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MAY 23 2017

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WW.PEA 17-054

May 11, 2017

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OFC. OF ENVIRONMENTAL
QUALITY CONTROL

Scott J. Glenn, Director
Office of Environmental Quality Control
Department of Health, State of Hawaii
235 South Beretania Street, Room #702
Honolulu, Hawaii 96813

Dear Mr. Glenn:

SUBJECT: Sand Island Wastewater Treatment Plant Outfall
Shoreline Revetment Project
Draft Environmental Assessment and
Anticipated Finding of No Significant Impact (DEA-AFONSI)

With this letter, the City and County of Honolulu, Department of Design and Construction–Wastewater Division hereby transmits the Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFONSI) for the Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project. The project is situated at TMKs (1) 1-5-041:006 and (1) 1-5-041:003 in the Kona District on the Island of Oahu for publication in the next available edition of the Environmental Notice.

Enclosed is a completed OEQC Publication Form, two copies of the DEA-AFONSI, and Adobe Acrobat PDF file of the same, and an electronic copy of the Publication Form in MS Word. Simultaneous with this letter, we have submitted the summary of the action in text file by electronic mail to your office.

If there are any questions, please contact Cindy Masuoka at (808) 768-8761 or via email at cmasuoka@honolulu.gov.

Very truly yours,

Robert J. Kroning, P.E.
Director

Enclosures:

1. OEQC Publication Form
2. DEA-AFONSI (2 Hard Copies)
3. CD containing OEQC Publication Form (in MS Word) and DEA-AFONSI (in Adobe PDF)

17-490

AGENCY
PUBLICATION FORM

Project Name:	Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
Project Short Name:	Sand Island Shoreline Revetment
HRS §343-5 Trigger(s):	(1) Propose the use of state or county lands or the use of state or county funds (2) Propose any use within any land classified as a conservation district (3) Propose any use within a shoreline area
Island(s):	O'ahu
Judicial District(s):	Kona
TMK(s):	(1) 1-5-041:006; (1) 1-5-041:003
Permit(s)/Approval(s):	Special Management Area Permit Conservation District Use Permit Shoreline Certification Shoreline Setback Variance Section 404, Clean Water Act, Individual Permit Section 10, Rivers and Harbors Act, Permit National Pollutant Elimination System (NPDES) Construction Stormwater General Permit Coverage (Form C) NPDES, Construction Activity Dewatering Permit (Form G) Community Noise Permit/Variance Coastal Zone Management Consistency Determination Conditional Use Permit, Minor Land Disposition
Proposing/Determining Agency:	City and County of Honolulu, Department of Design and Construction – Wastewater Division
Contact Name, Email, Telephone, Address	Cindy Masuoka cmasuoka@honolulu.gov (808) 768-8761 650 South King Street, 11th floor Honolulu, Hawai'i 96813
Accepting Authority:	(for EIS submittals only)
Contact Name, Email, Telephone, Address	
Consultant:	SSFM International
Contact Name, Email, Telephone, Address	Jennifer M. Scheffel jscheffel@ssfm.com (808) 356-1273 501 Sumner Street, Suite 620 Honolulu, Hawai'i 96817

Status (select one)	**Submittal Requirements**
__X__ DEA-AFNSI	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEA, and 4) a searchable PDF of the DEA; a 30-day comment period follows from the date of publication in the Notice.
____ FEA-FONSI	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; no comment period follows from publication in the Notice.
____ FEA-EISPN	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; a 30-day comment period follows from the date of publication in the Notice.

____ Act 172-12 EISPN ("Direct to EIS")	Submit 1) the proposing agency notice of determination letter on agency letterhead and 2) this completed OEQC publication form as a Word file; no EA is required and a 30-day comment period follows from the date of publication in the Notice.
____ DEIS	Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEIS, 4) a searchable PDF of the DEIS, and 5) a searchable PDF of the distribution list; a 45-day comment period follows from the date of publication in the Notice.
____ FEIS	Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEIS, 4) a searchable PDF of the FEIS, and 5) a searchable PDF of the distribution list; no comment period follows from publication in the Notice.
____ FEIS Acceptance Determination	The accepting authority simultaneously transmits to both the OEQC and the proposing agency a letter of its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS; no comment period ensues upon publication in the Notice.
FEIS Statutory Acceptance	Timely statutory acceptance of the FEIS under Section 343-5(c), HRS, is not applicable to agency actions.
____ Supplemental EIS Determination	The accepting authority simultaneously transmits its notice to both the proposing agency and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is or is not required; no EA is required and no comment period ensues upon publication in the Notice.
____ Withdrawal	Identify the specific document(s) to withdraw and explain in the project summary section.
____ Other	Contact the OEQC if your action is not one of the above items.

Project Summary

The City and County of Honolulu (CCH) Department of Design and Construction (DDC) Wastewater Division proposes to construct a new revetment structure at the location of the Sand Island WWTP Outfall structure along the shoreline on the southwest point of Sand Island in Honolulu, Hawai'i.

The proposed revetment would be approximately 450 feet long and would armor the shoreline to prevent further erosion. The revetment is proposed to extend from the approximate location where the outfall extends into the ocean northward along the shoreline to the dredged channel. The revetment structure would be an un-cemented rock rubble mound that would be built using boulder size rocks.

The revetment is needed to protect the Sand Island WWTP outfall, which is critical infrastructure for the City of Honolulu. The Sand Island WWTP outfall is the only wastewater outfall servicing the Honolulu area. Failure of or damage to the outfall could have catastrophic health, environmental, and economic consequences. The progressive shoreline erosion is a serious potential threat that could eventually expose and compromise the outfall pipeline.

