediment on Portlock Beach naturally moves from southeast to northwest (towards the Hawaii Kai Marina entrance channel). There is no natural mechanism that reverses the sediment transport. Backpassing would take sand that accumulates on the Portlock side of the groin and move it to eroded portions of Portlock Beach.

Initial sand backpassing will take place during construction of the proposed structure. Approximately 400 cubic yards of sand that has been trapped by the existing temporary sandbag groin since construction in 2013 will be harvested and trucked to the southeast end of Portlock Beach. The sand will be used to restore the heavily eroded shoreline fronting TMKs (1) 3-9-002:001, 002, 003, 004, and 034 (Figure 2-5). The shoreline in this area is eroding at a rate of approximately 1 foot per year (UH Coastal Geology Group, 2009). A preliminary design effort shows the placed sand will increase dry beach width by an average of 7 feet over a length of 280 feet of shoreline (Figure 2-7). The maximum dry beach width increase will be 13 feet fronting TMK (1) 3-9-002:034. The sand fill will be placed to a height of +4 feet MLLW with a beach face slope of 6 vertical to 1 horizontal (6V:1H). Representative backpassing design profiles are shown in Figure 2-8.

Future sand backpassing projects will be used to harvest sand that accumulates adjacent to the proposed groin on Portlock Beach. The proposed structure will trap 1,600 cubic yards of sand, an additional 1,200 cubic yards compared to the amount retained by the existing temporary sandbag groin, which has been an estimated 400 cubic yards since completion in 2013. When the groin reaches its maximum sediment carrying capacity, backpassing will return the shoreline to the 2013 post-construction position. The total amount of sand available for backpassing will be 1,600 cubic yards approximately every four years based on estimated sediment transport rates along Portlock Beach (see Section 3.1.6).

Figure 2-5. Heavily eroded shoreline at the southeast end of Portlock Beach looking south (June 23, 2016 photo)

Figure 2-6. Heavily eroded shoreline at the southeast end of Portlock Beach looking north (June 23, 2016 photo)

Figure 2-7. 400 cubic yard sand backpassing concept plan

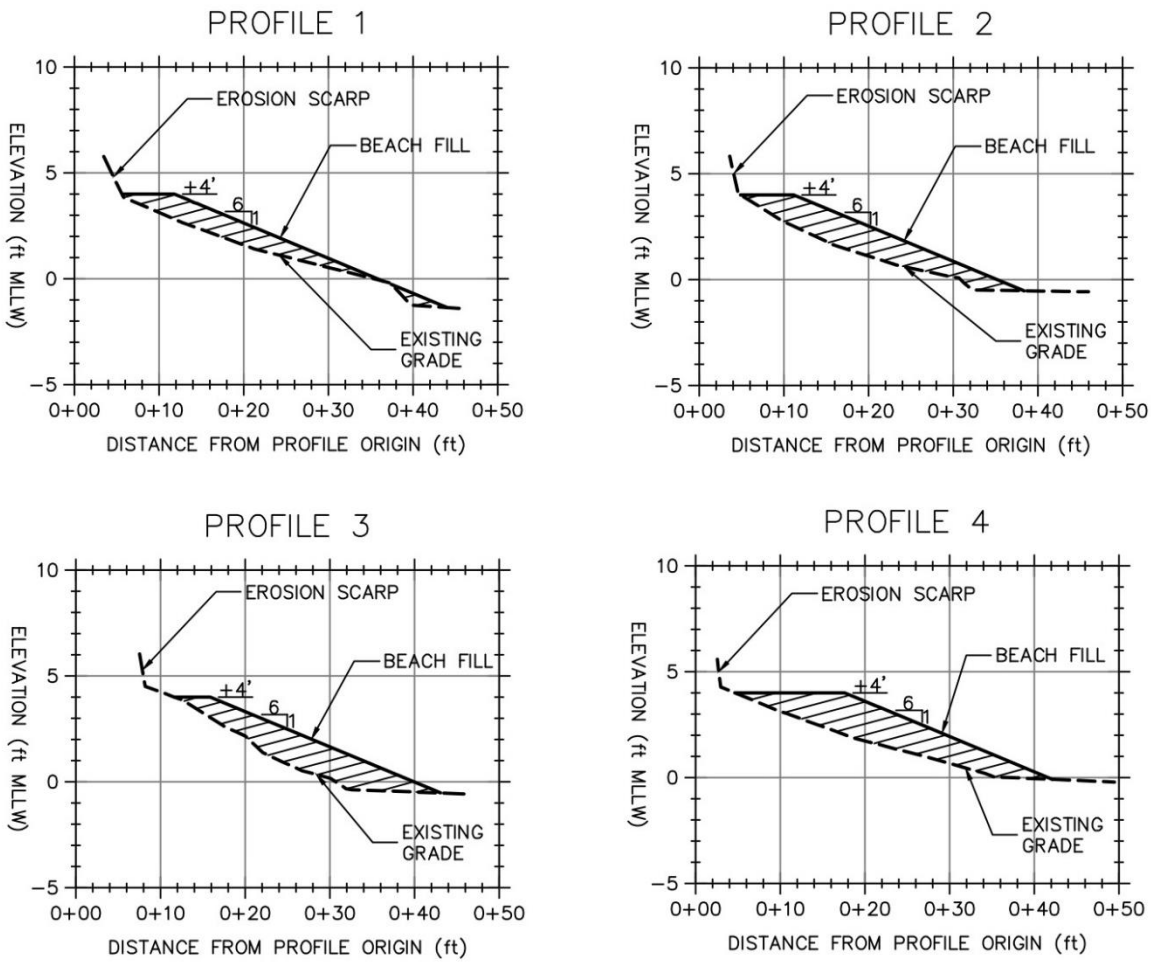

Figure 2-8. Preliminary design profiles for 400 cubic yards of sand backpassing

2.3 Project Renderings

Computer generated renderings shown in Figure 2-9 and Figure 2-10 illustrate how the proposed new rock groin will appear from Portlock Beach and from Kalanianaole Highway Bridge, respectively. The existing temporary sandbag groin is also shown with each rendering for comparison.

(a)

(b)

Figure 2-9. Project site looking west from Portlock Beach:

(a) existing condition, (b) with proposed 290-foot long L-head groin

(a)

(b)

Figure 2-10. Project site looking from the Kalanianaole Highway Bridge: (a) existing condition, (b) with proposed 290-foot long L-head groin

2.4 Construction Methodology

Construction of the proposed Hawaii Kai Marina groin replacement is challenging due to limited access and space for a staging area on the shoreline. Thus the project must entail a replacement groin design and construction methodology that is relatively quick to construct with minimal impacts to the adjacent residential properties and recreational users. The construction period for the proposed action is estimated to be 60 working days, or approximately 3 months. Construction duration estimates for the other groin alternatives considered are shown in Table 2-3.

Proposed construction access and staging areas are shown in Figure 2-11. Large construction equipment and materials can be offloaded at the site via barge in the Hawaii Kai Marina entrance channel, with the primary staging area for material located across the entrance channel in Maunalua Bay Beach Park. Staging in Maunalua Bay Beach Park will require construction of a temporary pier on the western shore of the entrance channel, similar to the temporary pier built during the 2013 entrance channel dredging project (Figure 2-12). The temporary pier will not interfere or obstruct boat traffic into or out of the Hawaii Kai Marina.

A secondary staging area can be located on the beach adjacent to the existing groin (fronting TMK (1) 3-9-002:031) for equipment storage and a limited amount of construction material. Stone will be delivered to the staging areas by truck every couple of days, or possibly even daily, early in the morning. Construction equipment will consist primarily of a large excavator and a barge. Access to the beach restoration and sand backpassing area will be along Portlock Beach.

A possible groin construction sequence is as follows:

1. Establish access to the site by constructing a temporary pier at Maunalua Beach Park for material and equipment offloading via barge.
2. Implement sand backpassing: excavate approximately 400 cubic yards of beach sand from the east side of the existing groin. Transport and place the excavated sand on the southeast end of Portlock Beach, fronting TMKs 3-9-002:001 through 3-9-002:004.
3. Working seaward from the Kalanianaole Highway Bridge, remove existing sandbags and other loose material from the sea floor, excavate the toe trenches, and then place the core material, underlayer stone, and armor stone up to the +2.5-foot elevation. Remove the existing groin remnants as necessary or as construction proceeds away from the shore. Stockpile additional armor stone on both sides as necessary to provide for adequate equipment access width along the stem.
4. Move seaward, constructing the lower portion of the groin stem until the groin head area is reached, then construct the lower portion of the head out to the groin termination.
5. Working backward toward shore, construct the finished groin to the design elevation.
6. Demobilize equipment and temporary landing platform.

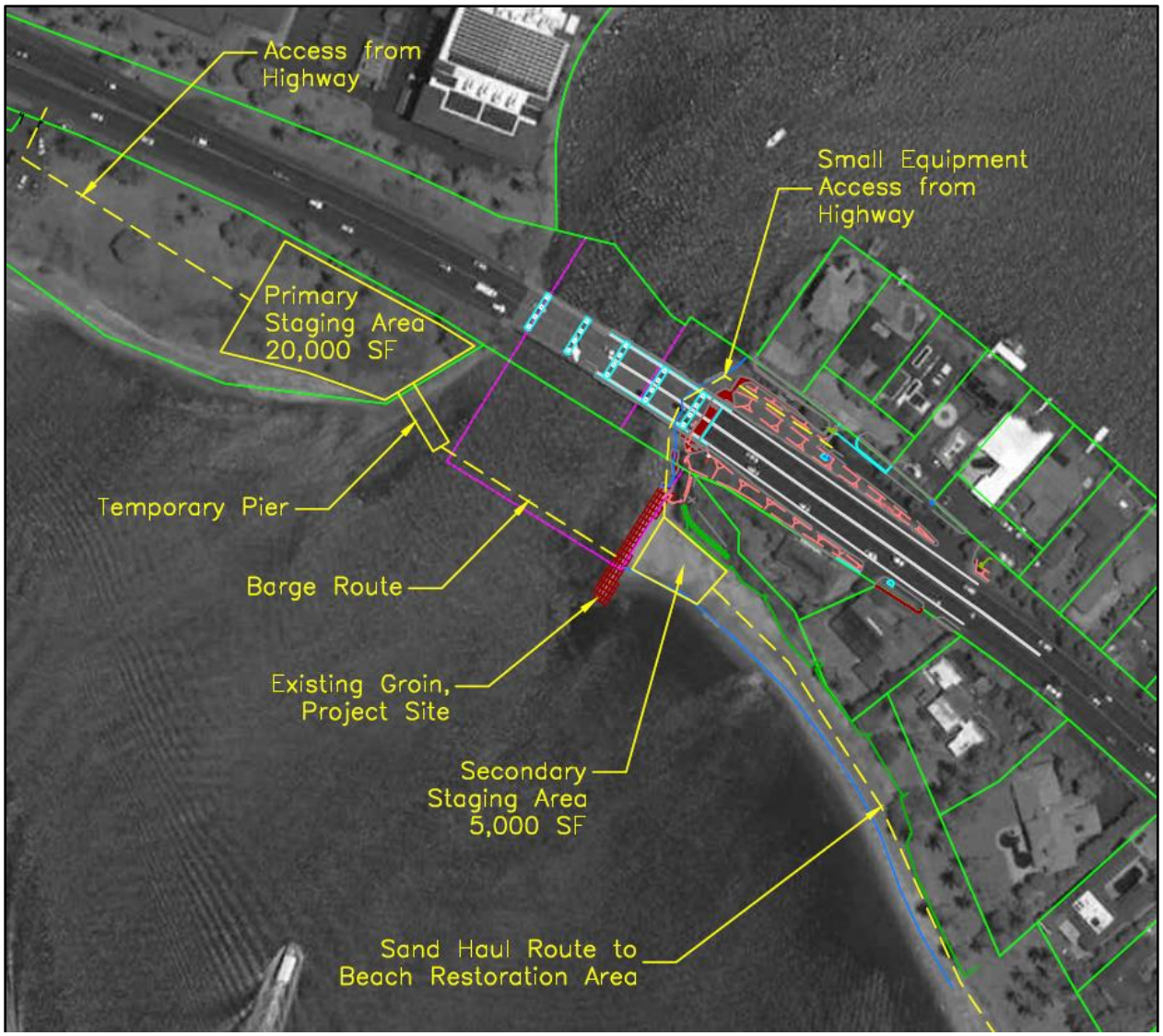

Figure 2-11. Construction access and staging areas

Figure 2-12. Temporary pier built for the 2013 dredging project

2.5 Construction Cost

The preliminary estimated construction cost for the preferred groin replacement option is $1,900,000. Construction cost estimates for the other groin alternatives considered are shown in Table 2-3.

Table 2-3. Construction cost and schedule estimates for groin alternatives

Layout	Cost	Construction Duration (Work Days)
Extended Length w/L-head (preferred)	$1,900,000	55
Existing Length	$1,550,000	45
Existing Length w/L-head	$1,770,000	50
Extended Length	$1,700,000	50
Max Length w/L-head	$2,070,000	60

3. OVERVIEW OF THE EXISTING ENVIRONMENT

3.1 Physical Environment

3.1.1 Bathymetry and Geomorphology

Maunalua Bay is a pronounced embayment at the southeast end of the island of Oahu. Figure 3-1 shows the large scale bathymetry and geomorphology of Maunalua Bay compiled from National Oceanographic and Atmospheric Administration (NOAA) maps and other existing information. Figure 3-2 shows the nearshore bathymetry and geomorphology at the project site.

The Maunalua Bay shoreline is fronted by a shallow fringing fossil limestone reef that extends approximately 3,000 feet offshore and includes channels and pockets filled with sand. Depths are generally 5 feet or less, with some areas baring at low tide. The reef generally consists of low relief limestone, with a veneer of sand or silt in several locations. Seaward of the reef, the bottom drops gradually to a wide shelf of sand and scattered limestone formations at depths of 50 to 60 feet (AECOS, 1981).

To the west, a series of sandbars extend seaward from Paiko Peninsula, with some being emergent at low tide. There are extensive silt deposits on the reef section off Kuliouou Beach Park and the inner sections of the reef off Maunalua Beach Park.

The bathymetry directly offshore of the project site is complex due to multiple natural and man-made channels that transect the reef flat. The Kui Channel has depths of approximately 12 feet; the channel walls are steep and rise to an elevation of approximately -4 feet MLLW. The Kui Channel splits into three separate channels as it approaches the shoreline: one that trends northeast and parallels Kalanianaole Highway, the Hawaii Kai Marina entrance channel, and the easternmost that intersects Portlock Beach 250 feet the east of the existing groin. The existing temporary sandbag groin is located on a shoal between the entrance channel and the Portlock Beach channel. This shoal is clearly indicated by the 4-foot depth contour shown in Figure 3-2.

The area directly seaward of the project site is characterized by NOAA as “pavement”, which refers to low-relief, solid carbonate rock, and was confirmed by SEI using water jet probing. However, both the entrance channel and the channel that intersects Portlock Beach have sand bottoms.

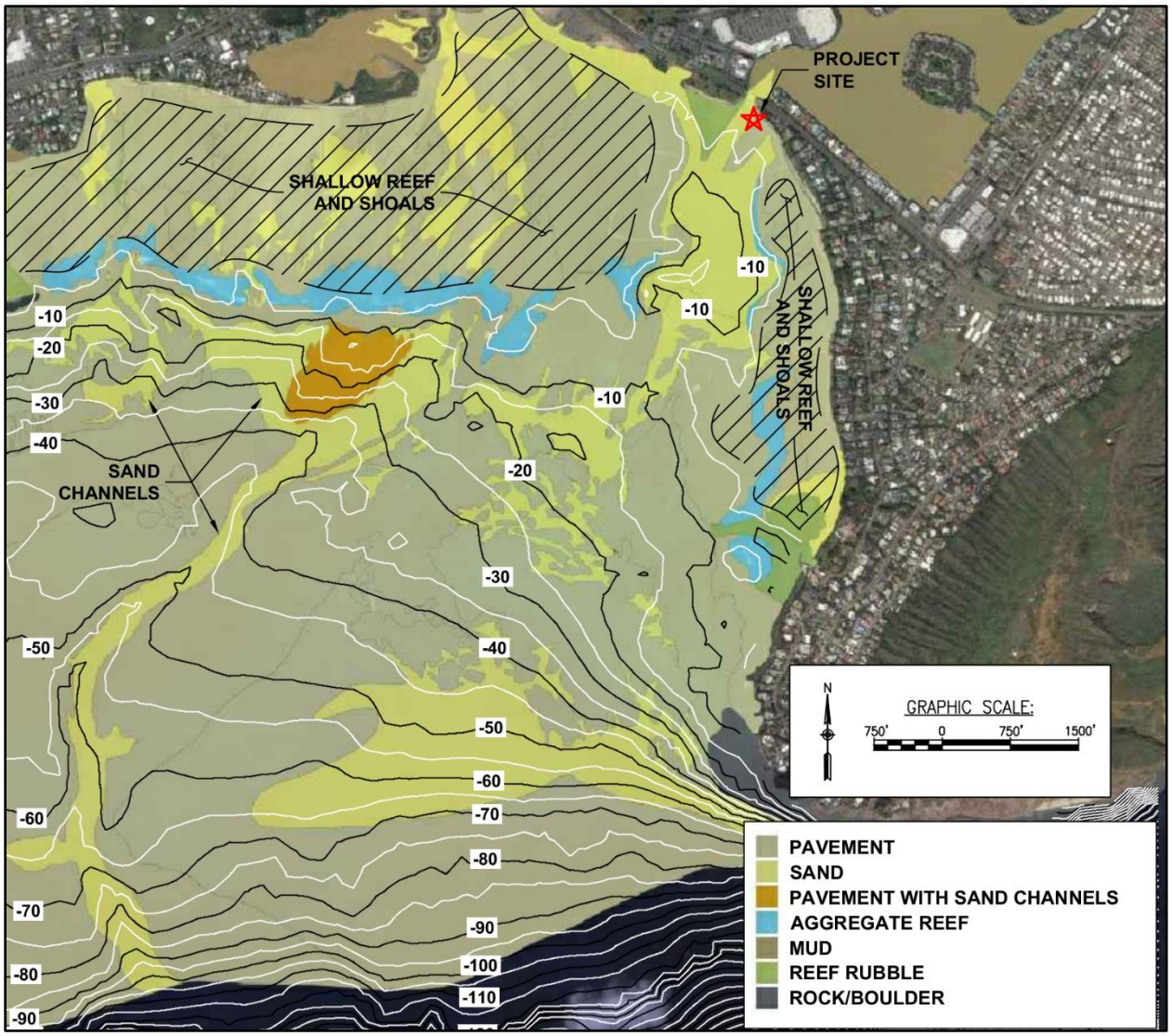

Figure 3-1. Offshore bathymetry (contours in feet) and geomorphology (from NOAA)

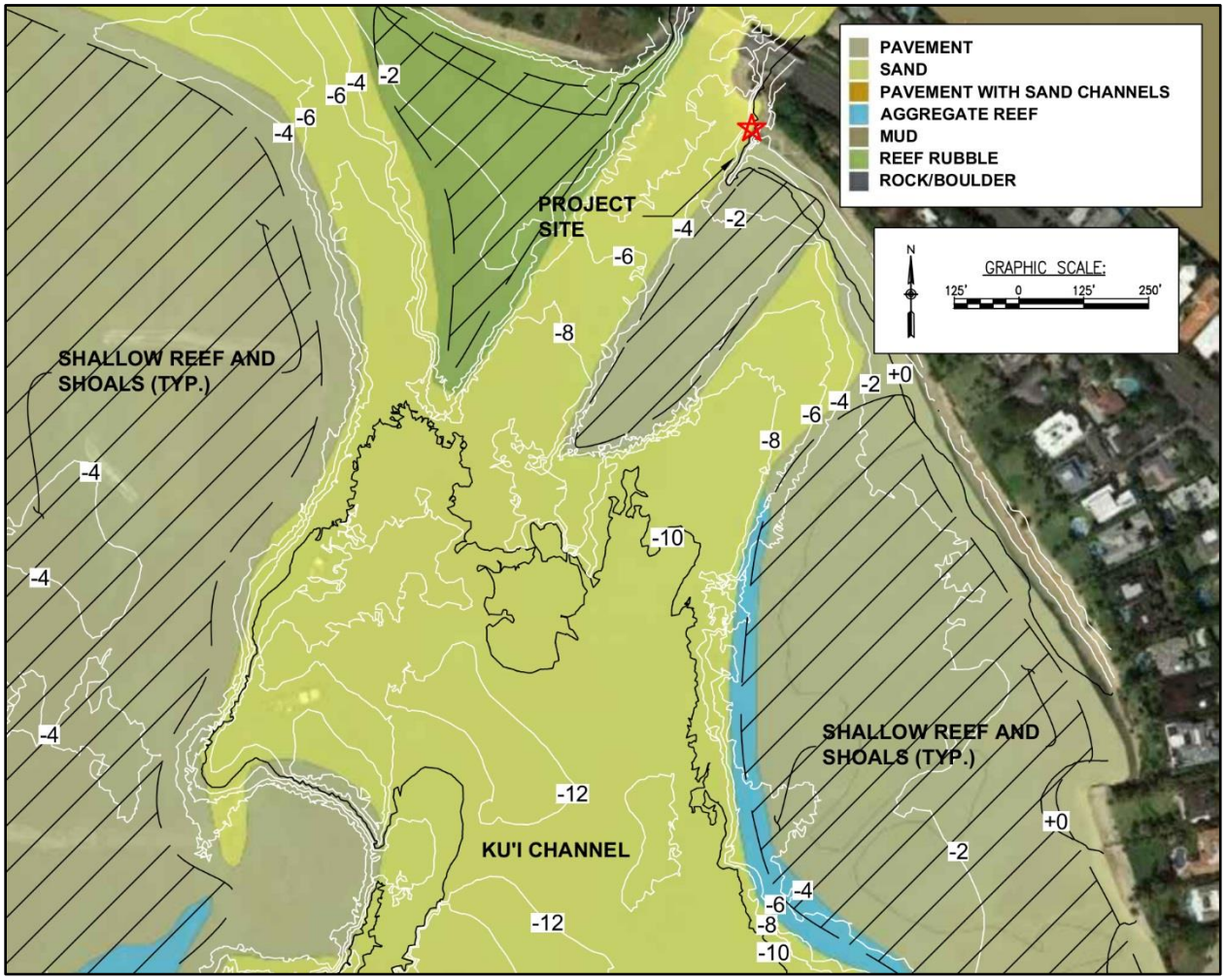

Figure 3-2. Nearshore bathymetry (contours in feet) and geomorphology (from NOAA)

3.1.2 Climate

The Hawaiian Islands are situated south of the North Pacific High, a semi-permanent high-pressure cell. Located in the northeastern Pacific, the North Pacific High is the dominant feature affecting air circulation in the region. Over the Hawaiian Islands, this high-pressure cell produces very persistent northeasterly winds (trade winds). During the winter months, cold fronts sweep across the north central Pacific Ocean, bringing rain to the Hawaiian Islands and intermittently modifying the trade wind regime.

3.1.2.1 Temperature and Rainfall

Due to the tempering influence of the Pacific Ocean and their low-latitude location, the Hawaiian Islands experience small diurnal and seasonal variations in ambient temperature. Average temperatures in the coolest and warmest months in the Hawaii Kai area are 74.9˚ Fahrenheit (F) (January) and 80.9˚F (September).

Mountainous topography and the dominant northeast trade winds are the two primary factors that influence the amount of rainfall at any given location on Oahu. Rainfall averages nearly 250

inches per year near the top of the Koolau Range on the windward side of Oahu. Rainfall is much lower on the leeward side of the Koolau Range, where the project is located. Average annual rainfall in Hawaii Kai is approximately 30 inches per year. Nevertheless, humidity is still moderately high, ranging from mid-60 to mid-70 percent. Temperature and precipitation data from the nearby Hawaii Kai Golf Course are listed in Table 3-1.

Table 3-1. Average Monthly Temperature and Rainfall

Month	Normal Ambient Temperature, ºFahrenheit		Average Monthly Rainfall (inches)
	Average Daily Minimum	Average Daily Maximum	
January	65.9	74.9	5.34
February	65.5	74.6	3.31
March	65.8	75.0	4.57
April	66.4	76.2	2.14
May	68.0	77.3	1.26
June	69.7	79.0	0.57
July	70.6	79.6	1.12
August	71.5	80.2	1.05
September	71.9	80.9	0.62
October	71.1	79.9	2.48
November	69.6	77.7	3.87
December	67.1	75.4	4.57
Source: Western Regional Climate Center (Data from the Hawaii Kai Golf Course).			

3.1.2.2 Wind

The prevailing winds throughout the year in Hawaii are the northeast trade winds. Trade wind frequency varies from more than 90% during the summer season to only 50% in January, with an overall annual frequency of approximately 70%. Westerly, or Kona, winds occur primarily during the winter months and are generated by low pressure systems near the islands. Figure 3-3 is a wind rose diagram applicable to the project site based on wind data recorded at Honolulu International Airport from 1949 to 1995. The wind rose shows the frequency of occurrence based on wind speed and direction and indicates the dominance of trade wind flow in the islands.

Trade winds are produced by the outflow of air from the North Pacific High. The center of this high pressure system is typically located well north and east of the Hawaiian chain, but it moves to the north and south seasonally. In the summer months, the center moves to the north, causing the trade winds to be at their strongest from May through September. In the winter, the center moves to the south, resulting in decreasing trade wind frequency from October through April.

Wind patterns of a more transient nature increase during the winter months. Winds from extra-tropical storms can be strong from almost any direction, depending on the strength and position of the storm. The low pressure systems associated with these storms typically track west to east across the North Pacific, north of the Hawaiian Islands. Kona winds generally come from a southerly to southwesterly direction, and are sometimes associated with slow moving low

pressure systems known as "Kona lows" situated near the island chain. These storms are often accompanied by heavy rains.

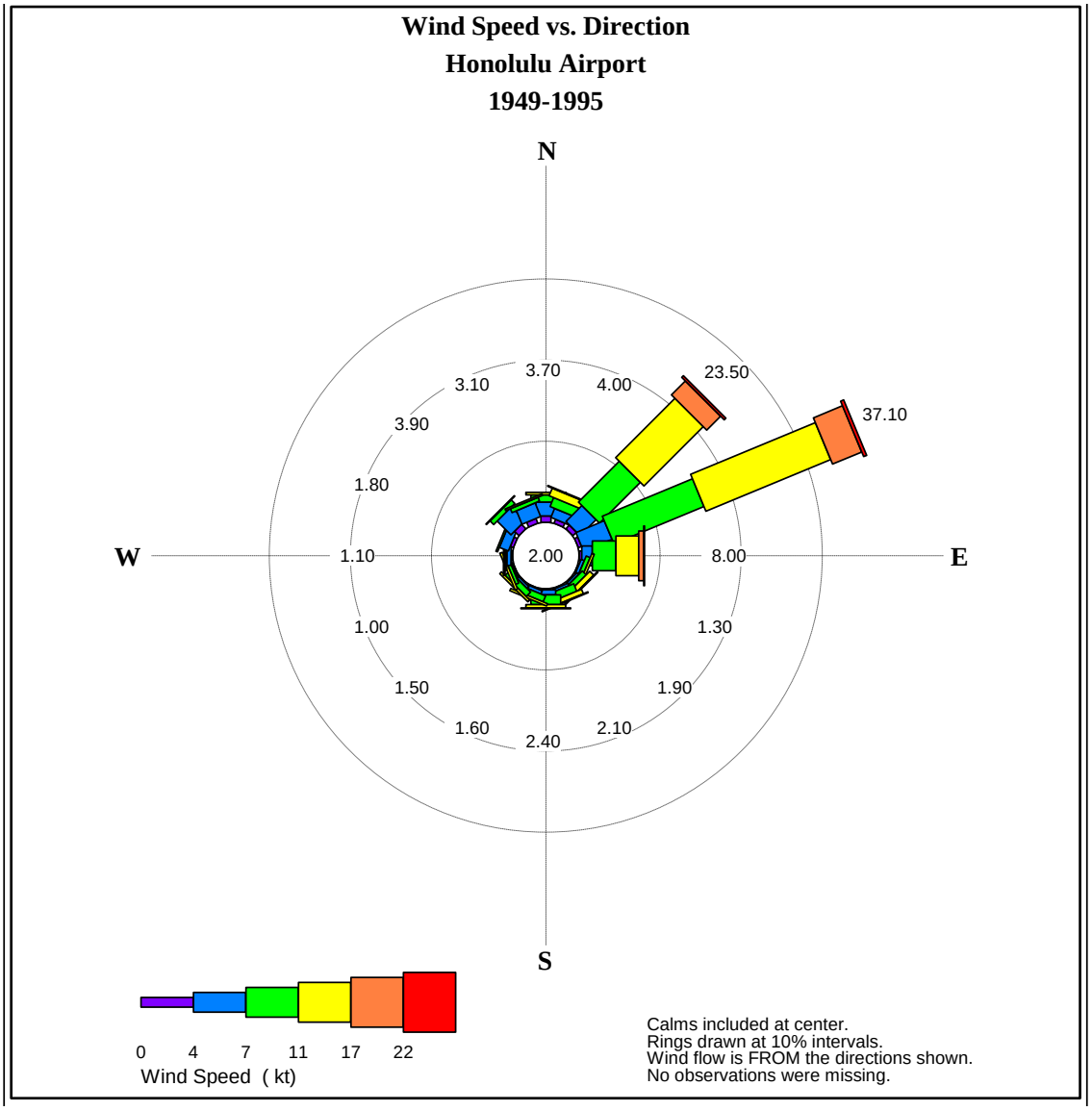

Figure 3-3. Frequency of occurrence of wind speed and direction, Honolulu International Airport

3.1.2.3 Extreme Wind

Table 3-2 is a list of the yearly maximum 2-minute averaged wind speeds at Honolulu International Airport for the 44-year period from 1969 to 2012, ordered by wind speed. Some of the annual maxima shown are associated with specific storm events. The highest value of 46 miles per hour in November of 1982 occurred during the passage of Hurricane Iwa. Other events include Hurricane Iniki in 1992 at 38 miles per hour, and several severe Kona storms with wind speeds up to 40 miles per hour.

An extreme value distribution was applied to the 44 annual maximum 2-minute averaged wind speed records to develop expected extreme wind speeds for various return periods ranging from

1 to 100 years. The extreme value wind speeds are presented in Table 3-3. The maximum 2-minute averaged wind listed in Table 3-2 (46 mph) is equivalent to the 50-year wind speed from Table 3-3.

Table 3-2. Annual Maximum 2-minute wind speeds at Honolulu International Airport

Year	Wind Speed (MPH)	Year	Wind Speed (MPH)
1982	46	1972	33
1969	40	1973	33
1970	40	1993	33
2004	40	1999	33
2007	39	2010	33
2011	39	1997	32
1976	38	2003	32
1992	38	2005	32
1977	37	1994	31
2008	37	2006	31
1975	36	1981	30
2002	36	1985	30
1980	35	1986	30
1990	35	1989	30
2000	35	2012	30
2001	35	1987	29
2009	35	1988	29
1971	34	1984	28
1974	34	1991	28
1978	34	1995	28
1979	34	1996	28
1998	34	1983	23

Table 3-3. Extreme value distribution periods for 2-minute averaged wind speeds at Honolulu International Airport (1969 to 2012)

Return Period (years)	Wind Speed (MPH)
1	33.3
2	35.6
5	38.7
7	39.8
10	41.0
15	42.3
20	43.3
25	44.0
30	44.6
40	45.6
50	46.3
75	47.7
100	48.6

3.1.2.4 Air Quality

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

Generally, air quality in the vicinity of the project site is excellent. The State of Hawaii Department of Health (DOH) monitors ambient air quality on Oahu using a system of four monitoring sites. The closest monitoring site to the project is on Punchbowl Street in Honolulu. The primary purpose of the monitoring network is to measure ambient air concentrations of the six criteria NAAQS pollutants. DOH monitoring data for 2014 shows that air quality in the area during this year never exceeded the short-term or long-term State or National standards for the six pollutants measured (particulate matter ($PM_{2.5}$ and PM_{10}), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide, and hydrogen sulfide). The only ozone monitoring station on Oahu is located on Sand Island. Existing ozone concentrations at that location also meet State and Federal ambient air quality standards.

3.1.3 Tide and Water Level Rise

The total water depth is composed of the depth below the sea level datum, plus factors that add to the still water level (SWL) such as the astronomical tide, wave setup, storm surge (pressure setup and wind setup), mesoscale eddies, and potential sea level change over the life of the project. The sea level datum for this project is the mean lower low water (MLLW) level, which represents the average elevation of the lowest daily tides.

3.1.3.1 Astronomical Tides

Hawaii tides are semi-diurnal with pronounced diurnal inequalities (i.e., two tidal cycles each day with the range of high and low water levels being unequal). Tidal predictions and historical extreme water levels are given by the Center for Operational Oceanographic Products and Services (COOPS), National Ocean Service (NOS), NOAA. The nearest tide station to the Hawaii Kai Marina is located at Honolulu Harbor. The water level data from this station is shown in Table 3-4 and is based on the 1983-2001 tidal epoch.

Table 3-4. Water level data for Honolulu Harbor (NOAA)

Datum	Elevation (feet mllw)	Elevation (feet msl)
Mean Higher High Water	+1.9	+1.1
Mean High Water	+1.5	+0.7
Mean Tide Level	+0.8	0.0
Mean Low Water	+0.2	-0.6.
Mean Lower Low Water	0.0	-0.8

3.1.3.2 Mesoscale Eddies and Other Oceanographic Phenomena

Hawaii is subject to periodic extreme tide levels due to large oceanic eddies and other oceanographic phenomena that have recently been recognized and that sometimes propagate through the islands. *Mesoscale eddies* produce tide levels that can be up to 0.5 feet higher than normal for periods up to several weeks (Firing and Merrifield, 2004). Temporary sea level rise has also been associated with phenomena related to the El-Nino/Southern Oscillation (ENSO).

It is now widely accepted among Hawaii coastal scientists and engineers that a 2003 erosion event that damaged the shoreline at Kaanapali on the island of Maui was caused by the vigorous and sustained occurrence of southern swell in combination with pronounced short-term increases in sea level due to the presence of mesoscale eddies (SEI 2003, Vitousek 2007). The highest sustained sea level measurements recorded at the Honolulu Harbor tide gauge occurred during September of 2003. Comparison and analysis of tide level, satellite altimetry, and hydrographic measurements around the Hawaiian Islands suggest that the 2003 extreme water levels were largely due to an anti-cyclonic eddy with an offshore water level rise of approximately 0.5 feet and a diameter of roughly 186 miles.

3.1.3.3 Wave Setup

During high wave events, the water level shoreward of the breaker zone may be elevated above the tide level as a result of the wave breaking process. This water level rise, termed *wave setup*, may be as much as 10 to 12% of the breaker height.

3.1.3.4 Storm Surge

During tropical storm and hurricane conditions, with high winds and very low pressures, an additional water level rise termed *storm surge* can occur. There is no storm surge component to waves generated by distant storms. Storm surge on continental coasts can be amplified by the wide and shallow continental shelf. This type of surge is only minimally present in Hawaii due to the narrow insular shelf that surrounds the islands.

3.1.3.5 Sea Level Change

It is widely recognized that global warming has caused a world-wide acceleration in sea level rise. The present estimated rate of global mean sea-level change (SLC) is +3.42 mm/yr (NASA, 2016).

The sea level trend for Honolulu Harbor for the period of 1905 to present is shown in Figure 3-4 (NOAA, 2015). The rate of sea level change (RSLC) is shown in the figure as being +1.41 ± 0.22 mm/yr based on monthly data for the period 1905 to 2013. Figure 3-4 shows interannual anomalies of up to approximately 0.5 feet (15 cm) in Honolulu Harbor.

Sea level rise for Oahu using three scenarios provided by the USACE (2014) is shown in Figure 3-5 and Table 3-5. The intermediate rate is used as a reasonable prediction for future sea level at the project site. For a project design life of 50 years, the calculations predict an increase of 0.68 feet (8 inches) by 2065. For comparison, the low and high estimates using the same procedure are 0.25 feet (3 inches) and 2.03 feet (24 inches), respectively.

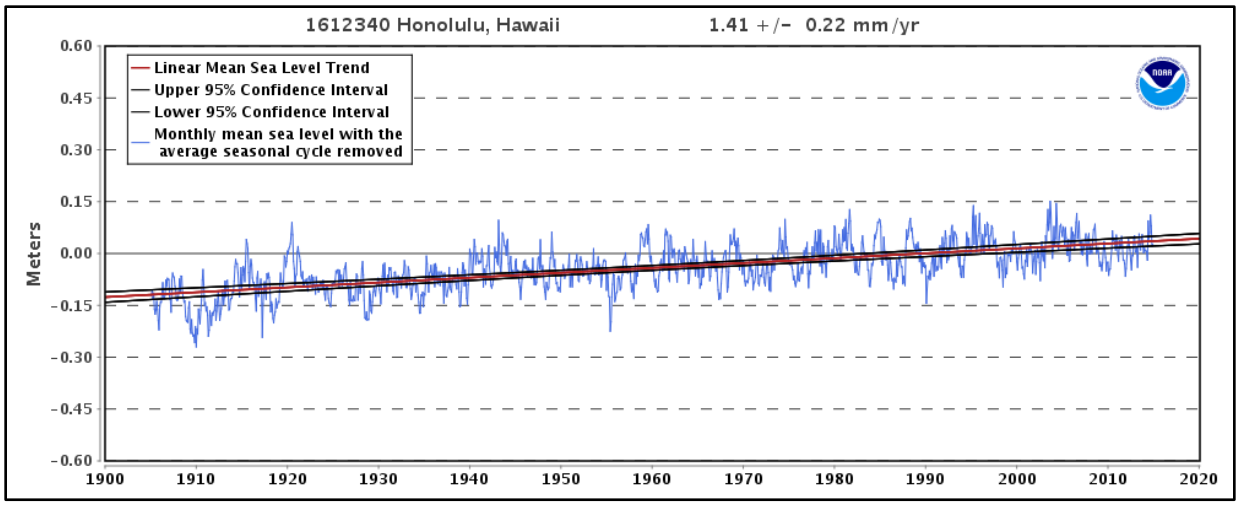

Figure 3-4. Mean sea level trend, Honolulu Harbor, 1905 to present (NOAA, 2015)

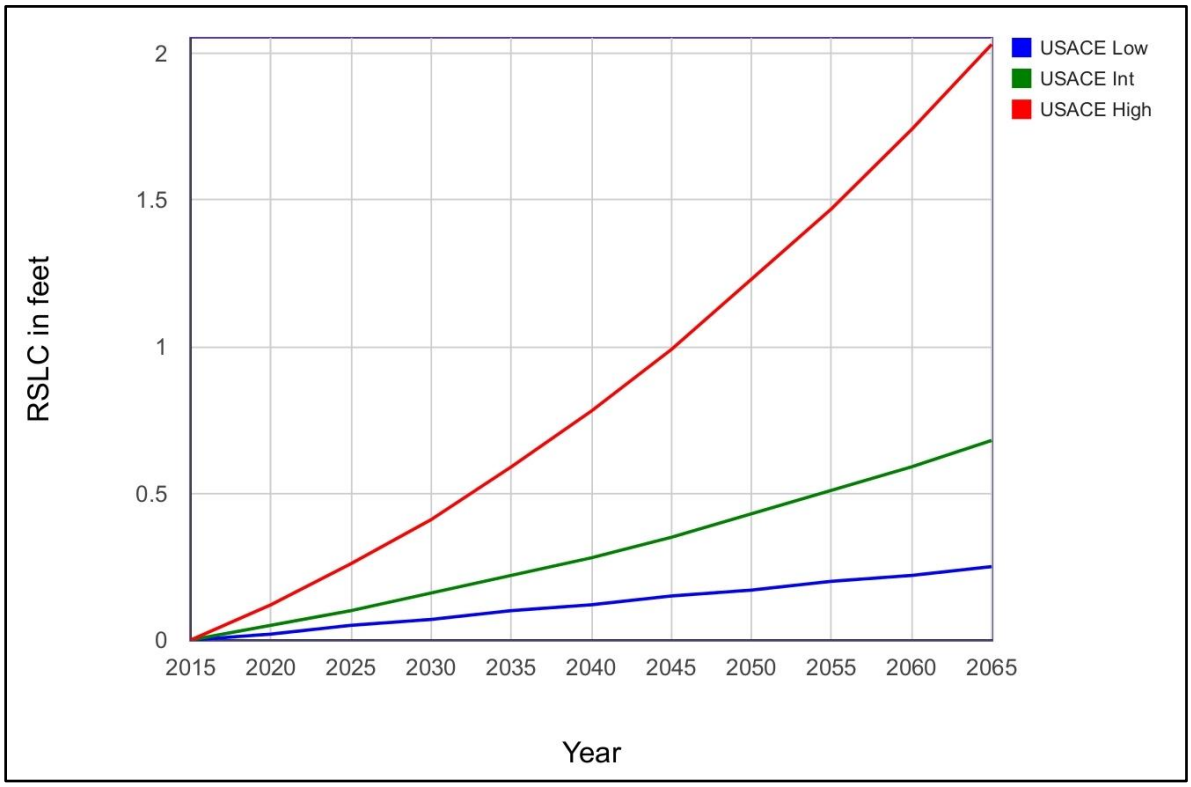

Figure 3-5. Scenarios for projected Relative Sea Level Change, Honolulu Harbor (USACE, 2014)

Table 3-5. Projected Sea Level Change, Honolulu Harbor (USACE, 2014); values in feet

Year	USACE Low Rate	USACE Int Rate	USACE High Rate
2015	0	0	0
2020	0.02	0.05	0.12
2025	0.05	0.1	0.26
2030	0.07	0.16	0.41
2035	0.1	0.22	0.59
2040	0.12	0.28	0.78
2045	0.15	0.35	0.99
2050	0.17	0.43	1.23
2055	0.2	0.51	1.47
2060	0.22	0.59	1.74
2065	0.25	0.68	2.03

3.1.4 Currents

Currents in Maunalua Bay are predominantly tide and wind-driven, while nearshore currents are wave-driven. The surface layer moves in response to the wind, and the prevailing trade winds result in transport to the southwest, or offshore.

The subsurface layers are influenced by the semi-diurnal tide. During flood tide the predominant flow direction is to the west, toward Diamond Head. Ebb tide results in a reversed and generally weaker flow to the east (Storlazzi, 2009). There are times, however, when the ebb current flow is strong enough to counteract the trade wind influence, and even the surface layers move to the east. It is not uncommon to see, at the end of an ebb tide, a slightly discolored plume of water from the Hawaii Kai Marina outflow present off Hanauma Bay or Lanai Lookout.

Typical subsurface current speeds in the main entrance channel are in the 0.2 to 0.3 knot range (SEI, 1988). The flow in the interior channel, paralleling Maunalua Bay Beach Park, follows the channel through the reef. The current direction becomes more variable in the outer Kui Channel, apparently because of the extensive deeper areas on both sides of the channel.

3.1.5 Wave Transformation and Numerical Modeling

The design of coastal structures requires determination of the design wave conditions at the project site. Wave behavior is complex, with deepwater waves determined by growth and decay factors in generating regions such as hurricanes, and shallow water behavior dramatically influenced by wave approach direction and bathymetry.

There are a number of phenomena that apply to the behavior of water waves in shallow nearshore water that are important for understanding fundamental coastal processes. As deepwater waves propagate toward shore, they begin to encounter and be transformed by the ocean bottom. Wave speed is governed by the wavelength in deep water, but in shallow water the wave speed becomes directly related to the water depth. As waves decelerate with decreasing depth, the process of *wave shoaling* generally steepens the wave by increasing the

wave height and decreasing the wavelength. *Wave breaking* occurs when the wave profile shape becomes too steep to be maintained. This typically occurs when the ratio of wave height to water depth is approximately 0.78, and is a mechanism for dissipating the wave energy. Wave energy is also dissipated due to bottom friction. The process of wave breaking causes a rise in nearshore water level termed *wave setup*. The difference in wave setup at adjacent nearshore areas is the hydraulic mechanism responsible for driving wave-derived longshore and cross-shore ("rip") currents. The phenomenon of *wave refraction* is caused by differential wave speed along a wave crest, and will cause wave crests to converge or diverge and may locally increase or decrease wave heights. Although not a shallow water phenomenon, *wave diffraction* is the lateral transmission of wave energy along the wave crest, and will cause the spreading of waves in a "shadow zone", such as occurs behind a breakwater, L-head, or other barrier. *Wave reflection* will occur along vertical or steep shorelines or submerged features, including steep beaches, rock formations, reefs, or man-made structure such as breakwaters or seawalls.

Wave transformations are mathematically complex, and calculations over broad areas and complicated bathymetry require the use numerical computer models. Three numerical models were used in this study to investigate different aspects of wave behavior:

<u>SWAN</u>
Simulating Waves Nearshore (SWAN) is a third-generation wave model developed by Delft University of Technology that computes random, short-crested wind-generated waves in coastal regions and inland waters (Booij et al 1999). The SWAN model can be applied as a steady state or non-steady state model, and is fully spectral (over the total range of wave frequencies). Wave propagation is based on linear wave theory, including the effect of wave generated currents. SWAN provides many output quantities including two-dimensional spectra, significant wave height and mean wave period, and average wave direction and directional spreading. For this project, the SWAN model was used to transform waves from deep water to the project site. SWAN model results were used to determine wave conditions at the shore as well as provide wave parameter input for the nearshore model Bouss-2D.

<u>Bouss-2D</u>
Bouss-2D (Nwogu and Demirbilek, 2001) simulates the propagation and transformation of waves in coastal regions and harbors based on a time-domain solution of Boussinesq-type equations. The governing equations are valid from deep to shallow water and can simulate most of the phenomena of interest in the nearshore zone and harbor basins including shoaling and refraction over variable bathymetry, reflection and diffraction near structures, energy dissipation due to wave breaking and bottom friction, and breaking-induced longshore and rip currents.

Bouss-2D is phase resolving model, meaning that wave crests and troughs are modeled and propagated in time and space. The result is an accurate representation of wave heights and wave patterns across the domain. Bouss2D is particularly useful in complex shallow water bathymetry and was used to determine wave patterns at the project site. These wave patterns were used to force the MEPBAY model.

<u>MEPBAY</u>
Model for Equilibrium Planform of Bay Beaches (MEPBAY), developed by Klein et al. (2003), is an empirical shoreline prediction model that is based on the parabolic bay shape model. The

associated program presents the results graphically on a screen display overlaying the image of the existing shoreline. The model was used to calculate the equilibrium shoreline shaped in the presence of groin structures.

3.1.5.1 General Wave Climate

The wave climate in Hawaii is typically characterized by four general wave types. These include northeast trade wind waves, southern swell, southeast trade wind swell, North Pacific swell, and Kona wind waves (Figure 3-6). Tropical storms and hurricanes also generate waves that can approach the islands from virtually any direction. Any and all of these wave conditions may occur at the same time.

Trade wind waves occur throughout the year and are the most persistent in April through September when they usually dominate the local wave climate. They result from the strong and steady trade winds blowing from the northeast quadrant over long fetches of open ocean. Trade wind deepwater waves are typically between 3 to 8 feet in height with periods of 5 to 10 seconds, depending upon the strength of the trade winds and how far the fetch extends east of the Hawaiian Islands. The direction of approach, like the trade winds themselves, varies between north-northeast and east-northeast and is centered on the northeast direction. Although the Hawaii Kai area is sheltered from the direct approach of trade wind waves by the Portlock Point headland, a portion of the trade wind wave energy reaches the area by diffracting around the southeast end of Oahu, and contributes to a generally rough offshore sea state during trade wind conditions.

Southern swell is generated by storms in the southern hemisphere and is most prevalent during the summer months of April through September. Traveling distances of up to 5,000 miles, these waves arrive with relatively low deepwater wave heights of 1 to 4 feet and long periods of 14 to 20 seconds. Depending on the positions and tracks of the southern hemisphere storms, southern swell approaches from the southeast through southwest directions. Hawaii Kai is directly exposed to swell from the southerly direction, and these wave represent the greatest source of wave energy reaching the project site.

Waves can also be generated by the southeastern trade winds that blow south of the equator and can occur any time during the year. Southeast trade wind swell has small wave heights on the order of 1 foot and typical periods less than 12 seconds. These waves are not typically used as design criteria but can be important for sediment transport due to their frequency of occurrence.

During the winter months in the northern hemisphere, strong storms are frequent in the North Pacific in the mid latitudes and near the Aleutian Islands. These storms generate large North Pacific swells that range in direction from west-northwest to northeast and arrive at the northern Hawaiian shores with little attenuation of wave energy. Deepwater wave heights often reach 15 feet and in extreme cases can reach 30 feet. Wave periods vary between 12 and 20 seconds, depending on the location of the storm. Hawaii Kai is well sheltered from swell approach from the north and northwest by island shadowing.

Kona storm waves directly approach the south shore; however these waves are fairly infrequent, occurring only approximately 10 percent of the time during a typical year. Kona waves

typically range in period from 6 to 10 seconds with heights of 5 to 10 feet, and approach from the southwest. However, deepwater wave heights during the severe Kona storm of January 1980 were approximately 24 feet. The waves during this event had a significant impact on the south and west shores of Oahu.

Severe tropical storms and hurricanes have the potential to generate extremely large waves, which in turn could potentially result in large waves at the project site. Recent hurricanes impacting the Hawaiian Islands include Hurricane Iwa in 1982 and Hurricane Iniki in 1992. Iniki directly hit the island of Kauai and resulted in large waves along the southern shores of all the Hawaiian Islands. Damage from these hurricanes was extensive. Although not frequent or even likely events, they are often considered for project design conditions, particularly with regard to shoreline structures.

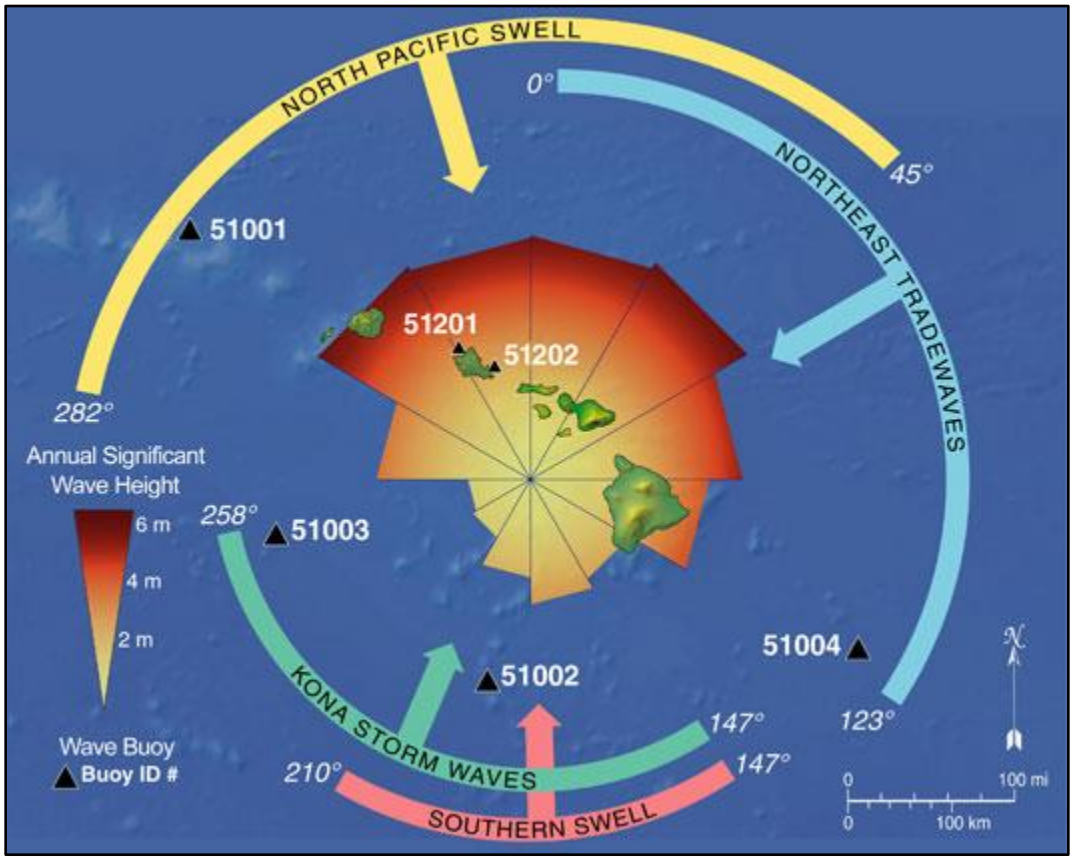

Figure 3-6. Common wave types and approach directions in Hawaii (University of Hawaii SOEST)

3.1.5.2 Deepwater Wave Statistics (Prevailing Waves)

Deepwater wave data for this project were obtained from offshore wave buoys and wave hindcasts. Wave hindcasting is a tool used to calculate past wave events based on weather models and historical data. With the proper inputs, wave hindcast models can calculate historical wave climates anywhere in the world. Hindcast model outputs are often recorded for a single location, known as a "virtual buoy".

WaveWatch III (WWIII) is a numerical wave model used to forecast and hindcast waves. Hindcast data for a 29-year period (1979-2007) are available at a wide range of locations through NOAA/NCEP. For this study, hindcast data were obtained from virtual buoy HNL11, located 22 miles southwest of Barbers Point (Figure 3-7). Measured data from CDIP Buoy 098, located east of Kailua Bay, were used to analyze prevailing trade wind conditions (see Figure 3-7).

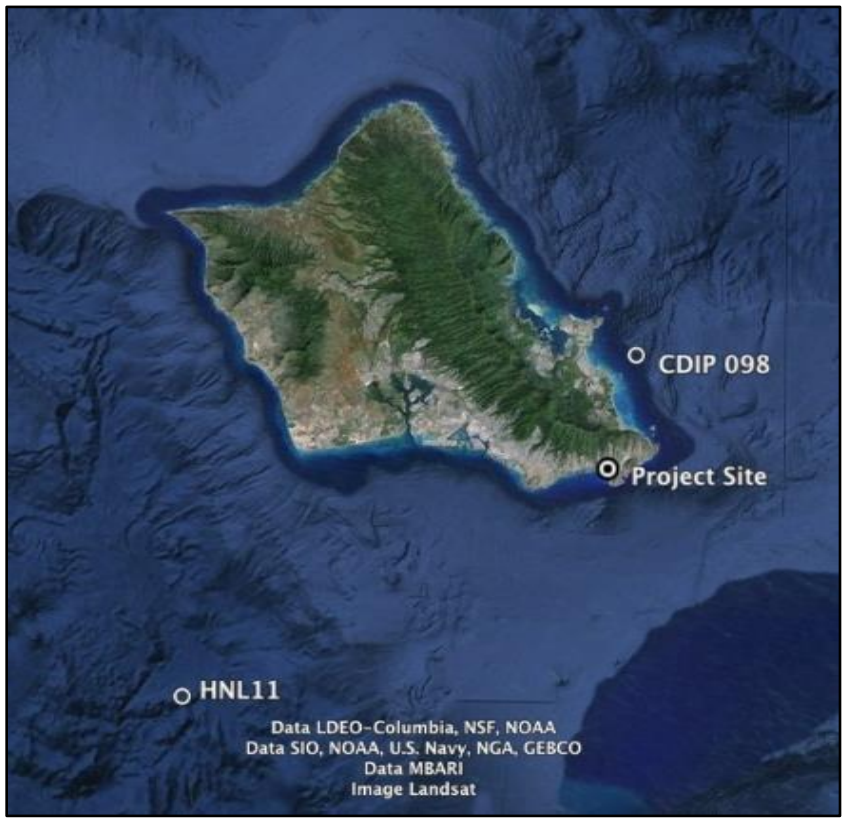

Figure 3-7. Buoy and virtual buoy locations

It is rare for the sea state to consist of a singular wave condition. Wave events are defined by parameters that include wave height, peak period, and peak direction. The wave parameters from the hindcast model are calculated from a modeled wave spectrum. The spectrum shows the distribution of wave energy relative to wave frequency (wave frequency is the inverse of wave period). This methodology allows multiple wave conditions to be accounted for at the same time for a more accurate description of the sea state. These data are then used as a statistical basis for generating percent occurrence histograms and extreme wave return period information using an extreme value distribution (e.g. Weibull or Gumbel). The wave data obtained from NOAA/NCEP at the virtual buoy HNL11 were used to describe the wave climate for waves approaching from the south. The location of buoy HNL11 is somewhat sheltered from trade wind waves; therefore, data from buoy CDIP 098 were used to define deepwater trade wind waves.

Figure 3-8 is a wave height rose diagram that shows the percent occurrence of wave height and direction for trade wind waves as measured at CDIP 098. Table 3-6 is the corresponding histogram. Figure 3-9 and Table 3-7 are the corresponding rose diagram and histogram for the wave period parameter for trade wind waves. The histograms and roses show that trade wind

waves typically range between 4 and 8 feet in height, with heights rarely larger than 10 feet. Trade wind wave periods typically range from 6 to 10 seconds. The percent occurrence is over 100% as the hindcast model accounts for multiple wave events at the same time. Long period, large waves from the north that appear in the histogram are North Pacific swell that wrap around the island.

The wave height rose and the corresponding histogram for waves approaching from the south, as measured at HNL11, are shown in Figure 3-10 and Table 3-8, respectively. The wave period rose and the corresponding histogram are shown in Figure 3-11 and Table 3-9, respectively. The histogram shows a distinct bimodal wave grouping. Southern swell approaches from 180° to 210° and has a peak period between 10 and 18 seconds. Waves approaching from 135° to 150° are southeast trade wind waves and typically have small wave heights, with periods from 6 to 12 seconds.

Four prevailing deep water conditions were selected from the data in the histograms:

- NE trade wind waves
- SE trade wind swell
- Southern swell
- South-southwest swell

This range of prevailing waves and wave directions was selected to investigate a possible relationship between the deepwater waves and nearshore wave patterns at the project site. These four prevailing conditions were used to define the coastal processes and beach morphology at the project site. The prevailing conditions were chosen as representative waves by using the largest percent occurrence.

A high-prevailing south swell event was selected for the calculation of the crest height of the structure (see Section 2.2). Semi-annual conditions are described as an above-average high-energy wave event, or deepwater conditions that are expected offshore of the project site twice per year on average.

Deepwater wave parameters of significant wave height (H_s), peak period (T_p), and peak direction (D_p) were developed from the buoy data to characterize the prevailing and semi-annual wave conditions, and are presented in Table 3-10. These parameters were used as input for the numerical wave modeling analysis of the project site.