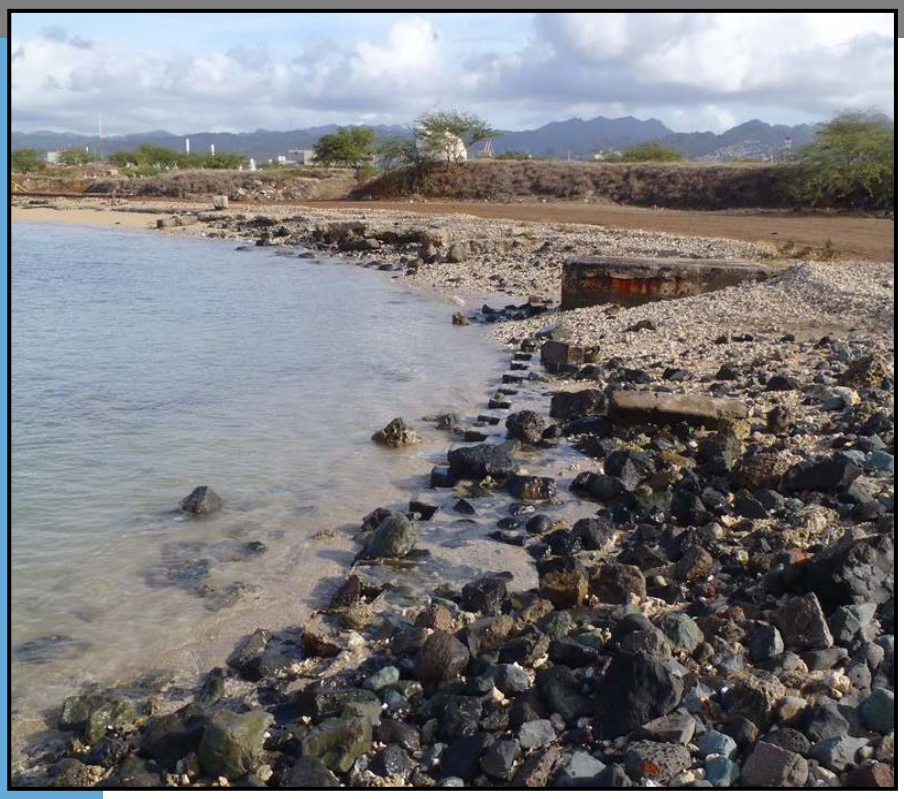
DRAFT ENVIRONMENTAL ASSESSMENT

for

Sand Island Wastewater Treatment Plant Outfall

Shoreline Revetment Project

Honolulu, Hawai‘i



Prepared For

City and County of Honolulu
Department of Design and Construction

Prepared By

SSFM INTERNATIONAL

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Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project Honolulu, Hawai‘i

Prepared for:

City and County of Honolulu
Department of Design and Construction
650 South King Street, 11th floor
Honolulu, Hawai‘i 96813

Prepared by:

SSFM International, Inc.
501 Sumner Street, Suite 620
Honolulu, Hawai‘i 96817

May 2017

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Project Summary

Project Name	Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
Location	Honolulu, Hawai‘i
District	Kona
Project Site Tax Map Key	(1) 1-5-041:006 (1) 1-5-041:003
Landowner	State of Hawai‘i Division of State Parks
Project Site Existing Uses	The project site is vacant land that contains the existing buried Sand Island Wastewater Treatment Plant (WWTP) outfall pipeline.
State Land Uses	Urban
City and County of Honolulu Zoning	P-2, General Preservation District
Proposed Action	The City and County of Honolulu (CCH) Department of Design and Construction (DDC) Wastewater Division proposes to construct a new revetment structure at the location of the Sand Island WWTP Outfall structure along the shoreline on the southwest point of Sand Island in Honolulu, Hawai‘i. The proposed revetment would be approximately 450 feet long and would armor the shoreline to prevent further erosion. The revetment is proposed to extend from the approximate location where the outfall extends into the ocean northward along the shoreline to the dredged channel. The revetment structure would be an un-cemented rock rubble mound that would be built using boulder size rocks.
Anticipated Impacts	The Proposed Action is not expected to negatively alter existing conditions at the site or have negative impacts on the environment. The proposed revetment is limited to the approximate 400 feet of pipeline alignment that is presently threatened with erosion. The revetment would halt shoreline erosion along this alignment. As both ends of the revetment are embedded into the existing backshore ground, the revetment should not alter the shoreline or coastal processes to the north, south, or east. There would be no marine impacts other than short-term turbidity during construction.
Proposing Agency	City and County of Honolulu Department of Design and Construction 650 South King Street, 11th floor Honolulu, Hawai‘i 96813
Anticipated Determination	Finding of No Significant Impact (FONSI)
Project Site Permits/ Approvals Required	See **Table 1-2. Permits and Approvals Required for the Proposed Action**

EA Preparer	SSFM International 501 Sumner Street, Suite 620 Honolulu, Hawai‘i 96817 Contact: Jennifer Scheffel (808) 356-1273
Individuals, Community Groups, and Agencies Consulted	See **Chapter 6: Agencies and Organizations Consulted**

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Appendix C: Biological Resources Survey Report

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Acronyms

%	percent
°F	degrees Fahrenheit
μg/m^3	micrograms per cubic meter
AAQS	Ambient Air Quality Standards
BMPs	Best Management Practices
BWS	Board of Water Supply
CAA	Clean Air Act
CCH	City and County of Honolulu
CO	carbon monoxide
CO_2	carbon dioxide
CWB	Clean Water Branch
CWRM	Commission on Water Resource Management
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act of 1972
DDC	Department of Design and Construction
DLNR	Department of Land and Natural Resources
DNL	decibel noise level
DOH	Department of Health
DOT	Department of Transportation
DSP	Division of State Parks
EA	Environmental Assessment
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
HAR	Hawai‘i Administrative Rules
HECO	Hawaiian Electric Company
HFD	Honolulu Fire Department
HNN	Hawai‘i News Now
HPD	Honolulu Police Department
HRS	Hawai‘i Revised Statutes
ICAC	Interagency Climate Adaptation Committee
MBTA	Migratory Bird Treaty Act
mgd	million gallons per day
MLLW	mean lower low water
msl	mean sea level
NAAQS	National Ambient Air Quality Standards
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service

O_3	ozone
$PM_{2.5}$	particulate matter less than 2.5 microns
PM_{10}	particulate matter less than 10 microns
POW	prisoner of war
ppb	parts per billion
ppm	parts per million
PVT Landfill	PVT Integrated Solid Waste Management Facility
ROH	Revised Ordinances of Honolulu 1990
SHPD	State Historic Preservation Department
SLUC	State of Hawai‘i Land Use Commission
SMA	Special Management Area
SO_2	sulfur dioxide
SRA	State Recreation Area
UH SOEST	University of Hawai‘i School of Ocean and Earth Science and Technology
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WRCC	Western Regional Climate Center
WWTP	Wastewater Treatment Plant

CHAPTER 1: PROJECT DESCRIPTION

1.1 Introduction

The City and County of Honolulu (CCH) Department of Design and Construction (DDC) Wastewater Division proposes to construct a new revetment structure at the location of the Sand Island Wastewater Treatment Plant (WWTP) Outfall pipeline along the shoreline on the southwest point of Sand Island in Honolulu, Hawai'i.

This Environmental Assessment (EA) has been prepared pursuant to the requirements of Hawai'i Revised Statutes (HRS) Chapter 343, Environmental Impact Statements.

1.2 Project Background

The Sand Island WWTP 84-inch ocean outfall extends approximately 1,450 feet from the treatment plant to a transition point on the Sand Island shoreline where it extends offshore for 12,500 feet. In the offshore direction, the pipeline is buried in a 13-foot 4-inch-wide trench that was excavated into the fossil reef and lined with sheet pile. The top of the pipe is approximately 7.5 feet below the top of the sheet pile. The pipe is overlain and protected by Class "C"[1] and Class "B"[2] stone. The inshore portion of the pipe was constructed with the top of the pipe approximately 2.2 feet below grade[3] with the top of the pipe at an elevation of -3 feet mean sea level (msl) for 1,000 feet inshore of the stop gate, described below. Therefore, the land portion of the outfall is relatively unarmored and vulnerable to damage should the section become exposed to wave activity.

Design of the pipeline in 1973 included a "stop gate" near the shoreline. The stop gate consists of a concrete housing with horizontal dimensions 7 feet 8 inches alongshore by 12 feet 4 inches cross shore. The top of the concrete housing is approximately 3.5 feet above msl, and the 84-inch effluent discharge pipe passes through the concrete housing. The manhole is 17 feet 2 inches in vertical height. At the time of construction, the stop gate was located more than 150 feet inshore of the shoreline.

As part of an outfall mapping and condition inspection project conducted in 2011 and 2012, dramatic erosion and recession of the shoreline was documented. Although the existing rock revetment for the outfall that was constructed at approximately the same time as the outfall continues to offer some protection for the shoreline, it is in a degraded condition.

1.3 Purpose and Need for the Proposed Action

Purpose of the Proposed Action

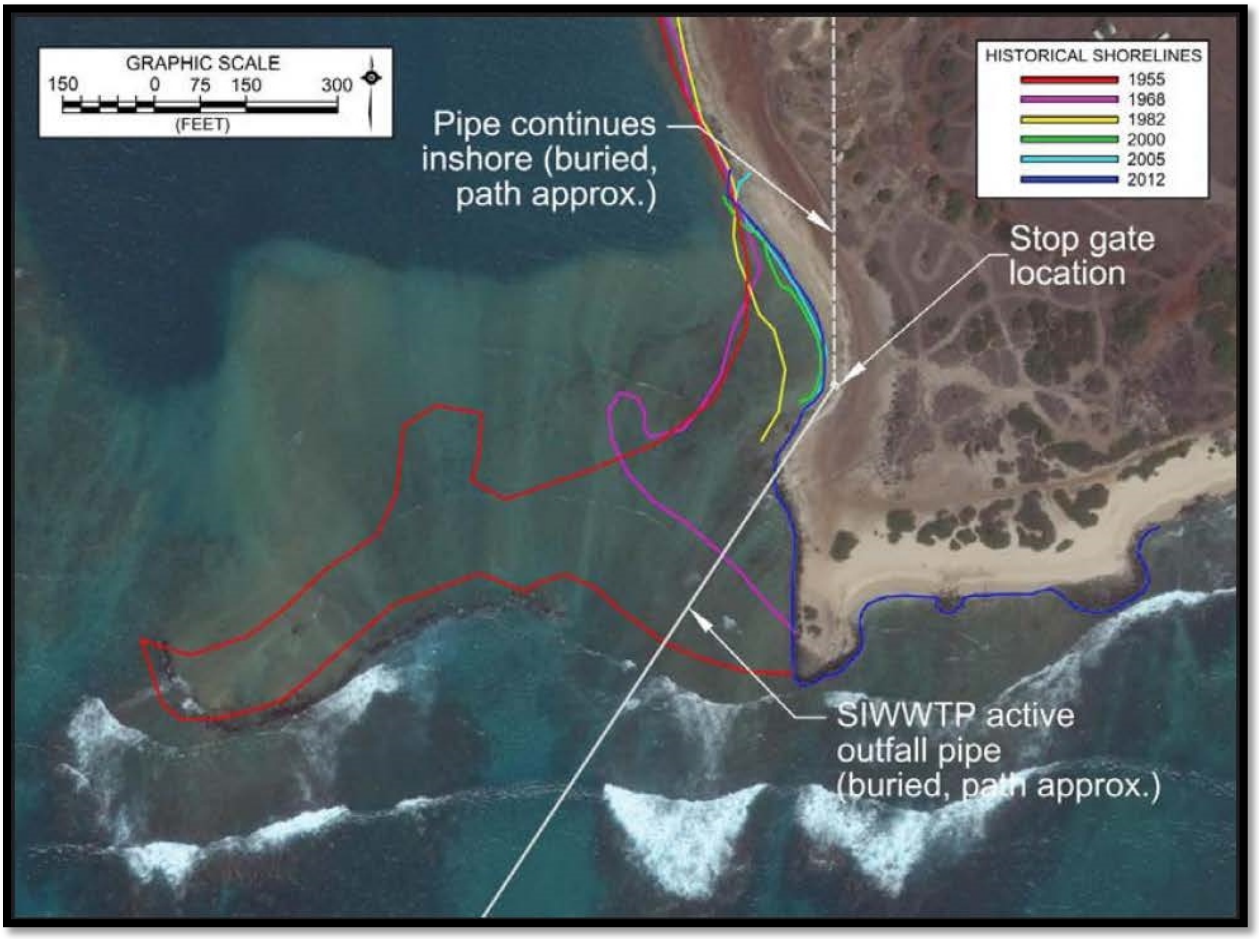
The purpose of the Proposed Action is to minimize shoreline erosion at the Sand Island WWTP outfall pipeline's ocean entry in order to ensure the continued operation of the outfall with minimal maintenance.