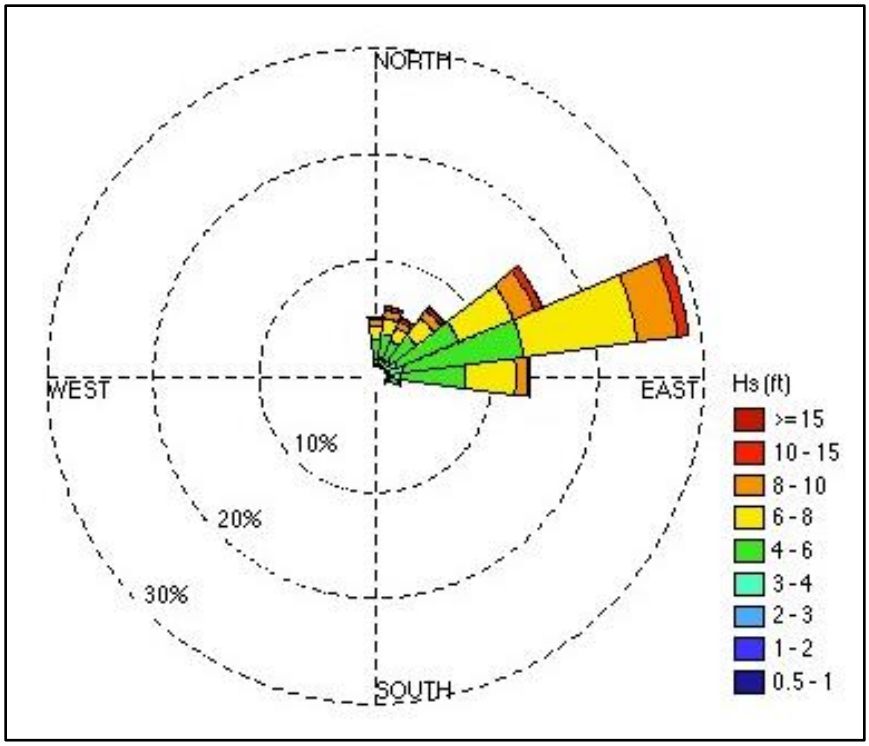

Figure 3-8. Deepwater wave height rose from CDIP 098. Data includes waves in the trade wind band between 0°-105°

Table 3-6. Deepwater wave height and histogram from CDIP 098

Hs (ft)\Dir	0	15	30	45	60	75	90	105	Total
1-2	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
2-3	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	1.0
3-4	0.5	0.6	0.6	0.7	1.0	1.5	1.1	0.3	6.3
4-6	1.9	2.3	1.9	3.0	6.3	11.4	6.3	0.8	34.0
6-8	1.3	1.5	1.4	2.1	5.6	10.8	4.7	0.2	27.5
8-10	0.6	0.8	0.6	0.9	2.2	3.9	1.2	0.0	10.1
10-12	0.2	0.3	0.3	0.3	0.6	0.9	0.2	0.0	2.7
12-14	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.6
14-16	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.1
16-20	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.1
20+			0.0	0.0			0.0		0.0
Total	4.6	5.7	5.0	7.2	16.0	28.8	13.6	1.5	

	0	15	30	45	60	75	90	105
Mean	6.2	6.2	6.4	6.2	6.4	6.4	5.9	5.0
Std Dev	2.2	2.2	2.3	2.1	1.9	1.8	1.6	1.4
Min	1.9	1.8	1.7	1.8	2.0	1.9	2.2	1.9
Max	17.1	18.3	20.5	20.5	18.6	19.8	21.2	12.3

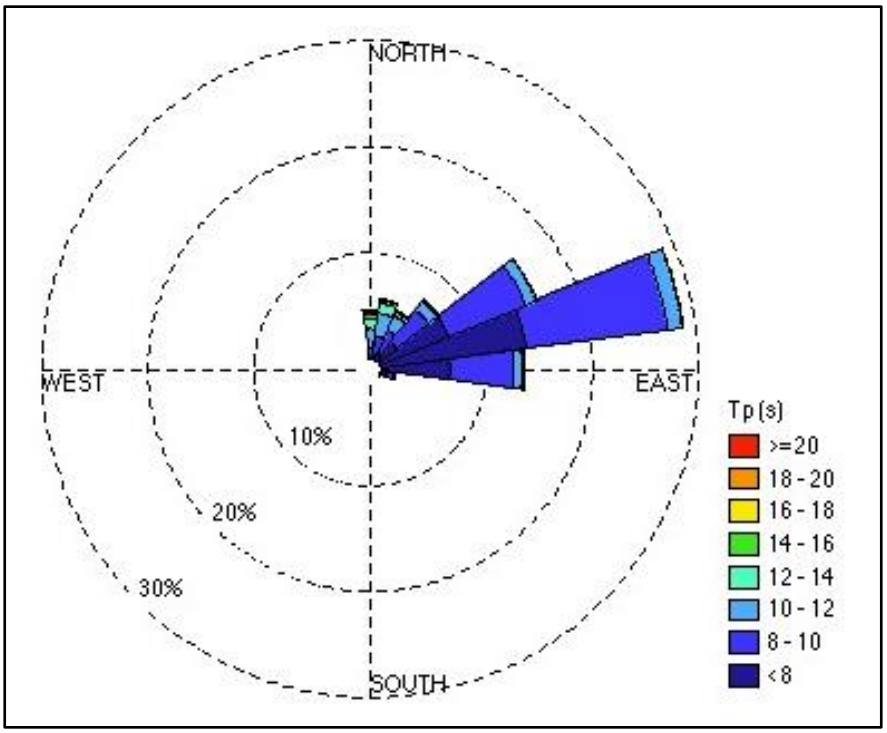

Figure 3-9. Deepwater wave period rose from CDIP 098. Plot only shows waves between 0°-105°

Table 3-7. Deepwater wave period and histogram from CDIP 098

Tp (s)\Dir	0	15	30	45	60	75	90	105	Total
4-6	0.0	0.0	0.1	0.2	0.8	2.7	2.0	0.2	6.0
6-8	0.1	0.3	0.7	2.0	6.2	11.2	4.5	0.4	25.5
8-10	0.9	1.8	2.3	3.8	7.9	13.4	6.1	0.6	36.8
10-12	1.8	2.2	1.5	1.0	1.0	1.4	0.8	0.1	9.8
12-14	1.0	0.9	0.4	0.1	0.1	0.1	0.2	0.1	2.9
14-16	0.4	0.3	0.1	0.0	0.0	0.0	0.1	0.1	1.2
16-18	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
18-20	0.1	0.0	0.0	0.0					0.2
20+	0.1	0.0							0.1
Total	4.6	5.7	5.0	7.2	16.0	28.8	13.6	1.5	

	0	**15**	**30**	**45**	**60**	**75**	**90**	**105**
Mean	12.0	10.9	9.8	8.8	8.2	8.0	8.0	8.4
Std Dev	2.6	2.1	1.9	1.6	1.4	1.4	1.8	2.3
Min	4.8	4.8	4.4	4.6	4.2	4.2	4.2	4.2
Max	25.0	25.0	18.2	18.2	16.7	16.7	16.7	16.7

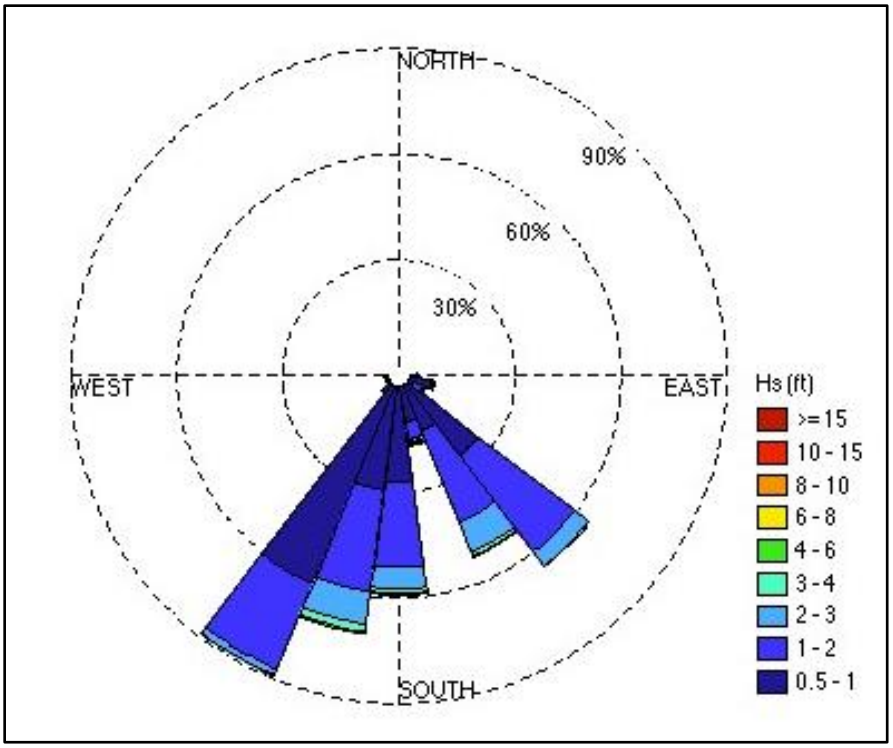

Figure 3-10. Deepwater wave height rose from HNL11. Plot only shows waves between 90°-270°

Table 3-8. Deepwater wave height and direction histogram from HNL11

Hs (ft)\Dir	90	105	120	135	150	165	180	195	210	225	240	255	270	Total
0.5-1	0.6	6.4	1.1	25.3	13.7	10.1	27.0	29.6	60.7	2.8	0.3	0.2	0.6	178.5
1-2	0.2	0.4	3.3	34.4	28.0	5.0	24.2	29.1	26.4	0.4	0.1	0.1	0.3	151.9
2-3	0.4	0.3	0.6	5.0	9.1	1.0	6.2	9.3	1.9	0.1	0.0	0.1	0.2	34.0
3-4	0.4	0.1	0.0	0.3	1.2	0.5	1.3	2.3	0.1	0.0	0.0	0.1	0.1	6.4
4-6	0.2	0.0	0.0	0.0	0.4	0.3	0.5	0.6	0.0	0.0	0.1	0.1	0.1	2.4
6-8	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
8-10	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
10-12					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12-14						0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14-16					0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0
16-20						0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20+							0.0	0.0	0.0		0.0	0.0		0.0
Total	1.9	7.2	5.0	65.1	52.5	17.0	59.2	70.9	89.2	3.4	0.5	0.7	1.3	

	90	105	120	135	150	165	180	195	210	225	240	255	270
Mean	2.3	0.8	1.4	1.2	1.5	1.2	1.3	1.3	0.9	0.9	2.4	3.3	2.1
Std Dev	1.5	0.6	0.5	0.5	0.7	1.0	0.7	0.8	0.4	1.0	2.8	3.6	2.3
Min	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Max	8.7	6.5	7.8	8.8	14.0	18.9	27.0	26.9	25.9	16.7	20.1	23.7	19.8

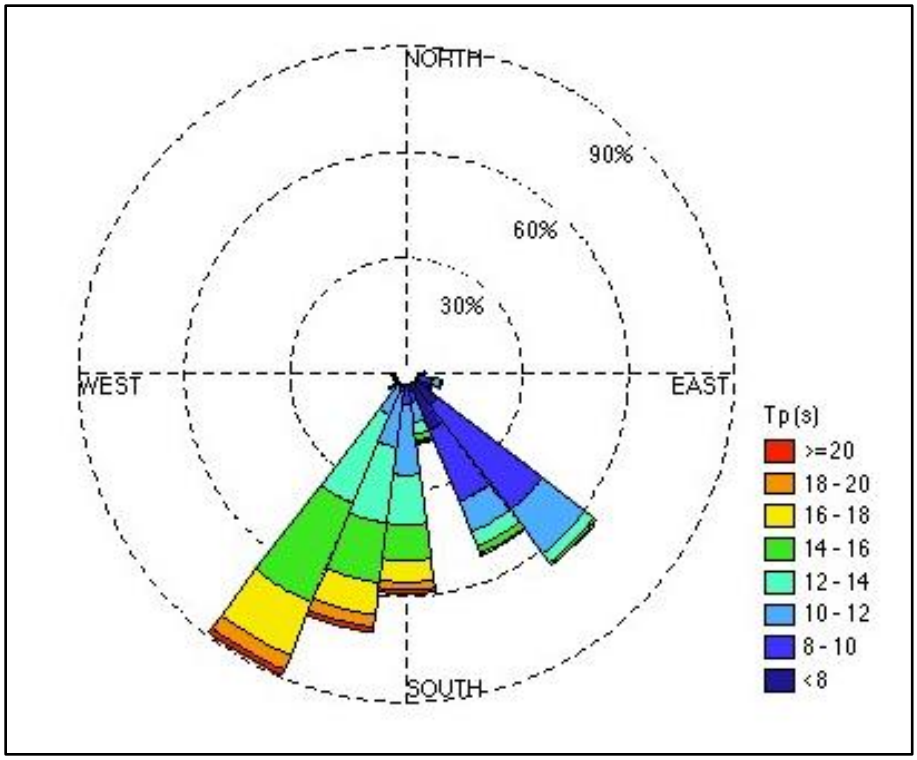

Figure 3-11. Deepwater wave period rose from HNL11. Plot only shows waves between 90°-270°

Table 3-9. Deepwater wave period and direction histogram from HNL11

Tp (s)\Dir	90	105	120	135	150	165	180	195	210	225	240	255	270	Total
4-6	1.0	0.4	3.7	1.1	4.6	1.2	0.2	0.2	0.2	0.1	0.1	0.2	0.2	13.3
6-8	0.2	0.1	0.4	6.8	9.4	0.9	0.3	0.2	0.2	0.2	0.2	0.2	0.1	19.1
8-10	0.2	4.0	0.8	37.4	22.0	2.9	4.9	1.4	0.3	0.1	0.1	0.2	0.2	74.4
10-12	0.3	2.5	0.2	15.5	9.3	5.8	20.1	15.9	8.8	0.7	0.1	0.1	0.5	79.8
12-14	0.1	0.1	0.0	3.2	4.3	3.4	14.0	21.8	27.2	1.2	0.0	0.0	0.2	75.7
14-16	0.2	0.0		0.8	2.1	1.9	10.2	17.0	30.4	0.8	0.0	0.0	0.1	63.6
16-18				0.2	0.6	0.7	6.1	9.3	16.3	0.2			0.0	33.5
18-20				0.0	0.1	0.1	2.3	3.5	4.3	0.0				10.4
20+				0.0	0.0	0.0	1.0	1.5	1.5	0.0			0.0	4.2
Total	1.9	7.2	5.0	65.1	52.5	17.0	59.2	70.9	89.2	3.4	0.5	0.7	1.3	

	90	105	120	135	150	165	180	195	210	225	240	255	270
Mean	7.4	9.6	5.9	9.5	9.3	11.3	13.1	13.9	14.6	12.7	8.0	7.8	10.2
Std Dev	3.4	1.5	1.8	1.6	2.5	2.9	2.8	2.6	2.2	2.7	2.5	2.4	2.8
Min	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max	15.4	14.7	12.7	20.1	21.5	23.0	25.6	25.1	23.8	21.0	14.5	14.4	24.8

Table 3-10. Selected prevailing deepwater wave parameters

Wave Type	Data Source	Hs (feet)	Tp (sec)	Dp (deg TN)
Prevailing Trade Wind	CDIP 098	6	8	75
Prevailing SE	HNL 11	1	11	135
Prevailing S	HNL 11	2	14	180
Prevailing SSW	HNL 11	1.5	15	210
Semi-annual South	HNL 11	4	16	195

3.1.5.3 Offshore Wave Transformation

A nested three-grid setup in the SWAN wave model was used to propagate the deepwater design waves to the project area, as shown in Figure 3-12. The wave conditions are applied along all boundaries of the largest grid, which has a resolution of 1,640 feet and nests an intermediate grid with a resolution of 820 feet, and then a nearshore grid with a resolution of 164 feet.

Figure 3-13 is an example of the SWAN output, and shows the transformation of a south-southwest deepwater swell as it approaches the project site. Figure 3-13 shows that there is minimal shadowing from swells approaching from the south. In contrast, Figure 3-14 shows the approach of NE trade wind waves. Though the project site is severely shadowed from direct approach of the trade wind waves, the model shows that some trade wind wave energy still reaches the project site. The change in wave direction shown in Figure 3-13 and Figure 3-14 is primarily caused by the wave refraction phenomenon.

SWAN models were run for the prevailing and semi-annual offshore wave conditions described previously, as well as for the Kona storm and closely approaching hurricane scenarios. The results were used as input for the higher resolution, nearshore models of waves and currents in the vicinity of the project site.

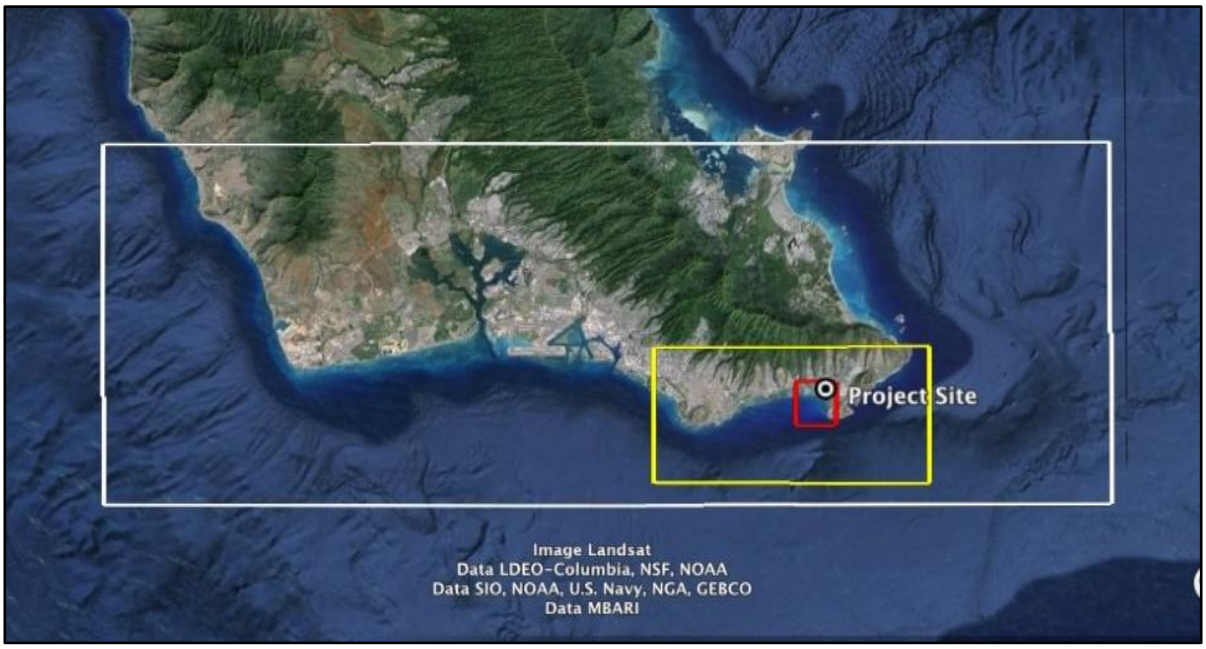

Figure 3-12. SWAN grid boundaries

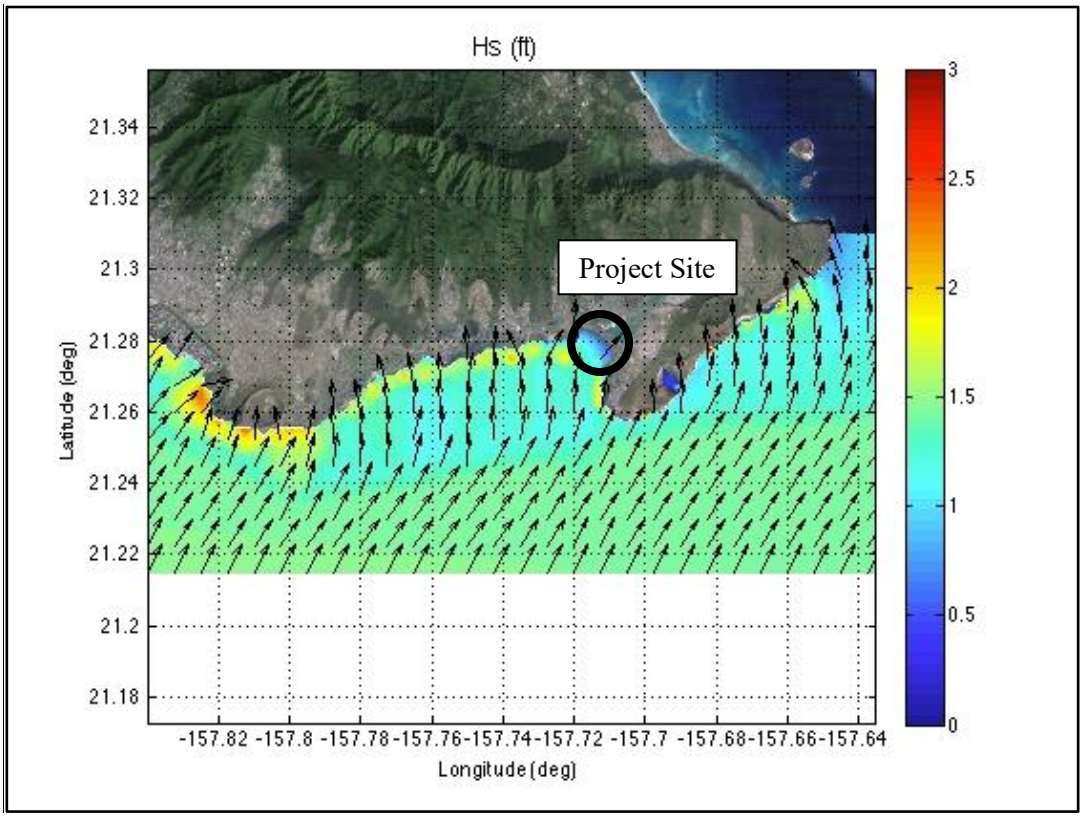

Figure 3-13. Wave height and approach vectors, SSW prevailing condition southern swell

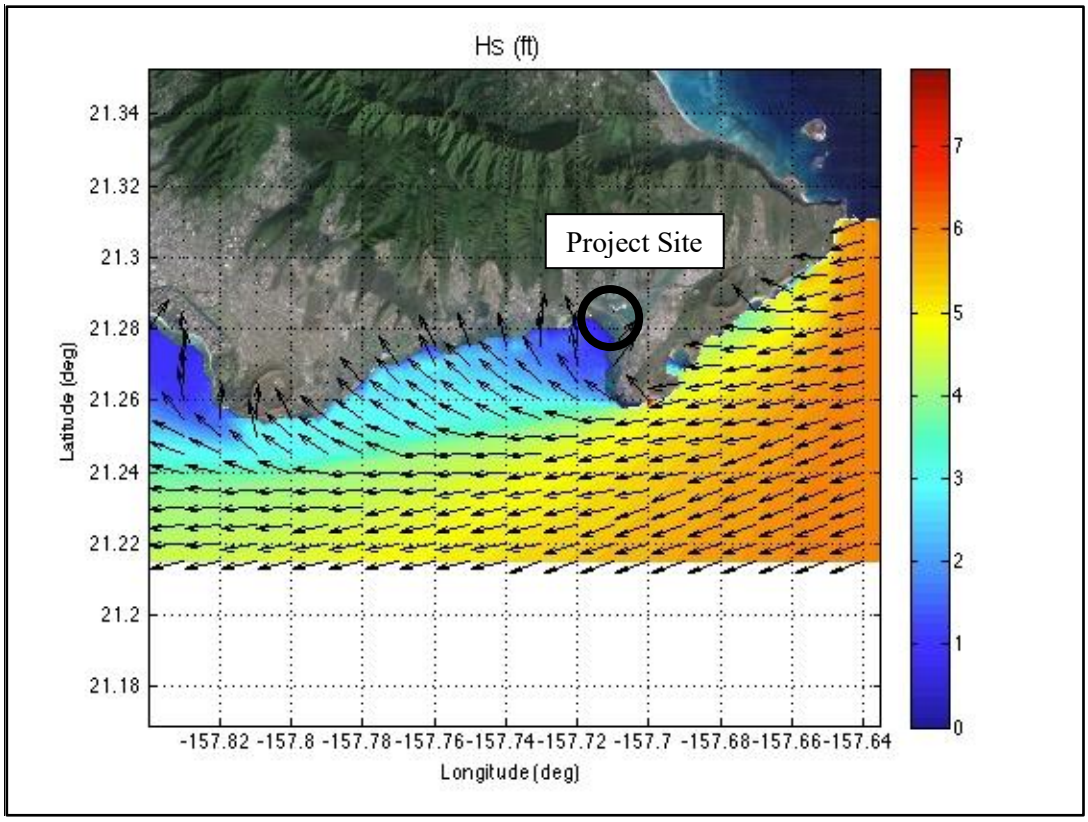

Figure 3-14. Wave height and approach vectors, prevailing trade wind waves

3.1.5.4 Modeled Still Water Level

Nearshore wave models require an estimation of the still water level (SWL) across the model domain for the modeled conditions. In the present analysis, the total still water level rise (see Section 3.1.3) considered is a linear combination of:

1. Astronomical tide (S_a),
2. Sea level rise due to atmospheric pressure reduction (S_p),
3. Wind tide caused by wind stress (S_x and S_y),
4. Wave set-up on the beach as a result of breaking waves (S_w).

or,

$$S = S_a + S_p + S_x + S_y + S_w$$

The SWL used for design conditions is a probable worst case scenario. For the prevailing and semi-annual wave cases, the SWL for average conditions is used.

An astronomical tide (S_a) of +0.8 feet is used for models of prevailing and semi-annual conditions. This is equivalent to the mean sea level (MSL) as measured at the Honolulu Harbor tidal station. An astronomical tide of +1.9 feet is used for model hurricane (design) conditions. This is equivalent to the mean higher high water (MHHW) level as measured at the Honolulu Harbor tidal station.

The combination of S_p, S_x and S_y is defined as storm surge. Outside of the breaking surf zone, the still water level is composed of storm surge added to the tide level. For the design hurricane case, storm surge is 0.37 feet and was approximated from measured values from Kewalo Basin during Hurricane Iwa (1982). There is no storm surge component to southern swell or trade wind waves.

In Hawaii, wave setup (S_w) is typically the largest contributor to the still water level rise for design wave events. Wave setup is a complex phenomenon and is most accurately predicted using wave models such as SWAN and Bouss-2D. The wave setup is calculated as part of the wave transformation and is incorporated into the SWL by the model. Wave setup from the SWAN model output was included in the total SWL calculations for the structure design.

As local water level anomalies and sea level change are important long-term considerations (see Section 3.1.3.2 and Section 3.1.3.5), they are also included as part of the still water level rise calculations for the model hurricane. A +0.5 feet water level anomaly and +0.7 feet SLC were included in the model hurricane water level. +0.7 feet SLC was included in the prevailing and semi-annual wave models.

3.1.5.5 Nearshore Wave Transformation

As waves move into shallow water, bathymetry has greater influence on wave behavior. Waves interact with the bottom dissipating more energy through depth induced breaking and bottom friction.

The prevailing offshore wave cases described in Table 3-10 were modeled using the Bouss-2D numerical model to investigate the wave crest transformation across the fringing reef. The prevailing condition models were run at a water level of +1.65 feet MLLW, a typical water level expected at the site and equivalent to the MSL level (+0.8 feet), half of the 50-year sea level rise (+0.35 feet), and +0.5 feet of mesoscale eddy.

A snapshot image from the Bouss-2D model showing the nearshore wave patterns for the semi-annual south swell case is shown in Figure 3-15. Individual wave crests have been outlined in white. The effect of a combined shoal and channel off the project site produces a wave pattern that will tend to drive beach sediment to the northwest, in the direction of the entrance channel.

This wave crest pattern was observed in all Bouss-2D models of prevailing conditions, regardless of the offshore wave direction. Even the trade wind waves followed a similar wave transformation pattern as the waves approach the Portlock shoreline, albeit with much smaller wave heights. The results indicate that nearshore wave patterns depend more on the local bathymetry than the deepwater wave parameters, and the sediment transport to the northwest in the vicinity of the groin prevails despite the difference in offshore wave direction. See Section 3.1.6.4 for an analysis of sediment transport along Portlock Beach.

Figure 3-15. Bouss-2D prevailing south swell water surface animation

3.1.5.6 Design Still Water Level and Wave Height

Design conditions were modeled using the SWAN numerical model. The design conditions consist of 1) a closely approaching hurricane condition, and 2) the semi-annual south swell. The design hurricane conditions were used to determine a design wave height at the shore for sizing the rock rubble mound structure and its components. The semi-annual south swell case was used to optimize the crest height of the structure and design the structure cross sections as described in Section 2.2.

The design wave was chosen to be generated by a closely approaching hurricane with a significant deepwater wave height (H_s) of 27.0 feet, peak period (T_p) of 12 seconds, and peak direction (D_p) of 186°. The design hurricane model was run with a still water level of 4.97 feet that included effects of tide, storm surge, wave setup, and mesoscale eddy. These conditions were modeled using a high resolution SWAN grid.

In the shallow nearshore environments of Hawaii, a depth limited criteria is often used for the design wave height. Depth limited waves are calculated by applying a factor (usually around 0.78) to the nearshore water depths. As the nearshore bathymetry of Maunalua Bay is a complex system of shallow reefs and natural and dredged channels, waves that reach the nearshore are typically smaller than the depth limited wave height and are non-breaking. Therefore, the depth limited condition was not used to predict nearshore wave heights.

Design conditions at the shoreline were modeled using SWAN. The SWAN model results use significant wave height (H_s) as a representative wave parameter. However, a more conservative wave height parameter, $H_{1/10}$ (the average of the highest 1/10 wave heights) is often used for design purposes. To calculate $H_{1/10}$, the significant wave height, H_s (or $H_{1/3}$), was scaled by a factor of 1.27. This scale factor assumes the shallow water waves have a distribution that matches the Rayleigh probability distribution function, an assumption that has been validated by numerous sources (Thornton and Guza 1983, Goda 2000).

A summary of the design deepwater conditions and the transformed wave characteristics is presented in Table 3-11. Figure 3-16 shows the SWAN model results for the closely approaching hurricane wave heights transforming from deepwater to shore, and Figure 3-17 shows the resulting hurricane wave heights at the project site. Figure 3-18 shows model results for wave heights for the semi-annual south swell transforming from deepwater to shore, and Figure 3-19 shows the semi-annual wave heights at the project site.

A design wave height of 2.74 feet, derived from the model hurricane, was used for armor stone sizing. A design wave height of 1.27 feet, derived from semi-annual south swell conditions, was used for groin crest elevation design.

Table 3-11. Design conditions

	Semi-annual South Swell	Model Hurricane
Deepwater Wave Type		
H_s (feet)	4	27
T_p (sec)	16	12
Dir (°TN)	195	186
Still Water Level Rise		
Astronomical tide (feet)	0.8	1.5
Sea level rise (feet)	0.7	0.7
Mesoscale Eddies (feet)	0	0.5
Wave setup (feet)	0.15	1.9
Storm Surge (feet)	0	0.37
Total SWL rise (feet)	1.65	4.97
Nominal Water Depth (feet, MLLW)	2	2
Design Water Depth (feet)	3.65	6.97
Design Wave Height (SWAN)		
Hs (feet)	1	2.2
H_{10} (feet)	1.27	2.79

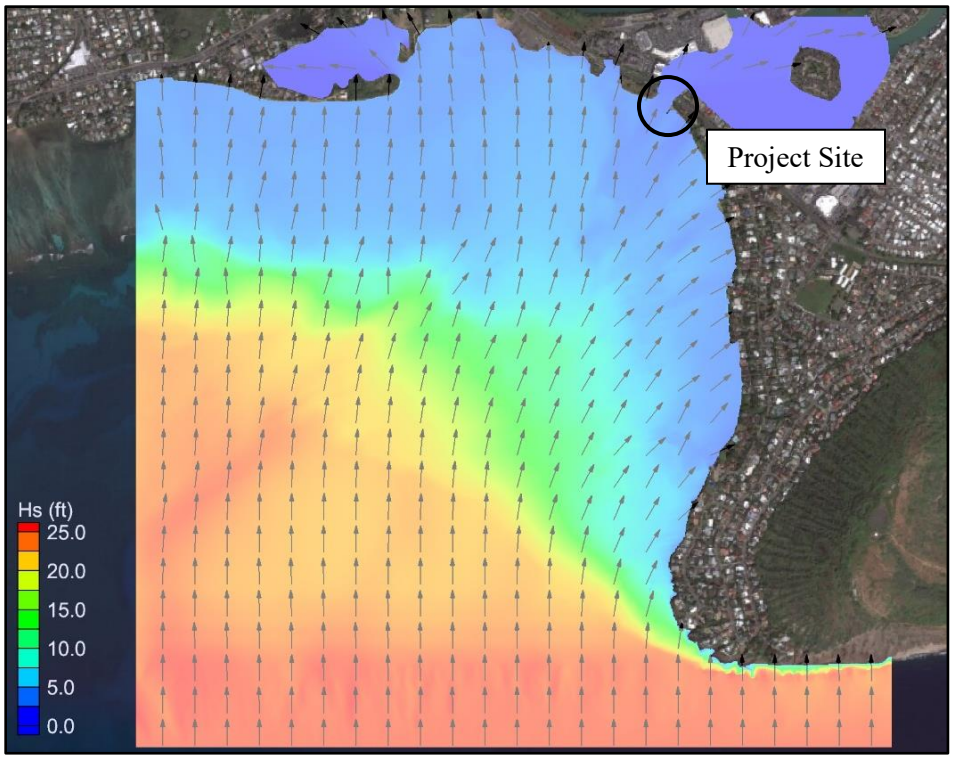

Figure 3-16. Significant wave height transformation and approach vectors in Maunalua Bay for design hurricane conditions

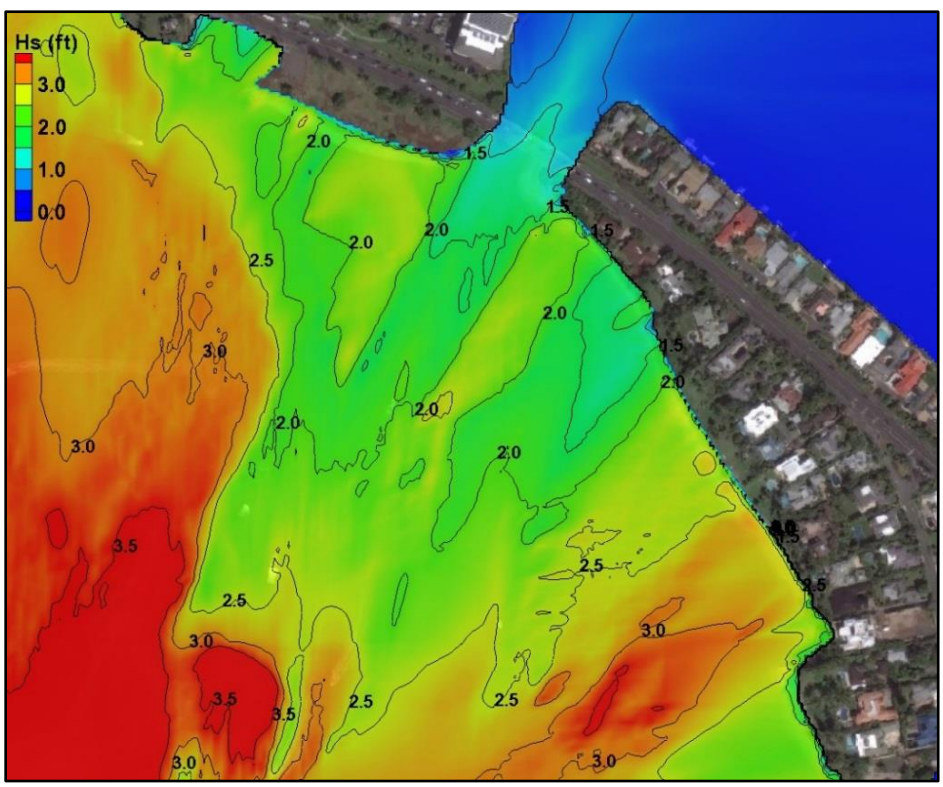

Figure 3-17. Significant wave height results at the project site for design hurricane conditions

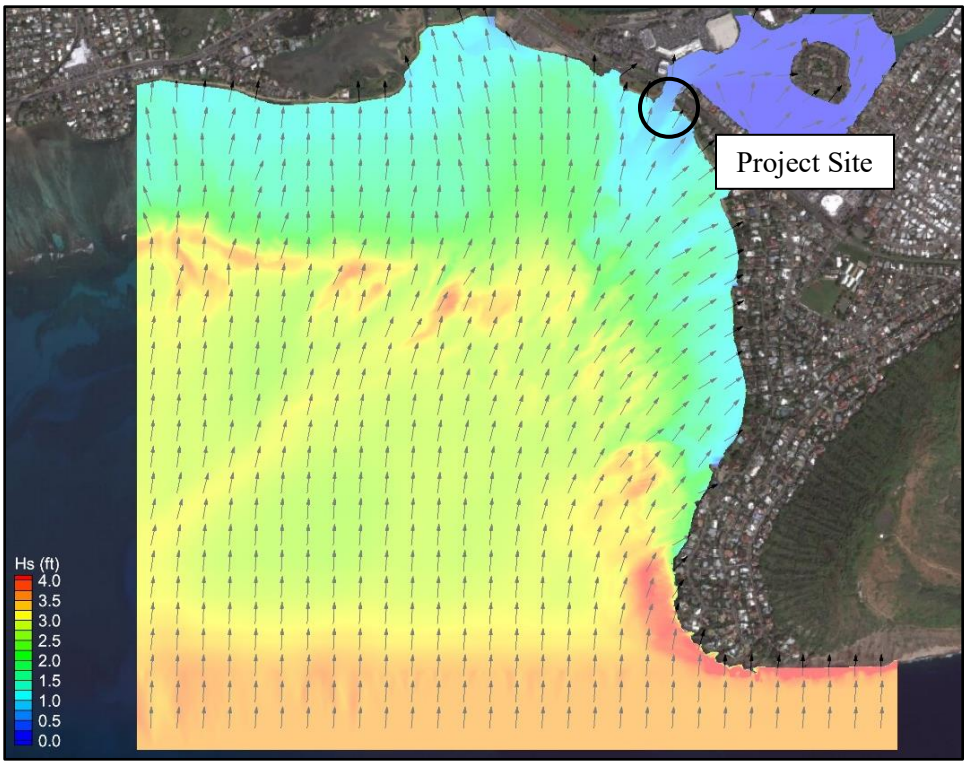

Figure 3-18. Significant wave height transformation and approach vectors for semi-annual south swell conditions

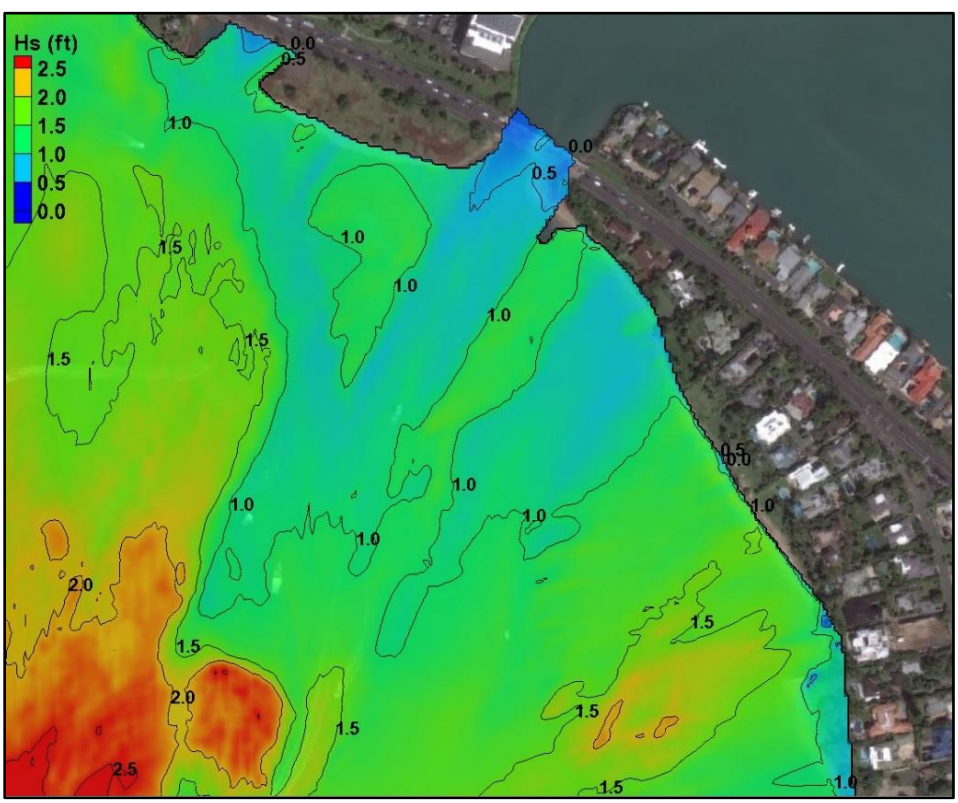

Figure 3-19. Significant wave height at the project site, semi-annual south swell

3.1.6 Sediment Transport

Quantitative estimation of littoral transport is difficult due to the complexities and uncertainties of wave climate, bathymetry, bottom conditions, sediment supply, and grain size parameters. Several methods were used to model the sediment transport rates at the project site. These include:

- Surveyed Beach Profile
- Aerial Photographs
- Topographic Surveys
- Energetics Based Transport Equations

3.1.6.1 Beach Profiles Method

Rocheleau (1973) calculated a sediment transport rate at Portlock Beach using beach profiles surveyed over a period of 2.5 months. At that time, the temporary sandbag groin did not exist and a sand spit extended from Portlock Beach into the Hawaii Kai Marina entrance channel. The profiles measured an accumulation of 190 cubic yards of material over the course of the surveys, which was extrapolated to a sediment transport rate of 900 cubic yards per year.

3.1.6.2 Aerial Photograph Method

Shoreline position at a given time can be observed using georeferenced aerial photographs. Plotting the shoreline position versus time shows the area of beach erosion or accretion for a coastline. Using aerial photographs from 1974 and 1988, Sea Engineering, Inc. (1989) calculated an annual loss of 750 cubic yards of sediment from Portlock Beach.

This analysis was updated for the present day configuration of Portlock Beach and the Hawaii Kai Marina entrance channel. Geo-referenced aerial photographs of Portlock Beach were taken on August 22, 2013 and August 12, 2014 (Figure 3-20). No beach nourishment or construction activities took place on Portlock Beach between the photographs that would affect the estimation. Between August 22, 2013 and August 12, 2014 there was beach accretion of 1,600 square feet. Using a simple prismatic model for the beach cross-section with a crest height of 6 feet gives a volumetric accumulation of 358 cubic yards. This was extrapolated to a sediment transport rate of roughly 365 cubic yards per year to the northwest.

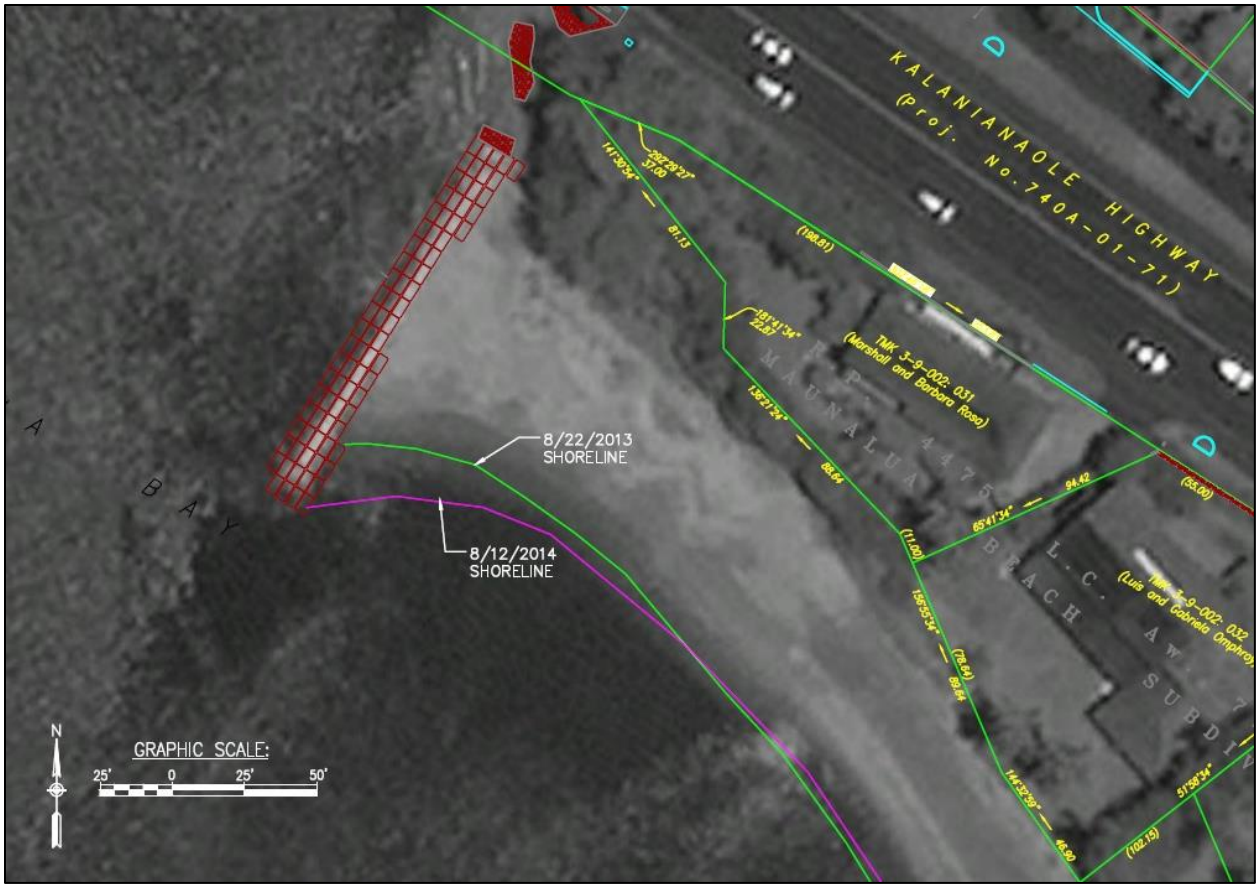

Figure 3-20. 8/22/2013 and 8/12/2014 shoreline positions

3.1.6.3 Topographic Survey Method

A post-construction topographic survey of the rebuilt temporary sandbag groin and nourished portion of Portlock Beach was performed on July 25, 2013 by Austin Tsutsumi & Associates (ATA). SEI and ATA updated the survey on April 23, 2015. The two surveys were used to generate representative surfaces of the beach which were then compared in AutoCAD Civil3D. There was an increase of beach volume adjacent to the groin of 750 cubic yards between the two surveys, which was extrapolated to a sediment transport rate of 435 cubic yards per year to the northwest.

3.1.6.4 Energetics Based Transport Method

Energetics based transport calculations assume that littoral drift is caused by the release of energy in the longshore direction due to wave breaking at an angle to the beach. Relatively simple formulas have been derived based on both theoretical considerations from linear wave theory and empirical values derived from field measurements. These are documented in the USACE *Shore Protection Manual* (1984), and are collectively referred to as the CERC formula. The CERC formula is based upon energy available to move sand, and relies on empirical data from mainland beach systems for calibration.

The immersed weight transport rate I_l is calculated by:

$$I_l = KP_{ls}$$

where K is known as the wave power coefficient, empirically determined to be 0.39. P_{ls} is the longshore energy flux factor based upon significant wave height.

The sediment transport rate, Q, can be substituted for the immersed weight using:

$$Q = \frac{I_l}{(\rho_s - \rho)ga'}$$

where ρ_s is the density of the sand grain, ρ is the density of sea water, g is gravitational acceleration and a' is a coefficient for pore space. The relation is then given in the *Shore Protection Manual*:

$$Q{=}7.5{\times}10^3 P_{ls}$$

in cubic yards per year.

The longshore energy flux factor is determined by:

$$P_{ls} = 0.0884\rho g^{3/2} H_{sb}^{5/2} sin2\alpha_b$$

where H_{sb} is the average significant breaking wave height over the course of a year, and α_b is the average breaking wave angle to the shoreline. Offshore wave height analysis and numerical modeling described in the *Basis of Design Report* were used to estimate an average breaking wave height of 0.1 meters and breaking wave angle of 5 degrees on this area of Portlock Beach.

The wave power coefficient was empirically determined from continental U.S. dissipative beaches that are typically long, wide, and flat sloped, with wide surf zones. Beaches in Hawaii are generally short, are relatively narrow with steep foreshores and narrow surf zones. Recognizing this, SEI (1982), using data from Hawaiian beaches, determined the relation:

$$Q = 1.2 \times 10^3 P_{ls}$$

Using the CERC formula, energetics based sediment transport was calculated to be 1,800 cubic yards per year.

3.1.6.5 Sediment Transport Summary

The values for yearly sediment transport are summarized in Table 3-12 and vary widely. The problem, then, is to select the most reasonable value for further application. The CERC formula is a good approximation of the upper bound of sediment transport to the site, as it assumes all the energy from the oblique waves is used to transport sand. The aerial photograph and topographic survey analyses provide the most accurate picture of what the present day sediment transport rate is along Portlock Beach. The rates calculated using these two methods were averaged to obtain a sediment transport rate of 400 cubic yards per year.

Table 3-12. Sediment transport rate summary table

Method	Q (cubic yards / year)
CERC Formula	1,800
Beach Profiles (1972)	900
Aerial Photographs (1989)	750
Aerial Photographs (2015)	360
Topographic Surveys (2015)	435

3.1.7 Natural Hazards

3.1.7.1 Flooding

Flood hazards for the portion of Portlock Beach in which the project is located are shown on Flood Insurance Rate Map (FIRM) Flood Sheet 15003C0393G, which indicates that there are no threats of flooding from streams but that the shoreline is exposed to flooding caused by storm waves and tsunami. The area immediately inland of the shoreline is in Zone VE with a base flood elevation of 12 feet above mean sea level.

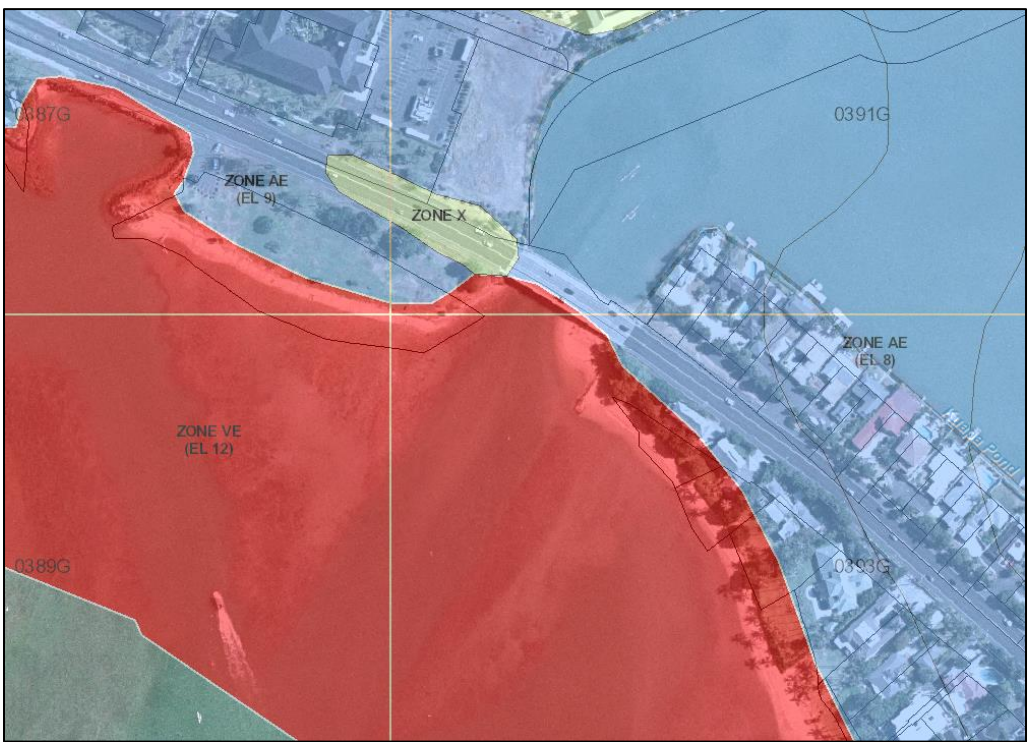

Figure 3-21. Flood Insurance Rate Maps for the Hawaii Kai Marina entrance channel

3.1.7.2 Tsunami

Tsunami are waves that result from large-scale seafloor displacements. They are most commonly caused by large magnitude earthquakes (typically magnitude 7.0 or greater). If the earthquake involves a large segment of land that displaces a large volume of water, the water will travel outwards in a series of waves, each of which extends from the ocean surface to the seafloor where the earthquake originated. Tsunami waves typically have small wave heights in

deep water, but they can have wavelengths of hundreds of miles and travel at 500 miles per hour. The waves increase greatly in height as they shoal and can push inland at considerable speed. The water then recedes, also at considerable speed, and the recession often causes as much damage as the original wave front itself.

Most tsunamis in Hawaii originate from the tectonically active areas located around the Pacific Rim (e.g., Alaska, Japan, and Chile). Waves created by earthquakes in these areas take hours to reach Hawaii, and the network of sensors that is part of the Pacific Tsunami Warning System are able to provide Hawaii with several hours advance warning of tsunami from these locations. Less commonly, tsunamis originate from seismic activity in the Hawaiian Islands, and there is much less advance warning for these. The 1975 Halape earthquake (magnitude 7.2) produced a wave that reached Oahu in less than a half hour, for example.

Fletcher et al. (2002) report that 10 of the 26 tsunamis with flood elevations greater than 3.3 feet (1 meter) that have made landfall in the Hawaiian Islands during recorded history have had "significant damaging effects on Oahu." This means that, on average, one damaging tsunami reaches Oahu every 19 years. The recent record (1946 to the present) has seen at least four tsunami cause damage on Oahu, a rate that is very close to the long-term average. In view of this, the U.S. Geological Survey (Fletcher et al., 2002) has given the Hawaii Kai coastal zone a moderate (4) Overall Hazard Assessment (OHA). The report notes that while observations of tsunami flooding on the south shore of Oahu have not exceeded 9 feet, much of the Hawaii Kai coastline is below that elevation.

The 2011 magnitude 9.0 Tohoku earthquake off the coast of Japan produced a significant tsunami that reached Hawaii. Tsunami runup maps show that there was 4 feet of runup at the west channel by the Maunalua Bay boat ramp (International Tsunami Information Center, 2013). Residents reported strong flows in and out of the main entrance channel. The flows were strong enough to transport sand, and the sand spit on the east side of the channel eroded. Additionally, soundings show that the entrance channel was deeper after the tsunami.

3.1.7.3 Storm Waves

The wave regime along the project shoreline is discussed in considerable detail in Section 3.1.5 of this report. The U.S. Geological Survey (Fletcher et al., 2002) rates the threat from high waves along the shoreline as low to moderate because of the region's offshore fringing reef that absorbs much of the offshore swell.

3.2 Biological Environment

3.2.1 Marine Biota

Marine biological reconnaissance of the project site was performed by AECOS, Inc. in 2015. A report detailing AECOS's findings is included as Appendix C.

3.2.1.1 Hawaii Kai General

Maunalua Bay is lined by a fringing reef extending approximately 3,000 feet offshore. Between the shore and reef margin is a low-relief flat, and seaward of the fringing reef is a wide shelf of sand bottom with scattered limestone outcrops.
The reef remnants off Maunalua Bay Beach Park and Portlock Bach are highly-eroded, low-relief limestone platforms. These shallow (less than 3 feet) reef areas are covered with a veneer of sand and silt. Some sections are exposed at low tide. The benthic communities close to shore are highly disturbed and dominated by sessile filter and suspension feeding organisms. The reef flat off Maunalua Bay Beach Park and Portlock Beach is dominated by non-indigenous algae. The algae grow on limestone rubble, easily rolled by waves and swells. Algal growth is most dense close to shore. A seagrass bed is located in the entrance channel, west of the project site.

Very few coral colonies are present on the reef flat, with the nearest colony to the entrance channel located more than 300 feet offshore. Other reef macro-invertebrates, such as brittle stars, sea urchins, and sea anemones are relatively uncommon. Fish biomass and diversity are very low in the nearshore areas of low relief bottom.

The bottom of the entrance channel consists largely of shifting sands and silt, and does not provide suitable habitat for most reef organisms. Hard surfaces, such as areas where the channel bisects the reef flat and concrete pilings of the bridge, are colonized primarily by introduced fouling organisms. Results of a survey conducted by Wilson Okamoto & Associates, Inc. (1988) indicated the presence of burrows of snapping shrimp and larger crab species in the entrance channel.

Benthic habitats for the Hawaii Kai area compiled by the Pacific Islands Ocean Observing System (PacIOOS) Voyager are shown in Figure 3-22.

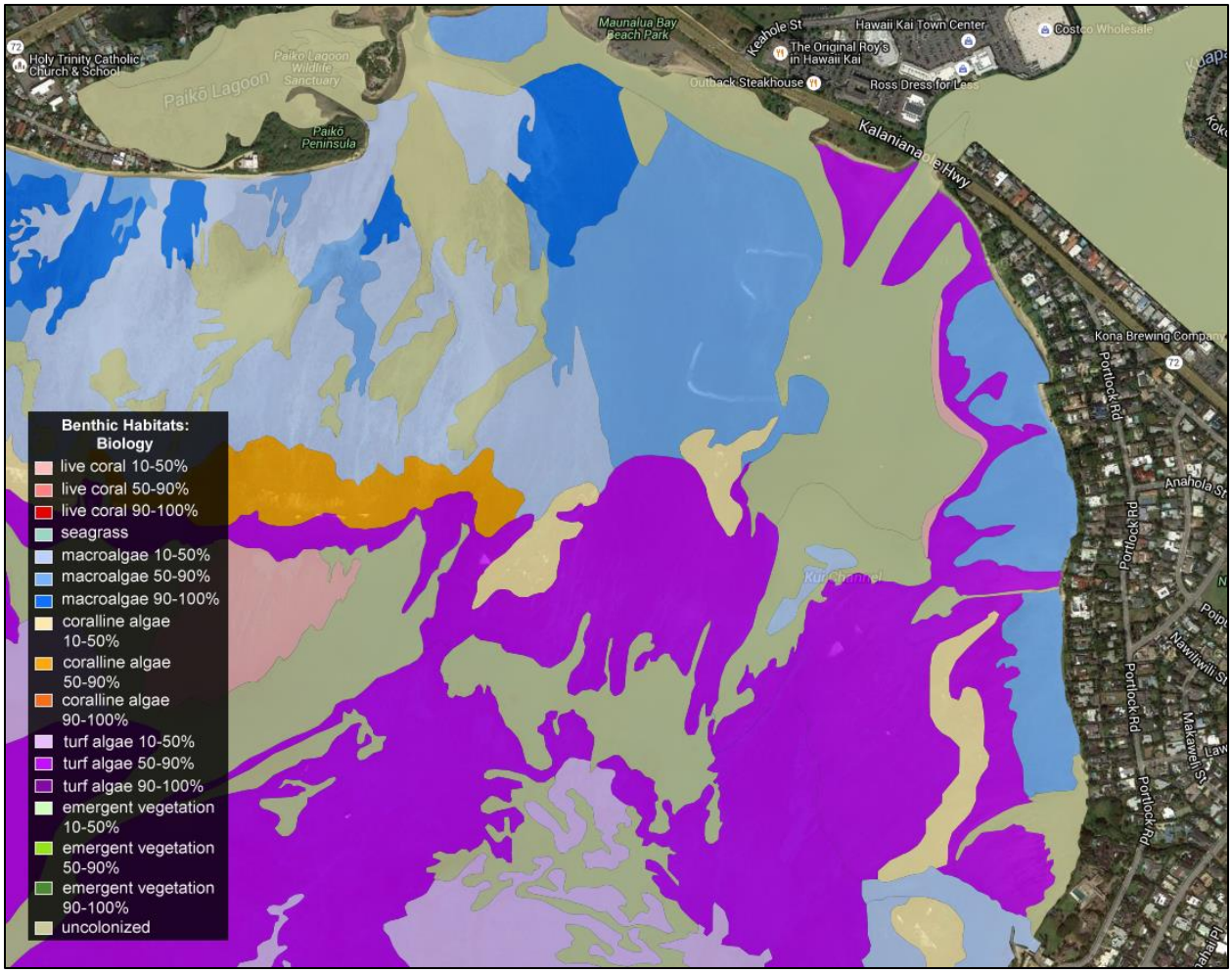

Figure 3-22. Maunalua Bay benthic habitat biology (PacIOOS)

3.2.1.2 Project Site

On March 17, 2015, AECOS, Inc. conducted a quantitative survey of the marine community composition in the project area. The survey area included the existing temporary sandbag groin, and the seafloor adjacent to either side of the groin and seaward from the groin structure. A total of five transects were used to survey the marine biota on the groin and surrounding bottom (Figure 3-23).

Transects "Groin East" and "Groin West" were placed parallel to the entire length of the groin. These transects were positioned on the groin midway between the base of the sandbags and the waterline. Three transects were used to sample the seafloor surrounding the groin: 1) a transect parallel to the west side of the groin and 16 feet off the groin ("Channel"), 2) a transect oriented 16 feet off the east side of the groin ("Seafloor East"); and 3) a transect across the bottom, extending offshore from the seaward end of the groin ("Offshore").

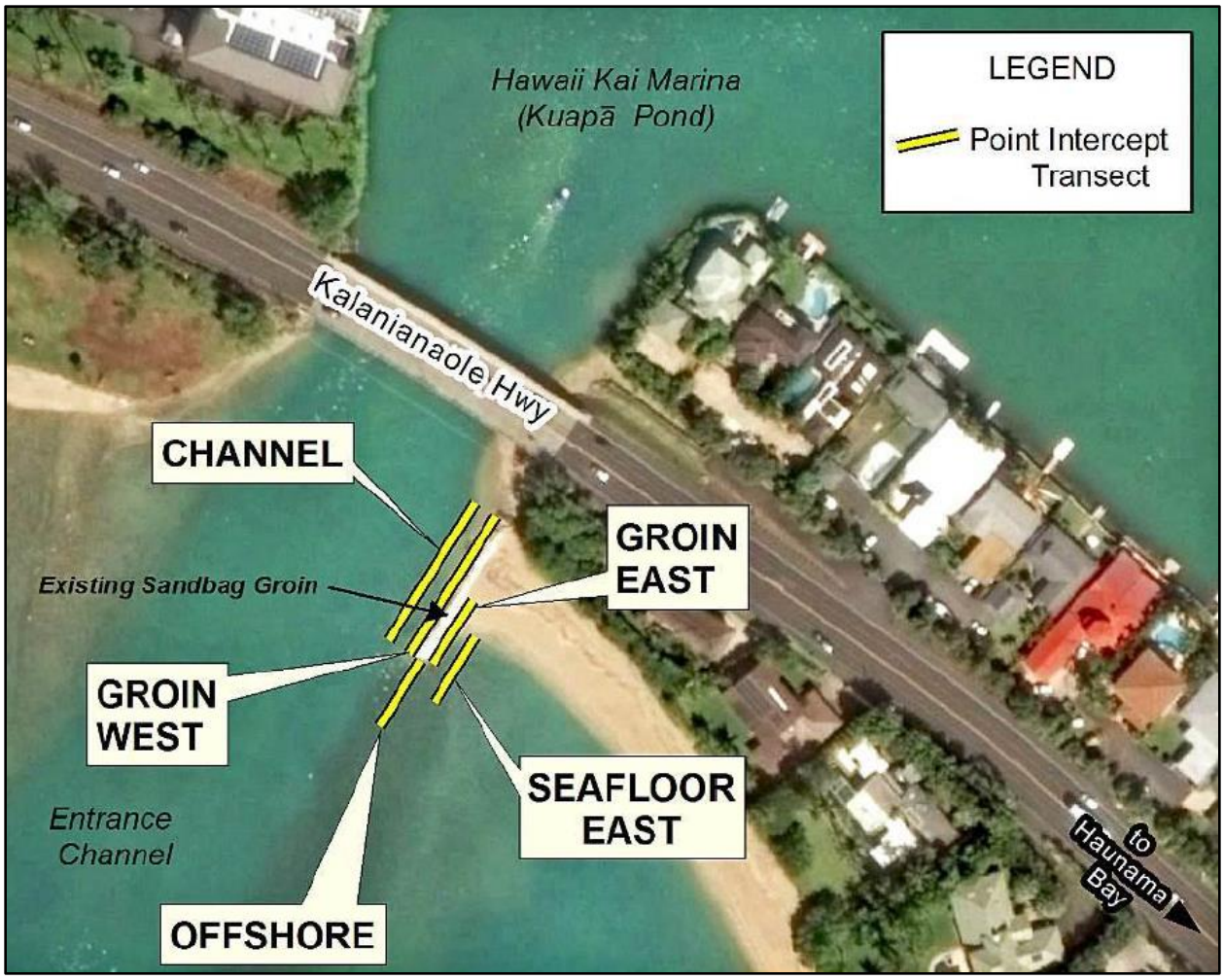

Figure 3-23. AECOS transect locations

General

In general, the benthic community structure on the Hawaii Kai Marina entrance channel groin and on the reef bottom surrounding the groin is dominated by macroalgae, turf algae, and sand.

Temporary Sandbag Groin

The intertidal zone of the existing sand groin is covered with macroalgae and low-growing turf algae. Invertebrates are not common on the groin. A few juvenile mullets were observed on the west side of the groin, towards the entrance channel and bridge. Submerged stacked sandbags, with macroalgae and cyanobacteria, lie along the base of the west side of the groin (Figure 3-24). Much of the east side of the sandbag groin is uncolonized or coated with cyanobacteria and black tuft seaweed. No corals were observed growing on the groin.

Data collected from two transects on the groin were used to calculate benthic community composition (Figure 3-25). The dominant benthic type on the groin is macroalgae and sand. Other benthic types included uncolonized sandbag, turf algae, invertebrate, cyanobacteria, and crustose coralline alga (CCA). Rubble was minimal and coral cover was zero.

Figure 3-24. Macroalgal and cyanobacterial growth on the sandbag groin

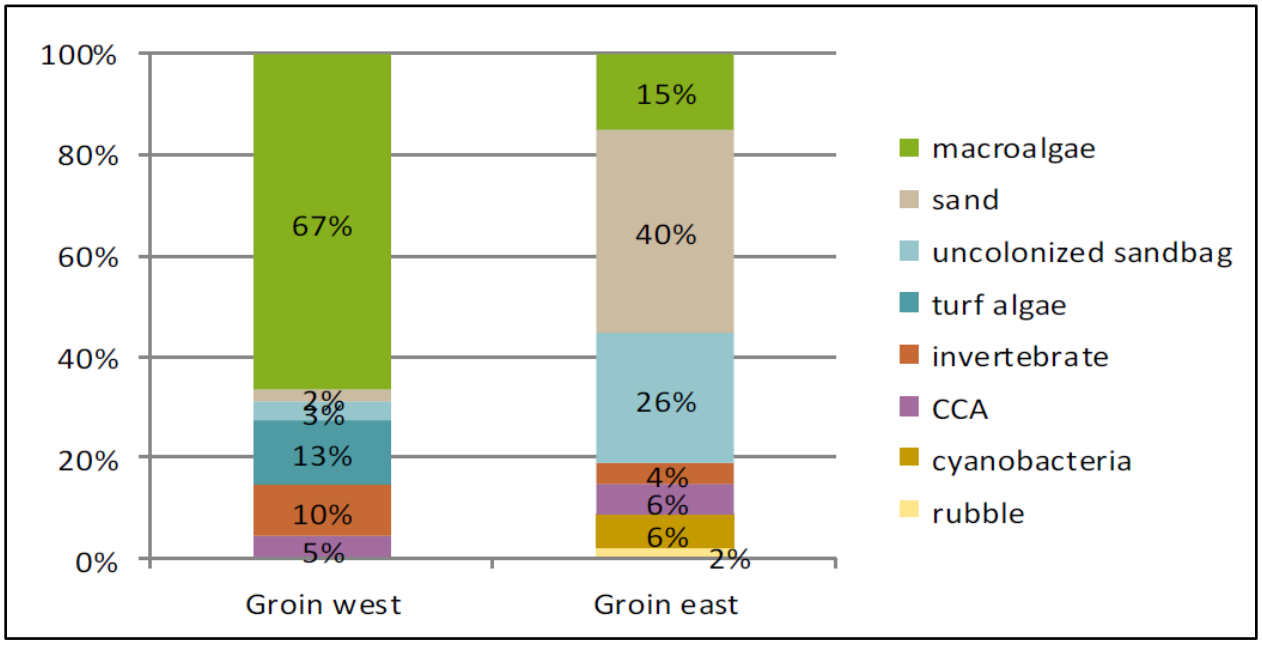

Figure 3-25. Mean percent benthic cover for the temporary sandbag groin

<u>Seafloor Surrounding Temporary Sandbag Groin</u>
The seafloor surrounding the sandbag groin is a relatively flat bottom comprised of sand with patches of limestone and rubble. A large area of sand lies to the southeast of the groin, fronting Portlock Beach. The reef platform seaward of the groin is coated with turf and macroalgae. A large bed of seagrass was observed near the west side of the groin, located directly adjacent on the west side of the submerged sandbags (Figure 3-26). The bed extends west into the entrance channel and in the seaward direction. Few invertebrates occur on the bottom to either side of the groin and on the reef flat offshore of the groin.

The benthic community composition near the groin structure is shown in Figure 3-27. The dominant benthic type on the seafloor is sand, macroalgae, and seagrass. Rubble and

uncolonized limestone were also encountered. CCA, turf, and cyanobacteria cover are minimal, and macroinvertebrate and coral cover are zero.

Figure 3-26. Rubble with macroalgal cover (left) and seagrasses (right) on the seafloor surrounding the groin

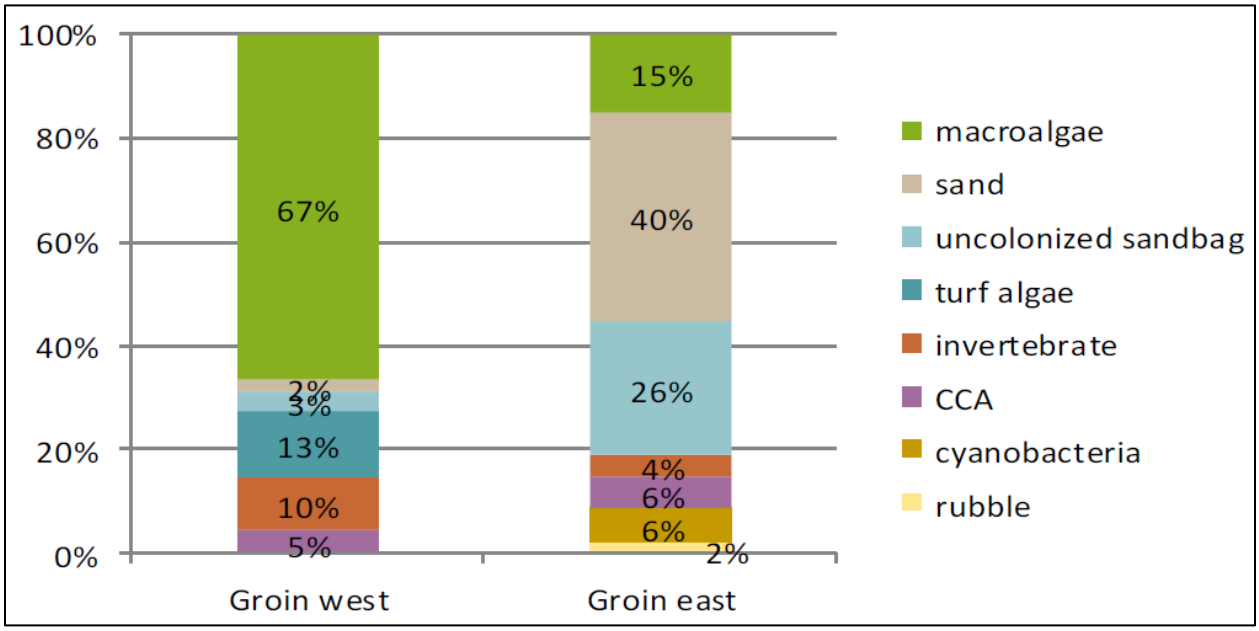

Figure 3-27. Mean percent benthic cover surrounding groin

<u>Fish Resources</u>
A total of 2 species of fishes were identified in the groin and surrounding area surveys: mullet fish and frogfish.

3.2.2 Protected Species

No listed endangered or threatened species were encountered in the March 2015 survey. Listed marine species (sea turtles, Hawaiian monk seals, and humpback whales) can occur in the general vicinity as might state-protected species (hermatypic corals and black-lipped pearl oyster or *Pinctada margaritifera*).

Sea Turtles

Of the sea turtles found in the Hawaiian Islands, only the green sea turtle is common in the project vicinity. In 1978, the green sea turtle was listed as a threatened species under the Endangered Species Act (ESA; USFWS, 1978, 2001). Since protection, the green sea turtle has become the most common sea turtle in Hawaiian waters with a steadily growing population (Chaloupka et al., 2008). Green sea turtle nesting mostly occurs on beaches of the Northwestern Hawaiian Islands. None of the Hawaiian sea turtles are known to nest in the project vicinity.

The green sea turtle diet consists primarily of benthic macroalgae (Arthur and Balazs, 2008), which the shallow reefs of the main Hawaiian Islands provide in abundance. During the survey, a food resource (seagrass) was located in the project vicinity.

Hawaiian Monk Seals

Monk seals use the Oahu beaches and coastline for hauling out, pupping, and nursing. The project is not included in the NOAA Fisheries Hawaiian monk seal critical habitat. The nearest areas declared as monk seal critical habitat are Diamond Head to the west and Hanauma Bay to the east. The project area is not currently proposed as critical habitat for this or any other endangered, threatened, or protected species.

The majority of monk seal sighting information collected in the main Hawaiian Islands is reported by the general public and is highly biased by location and reporting effort. Systematic monk seal count data come from aerial surveys conducted by the Pacific Islands Fisheries Science Center (PIFSC). Aerial surveys of all the main Hawaiian Islands were conducted in 2000-2001 and in 2008 (Baker and Johanos, 2004, PIFSC unpublished data). One complete survey of Oahu was conducted for each of these years. The 2000 survey was conducted from an airplane and the 2001 and 2008 surveys were conducted by helicopter. No Hawaiian monk seals were sighted off the Hawaii Kai Marina entrance channel during any of the three surveys.

Reports by the general public, which are non-systematic and not representative of overall seal use of main Hawaiian Islands shorelines, have been collected in the main Hawaiian Islands since the early 1980s. A sighting is defined as a calendar day during which an individual seal was documented as present at a given location. It should be noted that the majority of monk seal sightings are reported when seals are sighted onshore. No monk seals have been recorded hauling out on Portlock Beach or Maunalua Bay Beach Park. Most sightings in the Hawaii Kai area are generally in the water around Spitting Caves and China Walls on Portlock Point. Seals occasionally haul out on the shelf at Kokee Flats, to the south of Portlock Beach.

Humpback Whales

The humpback whale was listed as endangered in 1970 under the ESA. In 1993 it was estimated that there were 6,000 humpback whales in the North Pacific Ocean, and that 4,000 of these regularly came to the Hawaiian Islands. The population is estimated to be growing at between 4

and 7% per year. Today, as many as 10,000 humpback whales may visit Hawaii each year (HIHWNMS, 2014).

The waters of Maunalua Bay are within the Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS). Humpback whales normally occur in Hawaiian waters annually from November to May with the peak between January and March (HIHWNMS, 2014).

Corals

Coral species are protected under Hawaii State law, which prohibits "breaking or damaging, with any implement, any stony coral from the waters of Hawaii, including any reef or mushroom coral" (HAR §13-95-70, DLNR, 2010). It is also unlawful to take, break or damage with any implement, any rock or coral to which marine life of any type is visibly attached (HAR §13-95-71, DLNR, 2002). No corals were observed within the project area.

Seagrasses

Seagrasses, although not actually types of grass, are vascular plants and not algae. In general, seagrasses thrive in areas with low sedimentation, adequate water flow, and low wave energy (Hemminga and Duarte, 2000). Previous studies have observed seagrasses in sand areas offshore of Portlock Beach and Maunalua Bay Beach Park (AECOS, 2010). Seagrass constitutes a unique habitat in Hawaiian waters and some species are consumed by green sea turtles (Russell et al. 2003). The general degradation of seagrass beds by eutrophication (excessive nutrients from land runoff), sedimentation, chemical poisoning, collecting and gleaning, trampling, anchoring, etc. is a widespread threat to the recovery of depleted sea turtle stocks (NMFS and USFWS, 1998a and 1998b).

Seagrass beds are considered a Special Aquatic Site under the Clean Water Act (Subpart E of 40 CFR Part 230). Special aquatic sites are defined in the Act as "…sanctuaries and refuges, wetlands, mud flats, vegetated shallows (seagrass beds), coral reefs, and [stream] riffle and pool complexes." When a project requiring a Clean Water Act, Section 404 permit (regulating the discharge of dredged, excavated, or fill material in wetlands, streams, rivers, and other water of the U.S.) is proposed to be conducted in a Special Aquatic Site, as part of the permitting process, all alternatives that do not result in a discharge into a Special Aquatic Site are presumed to have lesser adverse impact.

3.2.3 Water Quality

The waters surrounding the project site are designated Class A marine waters (HDOH, 2014a). It is the objective of Class A marine waters that their use for recreational purposes and aesthetic enjoyment be protected. Other uses are permitted as long as they are compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation in and on these waters.

Field measurements of temperature, salinity, pH, and dissolved oxygen were taken and water samples for analysis of salinity (by salinometer), turbidity, total suspended solids (TSS), ammonia, nitrate+nitrite, total nitrogen, total phosphorus, and chlorophyll were collected from three stations on March 13, 2015. *Station Bridge* was just south of the Kalanianaole Highway bridge, approximately 3 feet off the shore. *Station Channel* was located in the entrance channel,

approximately 9.8 feet west from the groin. *Station East* was located approximately 16 feet east of the groin fronting Portlock Beach. Water quality sampling locations are shown in Figure 3-28. Details of the water quality measurements can be found in Appendix A.

Results of the three water quality sampling events are summarized in Table 3-13 (physical parameters) and Table 3-14 (nutrients and chlorophyll α). Temperature, DO saturation, and pH increased slightly from *Station Bridge* to *Station East*, while total nitrogen (TN) and total phosphorus (TP) concentrations decreased. No other spatial trends were apparent at the time of this sampling event.

The waters of Maunalua Bay are listed on the State of Hawaii DOH 2014 list of impaired waters prepared under Clean Water Act §303(d) (HDOH, 2014a). The listing indicates that the waters in these areas do not meet applicable water quality standards for nitrate+nitrate, ammonia, total nitrogen, and chlorophyll α.

The primary purpose of the water quality measurements was to characterize the existing aquatic environment, not to set baseline values or determine compliance with Hawaii's water quality standards. State criteria for all nutrient measurements, turbidity, and chlorophyll α are based upon having geometric mean values, which require a minimum of three separate samples per sampling station to calculate.

Water quality conditions in the project area on March 13, 2015 met state water quality criteria for pH, and DO saturation. Conditions likely comply with temperature and salinity criteria (measured values are essentially ambient). Turbidity was within a range common for Hawaiian embayments. There are no state embayment criteria for TSS, but this parameter is often measured for projects that could possibly impact sediment distribution.

Nutrients (with the exception of ammonia) are characteristic of Hawaii embayments. Ammonia concentrations were elevated at *Station Bridge* and *Station East*. The reason for this is not known, but may have been due to decaying organic matter in Keahupua-o-Maunalua Pond (ammonia being an intermediate breakdown product of organic nitrogen).

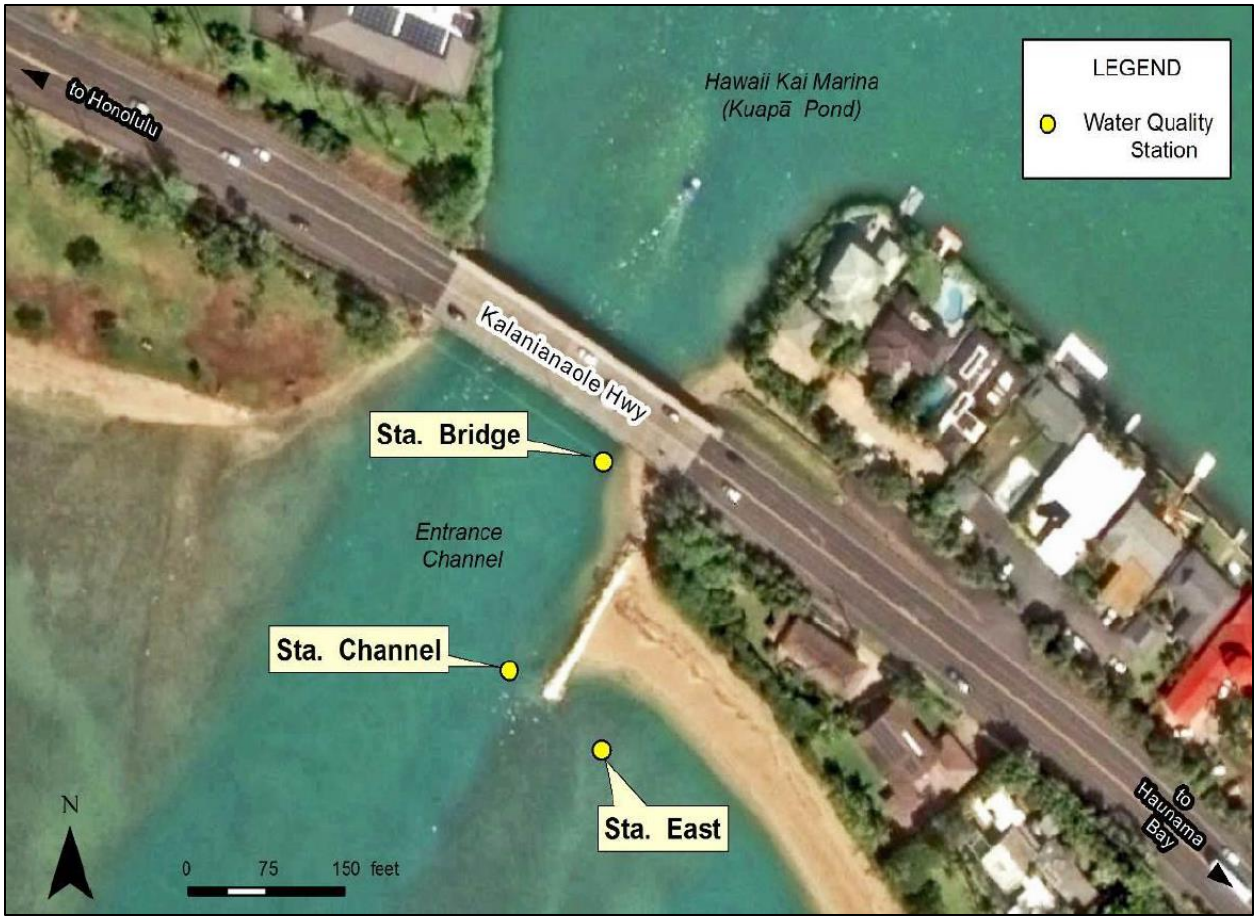

Figure 3-28. Water quality sample locations

Table 3-13. Summary of physical water quality results near the Hawaii Kai Marina entrance channel groin

Station Statistic	Temp. (°C)	Salinity (PSU)	DO (mg/L)	DO Sat. (%)	pH	Turbidity† (NTU)	TSS (mg/L)
Bridge	**24.4**	**35.50**	**6.87**	**101**	**8.11**	**2.31**	**8.0**
Channel	**25.3**	**35.30**	**6.80**	**102**	**8.11**	**4.20**	**9.5**
East	**25.5**	**35.65**	**6.83**	**102**	**8.13**	**2.96**	**8.2**

Table 3-14. Summary of geometric means for nutrients and chlorophyll α water quality results near the Hawaii Kai Marina entrance channel groin

Station Statistic	Ammonia (µgN/L)	Nitrate+ Nitrite (µgN/L)	Total N (µgN/L)	Total P (µgP/L)	Chl. α (µg/L)
Bridge	**20**	**1**	**104**	**41**	**0.27**
Channel	**4**	**2**	**91**	**28**	**0.29**
East	**10**	**1**	**88**	**25**	**0.20**

Table 3-15. Selected state water quality criteria applicable to "dry" embayments after HAR §11-54-06(3) (HDOH, 2014a)

Parameter	Geometric Mean value not to exceed this value	Value not to be exceeded more than 10% of the time	Value not to be exceeded more than 2% of the time
Total Nitrogen (µg N/L)	150.0	250.0	350.0
Ammonia (µg N/L)	3.5	8.5	15.0
Nitrate+Nitrite (µg N/L)	5.0	14.0	25.0
Total Phosphorus (µg/L)	20.0	40.0	60.0
Chlorophyll α (µg/L)	0.50	1.50	3.00
Turbidity (NTU)	0.40	1.0	1.50
Other "standards": - pH units shall not deviate more than 0.5 units from ambient and not lower than 7.0 nor higher than 8.6. - Dissolved oxygen shall not decrease below 75% of saturation. - Temperature shall not vary more than 1C° from ambient conditions. - Salinity shall not vary more than 10% from ambient.			

3.3 Human Environment

3.3.1 Noise

Hawaii Administrative Rules §11-46, "Community Noise Control" establishes maximum permissible sound levels (Table 3-16) and provides for the prevention, control, and abatement of noise pollution in the State from stationary noise sources and from equipment related to agricultural, construction, and industrial activities. The standards are also intended to protect public health and welfare, and to prevent the significant degradation of the environment and quality of life. The limits are applicable at the property line rather than at some pre-determined distance from the sound source. The project site itself is located in the Conservation District, but there are no noise-sensitive uses in the area at the present time. Because of that, the Class A limits applicable to land zoned for residential use appears the most applicable. HAR §11-46-7 grants the Director of the Department of Health the authority to issue permits to operate a noise source which emits sound in excess of the maximum permissible levels specified in Table 3-16 if it is in the public interest and subject to any reasonable conditions. Those conditions can include requirements to employ the best available noise control technology.

Table 3-16. Maximum Permissible Sound Levels in dBA

Zoning Districts	Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Class A	55	45
Class B	60	50
Class C	70	70

Table Notes:
(1) Class A zoning districts include all areas equivalent to lands zoned residential, conservation, preservation, public space, open space, or similar type.

(2) Class B zoning districts include all areas equivalent to lands zoned for multi-family dwellings, apartment, business, commercial, hotel, resort, or similar type.

(3) Class C zoning districts include all areas equivalent to lands zoned agriculture, country, industrial, or similar type.

(4) The maximum permissible sound levels apply to any excessive noise source emanating within the specified zoning district, and at any point at or beyond (past) the property line of the premises. Noise levels may exceed the limit up to 10% of the time within any 20-minute period. Higher noise levels are allowed only by permit or variance issued under sections 11-46-7 and 11-46-8.

(5) For mixed zoning districts, the primary land use designation is used to determine the applicable zoning district class and the maximum permissible sound level.

(6) The maximum permissible sound level for impulsive noise is 10 dBA (as measured by the "Fast" meter response) above the maximum permissible sound levels shown.

Source: Hawaii Administrative Rules §11-46, "Community Noise Control"

3.3.1.1 Existing Sound Levels

Existing ambient noise levels vary considerably within the project area both spatially (i.e., from place to place) and temporally (i.e., from one time to another). In general, existing background sound levels at the project site are relatively high, 55 to 60 dBA, due to vehicle traffic on Kalanianaole Highway and boat traffic in the entrance channel. In the vicinity of significant construction activity noise levels can intermittently reach 80 dBA.

3.3.2 Historic, Cultural and Archaeological Resources

The following general discussion of historical and cultural resources in the project vicinity is based on investigations accomplished by International Archaeological Research Institute, Inc. (Jordan et al, 2010).

<u>Habitation</u>
Maunalua Bay received its first Western visitors in the summer of 1786 when Captain Nathaniel Portlock of the *King George* and Captain George Dixon of the *Queen Charlotte* anchored offshore. Hawaiian canoes greeted Portlock and Dixon's vessels as soon as they arrived. Extensive trade took place between the two groups, in which the English traded iron nails, beads,

buttons, and small pieces of iron, while the Hawaiians traded coconuts, plantains, sugarcane and sweet potato (Putzi et al. 1998). Portlock noted that the Maunalua Bay area was sparsely populated, with Honolulu being the primary economic center of the island at the time.

Post-contact, the area remained sparsely populated. In the late 1820s, Missionaries Gilbert F. Mathison and Levi Chamberlain visited the area. During his visit Mathison noted approximately 100 huts within a grove of coconut trees in Maunalua, although the exact location of the huts are unknown (McAllister 1933).

The population and development of the area remained minimal through the 19th century and early 20th century, as land use around the fishpond was mainly devoted to ranching and agriculture. In the late-1950s businessman Henry Kaiser began developing the area into a residential community and marina, including dredging of the fishpond into its present configuration.

Horticulture

Sweet potato and similar root crops were grown on the land within the Maunalua Ahupua′a, but away from the Keahupua-o-Maunalua fishpond and outside the project area. Sweet potato would have been grown on the hillslopes and in drier lowlands. The fishpond and swampland would have been too wet for sweet potato cultivation. The soils in the fishpond may once have included wetland taro pondfield soils around pond margins, but this is not confirmed.

Aquaculture

Fishponds were an important resource and food supply for the Ancient Hawaiians. *Koa* (fishing shrines) are often located nearby, showing that the native Hawaiians recognized their importance as a food source. Fishponds were carefully maintained in traditional times, with even Kamehameha the 1st reportedly participating in the restoration of the Keahupua-o-Maunalua (Kamakau 1961). During the *Māhele Aina* (the Great Land Division of 1848) fishponds were considered part of the land and were even included in land-division records.

Jordan describes the significance of fishponds in Hawaiian culture and lifestyle:

> Fishponds (*loko i'a*) were significant features in the traditional Hawaiian past, and they continue to reflect Hawaiian culture today. "Oahu boasted at least 184 fishponds, more than any other island" (Kirch 1996). There are many different structural types of fishponds as well as several different sociopolitical relationships that groups of people share with these features. In some cases, a traditional fishpond was small and was built by a family who maintained the pond on their own. Other ponds were very large and required a great deal of engineering to construct. These large, even monumental, fishponds were generally owned by the *ali'i* (chiefs) who represented the *mo'o* (paramount chief, ruler). The *ali'i* employed *konohiki* (supervisors), who oversaw the work of *maka'ainana* (commoners), who did most of the daily maintenance work and harvesting.

Over the last century, the health of Hawaiian fishponds has been in steady decline. Many fishponds have been destroyed, and very few remain in their original condition. Even fewer still serve their traditional purpose. As fishponds are often located along calm and attractive shorelines, many have been chosen for development over the past century.

Loko Keahupua-o-Maunalua (State Site No. 50-80-15-049) has been described as the largest fishpond in the state (Takemoto et al. 1975, USACE, 1975). Extensive wetlands that were created during the last ice age were modified by the ancient Hawaiians to create the fishpond. Legend tells that the fishpond walls were constructed with the help of the Menehune, who finished the partially completed wall in one night. An 1851 map by Webster shows the pond covering an area of 212 ha (523 acres). By 1921 the pond was partially filled and the surface area was reduced to 122 ha (301 acres), plus 43 ha (125 acres) of swampland (Mann, 1921; McAllister 1933; Sterling and Summers 1978).

A rock-walled fish trap appears on the 1921 map of the area near what is now the Hawaii Kai Marina entrance channel (Figure 3-29). The trap has not appeared on any more recent maps of the area and was not encountered during the 2013 entrance channel dredging project. No record of the trap exists beyond the appearance on the 1921 map. If any portion of the fish trap remains, it may be in or near the project area and eligible for nomination to the National Register of Historic Places (NRHP).

The condition and function of the pond have changed dramatically in the last century. This is due to the development of Hawaii Kai Marina and dredging of the marina since the 1950s. Despite the significant changes in function, use, and physical makeup that have transformed the Loko Keahupua-o-Maunalua into the Hawaii Kai Marina of present, there are some community groups that want to reduce further alteration to the fishpond. Jordan describes the contentious issue of fishpond modification in Hawaii:

> Although the fishpond has gone through physical transformation, it remains important to contemporary community groups, who want to protect the pond from further damage. This cultural and political issue is an important one in the State of Hawaii, both for privately owned fishponds like Keahupua-o-Maunalua and for fishponds owned by the State. State-owned fishponds have recently become protected by a law prohibiting their sale (Hawaii Bill 1665, Act 210).

<u>Hawaiian Trails</u>
In the 1851 map by Webster, a road starts at the *pali* (cliff) at Makapuu Bay and terminates in Maunalua Bay. What Webster calls a "road" is described by Maly and Wong-Smith (O'Hare et al. 2003) as a trail that would have connected Waimanalo with the fishpond. The paved road was approximately 15 feet wide and was likely used for horse-drawn carts. The road may date to sometime after 1825.

<u>Burials</u>
Multiple burial sites have been discovered in Hawaii Kai, but none within the project area. The closest burial site to the proposed groin is located on residential property in Portlock. In 2002, bones were discovered during excavation of a small ditch at 251 Portlock Road. The original location of the bones was unclear, and only pieces of rib and cranial fragments were discovered.

This site is located 1,500 feet to the southeast of the groin site and is well landward of the beach restoration area.

Heiau

Heiau (temples) are among the most substantial traditional spiritual structures in Hawaii. These often large temples were usually built by the ali‘i. Today, relatively few heiau remain on Oahu, in part because of lack of continued maintenance. Many heiau were destroyed during the industrial and residential expansion since A.D. 1900. Three heiau still exist in the Hawaii Kai area but are well outside of the project area. The proposed action will have no impact on these heiau.

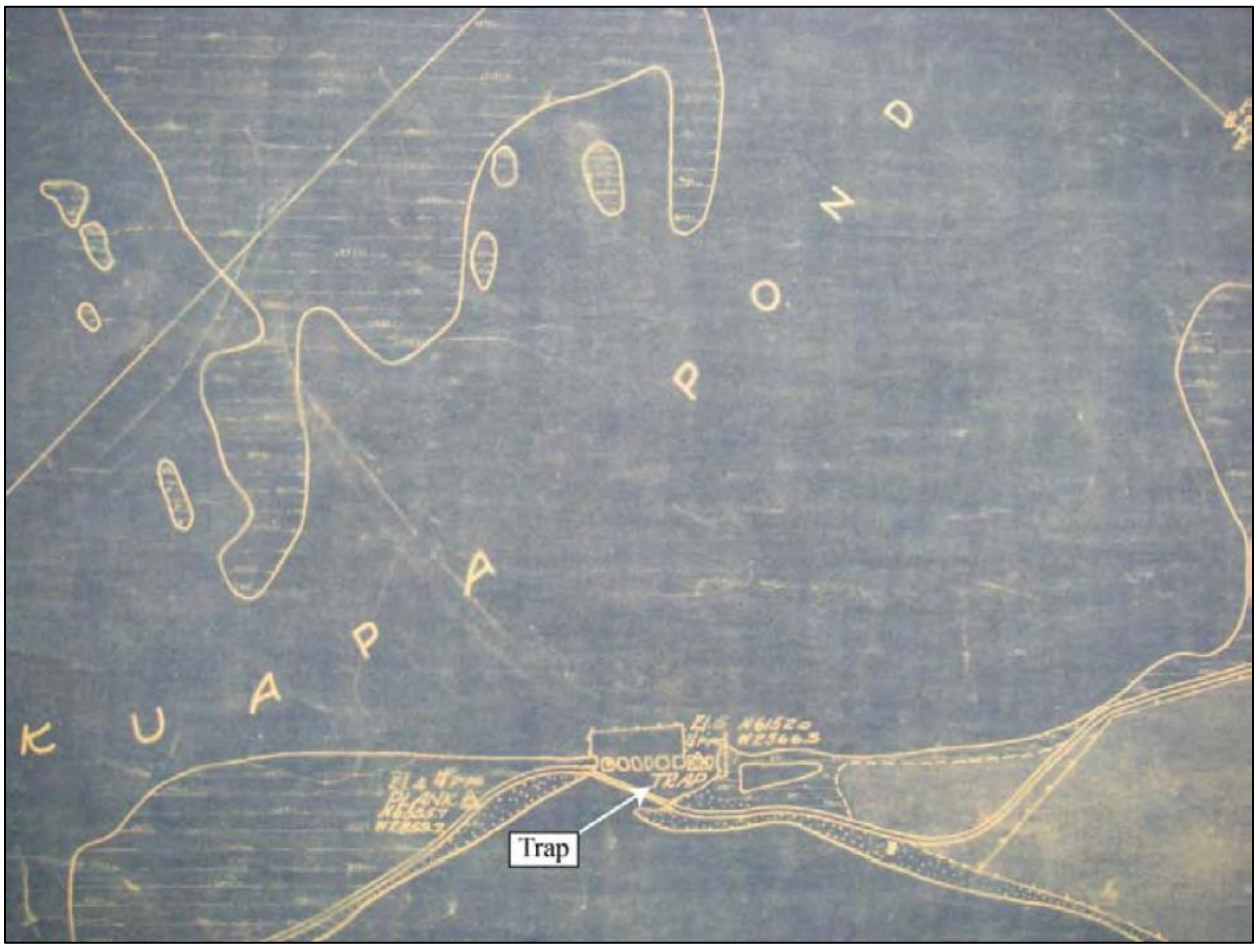

Figure 3-29. 1921 Portion of Maunalua Apana 30, LCA 7713 R.P. 4475, Koolaupoko, Oahu - Surveyor Jas. B Mann

3.3.3 Recreation

John Clark, a recognized expert on ocean recreation and cultural activities in Hawaii, completed an assessment of ocean recreation activities in the project vicinity (see Appendix B). His assessment included observation of ocean activities and ocean conditions in the project area, interviews with shoreline users, and evaluation of possible project effects and impacts on recreation activities

Sunbathing
Sunbathing takes place on the beach adjacent to the project site. However, Portlock Beach does not see the visitor density that nearby Hanauma Bay and Sandy Beach have on a daily basis. Minimal parking and a narrow beach at high tide keep visitors and tourists away. Most beach users are residents of the Portlock and Hawaii Kai community.

Swimming
Swimming rarely takes place at the project site. The shallow, cobble shoal and turbid water fronting the beach does not offer good swimming conditions.

Snorkeling
Snorkeling is uncommon at the project site. Turbid water, heavy boat traffic, and minimal fish and coral diversity lead snorkelers to other areas including nearby Hanauma Bay or further offshore in Maunalua Bay.

Surfing
No surfing occurs in the project area. "Seconds" is the nearest surf spot and is located well offshore near the outermost channel markers of the entrance channel.

Fishing and Gathering
Fishing is a common activity at the project site and was observed during John Clark's field investigations. Fishermen use both the existing temporary sandbag groin and the beach for whipping and casting, respectively. Papio and ulua are commonly caught in the nearshore waters off of Oahu. At the east end of the beach, short sections of PVC pipe, which are commonly used as pole holders for casters, were observed cemented in several places on the seawalls. Spearfishing is uncommon in the waters directly offshore the project site, though one informant reported fishing from boats in the nearshore waters. Additionally, one informant reported crabbing in the vicinity of the project site. No gathering activities of other marine species were observed during the field trips or reported by informants.

Other Activities
The beach is used as a rest stop by canoes from the Hui Nalu Canoe Club. Owners of other non-motorized craft, such as kayaks and standup paddleboards, will occasionally stop at the beach.

3.3.4 Economic Setting

The Hawaii Kai Marina is used by a number of commercial businesses serving the needs of tourists for activities, such as fishing, diving, sightseeing, surfing, kayaking, and thrill sports. Ten commercial watersport companies operated in and out of the marina in 2016. The proposed project will benefit the local economy by maintaining the navigable capacity of the marina and entrance channel used by these commercial businesses.

3.3.5 Scenic and Aesthetic Resources

Both residents and the visitor industry depend on Oahu's scenic resources. The beauty of Oahu's coastline draws millions of tourists to its sights and beaches each year. An absence of tall buildings near the coastline in Hawaii Kai has largely left view planes of Koko Head, Koko Head Crater, the Koolau Mountains, and Diamond Head intact.

3.3.6 Public Infrastructure and Services

3.3.6.1 Transportation

Vehicular and Pedestrian Access
Pedestrian access is available from Portlock Road through public rights-of-way, one of which is located 1,000 feet to the southeast of the project site between TMK 3-9-02:010 and TMK 3-9-02:009. There is no direct vehicular access to the project site.

Harbors
The nearest marina is the Hawaii Kai Marina, which is owned and operated by the Hawaii Kai Marina Community Association. The nearest public harbor is the Ala Wai Harbor, which is owned and operated by the State of Hawaii. Commercial cargo arrives and departs Oahu through Honolulu Harbor.

Airports
Honolulu International Airport (HNL) is located approximately 16 miles west of the project site.

3.3.6.2 Water, Sewer and Communications Systems

Water Supply
The Honolulu Board of Water Supply (BWS) is responsible for the management, control and operation of Oahu's municipal water system that serves the East Honolulu area. The BWS system is an integrated, island-wide system with interconnections between water sources and service areas. Water is exported from areas of available supply to areas of municipal demand.

No BWS facilities are present seaward of the shoreline where the proposed groin replacement will occur. BWS does not maintain or operate any pipelines or other water supply facilities within the area that will be used by construction equipment.

Sanitary Wastewater Collection and Treatment Facilities
The City and County of Honolulu, Department of Environmental Services manages the municipal wastewater collection, treatment, and disposal system that serves the residential subdivision surrounding the project site. The project site lies within the Kuliouou service area, with outflows processed through the Hawaii Kai Wastewater Treatment Plant. The nearest City and County of Honolulu sanitary sewer line is located inland from the project area.

Telecommunication Facilities
Overhead telecommunication lines cross the Hawaii Kai Marina entrance channel seaward of the Kalanianaole Highway Bridge. The lines go over the revetment section of the proposed groin and present a potential construction hazard. The telecommunication lines will be otherwise unaffected by groin construction.

Electric Power
The Hawaiian Electric Company (HECO) provides electrical service to the project area. Most of the electrical power that is consumed in Hawaii Kai comes from fossil fuel-fired generating units located at Waiau, Campbell Industrial Park, and Kahe. Power is delivered to customers by a system of underground and overhead transmission and distribution lines. Overhead transmission

lines cross the Hawaii Kai Marina entrance channel seaward of the Kalanianaole Highway Bridge. The lines go over the revetment section of the proposed groin and could present a potential construction hazard. The transmission lines will be otherwise unaffected by groin construction.

3.3.6.3 Solid Waste Collection and Disposal

The City and County of Honolulu, Department of Environmental Services manages Hawaii Kai's municipal solid waste system, including the H-POWER resource recovery facility and one sanitary landfill. A private company operates a construction debris landfill in Nanakuli, and private companies are responsible for solid waste collection from virtually all of the island's commercial organization.

3.3.6.4 Police, Fire and Emergency Medical Services

Police Protection

The Department of Land and Natural Resources, Division of Conservation and Resources Enforcement (DOCARE) is responsible for enforcement activities in areas controlled by the Department of Land and Natural Resources, which includes the area seaward of the certified shoreline where the groin construction will take place. The nearest police station is located at the Waikiki Police Substation on Kalakaua Avenue adjacent to the Moana Hotel. Honolulu Police Department headquarters is located in Honolulu on Beretania Street near its intersection with Ward Avenue.

Fire Protection

The nearest fire station is Honolulu Fire Department, Station 34 on Lunalilo Home Road, at the intersection of Lunalilo Home Road and Kapaia Street. The station is roughly 1.5 miles by road from the project site.

Emergency Medical Services

The three hospitals nearest to the project site are the Kapiolani Women's and Children's Hospital on Punahou Street in Honolulu, Straub Hospital on King Street, and Queen's Hospital on Punchbowl Street. All three hospitals provide emergency medical services (EMS) to the area, as does the fire station mentioned above.

4. POTENTIAL IMPACTS OF THE PROPOSED ACTION

This section summarizes the potential adverse and beneficial effects that are anticipated to result from the proposed project. The discussion is organized by the type of potential resource impact (e.g., coastal processes effects, marine biological effects, water quality effects, etc.). Good project design and implementation integrates features and practices intended to avoid or mitigate potential environmental effects into the overall design of the project. Because of this, in most cases the discussion of "mitigation measures" is integrated into the overall discussion rather than limited to a separate section of the report. Each resource section in this chapter includes a discussion of criteria used to determine the significance effects on the resource.

4.1 Effects on Seafloor and Shoreline Processes

4.1.1 Impacts During Construction

In-water construction impacts will be limited to the immediate area of groin construction. The new groin footprint and construction easement area will be carefully delineated, and no construction activities or in-water material storage will be permitted outside of this area. The seafloor in the project area is primarily sand, with loose rubble and some patches of exposed fossil reef rock. The existing groin will be removed as the new groin is being built. Construction of the proposed new groin will alter the bathymetry of the area it covers. The construction easement area will have limited public access during construction. Boat traffic in and out of Hawaii Kai Marina may be temporarily constrained by construction activities. Construction will be in accordance with all necessary permits and approvals necessary for the project.

4.1.2 Long Term Effects on the Shoreline

Long-term impacts to the seafloor and bathymetry will be limited to the actual footprint of the new groin and the area in the lee of the L-head. The groin is expected to reduce the longshore sediment transport rate past the groin by trapping sediment on Portlock Beach. The prevailing sand transport in the project vicinity is from east to west. As sediment is retained on the beach to the east of the groin, the dry beach width is expected to increase by up to 50 feet.

Westerly sediment transport from Portlock Beach to Maunalua Bay Beach Park is prevented by the Hawaii Kai Marina entrance channel. The entrance channel acts as a sediment sink, in that sand that enters the entrance channel is no longer part of the beach system. There is no natural mechanism to transport sand from the entrance channel back onto the beach under normal conditions. Because of this, Portlock Beach doesn't provide sediment to the Maunalua Bay Beach Park shoreline and construction of the groin will not cut off the shoreline's sediment source. The proposed groin will not affect erosion rates on the shoreline to the west of the entrance channel.

4.2 Water Quality Impacts

4.2.1 Impacts During Construction

Construction will be accomplished using conventional heavy equipment, and will proceed from shore with the placement of stone to form a working platform, and then working back to shore

placing stone to the finished groin lines and grades. A temporary increase in turbidity levels in the immediate area of construction is expected; however, this will be mitigated by the employment of BMPs and the requirements of the State Department of Health Water Quality Certification which will be required for the project. BMPs and environmental protection measures to be employed are summarized in Section 7.2. Water quality protection measures will include the following general requirements:

- Turbidity containment barriers shall be installed and maintained to completely surround the work area so as to control and contain construction generated turbidity.
- The water area affected by construction shall be monitored, and if monitoring indicates that the turbidity standards are being exceeded, construction shall be suspended until the condition is corrected.
- The construction contractor shall be required to employ standard BMPs for construction in coastal waters, such as daily inspection of equipment for conditions that could cause spills or leaks; cleaning of equipment prior to operation near the water; proper location of storage, refueling, and servicing sites away from the water; implementation of adequate on site spill response procedures; and stormy weather preparation plans.
- All construction activities shall be confined to the immediate area of construction, and no excess construction material shall be stockpiled in the water.
- Construction materials (e.g., stone and concrete) shall be inert and free of earthen and any other deleterious substances.

4.2.2 Long Term Effects on Water Quality

Following completion of construction and removal of turbidity containment devices, the affected water body is expected to return to its pre-construction condition. No long-term effects on water quality or water circulation in the project area are expected.

4.3 Biological Effects

Several aspects of the proposed project have the potential to affect marine biota, including:

- Direct physical disturbance of the seafloor and water column during construction.
- Indirect effects associated with project related changes in water quality.
- Indirect effects related to re-colonization patterns as biota re-establishes itself in areas that were disturbed by temporary construction activities following the completion of construction.

4.3.1 Construction Period Impacts

The nearshore and reef flat biological assemblages of Maunalua Bay in the vicinity of the Hawaii Kai Marina are poorly developed and suggest a highly disturbed environment. Maunalua Bay appears to be negatively affected by a variety of environmental disturbances, including freshwater input and sedimentation, from landward sources. Direct impacts to marine biological resources at the project site will result in the loss of marine resources that occur on the existing temporary sandbag groin and within the footprints of the existing and proposed structures. These communities are dominated by a number of algal species. Biological assemblages residing on

and around the present groin will be impacted, but it is expected that similar assemblages will recolonize any newly placed solid structure. Recruitment of biota to the new groin structures will likely include marine species established nearby, and may possibly include corals.

It is anticipated that the fish that occur in the project vicinity will actively avoid direct impacts from project activities. Some impairment of ability of EFH managed species to find prey items could occur, but this effect should be temporary and spatially limited to the immediate vicinity of construction activities. Most of the Management Unit Species (MUS) that use the EFH are not tied to artificial substrates, and routinely experience turbid and sand scoured environment in the area. The new structure will maintain fish habitat in the project area, and will provide additional fish foraging resources on the new groin. Construction of the groin on essentially sand bottom is not expected to adversely affect fish populations, fish habitat, or fish foraging resources. The seagrass bed observed in the biological survey is located outside of the project footprint. Infaunal resources are expected to recover rapidly.

4.3.2 Long Term Impacts

The project will replace approximately 12,000 square feet of primarily sand and rubble seafloor with a high relief rock rubble mound revetment and groin structure. The rock groin will provide bare, stable surfaces for recruitment of corals, algae, and other invertebrates. The groin will be a porous, permeable structure, with approximately 37 percent interstitial void space between stones. Obligate reef dwellers are often limited by the availability of suitable shelter, especially juveniles. Reef fishes prefer reef holes and crevices commensurate with the size of the fish. The interstitial spaces between stones will also provide habitat for benthic (crabs, shrimps, worms, etc.) and sessile organisms (sponges and tunicates) which will provide additional foraging resources for fishes. The boulders also provide a hard, stable surface for coral colonization, and elevates them above the shifting sand and rubble bottom.

The Iroquois Point Beach Nourishment and Stabilization Project on the south shore of Oahu, immediately west of the Pearl Harbor entrance channel, involved the construction of nine rock rubble mound groins similar in size and construction to the proposed replacement at the Hawaii Kai Marina Entrance Channel. The Iroquois Point project was completed in May 2013. Extensive marine ecosystem monitoring is being accomplished for this project (AECOS, 2014). The 1-year post-construction marine ecosystem monitoring shows that the project has resulted in a significant increase in marine species diversity and density. In the vicinity of the groins there has been a 25-fold increase in fish abundance, not counting small baitfish, and a tripling of species richness (number of species). Fish biomass is more than six times greater than prior to construction. Prior to construction of the groins, fish biomass at Iroquois Point was considered low compared to island averages around the state, roughly on par with the shallow reef flats near Waikiki (AECOS, 2009b, 2011, 2014). After construction the biomass at the groins is on par with maximum values observed around the state (AECOS, 2014). Other changes in the vicinity of the groins includes an increase in crustose coralline algae cover from 1% to 60%, coral cover increase from 0 to 0.6% and macroinvertebrate cover from 1.4% to 6.3%. Coral abundance in the groin vicinity increased from 0 to 16 colonies per 10 m^2, with the most common coral species being *Pocillopora damicornis*. These changes are attributable to the creation of hard, stable habitat for colonization, and similar changes are expected should the proposed rubble mound revetment and groin be built.

4.3.3 Effects on Endangered Species

As discussed in Section 3.2.2, the nearshore area off Hawaii Kai is frequented by endangered and threatened species. The threatened green sea turtle (*Chelonia mydas*), which may feed on the algae and seagrass covered bottom, is often sighted in Maunalua Bay. The waters of Maunalua Bay are within the Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS). Hawaiian monk seals (*Monachus schauinslandi*) have been seen in Maunalua Bay on rare occasions, but this is exceptional, and they have not been reported in the vicinity of the proposed project. No other listed species are known to frequent the waters of Maunalua Bay.

Construction of the groin will not involve in water work that significantly increases underwater sound and that will adversely affect marine creatures. Sea turtles and marine mammals typically avoid human activity, so exposure to such activity and equipment operation will be infrequent and non-injurious, resulting in insignificant effects on the ESA-listed marine species. Turbidity does not appear to deter green sea turtles from foraging and resting areas and construction projects in Hawaii have found sea turtles adaptable and tolerant of construction-related disturbances (Brock, 1998 a,b). As the impact area is relatively small and primarily on sandy bottom construction will not affect turtle foraging area. The project will not directly affect humpback whales, and sounds generated from groin replacement activities are not anticipated to be substantial enough to cause an acoustic disturbance to protected species in nearshore waters.

The following BMPs as typically recommended by the National Marine Fisheries Service (NMFS) will be adhered to during construction of the project to avoid impacts to the turtles or other marine protected species:

1. Conduct a survey for marine protected species before any work in the water starts, and if a marine protected species is in the area, a 150-foot buffer must be observed between the protected species and the work zone.
2. Establish a safety zone around the project area whereby observers will visually monitor this zone for marine protected species 30 minutes prior to, during, and 30 minutes post project in-water activity. Record information on the species, numbers, behavior, time of observation, location, start and end times of project activity, sex or age class (when possible) and any other disturbances (visual or acoustic).
3. Conduct activities only if the safety zone is clear of all marine protected species.
4. Upon sighting of a marine protected species within the safety zone during project activity, immediately halt the activity until the animal has left the zone. In the event a marine protected species enters the safety zone and the project activity cannot be halted, conduct observations and immediately contact NMFS staff in Honolulu to facilitate agency assessment of collected data.
5. For on-site project personnel that may interact with a marine protected species potentially present in the project area, provide education on the status of any listed species and the protections afforded to those species under Federal laws.

A summary of anticipated effects on endangered species is as follows:

- By using the above BMPs, noise/physical disturbance to green sea turtles is expected to be temporary and insignificant and not result in adverse behavioral changes.

- Based on the in-water work being conducted in very shallow water with turbidity containment barriers surrounding the work area, any exposure of marine protected species to turbidity and sedimentation is expected to be temporary and not significant.

Given the extensive turtle foraging area in Maunalua Bay, and the relatively small percent loss which will result during construction, the change in turtle foraging habits and habitats is not expected to be significant.

4.4 Noise Impacts

It is not feasible to mitigate construction noise to the extent that it does not at times exceed existing background noise levels or is inaudible to beach users, residents, etc. Some reduction is practical; however, and the following measures will be implemented:

- Equipment operation on the shoreline will be limited to the hours between 7:00 a.m. and 7:00 p.m.
- Broadband noise backup alarms in lieu of higher frequency beepers will be required for construction vehicles and equipment. Broadband noise alarms tend to be less audible and intrusive with distance as they blend in with other background noise sources.
- The project will specify use of the quietest locally available equipment, e.g., high insertion loss mufflers, fully enclosed engines, and rubber tired equipment when possible.
- The use of horns for signaling will be prohibited.

4.5 Effects on Historic, Cultural, and Archaeological Resources

As discussed in Section 3.3.2 of this report, the Hawaii Kai area has a rich historical and cultural legacy. However, two aspects of the project make it unlikely that it will have a significant adverse effect on historic or archaeological sites.

1. Implementation of the project does not involve construction on or excavation of backshore land areas that might contain physical remains. Work on land will take place only on the beach in areas that have been previously dredged. Care will be taken when working on the beach to avoid disturbing previously undisturbed sandy sediments that might hide subsurface deposits.
2. Construction of the new groin will take place completely in the water, seaward of the shoreline, and does not involve modification of soft deposits which could reasonably be expected to have the potential to hide archaeological materials or burials.

A rock-walled fish trap associated with the fishpond appears on a 1921 map of the area near what is now the entrance channel. Construction of the bridge and dredging of the entrance channel make it highly unlikely that any portion of the fish trap still exists, and no evidence of the fish trap was encountered during the 2013 entrance channel dredging project. The contractor will be notified of the trap's potential existence, and construction will be halted should any evidence of the trap encountered.

There do not appear to be any known traditional Hawaiian cultural practices that will be adversely affected by the proposed project, nor does it seem like the activities associated with the

project will conflict with traditional cultural practices as expressed in legend. The proposed project is entirely seaward of the shoreline where the existence of any cultural artifacts or remains are very unlikely. Based on the above, the proposed project is unlikely to have an adverse effect on rights customarily and traditionally exercised for subsistence, cultural and religious purposes.

4.6 Recreational Impacts

4.6.1 Impacts on Beach and Park Activities during Construction

An approximate 5,000 square foot (0.1 acre) construction work and staging area will be located on Portlock Beach adjacent to the proposed groin and a similar sized area will be located west of the entrance channel in Maunalua Bay Beach Park. These areas will not be available for recreational use for the duration of construction activity. Construction access and staging areas are shown in Figure 2-11.

4.6.2 Impacts on Boat Traffic during Construction

Brief interruptions of boat traffic are expected during construction. Construction materials and equipment will be ferried across the entrance channel from the staging area in Maunalua Bay Beach Park to the staging area on Portlock Beach. Flagmen and Hawaii Kai Marina patrol boats will be utilized to prevent dangerous interactions between construction barges and boats that are entering or exiting the marina.

4.6.3 Impacts on Other Recreational Activities During Construction

<u>Snorkeling and Swimming</u>
A turbidity containment barrier will surround the in-water construction activity and effectively "fence" off the work from any people in the water. The shallow reef in the project area is not known as a particularly good site for snorkeling and swimming. The reef does not seem to attract the volume or variety of fish that other reefs do, and for this reason snorkeling is an infrequent activity here. In addition, visibility over the reef is poor due to wave agitation of fine sediment on the ocean bottom. Hence, the proposed project is not expected to have a negative impact on snorkeling activities.

<u>Fishing and Gathering</u>
Two types of pole fishing occur in the project site: whipping and casting. Fisherman often use the existing sandbag groin for whipping. Once construction staging areas are established and equipment is mobilized, use of the temporary sandbag groin will be prohibited. Additionally, fishermen will not be able to access the proposed groin at any point during its construction. After construction equipment has been demobilized, the project area will again be open to recreational activities.

4.6.4 Long Term Recreational Impacts

No long-term adverse impacts to recreational uses are anticipated.

4.7 Changes in Susceptibility to Natural Hazards

The proposed project will replace the existing temporary sandbag groin at the Hawaii Kai Marina entrance channel with a stable, engineered, rock rubble mound revetment and groin designed to withstand a closely approaching hurricane with a significant deepwater wave height of 27 feet. The proposed project will not change the shoreline elevation and will not change the existing tsunami flood hazard.

The proposed groin replacement is located in an area that does not receive runoff from adjacent areas. It is not within the flood plain of a stream or canal. Hence, there is no potential for increased risk from this flooding, and the physical change in the shore that is proposed does not have the potential to alter storm runoff risks in adjacent areas.

4.8 Air Quality Impacts

Construction activities will create temporary degradation in air quality in the immediate vicinity of the project area due to emissions from construction equipment. This negative impact to air quality will be limited to typical work hours, and will end once the groin is in place. The emissions from the equipment's internal combustion engines are far too small to have a significant or lasting effect on air quality. The contractor will observe all BMPs to keep construction related emissions to the lowest practicable levels.

Short-term degradation of air quality that may occur due to emissions from construction equipment may include increased carbon monoxide (CO) levels, nitrogen oxide (NOx) levels, volatile organic compounds (VOCs), directly-emitted particulate matter (PM_{10} and $PM_{2.5}$), and toxic air contaminants such as diesel exhaust particulate matter. Sulfur dioxide (SO_2) is generated by oxidation during combustion of organic sulfur compounds contained in diesel fuel. Off-road diesel fuel meeting Federal standards can contain up to 5,000 parts per million (ppm) of sulfur, whereas on-road diesel is restricted to less than 15 ppm of sulfur.

Implementation of the following measures will reduce any air quality impacts resulting from construction activities:

- Properly tune and maintain construction equipment and vehicles.
- Locate equipment and materials storage sites as far away from residential and commercial uses as practical. Keep construction areas clean and orderly.