[1] Rock with nominal size of ½ foot
[2] Rock with nominal size of 1 foot
[3] It is unknown what "grade" was at the time of construction

Need for the Proposed Action

Aerial photographic analysis shows that erosion of the shoreline in the project area has occurred between 1949 and 2012, although it appears to have been mostly stable since 2005. To update the erosion analysis, a topographic survey was conducted in March 2017 to locate the current position of the beach toe. The survey indicated that the shoreline continued to erode between 2012 and 2017. North of the stop gate, the shoreline receded up to 20 feet, which further exposed the stop gate structure. In addition, the revetment south of the stop gate is further breached, and the beach to the east has eroded approximately 10 feet. The shoreline is man-made, and there is no certainty that stability will ever occur naturally. Predicted sea level rise will likely result in further shoreline erosion. **Figure 1-1** shows the extent of shoreline erosion in the vicinity of the project area between 1955 and 2012. **Figure 1-2** shows the current beach toe position compared to the 2012 position.

Figure 1-1. Shoreline Erosion, 1955 to 2012



Source: Sea Engineering, Inc., 2015

Figure 1-2. Comparison of 2012 and 2017 Shoreline

Source: Sea Engineering, Inc., 2017

A rock revetment was constructed at approximately the same time as the outfall construction in 1975. This revetment continues to provide some protection for the shoreline but is in a degraded condition. While the existing revetment has likely contributed to slowing the recent erosion rate, it does not offer substantial protection for the on-land portion of the buried outfall, which puts the outfall at risk. Extreme wave and storm events can cause rapid erosion and damage to the shoreline. During such an event, the damage can occur over a short time span, possibly overnight. Climate change factors, including sea level rise, are likely to increase the near-shore wave exposure of the outfall. Additionally, the existing revetment structure will likely continue to degrade. Any significant damage to the structure will probably cause an increase in shoreline erosion near the stop gate structure.

Although the stop gate was constructed more than 150 feet inshore of the shoreline, it is currently located at the waterline due to erosion. There is a concern that continued shoreline erosion, particularly in conjunction with a potential tropical storm, may begin to remove cover material and expose the trench

and possibly damage the outfall. Additionally, the concrete housing of the stop gate was found to have rust stains indicative of rusting rebar, as well as some delamination of the concrete surface.

The Sand Island WWTP outfall is critical infrastructure for the City of Honolulu as it discharges an average of 66 million gallons of effluent per day. The Sand Island WWTP outfall is the only wastewater outfall servicing the Honolulu area. Failure of or damage to the outfall could have catastrophic health, environmental, and economic consequences. The progressive shoreline erosion is a serious potential threat that could eventually expose and compromise the outfall pipeline.

1.4 Project Location and Site Characteristics

Project Location

The project site is located at the southern tip of Sand Island on land that has been set aside to the Department of Land and Natural Resources (DLNR), Division of State Parks (DSP) under Executive Order 2704. CCH will coordinate with the DLNR Land Division to obtain an easement for the revetment and construction access. The project site and surrounding lands and water are owned by the State of Hawai'i, as shown in **Figure 1-3**.

Topography

A topographic survey of the project area was conducted in October 2014. The topographic survey indicated a beach berm elevation of approximately 5 feet and a nearshore reef flat elevation of approximately -0.5 feet. The survey also showed that the portion of the pipeline within 150 feet of the stop gate, extending both inshore and offshore, is at the current waterline.

Shoreline Description

The shoreline reach in this area is fronted by a wide and shallow fringing reef that terminates at the edge of one of the dredged seaplane channels and extends approximately 500 feet offshore of the southern tip of Sand Island. A set of concrete barriers curves across the outer part of the reef flat, but these barriers are in poor condition and offer no real protection for the shoreline.

The shoreline in the southern portion of project area (i.e., near the existing stop gate) is composed of a mix of coral gravel and basalt cobbles with little sand, which are likely derived from cobble fill eroded from the pipe trench. The shoreline south of the stop gate transitions into small basalt boulders and concrete rubble, likely placed to combat erosion. The basalt boulders continue around the southern tip of Sand Island where they protect another concrete housing and manhole cover belonging to an inactive pipe. The shoreline turns east and becomes a sandy beach. Erosion scarps exposing consolidated fill material can be seen in this area. To the north of the stop gate, the beach is composed of a wide variety of materials, including basalt and coral cobbles, concrete debris, scarps of lithified sediment, and a gravel berm that runs along much of the shore and defines the upper reach of typical wave action. The upper swash and beach berm are composed of coralline gravel either transported across the fringing reef or derived from eroded fill material. The low berm height and gravel sediment are indicative of small but persistent waves. The backshore is composed of red clay fill.