Because most of the work that will take place will be in the water or on the sandy shoreline, the proposed project involves little or no on-site soil disturbance that could result in particulate emissions. Application of water to the site and equipment can control fugitive dust emissions if they arise.

Once construction is completed, the project will have no long-term air emissions or impact on air quality.

4.9 Land Use and Socio-Economic Effects

The proposed action will reduce the rate of sediment settling in the entrance channel, thus increasing the time between maintenance dredging that is required to keep the channel navigable. The marina is used by a number of commercial businesses serving the needs of tourists for activities, such as fishing, diving, sightseeing, surfing, and kayaking. In addition to docking approximately 1,000 private vessels, the marina also serves several important public functions by providing safe harbor for passing vessels during storm events and serving as a base of operations for fire and rescue operations during times of emergency. In 1994, the State Legislature passed Act 231, Session Laws of Hawaii 1994, which states "The legislature declares that keeping the entrance to the Hawaii Kai Marina in navigable condition serves a public purpose because important health, safety, and welfare considerations are involved."

The direct socio-economic effects of the proposed project are limited principally to construction employment and related business activity. The direct construction employment and business expenditures are not large enough to affect the larger socio-economic context of the area. Construction is expected to have negligible economic impact on commercial activities in and around the marina.

4.10 Visual Impacts

Construction equipment, material stockpiles, and construction activities will be present within the project area for several weeks during the construction of the project. These impacts are temporary and will not be present once the construction phase of the project is completed.

The proposed structure is larger than the existing sandbag structure. The L-head crest height of the proposed groin is +5' MLLW, while the offshore end of the existing groin is +3.5'. The proposed action extends 40 feet further offshore than the existing structure and has a 50-foot long L-head that angles towards Koko Head. The proposed structure may have some impact on scenic view planes of Diamond Head from Portlock Beach. However, to a beach user standing on the beach crest, the top of the structure will be well below the horizon. Artistic renderings of the proposed action are shown in Section 2.3.

Residents at 6973 Kalanianaole Highway expressed opposition to the preferred *extended length with L-head* configuration based on view plane interference (see Appendix C). On June 30th, 2016, SEI and the HKMCA board met to discuss a plan to address the residents' concerns. The HKMCA reached out to the Portlock Road Community Association (PRCA) for additional feedback from the community. Respondents from the PRCA indicated their preference for a groin configuration that is engineered to retain the largest volume of sand on Portlock Beach. Alhough the *maximum length with L-head* configuration would retain more sand on Portlock Beach than the preferred configuration, the increased visual impact and construction cost outweigh the benefit of the additional sand. The HKMCA decided to keep the *extended length with L-head* configuration as the preferred design option. Reduction of the structure's crest height was also considered as a mitigation option, but was not further pursued as the present design crest height is considered minimal, and lowering the height would likely result in greater overtopping and reduce the efficiency of the structure for containing sand.

4.11 Impacts on Public Infrastructure and Services

The proposed groin replacement has little potential to affect public infrastructure and services. Once in operation it will not require water or electrical power. In and of itself, it does not generate a need for additional sanitary wastewater collection and treatment facilities and it will not affect stormwater runoff that might impact the City's stormwater system. Most people visiting that end of the beach would come by foot rather than in vehicles, and the improvements are not expected to increase the resident or visitor population of the island.

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

Construction of the project will involve a relatively small construction crew, estimated to range between 6 and 12 workers onshore. During most of the construction these workers can park either in a construction staging area or existing public parking facilities located at Maunalua Bay Beach Park or on Portlock Road. Mobilization and demobilization of the on-shore equipment will require large trucks moving through Hawaii Kai; however, this will be of limited duration. Because of the small number of vehicle-trips involved, construction worker and equipment/material delivery trips do not have the potential to substantially affect traffic volumes and/or the level of service on area roadways and do not require substantial mitigation efforts.

5. POTENTIAL IMPACTS OF THE NO ACTION ALTERNATIVE

As shown by the behavior of the previous temporary sandbag groins, the existing temporary sandbag groin will eventually deteriorate until it ultimately fails. Failure of the groin would allow sediment to migrate unimpeded into the entrance channel. A sand spit would begin to form on the east side of the entrance channel. With time, the sand spit would grow and begin to encroach on the third passageway under the Kalanianaole Highway Bridge that was opened for navigation during the 2013 dredging project. Additionally, the seagrass bed on the west side of the existing groin would be covered in sediment.

Portlock Beach erosion rates may increase as sand is lost to the entrance channel at a faster rate. The most dramatic increase of erosion rates will be the segment of beach adjacent to the existing sandbag groin, which has accreted sand since the existing groin was installed.

Rocheleau and Crane (1972) estimated that tidal flows into and out of Hawaii Kai Marina can sustain a maximum entrance channel cross-sectional area of 700 square feet. Bathymetric surveys in 1998, before the original temporary sandbag groin was installed, showed the cross-sectional area of the entrance channel was 415 square feet, and only the westernmost passage under the Kalanianaole Highway Bridge was navigable. The sand spit would eventually return to its pre-groin shape (**Error! Reference source not found.**), and boat traffic would once again e restricted to one passageway. Sandbars would likely form on either side of the bridge creating navigational hazards. A consequence of a narrower entrance channel is stronger current in the channel during the rising and falling tide. Current in the entrance channel was measured at 1.2 knots in 1998, which can make navigation of the entrance channel difficult.

In 1998, there were approximately 650 to 750 boats registered in the Hawaii Kai Marina. Presently the Hawaii Kai Marina serves over 1,000 registered vessels. Boat traffic in and out of the marina has likely increased with the increasing number of registered vessels in the marina. A narrower entrance channel would cause delays for boats entering and leaving the marina. Heavy boat traffic and stronger currents through the entrance channel of the marina would increase the likelihood of collisions.

Eventually, the narrower and shallower entrance channel would restrict access for the larger vessels that use the marina, many of which are commercial businesses. Twelve commercial businesses operated out of the Hawaii Kai Marina in 2016.

“No Action” would not affect historic, cultural, and archaeological resources.

6. RELATIONSHIP TO RELEVANT PLANS, POLICIES, AND CONTROLS

This section discusses the compliance and compatibility of the proposed Hawaii Kai Marina entrance channel groin replacement with pertinent plans, policies, and regulations at county, state, and federal levels.

6.1 City and County of Honolulu

6.1.1 Special Management Area

The Hawaii Coastal Zone Management (CZM) Program (HRS Chapter 205A) regulates all types of land uses and activities ("development") in the Special Management Area (SMA). The SMA on Oahu is regulated by the City and County of Honolulu. Portions of the project and project staging areas that are located within the SMA will be subject to the SMA rules and regulations for the City and County of Honolulu.

Shoreline certification at the project site is in progress. Should portions of the project be landward of the Certified Shoreline, a City and County of Honolulu SMA permit will be required. As the project cost will likely be in excess of $500,000, the permit would be a Major permit and require a public hearing in compliance with the Revised Ordinances of Honolulu (ROH), Chapter 25.

Special Management Area designations are required by Chapter 205A (HRS) to promote the CZM policies and objectives for coastal areas that are in county jurisdiction. The project should therefore comply with the objectives and policies contained in 205A-2, HRS and the review guidelines contained in 205A-26, HRS.

6.1.2 Relationship to the Oahu General Plan

The *Oahu General Plan* (1992 edition, amended in 2002) sets broad objectives and policies to guide the long-range development of the City and County of Honolulu. The proposed Hawaii Kai Marina entrance channel groin replacement is relevant to two key objectives outlined in the *Oahu General Plan*. Each of these objectives and the relevant policies are listed below, followed by a discussion of the project's relationship to them.

1. II. Economic Activity, Objective B: To maintain the viability of Oahu's visitor industry.
    - Policy 8: Preserve the well-known and widely publicized beauty of Oahu for visitors as well as residents.

<u>Discussion</u>: Though the proposed structure is slightly larger than the existing temporary sandbag groin, the proposed groin will have a minimal effect on public scenic view planes from Kalanianaole Highway, Portlock Beach, Maunalua Bay Beach Park or offshore vessels. Renderings of the proposed action are shown in Section 2.3. As the existing sandbags deteriorate with time, they become unsightly and increasingly ineffective. Rock rubble mound structures are both durable and have a natural appearance.

Visitors and local residents use Maunalua Bay for recreational activities, and twelve commercial businesses operated out of the Marina in 2016, contributing to Oahu's visitor industry. Maintaining the navigability of the entrance channel is imperative for the operation of these businesses.

2. III. Natural Environment, Objective A: To protect and preserve the natural environment.
    - Policy 2: Seek the restoration of environmentally damaged areas and natural resources.

Discussion: Erosion is threatening the backshore and shoreline property at the south end of Portlock Beach. Sand backpassing will move sand that has accumulated adjacent to the existing groin and will place it in front of four shoreline properties at the south end of the beach that have had significant erosion. Initially 400 cubic yards of sediment will backpassed and the beach will be expanded by an average of 7 feet. After groin construction the backpassing plan will be expanded to 1,600 cubic yards and will take place approximately every four years, or as the groin reaches its maximum sediment carrying capacity. This sand will help provide protection from shoreline erosion. Transport processes will eventually move the sand in the direction of the new groin; backpassing at regular intervals of approximately four years will stabilize the beach, mitigate shoreline erosion, and prevent the migration of sand into the entrance channel.

3. X. Culture and Recreation, Objective D: To provide a wide range of recreational facilities and services that are readily available to all residents of Oahu.
    - Policy 8: Encourage ocean and water-oriented recreation activities that do not adversely impact on the natural environment.
    - Policy 10: Encourage the private provision of recreation and leisure-time facilities and services.

Discussion: The Hawaii Kai Marina is heavily used for recreational and commercial purposes. A number of commercial businesses serve the needs of tourists for activities such as fishing, diving, sightseeing, surfing, and kayaking. A navigable entrance channel is necessary to maintain the recreational opportunities for visitor and resident users of the Hawaii Kai Marina.

6.1.3 Relationship to the East Honolulu Sustainable Communities Plan

The *East Honolulu Sustainable Communities Plan* is one of eight community plans for the City and County of Honolulu intended to help guide public policy, investment, and decision-making through the 2020 planning horizon. The vision statement and supporting provisions of the *East Honolulu Sustainable Communities Plan* are oriented toward maintaining and enhancing the region's ability to sustain its unique character and lifestyle.

The Plan is a culmination of the City Charter-mandated development plan revision effort led by the City and County of Honolulu's Planning Department and its successor agency, the Department of Planning and Permitting. The effort was comprised of a process that encouraged and enabled significant involvement from the region's neighborhood boards, community associations and numerous individuals.

The Plan offers guidance regarding the project area and objectives in the following sections:

4. 3. Land Use Policies, Principles, and Guidelines
   - 3.1 Open Space Preservation and Development
     - 3.1.3 Guidelines
       - 3.1.3.6 - Shoreline Areas

"…chronic erosion or accretion appears to be occurring only in two locations – at Paiko Peninsula and in the Portlock area between the Hawaii Kai Marina entrance channel and the former Henry Kaiser Estate."

Guidelines pertaining to shoreline areas - *"Require additional minimum setbacks for structures near the shoreline and implement other management strategies to protect unstable sandy beach areas at Paiko Peninsula and Portlock."*

Sand that accumulates adjacent to the groin will be used to restore beaches that have eroded at the southeast end of Portlock Beach. Erosion in this area is threatening the backshore and private property. Periodic sand backpassing will reduce the threat of erosion, wave runup, and wave attack.

- 3.1.3.8 – Marina

"The Hawaii Kai Marina contributes to the open space system by providing recreational value and visual relief from adjacent urban uses."

Guidelines concerning the Hawaii Kai Marina - *"Enhance the recreational value of this open space by improving facilities in support of boating…"*

The proposed groin will reduce the rate of sediment accumulation in the entrance channel, maintaining the navigability of the channel and thus the recreational value of the marina.

6.2 State of Hawaii Laws and Regulations

As most or all of the project is located on State land, it will require a Conservation District Use Permit (CDUP) pursuant to Title 13 Chapter 5, Hawaii Administrative Rules (HAR). The CDUP is required for all projects that are located in the Conservation District. For shoreline projects, the Conservation District includes all lands seaward of the Certified Shoreline ("Submerged Lands"). The permit is administered through the DLNR Office of Conservation of Coastal Lands (OCCL).

The requirement for a Department of the Army (DA) permit pursuant to Section 404 of the Clean Water Act will also require a Section 401 Water Quality Certification to be issued by the State Department of Health. The permit requires submission of an *Applicable Monitoring and Assessment Program (AMAP)* with the permit application. The AMAP details the program that will be used during construction to monitor construction BMP activities and conduct water quality monitoring and testing to ensure compliance with State regulations.

The project will also require a Hawaii Coastal Zone Management (CZM) Program review for consistency with the CZM objectives and policies (HRS Chapter 205A). The CZM is administered by the State Department of Business, Economic Development, and Tourism (DBEDT), Office of Planning.

6.2.1 Relationship of the Project to the State Conservation District Rules

The Board of Land and Natural Resources (BLNR) regulates uses of the State Conservation District by issuing Conservation District Use Permits (CDUP) for approved activities.

Statutes governing use administration procedures of the Conservation District are written in Hawaii Revised Statutes, Chapter 183C (HRS Chapter 183C Conservation District). Administration is further clarified by the Hawaii Administration Rules, Title 13, Chapter 5 (HAR §13-5 Conservation District). The project area in the Conservation District is classified as a Resource Subzone. The identified land use for the project is P-15 Shoreline Erosion Control, P-16 Beach Restoration, and R-5 Marine Construction. As specified in HAR §13-5-24(c)(4), the proposed use is permitted in the Resource Subzone with the issuance of a BLNR-approved "D-1" (Board) Conservation District Use Permit. P-15 land use requires a shoreline certification, which is in-progress at the time of publication of this document.

The criteria that the DLNR-OCCL will use in evaluating the project are outlined in Hawaii Administrative Rules §13-5-30. Each criterion is listed below, followed by a discussion of how the proposed project complies with it.

- **The proposed land use is consistent with the purpose of the conservation district;**

Discussion: The purpose of the Conservation District is to conserve, protect, and preserve the important natural resources of the State through appropriate management and use to promote their long-term sustainability and the public's health, safety, and welfare (HAR §13-5-1). As discussed throughout this document, the proposed project is expected to reduce the rate of sediment loss from Portlock Beach into the Hawaii Kai Marina entrance channel, thereby maintaining the variety of, and access to, water-oriented recreational activities while protecting other valuable coastal resources. Thus, it is in keeping with the purpose of the Conservation District. As shown by the history of the groin, the project is consistent with the Coastal Erosion Management Plan (COEMAP), adopted by the Board of Land and Natural Resources (BLNR), which identifies beach maintenance and restoration as a long-term strategy where applicable for maintaining the shoreline.

- **The proposed land use is consistent with the objectives of the subzone of the land on which the use will occur;**

Discussion: The objective of the Resource Subzone is to ensure, with proper management, the sustainable use of the natural resources of those areas. The most prevalent natural resource in the project area is beach sand. The proposed action prevents this sand from being transported into the Hawaii Kai Marina entrance channel and lost from Portlock Beach system. As the groin reaches its maximum sediment carrying capacity, a sand backpassing plan will be initiated that will take sand that has accumulated adjacent to the groin and move it to the east end of Portlock Beach. Sand backpassing is an efficient and sustainable strategy to manage the limited sand

resources along Portlock Beach. Post-construction impacts to other natural resources including marine biota will be minimal.

- **The proposed land use complies with provisions and guidelines contained in chapter 205A, HRS, entitled "Coastal Zone Management," where applicable;**

Discussion: A Hawaii Coastal Zone Management Program Consistency Review will be accomplished to confirm the consistency of the project with the Coastal Zone Management Act and the objectives outlined in Chapter 205A, HRS (see Section 6.2.3).

- **The proposed land use will not cause substantial adverse impact to existing natural resources within the surrounding area, community, or region;**

Discussion: Impacts to existing natural resources will be minimal and limited to the construction period. BMPs will be followed to reduce adverse effects to the environment during construction. There will be no long-term effects to natural resources within the affected project area. Marine biota surveys have shown much of the affected area to be sandy or other mobile substrate that is unlikely to be adversely affected by the proposed action.

The groin will prevent sand along Portlock Beach from settling in the entrance channel. Sand that accumulates to the east of the groin will be backpassed approximately every 4 years and used to restore eroded shorelines at the east end of Portlock Beach.

- **The proposed land use, including buildings, structures, and facilities, shall be compatible with the locality and surrounding areas, appropriate to the physical conditions and capabilities of the specific parcel or parcels;**

Discussion: The proposed action is appropriate to reduce sediment transport into the Hawaii Kai Marina entrance channel given the oceanographic and physical processes along Portlock Beach (see Section 3.1). Longshore sediment movement along Portlock Beach is to the west, towards the entrance channel, and the structure will trap sediment that would otherwise migrate unimpeded into the channel.

- **The existing physical and environmental aspects of the land, such as natural beauty and open space characteristics, will be preserved or improved upon, whichever is applicable;**

Discussion: The existing sandbags are temporary, unsightly, and potentially hazardous. Rock rubble mound groins appear more natural than large sandbags and are common features at the entrance channels to marinas, ports, and harbors.

- **Subdivision of land will not be utilized to increase the intensity of land uses in the conservation district**;

Discussion: No property subdivision is needed for the proposed project.

- **The proposed land use will not be materially detrimental to the public health, safety, and welfare.**

Discussion: Once the proposed structure has been completed, there will be no regular sources of emissions or waste that could prove detrimental to public health. All offshore uses have inherent safety risks to users (e.g., inclement weather, rough seas, potentially dangerous marine life). However, as discussed in Section 4.1.2, the project will not create a significant hazard to public health, safety, and welfare.

6.2.2 Relationship of the Project to the State Department of Health – Clean Water Branch

The Clean Water Act (CWA) is the key legislation governing surface water quality protection in the United States. Sections 401, 402, and 404 of the Act require permits for actions that involve wastewater discharges or discharge of dredged or fill material into waters of the United States. In Hawaii, the U.S. Environmental Protection Agency (EPA) has delegated responsibility for implementing the Act to the State Department of Health, Clean Water Branch (DOH-CWB).

Actions that may constitute fill into waters of the United States include:

- Placement of revetment and groin materials (core material, geotextile, underlayer stone, and armor stone)
- Excavation of beach sand during construction and placement of sand on the east Portlock shoreline below the MHHW line.

The Water Quality Certification (WQC) will require submission to the DOH of an AMAP, which will detail the water quality sampling and testing necessary during construction and outline BMPs that will be used to prevent contamination of coastal waters.

6.2.3 Relationship of the Project to the Coastal Zone Management Program

Enacted as Chapter 205A, HRS, the Hawaii Coastal Zone Management (CZM) Program was promulgated in 1977 in response to the Federal Coastal Zone Management Act of 1972. The CZM area encompasses the entire state, including all marine waters seaward to the extent of the state's police power and management authority, as well as the 12-mile U.S. territorial sea and all archipelagic waters. Application will be made to the State Office of Planning, CZM Program, for a CZM Consistency Determination.

The relationship of the project to the objectives and policies of the CZM program listed in 205A-2, HRS, are as follows:

1. Recreational Resources

Objective: Provide coastal recreational opportunities accessible to the public.

Policies:

- Improve coordination and funding of coastal recreational planning and management;

- Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area;
- Protect coastal resources uniquely suited for recreational activities that cannot be provided in other areas;
- Require replacement of coastal resources having significant recreational value including, but not limited to, surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;
- Provide and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;
- Provide an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;
- Ensure public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;
- Adopt water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;
- Develop new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and
- Encourage reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the Land Use Commission, Board of Land and Natural Resources, and county authorities.

Discussion: The primary purpose of the project is to replace the existing groin with a stable, engineered groin to reduce the rate of sediment accumulation in the Hawaii Kai Marina entrance channel. The Hawaii Kai Marina facilitates a number of recreational activities including fishing, diving, sightseeing, surfing, and kayaking. A navigable entrance channel is necessary to maintain the recreational opportunities for visitor and resident users of the Hawaii Kai Marina.

2. Historic Resources

Objective: Protect, preserve, and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Policies:

- Identify and analyze significant archaeological resources;
- Maximize information retention through preservation of remains and artifacts or salvage operations; and
- Support state goals for protection, restoration, interpretation, and display of historic resources.

Discussion: The State Historic Preservation Division (SHPD) will be consulted to determine requirements for the proposed project to comply with Section 106 of the National Historic Preservation Act and Hawaii Revised Statutes (HRS) §6E-8. The construction specifications

will contain provisions to protect any historic resources and alert the proper agencies should any be found during the construction activities.

3. Scenic and Open Space Resources

Objective: Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources.

Policies:

- Identify valued scenic resources in the coastal zone management area;
- Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;
- Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and
- Encourage those developments that are not coastal dependent to locate in inland areas.

Discussion: The proposed project will preserve the quality of coastal scenic and open space resources by maintaining a sandy beach area on the Portlock side of the groin. Shoreline open space will be improved at the southeast end of Portlock Beach by restoring eroded beaches with the proposed sand backpassing plan. Scenic view planes from Portlock Beach, Maunalua Bay Beach Park, and offshore vessels will be moderately affected by the new structure, which has a profile that is slightly larger than the existing groin.

4. Coastal Ecosystems

Objective: Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Policies:

- Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;
- Improve the technical basis for natural resource management;
- Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;
- Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and
- Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

Discussion: The proposed project is not anticipated to have any significant long-term impacts on coastal ecosystems. The project construction specifications will include requirements which will reduce, minimize, and avoid the potential for adverse impacts during construction to the

maximum extent practicable. Marine biota surveys have shown much of the affected area to be sandy or other mobile substrate. The creation of a hard, stable habitat for shelter and colonization on the proposed groin may increase fish abundance, crustose coralline algae cover, coral cover, and macroinvertebrate cover.

5. Economic Uses

Objective: Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policies:

- Concentrate coastal dependent development in appropriate areas;
- Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and
- Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:
- Use of presently designated locations is not feasible;
- Adverse environmental effects are minimized; and
- The development is important to the State's economy.

Discussion: The Hawaii Kai Marina is used by a number of commercial businesses serving the needs of visitors and local residents alike for activities such as fishing, diving, sightseeing, surfing, and kayaking. A navigable entrance channel into the marina is necessary for these businesses to operate. The proposed action will maintain the long-term navigability of the entrance channel.

6. Coastal Hazards

Objective: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.

Policies:

- Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;
- Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards;
- Ensure that developments comply with requirements of the Federal Flood Insurance Program; and
- Prevent coastal flooding from inland projects.

Discussion: The proposed project will increase the width of the dry beach that fronts the inshore development. Additionally, backpassed sand will be used to replenish eroded portions of the

beach at the southeast end of Portlock Beach. This will support the ability of the beach to dissipate wave energy and reduce wave runup, and thus provide added protection for the backshore infrastructure. The proposed project will not change the shoreline elevation and will not change the existing tsunami flood hazard.

7. Managing Development

Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policies:

- Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;
- Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and
- Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

Discussion: All potential short and long-term impacts of the proposed action will be communicated to the public and concerned agencies. The proposed project permitting and approval process will provide an opportunity for public participation and discussion in the plan formulation process.

8. Public Participation

Objective: Stimulate public awareness, education, and participation in coastal management.

Policies:

- Promote public involvement in coastal zone management processes;
- Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and
- Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.

Discussion: The public will have an opportunity to review and comment on this DEA as part of the public review process.

9. Beach Protection

Objective: Protect beaches for public use and recreation.

Policies:

- Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;
- Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and
- Minimize the construction of public erosion-protection structures seaward of the shoreline.

Discussion: Though the structure extends out into the ocean, it is the best engineered solution for the given situation at the entrance channel and Portlock Beach. The proposed groin replacement will increase the width of Portlock Beach adjacent to the structure by retaining sand that would otherwise migrate into the entrance channel. Sand that accumulates adjacent to the groin can be backpassed to the southeast end of Portlock Beach to restore beaches that have been eroded.

10. Marine Resources

Objective: Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

Policies:

- Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;
- Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;
- Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;
- Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and
- Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Discussion: The proposed project is not anticipated to significantly affect marine and coastal resources. The project plan will be fully coordinated with federal and state marine resource agencies, including NOAA/NMFS, USFWS, USEPA and DLNR-DAR.

6.2.4 Hawaii State Planning Act

The Hawaii State Planning Act (Chapter 226, Hawaii Revised Statutes, as amended) outlines themes, goals, guidelines, and policies for statewide planning. The proposed Hawaii Kai Marina entrance channel groin relates to the following objectives stated in §226-11: "*Objectives and policies for the physical environment--land-based, shoreline, and marine resources*":

- Exercise an overall conservation ethic in the use of Hawaii's natural resources.
- Ensure compatibility between land-based and water-based activities and natural resources and ecological systems.
- Take into account the physical attributes of areas when planning and designing activities and facilities.
- Manage natural resources and environs to encourage their beneficial and multiple uses without generating costly or irreparable environmental damage.
- Pursue compatible relationships among activities, facilities, and natural resources.
- Promote increased accessibility and prudent use of inland and shoreline areas for public recreational, educational, and scientific purposes [L 1978, c 100, pt of §2; am L 1986, c 276, §10].

and §226-13: "*Objectives and policies for the physical environment—land, air, and water quality*":

1. Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.

Discussion*:* The proposed project is intended to replace the existing temporary sandbag groin with a fully functional structure in order to reduce the rate of sediment accumulation in the Hawaii Kai Marina entrance channel. Groin replacement will provide additional stability to Portlock Beach and will maintain the recreational value of an area that is already used by local residents and visitors and supports multiple recreational and commercial uses. Sand backpassing will restore eroded shoreline at the east end of Portlock Beach, an area where erosion threatens backshore and private property. Thus, it is consistent with the above objectives.

6.3 Federal Acts and Legislation

Department of the Army (DA) permits are issued by the U.S. Army Corps of Engineers (USACE) pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403) and Section 404 of the Clean Water Act of 1972 (33 USC 1344). All work or structures in or affecting the course, condition, location, or capacity of navigable waters, including tidal wetlands, require a DA permit pursuant to Section 404. As the proposed project will be constructed in navigable waters of the U.S., it will require a DA permit issued pursuant to Section 10 and Section 404. The approvals and consultations that will be needed from Federal agencies other than the Corps of Engineers are listed below.

6.3.1 Archaeological and Historic Preservation Acts

Consultation with the State Historic Preservation Division (SHPD) will be accomplished to ensure that the project complies with the provisions of the Archaeological and Historic Preservation Act (16 U.S.C. § 469a-1) and the National Historic Preservation Act (NHPA) (16 U.S.C. § 470(f)). A NHPA Section 106 review will be accomplished during federal (Department of the Army) permit processing for work in the water.

6.3.2 Clean Air Act (42 U.S.C. § 7506(c))

As discussed in Section 4.8, the only emissions associated with the project would be during construction. Once construction is completed the proposed project will not produce any emissions. It is consistent with the provisions of the Clean Air Act.

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

The Clean Water Act (CWA) is the key legislation governing surface water quality protection in the United States. Sections 401, 402, and 404 of the Act require permits for actions that involve wastewater discharges or discharge of dredged or fill material into waters of the United States. The placement of stone into nearshore marine waters constitutes fill as defined in the CWA and is subject to regulations implementing the CWA. An application will be made to the Department of the Army for authorization to construct the project under Section 404 of the CWA. In Hawaii, the U.S. Environmental Protection Agency has delegated responsibility for implementing Section 401 of the Act to the State Department of Health, Clean Water Branch (DOH-CWB). A Section 401 Water Quality Certification Application for this project will be submitted to DOH-CWB.

6.3.4 Rivers and Harbors Act (33 USC §403)

Section 10 of the Rivers and Harbors Act, 33 USC §403, requires a Department of the Army (DA) permit for any activity that obstructs or alters navigable waters of the U.S., or the course, location, condition, or capacity of any port, harbor, refuge, or enclosure within the limits of any breakwater, or of the channel of any navigable water. The proposed structure will extend into navigable water; hence the project requires a Section 10 permit from the U.S. Army Corps of Engineers.

6.3.5 Endangered Species Act (16 U.S.C. 1536(a)(2) and (4))

The Endangered Species Act (16 U.S.C. §§ 1531-1544, December 28, 1973, as amended 1976-1982, 1984 and 1988) provides broad protection for species of fish, wildlife, and plants that are listed as threatened or endangered in the U.S. or elsewhere. The Act mandates that federal agencies seek to conserve endangered and threatened species and use their authorities in furtherance of the Act's purposes. It provides for listing species, as well as for recovery plans and the designation of critical habitat for listed species. The Act outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species, and contains exceptions and exemptions.

Existing biota on and near the project site and potential impacts of the proposed project are discussed in Sections 3.2.1, 3.2.2, and 4.3 of this DEA. The endangered green sea turtle, humpback whale, and monk seal are known to frequent the waters of Maunalua Bay; however, no significant negative impacts to these species are anticipated to occur as a result of the project.

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

The FWCA provides for consultation with the U.S. Fish and Wildlife Service (USFWS) and other relevant Federal and State agencies when a Federal action proposes to modify or control

U.S. waters for any purpose. This consultation will be initiated during the federal permitting process.

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

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

The proposed project is located within waters 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 Fisheries Management Plan (FMP), at least 58 (juvenile and adult life stages) are known to occur in the general vicinity of the Hawaii Kai Marina entrance channel and Maunalua Bay (AECOS, 2010).

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

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

Reauthorized in 1994, the MMPA establishes a moratorium, with certain exceptions, on the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas and on importing of marine mammals and marine mammal products into the U.S. The proposed project will be accomplished in accord with the requirements of the MMPA.

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

Section 106 of the NHPA of 1966, 16 USC §470(f), as amended, requires Federal agencies having direct or indirect jurisdiction over a Federal undertaking to take into account effects on any district, site, building, structure, or object that is included or is eligible for inclusion in the National Register of Historic Places (NRHP) prior to the approval of expenditure of any funds or issuance of any license or permit. The existing temporary sandbag groin is not eligible for inclusion in the Hawaii and National Register of Historic Places.

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

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

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

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

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

Marine biological consultants have determined that there are no coral reef resources present in and around the project site that could be affected by the proposed project (see Appendix B).

7. MITIGATION MEASURES DURING CONSTRUCTION

7.1 Protection of Endangered Species

The following endangered species Best Management Practices (BMPs), as recommended by the National Marine Fisheries Service (NMFS), shall be adhered to during construction of the project.

- Establish a safety zone around the project area whereby observers shall visually monitor this zone for marine protected species 30 minutes prior to, during, and 30 minutes post daily project activity. Record information on the species, numbers, behavior, time of observation, location, start and end times of project activity, sex or age class (when possible), and any other disturbances (visual or acoustic).

- If a marine protected species is in the area, either hauled out onshore or in the nearshore waters, a 150-foot buffer must be observed with no humans approaching it. If a monk seal/pup pair is seen, a minimum 300-foot buffer must be observed.

- In the event a marine protected species enters the safety zone and the project activity cannot be halted, conduct observations and immediately contact NMFS staff in Honolulu to facilitate agency assessment of collected data. For monk seals contact the Marine Mammal Response Coordinator, David Schofield, at (808) 944-2269, as well as the monk seal hotline at (808) 220-7802. For turtles, contact the turtle hotline at (808) 983-5730.

- For on-site project personnel that may interact with a listed species potentially present in the action area, provide education on the status of any listed species and the protections afforded to those species under Federal laws. NMFS may be contacted for scheduling educational briefings to convey information on marine mammal behavior, and explain why and when to call NMFS and other resource agencies.

7.2 Best Management Practices during Construction

BMPs for construction operations will be developed to help minimize adverse impacts to coastal water quality and the marine ecosystem. The project specifications will require the Construction Contractor to adhere to environmental protection measures, including, but not limited to, the following:

1. The Contractor shall perform the work in a manner that minimizes environmental pollution and damage as a result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of the construction period.
2. Any construction related debris that may pose an entanglement hazard to marine protected species must be removed from the project site if not actively being used and/or at the conclusion of the construction work.
3. The Contractor shall submit a Best Management/Environmental Protection Plan for approval prior to initiation of construction. The plan shall include, but not be limited to:
   - Protection of Land Resources
   - Protection of Water Resources
   - Disposal of Solid Waste

- Disposal of Sanitary Waste
- Disposal of Hazardous Waste
- Dust Control
- Noise Control

4. The construction contractor shall be required to employ standard BMPs for construction in coastal waters, such as daily inspection of equipment for conditions that could cause spills or leaks; cleaning of equipment prior to operation near the water; proper location of storage, refueling, and servicing sites; and implementation of adequate spill response procedures, stormy weather preparation plans, and the use of silt curtains and other containment devices.
5. Designated project personnel will be responsible for daily inspections and maintenance of all project BMPs. Inspections and observations will be noted upon Daily Production Reports and, combined with Water Quality Monitoring Reports, will be submitted to the contracting officer daily.
6. No contamination (trash or debris disposal, alien species introductions, etc.) of marine (reef flats, lagoons, open oceans, etc.) environments adjacent to the project site shall result from project related activities.
7. The Contractor shall confine all construction activities to areas defined by the drawings and specifications. No construction materials shall be stockpiled in the marine environment outside of the immediate area of construction.
8. The Contractor shall keep construction activities under surveillance, management and control to avoid pollution of surface or marine waters. Construction related turbidity at the project site shall be controlled so as to meet water quality standards. All water areas affected by construction activities shall be monitored by the Contractor. If monitoring indicates that the turbidity standards are being exceeded due to construction activities, the Contractor shall suspend the operations causing excessive turbidity levels until the condition is corrected. Effective silt containment devices shall be deployed where practicable to isolate the construction activity, and to avoid degradation of marine water quality and impacts to the marine ecosystem. In-water construction shall be curtailed during sea conditions that are sufficiently adverse to render the silt containment devices ineffective.
9. Underlayer fill shall be protected from erosion with armor units as soon after placement as practicable.
10. Waste materials and waste waters directly derived from construction activities shall not be allowed to leak, leach or otherwise enter marine waters.
11. The presence of heavy equipment on the shoreline creates a potential for pollutants, such as fuel and petroleum products, to enter the water. To prevent such discharges from occurring, heavy equipment will be visually inspected at the beginning and end of each work day to ensure early detection of potential leaks or line breaks. Equipment will be kept clean to ensure that grease or dirt does not enter the water. Fuel will be delivered to the site at sufficiently frequent intervals such that the volume of fuel stored on site is minimal. Spill kits will be kept at the site and workers will be trained on spill response.
12. Fueling of project related vehicles and equipment should take place away from the water. A contingency plan to control the accidental spills of petroleum products at the construction site should be developed. Absorbent pads, containment booms and skimmers will be stored on site to facilitate the cleanup of petroleum spills.
    - In the event of a spill, the following actions shall be taken:

- STOP FUELING / OILING IMMEDIATELY!
- Reduce the amount of the spill by shutting down the equipment, shutting off the valve, shutting off the pump, uprighting the container, etc. Place a pan or bucket under the leak to catch as much of the spill as possible.
- Confine fuel to containment areas as much as possible.
- Notify the Company Spill Response Safety Officer by radio or telephone. He will take over coordination of operations and further notifications. Whether assistance is required or not, all supervisors and personnel shall follow these notification steps.
- If the spill is too large to handle with on-site resources, then an emergency spill clean-up contractor will be notified and mobilized.
- Notify the Contracting Officer immediately.
- The spill clean-up contractor will take over containment, clean-up, and disposal of the spill and any contaminated material in accordance with their established procedures. The contractor will provide whatever aid the spill clean-up contractor requires.

13. Any spills or other contaminations shall be immediately reported to the DOH Clean Water Branch (808-586-4309).
14. The project shall be completed in accordance with all applicable State and County health and safety regulations.
15. All construction material shall be free of contaminants of any kind including: excessive silt, sludge, anoxic or decaying organic matter, turbidity, temperature or abnormal water chemistry, clay, dirt, organic material, oil, floating debris, grease or foam or any other pollutant that would produce an undesirable condition to the beach or water quality.
16. Best management practices shall be utilized to minimize adverse effects to air quality and noise levels, including the use of emission control devices and noise attenuating devices.
17. The contractor, at his own expense, shall keep the project area and surrounding area free from dust nuisance. A dust control program shall be implemented, and wind-blown sand and dust shall be prevented from blowing offsite by watering when necessary. The work shall be in conformance with applicable federal and local laws and regulations regarding air pollution control.
18. Public safety best practices shall be implemented, possibly including posted signs, areas cordoned off, and on-site safety personnel.
19. Areas of operation upon the shoreline will be clearly marked with fencing, barricades, or other approved devices, to protect the public from the hazards of construction. All work areas will have posted signs advising the public of current construction activities and related hazard warnings.
20. Public access along the shoreline during construction shall be maintained so far as practicable and within the limitations necessary to ensure safety.
21. Work will not be performed until a preconstruction survey is conducted, where necessary, to identify structures, significant environmental features, etc. This survey will determine baseline conditions to which the area will be returned, following the completion of construction. Resources landward of construction areas will be protected from construction activities as necessary.
22. The Project Staging Area will be used as the primary point of collection of all waste derived from project construction. Rubbish and construction debris will be collected and confined to waste bins. The containers will be serviced as needed to prevent build-up of large amounts of waste stored on-site.

23. Portable chemical toilets will be located on-site and will be serviced weekly, at a minimum.
24. All storage containers will be free of leaks to prevent solid/sanitary waste from entering the environment. If leaks are detected at any time, repairs will be made immediately or the deficient container will be replaced.
25. No wash down of project equipment, or runoff from such activities, will be permitted on this project.
26. Hazardous waste will not be generated during the performance of the contract. Typical petroleum products used during the normal course of construction activities may potentially be sources of hazardous waste. Only the minimum amounts required to perform the work activities will be stored on-site.
27. The contractor shall coordinate his haul route, staging area, and all associated requirements, such as land use permit, with the contracting officer and the affected landowners.
28. The contractor shall be responsible for the clearing and removal of all silt and debris generated by his construction work and deposited and accumulated on roadways and other areas.
29. All existing utilities, concrete walkways, steps and walls, whether or not shown on the drawings, except those designated to be removed, shall be protected from damage at all times during construction and grading work. Any damages to them shall be repaired by the contractor at his expense.
30. The contractor shall verify dimensions, locations, elevations, etc., that are indicated for verification and inform the contracting officer in writing of any differences prior to installation of new facilities.
31. The contractor shall tone the area to be excavated to determine the location of uncharted utilities. The contractor shall be responsible and shall pay for all damages to existing utilities. The contractor shall also contact the necessary utility companies to properly locate the underground utilities and cables that lie in and adjacent to the roadway.
32. Work shall be done between 7:00 AM and 5:00 PM HST. No work shall be done on Saturdays, Sundays, holidays, or after normal work hours at any time, without special arrangement and prior approval by the contracting officer. Project work shall be in conformance with applicable federal and local laws and regulations regarding community noise control.
33. No blasting will be allowed on this project.
34. Waste material will be disposed of at an approved off-site disposal area. The contractor shall be responsible for locating the disposal area.
35. The contractor shall take extreme care in performing work near existing concrete electrical/communication ducts and overhead wires. Appropriate protection shall be implemented as required to prevent damage to those lines.
36. If the contractor uncovers any cultural remains, such as artifacts or burials, during excavation work, the contractor shall stop work in the area of the find and notify the contracting officer.
37. No contractor shall perform any demolition, grubbing, stockpiling, and grading operation so as to cause falling rocks, soil, or debris in any form to fall, slide, or flow onto adjoining properties, streets, or natural watercourses. Should such violation occur, the contractor may be cited, and the contractor shall immediately make all remedial actions necessary.

38. The contractor shall provide for access to and from all existing driveways and walkways at all times.

8. ENVIRONMENTAL ASSESSMENT SIGNIFICANCE CRITERIA

Chapter 343, Hawaii Revised Statutes (HRS), and Hawaii Administrative rules (HAR) §11-200, establish certain categories of action that require the agency processing an applicant's request for approval to prepare an Environmental Assessment. HAR §11-200-11.2 established procedures for determining if an Environmental Assessment (EA) is sufficient or if an Environmental Impact Statement (EIS) should be prepared for actions that may have a significant effect on the environment. HAR §11-200-12 lists the following criteria to be used in making such a determination. Based on analysis presented in this document, a Finding of No Significant Impact (FONSI) is anticipated, and an EIS will therefore not be required for the proposed action.

1. *Involves an irrevocable commitment to loss or destruction of any natural or cultural resource.*

Implementation of the project does not involve construction on or excavation of land that might contain physical historic or archaeological remains. A fish trap was mapped historically near the entrance channel, but its existence and historical significance remains in question. No evidence of the fish trap was encountered during the 2004 and 2013 maintenance dredging and temporary sandbag groin construction. The proposed project is unlikely to have any significant adverse effect on known practices customarily and traditionally exercised for subsistence, cultural and religious purposes.

2. *Curtails the range of beneficial uses of the environment.*

Public access to the project site will be restricted during construction of the proposed action. At the conclusion of construction, access will be reestablished. The proposed action is not anticipated to have any adverse long-term effects on the uses of the environment.

3. *Conflicts with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 343, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.*

The proposed project is consistent with Hawaii's State Environmental Policy as established in Chapter 343(4)(A), HRS, to establish, preserve, and maintain recreation areas, including the shoreline, for public recreational use.

4. *Substantially affects the economic welfare, social welfare, and cultural practices of the community or State.*

A navigable entrance channel into the Hawaii Kai Marina is necessary for the dozen businesses that operate from the marina. The proposed action will replace a temporary structure that is expected to degrade in the near future; degradation and failure of the temporary structure will allow sediment to accumulate in the entrance channel at a faster rate, which will cause the channel to narrow and shoal, reducing its navigability. The proposed action will help maintain the economic welfare of businesses that use the marina by helping maintain a navigable entrance channel.

No adverse effect on cultural practices in the project area is expected.

5. *Substantially affects public health.*

The proposed project will have some impact on air, noise, and water quality during construction; however, these will be mitigated to the maximum extent practicable by BMPs and monitoring procedures. The project will not result in any post-construction or long-term effects on public health.

6. *Involves substantial secondary impacts, such as population changes or effects on public facilities.*

The project will not alter the existing land use pattern in and around the project site. The proposed project has little or no potential to affect public infrastructure and services. Once completed it will require no water, power, sanitary wastewater collection, or additional emergency services. There are no public facilities located within the affected project area.

7. *Involves a substantial degradation of environmental quality.*

Other than temporary, short-term environmental impacts during construction, which are generally not considered significant, the proposed project is not anticipated to result in impacts that could degrade the environmental quality in the project area.

8. *Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions.*

The proposed project involves replacing the existing groin with a stable, engineered groin. It will not alter the entrance channel depth or width. The groin allows for future maintenance dredging of the entrance channel; however, it does not require or commit to future actions.

9. *Substantially affects a rare, threatened, or endangered species, or its habitat.*

The nearshore area by the Hawaii Kai Marina entrance channel may be frequented by the threatened green sea turtle, which may feed on the algae and seagrass covered bottom. Turtle protection procedures, as recommended by the National Marine Fisheries Service (NMFS), will be in place during construction. The waters of Maunalua Bay are within the Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS), and humpback whales are occasionally seen offshore. The project will not directly affect humpback whales, and sounds generated from groin replacement activities are not anticipated to be substantial enough to cause an acoustic disturbance to protected species in nearshore waters. There have been no documented Hawaii Monk Seal sightings on Portlock Beach or Maunalua Bay Beach Park. There will be no long-term impact to rare, protected, threatened, or endangered species.

10. *Detrimentally affects air or water quality or ambient noise levels.*

There will be some temporary, short-term impacts to air and water quality and noise levels during construction. However, these impacts will be limited to the construction period and are not anticipated to be significant. BMP's, water turbidity controls, and a water quality monitoring program will be in effect to help minimize the construction impacts. The contractor will be required to submit an Best Management Practices Plan for approval prior to the start of construction, which will include provisions for reducing air, water, and noise impacts. Once construction is complete there will be no activity or mechanism for further air, water, or noise impacts.

11. Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.

The project area is located in and adjacent to coastal waters and a tsunami hazard zone. The proposed project will not change the shoreline elevation and will not change the existing tsunami flood hazard. The proposed rock rubble mound structure has been designed for extreme wave conditions that may occur during the life of the project.

12. Substantially affects scenic vista and view planes identified in county or state plans or studies.

The proposed groin replacement will be larger and more visible than the existing sandbag structure. However, the new groin will not significantly alter view planes from Kalanianaole Highway, Portlock Beach, Maunalua Bay Beach Park, or from offshore vessels.

13. Requires substantial energy consumption.

Other than energy expended during construction operations, the project will require no additional energy consumption.

9. CONSULTATION

9.1 Parties Consulted

The names of individuals and organizations contacted to provide pre-consultation for the project are summarized below. Those who responded to requests for consultation through Sea Engineering or John Clark are indicated by asterisks. Consultation letters and responses are included in Appendix C.

Federal

U.S. Army Corps of Engineers, Honolulu District, Regulatory Branch*
U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office
NOAA, National Marine Fisheries Service, Pacific Islands Regional Office*
U.S. Environmental Protection Agency, Region IX, Pacific Islands Contact Office*
U.S. Coast Guard Sector Honolulu, Waterways Management*

State of Hawaii

Department of Land and Natural Resources
- Historic Preservation Division
- Office of Conservation and Coastal Lands*
- Division of Boating and Ocean Recreation
Department of Health, Clean Water Branch*
Department of Business, Development, Economics and Tourism, Office of Planning*
Department of Transportation, Harbors Division
Department of Transportation, Highways Division*
Office of Hawaiian Affairs*

City & County of Honolulu

Department of Planning and Permitting

Other

Surfrider Foundation*
Frazier McGilvray (Malama Maunalua)*
Portlock Road Community Association*
Ahu Moku o Oahu – Kona
Hawaiian Civic Club - Maunalua
Marshall and Barbara Rosa (Portlock Residents)*
Mary Dang (Portlock Resident)*
Pua Rochlen (Portlock Resident)*
John Frederick (owner of Fish and Dive Hawaii)*
Cormac O'Carrol (Hawaii Water Sports Center)*
Chris Cramer (Maunalua Fishpond Heritage Center)*
Matt Zimmerman (Island Divers)*
Keone Downing (Save our Surf)*

9.2 EA Preparers

The Hawaii Kai Marina Entrance Channel Groin Replacement DEA was prepared by Sea Engineering, Inc. The respective contributions of individuals are as follows:

Derek P. Linsley M.S. Ocean Engineering	Principal-in-Charge
James H. Barry, PE M.S. Ocean Engineering	Contributing Author

Technical consultants included the firm of AECOS, Inc. (marine biology and water quality) and John Clark (ocean and beach recreation).

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APPENDIX A. MARINE BIOLOGY AND WATER QUALITY - AECOS

Marine Biological and Water Quality Surveys at Hawaii Kai Marina, Hawaii Kai, Oahu

AECOS, Inc. (2015)

AECOS No. 1150C

Marine biological and water quality surveys at Hawaiʻi Kai Marina, Hawaiʻi Kai, Oʻahu

Prepared by:

AECOS, Inc.

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Kāneʻohe, Hawaiʻi 96744-3221

April 24, 2015

Marine biological and water quality surveys at Hawai‘i Kai Marina, Hawai‘i Kai, O‘ahu

April 24, 2015 | ***Draft*** | *AECOS* No. 1150C

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Introduction

The Hawaiʻi Kai Marina Community Association proposes to replace an existing sand bag groin (see title page photo) outside the marina entrance channel in Hawaiʻi Kai along the south shore of Oʻahu, Hawaiʻi (See Figure 1). *AECOS* was contracted to conduct environmental surveys to support permitting for the project ("Project")[1]. Our surveys were conducted on March 17, 2015 and included both water quality sampling and biological surveys on the groin and surrounding area. This report details findings of those surveys.

Project Description

The Project site is located along the shoreline adjacent to the Hawaiʻi Kai Marina entrance channel connecting the marina with Maunalua Bay. The existing sand bag groin is proposed to be removed and a new permanent groin to be built. The permanent replacement groin will be similar in size and location as the existing sand bag groin. The major difference will be the use of rock boulders instead of sand bags (J. Barry, pers. comm.).

Marine Environment in Project Vicinity

The reef and the shoreline of Maunalua Bay in the project vicinity have been extensively modified since the 1930s (WOA, 1988). Development of the Hawaiʻi Kai Marina began in 1959 by modifying Kuapā Pond (USACE, 1975). Kuapā Pond itself was "created" by the ancient Hawaiians (legend has it, with the help of the *menehune*) by modifying an extensive wetland (Kumu Pono Associates, 1998). The wetland system was created around 11,600 years ago by the flooding of a valley (older embayment) at the end of the last glacial period, with the rise in sea level resulting from worldwide glacial melt (Stearns, 1985). Erosion of the adjacent headlands led to a build-up of sediment between the wetlands and Maunalua Bay, forming a barrier beach restricting water flow between the wetland and Maunalua Bay (Nixon, 1994).

According to WOA (1988), when Kalanianaʻole Highway was built in the late 1930s, the main channel from Kuapā Pond to Maunalua Bay was widened to 12 m (40 ft) and another channel to the west arm of the marina constructed to improve water exchange. The entrance channel was built at a natural break in the reef, probably a drainage channel for the brackish water of Kuapā Pond initially formed during a lower stand of the sea (*AECOS*, 1979). The entrance channel was again dredged in the 1940s to facilitate landing craft operations

[1] Report prepared for Sea Engineering, Inc. for environmental entitlements. This report will become part of the public record for the Project

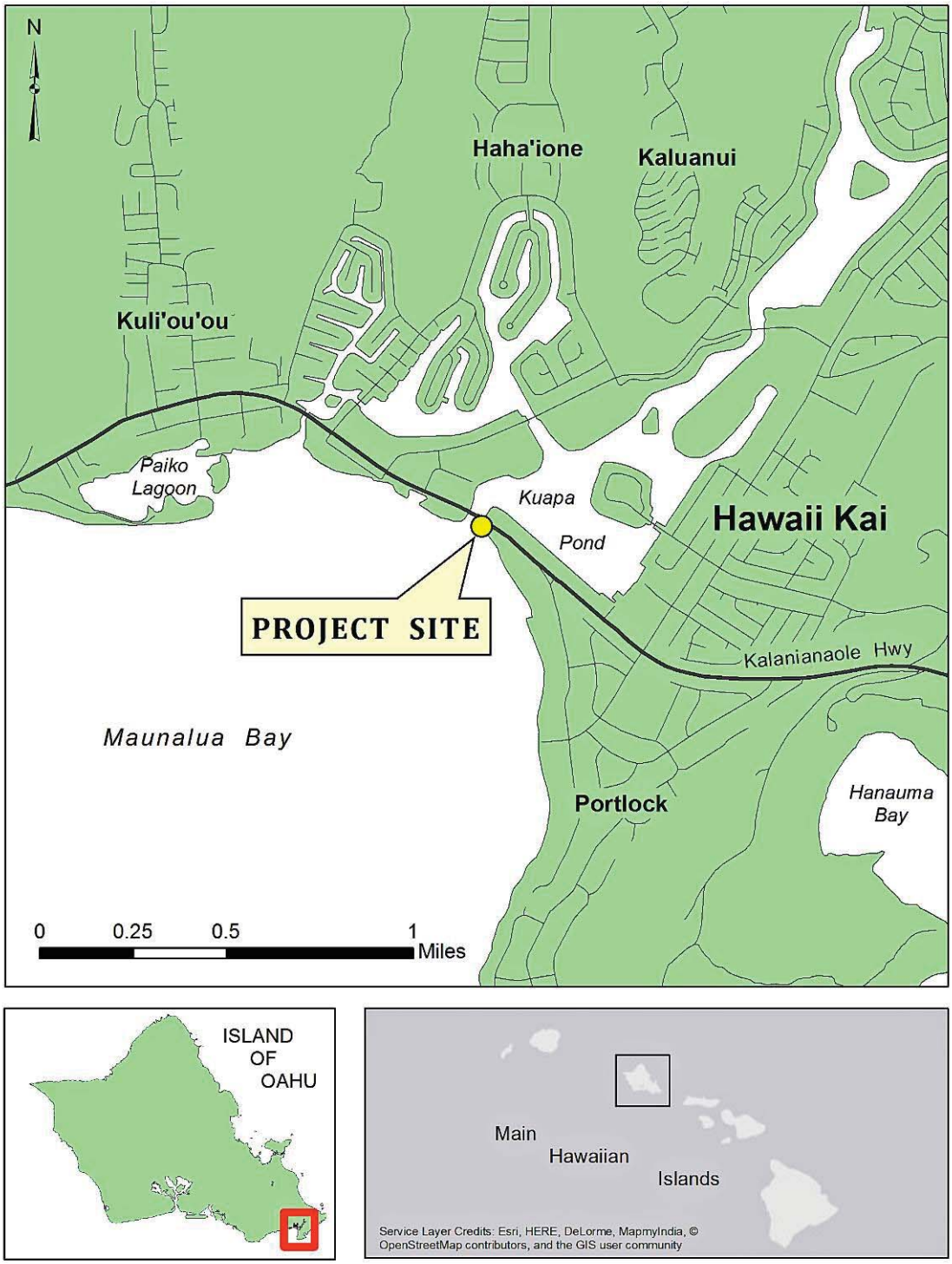

Figure 1. General location of Project area on the Island of O'ahu.

and to service a military installation during World War II. As part of the development of the Hawaiʻi Kai community, the entrance channel was widened to 76 m (250 ft) and dredged to 1.9 m (6.2 ft) to accommodate potential runoff from a 100-year storm. At that time, an access channel from Kuliʻouʻou Stream to the entrance channel was dredged parallel to the shore and the second channel to the west arm of the marina was dredged. The material from this dredging project was used to construct Maunalua Bay Beach Park and a boat launching area. Since the 1960s, the entrance channel has largely filled in and, despite maintenance dredging once every ten years, now closely resembles the 12 m (40 ft-) wide channel that was first created in the 1930s.

Maunalua Bay — Maunalua Bay encompasses the area off the coast of Oʻahu between Koko Head and Diamond Head. The bay is lined by a fringing reef extending about 915 m (3,000 ft) offshore. Between the shore and reef margin is a low-relief flat and seaward of the fringing reef is a wide shelf of sand bottom with scattered limestone outcrops.

The reef flats off Maunalua Bay Beach Park (located to the north of the entrance channel) and off Portlock Beach (located to the south) were surveyed by *AECOS* biologists in November 2007 and October 2009 (*AECOS*, 2010). The reef remnants off Maunalua Bay Beach Park and Portlock Bach are highly-eroded, low-relief limestone platforms. These shallow (less than 1 m or 3 ft) reef areas are covered with a veneer of sand and silt. Some sections are exposed at low tide. The benthic communities close to shore are highly disturbed and dominated by sessile filter and suspension feeding organisms. The reef flat off Maunalua Bay Beach Park and Portlock Beach is dominated by non-indigenous algae, such as *Acanthophora spicifera* (most abundant), *Avrainvillea amadelpha,* and *Lyngbya majuscule; Gracilaria salicornia* is occasionally found. The algae grow on limestone rubble, easily rolled by waves and swells. Algal growth is most dense close to shore. Other algae present on the reef flat include species that are preferred (Arthur and Balazs, 2008) by green sea turtles (*Chelonia mydas*), such as *Ulva fasciata*, *Hypnea cervicornis*, *Spyridia filamentosa*, *Cladophora catenata*, and *C. seriacea* (as well as the abundant *A. spicifera*). A seagrass bed, consisting of both the endemic *Halophila hawaiiana* and the introduced *H. decipiens*, is located off Portlock Beach, southeast of the project site.

Very few coral colonies are present on the reef flat, with the nearest colony to the entrance channel located more than 100 m (330 ft) offshore. Coral colonies present include *Montipora capitata*, *M. flabellata*, *Pocillopora damicornis*, *Poc. meandrina*, *Porites compressa* and *P. lobata*. Other reef macro-invertebrates, such as brittle stars, sea urchins, and sea anemones, are relatively uncommon. Fish biomass and diversity are very low in the nearshore areas of low relief

bottom. Fifteen species of fishes were observed on the reef flat. *Arothron hispidus* (*ʻoʻopu hue* or stripebelly puffer) and *Acanthurus nigrofuscus* (*māʻiʻiʻi* or brown surgeonfish) are common, while *Abudefduf abdominalis* (*mamo* or Hawaiian sergeant) and *Acanthurus blochii* (*pualu* or ringtail surgeonfish) are seen occasionally (*AECOS*, 2010).

Marina entrance channel — In 2007 and 2009, *AECOS* biologists surveyed the marina mouth for proposed maintenance dredging of the Hawaiʻi Kai Marina (*AECOS*, 2010). The following description is taken from that *AECOS* report. The bottom of the entrance channel consists largely of shifting sands and silt, and does not provide suitable habitat for most reef organisms. Hard surfaces, such as areas where the channel bisects the reef flat and concrete pilings of the bridge, are colonized by primarily introduced fouling organisms. The pilings, in particular, are heavily covered with *Carijoa riisei*, an introduced octocoral, and *Amathia distans* (bushy bryozoan). *Gracilaria salicornia* (gorilla ogo), an introduced red alga, is also attached to the pilings. *Dascyllus albisella* (*ʻaloʻiloʻi* or Hawaiian domino damselfish), *Acanthurus triostegus* (*manini* or convict tang), *Forcipiger flavissimus* (yellow longnose butterflyfish), and juvenile wrasses (Fam. Labridae) were observed in the entrance channel in the recent surveys.

Results of a survey conducted in 1988 and reported in the Environmental Assessment (EA) for the Maunalua Ferry Terminal (WOA, 1988) indicated the presence of burrows of *Alpheus mackayi* (snapping shrimp), and larger crab species in the entrance channel. The report also indicated the presence of *Psilogobius mainlandii* (Hawaiian shrimp goby), a species commensal with *A. mackay*, in bottom sediment.

Methods

Water Quality

Water quality samples were collected on March 13, 2015 from just below the water surface at three stations in the Project area; these locations are depicted in Figure 2. Station "Bridge" was just south of the Kalanianaʻole Highway bridge, approximately 1 m (3 ft) off the shore. Station "Channel" was located in the entrance channel, approximately 3 m (9.8 ft) west from the groin. Station "East" was located approximately 5 m (16 ft) east of the groin fronting Portlock Beach.