Figure 1-3. Project Location and Land Ownership

There is little natural shoreline left in this area. Modifications include the excavation and placement of the Sand Island WWTP outfall pipe, the rock revetment that extends to the southern tip of Sand Island, and the line of single concrete armor blocks that form a partial barrier across the fringing reef.

Bottom Substrate

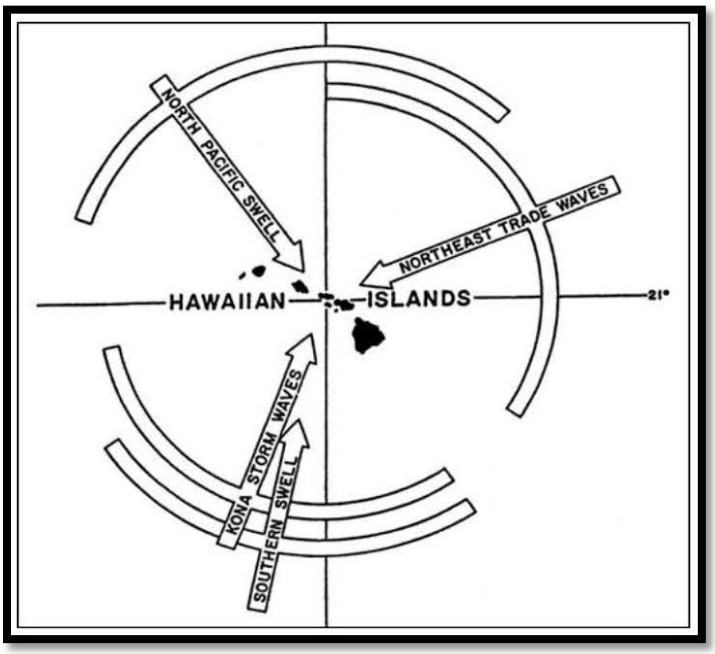
Most of the substrate fronting the shoreline appears to be composed of layers of sand, gravel, and coral rubble. There are two hard bottom areas: (1) at the stop gate, and (2) approximately 300 feet north of the stop gate. The northern area consists of a hard coralline reef material with no overlying sediment except on the beach face. However, inspection of the hard bottom revealed that it is a relatively thin layer, approximately 0.5 to 1 foot in thickness, and is broken up in places. It is likely that it previously had a greater areal extent but became broken and eroded due to exposure.

For shore protection design purposes, the substrate is considered to be an erodible substrate; therefore, the revetment will require a toe configuration designed to resist scouring.

Waves

The wave climate in Hawai'i is characterized by four general wave types: northeast trade wind waves, southern swell, North Pacific swell, and Kona wind waves. As shown in **Figure 1-4**, two of these wave types affect the southern shores: southern swell and Kona wind waves.

Figure 1-4. Common Wave Types and Approach Directions in Hawai'i



Source: Sea Engineering, Inc., 2017

The southern swell is generated by storms in the southern hemisphere and is most prevalent during the summer months of May through September. These waves travel distances up to 5,000 miles and have relatively low deepwater wave heights of 1 to 4 feet and periods of 14 to 20 seconds. Southern swells

approach between the southeasterly and southwesterly directions depending on the positions and tracks of the southern hemisphere storms. Sand Island is directly exposed to swell from the southerly direction.

Kona storm waves also directly approach the south shore. These waves are fairly infrequent and occur only about 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, during the Kona storm of January 1980, deepwater wave heights were approximately 17 feet.

Tides and Water Level Rise

Water depth fluctuations occur with the daily tides, as well as from storm surges during hurricanes, wave setup during high wave events, and both short- and long-term changes in ocean elevation.

The tides in Hawaiian waters 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 data for Honolulu Harbor, which is applicable to the project site, is shown in **Table 1-1**.

Table 1-1. Tidal Data for Honolulu Harbor

Description	Mean Lower Low Water Datum (feet)
Mean Higher High Water	1.90
Mean High Water	1.44
Mean Sea Level	0.82
Mean Low Water	0.16
Mean Lower Low Water	0.00

Source: Sea Engineering, Inc., 2017

The nearshore water level may be elevated above the tide level by the action of breaking waves offshore during high wave events. This water level rise, termed wave setup, may be as much as 10 to 12% of the breaker height. Thus, the water level could be elevated an estimated 1 to 2 feet during severe storm wave conditions. Storm surges occur during hurricane conditions due to wind stress and reduced atmospheric pressure. These storm surges can potentially add 1 to 2 feet to the stillwater level. During severe storm events, a "super elevation" of the water level at the shore may occur. The rise in stillwater level along the shore during a hurricane or other storm event is due to a combination of the astronomical tide, wave setup, and storm surge due to reduced atmospheric pressure and wind stress.

Hawai'i is also subject to periodic extreme tide levels due to large oceanic eddies that sometimes propagate through the islands. These eddies, termed mesoscale eddies, produce tide levels that can be on the order of 0.5 foot higher than normal for periods up to several weeks.

Water depth at the shoreline is a critical element in coastal engineering design. Deeper water allows higher wave heights to reach the shore, and coastal design must be adjusted accordingly.

1.5 Project Schedule and Construction Costs

It is expected that all permits and approvals, as provided in **Section 1.6**, would be obtained by June 2019. Construction would start upon the receipt of all permits and approvals and would last approximately six

(6) months. A preliminary cost estimate provided for the project estimates the cost of construction as approximately $3,691,000.

1.6 Permits and Approvals Required for the Proposed Action

In addition to the environmental disclosure requirements of HRS Chapter 343, implementation of the Proposed Action would require coordination with state and county agencies for permits or approvals as presented in **Table 1-2**.

Table 1-2. Permits and Approvals Required for the Proposed Action

Permit or Approval	Description	Regulation(s)	Administrative Authority
Special Management Area Permit	Required for any project located within the Special Management Area	• Hawai'i Revised Statutes, Chapter 205A	City & County of Honolulu, Department of Planning and Permitting
Conservation District Use Permit	Required for any project within the designated conservation district, which includes the land and marine waters makai of the certified shoreline.	• Hawai'i Administrative Rules, Title 13, Chapter 5 • Hawai'i Revised Statutes, Chapter 183C	Department of Land and Natural Resources, Land Division
Shoreline Certification	Required to determine the shoreline for purposes of implementing the shoreline setback law.	• Hawai'i Administrative Rules, Title 13, Chapter 222	Department of Land and Natural Resources, Land Division
Shoreline Setback Variance	Required for projects located within the shoreline setback (40 feet inland from the certified shoreline)	• Hawai'i Revised Statutes, Chapter 205A • Revised Ordinances of Honolulu, Chapter 23	City & County of Honolulu, Department of Planning and Permitting
Section 404 Individual Permit	Required for any project that will discharge dredged or fill material into waters of the United States.	• Clean Water Act, Section 404	U.S. Army Corps of Engineers
Section 10	Required for any structure in or over any navigable water of the United States.	• Rivers and Harbors Act, Section 10	U.S. Army Corps of Engineers

Permit or Approval	Description	Regulation(s)	Administrative Authority
National Pollutant Discharge Elimination System, Notice of Intent	Form C required for stormwater discharge associated with construction activities that disturb one (1) acre or more of total land area.	• Clean Water Act, Section 401 • Hawai'i Administrative Rules, Section 11-55	Department of Health, Clean Water Branch
National Pollutant Discharge Elimination System, Dewatering Permit	Form G required for discharges associated with construction activity dewatering.	• Hawai'i Administrative Rules, Section 11-55	Department of Health, Clean Water Branch
Community Noise Permit/Community Noise Variance	Required for construction projects exceeding 78 decibels (dBA) or those that have a total cost of more than $250,000.	• Hawai'i Revised Statutes, Chapter 342F • Hawai'i Administrative Rules, Title 11, Chapter 46	Department of Health, Indoor and Radiological Health Branch
Coastal Zone Management Consistency Determination	Required for any projects that affect any coastal use or resource.	• Hawai'i Revised Statutes, Chapter 205A	State of Hawai'i Office of Planning
Conditional Use Permit – Minor	Required for any projects located in the P-2, Preservation, Zone.	• Revised Ordinances of Honolulu, Chapter 21, Article 3	City & County of Honolulu, Department of Planning and Permitting
Land Disposition	Required for projects encroaching on State Land.	• Hawai'i Revised Statutes, Chapter 171	Department of Land and Natural Resources, Land Board

1.7 Anticipated Findings and Determinations

Based on the significance criteria set forth in Hawai'i Administrative Rules (HAR) 11-200 and discussed in **Section 5.1**, it is anticipated that the Proposed Action will not have a significant effect on the environment and that a Finding of No Significant Impact (FONSI) will be filed with the State of Hawai'i Office of Environmental Quality Control following the public comment period.

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CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

2.1 No-Action Alternative

Under the No-Action Alternative, the proposed revetment would not be constructed at the Sand Island WWTP outfall pipeline ocean entry on the south side of Sand Island. Although there would be no impacts resulting from construction, the No-Action Alternative would result in continuing erosion at the outfall ocean entry, which could eventually lead to exposure and compromise of the pipe.

2.2 Proposed Action

The Proposed Action includes the construction of a rock rubble mound revetment and replacement of the existing stop gate structure.

Rock Rubble Mound Revetment

A revetment is a sloping, un-cemented structure constructed of wave-resistant materials. The most common method of revetment construction is to place a layer of armor stone, sized according to the design wave height, over an underlayer of smaller rock that sits atop filter fabric. The underlayer is designed to distribute the weight of the armor layer and to prevent loss of fine shoreline material through voids in the revetment. Revetments in Hawai'i are typically built on a slope of 1.5 to 2 horizontal to 1 vertical to ensure stability. Toe scour protection can be provided by excavating to place the toe on solid substrate where possible, constructing the foundation as much as practical below the maximum depth of anticipated scour, or extending the toe to provide a scour apron of excess stone. It is important that the armor stone be carefully chosen and placed in a keyed and fitted manner to minimize gaps between stones, which increases the durability of the structure.

One major advantage of a revetment is that the rough, porous rock surface and relatively flat slope of the structure will tend to absorb wave energy, reduce wave reflection, and help to promote accretion of sand on a sandy beach when sufficient sand volume is available in the littoral environment. Additional advantages of revetments are that construction is relatively simply, construction material is readily available, and localized damage can be easily repaired by placement of additional armor stone. Should toe scour occur, the structure can settle and readjust without major failure. Damage from large waves is typically not catastrophic, and the revetment can still function effectively even if damage occurs. Properly designed and constructed rock revetments are durable, flexible, and highly resistant to wave damage.

A revetment is the preferred alternative for shore protection for the outfall pipe for the following reasons:

- High durability, flexibility, and strength
- Suitability in areas of erodible substrate
- Porous surface allows accretion of sand
- A revetment can provide protection over the top and backside of the outfall

Design of the Revetment

The proposed revetment would be approximately 450 feet long and would armor the shoreline to prevent further erosion. The revetment is proposed to extend from the approximate location where the outfall extends into the ocean northward along the shoreline to the dredged channel. The revetment structure

would be an un-cemented rock rubble mound that would be built using boulder size rocks. A small portion of the existing pipeline may be encased in tremie concrete where the sloped portion of the armor stone rests directly on top of it.