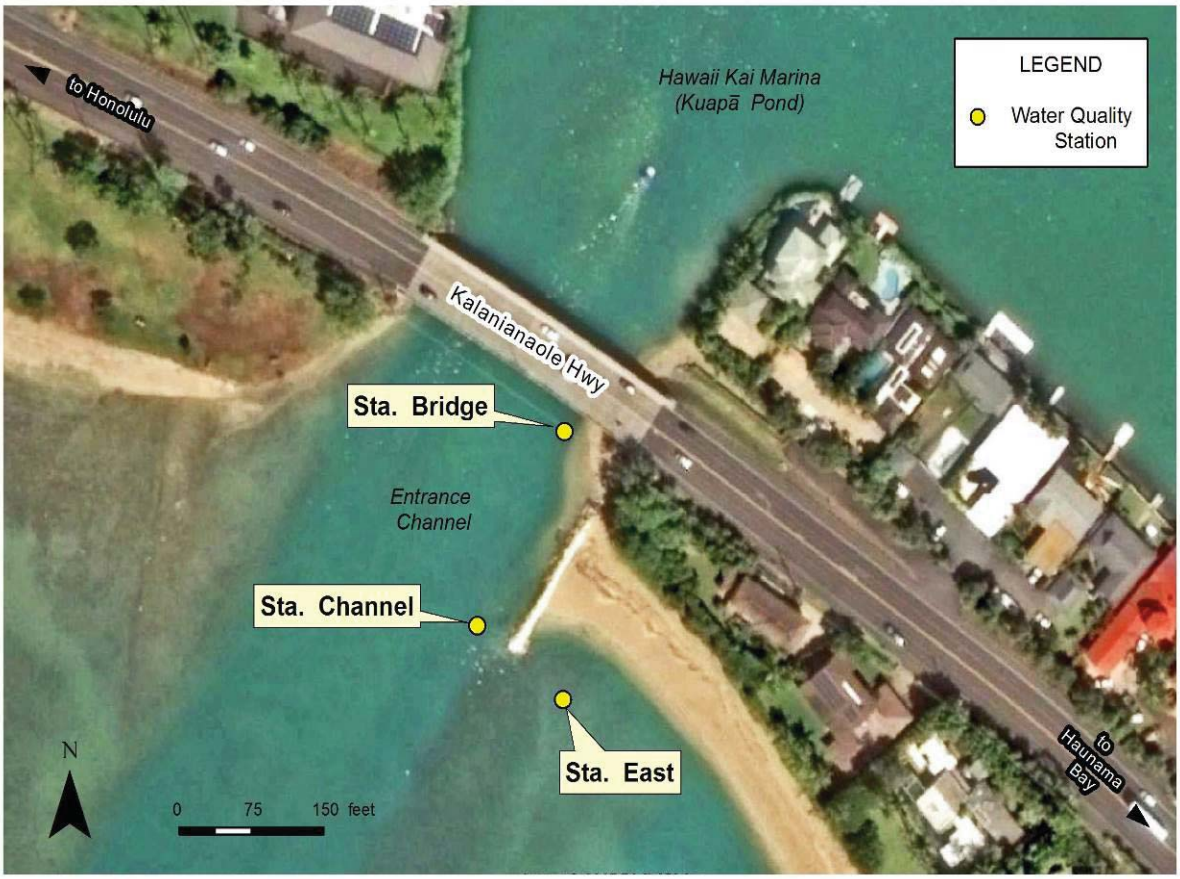

Figure 2. Location of water quality stations sampled on March 17, 2015.

Temperature, salinity, pH, dissolved oxygen (DO) and turbidity were measured in the field. Samples for total suspended solids (TSS), nutrients (ammonia, nitrate+nitrite, total nitrogen [TN], total phosphorus [TP]), and chlorophyll α were collected in appropriate containers, stored on ice, and delivered to *AECOS* Inc. laboratory on Oʻahu for analyses (*AECOS* log number 30827). Samples were analyzed by the methods as listed in Table 1.

Marine Survey

On March 17, *AECOS* biologists conducted a rapid assessment and quantitative survey of the marine community composition in the Project vicinity. The survey area included the existing sand bag groin, and the seafloor adjacent to either side of the groin and seaward from the groin structure (see Figure 3).

Table 1. Analytical methods and instruments used for water quality analyses for the Hawaii Kai Groin Project.

Analysis	Method	Reference	Instrument†
Temperature	SM 2550 B	SM (1998)	YSI Model PRO 20 DO meter thermistor
Salinity(field)	SM 2510-B	SM (1998)	YSI Model PRO 20 DO meter - conductivity calc.
pH	SM 4500 H+	SM (1998)	pHep HANNA meter
Dissolved Oxygen	SM 4500-O G	SM (1998)	YSI Model PRO 2030 DO meter
Salinity (salinometer)	SM 2510-B	SM (1998)	AGE Model 2100 salinometer
Turbidity	EPA 180.1 Rev 2.0	USEPA (1993)	HACH 2100N Turbidimeter
Total Suspended Solids	SM 2540 D	SM (1998)	Mettler Toledo H31 analytical balance
Ammonia	Kerouel and Aminot (1997)	Kerouel and Aminot (1997)	Seal AA3 Autoanayzer, colorimetric
Nitrate + Nitrite	Grasshoff (1983)	Grasshoff (1983)	Seal AA3 Autoanayzer, colorimetric
Total Nitrogen	Grasshoff (1983)	Grasshoff (1983)	Seal AA3 Autoanayzer, UV
Total Phosphorus	Grasshoff (1983)	Grasshoff (1983)	Seal AA3 Autoanayzer, UV
Chlorophyll *a*	SM 10200-H	SM (1998)	Turner Fluorometer

† typical instruments listed, others may have been substituted.

A total of five transects were used to survey the marine biota on the groin and surrounding bottom. Surveys on March 17 began at 10:00 AM, approximately 156 minutes before a -0.15 ft low tide (relative to MLLW; Hanauma Bay, HI. Station ID 1612301; NOAA, 2014). Underwater visibility ranged from 1 to 3 ft. Maximum water depth recorded was 5 ft (3 m). Marine biota were identified in the field and verified with various resource texts: algae (Huisman et al., 2007), macroinvertebrates (Hoover, 1999), and fishes (Hoover, 2008). A species list is presented as Appendix A.

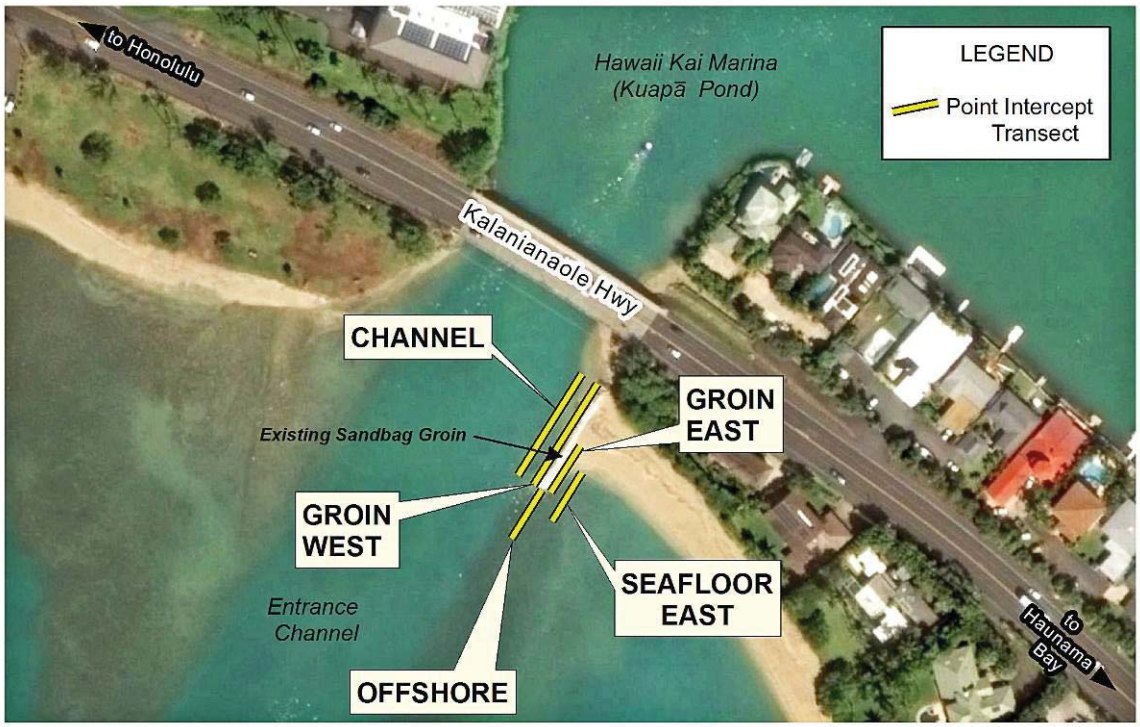

Figure 3. Approximate locations of March 2015 Hawaiʻi Kai Marina biological transect locations.

Groin surveys — One transect was placed parallel to the entire length of the groin on each side: one 43-m (141-ft) transect on the west side of the groin ("Groin West"); and one 23-m (75-ft) transect on the east side of the groin ("Groin East"). These transects were positioned on the groin midway between the base of the boulders and the waterline. On each transect, a line-point intercept protocol was used. At 0.5-m intervals, the bottom at each point was identified and assigned to one of the following categories: crustose coralline alga (CCA), macroalga, turf alga, macroinvertebrate, sand, rubble, or uncolonized (limestone, basalt, or man-made structure). Macroalgae were identified to a field identifiable taxon. Benthic percent cover was calculated for each transect by dividing the total number of points for a category by the total number of points sampled.

Seafloor surrounding groin — Three transects were used to sample the seafloor surrounding the groin: 1) a 43-m (141-ft) transect parallel to the west side of the groin and 5 m (16 ft) off the groin ("Channel"), 2) a 20-m(66-ft) transect oriented 5 m off the east side of the groin ("Seafloor East"); and 3) a 20-m (66-ft)

transect across the bottom, extending offshore from the seaward end of the groin ("Offshore").

Protected Species

Biologists recorded observations of any listed (threatened or endangered) marine species encountered during the survey.

Survey Results

Water Quality

The results of the March 13, 2015 water quality sampling event are summarized in Table 2. Temperature, DO saturation, and pH increased slightly from Sta. Bridge to Sta. East, while total nitrogen (TN) and total phosphorus (TP) concentrations decreased. No other spatial trends were apparent at the time of this sampling event.

Biological Observations

Groin — The intertidal zone of the existing sand groin is covered with macroalgae (*Spyridia filamentosa*, *Gracilaria salicornia*, *Griffithsia heteromorpha*, *Halimeda* sp.) and low-growing turf algae. Other, less frequently observed, algal species include: *Acanthophora spicifera*, *Asparagopsis taxiformis*, *Hypnea cervicornis*, *H. musciformis*, *Avranivillea amadelpha*, *Cladophora socialis*, *Chaetomorpha antennina*, and *Padina* sp. Invertebrates are not common on the groin; those observed include a hydroid (*Pennaria disticha*), bryozoans (*Schizoporella errata* and *Reteporellina denticulate*), molluscs (*Hipponix imbricatus Dendostrea sandvichensis*, *Isognomon perna*), and a barnacle (*Euraphia hembeli*). A few juvenile mullets (*Mugil cephalus*) were observed on the west side of the groin, towards the entrance channel and bridge. Submerged stacked sand bags, with macroalgae and cyanobacteria, lie along the base of the west side of the groin (Fig. 4). Much of the east side of sand bag groin is uncolonized or coated with cyanobacteria and black tuft seaweed (*Sphacelaria* spp.). No corals were observed growing on the groin.

Seafloor beyond groin — The seafloor surrounding the groin is a relatively flat bottom of sand with patches of limestone and rubble. A large area of sand lies to the southeast of the groin, fronting Portlock beach. The reef platform seaward of the groin is coated with turf and macroalgae. Algal species observed in this area include: *G. salicornia*, *A. spicifera*, *Halimeda discoidea*, *H. opuntia*,

Table 2. Water quality conditions in the project area on March 13, 2015.

Station	Time	Temp. (ºC)	Salinity (PSU)	DO (mg/L)	DO Sat. (%)	pH
Bridge	1245	24.4	35.50	6.87	101	8.11
Channel	1257	25.3	35.30	6.80	102	8.11
East	1310	25.5	35.65	6.83	102	8.13

Station	Turbidity (NTU)	TSS (mg/L)	NH_3 (µg N/L)	NO_3+NO_2 (µg N/L)	Total N (µg N/L)	Total P (µg P/L)	Chl. α (µg/L)
Bridge	2.31	8.0	20	1	104	41	0.27
Channel	4.20	9.5	4	2	91	28	0.29
East	2.96	8.2	10	1	88	25	0.20

Figure 4. The intertidal zone on the sand bag groin is coated in macroalgae (left photo) that extends as macroalgal and cyanobacterial growth along the base of the west side of the groin (right photo).

Chnoospora minima, *Neomeris annulata*, *Griffithsia heteromorpha*, *Asparagopsis taxiformis*, and *Padina* sp. A large bed of seagrass (mixed *Halophlia decipens* and *H. hawaiiana*) was observed near the west side of the groin, located directly adjacent on the west side of the submerged sand bags. The bed extends west into the entrance channel and in the seaward direction

Few invertebrates occur on the bottom to either side of the groin and on the reef flat offshore of the groin. The invertebrates encountered include: sponges (*Iotrochota protea* and *Sigmoadocia* sp.), blue octocoral (*Sarcothelia edmondsoni*), annelid worms (*Sabellastarte spectabilis*, *Loimia medusa*, and *Salmacina dysteri*), hermit crab (*Diogenidae* sp.), and sea cucumber (*Eupata godeffroyi*). One frogfish (*Antennarius commerson*) was observed on the reef flat seaward of the groin. Figure 5 displays representative photos of the bottom in the survey area.

Figure 5. The area seaward of the groin is a relatively flat bottom of sand and patches of limestone and rubble with macroalgal cover (left photo). A bed of seagrasses (*Halophlia decipens* and *H. hawaiiana*) occurs west of the groin (right photo).

Fish resources — A total of 2 species of fishes were identified in the groin and surrounding area surveys: mulletfish (*Mugil cephalus*) and frogfish (*Antennarius commerson*).

Benthic Community Composition

Groin — Data collected from two transects on the groin were used to calculate benthic community composition (Figure 6). The dominant benthic type on the groin is macroalgae (41% mean cover) and sand (21% mean cover). Bare sandbag (as "uncolonized sandbag") mean cover is 14%, and turf algae mean cover is 13%. Invertebrate, cyanobacteria, and CCA cover are similar, at 7%, 6% and 5% cover, respectively. Rubble is minimal, at 2% mean cover. Coral cover here was zero.

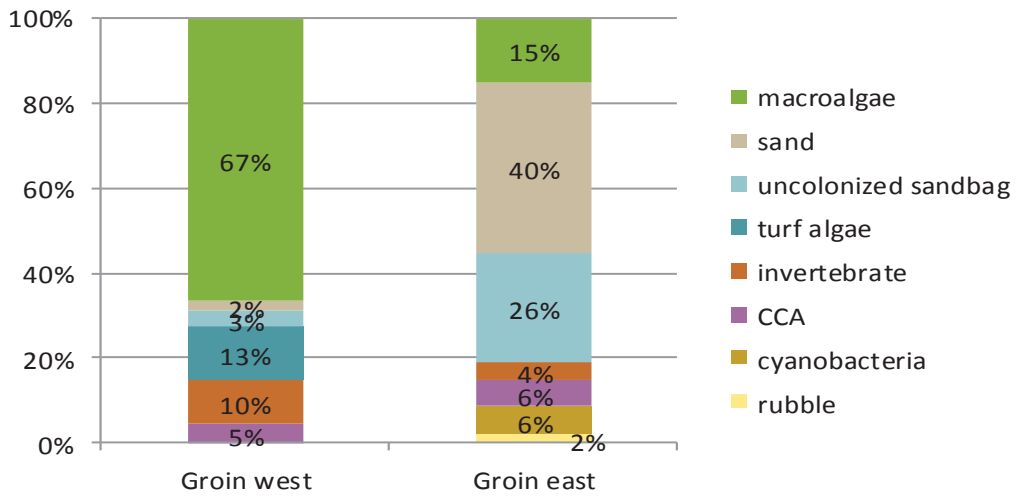

Figure 6. Mean percent benthic cover for groin, as measured using point-intercepts on two transects: one 43-m on the west side of the groin and one 23-m transect on the east side of the groin.

Seafloor surrounding groin — Data obtained from three transects laid on the seafloor surrounding the groin were used to calculate benthic community composition near the groin structure (Figure 7). The dominant benthic type on the seafloor is sand (54% mean cover), macroalgae and seagrass (each 13% mean cover). Rubble mean cover is 13% and bare limestone (as "uncolonized limestone") mean cover is 7%. CCA, turf, and cyanobacteria mean cover are minimal, at 4%, 2%, and 1%, respectively. Macroinvertebrate and coral cover are zero.

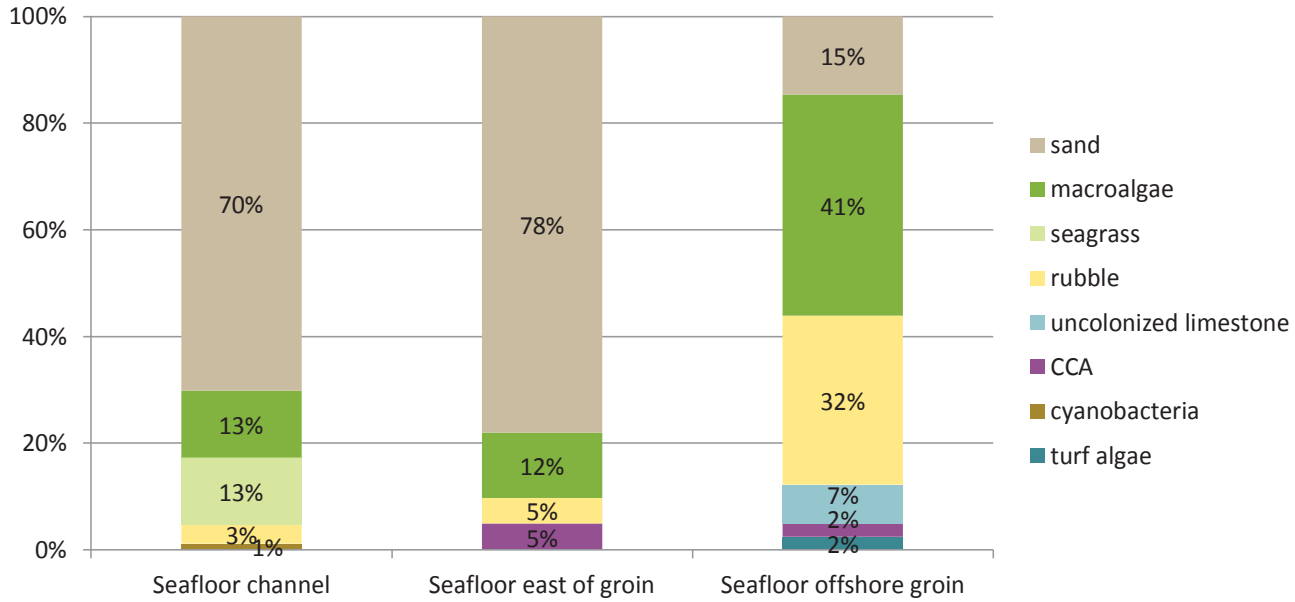

Figure 7. Mean percent benthic cover on reef surrounding groin as measured using point-intercepts on three transects surrounding the groin: one 43-m transect parallel to the west side of the groin, one 20-m transect off the east side of the groin, and one 20-m transect across the bottom, extending offshore of the groin.

Discussion

Water Quality

The Hawaii Kai Groin Project is located just off the shore in Maunalua Bay adjacent to the marina entrance channel. These waters are designated Class A marine waters (HDOH, 2014a). It is the objective of Class A marine waters that their use for recreational purposes and aesthetic enjoyment be protected. Other uses are permitted as long as compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation in and on these waters. Class A waters cannot act as receiving waters for any discharge which has not received the best degree of treatment or control. No new industrial discharges are permitted, with exception of acceptable non-contact thermal and drydock or marine railway discharges, storm water discharges, and discharges covered by a NPDES general permit approved by the U.S. Environmental Protection Agency (USEPA).

The waters of Maunalua Bay are listed on the Hawaiʻi Department of Health 2014 list of impaired waters prepared under Clean Water Act §303(d) (HDOH, 2014a). The listing indicate that waters in these areas do not meet applicable water quality standards for nitrate+nitrite, ammonia, total nitrogen, and chlorophyll α

Table 3. Selected state water quality criteria applicable to "dry" embayments after HAR §11-54-06 (3) (HDOH, 2014a).

Parameter	Geometric Mean value not to exceed this value	Value not to be exceeded more than 10% of the time	Value not to be exceeded more than 2% of the time
Total Nitrogen (µg N/L)	150.0	250.0	350.0
Ammonia (µg N/L)	3.5	8.5	15.0
Nitrate+Nitrite (µg N/L)	5.0	14.0	25.0
Total Phosphorus (µg/L)	20.0	40.0	60.0
Chlorophyll α (µg/L)	0.50	1.50	3.00
Turbidity (NTU)	0.40	1.0	1.50

Other "standards":

- pH units shall not deviate more than 0.5 units from ambient and not lower than 7.0 nor higher than 8.6.
- Dissolved oxygen shall not decrease below 75% of saturation.
- Temperature shall not vary more than 1C° from ambient conditions.
- Salinity shall not vary more than 10% from ambient.

State water quality criteria for embayments (see Table 3, above) comprise "wet" and "dry" criteria values based on average percent of freshwater inflow: wet criteria apply where average fresh water inflow from the land equals or exceeds one per cent of the embayment volume per day; dry criteria apply where average fresh water inflow from the land is less than one per cent of the

embayment volume per day. In this case, dry criteria apply based upon the salinity results that show no significant dilution from oceanic salinity (35.20 PSU; SOEST, 1996) for Maunalua Bay.

The primary purpose of our water quality measurements was to characterize the existing aquatic environment, not to set baseline values or determine compliance with Hawaii's water quality standards. State criteria for all nutrient measurements, turbidity, and chlorophyll α are based upon having geometric mean values, which require a minimum of three separate samples per sampling station to calculate.

Water quality conditions in the project area on March 13, 2015 met state water quality criteria for pH, and DO saturation. Conditions likely comply with temperature and salinity criteria (measured values are essentially ambient). Turbidity was within a range common for Hawaiian embayments. There are no state embayment criteria for TSS, but this parameter is often measured for projects that could possibly impact sediment distribution.

Nutrients (with the exception of ammonia) were characteristic of Hawaiʻi embayments. Ammonia concentrations were elevated at Stas. Bridge and East. The reason for this is not known, but may have been due to decaying organic matter in Kaupā Pond; ammonia being an intermediate breakdown product of organic nitrogen.

Potential exists for short term impacts from construction activities on water quality of the nearshore environment. A possible impact from construction is introduction of sediment into the water from construction activity. Recommended standard best management practices (BMPs) to protect water quality during construction should be used to minimize impacts to fish and wildlife resources. Such BMPs include, but are not limited to, using silt containment devices, avoiding creating runoff during coral spawning periods, and protecting soils from erosion.

Marine Resources

In general, the marine environment on the groin and on bottom surrounding the groin is dominated by macroalgae, algal turf, and sand.

ESA-listed and state protected species

No listed (endangered or threatened; DLNR, 1998, 2002, 2007, 2009; NOAA-NMFS, 2007 and 2011; USFWS, 2015) species were encountered in the March

2015 survey. Listed marine species (sea turtles, Hawaiian monk seal, and humpback whale) can occur in the general vicinity as might state-protected species (hermatypic corals and black-lipped pearl oyster or *Pinctada margaritifera*). The Project includes work in marine waters where ESA-listed species may be exposed to project-related activity. Sea turtles and marine mammals typically avoid human activity, so exposure to such activity and equipment operation would be infrequent and non-injurious, resulting in insignificant effects on the ESA-listed marine species. Additionally, protected species BMPs require that the project manager and contractor reduce the likelihood of interactions by watching for and avoiding protected species before commencing work and by postponing or halting operations when protected species are within 50 yards of project activities (USACE, 2012).

Sea turtles — Of the sea turtles found in the Hawaiian Islands, only the green sea turtle is likely in the Project vicinity. The hawksbill sea turtle (*Eretmochelys imbricata*) is rare in the Hawaiian Islands and only known to nest in the southern reaches of the state (NOAA-PIFSC, 2010). In 1978, the green sea turtle was listed as a threatened species under the Endangered Species Act (ESA; USFWS, 1978, 2001). Since protection, the green sea turtle has become the most common sea turtle in the Hawaiian Islands with a steadily growing population (Chaloupka et al., 2008). 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 (NMFS-USFWS, 1998).

Green sea turtle nesting occurs mostly on beaches of the Northwestern Hawaiian Islands, with 90% occurring at French Frigate Shoals (Balazs et al., 1992). None of the Hawaiian sea turtles is known to nest in the Project vicinity.

The green sea turtle diet consists primarily of benthic macroalgae (Arthur and Balazs, 2008), which the shallow reefs of the main Hawaiian Islands provide in abundance. Red macroalgae generally make up 78% of their diet, whereas green macroalgae make up 12% (Arthur and Balazs, 2008). Turbidity (murky water) does not appear to deter green sea turtles from foraging and resting areas and construction projects in Hawaiʻi have found sea turtles adaptable and tolerant of construction-related disturbances (Brock, 1998a,b). During our survey, no green sea turtles were observed, although a food resource (seagrass, see below) occurs there.

Shellfishes — Shellfishes, including pearl oyster (*Pinctada margaritifera*), are regulated throughout the State of Hawaiʻi, where it is prohibited to "catch, take, kill, possess, remove, sell or offer for sale", without a permit, pearl oysters and 6

other shellfishes (DLNR, 2009). None of the regulated shellfishes was observed during our survey.

Monk seal — Oʻahu's beaches and coastline are used by the endangered Hawaiian monk seal (*Monachus schauinslandi*) for hauling out and for pupping and nursing. Currently, only the remote Northwestern Hawaiian Islands are considered critical habitat for this species (50 CFR 226.201). However, recently the waters surrounding the Main Hawaiian Islands (MHI) have been proposed as monk seal critical habitat, excluding portions (e.g., boat harbors, cliffs, active lava, and large bays with extensive runoff) of the MHI coastal environments considered hardened shorelines or developed areas that do not have the essential features that would support Hawaiian monk seal use. The Project area does not meet the definition of critical habitat for monk seal. As defined as a location delineated by the identified boundaries, Maunalua Bay and Hawaiʻi Kai Harbor delineated as all coastline and waters located inshore of the line drawn between 21°16′53.22″ N/157°43′21.77″ W east to the point 21°15′49.13″ N/157°42′41.45″ W (50 CFR 226, June 2, 2011; NOAA-NMFS, 2011). The Project area is not proposed as critical habitat for this species.

Humpback whale — The humpback whale or *koholā* (*Megaptera novaeangliae*) was listed as endangered in 1970 under the ESA. In 1993 it was estimated that there were 6,000 humpback whales in the North Pacific Ocean, and that 4,000 of those regularly came to the Hawaiian Islands. The population is estimated to be growing at between 4 and 7% per year. Today, as many as 10,000 humpback whales may visit Hawaiʻi each year (HIHWNMS, 2014). The waters of the Project area are within the Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS, 2014).

Coral — Coral species are protected under Hawaiʻi state law, which prohibits "breaking or damaging, with any implement, any stony coral from the waters of Hawaiʻi, including any reef or mushroom coral" (HAR §13-95-70; DLNR, 2010). It is also unlawful to take, break or damage with any implement, any rock or coral to which marine life of any type is visibly attached (HAR §13-95-71, DLNR, 2002). On August 27, 2014, NOAA issued a final rule for listing 20 coral species as threatened under ESA (NOAA-NMFS, 2014). None of these newly listed corals occurs in Hawaiʻi.

Seagrasses — Three species of seagrasses are found in Hawaiʻi: an endemic (*Halophila hawaiiana*), an indigenous (*Ruppia maritima*), and an introduced species (*Halophila decipiens*). Seagrasses, although not types of grass, are vascular plants and not algae. In general, seagrasses thrive in areas with low sedimentation, adequate water flow, and low wave energy (Hemminga and Duarte, 2000). Previous studies have observed *H. hawaiiana* and *H. decipiens* in

sand areas offshore of Portlock Beach and Maunalua Bay Beach Park (*AECOS*, 2010). Seagrass constitutes a unique habitat in Hawaiian waters and both species of *Halophila* are consumed by green sea turtles (Russell et al., 2003). The general degradation of seagrass beds by eutrophication (excessive nutrients from land runoff), sedimentation, chemical poisoning, collecting and gleaning, trampling, anchoring, etc. is a widespread threat to the recovery of depleted sea turtle stocks (NMFS and USFWS, 1998a and 1998b).

Seagrass beds are considered a Special Aquatic Site under the Clean Water Act (Subpart E of 40 CFR Part 230). Special aquatic sites are defined in the Act as "… sanctuaries and refuges, wetlands, mud flats, vegetated shallows (seagrass beds), coral reefs, and [stream] riffle and pool complexes." When a project requiring a Clean Water Act, Section 404 permit (regulating the discharge of dredged, excavated, or fill material in wetlands, streams, rivers, and other waters of the U.S.) is proposed to be conducted in a Special Aquatic Site, as part of the permitting process, all alternatives that do not result in a discharge into a Special Aquatic Site are presumed to have lesser adverse impact.

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 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: bottomfish, pelagics, precious corals, crustaceans, and coral reef ecosystem. 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, 2005) and "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)."

The proposed Project is located within waters 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 58 (juvenile and adult life stages) are known to occur in the general vicinity of Hawaiʻi Kai Marina entrance channel and Maunalua Bay (*AECOS*, 2010).

Direct Impacts

The nearshore and reef flat biological assemblages of Maunalua Bay in the vicinity of the Hawaiʻi Kai marina are poorly developed and suggest a highly disturbed environment. Maunalua Bay appears to be negatively affected by a variety of environmental disturbances, including freshwater input and sedimentation, from landward sources. Direct impacts to marine biological resources at the Hawaii Kai groin site will result in the loss of marine resources that occur on the existing groin and within the footprints of the existing and proposed structures. These communities are dominated by a number of algal species. Biological assemblages residing on and around the present groin will be impacted, but it is expected that similar assemblages will recolonize any newly placed solid structure. Recruitment of biota to the new groin structures will likely include marine species established nearby, and may possibly include corals.

It is anticipated that the fish that occur in the Project vicinity will actively avoid direct impacts from Project activities. Some impairment of ability of EFH managed species to find prey items could occur, but this effect should be temporary and spatially limited to the immediate vicinity of construction activities. Most of the MUS that use the EFH species are not tied to artificial substrates, and routinely experience turbid and sand scoured environment in the area. The new structure will maintain fish habitat in the project area, and will provide additional fish foraging resources on the new groin. Construction of the groin on essentially sand bottom is not expected to adversely affect fish populations, fish habitat, or fish foraging resources. Infaunal resources are expected to recover rapidly.

Indirect Impacts

Potential indirect impacts to coral reef ecosystems and associated EFH from construction and operation of the Project may occur from degradation of water quality. Project construction may temporarily increase the amount of suspended sediment in the water column. It is anticipated that most fishes will avoid construction areas, and that potential impacts would be temporary and minor, resulting in displacement followed by rapid postconstruction recolonization by

these species. Such avoidance would occur only in those areas where active in-water work is occurring. Impacts to water quality associated with Project activities will be temporary and can be minimized using appropriate construction BMPs. Indirect impacts on EFH from construction are not expected if BMPs are implemented and adhered to. Thus, it will be necessary to enclose the groin project area with silt/sediment barriers as a BMP to contain suspended particulates during in-water work. At a minimum, water quality monitoring before, during, and after construction should be conducted for temperature, salinity, pH, DO, and particulates to insure compliance with state water quality criteria. Because the old groin will be removed in its entirety and replaced with a more stable one, biological monitoring would be unnecessary during construction. A postconstruction survey similar in scope to the preconstruction effort described herein could be conducted after one year to document recovery and/or improvements in benthic biota resulting from the Project.

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Appendix A. Inventory of marine biota observed off the Hawai'i Kai groin and surrounding seafloor, Hawai'i Kai, O'ahu (March 17, 2015)

PHYLUM, CLASS, ORDER FAMILY *Genus Species*	Common name, *Hawaiian name*	Status	Abundance
	ALGAE		
CYANOPHYTA	BLUE-GREEN ALGAE		
Lyngbya majuscula		---	C
RHODOPHYTA	RED ALGAE		
Acanthophora spicifera	*limu 'aki'aki*	Nat.	C
Asparagopsis taxiformis	*limu kohu* or *limu līpehe*	Nat.	
Gracilaria salicornia	gorilla *ogo*	Nat.	A
Griffithsia heteromorpha		Ind.	A
Hypnea cervicornis		Ind.	C
Hypnea musciformis	Hookweed	Ind.	C
Spyridia filamentosa		Ind.	A
CHLOROPHYTA	GREEN ALGAE		
Avrainvillea amadelpha	leather mudweed	Nat.	R
Cladophora socialis		Ind.	C
Chaetomorpha antennina		Ind.	O
Dictyota cf ceylanica		Ind.	R
Dictospaeria versluyii		Ind.	R
Halimeda opuntia	prickly pear halimeda		
Halimeda discoidea	rosette halimeda	Ind.	A
Neomeris sp.		Ind.	U
OCHROPHYTA	BROWN ALGAE		
Chrysonephos lewisii		Ind.	O
Chnoospora minima		Ind.	R
Lobophora variegate	variegated seaweed	Ind.	R
Padina sp.		Ind.	R
Sphacelaria spp.	black tuft seaweed	Ind.	C
MAGNOLIOPHYTA	SEAGRASS		
Halophila decipiens		Nat	C
Halophila hawaiiana		End.	C
	INVERTEBRATES		
PORIFERA, DEMOSPONGIAE, MYXILLIDAE	SPONGES		
Iotrochota protea	staining sponge	Ind	O
CHALINIDAE			
Sigmoadocia sp.	Boring sponge	Nat	O

PHYLUM, CLASS, ORDER **FAMILY** *Genus Species*	Common name, *Hawaiian name*	Status	Abundance
CNIDARIA, HYDROZOA, ANTHOATHECATA	HYDROIDS		
PENNARIIDAE			
Pennaria disticha	Christmas tree hydroid	Ind	R
CNIDARIA, ANTHOZOA, ALCYONACEA	SOFT CORALS		
XANIIDAE			
Sarcothelia edmondsoni	blue octocoral	End.	O
ANNELIDA, POLYCHAETA	ANNELID WORMS		
SABELLIDAE			
Sabellastarte spectabilis	feather duster worm	Ind	C
SERPULIDAE			
TEREBELLIDAE			
Loimia medusa	medusa spaghetti worm	Ind	O
SERPULIDAE			
Salmacina dysteri	sea frost	Ind	R
ECTOPROCTA, GYMNOLAEMATA, CHEILOSTOMATA	BRYOZOANS		
RETEPORIDAE			
Reteporellina denticulata	lace bryozoan	Ind	R
SCHIZOPORELLIDAE			
Schizoporella errata	erratic bryozoan	Ind	R
MOLLUSCA, GASTROPODA	GASTROPODS		
HIPPONICIDAE			
Hipponix imbricatus	shingly hoof shell	Ind.	R
MOLLUSCA,BIVALVIA	BIVALVES		
OSTREIDAE			
Dendostrea sandvicensis	Hawaiian oyster	Ind	O
ISOGNOMONIDAE			
Isognomon perna	brown purse shell, *nahawele*	Ind	
Unid. *Ostreidae*			O
ARTHROPODA, CRUSTACEA, CIRRIPEDIA	BARNACLES		
CHTHAMALIDAE			
Euraphia hembeli	Hembel's rock barnacle	Ind	R
DIOGENIDAE	HERMIT CRABS		
Unid. *Diogenidae*			R
ECHINODERMATA, HOLOTHUROIDEA	CUCUMBERS		
SYNAPTIDAE			
Eupata godeffroyi	Lion's paw sea cucumber	Ind.	R

PHYLUM, CLASS, ORDER **FAMILY** *Genus Species*	Common name, *Hawaiian name*	Status	Abundance
	VERTEBRATES		
VERTEBRATA, ACTINOPTERYGII, PERCIFORMES	BONY FISHES		
MUGILIDAE	MULLETFISH		
Mugil cephalus	Striped mulletfish; *ʻamaʻama*	Ind	R
ANTENNARIIDAE	FROGFISHES		
Antennarius commerson	Commerson's frogfish	Ind.	R

KEY TO SYMBOLS USED:

Abundance categories:

- R – Rare – only one or two individuals observed.
- U – Uncommon – several to a dozen individuals observed.
- O – Occasional – seen irregularly in small numbers
- C – Common – observed everywhere, although generally not in large numbers.
- A – Abundant – observed in large numbers and widely distributed.

Status categories:

- End – Endemic – species found only in Hawaiʻi
- Ind – Indigenous – species found in Hawaiʻi and elsewhere
- Nat – Naturalized – species introduced to Hawaiʻi intentionally, or accidentally.

APPENDIX B. OCEAN RECREATION ASSESSMENT – JOHN CLARK

Ocean Recreation Assessment for the Hawaii Kai Marina Groin Project at Hawaii Kai, Honolulu, Hawaii

John Clark (2016)

Ocean Recreation Assessment

for the

Hawaii Kai Marina Groin Project

at

Hawaii Kai, Honolulu, Hawaii

Prepared for:

Sea Engineering, Inc.
Makai Research Pier
41-202 Kalanianaole Highway, Suite 8
Waimanalo, Hawaii 96795

Prepared by:

John Clark
Planning Consultant
P.O. Box 25277
Honolulu, Hawaii 96825

May 2016

1.0 OCEAN RECREATION ASSESSMENT

1.1 Purpose

This ocean recreation assessment is intended to provide background information to Sea Engineering, Inc., for the planned replacement of a temporary sandbag groin at the Hawaii Kai Marina entrance channel bridge with a permanent boulder groin. Sea Engineering, Inc., is developing an environmental assessment, which includes a concept plan, for the proposed project.

1.2 Project Location

The project location is the shoreline of Maunalua Bay where Kalanianaole Highway passes over the entrance channel to Hawaii Kai Marina via a bridge. Maunalua Beach Park borders the west side of the bridge, and residential homes border the east side. A narrow white sand beach fronts the homes. The temporary sandbag groin borders the west edge of the beach and extends seaward of the first bay under the bridge.

1.3 Project Description

The project is intended to replace the temporary sandbag groin with a permanent boulder groin. The boulder groin will provide a solid structure to stabilize the west end of the beach fronting the residential homes and will prevent eroding beach sand from migrating into the entrance channel. Sand filling the four bays under bridge impacts their viability for passage of boat traffic, especially deeper draft boats.

1.4 Scope

The scope of work included:

1. Observing ocean activities and ocean conditions at the project site.

2. Identifying ocean recreation activities at the project site and determining whether the proposed project affects these activities.

3. Interviewing private boat owners in the marina, commercial ocean recreation business owners based in the marina, residents along the beach on the east side of the bridge, and the general public conducting ocean recreation activities at or near the project site.

4. Identifying potential impacts of the groin replacement project on the ocean recreation activities in the project site.

1.5 Survey Methodology

Information for this assessment was gathered from site visits, from interviews with people familiar with the shoreline of the project site, and from written surveys conducted via email. Information gathering was conducted during June and July of 2015 and again in April and May of 2016.

2.0 Physical Conditions

2.1 Historic Site Description

The 185-long bridge over Kalanianaole Highway was designed with four bays to permit boat traffic to pass under the bridge to and from Hawaii Kai Marina, a private marina. When the bays were officially opened on October 12, 1969, they were open for use only to boaters registered with the Hawaii Kai Marina Community Association. Today, approximately 500 power boats are registered. A boat ramp for the general public was constructed nearby in Maunalua Bay Beach Park.

2.2 Present Site Description

When the bridge was completed in 1969, all four bays were deep enough to accommodate boat traffic, but over time sand from the beach east of the entrance channel began eroding and migrating west into the channel, filling the bays. This situation prevented the passage of deeper draft boats in the first two bays and endangering their passage in the third and fourth bays. To address this situation the Hawaii Kai Marina Community Association has had to regularly dredge sand from the channel. In an effort to stop the beach erosion the State of Hawaii installed a temporary sandbag groin at the west end of the beach, but it has not been completely effective. Soundings in the four bays under the bridge taken in June 2015 showed that depths in the first bay were as shallow as one to two feet at 0.0 tide.

In addition, in 2014 the U. S. Army Corps of Engineers prohibited installation of additional sandbags on the temporary groin. In response to this development the Hawaii Kai Marina Community Association asked Sea Engineering, Inc., to design a permanent groin.

2.13 Ocean Bottom.

The ocean bottom on the west side of the sandbag groin is a wide boat channel that leads to the open ocean in Maunalua Bay.

The ocean bottom on the east side of the sandbag groin is a shallow reef flat, consisting of patches of reef and patches of sand.

3.0 Ocean Recreation Activities.

As a channel under Kalanianaole Highway that connects the Hawaii Kai Marina to the open ocean, the project site is used primarily by motorized boats that are issued permits for the marina by the Hawaii Kai Marina Community Association. These boats belong to Hawaii Kai residents and to owners of commercial ocean recreation businesses that are concentrated in the marina near Koko Marina Shopping Center and Hawaii Kai Shopping Center. The ocean recreation businesses provide a wide variety of activities to the general public, such as scuba diving, surfing lessons, parasailing, and jet ski rentals, but none of these activities are conducted in or near the project site. They take place offshore in the waters of Maunalua Bay, so most of the project site is used only by the authorized boat traffic to transit to and from the marina.

Non-motorized craft, such as kayaks and paddleboards, are also issued permits for the marina by the Hawaii Kai Marina Community Association. The Hui Nalu Canoe Club, which is headquartered at the west end of Maunalua Bay Beach Park, is also permitted to access the marina and use its waters for training.

In addition to the boat traffic to and from the marina, the project site, especially the adjacent beach on the east side of the sandbag groin, is used by the general public for various ocean recreation activities. While there is no parking on Kalanianaole Highway, parking is available on Portlock Road to the east of the project site. Six rights-of-way from Portlock Road lead through the shoreline homes to the beach. While they are not designated as public rights-of-way, they are not gated and are used by both area residents and the general public to access the beach.

3.1 Sunbathing.

Sunbathing is a common activity on the beach adjacent to the project site. The beach is used by the residents of the homes that border it, by other residents who live in the Portlock community, and to a lesser extent by residents from elsewhere. Tourists looking for beaches at the east end of Maunalua Bay also occasionally find their way here. The best time for sunbathing is at low tide. At high tide at least half of the beach is covered with water.

3.2 Swimming.

Swimming is a minor activity at the beach and the project site. The shallow reef flat fronting the beach does not offer good swimming conditions, especially at low tide.

3.3 Snorkeling.

The reef flat fronting the beach and the project site is not known as good site for snorkeling. Its waters are often murky, and it does not attract the volume or variety of fish that other reefs do.

3.4 Surfing.

No surfing occurs in the project area. The nearest surf spot, which is called Seconds, is well offshore and located on the east side of the entrance channel near the outermost channel markers.

3.9 Fishing and Gathering.

Two types of pole fishing occur in the project site, whipping and casting. During the field trips for this report, pole fishers were observed on the beach and on the sandbag groin, whipping for papio and ulua. Fishers were also observed casting for papio and ulua, placing their poles in sand spikes on the beach. At the east end of the beach, several low sea walls cross the sand where they border two narrow drainage canals. Short sections of pvc pipe, which are commonly used as pole holders for casters, are cemented in several places on these walls. No spear fishing was observed or reported on the shallow reef flat. One informant reported fishing from boats in the vicinity of the project site.

One informant reported crabbing in the vicinity of the project site.

No gathering activities of edible seaweed, shellfish, or other marine species were observed during the field trips or reported by informants.

3.9 Other Activities.

The beach is used as a rest stop during training runs for canoes from the Hui Nalu Canoe Club and occasionally by the owners of other non-motorized craft, such as kayaks and standup paddleboards.

One informant reported shell collecting on the beach adjacent to the project site.

4.0 Impacts on Ocean Recreation Activities.

4.1 Short Term Impacts.

Installation of the permanent boulder groin, including the removal of the temporary sandbag groin, will preclude ocean recreation activities at the west end of the beach, but this impact will only be for the duration of the construction.

The project is not anticipated to have any adverse impacts on the movement of boat traffic to and from the marina.

4.2 Long Term Impacts.

No long term impacts on ocean recreation activities are anticipated from this project.

4.3 Summary.

In summary, the replacement of the temporary sandbag groin with a permanent boulder groin will have no long term impacts on ocean recreation activities at or near the project site.

While identifying ocean recreation activities and the impacts on them were the primary objectives of this assessment, the final question in the written survey offered informants an opportunity to voice other comments and concerns about the project. These are listed below.

4.4 Comments and Concerns.

a. This looks like the right plan for the project.
b. Our biggest issue with the bridge is that we operate the deepest draft vessel from Hawaii Kai [Marina] that goes out daily. It is our bottom that is damaged if the channel is shallow. I believe this project helps.
c. The sand fills in [the entrance channel] very fast. Maybe the groin should extend a little further out.
d. Safeguards should be put in place for sediment control for the dredging and installation process.
e. [When designing the new groin, keep in mind that] other groins built in other areas of Maunalua Bay and Waikiki have almost no beach left compared to photos that show the areas prior to their construction.
f. Nearby underwater concrete structures show almost no coral or algae growth. Material and design should mimic the natural environments so that fish and limu can thrive. The use of stone over concrete is positive.
g. The following comments are from Malama Maunalua, a conservation organization dedicated to improving the health of Maunalua Bay.
   1. While recognizing the need of the marina users to safely access and egress the marina, the impacts of this proposed project need to be carefully studied before any action is taken. Malama Maunalua requests a determination that a third-party Environmental Impact Assessment/Study will be necessary for this project and requests that this be published and disseminated to the public prior to any permit application or project commencement.
   2. MM further requests to be included as a consulted party during the development of the draft EIS. Our concern will specifically be on the impact of this project on Maunalua Bay and adjacent F&W [Fish and Wildlife] refuge as well as impact to sand migration.
h. The following questions are from a concerned individual.
   1. Will this groin's view plane block the vista of property closest to groin?
   2. Will this project lower value of property?
   3. Will this angular sloped groin on the channel side be better than a vertical wall. If so why?
   4. Will this design stop sand from building up against channel side of groin?
   5. Will this L head groin create any scouring to Koko Head side of beach in front of Rosa and Omphroy lots?
   6. What will the lateral current flow look like when you block water with this L. Head?
   7. How much of this groin is in State waters?
   8. Who assumes liability for persons injured on the groin.
i. The following questions are from the resident at 7005 Kalanianaole Highway.
   1. Who pays for this project?
   2. What does it do to the existing shoreline?
j. The comments and concerns that follow are from the owners of the home at 6973 Kalanianaole Highway, which is adjacent to the sandbag groin and the entrance channel.
   1. Our property is directly affected by the project and is adjacent to the groin.
   Before the channel was dredged by Kaiser this was a ma kaha, a small opening to Kuapa fishpond. The original channel dredging eroded our property and Portlock beach.
   The entrance channel and beach were stable for many years with two channels open. The last two dredging projects when the sandbag groins were placed and the third bridge bay was dredged caused Portlock beach and the beach park to erode.
   2. The proposed groin abuts our property and the project directly affects us.
   It affects our privacy, views and peaceful enjoyment of our property and property

value.

A wall should be built along the end of our property and along the highway for privacy and security. This should be a part of the project and the expense and liability should be covered by the Hawaii Kai Marina not the State of Hawaii.

The State of Hawaii, the Army Corps of Engineers and the Department of Health need to directly supervise the project so that best practices will be observed and the dredging will be done on the incoming or stable tide so as not to add sediment to the reef.
In the last dredging project of 2013 the contractor removed massive amounts of rock supporting the bridge.

3. The existing sandbag groin does not continue to the bridge and the land is being eroded and undermined toward the end of our property but nothing has been done to remedy the situation. Trees have fallen in on the Portlock side of the channel behind our property and on the beach park side.

4. The State of Hawaii Department of Transportation should check the bridge integrity. A fence needs to be built to block access to the groin from the highway and under the bridge. Liability and safety are huge concerns. Kids often jump from the highway bridge and the existing groin. We have even seen a boat drive up on the sandbags on purpose.

5. We do not want the groin to be longer or hook to the side as it will impact our views. The groin should be as low as possible above water level.
The sandbag groin is holding the sand now and unless you build the groin out to the reef, maintenance dredging will always be necessary to maintain the channel depth. Thousands of yards of sand and coral, probably 1/3 of the dredged material were placed on the park side but were removed from the system during the last dredging done in 2013. The sand and coral was spread on the park beach but was condemned and removed before the 4th of July Fireworks display. This was the same quality and consistency of sand and coral that were placed on the beach on the Portlock side This was very damaging to the beach environment. The beach park is eroding and properties at the East end of Portlock beach are now experiencing huge erosion of their yards, in some places 30 feet has washed away.
Whenever maintenance dredging is done ALL material should be placed back on the beach either Portlock or park side.

6. The park side also needs to be protected by a rock wall or groin as it is being scoured out and eroding with the existing sand bag groin. The rock groin will exacerbate this condition.

APPENDIX C. CONSULTATION LETTERS AND RESPONSES

Sea Engineering, Inc.

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Phone: (808) 259-7966 / FAX (808) 259-8143 • Website: www.seaengineering.com

March 31, 2016

Mr. Edward Underwood, Administrator
Department of Land and Natural Resources
Division of Boating and Ocean Recreation
4 Sand Island Access Road
Honolulu, HI 96819

Subject: Consultation for Hawaii Kai Marina Groin Replacement

Dear Mr. Underwood,

The Hawaii Kai Marina Community Association (HKMCA) is proposing to replace the sandbag groin at the Hawaii Kai Marina entrance channel with a permanent, engineered structure. Sea Engineering, Inc. (SEI) is working with the HKMCA for planning and design of the groin replacement and preparation of an Environmental Assessment (EA) in accordance with HRS Chapter 343. The purpose of this letter is to inform you of the start of project planning, design, and EA preparation and to solicit any advance questions or comments that you may have.

The Hawaii Kai Marina entrance channel groin is a 150-ft long sandbag structure located on the east side of the main marina entrance channel, on Portlock Beach. The marina is owned and administered by the HKMCA; however, the entrance channel and groin are located within a Perpetual, Non-Exclusive Maintenance Easement granted in 2004 by the Board of Land and Natural Resources (BLNR). The groin was originally constructed in 2004 as an experimental structure and was rebuilt in 2013. Analysis shows that the groin has slowed the longshore transport of sand along Portlock Beach and has reduced the rate of sediment accumulation in the entrance channel.

Geotextile sandbag structures are temporary in nature. Though loss of the structure is not expected in the immediate future, the groin's effectiveness as a sand retention device is likely to degrade over time. Experience has shown that loss of the structure would lead to erosion of Portlock Beach and shoaling of the marina entrance channel.

Replacement Plan

SEI has completed a preliminary design effort and explored multiple options for a replacement structure, including straight and L-head groins with varying lengths. Maintenance of the existing groin and the "No Action" alternative were also considered.

Five designs for a permanent replacement for the existing sandbag groin were developed and are described in Table 1. All designs include a rock rubble mound groin and a 50-foot revetment

section that ties into the Kalanianaole Highway Bridge concrete rubble masonry (CRM) abutment. The structures are centered on the centerline of the existing sandbag groin. Design variations include:

- length of the groin stem, and
- inclusion of an L-head.

A sediment transport rate of 400 cubic yards per year was used for the calculation of updrift sediment infill. The sediment transport rate was estimated using both aerial images and topographic surveys.

Table 1: Groin alternatives summary table

	Layout	Revetment Length (ft)	Stem Length (ft)	L-Head Length (ft)	Toe Elevation (ft)	Additional Sediment Capacity (cu yards)	Additional Capacity (years)
1.	Existing length	50	140	0	-7	0	0
2.	Existing length w/ L-head	50	140	50	-7	350	1
3.	Extended length	50	180	0	-7	1,000	2.5
4.	Extended length w/ L-head	50	180	50	-7	1,200	3
5.	Maximum Length w/L-head	50	220	50	-7	1,650	4

All designs presented above will slow the transport of sand into the entrance channel. SEI's preferred design is the Extended Groin with L-head layout (Alternative 4 in Table 1). This design most efficiently traps sand on Portlock Beach. The shorter option traps less sediment and analysis of the longer option shows diminished returns that do not justify the additional stem length.

The L-head configuration increases the sediment carrying capacity of the structure without further extending the structure offshore and reduces the potential for wave-generated current formation along the Portlock side of the stem and around the tip of the structure.

The substrate under the groin footprint is loose sand/cobble, thus the groin will likely require an extended toe for scour protection. The HKMCA has asked SEI to design a deep toe at -7 ft MLLW on the channel side of the structure to allow widening of the dredging area in the entrance channel without compromising the structure. Dredging of the entrance channel beyond what is required to place the structure's foundation is not included in this project.

The preferred alternative layout and cross-sections are shown in attached Figure 1 and Figure 2

respectively.

Beach Maintenance Plan

Recently, residents of Portlock Beach have expressed interest to SEI in a sand back-passing scheme to nourish eroded beaches fronting their properties. This process would bring sand that accumulates adjacent to the groin up the beach to sand-starved, eroded areas. The L-head groin retains enough sand for this to be a viable option when the groin has reached capacity. As the groin approaches its maximum sediment trapping capacity, an excavator and small off-road capable trucks could be used to carry the sand up the beach. This process could be repeated as needed every 3 to 5 years to ensure that sand doesn't bypass the groin into the channel.

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Construction Methodology

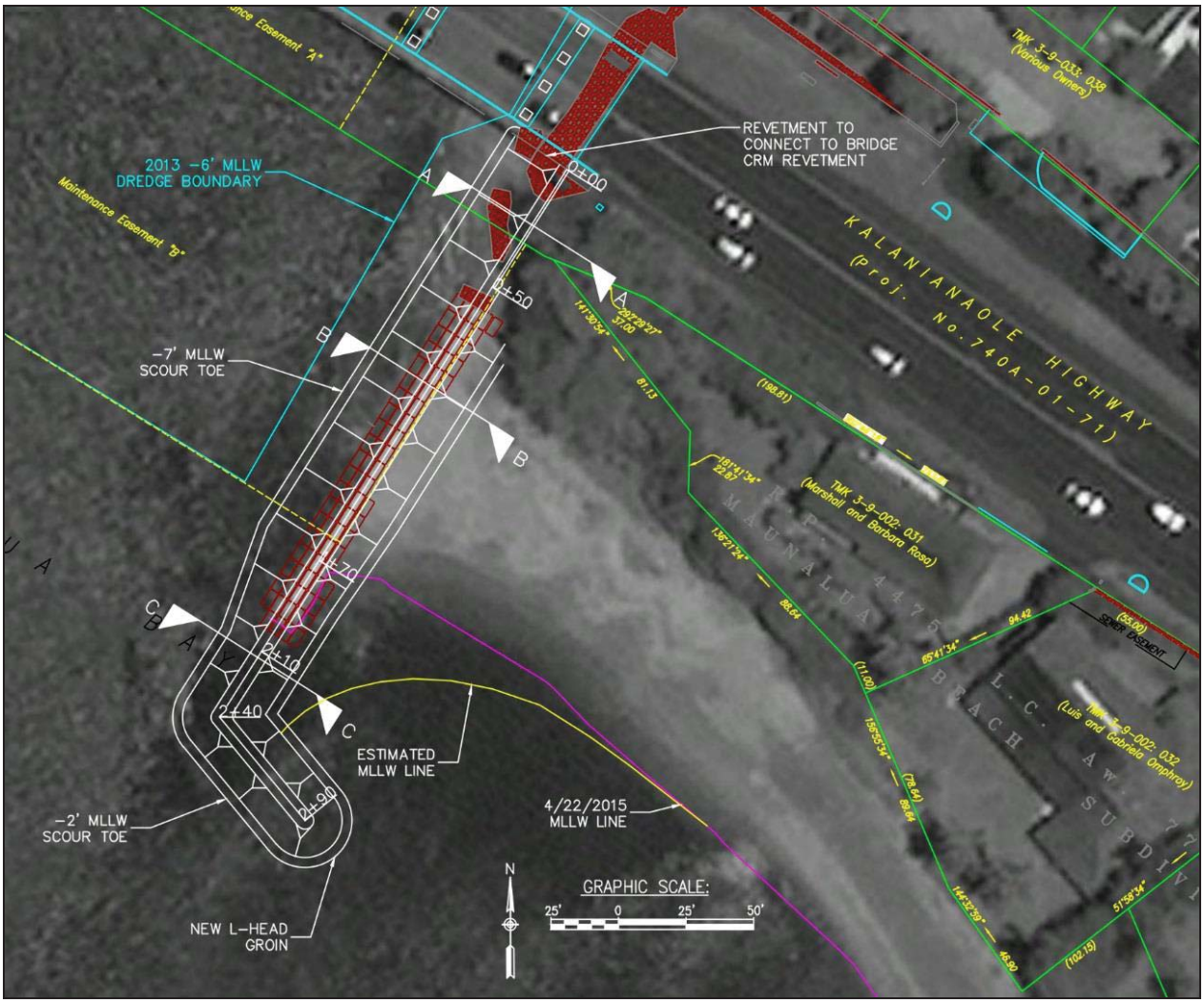
SEI expects construction of the new structure to be challenging due to limited access and limited space for a staging area on the shoreline. We expect some blocking of the entrance channel and some local disruption due to the need for staging, access, and stockpile areas.

With this consultation, we welcome any comments and opinions that DLNR-DOBOR may have on this project. Please feel free to contact me should you have additional questions. Thank you for your time and considerations.

Sincerely,

Derek Linsley
Coastal Engineer
Sea Engineering, Inc.
(808) 259-7966 ext. 21

Cc: Beverly Liddle, Hawaii Kai Marina Community Association



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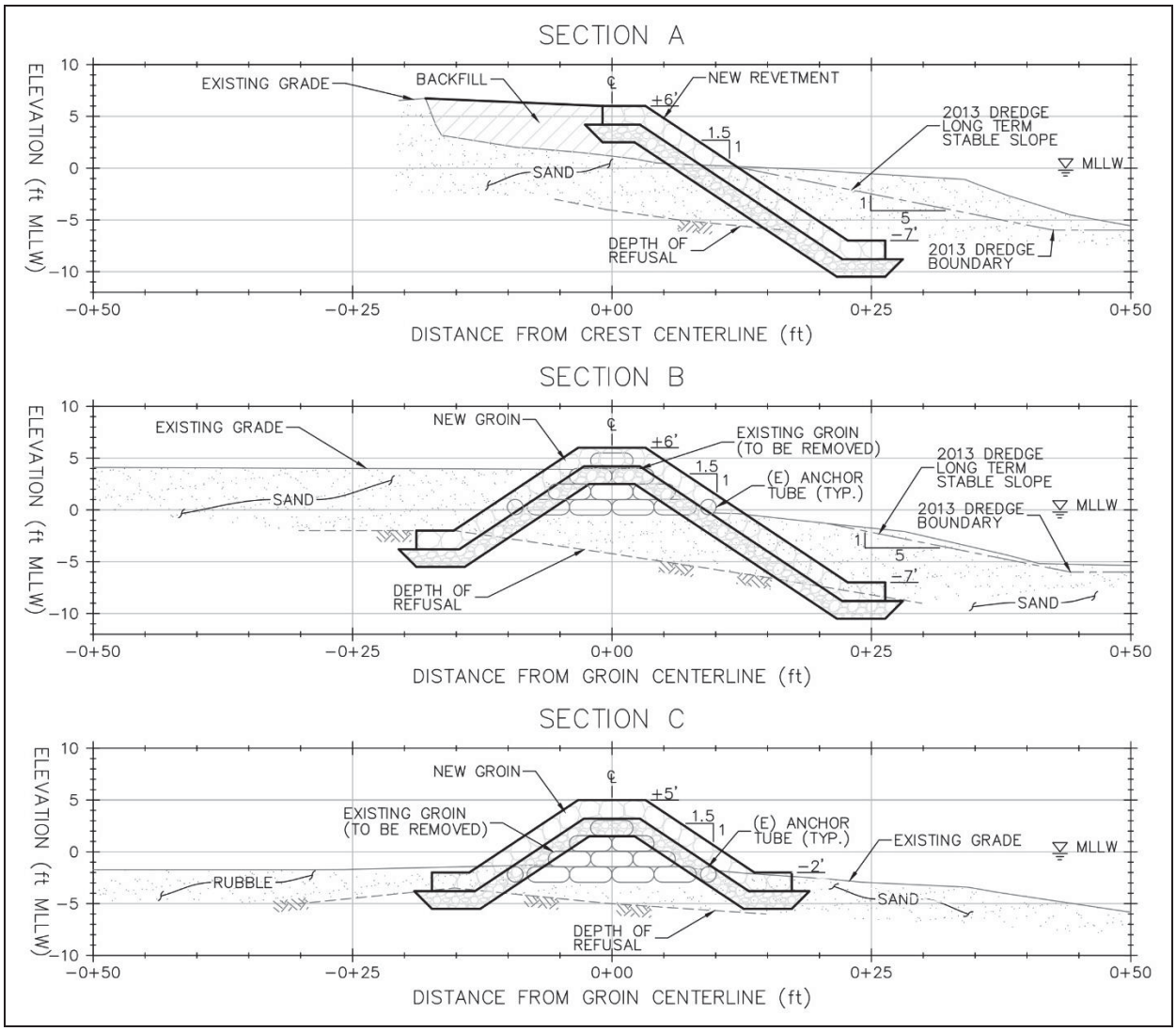

Figure 2: Extended Length with L-head option sections

Sea Engineering, Inc.

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Phone: (808) 259-7966 / FAX (808) 259-8143 • Website: www.seaengineering.com

March 31, 2016

Dr. Alan Downer, PhD, Administrator
State Historic Preservation Division
Department of Land and Natural Resources, State of Hawaii
Kakuhihewa Building
601 Kamokila Blvd., Suite 555
Kapolei, HI 96707

Subject: Consultation for Hawaii Kai Marina Groin Replacement

Dear Dr. Downer,

The Hawaii Kai Marina Community Association (HKMCA) is proposing to replace the sandbag groin at the Hawaii Kai Marina entrance channel with a permanent, engineered structure. Sea Engineering, Inc. (SEI) is working with the HKMCA for planning and design of the groin replacement and preparation of an Environmental Assessment (EA) in accordance with HRS Chapter 343. The purpose of this letter is to inform you of the start of project planning, design, and EA preparation and to solicit any advance questions or comments that you may have.

The Hawaii Kai Marina entrance channel groin is a 150-ft long sandbag structure located on the east side of the main marina entrance channel, on Portlock Beach. The marina is owned and administered by the HKMCA; however, the entrance channel and groin are located within a Perpetual, Non-Exclusive Maintenance Easement granted in 2004 by the Board of Land and Natural Resources (BLNR). The groin was originally constructed in 2004 as an experimental structure and was rebuilt in 2013. Analysis shows that the groin has slowed the longshore transport of sand along Portlock Beach and has reduced the rate of sediment accumulation in the entrance channel.

Geotextile sandbag structures are temporary in nature. Though loss of the structure is not expected in the immediate future, the groin's effectiveness as a sand retention device is likely to degrade over time. Experience has shown that loss of the structure would lead to erosion of Portlock Beach and shoaling of the marina entrance channel.

Replacement Plan

SEI has completed a preliminary design effort and explored multiple options for a replacement structure, including straight and L-head groins with varying lengths. Maintenance of the existing groin and the "No Action" alternative were also considered.

Five designs for a permanent replacement for the existing sandbag groin were developed and are

described in Table 1. All designs include a rock rubble mound groin and a 50-foot revetment section that ties into the Kalanianaole Highway Bridge concrete rubble masonry (CRM) abutment. The structures are centered on the centerline of the existing sandbag groin. Design variations include:

- length of the groin stem, and
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5.	Maximum Length w/L-head	50	220	50	-7	1,650	4

All designs presented above will slow the transport of sand into the entrance channel. SEI's preferred design is the Extended Groin with L-head layout (Alternative 4 in Table 1). This design most efficiently traps sand on Portlock Beach. The shorter option traps less sediment and analysis of the longer option shows diminished returns that do not justify the additional stem length.

The L-head configuration increases the sediment carrying capacity of the structure without further extending the structure offshore and reduces the potential for wave-generated current formation along the Portlock side of the stem and around the tip of the structure.

The substrate under the groin footprint is loose sand/cobble, thus the groin will likely require an extended toe for scour protection. The HKMCA has asked SEI to design a deep toe at -7 ft MLLW on the channel side of the structure to allow widening of the dredging area in the entrance channel without compromising the structure. Dredging of the entrance channel beyond what is required to place the structure's foundation is not included in this project.

The preferred alternative layout and cross-sections are shown in attached Figure 1 and Figure 2 respectively.

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Recently, residents of Portlock Beach have expressed interest to SEI in a sand back-passing scheme to nourish eroded beaches fronting their properties. This process would bring sand that accumulates adjacent to the groin up the beach to sand-starved, eroded areas. The L-head groin retains enough sand for this to be a viable option when the groin has reached capacity. As the groin approaches its maximum sediment trapping capacity, an excavator and small off-road capable trucks could be used to carry the sand up the beach. This process could be repeated as needed every 3 to 5 years to ensure that sand doesn't bypass the groin into the channel.

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With this consultation, we welcome any comments and opinions that DLNR-SHPD may have on this project. Please feel free to contact me should you have additional questions. Thank you for your time and considerations.

Sincerely,

Derek Linsley
Coastal Engineer
Sea Engineering, Inc.
(808) 259-7966 ext. 21

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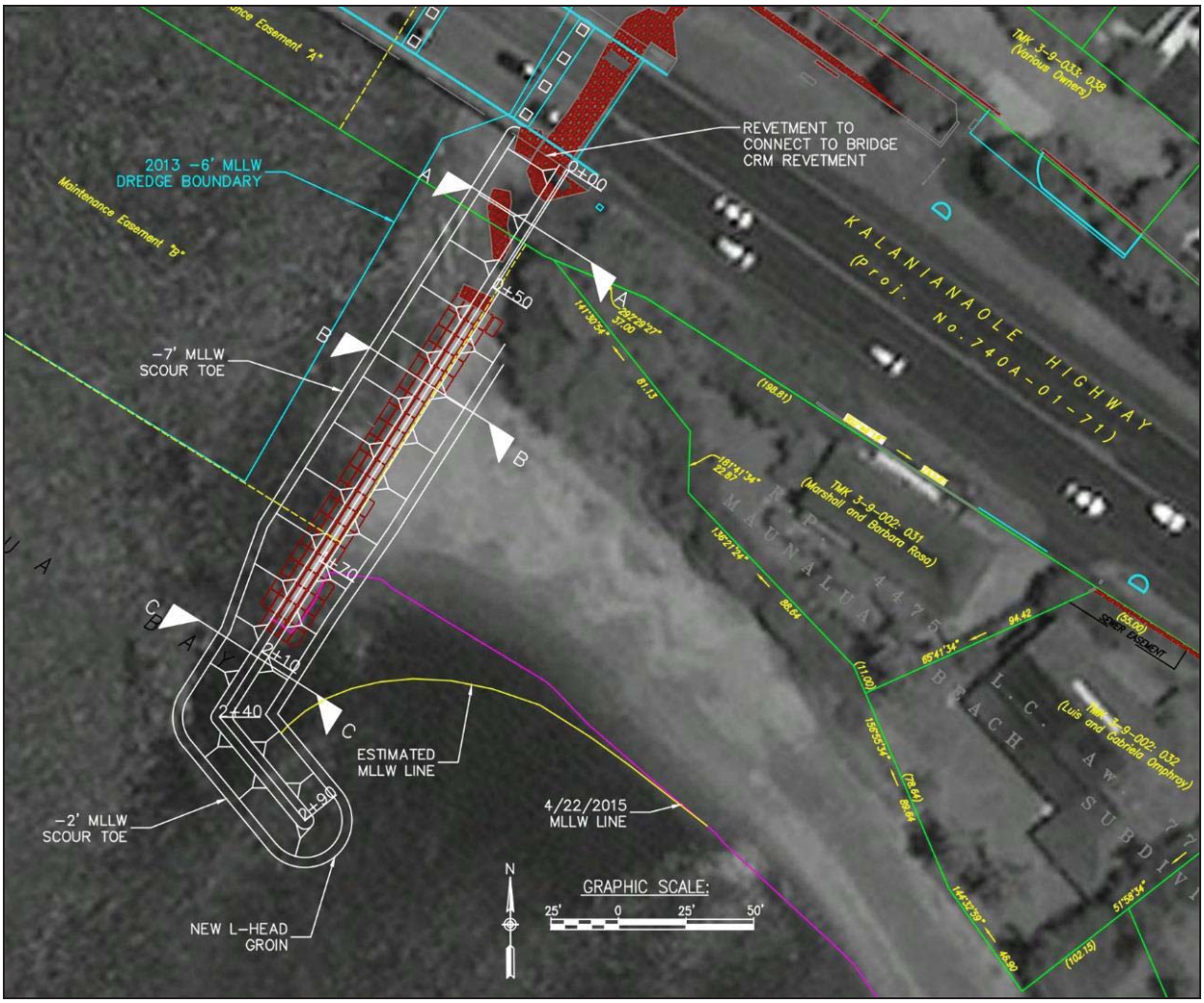

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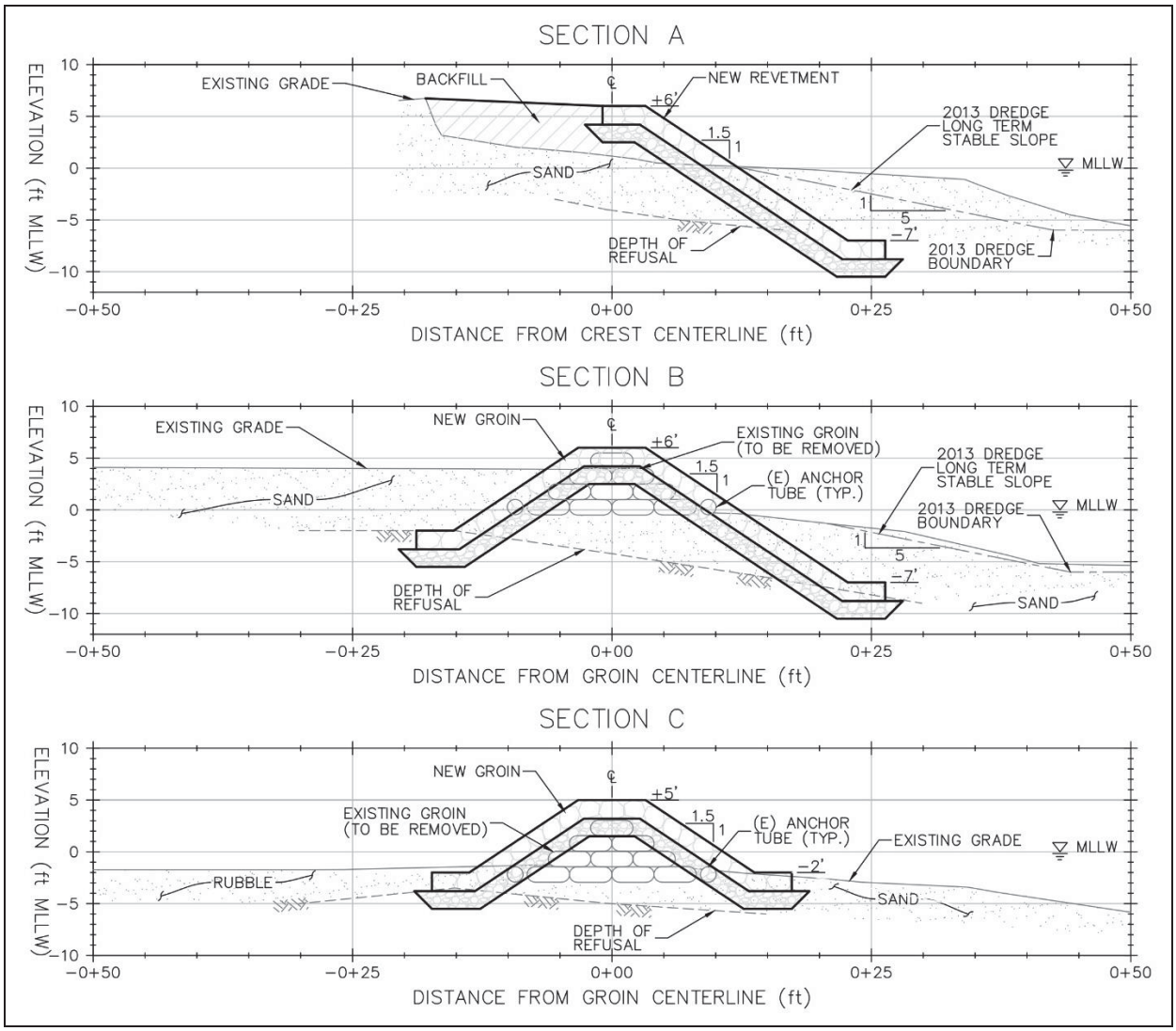

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March 31, 2016

Mr. Alec Wong, Chief
Clean Water Branch
State of Hawaii, Department of Health
919 Ala Moana Blvd., Room 301
Honolulu, HI, 96814

Subject: Consultation for Hawaii Kai Marina Groin Replacement

Dear Mr. Wong,

The Hawaii Kai Marina Community Association (HKMCA) is proposing to replace the sandbag groin at the Hawaii Kai Marina entrance channel with a permanent, engineered structure. Sea Engineering, Inc. (SEI) is working with the HKMCA for planning and design of the groin replacement and preparation of an Environmental Assessment (EA) in accordance with HRS Chapter 343. The purpose of this letter is to inform you of the start of project planning, design, and EA preparation and to solicit any advance questions or comments that you may have.

The Hawaii Kai Marina entrance channel groin is a 150-ft long sandbag structure located on the east side of the main marina entrance channel, on Portlock Beach. The marina is owned and administered by the HKMCA; however, the entrance channel and groin are located within a Perpetual, Non-Exclusive Maintenance Easement granted in 2004 by the Board of Land and Natural Resources (BLNR). The groin was originally constructed in 2004 as an experimental structure and was rebuilt in 2013. Analysis shows that the groin has slowed the longshore transport of sand along Portlock Beach and has reduced the rate of sediment accumulation in the entrance channel.

Geotextile sandbag structures are temporary in nature. Though loss of the structure is not expected in the immediate future, the groin's effectiveness as a sand retention device is likely to degrade over time. Experience has shown that loss of the structure would lead to erosion of Portlock Beach and shoaling of the marina entrance channel.

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Five designs for a permanent replacement for the existing sandbag groin were developed and are described in Table 1. All designs include a rock rubble mound groin and a 50-foot revetment

section that ties into the Kalanianaole Highway Bridge concrete rubble masonry (CRM) abutment. The structures are centered on the centerline of the existing sandbag groin. Design variations include:

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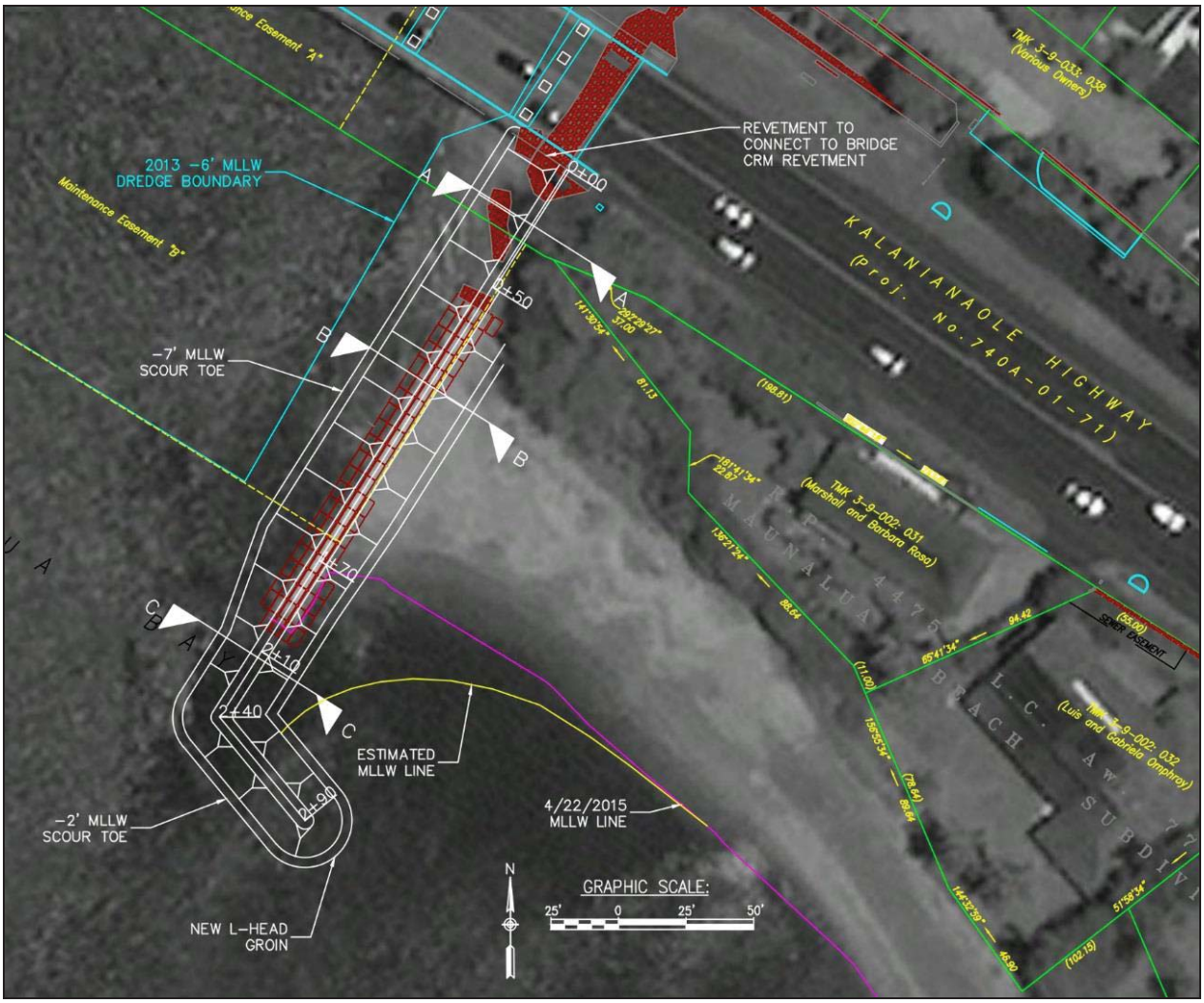
Derek Linsley
Coastal Engineer
Sea Engineering, Inc.
(808) 259-7966 ext. 21

Cc: Beverly Liddle, Hawaii Kai Marina Community Association



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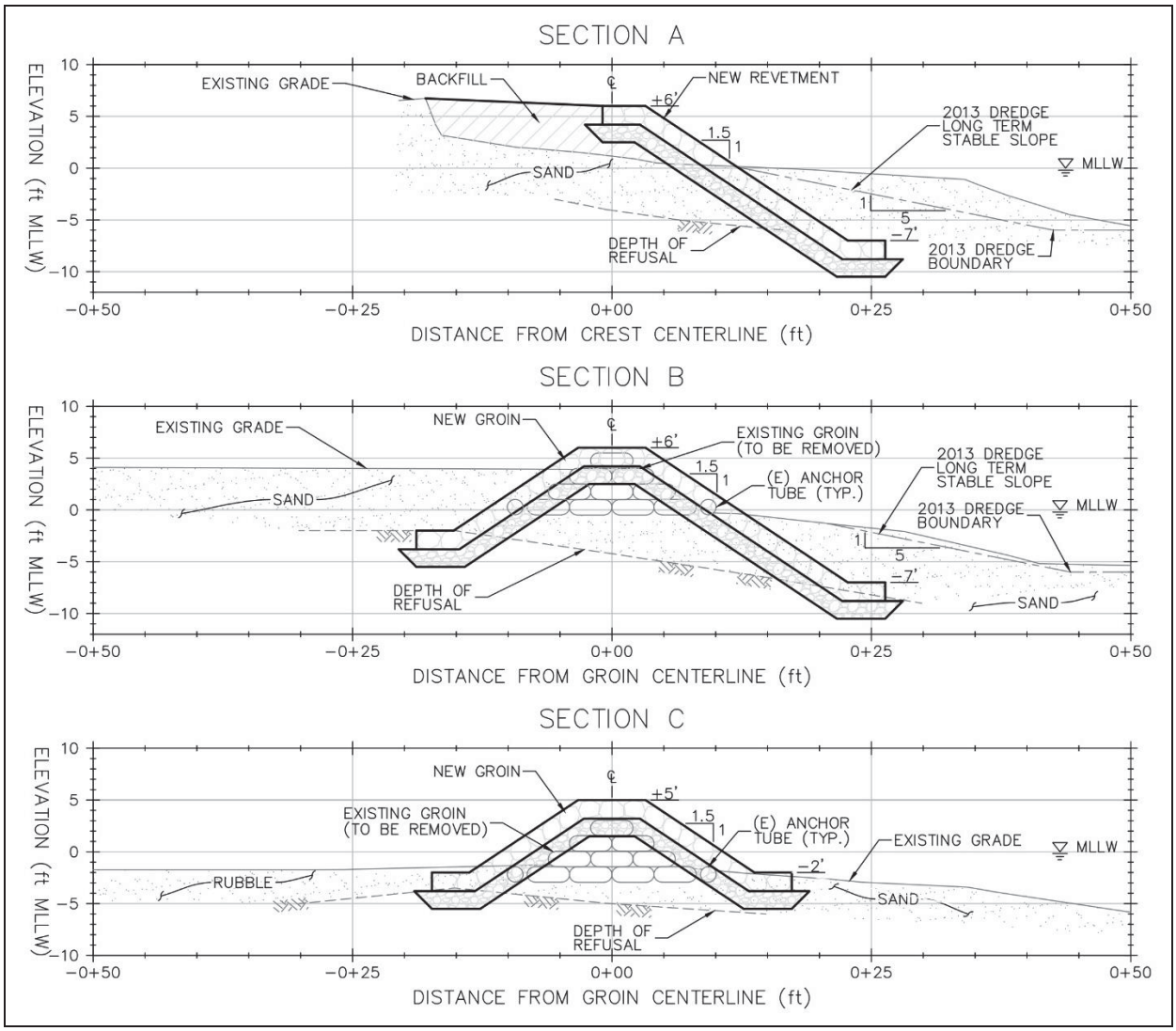

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March 31, 2016

Mr. Darrell T. Young, Deputy Director
Harbors Division
Department of Transportation, State of Hawaii
Hale Awa Ku Moku Building
79 South Nimitz Highway
Honolulu, HI 96813-4898

Subject: Consultation for Hawaii Kai Marina Groin Replacement

Dear Mr. Young,

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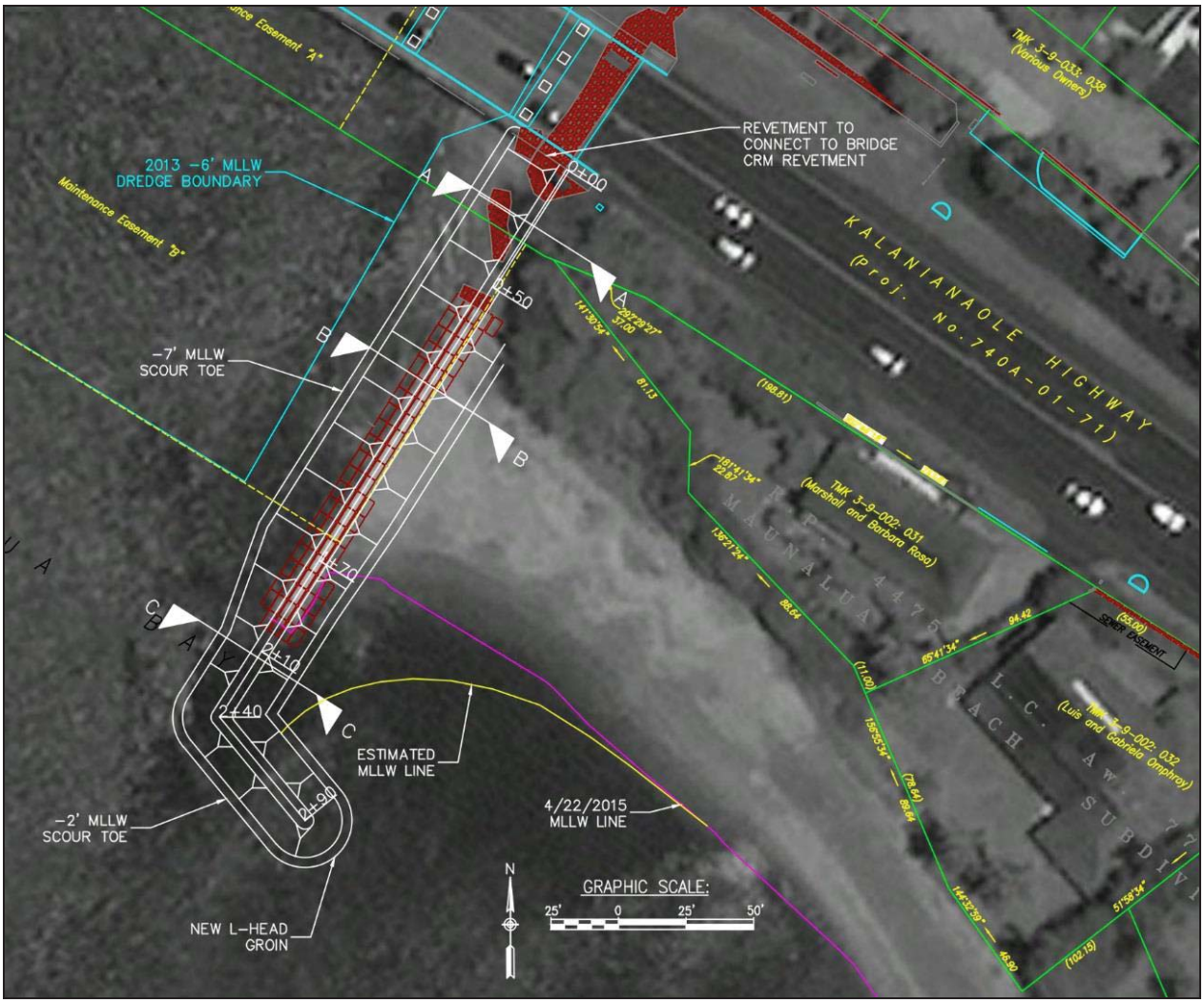

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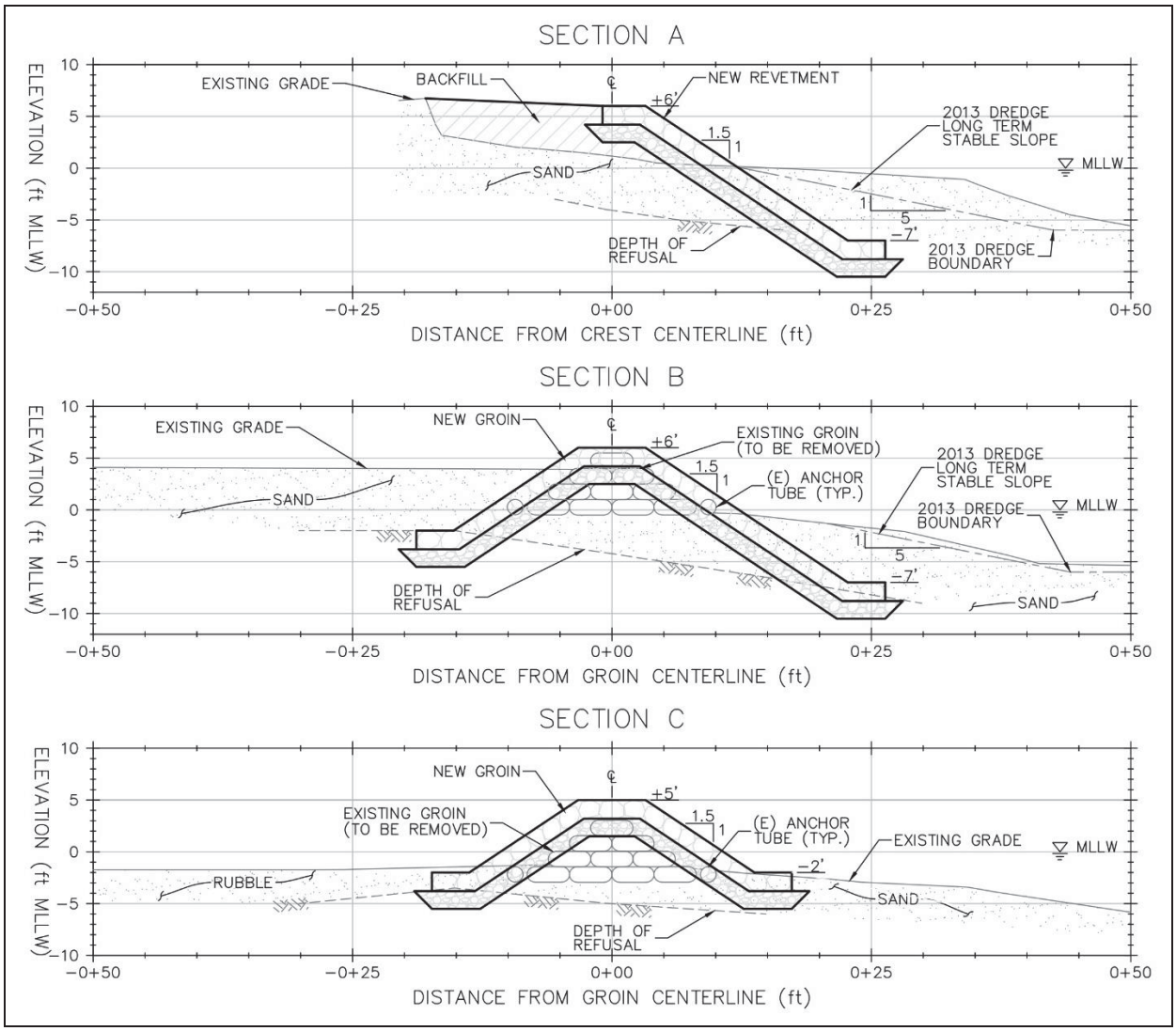

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March 31, 2016

Mr. George Atta, Director
Department of Planning and Permitting
City and County of Honolulu
650 S. King St.
Honolulu, HI 96813

Subject: Consultation for Hawaii Kai Marina Groin Replacement

Dear Mr. Atta,

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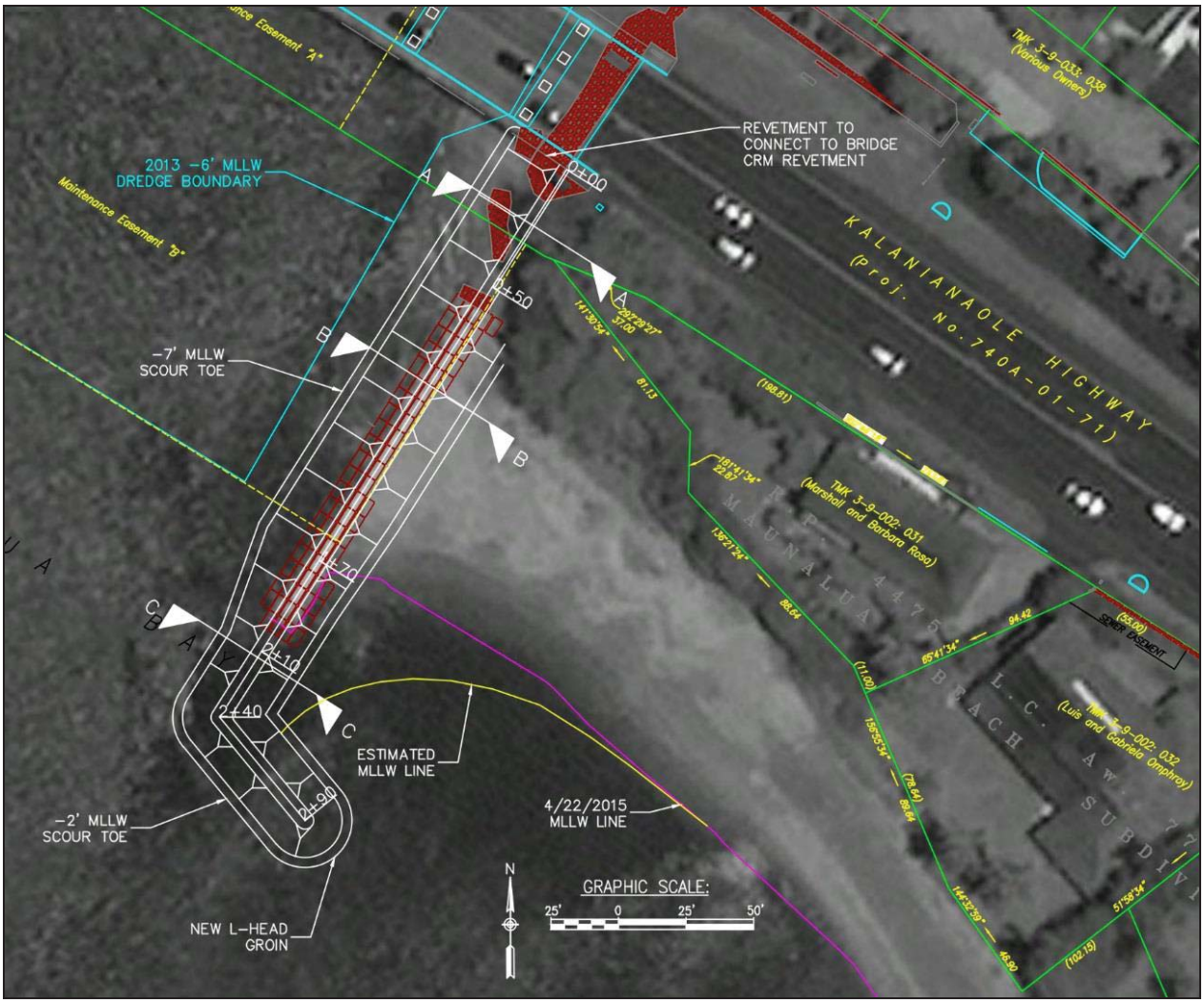

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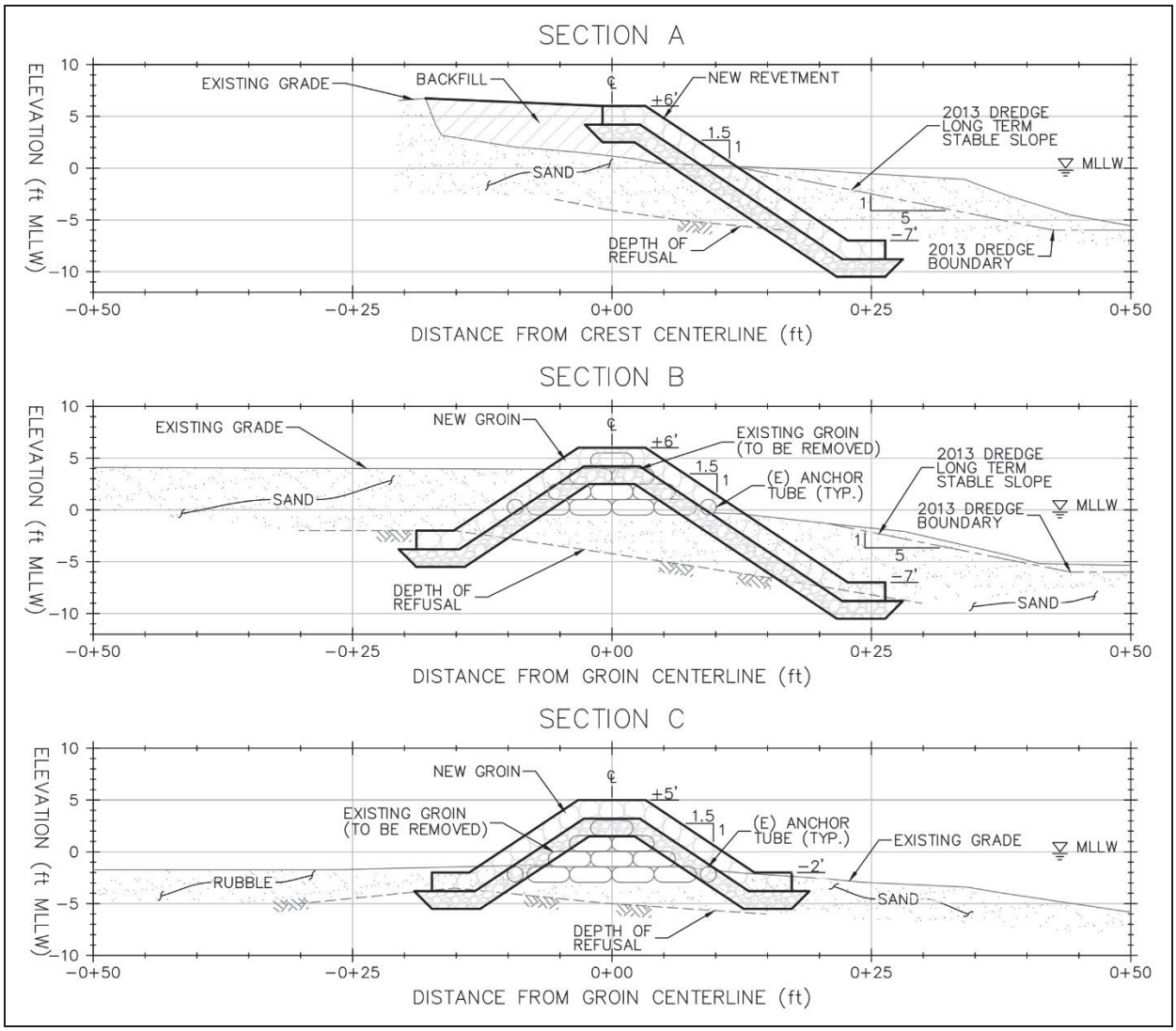

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Sea Engineering, Inc.

Makai Research Pier • Waimanalo, Hawaii 96795-1820 • E-mail: sei@seaengineering.com
Phone: (808) 259-7966 / FAX (808) 259-8143 • Website: www.seaengineering.com

March 31, 2016

Mr. Dean Higuchi
US Environmental Protection Agency
Pacific Islands Contact Office
PO Box 50003
Honolulu, HI 96850

Subject: Consultation for Hawaii Kai Marina Groin Replacement

Dear Mr. Higuchi,

The Hawaii Kai Marina Community Association (HKMCA) is proposing to replace the sandbag groin at the Hawaii Kai Marina entrance channel with a permanent, engineered structure. Sea Engineering, Inc. (SEI) is working with the HKMCA for planning and design of the groin replacement and preparation of an Environmental Assessment (EA) in accordance with HRS Chapter 343. The purpose of this letter is to inform you of the start of project planning, design, and EA preparation and to solicit any advance questions or comments that you may have.

The Hawaii Kai Marina entrance channel groin is a 150-ft long sandbag structure located on the east side of the main marina entrance channel, on Portlock Beach. The marina is owned and administered by the HKMCA; however, the entrance channel and groin are located within a Perpetual, Non-Exclusive Maintenance Easement granted in 2004 by the Board of Land and Natural Resources (BLNR). The groin was originally constructed in 2004 as an experimental structure and was rebuilt in 2013. Analysis shows that the groin has slowed the longshore transport of sand along Portlock Beach and has reduced the rate of sediment accumulation in the entrance channel.

Geotextile sandbag structures are temporary in nature. Though loss of the structure is not expected in the immediate future, the groin's effectiveness as a sand retention device is likely to degrade over time. Experience has shown that loss of the structure would lead to erosion of Portlock Beach and shoaling of the marina entrance channel.

Replacement Plan

SEI has completed a preliminary design effort and explored multiple options for a replacement structure, including straight and L-head groins with varying lengths. Maintenance of the existing groin and the "No Action" alternative were also considered.

Five designs for a permanent replacement for the existing sandbag groin were developed and are described in Table 1. All designs include a rock rubble mound groin and a 50-foot revetment

section that ties into the Kalanianaole Highway Bridge concrete rubble masonry (CRM) abutment. The structures are centered on the centerline of the existing sandbag groin. Design variations include:

- length of the groin stem, and
- inclusion of an L-head.

A sediment transport rate of 400 cubic yards per year was used for the calculation of updrift sediment infill. The sediment transport rate was estimated using both aerial images and topographic surveys.

Table 1: Groin alternatives summary table

	Layout	Revetment Length (ft)	Stem Length (ft)	L-Head Length (ft)	Toe Elevation (ft)	Additional Sediment Capacity (cu yards)	Additional Capacity (years)
1.	Existing length	50	140	0	-7	0	0
2.	Existing length w/ L-head	50	140	50	-7	350	1
3.	Extended length	50	180	0	-7	1,000	2.5
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5.	Maximum Length w/L-head	50	220	50	-7	1,650	4

All designs presented above will slow the transport of sand into the entrance channel. SEI's preferred design is the Extended Groin with L-head layout (Alternative 4 in Table 1). This design most efficiently traps sand on Portlock Beach. The shorter option traps less sediment and analysis of the longer option shows diminished returns that do not justify the additional stem length.

The L-head configuration increases the sediment carrying capacity of the structure without further extending the structure offshore and reduces the potential for wave-generated current formation along the Portlock side of the stem and around the tip of the structure.

The substrate under the groin footprint is loose sand/cobble, thus the groin will likely require an extended toe for scour protection. The HKMCA has asked SEI to design a deep toe at -7 ft MLLW on the channel side of the structure to allow widening of the dredging area in the entrance channel without compromising the structure. Dredging of the entrance channel beyond what is required to place the structure's foundation is not included in this project.

The preferred alternative layout and cross-sections are shown in attached Figure 1 and Figure 2

respectively.

Beach Maintenance Plan

Recently, residents of Portlock Beach have expressed interest to SEI in a sand back-passing scheme to nourish eroded beaches fronting their properties. This process would bring sand that accumulates adjacent to the groin up the beach to sand-starved, eroded areas. The L-head groin retains enough sand for this to be a viable option when the groin has reached capacity. As the groin approaches its maximum sediment trapping capacity, an excavator and small off-road capable trucks could be used to carry the sand up the beach. This process could be repeated as needed every 3 to 5 years to ensure that sand doesn't bypass the groin into the channel.

The HKMCA has also expressed interest in back-passing as a maintenance option. SEI recommends that back-passing be done before beginning construction of the new groin to minimize the resulting transport of sand into the channel. Aerial imagery and topographic surveys indicate that the existing sandbag groin has retained 430 cubic yards of sediment on Portlock Beach between its reconstruction in 2013 and a topographic survey performed in 2015. This is equivalent to a beach width increase of 15 feet. Back-passing would bring the shoreline to its 2013 position and increase the infill time listed in Table 1.

Construction Methodology

SEI expects construction of the new structure to be challenging due to limited access and limited space for a staging area on the shoreline. We expect some blocking of the entrance channel and some local disruption due to the need for staging, access, and stockpile areas.

With this consultation, we welcome any comments and opinions that the US EPA may have on this project. Please feel free to contact me should you have additional questions. Thank you for your time and considerations.

Sincerely,

Derek Linsley
Coastal Engineer
Sea Engineering, Inc.
(808) 259-7966 ext. 21

Cc: Beverly Liddle, Hawaii Kai Marina Community Association

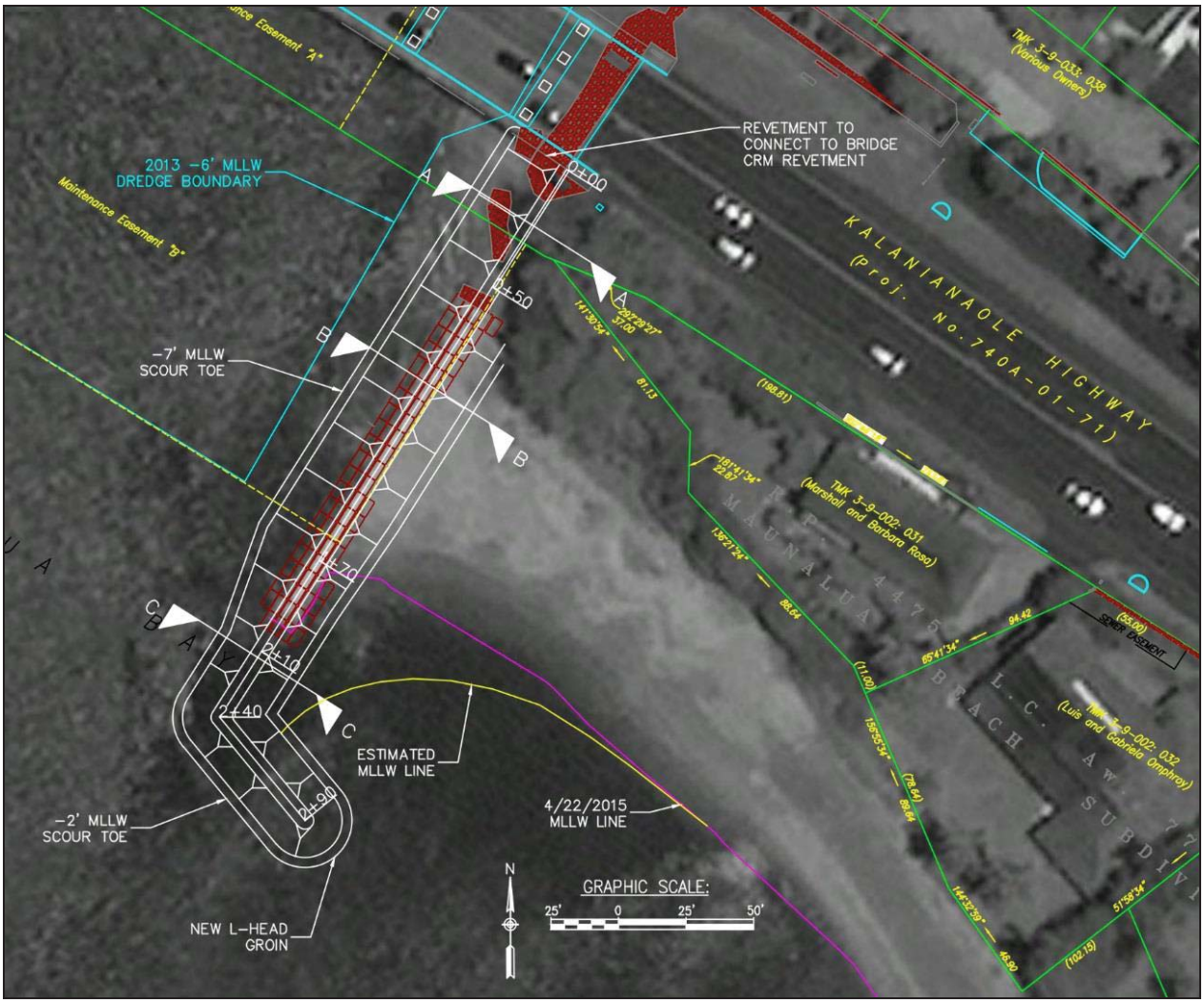

Figure 1: Extended Length with L-head option layout (existing sandbags shown in red)

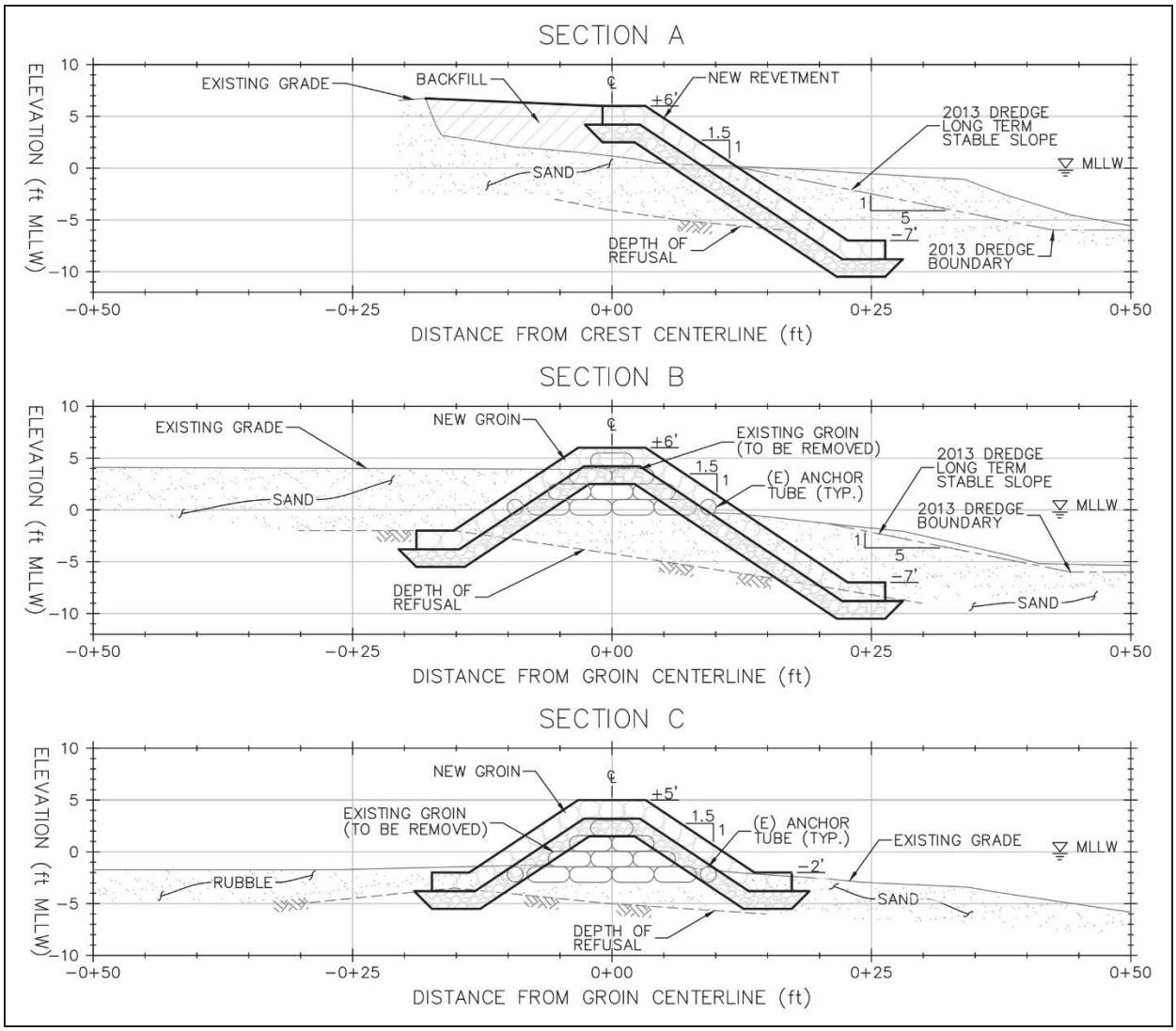

Figure 2: Extended Length with L-head option sections

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March 31, 2016

Mr. Michael D. Tosatto, Regional Administrator
Pacific Islands Regional Office
National Marine Fisheries Service
1845 Wasp Blvd., Building 176
Honolulu, HI 96818

Subject: Consultation for Hawaii Kai Marina Groin Replacement

Dear Mr. Tosatto,

The Hawaii Kai Marina Community Association (HKMCA) is proposing to replace the sandbag groin at the Hawaii Kai Marina entrance channel with a permanent, engineered structure. Sea Engineering, Inc. (SEI) is working with the HKMCA for planning and design of the groin replacement and preparation of an Environmental Assessment (EA) in accordance with HRS Chapter 343. The purpose of this letter is to inform you of the start of project planning, design, and EA preparation and to solicit any advance questions or comments that you may have.

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section that ties into the Kalanianaole Highway Bridge concrete rubble masonry (CRM) abutment. The structures are centered on the centerline of the existing sandbag groin. Design variations include:

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The substrate under the groin footprint is loose sand/cobble, thus the groin will likely require an extended toe for scour protection. The HKMCA has asked SEI to design a deep toe at -7 ft MLLW on the channel side of the structure to allow widening of the dredging area in the entrance channel without compromising the structure. Dredging of the entrance channel beyond what is required to place the structure's foundation is not included in this project.

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Construction Methodology

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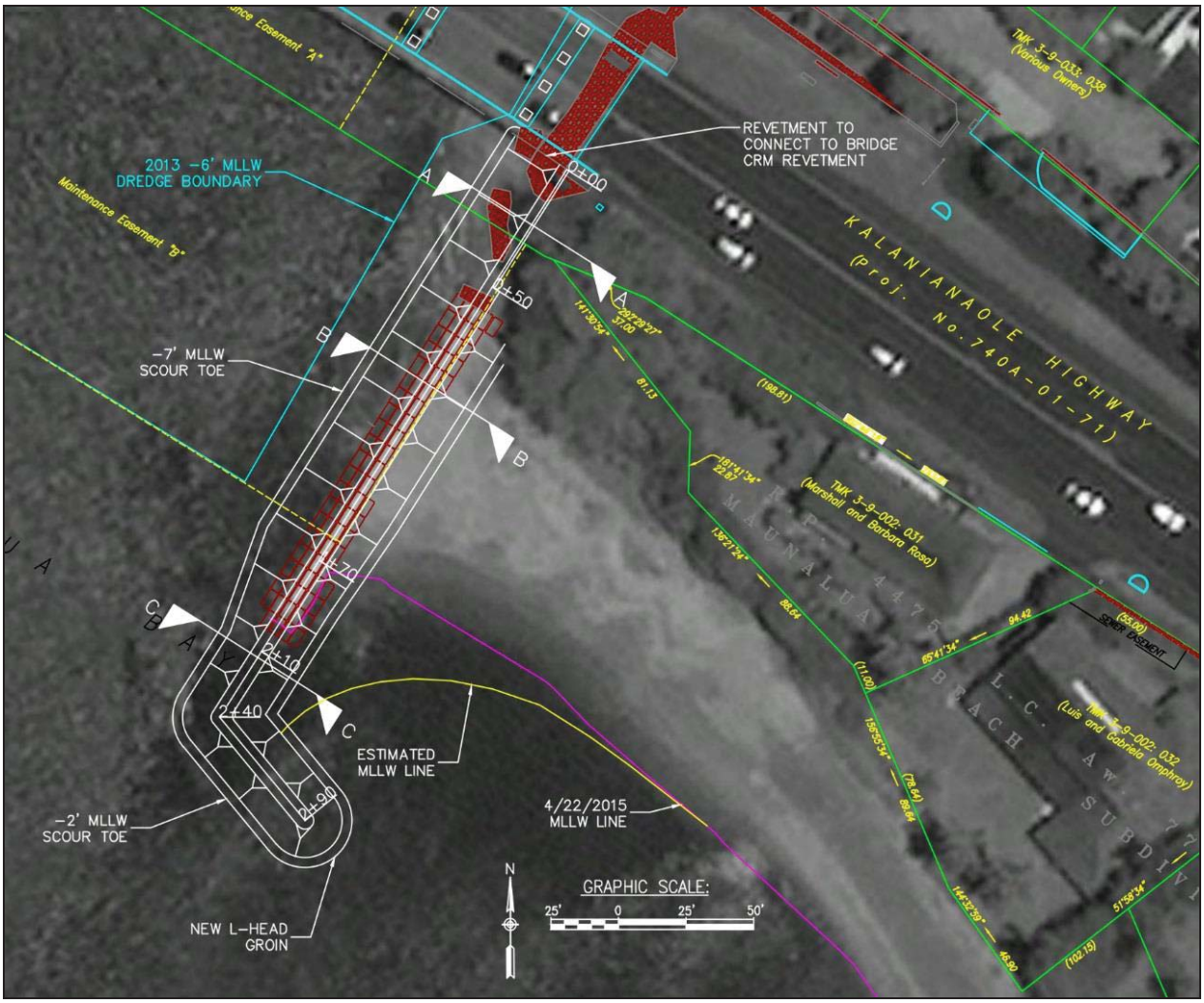
With this consultation, we welcome any comments and opinions that NOAA Fisheries may have on this project. Please feel free to contact me should you have additional questions. Thank you for your time and considerations.

Sincerely,

Derek Linsley
Coastal Engineer
Sea Engineering, Inc.
(808) 259-7966 ext. 21

Cc: Beverly Liddle, Hawaii Kai Marina Community Association



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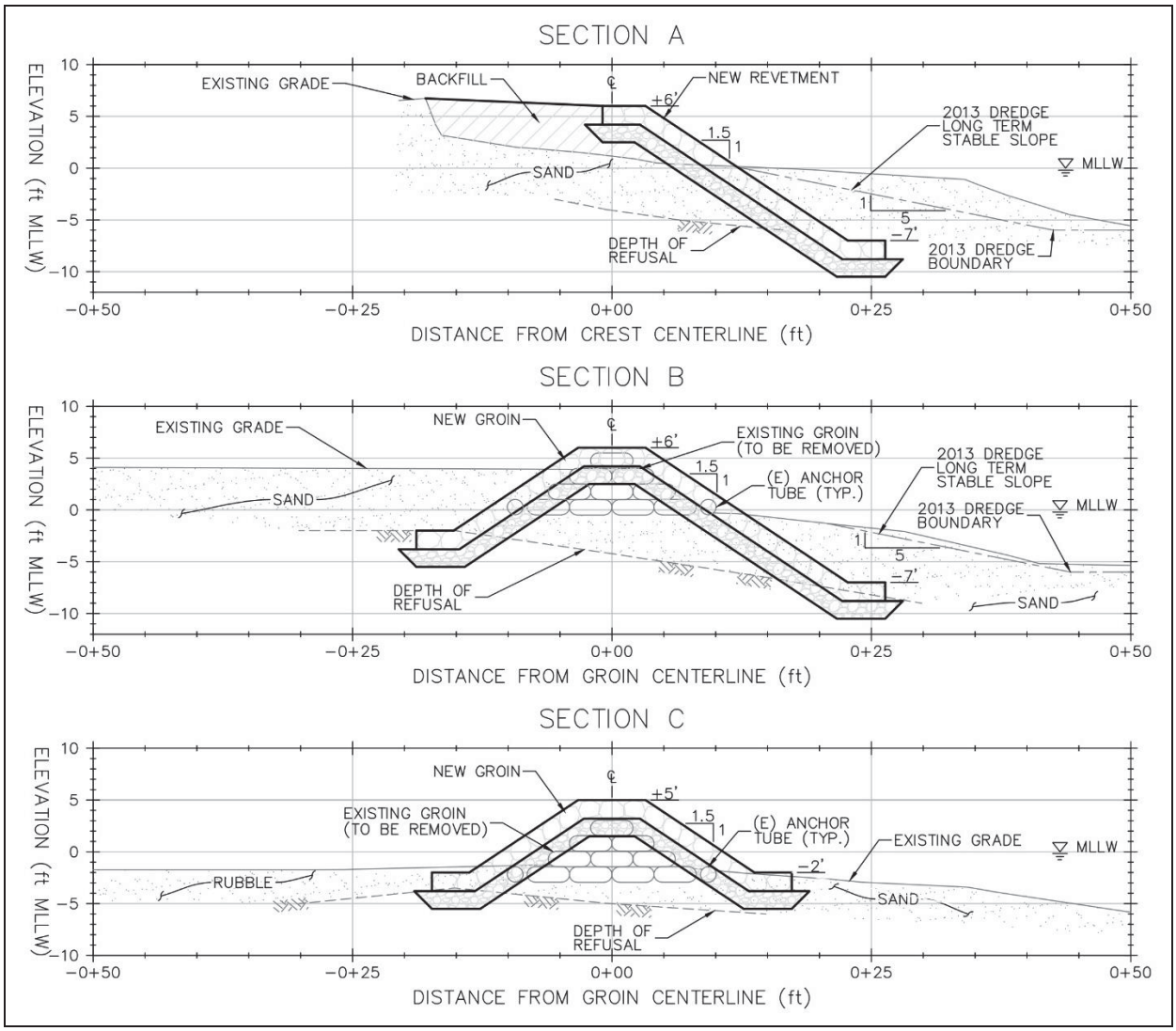

Figure 2: Extended Length with L-head option sections

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March 31, 2016

Mr. Allen Kam, AICP
Office of Hawaiian Affairs
560 N. Nimitz Hwy, Suite 200
Honolulu, HI 96817

Subject: Consultation for Hawaii Kai Marina Groin Replacement

Dear Mr. Kam,

The Hawaii Kai Marina Community Association (HKMCA) is proposing to replace the sandbag groin at the Hawaii Kai Marina entrance channel with a permanent, engineered structure. Sea Engineering, Inc. (SEI) is working with the HKMCA for planning and design of the groin replacement and preparation of an Environmental Assessment (EA) in accordance with HRS Chapter 343. The purpose of this letter is to inform you of the start of project planning, design, and EA preparation and to solicit any advance questions or comments that you may have.