The design of coastal structures requires the determination of design wave conditions. **Appendix B** contains the Coastal Assessment report for the project, which details the determination of the design wave conditions. In summary, the determination of the design wave includes the use of several models to assess the following:

- Design deepwater wave height: Represents an extreme event with a small probability of occurrence.
- Design stillwater level: Considers total water level rise as a combination of astronomical tide, storm surge, wave setup, and adjustments for global sea level rise and mesoscale eddy phenomena
- Nearshore wave transformations: Considers wave shoaling, wave refraction, wave reflection, and wave diffraction.

Table 2-1 provides a summary of the design wave parameters used to determine the appropriate design for the revetment.

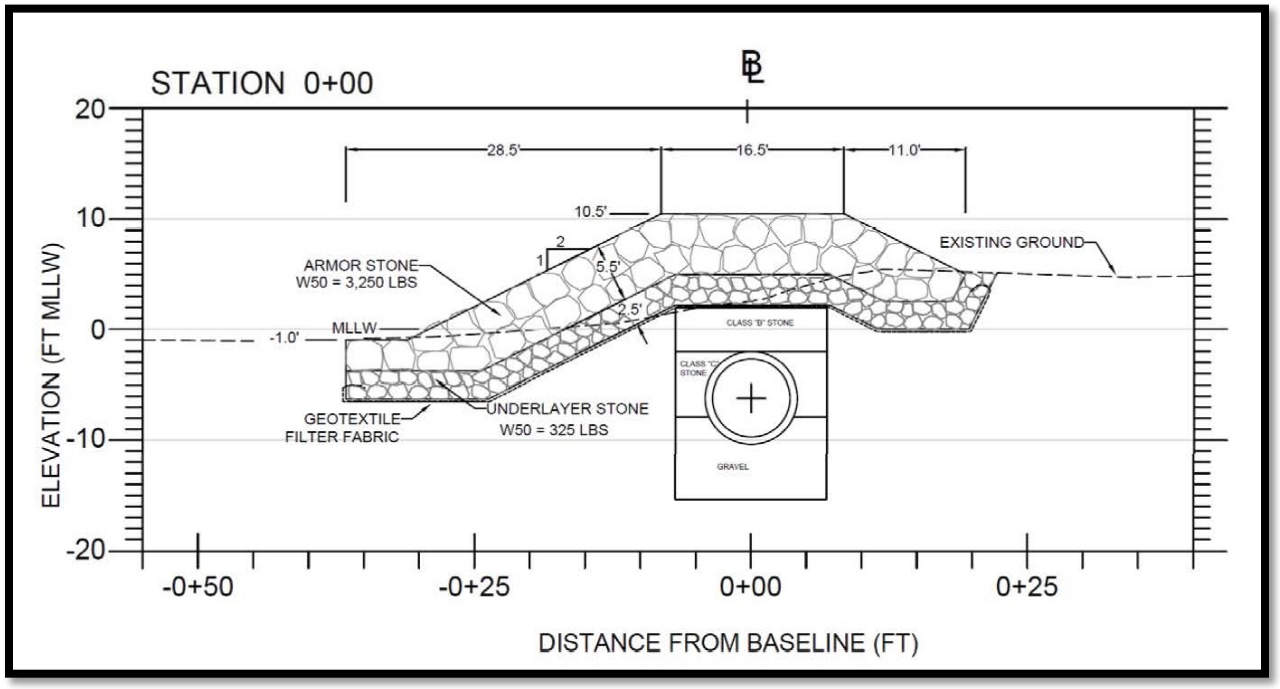
Table 2-1. Design Wave Summary

Parameter	Design Conditions
Deepwater Wave Height/Period	52.7 feet/14.3 seconds
Breaking Wave Height	45.3 feet
Total Stillwater Level Rise	7.3 feet
Nominal Water Depth (MLLW Datum)	1 foot
Design Water Depth	8.3 feet
Design Wave Height	6.5 feet

Source: Sea Engineering, Inc., 2017

As shown in **Figure 2-1**, the revetment would include a scour apron to ensure against erosion undermining the structure. The proposed revetment has a crest elevation of 10.5 feet above mean lower low water (MLLW) level. The slope is 1 vertical to 2 horizontal, and the nominal armor stone size is 3,250 pounds with a two-stone layer thickness of 5.5 feet.