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Geotextile sandbag structures are temporary in nature. Though loss of the structure is not expected in the immediate future, the groin's effectiveness as a sand retention device is likely to degrade over time. Experience has shown that loss of the structure would lead to erosion of Portlock Beach and shoaling of the marina entrance channel.

Replacement Plan

SEI has completed a preliminary design effort and explored multiple options for a replacement structure, including straight and L-head groins with varying lengths. Maintenance of the existing groin and the "No Action" alternative were also considered.

Five designs for a permanent replacement for the existing sandbag groin were developed and are described in Table 1. All designs include a rock rubble mound groin and a 50-foot revetment section that ties into the Kalanianaole Highway Bridge concrete rubble masonry (CRM)

abutment. The structures are centered on the centerline of the existing sandbag groin. Design variations include:

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The substrate under the groin footprint is loose sand/cobble, thus the groin will likely require an extended toe for scour protection. The HKMCA has asked SEI to design a deep toe at -7 ft MLLW on the channel side of the structure to allow widening of the dredging area in the entrance channel without compromising the structure. Dredging of the entrance channel beyond what is required to place the structure's foundation is not included in this project.

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Beach Maintenance Plan

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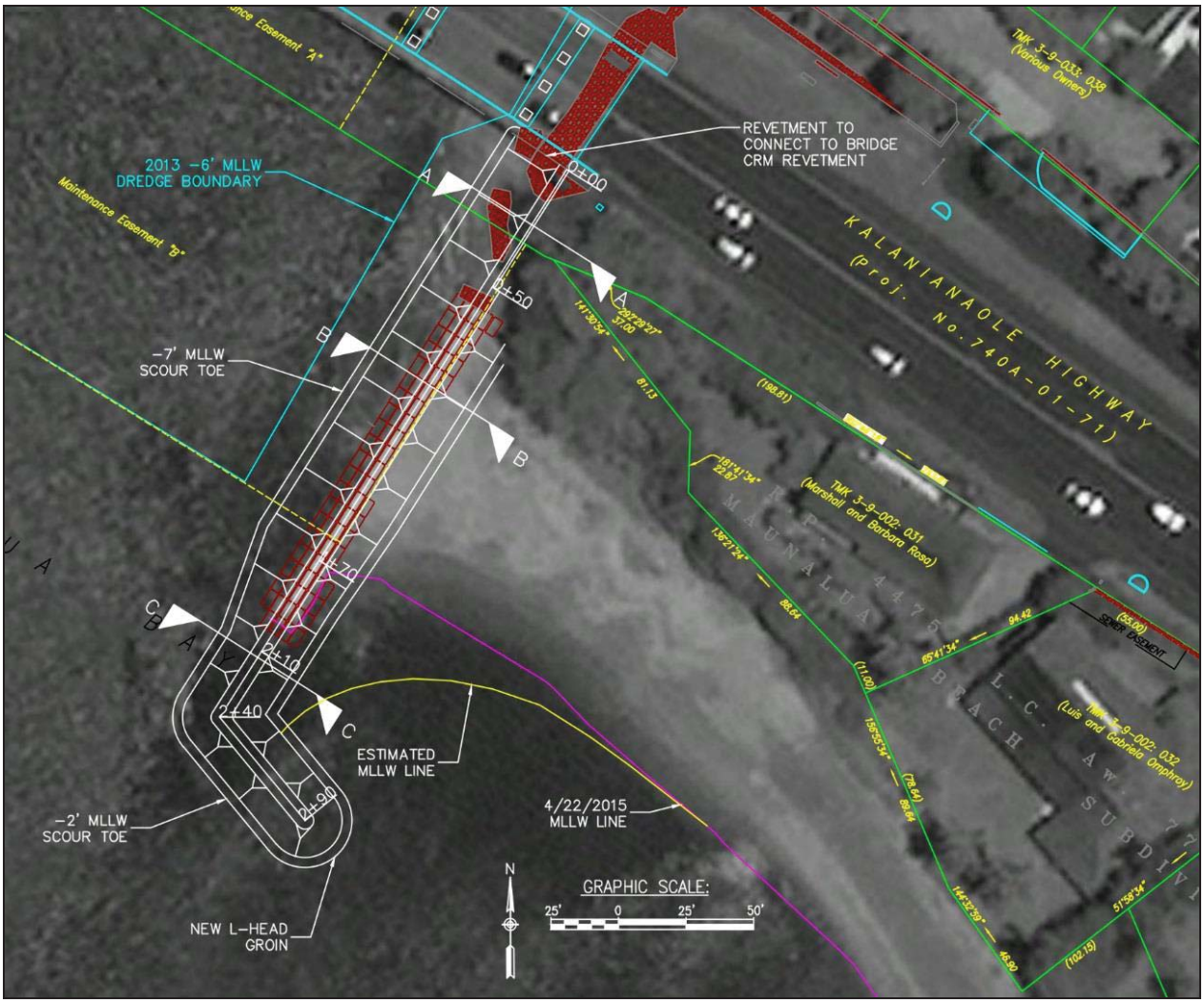
With this consultation, we welcome any comments and opinions that OHA may have on this project. Please feel free to contact me should you have additional questions. Thank you for your time and considerations.

Sincerely,

Derek Linsley
Coastal Engineer
Sea Engineering, Inc.
(808) 259-7966 ext. 21

Cc: Beverly Liddle, Hawaii Kai Marina Community Association



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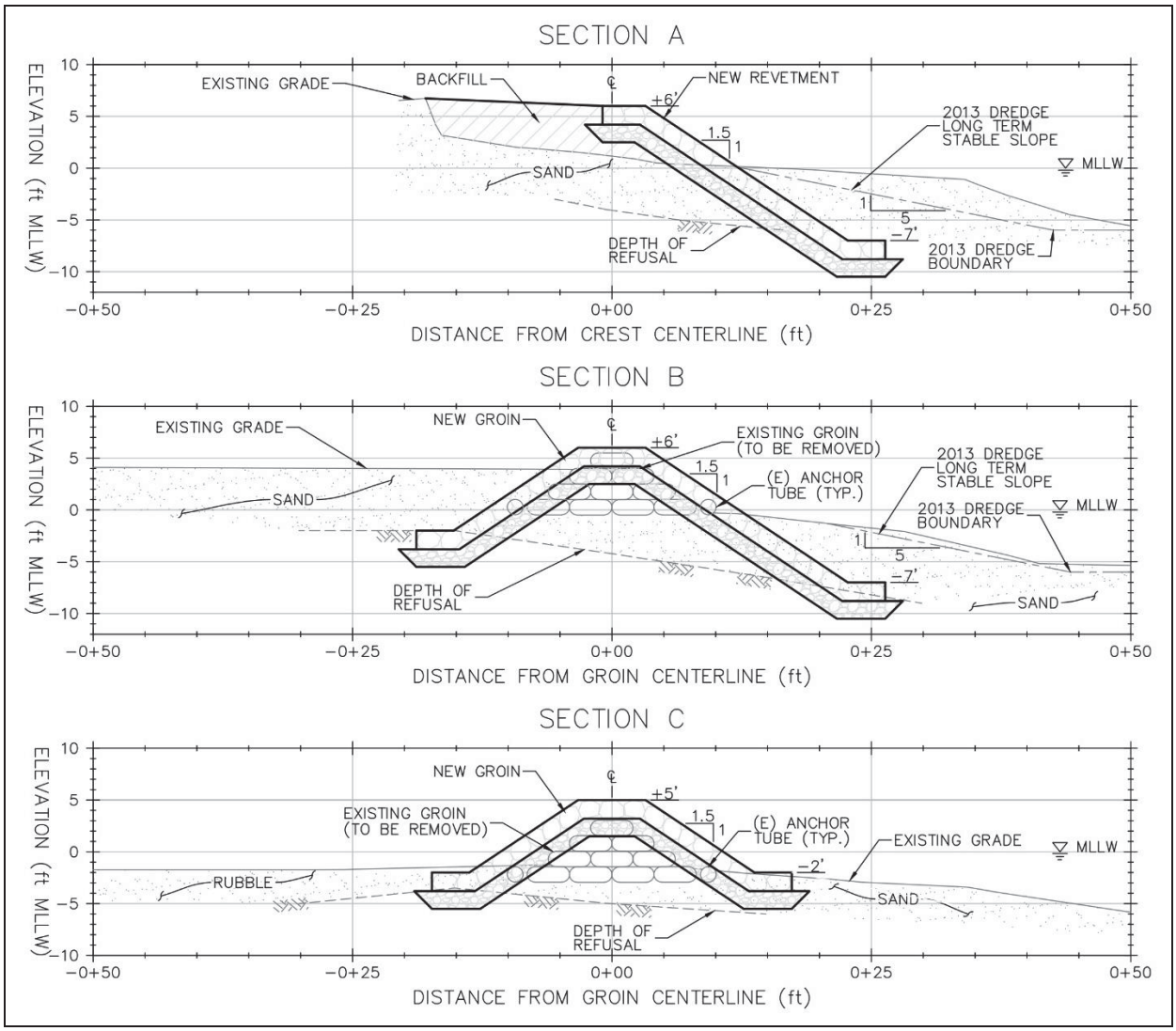

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March 31, 2016

Mr. Leo R. Asuncion, Jr., Acting Director
Office of Planning, State of Hawaii
PO Box 2359
Honolulu, HI 96804-2359

Subject: Consultation for Hawaii Kai Marina Groin Replacement

Dear Mr. Asuncion,

The Hawaii Kai Marina Community Association (HKMCA) is proposing to replace the sandbag groin at the Hawaii Kai Marina entrance channel with a permanent, engineered structure. Sea Engineering, Inc. (SEI) is working with the HKMCA for planning and design of the groin replacement and preparation of an Environmental Assessment (EA) in accordance with HRS Chapter 343. The purpose of this letter is to inform you of the start of project planning, design, and EA preparation and to solicit any advance questions or comments that you may have.

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With this consultation, we welcome any comments and opinions that the State of Hawaii Office of Planning may have on this project. Please feel free to contact me should you have additional questions. Thank you for your time and considerations.

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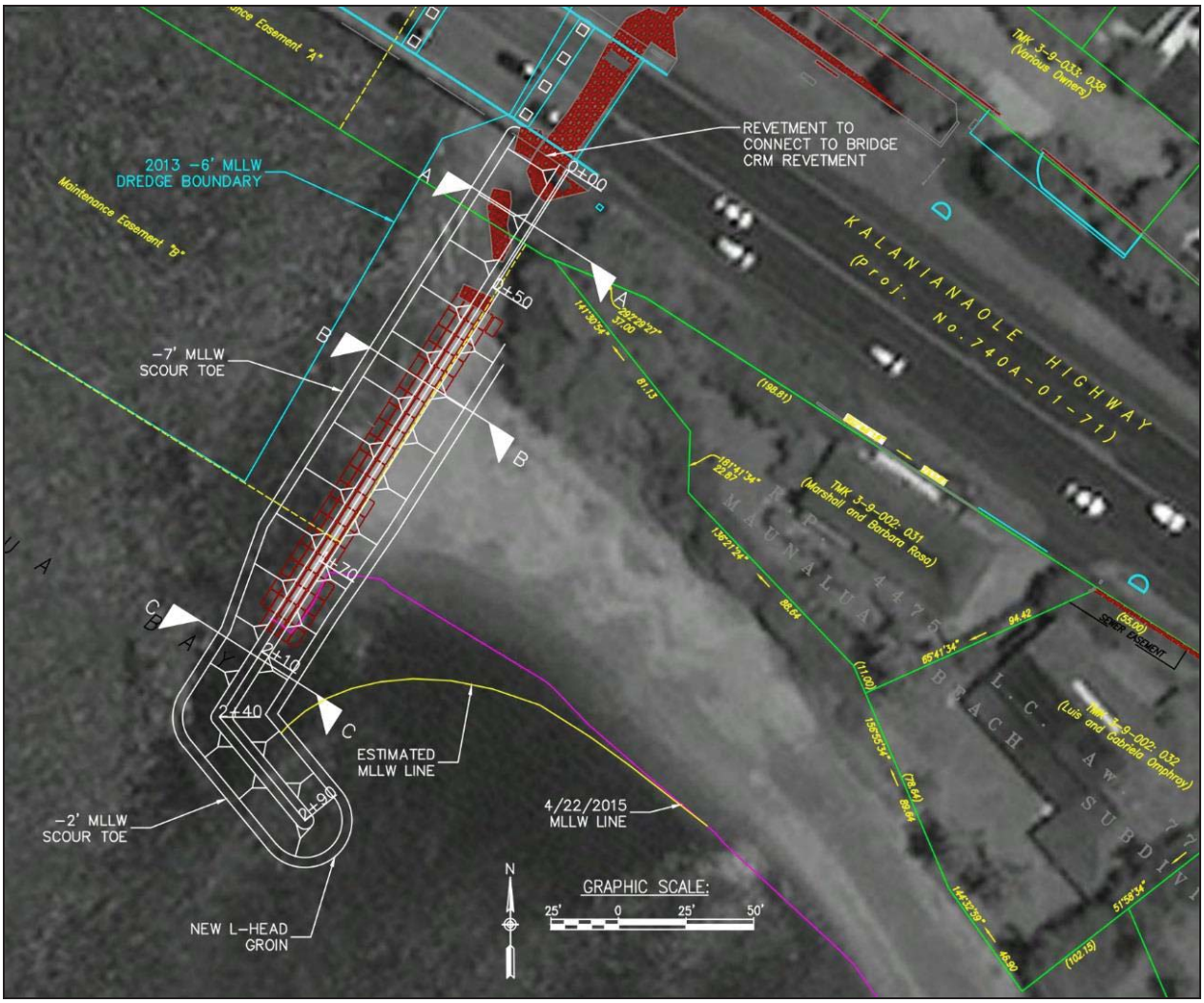

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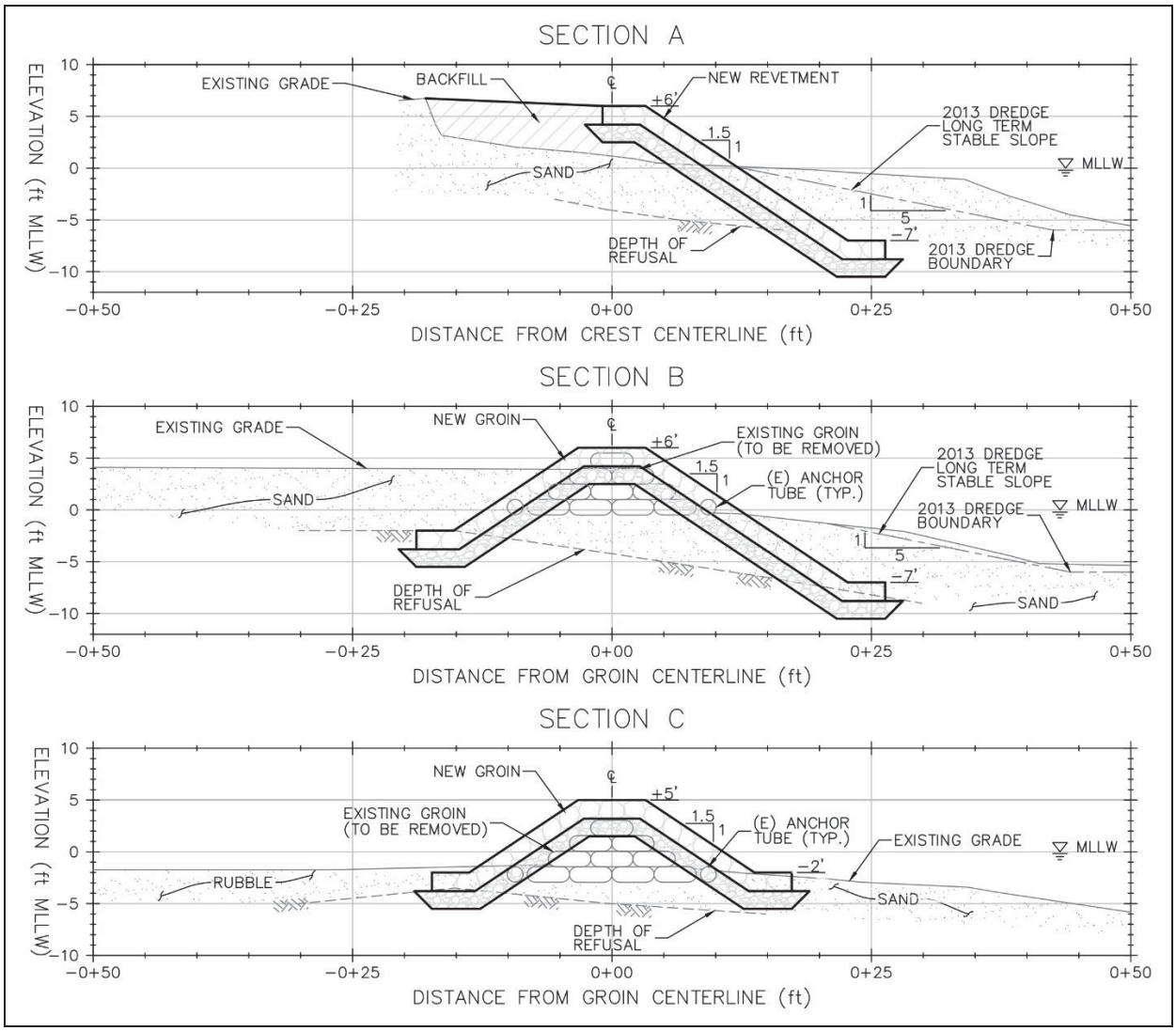

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March 31, 2016

Mr. Shane McCoy, Acting Regulatory Chief
US Army Corps of Engineers, Honolulu District
Building 230
Fort Shafter, HI 96858-5440

Subject: Consultation for Hawaii Kai Marina Groin Replacement

Dear Mr. McCoy,

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5.	Maximum Length w/L-head	50	220	50	-7	1,650	4

All designs presented above will slow the transport of sand into the entrance channel. SEI's preferred design is the Extended Groin with L-head layout (Alternative 4 in Table 1). This design most efficiently traps sand on Portlock Beach. The shorter option traps less sediment and analysis of the longer option shows diminished returns that do not justify the additional stem length.

The L-head configuration increases the sediment carrying capacity of the structure without further extending the structure offshore and reduces the potential for wave-generated current formation along the Portlock side of the stem and around the tip of the structure.

The substrate under the groin footprint is loose sand/cobble, thus the groin will likely require an extended toe for scour protection. The HKMCA has asked SEI to design a deep toe at -7 ft MLLW on the channel side of the structure to allow widening of the dredging area in the entrance channel without compromising the structure. Dredging of the entrance channel beyond what is required to place the structure's foundation is not included in this project.

The preferred alternative layout and cross-sections are shown in attached Figure 1 and Figure 2 respectively.

Beach Maintenance Plan

Recently, residents of Portlock Beach have expressed interest to SEI in a sand back-passing scheme to nourish eroded beaches fronting their properties. This process would bring sand that accumulates adjacent to the groin up the beach to sand-starved, eroded areas. The L-head groin retains enough sand for this to be a viable option when the groin has reached capacity. As the groin approaches its maximum sediment trapping capacity, an excavator and small off-road capable trucks could be used to carry the sand up the beach. This process could be repeated as needed every 3 to 5 years to ensure that sand doesn't bypass the groin into the channel.

The HKMCA has also expressed interest in back-passing as a maintenance option. SEI recommends that back-passing be done before beginning construction of the new groin to minimize the resulting transport of sand into the channel. Aerial imagery and topographic surveys indicate that the existing sandbag groin has retained 430 cubic yards of sediment on Portlock Beach between its reconstruction in 2013 and a topographic survey performed in 2015. This is equivalent to a beach width increase of 15 feet. Back-passing would bring the shoreline to its 2013 position and increase the infill time listed in Table 1.

Construction Methodology

SEI expects construction of the new structure to be challenging due to limited access and limited space for a staging area on the shoreline. We expect some blocking of the entrance channel and some local disruption due to the need for staging, access, and stockpile areas.

With this consultation, we welcome any comments and opinions that USACE-POH may have on this project. Please feel free to contact me should you have additional questions. Thank you for your time and considerations.

Sincerely,

Derek Linsley
Coastal Engineer
Sea Engineering, Inc.
(808) 259-7966 ext. 21

Cc: Beverly Liddle, Hawaii Kai Marina Community Association

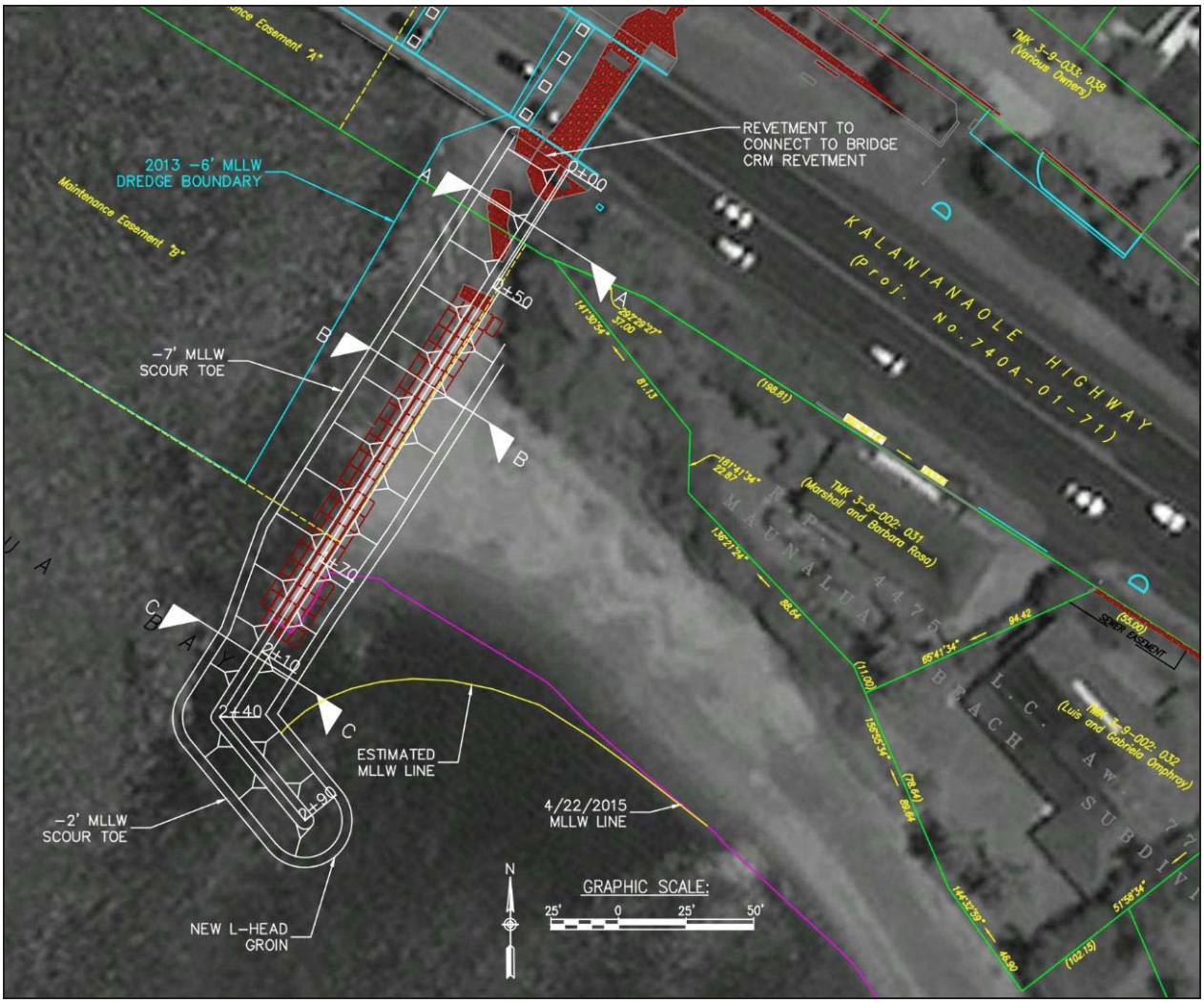

Figure 1: Extended Length with L-head option layout (existing sandbags shown in red)

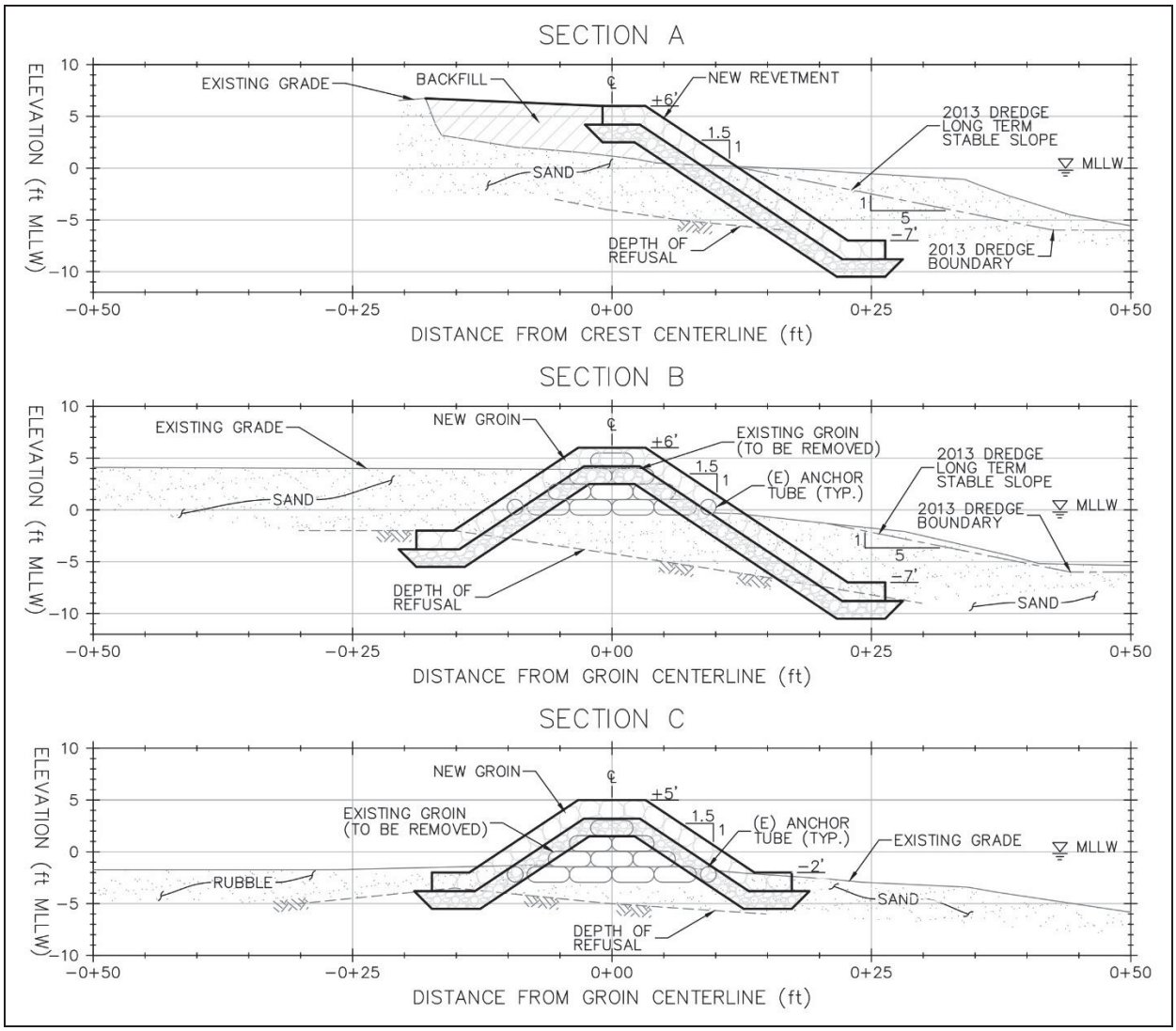

Figure 2: Extended Length with L-head option sections

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March 31, 2016

Mary Abrams, Field Supervisor
Pacific Islands Fish and Wildlife Office
US Fish and Wildlife Service
300 Ala Moana Blvd, Rm 3-122
Honolulu, HI 96850

Subject: Consultation for Hawaii Kai Marina Groin Replacement

Dear Mary Abrams,

The Hawaii Kai Marina Community Association (HKMCA) is proposing to replace the sandbag groin at the Hawaii Kai Marina entrance channel with a permanent, engineered structure. Sea Engineering, Inc. (SEI) is working with the HKMCA for planning and design of the groin replacement and preparation of an Environmental Assessment (EA) in accordance with HRS Chapter 343. The purpose of this letter is to inform you of the start of project planning, design, and EA preparation and to solicit any advance questions or comments that you may have.

The Hawaii Kai Marina entrance channel groin is a 150-ft long sandbag structure located on the east side of the main marina entrance channel, on Portlock Beach. The marina is owned and administered by the HKMCA; however, the entrance channel and groin are located within a Perpetual, Non-Exclusive Maintenance Easement granted in 2004 by the Board of Land and Natural Resources (BLNR). The groin was originally constructed in 2004 as an experimental structure and was rebuilt in 2013. Analysis shows that the groin has slowed the longshore transport of sand along Portlock Beach and has reduced the rate of sediment accumulation in the entrance channel.

Geotextile sandbag structures are temporary in nature. Though loss of the structure is not expected in the immediate future, the groin's effectiveness as a sand retention device is likely to degrade over time. Experience has shown that loss of the structure would lead to erosion of Portlock Beach and shoaling of the marina entrance channel.

Replacement Plan

SEI has completed a preliminary design effort and explored multiple options for a replacement structure, including straight and L-head groins with varying lengths. Maintenance of the existing groin and the "No Action" alternative were also considered.

Five designs for a permanent replacement for the existing sandbag groin were developed and are described in Table 1. All designs include a rock rubble mound groin and a 50-foot revetment

section that ties into the Kalanianaole Highway Bridge concrete rubble masonry (CRM) abutment. The structures are centered on the centerline of the existing sandbag groin. Design variations include:

- length of the groin stem, and
- inclusion of an L-head.

A sediment transport rate of 400 cubic yards per year was used for the calculation of updrift sediment infill. The sediment transport rate was estimated using both aerial images and topographic surveys.

Table 1: Groin alternatives summary table

	Layout	Revetment Length (ft)	Stem Length (ft)	L-Head Length (ft)	Toe Elevation (ft)	Additional Sediment Capacity (cu yards)	Additional Capacity (years)
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All designs presented above will slow the transport of sand into the entrance channel. SEI's preferred design is the Extended Groin with L-head layout (Alternative 4 in Table 1). This design most efficiently traps sand on Portlock Beach. The shorter option traps less sediment and analysis of the longer option shows diminished returns that do not justify the additional stem length.

The L-head configuration increases the sediment carrying capacity of the structure without further extending the structure offshore and reduces the potential for wave-generated current formation along the Portlock side of the stem and around the tip of the structure.

The substrate under the groin footprint is loose sand/cobble, thus the groin will likely require an extended toe for scour protection. The HKMCA has asked SEI to design a deep toe at -7 ft MLLW on the channel side of the structure to allow widening of the dredging area in the entrance channel without compromising the structure. Dredging of the entrance channel beyond what is required to place the structure's foundation is not included in this project.

The preferred alternative layout and cross-sections are shown in attached Figure 1 and Figure 2

respectively.

Beach Maintenance Plan

Recently, residents of Portlock Beach have expressed interest to SEI in a sand back-passing scheme to nourish eroded beaches fronting their properties. This process would bring sand that accumulates adjacent to the groin up the beach to sand-starved, eroded areas. The L-head groin retains enough sand for this to be a viable option when the groin has reached capacity. As the groin approaches its maximum sediment trapping capacity, an excavator and small off-road capable trucks could be used to carry the sand up the beach. This process could be repeated as needed every 3 to 5 years to ensure that sand doesn't bypass the groin into the channel.

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Construction Methodology

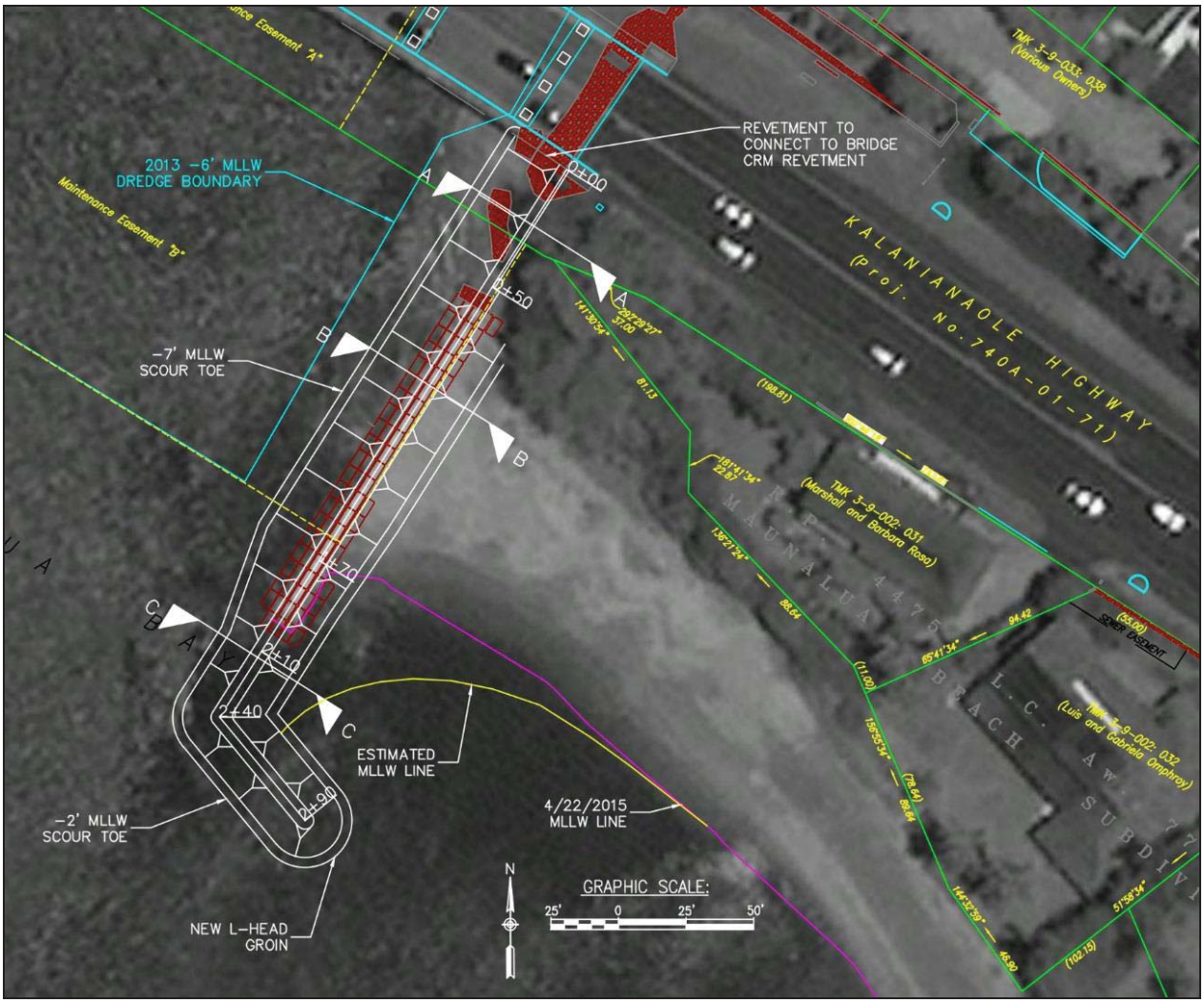
SEI expects construction of the new structure to be challenging due to limited access and limited space for a staging area on the shoreline. We expect some blocking of the entrance channel and some local disruption due to the need for staging, access, and stockpile areas.

With this consultation, we welcome any comments and opinions that the PIFWO may have on this project. Please feel free to contact me should you have additional questions. Thank you for your time and considerations.

Sincerely,

Derek Linsley
Coastal Engineer
Sea Engineering, Inc.
(808) 259-7966 ext. 21

Cc: Beverly Liddle, Hawaii Kai Marina Community Association



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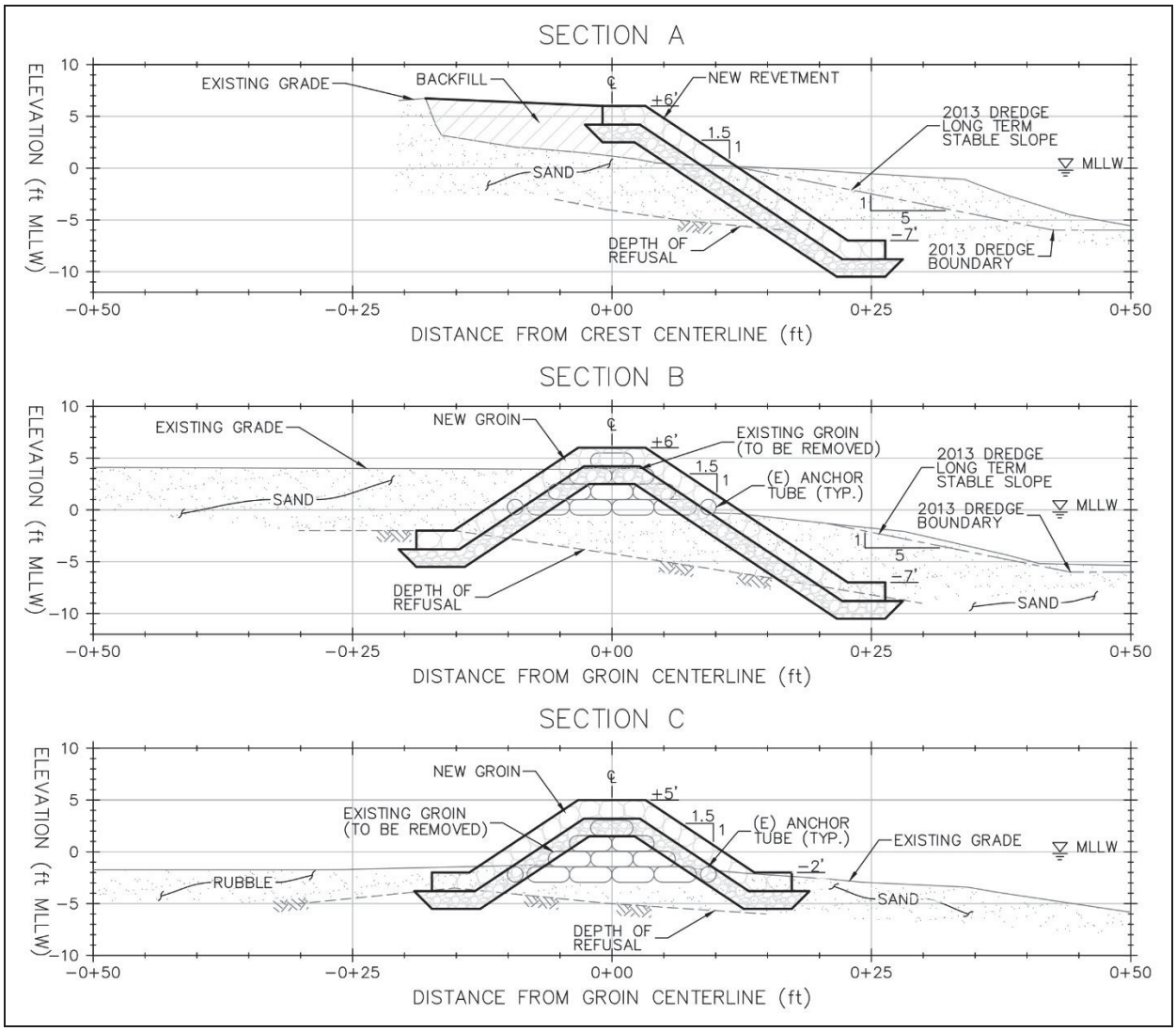

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June 13, 2016

Mr. Makani Christensen
Aha Moku o Oahu - Kona
PO Box 240353
Honolulu, HI 96824

Subject: Consultation for Hawaii Kai Marina Groin Replacement

Dear Mr. Makani Christensen,

The Hawaii Kai Marina Community Association (HKMCA) is proposing to replace the sandbag groin at the Hawaii Kai Marina entrance channel with a permanent, engineered structure. Sea Engineering, Inc. (SEI) is working with the HKMCA for planning and design of the groin replacement and preparation of an Environmental Assessment (EA) in accordance with HRS Chapter 343. The purpose of this letter is to inform you of the start of project planning, design, and EA preparation and to solicit any advance questions or comments that you may have.

The Hawaii Kai Marina entrance channel groin is a 150-ft long sandbag structure located on the east side of the main marina entrance channel, on Portlock Beach. The marina is owned and administered by the HKMCA; however, the entrance channel and groin are located within a Perpetual, Non-Exclusive Maintenance Easement granted in 2004 by the Board of Land and Natural Resources (BLNR). The groin was originally constructed in 2004 as an experimental structure and was rebuilt in 2013. Analysis shows that the groin has slowed the longshore transport of sand along Portlock Beach and has reduced the rate of sediment accumulation in the entrance channel.

Geotextile sandbag structures are temporary in nature. Though loss of the structure is not expected in the immediate future, the groin's effectiveness as a sand retention device is likely to degrade over time. Experience has shown that loss of the structure would lead to erosion of Portlock Beach and shoaling of the marina entrance channel.

Replacement Plan

SEI has completed a preliminary design effort and explored multiple options for a replacement structure, including straight and L-head groins with varying lengths. Maintenance of the existing groin and the "No Action" alternative were also considered.

Five designs for a permanent replacement for the existing sandbag groin were developed and are described in Table 1. All designs include a rock rubble mound groin and a 50-foot revetment section that ties into the Kalanianaole Highway Bridge concrete rubble masonry (CRM) abutment. The structures are centered on the centerline of the existing sandbag groin. Design

variations include:

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All designs presented above will slow the transport of sand into the entrance channel. SEI's preferred design is the Extended Groin with L-head layout (Alternative 4 in Table 1). This design most efficiently traps sand on Portlock Beach. The shorter option traps less sediment and analysis of the longer option shows diminished returns that do not justify the additional stem length.

The L-head configuration increases the sediment carrying capacity of the structure without further extending the structure offshore and reduces the potential for wave-generated current formation along the Portlock side of the stem and around the tip of the structure.

The substrate under the groin footprint is loose sand/cobble, thus the groin will likely require an extended toe for scour protection. The HKMCA has asked SEI to design a deep toe at -7 ft MLLW on the channel side of the structure to allow widening of the dredging area in the entrance channel without compromising the structure. Dredging of the entrance channel beyond what is required to place the structure's foundation is not included in this project.

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Beach Maintenance Plan

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The HKMCA has also expressed interest in back-passing as a maintenance option. SEI recommends that back-passing be done before beginning construction of the new groin to minimize the resulting transport of sand into the channel. Aerial imagery and topographic surveys indicate that the existing sandbag groin has retained 430 cubic yards of sediment on Portlock Beach between its reconstruction in 2013 and a topographic survey performed in 2015. This is equivalent to a beach width increase of 15 feet. Back-passing would bring the shoreline to its 2013 position and increase the infill time listed in Table 1.

Construction Methodology

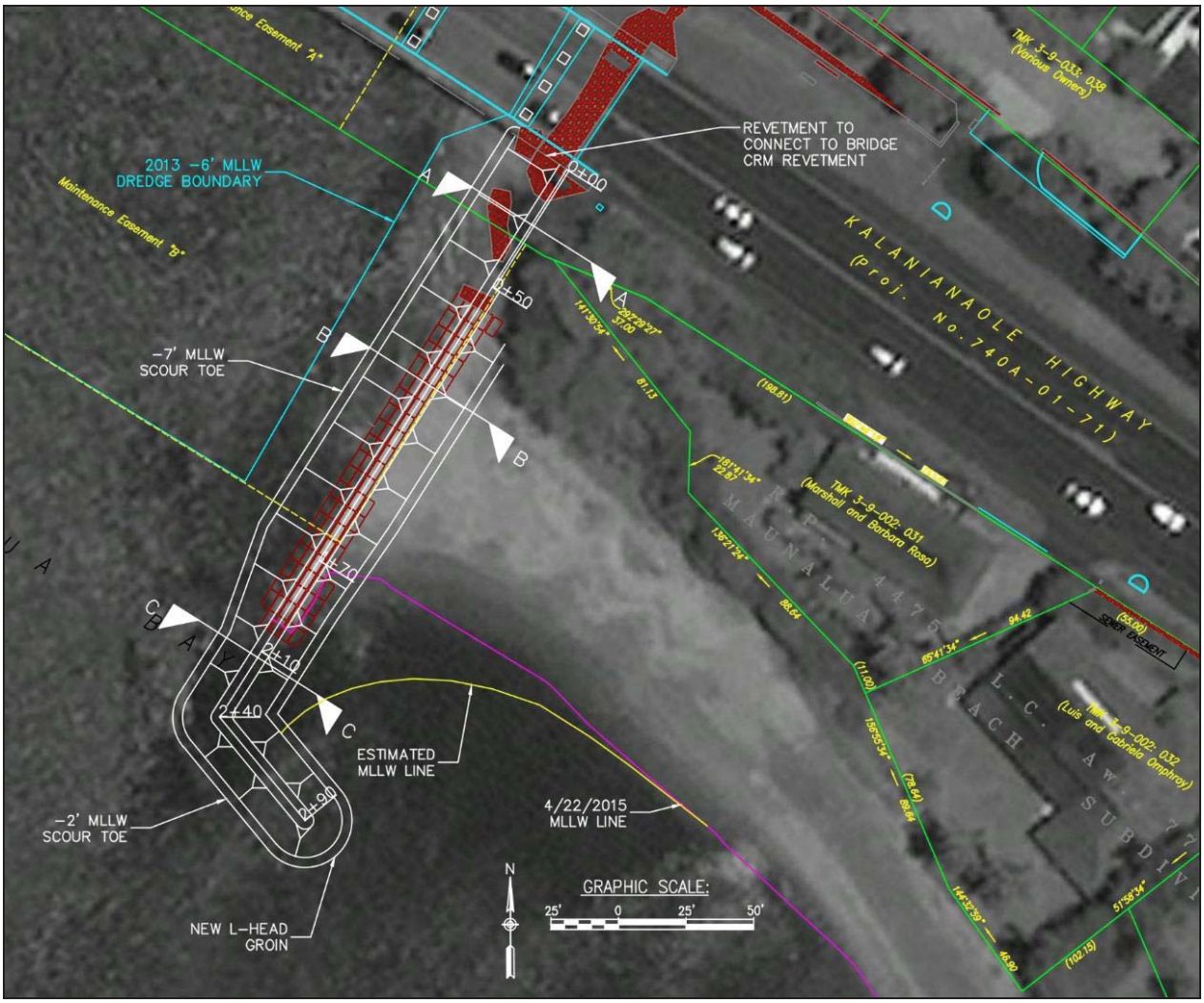
SEI expects construction of the new structure to be challenging due to limited access and limited space for a staging area on the shoreline. We expect some blocking of the entrance channel and some local disruption due to the need for staging, access, and stockpile areas.

With this consultation, we welcome any comments and opinions that Aha Moku o Oahu - Kona may have on this project. Please feel free to contact me should you have additional questions. Thank you for your time and considerations.

Sincerely,

Derek Linsley
Coastal Engineer
Sea Engineering, Inc.
(808) 259-7966 ext. 21

Cc: Beverly Liddle, Hawaii Kai Marina Community Association



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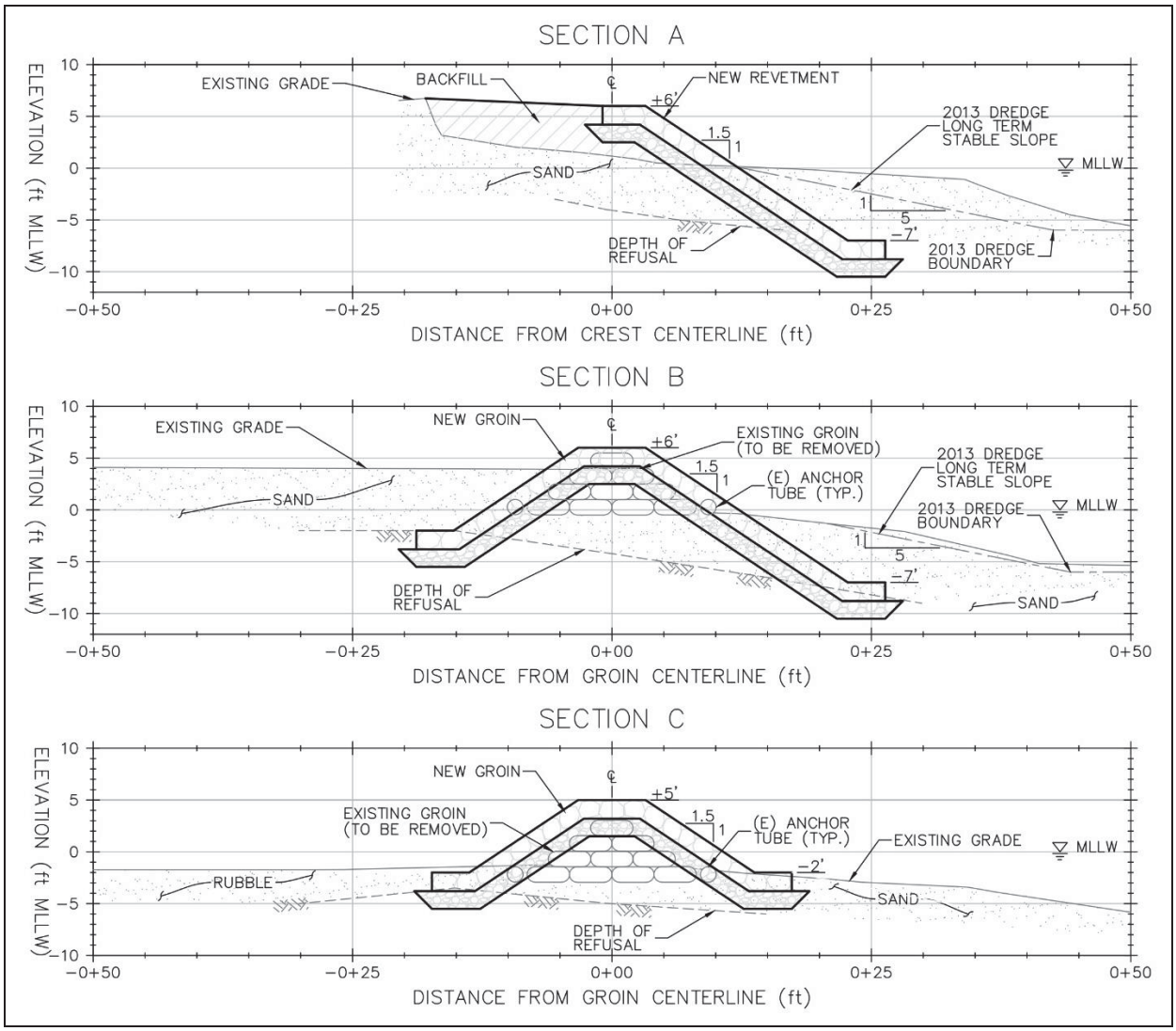

Figure 2: Extended Length with L-head option sections

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June 13, 2016

Ms. Kitty M. Simonds, President
Hawaiian Civic Club - Maunalua
PO Box 240388
Honolulu, HI 96824

Subject: Consultation for Hawaii Kai Marina Groin Replacement

Dear Ms. Kitty Simonds,

The Hawaii Kai Marina Community Association (HKMCA) is proposing to replace the sandbag groin at the Hawaii Kai Marina entrance channel with a permanent, engineered structure. Sea Engineering, Inc. (SEI) is working with the HKMCA for planning and design of the groin replacement and preparation of an Environmental Assessment (EA) in accordance with HRS Chapter 343. The purpose of this letter is to inform you of the start of project planning, design, and EA preparation and to solicit any advance questions or comments that you may have.

The Hawaii Kai Marina entrance channel groin is a 150-ft long sandbag structure located on the east side of the main marina entrance channel, on Portlock Beach. The marina is owned and administered by the HKMCA; however, the entrance channel and groin are located within a Perpetual, Non-Exclusive Maintenance Easement granted in 2004 by the Board of Land and Natural Resources (BLNR). The groin was originally constructed in 2004 as an experimental structure and was rebuilt in 2013. Analysis shows that the groin has slowed the longshore transport of sand along Portlock Beach and has reduced the rate of sediment accumulation in the entrance channel.

Geotextile sandbag structures are temporary in nature. Though loss of the structure is not expected in the immediate future, the groin's effectiveness as a sand retention device is likely to degrade over time. Experience has shown that loss of the structure would lead to erosion of Portlock Beach and shoaling of the marina entrance channel.

Replacement Plan

SEI has completed a preliminary design effort and explored multiple options for a replacement structure, including straight and L-head groins with varying lengths. Maintenance of the existing groin and the "No Action" alternative were also considered.

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The substrate under the groin footprint is loose sand/cobble, thus the groin will likely require an extended toe for scour protection. The HKMCA has asked SEI to design a deep toe at -7 ft MLLW on the channel side of the structure to allow widening of the dredging area in the entrance channel without compromising the structure. Dredging of the entrance channel beyond what is required to place the structure's foundation is not included in this project.

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Construction Methodology

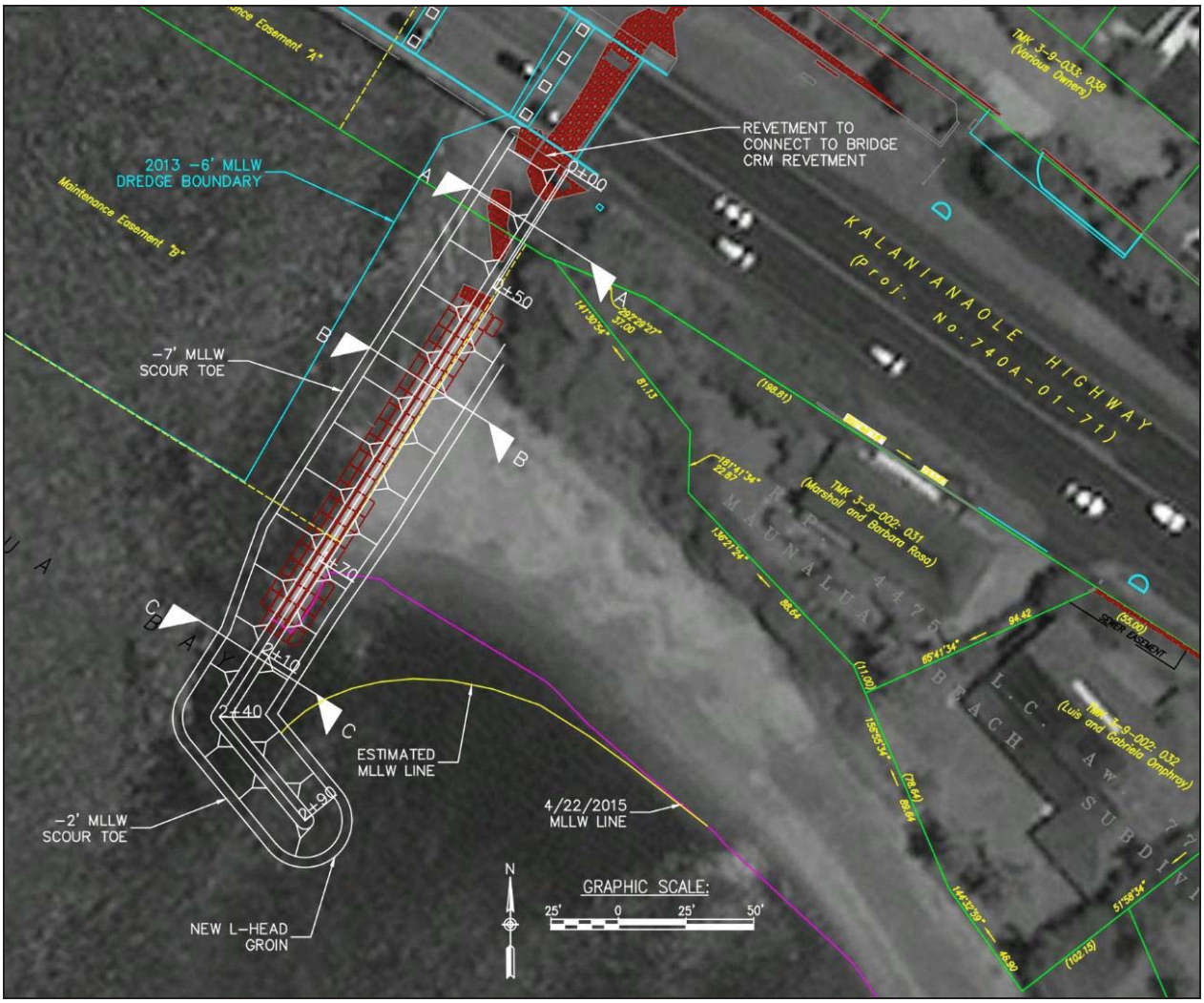
SEI expects construction of the new structure to be challenging due to limited access and limited space for a staging area on the shoreline. We expect some blocking of the entrance channel and some local disruption due to the need for staging, access, and stockpile areas.

With this consultation, we welcome any comments and opinions that the Hawaiian Civic Club - Maunalua may have on this project. Please feel free to contact me should you have additional questions. Thank you for your time and considerations.

Sincerely,

Derek Linsley
Coastal Engineer
Sea Engineering, Inc.
(808) 259-7966 ext. 21

Cc: Beverly Liddle, Hawaii Kai Marina Community Association



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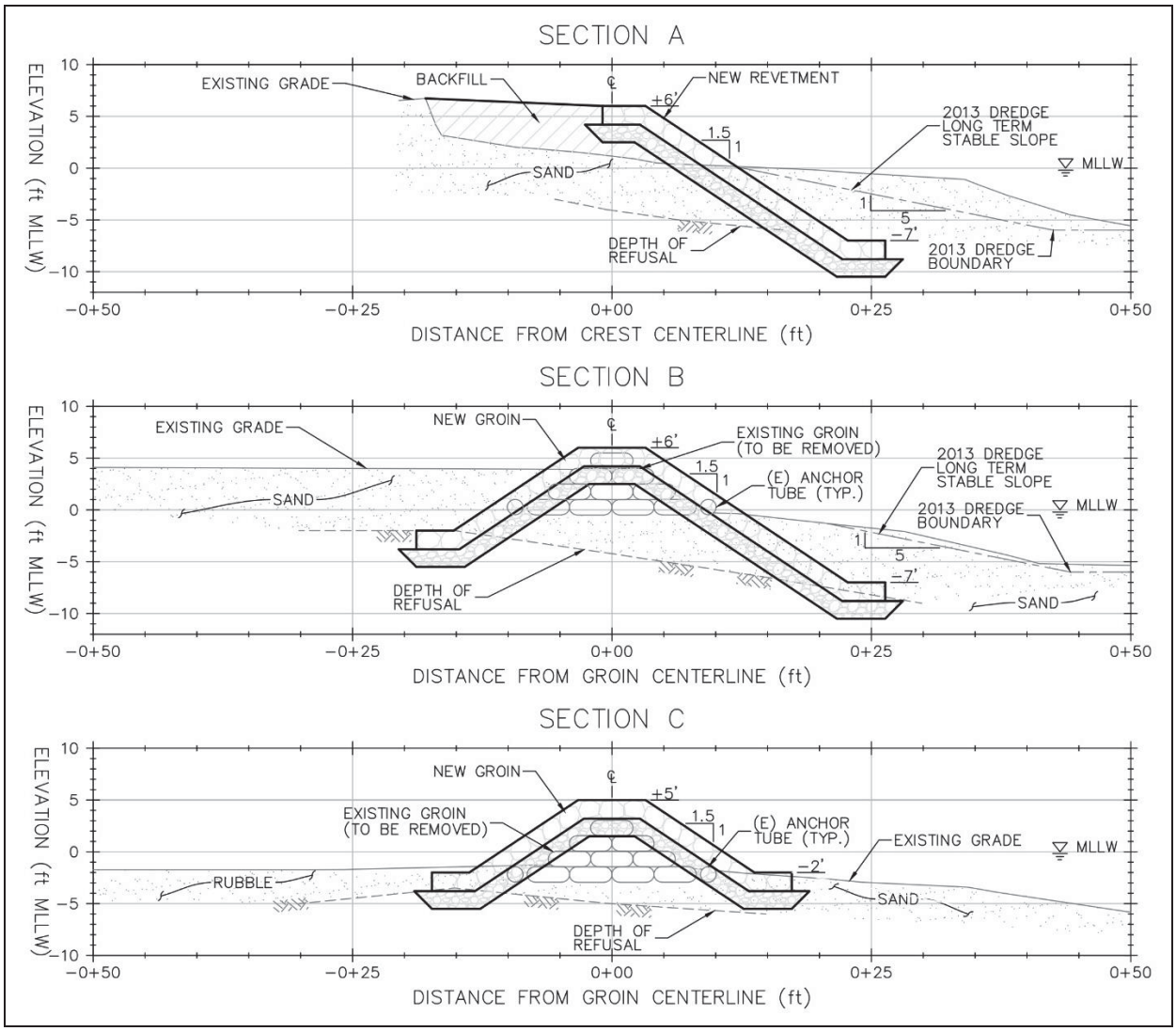

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June 13, 2016

Mr. Frazier McGilvray, Executive Director
Malama Maunalua
6600 Kalanianaole Hwy, #212
Honolulu, HI 96825

Subject: Consultation for Hawaii Kai Marina Groin Replacement

Dear Mr. Frazier McGilvray,

The Hawaii Kai Marina Community Association (HKMCA) is proposing to replace the sandbag groin at the Hawaii Kai Marina entrance channel with a permanent, engineered structure. Sea Engineering, Inc. (SEI) is working with the HKMCA for planning and design of the groin replacement and preparation of an Environmental Assessment (EA) in accordance with HRS Chapter 343. The purpose of this letter is to inform you of the start of project planning, design, and EA preparation and to solicit any advance questions or comments that you may have.

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With this consultation, we welcome any comments and opinions that Malama Maunalua may have on this project. Please feel free to contact me should you have additional questions. Thank you for your time and considerations.

Sincerely,

Derek Linsley
Coastal Engineer
Sea Engineering, Inc.
(808) 259-7966 ext. 21

Cc: Beverly Liddle, Hawaii Kai Marina Community Association

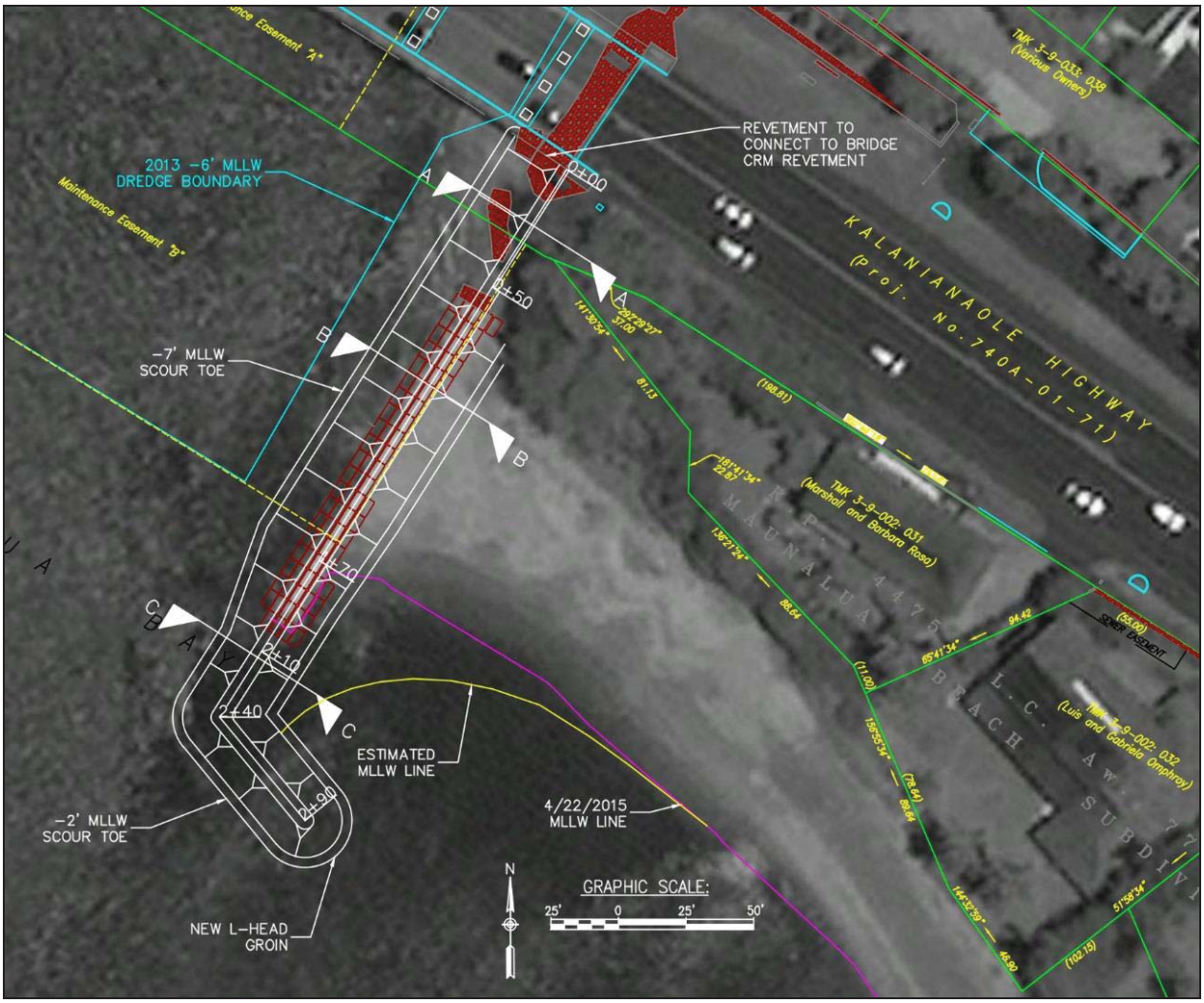

Figure 1: Extended Length with L-head option layout (existing sandbags shown in red)

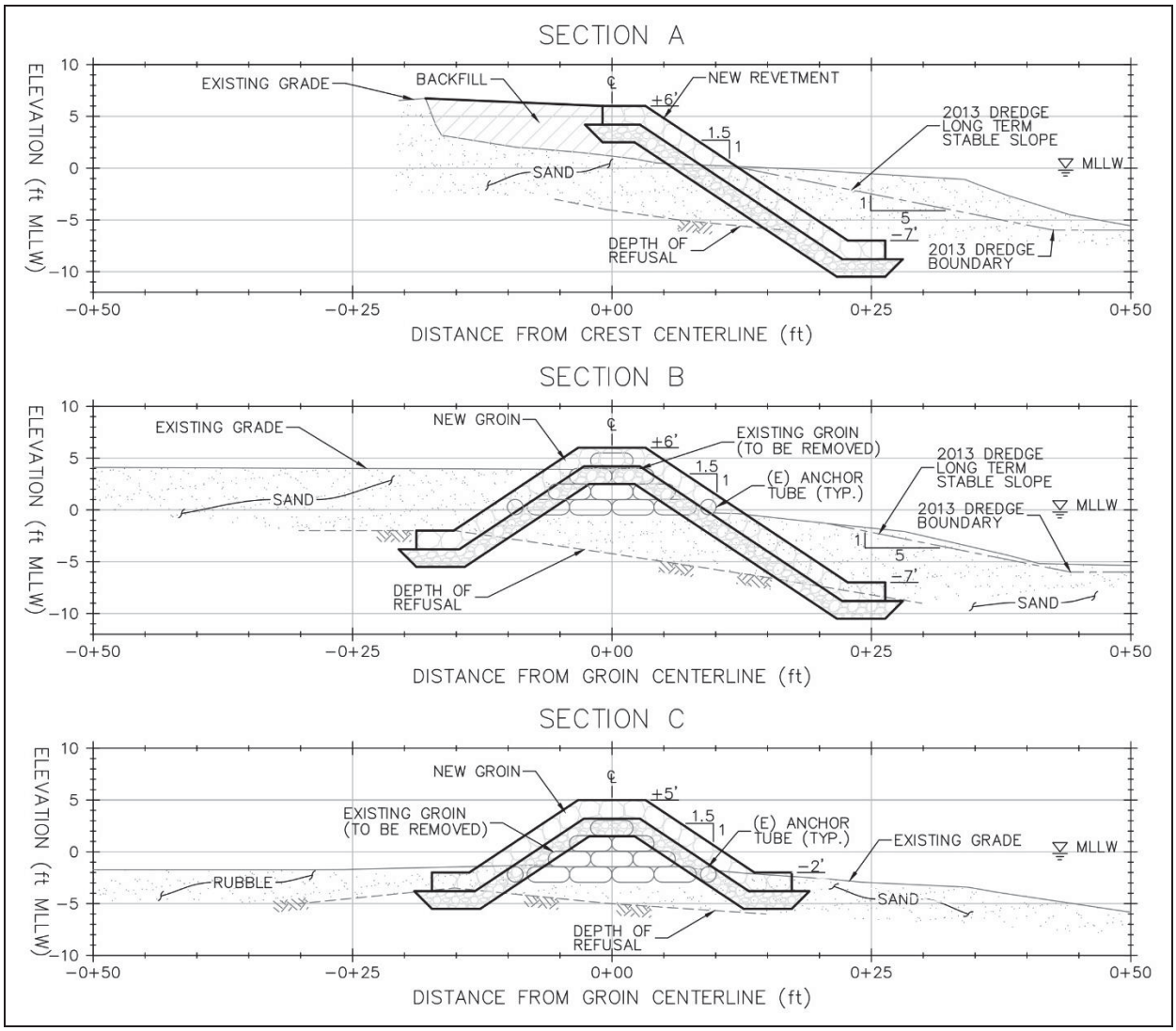

Figure 2: Extended Length with L-head option sections

Sea Engineering, Inc.

Makai Research Pier • Waimanalo, Hawaii 96795-1820 • E-mail: sei@seaengineering.com
Phone: (808) 259-7966 / FAX (808) 259-8143 • Website: www.seaengineering.com

June 13, 2016

Mr. David Holzman, President
Portlock Road Community Association

Subject: Consultation for Hawaii Kai Marina Groin Replacement

Dear Mr. David Holzman,

The Hawaii Kai Marina Community Association (HKMCA) is proposing to replace the sandbag groin at the Hawaii Kai Marina entrance channel with a permanent, engineered structure. Sea Engineering, Inc. (SEI) is working with the HKMCA for planning and design of the groin replacement and preparation of an Environmental Assessment (EA) in accordance with HRS Chapter 343. The purpose of this letter is to inform you of the start of project planning, design, and EA preparation and to solicit any advance questions or comments that you may have.

The Hawaii Kai Marina entrance channel groin is a 150-ft long sandbag structure located on the east side of the main marina entrance channel, on Portlock Beach. The marina is owned and administered by the HKMCA; however, the entrance channel and groin are located within a Perpetual, Non-Exclusive Maintenance Easement granted in 2004 by the Board of Land and Natural Resources (BLNR). The groin was originally constructed in 2004 as an experimental structure and was rebuilt in 2013. Analysis shows that the groin has slowed the longshore transport of sand along Portlock Beach and has reduced the rate of sediment accumulation in the entrance channel.

Geotextile sandbag structures are temporary in nature. Though loss of the structure is not expected in the immediate future, the groin's effectiveness as a sand retention device is likely to degrade over time. Experience has shown that loss of the structure would lead to erosion of Portlock Beach and shoaling of the marina entrance channel.

Replacement Plan

SEI has completed a preliminary design effort and explored multiple options for a replacement structure, including straight and L-head groins with varying lengths. Maintenance of the existing groin and the "No Action" alternative were also considered.

Five designs for a permanent replacement for the existing sandbag groin were developed and are described in Table 1. All designs include a rock rubble mound groin and a 50-foot revetment section that ties into the Kalanianaole Highway Bridge concrete rubble masonry (CRM) abutment. The structures are centered on the centerline of the existing sandbag groin. Design variations include:

- length of the groin stem, and
- inclusion of an L-head.

A sediment transport rate of 400 cubic yards per year was used for the calculation of updrift sediment infill. The sediment transport rate was estimated using both aerial images and topographic surveys.

Table 1: Groin alternatives summary table

	Layout	Revetment Length (ft)	Stem Length (ft)	L-Head Length (ft)	Toe Elevation (ft)	Additional Sediment Capacity (cu yards)	Additional Capacity (years)
1.	Existing length	50	140	0	-7	0	0
2.	Existing length w/ L-head	50	140	50	-7	350	1
3.	Extended length	50	180	0	-7	1,000	2.5
4.	Extended length w/ L-head	50	180	50	-7	1,200	3
5.	Maximum Length w/L-head	50	220	50	-7	1,650	4

All designs presented above will slow the transport of sand into the entrance channel. SEI's preferred design is the Extended Groin with L-head layout (Alternative 4 in Table 1). This design most efficiently traps sand on Portlock Beach. The shorter option traps less sediment and analysis of the longer option shows diminished returns that do not justify the additional stem length.

The L-head configuration increases the sediment carrying capacity of the structure without further extending the structure offshore and reduces the potential for wave-generated current formation along the Portlock side of the stem and around the tip of the structure.

The substrate under the groin footprint is loose sand/cobble, thus the groin will likely require an extended toe for scour protection. The HKMCA has asked SEI to design a deep toe at -7 ft MLLW on the channel side of the structure to allow widening of the dredging area in the entrance channel without compromising the structure. Dredging of the entrance channel beyond what is required to place the structure's foundation is not included in this project.

The preferred alternative layout and cross-sections are shown in attached Figure 1 and Figure 2 respectively.

Beach Maintenance Plan

Recently, residents of Portlock Beach have expressed interest to SEI in a sand back-passing scheme to nourish eroded beaches fronting their properties. This process would bring sand that accumulates adjacent to the groin up the beach to sand-starved, eroded areas. The L-head groin retains enough sand for this to be a viable option when the groin has reached capacity. As the groin approaches its maximum sediment trapping capacity, an excavator and small off-road capable trucks could be used to carry the sand up the beach. This process could be repeated as needed every 3 to 5 years to ensure that sand doesn't bypass the groin into the channel.

The HKMCA has also expressed interest in back-passing as a maintenance option. SEI recommends that back-passing be done before beginning construction of the new groin to minimize the resulting transport of sand into the channel. Aerial imagery and topographic surveys indicate that the existing sandbag groin has retained 430 cubic yards of sediment on Portlock Beach between its reconstruction in 2013 and a topographic survey performed in 2015. This is equivalent to a beach width increase of 15 feet. Back-passing would bring the shoreline to its 2013 position and increase the infill time listed in Table 1.

Construction Methodology

SEI expects construction of the new structure to be challenging due to limited access and limited space for a staging area on the shoreline. We expect some blocking of the entrance channel and some local disruption due to the need for staging, access, and stockpile areas.

With this consultation, we welcome any comments and opinions that the Portlock Road Community Association may have on this project. Please feel free to contact me should you have additional questions. Thank you for your time and considerations.

Sincerely,

Derek Linsley
Coastal Engineer
Sea Engineering, Inc.
(808) 259-7966 ext. 21

Cc: Beverly Liddle, Hawaii Kai Marina Community Association

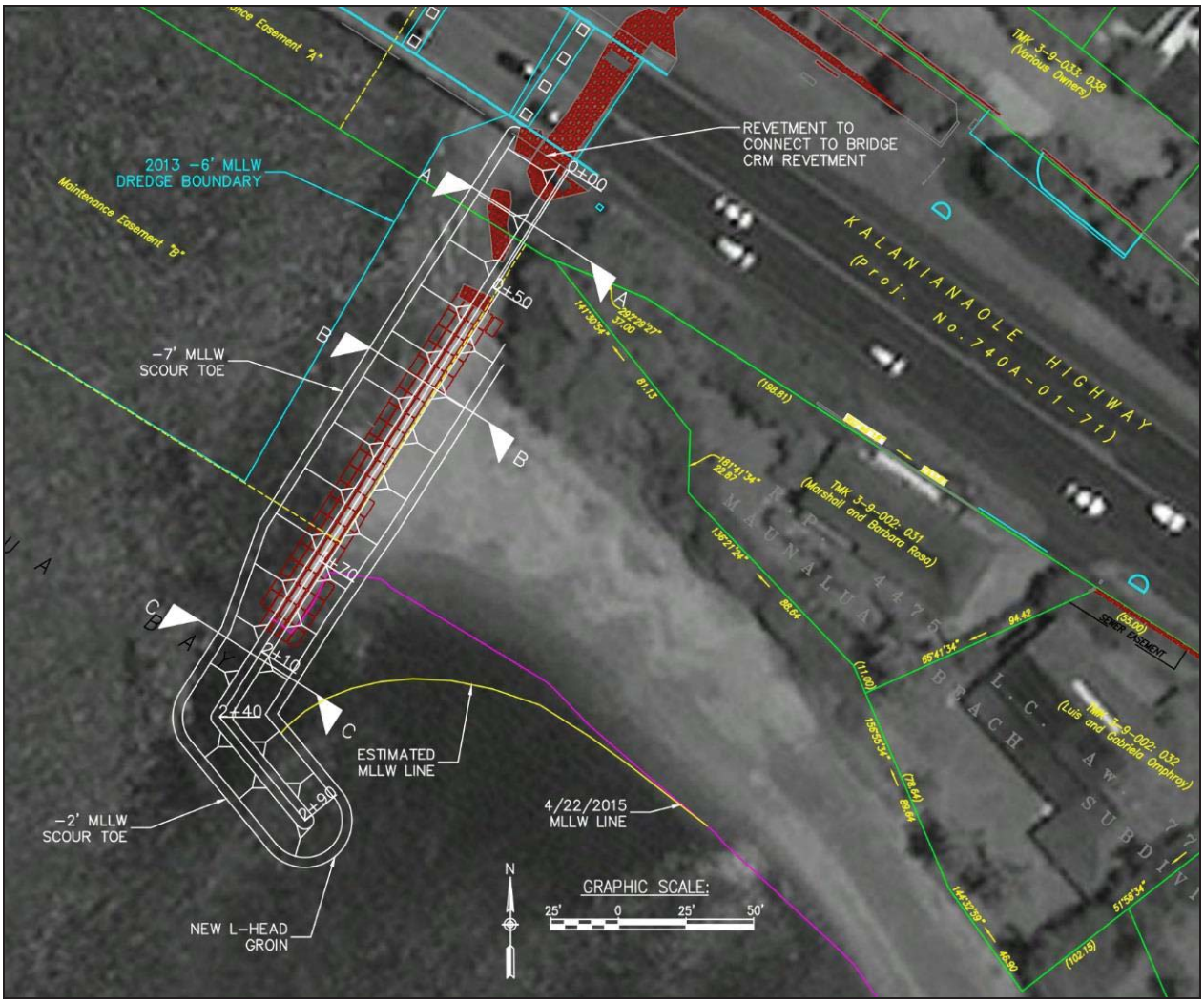

Figure 1: Extended Length with L-head option layout (existing sandbags shown in red)

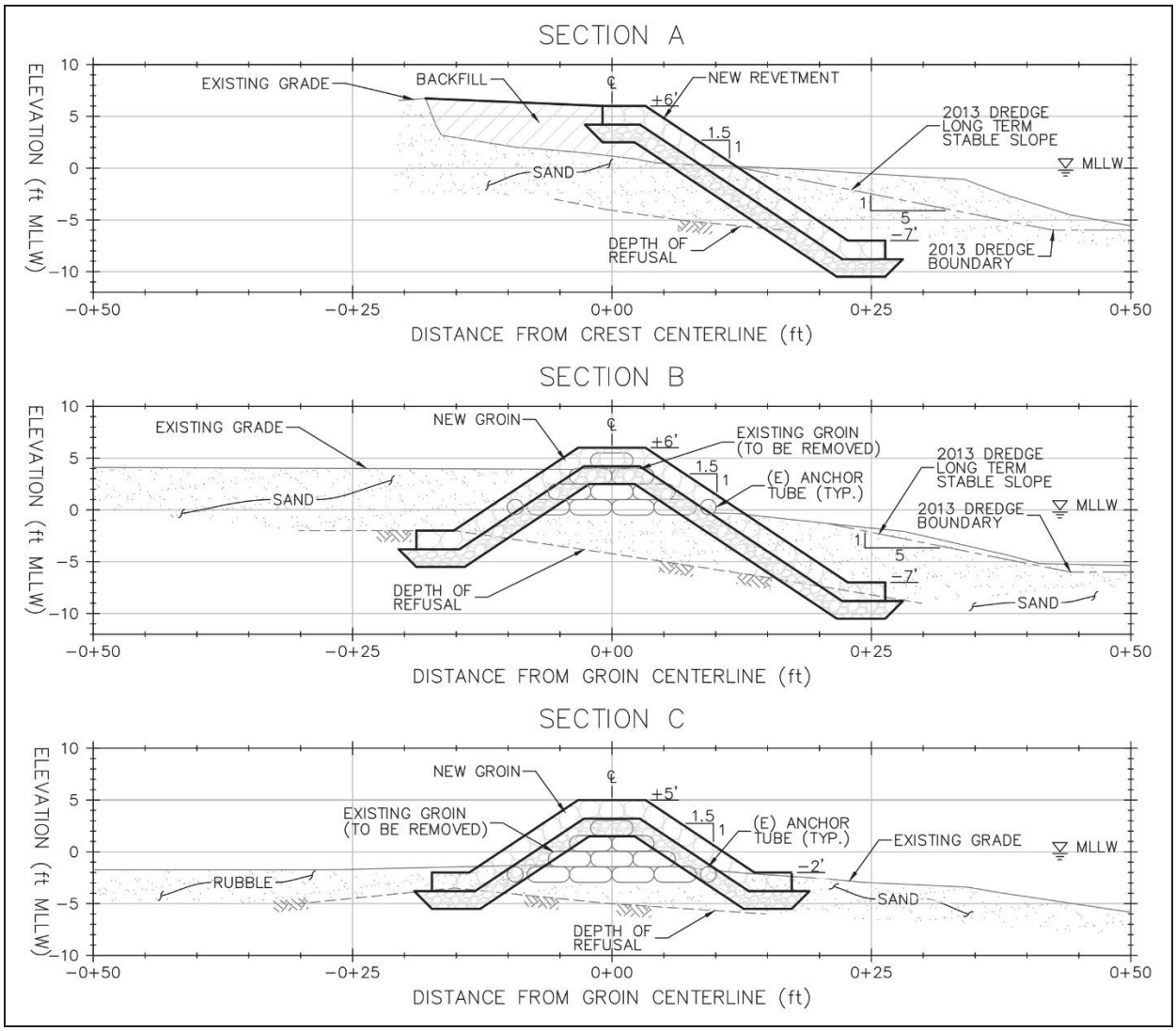

Figure 2: Extended Length with L-head option sections

OFFICE OF PLANNING
STATE OF HAWAII

DAVID Y. IGE
GOVERNOR

LEO R. ASUNCION
DIRECTOR
OFFICE OF PLANNING

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http://planning.hawaii.gov/

Ref. No. P-15099

April 6, 2016

Mr. Derek Linsley
Coastal Engineer
Sea Engineering, Inc.
41-305 Kalanianaole Highway
Waimanalo, Hawaii 96795

Dear Mr. Linsley:

Subject: Pre-consultation for Environmental Assessment for Hawaii Kai Marina Groin Replacement

The Office of Planning (OP) has reviewed your Environmental Assessment (EA) pre-consultation request, received April 4, 2016, and has the following comments to offer.

1. The subject EA should discuss the purposes of the proposed permanent, engineered structure which will replace the sandbag groin at the Hawaii Kai Marina entrance channel, and clarify the trigger(s) of requirements of Hawaii Revised Statutes (HRS) Chapter 343.

2. Hawaii's Coastal Zone Management (CZM) law, HRS Chapter 205A, requires all state and county agencies to enforce the CZM objectives and policies. The assessment on compliance with HRS Chapter 205A is an important component for satisfying the requirements of HRS Chapter 343.

   The subject EA should include an assessment as to how the proposed development conforms to the CZM objectives and supporting policies set forth in HRS § 205A-2, as amended. These objectives and policies include: recreational resources, historic resources, scenic and open space resources, coastal ecosystems, economic uses, coastal hazards, managing development, public participation, beach protection and marine resources. Please note that Act 120, Session Laws of Hawaii (SLH) 2013, made permanent Act 160, SLH 2010. Beach protection shall refer to HRS 205A-2(c)(9), as amended.

3. According to the information provided from your request, the proposed groin replacement is shoreline related, and the staging area may be located within the special management area (SMA), under HRS Chapter 205A. The EA should

specifically discuss the compliance with the requirements of SMA use and shoreline setbacks, by consulting with the Department of Planning and Permitting, City and County of Honolulu.

4. Except as provided in HRS § 205A-44(b), structures are prohibited in the shoreline area without a variance. If a shoreline setback variance is required, the EA should address how the engineered groin will meet the standards of variance set forth in HRS § 205A-46 and Chapter 23, Revised Ordinances of Honolulu.

5. Please note any artificial light from exterior lighting fixtures, including but not necessarily limited to floodlights, up-lights or spotlights used for decorative or aesthetic purposes, shall be prohibited if the light directly illuminates, or is directed to project across property boundaries toward, the shoreline and ocean waters, except as may otherwise be permitted pursuant to HRS § 205A-30.5(b).

6. If an Army Corps of Engineers Permit is required for the proposed marina groin replacement, please consult with our office for CZM federal consistency review by the Hawaii CZM Program.

If you have any questions regarding this comment letter, please contact Mr. Shichao Li of our CZM Program at (808) 587-2841.

Sincerely,

Leo R. Asuncion
Director

DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
EMD/CWB

04015PCTM.16

April 8, 2016

Mr. Derek Linsley
Coastal Engineer
Sea Engineering, Inc.
Makai Research Pier
41-305 Kalanianaole Highway
Waimanalo, Hawaii 96795

Dear Mr. Linsley:

SUBJECT: Comments on the Environmental Assessment (EA) Consultation for Hawaii Kai Marina Groin Replacement Honolulu, Island of Oahu, Hawaii

The Department of Health (DOH), Clean Water Branch (CWB), acknowledges receipt of your letter, dated March 23, 2016, requesting comments on your project. The DOH-CWB has reviewed the subject document and offers these comments. Please note that our review is based solely on the information provided in the subject document and its compliance with the Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. You may be responsible for fulfilling additional requirements related to our program. We recommend that you also read our standard comments on our website at: http://health.hawaii.gov/epo/files/2013/05/Clean-Water-Branch-Std-Comments.pdf

1. Any project and its potential impacts to State waters must meet the following criteria:

   a. Antidegradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected.

   b. Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State waters.

   c. Water quality criteria (HAR, Sections 11-54-4 through 11-54-8).

2. You may be required to obtain National Pollutant Discharge Elimination System (NPDES) permit coverage for discharges of wastewater, including storm water runoff, into State surface waters (HAR, Chapter 11-55).

For NPDES general permit coverage, a Notice of Intent (NOI) form must be submitted at least 30 calendar days before the commencement of the discharge. An application for a NPDES individual permit must be submitted at least 180 calendar days before the commencement of the discharge. To request NPDES permit coverage, you must submit the applicable form ("CWB Individual NPDES Form" or "CWB NOI Form") through the e-Permitting Portal and the hard copy certification statement with the respective filing fee ($1,000 for an individual NPDES permit or $500 for a Notice of General Permit Coverage). Please open the e-Permitting Portal website located at: https://eha-cloud.doh.hawaii.gov/epermit/. You will be asked to do a one-time registration to obtain your login and password. After you register, click on the Application Finder tool and locate the appropriate form. Follow the instructions to complete and submit the form.

3. If your project involves work in, over, or under waters of the United States, it is highly recommended that you contact the Army Corp of Engineers, Regulatory Branch (Tel: 835-4303) regarding their permitting requirements.

   Pursuant to Federal Water Pollution Control Act [commonly known as the "Clean Water Act" (CWA)], Paragraph 401(a)(1), a Section 401 Water Quality Certification (WQC) is required for "[a]ny applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may **result** in any discharge into the navigable waters..." (emphasis added). The term "discharge" is defined in CWA, Subsections 502(16), 502(12), and 502(6); Title 40 of the Code of Federal Regulations, Section 122.2; and Hawaii Administrative Rules (HAR), Chapter 11-54.

4. Please note that all discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 WQC are required, must comply with the State's Water Quality Standards. Noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements, specified in HAR, Chapter 11-55, may be subject to penalties of $25,000 per day per violation.

5. It is the State's position that all projects must reduce, reuse, and recycle to protect, restore, and sustain water quality and beneficial uses of State waters. Project planning should:

   a. Treat storm water as a resource to be protected by integrating it into project planning and permitting. Storm water has long been recognized as a source of irrigation that will not deplete potable water resources. What is often overlooked is that storm water recharges ground water supplies and feeds streams and estuaries; to ensure that these water cycles are not disrupted, storm water cannot be relegated as a waste product of impervious surfaces. Any project planning must recognize storm water as an asset that sustains and protects

natural ecosystems and traditional beneficial uses of State waters, like community beautification, beach going, swimming, and fishing. The approaches necessary to do so, including low impact development methods or ecological bio-engineering of drainage ways must be identified in the planning stages to allow designers opportunity to include those approaches up front, prior to seeking zoning, construction, or building permits.

b. Clearly articulate the State's position on water quality and the beneficial uses of State waters. The plan should include statements regarding the implementation of methods to conserve natural resources (e.g. minimizing potable water for irrigation, gray water re-use options, energy conservation through smart design) and improve water quality.

c. Consider storm water Best Management Practice (BMP) approaches that minimize the use of potable water for irrigation through storm water storage and reuse, percolate storm water to recharge groundwater to revitalize natural hydrology, and treat storm water which is to be discharged.

d. Consider the use of green building practices, such as pervious pavement and landscaping with native vegetation, to improve water quality by reducing excessive runoff and the need for excessive fertilization, respectively.

e. Identify opportunities for retrofitting or bio-engineering existing storm water infrastructure to restore ecological function while maintaining, or even enhancing, hydraulic capacity. Particular consideration should be given to areas prone to flooding, or where the infrastructure is aged and will need to be rehabilitated.

If you have any questions, please visit our website at:http://health.hawaii.gov/cwb/, or contact the Engineering Section, CWB, at (808) 586-4309.

Sincerely,

ALEC WONG, P.E., CHIEF
Clean Water Branch

CTM:ctm

c: EPO [via e-mail only]

Preliminary NMFS comments on proposed Hawaii Kai Marina Groin April 2016

NMFS appreciates the opportunity to provide preliminary marine habitat/EFH focused feedback as per the list below for project planning and design, and EA preparation for the following proposed project:

Sea Engineering, Inc. (SEI), on behalf of the Hawai'i Kai Marina Community Association (HKMCA), is proposing to replace the existing sandbag groin at the Kawaii Kai Marina entrance with a permanent, engineered structure. A list of 5 hardened options have been described as per the March 31, 2016 letter sent to NMFS. The preferred option is an extended length with an L-head feature. This adds 40 feet to the existing stem length, the L-head is 50 feet extending parallel to shore. Its additional sediment capacity of 1,200 cu yards, relative to the existing structure, is stated to be more efficient at trapping sand at Portlock Beach and provides 3 years of additional capacity.

General comments:

1. Clarify in the draft EA how the proposed project will provide additional capacity; e.g. will the new L-head structure increase the time between dredges of the channel entrance?

2. Evaluate and describe in the draft EA alternatives beyond installing a hard-groin structure such as the no-action alternative, and alternatives that include soft or modified soft/hard approaches. E.g. clarify if the sand bag approach can be extended and engineered in the same way that the hardened structure can in order to provide flexibility in the face of sea level rise (SLR) and erosion.

3. Describe in the draft EA a detailed scope of work associated with each alternative evaluated. E.g. describe what in-water work will occur; how much dredging (area and volume) will be required to place the structure's foundation of the preferred alternative; how much new fill (area and volume) will be placed on the seafloor; whether geotechnical cores be taken to assess sediment size, composition, nutrients and pollutants; how much work can be conducted from land; if there will be soil fill associated with the project etc.

4. Ensure the engineering options take into account projected sea-level rise (SLR) estimates.

5. Ensure erosion (and accretion) patterns and rates of adjacent shoreline and bottom that may result from each alternative are modeled and the impacts of these to marine habitat/EFH evaluated.

6. Describe in the draft EA what type of prolonged or ongoing maintenance would be required for each alternative mid- and long-term (e.g. with SLR).

7. Conduct marine surveys of the project area to allow for a) a complete analysis of the impacts associated with each alternative; b) evaluation of feasible compensatory mitigation/offset for any unavoidable loss of EFH resulting from the final proposed action. Marine surveys should describe the fish, algae and non-coral invertebrates present in the project area, also quantify the number, size, species and morphology of corals, and the density and species of seagrass.

8. Evaluate and describe in the draft EA the direct and indirect impacts to the marine environment associated with each alternative. Direct impacts include abrasion to marine organisms including corals and seagrass from dredging and fill, and loss/conversion of marine habitat. Indirect impacts include turbidity and sedimentation, alteration of the natural flow of water, erosion rates and patterns, and alterations of the benthos and EFH from erosion of shoreline also from accretion of sand along Portlock Beach.

9. Analyze and clarify in the draft EA if a permanent hardened structure will lead to accelerated alteration of EFH compared to the current sandbag groin by retaining more sand and sediment.

10. Evaluate and describe in the draft EA mitigation measures to avoid/minimize and offset impacts to marine habitat including EFH. This would include but not be limited to BMPs for managing the construction, stockpiles and in-water work to prevent sedimentation and turbidity increases to protect EFH; proposed measures to reduce the conversion of natural seafloor habitat to artificial substrate/beach; proposed measures to reduce downstream erosion of shoreline; proposed measure to manage impact associated with

Note: any anticipated beach replenishing and excavation of sediment requiring in-water work will need a separate permit at the time of nourishment activities. Nourishment will need to take into account the current status of resources and EFH and how adding sand to beach may impact these.

DEPARTMENT OF THE ARMY
HONOLULU DISTRICT, U.S. ARMY CORPS OF ENGINEERS
FORT SHAFTER, HAWAII 96858-5440

April 15, 2016

SUBJECT: Permit Required for the Hawaii Kai Marina Groin Replacement, Hawaii Kai, Honolulu, Oahu, DA File No. POH-2016-00095

Sea Engineering Inc.
c/o Mr. Derek Linsley
Makai Research Pier
Waimanalo, Hawaii 96795-1820

Dear Mr. Linsley:

The U.S. Army Corps of Engineers, Honolulu District (Corps), is in receipt of your request dated March 31, 2016 for the proposed replacement and expansion of an existing sandbag groin in Hanapepe Bay, Honolulu, Island of Oahu, Hawaii. Your project has been assigned Department of the Army (DA) file number POH-2016-00095. Please reference this number in all future correspondence with this office concerning your proposed activity.

We have completed review of your submittal pursuant to Section 404 of the Clean Water Act (Section 404) and Section 10 of the Rivers and Harbors Act of 1899 (Section 10). Section 404 requires authorization prior to the discharge and/or placement of dredged or fill material into waters of the U.S., including adjacent wetlands. Section 10 requires authorization prior to conducting work in, over, under, and affecting navigable waters. We have determined that the project is located in the Pacific Ocean, a navigable water of the U.S. under the regulatory jurisdiction of the Corps.

Based on your submittal, the proposed work to replace the existing sand groin with a riprap groin in the Pacific Ocean next to the entrance to Kuapa Pond in Hawaii Kai, Honolulu, Oahu, will require placing fill and a structure within the Pacific Ocean. Therefore, in accordance with Section 404 and Section 10 you must obtain a DA permit from this office prior to commencing your proposed work.

The proposed work to replace the existing sand groin with a riprap groin in the Pacific Ocean next to the entrance to Kuapa Pond in Hawaii Kai, Honolulu, Oahu, may qualify for authorization under an individual permit. A checklist to assist you in preparing an application for an individual permit activity is provided in Enclosure 1.

Please complete and submit a DA permit application to this office for review at CEPOH-RO@usace.army.mil. The DA permit application is available online at: http://www.poh.usace.army.mil/Portals/10/docs/publicnotices/POH_Permit_Application_mar2015_fillable.pdf. You may request to schedule a pre-application consultation with the project manager identified below to ensure submittal of a complete application.

Before authorizing work under our statutory authorities, the Corps must ensure a project complies with applicable Federal laws and regulations, such as the Endangered Species Act (ESA), Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), Section 401 of the Clean Water Act, Coastal Zone Management Act, and the National Historic Preservation Act. In most instances, the Corps will coordinate directly with the appropriate agencies, but we may require additional information from you to complete the coordination and consultation. The proposed work of replacing the existing sand groin with a riprap groin in the Pacific Ocean next to the entrance to Kuapa Pond in Hawaii Kai, Honolulu, Oahu, may not meet the requirements of the Standard Local Operating Procedures for Endangered Species in the Central and Western Pacific Region (Pac-SLOPES). To facilitate expedited ESA consultation and reduce permit application review time, the Corps will accept a prepared Biological Evaluation addressing the potential impacts to ESA-listed species as an attachment to the application. Similarly, to facilitate expedited Essential Fish Habitat (EFH) consultation to comply with the MSFCMA and reduce permit application review time, the Corps will accept a prepared EFH Assessment addressing the potential impacts to EFH as an attachment to the application.

Thank you for your cooperation with the Honolulu District Regulatory Program. Should you have any questions related to this determination, please contact Ms. Vera Koskelo of my staff at 808-835-4310 or via e-mail at Vera.B.Koskelo@usace.army.mil. You are encouraged to provide comments on your experience with the Honolulu District Regulatory Office by accessing our web-based customer survey form at http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0.

Sincerely,

MCCOY.SHANE.M.1364766315

Digitally signed by MCCOY.SHANE.M.1364766315
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=MCCOY.SHANE.M.1364766315
Date: 2016.04.15 13:25:58 -10'00'

Shane McCoy
Acting Chief, Regulatory Office

Enclosure

cc: State of Hawaii DBEDT Office of Planning (John Nakagawa)
NOAA-NMFS, Habitat Conservation Division (Gerry Davis)
NOAA-NMFS, Protected Resources Division (Randy McIntosh)
USCG (Nicolas A. Jarboe)
DOH (Darryl Lum)

DAVID Y. IGE
GOVERNOR OF
HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

KEKOA KALUHIWA
FIRST DEPUTY

JEFFREY T. PEARSON, P.E.
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

DLNR:OCCL:NF

Correspondence OA-16-188

APR 2 7 2016

Derek Linsley
Sea Engineering, Inc.
Makai Research Pier
Waimanalo, HI 96795

SUBJECT: Consultation for the Proposed Hawaii Kai Marina Groin Replacement Project Located at Maunalua Bay, Oahu; Tax Map Key: Seaward of (1) 3-9-008:035

Dear. Mr. Linsley,

The Department of Land and Natural Resources (DLNR), Office of Conservation and Coastal Lands (OCCL) is in receipt of your letter dated March 29, 2016 regarding the proposed Hawaii Kai Marina Groin Replacement project located seaward of Tax Map Key (TMK) (1) 3-9-008:035. The area seaward of TMK (1) 3-9-008:035 includes submerged lands that are located in the Conservation District Resource Subzone. The Hawaii Kai Marina Community Association (HKMCA) has contracted Sea Engineering, Inc. for the planning and design of the groin replacement and preparation of an Environmental Assessment (EA).

The Hawaii Kai Marina is owned and administrated by HKMCA, however, the entrance channel and groin are located within a Perpetual, Non-Exclusive Maintenance Easement (the Easement, DLNR Ref. LOD No. 28,553) granted in 2004 by the Board of Land and Natural Resources (BLNR). The Easement rights include the right to dredge, use, maintain, and repair the Hawaii Kai Marina entrance channel and the sandbag groin. Condition 12 of the Terms and Conditions of the Easement states that *the Grantee shall maintain, repair and upkeep the existing entrance and sandbag groin in a condition satisfactory to the Grantor, and in a manner that will enhance the public shoreline and access thereto. Any improvements to the existing entrance and sandbag groin shall be subject to the prior written approval of the BLNR.*

The existing Hawaii Kai Marina entrance channel groin is a 150 foot long sandbag structure located on the east side of the main marina entrance channel, on Portlock Beach, that was originally constructed in 2004 and rebuilt in 2013 (DLNR Ref. CDUA OA-2935). According to your letter, HKMCA is proposing to replace the temporary geotextile sandbag structure with a permanent, engineered groin to prevent erosion of Portlock Beach and shoaling of the marina entrance channel that would likely result if the temporary sand bag groin is severely damaged or lost. You noted in your letter that analysis shows that the groin has slowed the longshore

transport of sand along Portlock Beach and has reduced the rate of sediment accumulation in the entrance channel.

The proposed project is an identified land use pursuant to Hawaii Administrative Rules Chapter 13-5-22, P-16 Shoreline Erosion Control (D-1) *Seawall, revetment, groin, or other coastal erosion control structure or device, including sand placement, to control erosion of land or inland area by coastal waters, provided that the applicant shows that (1) the applicant would be deprived of all reasonable use of the land or building without the permit; (2) the use would not adversely affect beach resources or lateral public access along the shoreline, without adequately compensating the State for its loss; or (3) public facilities (e.g., public roads) critical to public health, safety, and welfare would be severely damaged or destroyed without a shoreline erosion control structure, and there are no reasonable alternatives (e.g., relocation). Requires a shoreline certification.* In order to apply for this use, the applicant will be required to submit to OCCL a Conservation District Use Application and all required attachments, i.e. a Hawaii Revised Statutes Chapter 343 environmental document, for the proposed project. The application can be found on our website at http://dlnr.hawaii.gov/occl/forms-2/. To allow, modify, or deny the proposed land use will be at the discretion of the BLNR. Please include the sand "back-passing" scheme with your application.

Thank you for the opportunity to comment on the proposed project. If you have any questions, please feel free to contact Natalie Farinholt in the Office of Conservation and Coastal Lands at (808) 587-0399 or Natalie.A.Farinholt@Hawaii.gov.

Sincerely,

for Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

Cc: C&C, DPP
DOBOR
Land Division

Hawaii Kai Marina Groin Project
Ocean Recreation Survey

1. Date: **May 2, 2016**

2. Name: **Marshall & Barbara Rosa**

3. Mailing address: **6973 Kalanianaole Hwy, Honolulu HI 96825**

4. Email: **ROSAM002@hawaii.rr.com**

5. Phone: **(808) 395-1400**

6. Name of business: **Homeowner immediately adjacent to groin project**

7. What ocean recreation activities do you do in the bay in this area of the project? Where do you access the bay? How often do you go? On average, how many people go with you per visit?
   Our property is directly affected by the project and is adjacent to the groin.
   Before the channel was dredged by Kaiser this was a ma kaha, a small opening to Kuapa fishpond. The original channel dredging eroded our property and Portlock beach.
   The entrance channel and beach was stable for many years with two channels open. The last two dredging projects when the sandbag groins were placed and the third bridge bay was dredged caused Portlock beach and the beach park to erode.

8. What other ocean recreation activities do you see in the area of the project?
9. What concerns do you have in regard to this project? **See Below**
10. Do you have any additional comments or recommendations? **See Below**

The proposed groin abuts our property and the project directly affects us.
It affects our privacy, views and peaceful enjoyment of our property and property value.

A wall should be built along the end of our property and along the highway for privacy and security. This should be a part of the project and the expense and liability should be covered by the Hawaii Kai Marina not the State of Hawaii.

The State of Hawaii, the Army Corps of Engineers and the Department of Health needs to directly supervise the project so that best practices will be observed and the dredging will be done on the incoming or stable tide so as not to add sediment to the reef.
In the last dredging project of 2013 the contractor removed massive amounts of rock supporting the bridge.

The existing sandbag groin does not continue to the bridge and the land is being eroded and undermined toward the end of our property but nothing has been done to remedy the situation. Trees have fallen in on the Portlock side of the channel behind our property and on the beach park side.
The State of Hawaii Department of Transportation should check the bridge integrity.

A fence needs to be built to block access to the groin from the highway and under the bridge. Liability and safety are huge concerns. Kids often jump from the highway bridge and the existing groin. We have even seen a boat drive up on the sandbags on purpose.

We do not want the groin to be longer or hook to the side as it will impact our views. The groin should be as low as possible above water level.

The sandbag groin is holding the sand now and unless you build the groin out to the reef; maintenance dredging will always be necessary to maintain the channel depth.

Thousands of yards of sand and coral, probably 1/3 of the dredged material were placed on the park side but were removed from the system during the last dredging done in 2013. The sand and coral was spread on the park beach but was condemned and removed before the 4th of July Fireworks display. This was the same quality and consistency of sand and coral that were placed on the beach on the Portlock side

This was very damaging to the beach environment. The beach park is eroding and properties at the East end of Portlock beach are now experiencing huge erosion of their yards, in some places 30 feet has washed away.

Whenever maintenance dredging is done ALL material should be placed back on the beach either Portlock or park side.

The park side also needs to be protected by a rock wall or groin as it is being scoured out and eroding with the existing sand bag groin. The rock groin will exacerbate this condition.

Marshall & Barbara Rosa

Please return completed survey to John Clark at jclark@hawaii.rr.com or by mail to P. O. Box 25277, Honolulu, HI 96825. Questions: 808 396-4227. Mahalo.

PHONE (808) 594-1888

FAX (808) 594-1938

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
560 N. NIMITZ HWY., SUITE 200
HONOLULU, HAWAI'I 96817

HRD16-7822

May 11, 2016

Derek Linsley
Sea Engineering, Inc.
Makai Research Pier
Waimānalo, HI 96795

Re: Request for Consultation in Preparation for the Environmental Assessment for the Planning and Design of the Sandbag Groin Replacement at the Hawai'i Kai Marina Entrance
Maunalua 'Ili, Waimānalo Ahupua'a, Ko'olaupoko Moku, O'ahu Mokupuni

Aloha Mr. Linsley:

The Office of Hawaiian Affairs (OHA) is in receipt of your April 6, 2016 letter requesting consultation in preparation for the environmental assessment (EA) for the planning and design of the sandbag groin replacement at the Hawai'i Kai Marina entrance. The project proponent is Sea Engineering, Inc., acting on behalf of the Hawai'i Kai Marina Community Association (Applicant).

Applicant is proposing one action with two components. First, the building of a new groin structure extending farther seaward than the current one and having an L-head layout. The groin will have a total stem length of 220-feet, from the existing 140-feet, with a 50-foot revetment (width), and a 50-foot L-head length. Second, sediments accumulated behind the new groin will be used in a beach nourishment action for Portlock Beach.

As both components are directly related to each other they should be evaluated as a single project in the EA. We also recommend that the Applicant take into consideration all the impacts that the groin and beach nourishment will have upon the littoral ecosystem and activities. Maunalua Bay is heavily used by community members for subsistence and recreational

activities. Consultation should extend to all individuals and organizations that use the Bay, including an open, public meeting.

OHA appreciates the outreach efforts that Sea Engineering, Inc. has undertaken by consulting with us. In the future, we would appreciate a list of all other consulted parties in order to determine whether additional ones, particularly Native Hawaiian Organizations (NHO), should be suggested. If you have not already done so, please consult with the 'Aha Moku Council, the appropriate O'ahu based Hawaiian Civic Clubs, and the O'ahu Island Burial Council. We also recommend the NHO list held by the Department of Interior (DOI), available at https://www.doi.gov/hawaiian/NHOL.

Mahalo for the opportunity to comment. We look forward to reviewing the draft EA, once available. Should you have any questions, please contact Jeannin Jeremiah at 594-1790 or by email at jeanninj@oha.org.

'O wau iho nō me ka 'oia 'i'o,

Kamana'opono Crabbe

Kamana'opono M. Crabbe, Ph.D.
Ka Pouhana, Chief Executive Officer

KC:jj

**Please address replies and similar, future correspondence to our agency:*
Dr. Kamana'opono Crabbe
Attn: OHA Compliance Enforcement
560 N. Nimitz Hwy, Ste. 200
Honolulu, HI 96817

Derek Linsley

From: Wiltse, Wendy <Wiltse.Wendy@epa.gov>
Sent: Wednesday, June 29, 2016 5:20 PM
To: Derek Linsley
Cc: Higuchi, Dean
Subject: FW: Hawaii Kai Marina Entrance Channel - Groin Replacement Project
Attachments: EPA Consultation Letter.pdf

Dear Mr. Linsley:

Thank you for the opportunity to provide input on the Hawaii Kai Marina Groin. I recommend you consult with the US Army Corps of Engineers Regulatory Branch (USACE) if you have not already done so. The groin construction will require authorization by USACE. You may also consider holding a pre-application meeting with USACE, EPA, National Marine Fisheries Service and the US Fish and Wildlife Service as they will be consulted during the permitting process and may request supplemental information such as benthic biological surveys and a compensatory mitigation plan.

I appreciate being informed early of this project.

Sincerely,
Wendy Wiltse, Ph.D.

EPA Region 9 - PICO
300 Ala Moana Blvd. Box 50003
Room 5-152
Honolulu, HI 96734
Ph: 808-541-2752
FAX: 808-541-2712
wiltse.wendy@epa.gov

From: Derek Linsley [mailto:dlinsley@seaengineering.com]
Sent: Wednesday, June 29, 2016 3:01 PM
To: Higuchi, Dean
Subject: Hawaii Kai Marina Entrance Channel - Groin Replacement Project

Aloha Mr. Higuchi,

Back in March I mailed you a preconsultation letter (attached) for a project that we are preparing an Environmental Assessment for at the Hawaii Kai Marina Entrance Channel. The project includes replacing the existing sandbag groin with a permanent rock structure.

I am e-mailing you to ask if you have had time to review the letter and whether you or the US EPA has any questions or comments on the project at this point. Thank you for your time.

Regards,

Derek Linsley

--

Derek Linsley
Ocean Engineer
Sea Engineering, Inc.
www.seaengineering.com
dlinsley@seaengineering.com
808.259.7966 ext. 21

Derek Linsley

From: Kim, Jiny <jiny_kim@fws.gov>
Sent: Wednesday, July 20, 2016 1:19 PM
To: Derek Linsley
Subject: Re: FW: Hawaii Kai Marina Entrance Channel - Groin Replacement Project

Hi Derek,

Our office (including the aquatics department) does not have comments at this time.

Mahalo!

Jiny Kim
Biologist
O'ahu, Kaua'i, Northwestern Hawaiian Islands, and American Samoa
Pacific Islands Fish and Wildlife Office
U.S. Fish and Wildlife Service
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawai'i 96850
Ph: 808.792.9444

On Mon, Jul 18, 2016 at 11:08 AM, Derek Linsley <dlinsley@seaengineering.com> wrote:

> Great, thank you Jiny. I will make sure a copy of the DEA makes it to your office when we publish it through OEQC.
>
> Regards,
>
> Derek Linsley
>
> --
>
> Derek Linsley
>
> Ocean Engineer
>
> Sea Engineering, Inc.

From: Kim, Jiny [mailto:jiny_kim@fws.gov]
Sent: Monday, July 18, 2016 10:50 AM

To: Derek Linsley <dlinsley@seaengineering.com>
Subject: Re: FW: Hawaii Kai Marina Entrance Channel - Groin Replacement Project

Hi Derek,

I did not have any comments, but am checking with the aquatics team on regard to any comments they might have. I will let you know if I hear anything from them.

Our office would like to review the DEA when it is complete.

Mahalo!

Jiny Kim

Biologist

O'ahu, Kaua'i, Northwestern Hawaiian Islands, and American Samoa

Pacific Islands Fish and Wildlife Office

U.S. Fish and Wildlife Service

300 Ala Moana Boulevard, Room 3-122

Honolulu, Hawai'i 96850

Ph: 808.792.9444

On Mon, Jul 18, 2016 at 9:26 AM, Derek Linsley <dlinsley@seaengineering.com> wrote:

> Aloha Jiny,

Just checking if you've had a chance to review the Hawaii Kai Marina Entrance Channel Groin Replacement pre-consultation letter. We're wrapping up our DEA and I would like to include any comments that the FWS has at this point. Thank you!

Regards,

Derek Linsley

--

Derek Linsley

Ocean Engineer

Sea Engineering, Inc.

From: Kim, Jiny [mailto:jiny_kim@fws.gov]
Sent: Thursday, June 30, 2016 2:27 PM

To: Derek Linsley <dlinsley@seaengineering.com>
Subject: Re: FW: Hawaii Kai Marina Entrance Channel - Groin Replacement Project

Your welcome. Have a great long weekend!

Jiny Kim

Biologist

O'ahu, Kaua'i, Northwestern Hawaiian Islands, and American Samoa

Pacific Islands Fish and Wildlife Office

U.S. Fish and Wildlife Service

300 Ala Moana Boulevard, Room 3-122

Honolulu, Hawai‘i 96850

Ph: 808.792.9444

On Thu, Jun 30, 2016 at 2:26 PM, Derek Linsley <dlinsley@seaengineering.com> wrote:

Thank you Jiny, I appreciate the response.

Derek

--

Derek Linsley

Ocean Engineer

Sea Engineering, Inc.

From: Kim, Jiny [mailto:jiny_kim@fws.gov]
Sent: Thursday, June 30, 2016 2:23 PM
To: Derek Linsley <dlinsley@seaengineering.com>
Subject: Re: FW: Hawaii Kai Marina Entrance Channel - Groin Replacement Project

Aloha Derek,

I have been assigned to review this project. I will let you know if I have any questions and get back to you shortly.

Mahalo,

Jiny Kim

Biologist

O‘ahu, Kaua‘i, Northwestern Hawaiian Islands, and American Samoa

Pacific Islands Fish and Wildlife Office

U.S. Fish and Wildlife Service

300 Ala Moana Boulevard, Room 3-122

Honolulu, Hawai‘i 96850

Ph: 808.792.9444

From: Derek Linsley [mailto:dlinsley@seaengineering.com]
Sent: Wednesday, June 29, 2016 3:50 PM
To: mary_abrams@fws.gov
Subject: Hawaii Kai Marina Entrance Channel - Groin Replacement Project

Aloha Ms. Abrams,

Back in March I mailed you a preconsultation letter (attached) for a project that we are preparing an Environmental Assessment for at the Hawaii Kai Marina Entrance Channel. The project includes replacing the existing sandbag groin with a permanent rock structure.

I am e-mailing you to ask if you have had time to review the letter and whether you or the US FWS has any questions or comments on the project at this point. Thank you for your time.

Regards,

Derek Linsley

--

Derek Linsley

Ocean Engineer

Sea Engineering, Inc.

www.seaengineering.com

dlinsley@seaengineering.com

808.259.7966 ext. 21

DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
EMD/CWB

08047CEC.16

August 30, 2016

Mr. Derek Linsley
Sea Engineering Inc.
Makai Research Pier
Waimanalo, Hawaii 96795-1820

Dear Mr. Linsley:

Subject: Section 401 Water Quality Certification (WQC) Requirements for the Hawaii Kai Marina Groin Replacement, Hawaii Kai, Honolulu Island of Oahu, Hawaii DA File No. POH-2016-00095

Reference is made to a letter, dated April 15, 2016, from Mr. Shane McCoy, Acting Chief, Regulatory Office, Honolulu District of the Pacific Ocean Division (POH), U.S. Army Corps of Engineers (COE), to you which stated that:

> "Based on your submittal, the proposed work to replace the existing sand groin with a riprap groin in the Pacific Ocean next to the entrance to Kuapa Pond in Hawaii Kai, Honolulu, Oahu, will require placing fill and a structure within the Pacific Ocean. Therefore, in accordance with Section 404 and Section 10 you must obtain a DA permit from this office prior to commencing your proposed work.
>
> The proposed work to replace the existing sand groin with a riprap groin in the Pacific Ocean next to the entrance to Kuapa Pond in Hawaii Kai, Honolulu, Oahu, may qualify for authorization under an individual permit. ..."

As such and pursuant to Federal Clean Water Act (CWA) Paragraph 401(a)(1) and Hawaii Administrative Rules (HAR), §11-54-9.1, a Section 401 WQC is required for "[a]ny applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which **may result in any discharge** into the navigable waters ..." (Emphasis added)

Pursuant to HAR, §11-54-9.1.02(a):

> "The owner or its duly authorized representative shall submit a complete water quality certification application for the discharge resulting from an activity..."

The Section 401 WQC Application Form and guidelines may be downloaded from our website at: https://eha-cloud.doh.hawaii.gov/epermit.

Data Quality Objectives (DQO) planning process is recommended for preparing the "Applicable Monitoring and Assessment Plan (AMAP)" as required in Item No. 11 of the Application. "Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4)," (EPA/240/B-06/001) is available at EPA's Quality System support Web site (http://www.epa.gov/quality).

The DOH-CWB has prepared an **"AMAP GUIDELINES (DQO format), August 14, 2015 Version 1"** for Applicants seeking DOH-CWB's conditional blanket Section 401 WQC coverage under File No. WQC0804 issued on August 14, 2015 for project qualifies for certain DA 2012 NWPs verification. This document is located at DOH-CWB website: http://health.hawaii.gov/cwb/files/2013/04/WQC0804.FNL_.15.pdf
You may use this AMAP guidelines as references while preparing your project specific AMAP for the subject project.

Please make sure that the person to be duly authorized by you under Item No. 16 of the Application meets 40 CFR §122.22 (b) requirements.

Please complete and submit the Section 401 WQC Application, a CD or DVD that contains the Application and all attachments in pdf format (minimum 300 dpi), and the required filing fee to the Clean Water Branch (CWB) for processing.

Please be informed that Hawaii Revised Statutes, Section 342D-50, requires that:

> **[§342D 50] Prohibition**. (a) No person, including any public body, shall discharge any water pollutant into state waters, or cause or allow any water pollutant to enter state waters except in compliance with this chapter, rules adopted pursuant to this chapter, or a permit or variance issued by the director.

Please include the following certification statement in all future correspondence with the Department of Health for the subject project:

> **"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."**

If you have any questions, please contact Mr. Edward Chen of the Engineering Section, CWB, at (808) 586-4309.

Sincerely,

Alec Wong

ALEC WONG, P.E., CHIEF
Clean Water Branch

EC

c: Dr. Wendy Wiltse, PICO, R9, EPA [via e-mail Wiltse.Wendy@epa.gov only]
Regulatory Office, POH, COE [via e-mail cepoh-ro@usace.army.mil only]
Mr. John Nakagawa, CZM Program, Office of Planning, DBEDT
[via e-mail JNakagawa@dbedt.hawaii.gov only]
Mr. Tunis McElwain, POH, COE [via e-mail Tunis.W.McElwain@usace.army.mil only]
Ms. Vera Koskelo, POH, COE [via e-mail Vera.B.Koskelo@usace.army.mil only]