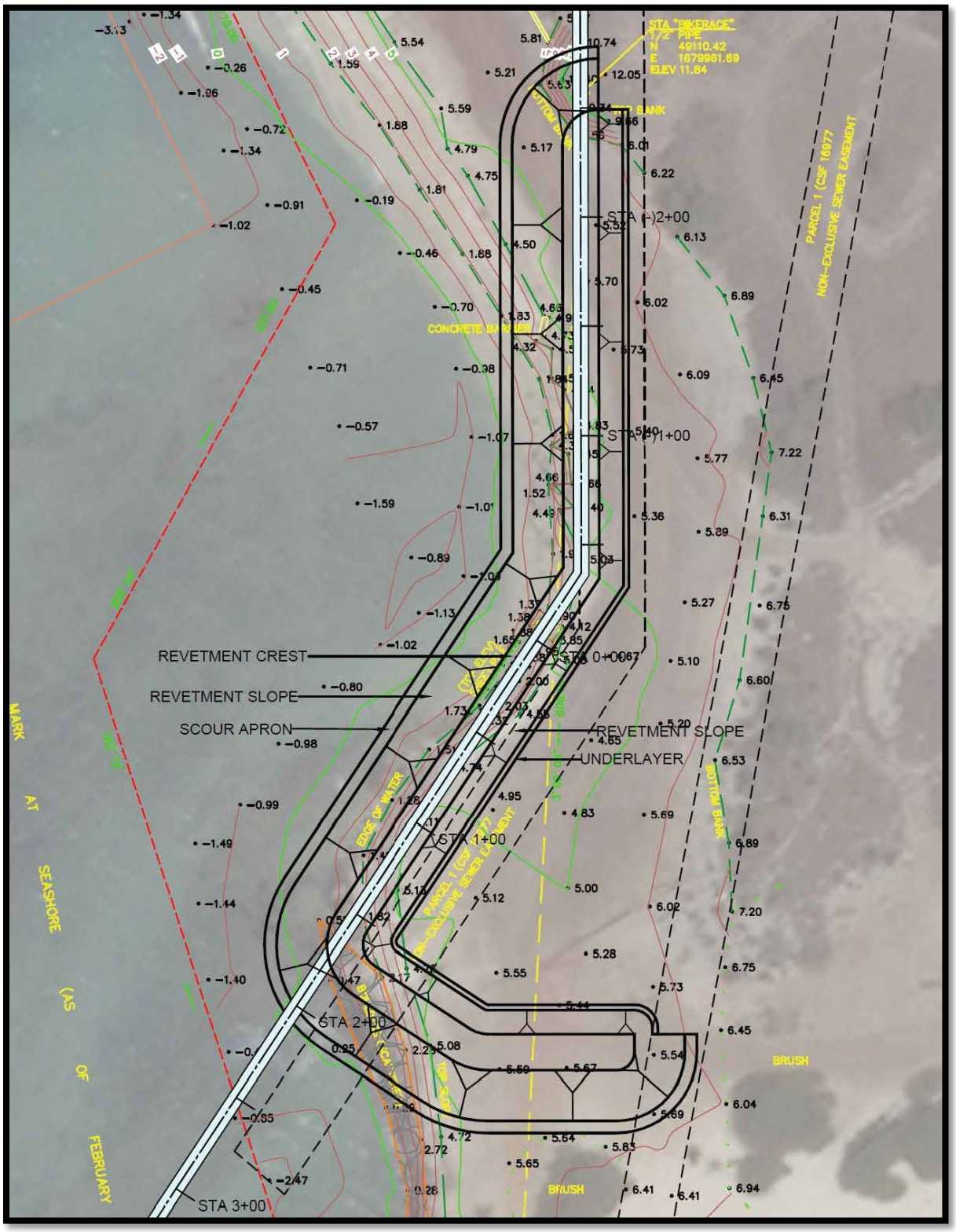
Figure 2-1. Revetment Design and Typical Section



Source: Sea Engineering, 2015

The revetment would follow the pipeline alignment for approximately 300 feet along the shoreline to its entry point into the ocean, at which point it will turn landward for approximately 150 feet, as shown in **Figure 2-2**. The extensive landward return is to prevent flanking erosion of the structure, as the existing shore protection will likely continue to degrade with time. The southern shoreline of Sand Island at this location is reasonably protected by a natural beach with a good volume of sand. However, overtopping will likely occur due to the low grade elevations, and much of the area landward of the new structure can be expected to be awash during such an event. The landward slope and embedment of the structure will prevent significant damage.

Figure 2-2. Revetment Design Layout



Source: Sea Engineering, 2015

All stone would be of a suitable quality to ensure permanence in the structure and in the climate of the area. Stone would be free from cracks, blast fractures, bedding, seams, and other defects that may increase its susceptibility to deterioration from natural causes. The stone would be clean and reasonably free from soil, quarry fines, and would contain no refuse.

Construction of the Revetment

All construction would take place above the pipeline design elements; the original trench elements, including sheet pile, rocking, and the pipeline itself would not be disturbed. Construction would consist four steps:

1. Base preparation (e.g., grading, debris removal, etc.)
2. Laying of geotextile filter fabric
3. Installation of underlayer stone
4. Installation of armor stone

All construction activities would be confined to the immediate area of construction. It is expected that all work would occur from the shore. Construction equipment and revetment materials would be stored at a 14-acre vacant site on the south side of the Sand Island WWTP that would be used as a staging area/contractor yard. Additionally, any excavated material would be stored at the staging area/contractor yard until such time as it can be disposed of at the PVT Integrated Solid Waste Management Facility (PVT Landfill). The construction contractor would be required to employ Best Management Practices (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 or in 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. No construction materials would be stockpiled in the water. Turbidity containment barriers would be installed and maintained to control and contain construction-generated turbidity. The water area around the construction site would be visually monitored, and if monitoring suggests that the turbidity standards are being exceeded, construction would be suspended until the condition is corrected.

Base Preparation

All debris within the reaches of construction would be removed. Areas on which geotextile and stone are to be placed would be graded to be free of any obstruction, debris, depressions, erosion features, or vegetation. Any irregularities of the surface would be removed to ensure a smooth surface for laying of the geotextile filter fabric.

Laying of Geotextile Filter Fabric

Upon completion of the preparation of the base, a filter layer composed of geotextile fabric would be placed on the prepared base. The geotextile filter fabric would be secured to the soil by pins, staples, sand bags, or stone to prevent movement prior to the placement of the underlayer stone, and any overlap of geotextile panels would be 36 inches. The geotextile filter fabric would be protected at all times during construction from contamination by surface runoff, as well as protected from damage prior to and during the placement of underlayer stone. Work would be scheduled to ensure that the underlayer stone is installed within 7 days of the laying of the geotextile filter fabric.

Installation of Underlayer Stone

The underlayer stone would be placed upon the geotextile filter fabric in one operation to avoid tearing, puncturing, or displacing the geotextile filter fabric. The underlayer stone would be placed in two layers in a manner to produce a well-graded mass of stone with minimum voids. The stone would be lowered in a bucket or container and placed in a systematic manner. Placement would begin at the bottom of the slope and would proceed upward.

Installation of Armor Stone

Armor stone would be placed atop the underlayer stone in two layers with minimum sized voids through which underlayer stones cannot pass. Stones would be placed by equipment suitable for handling the stones without damaging the stones. Stones would be randomly placed.

Stop Gate Replacement

The existing stop gate is showing signs of wear and would be replaced approximately 20 feet upstream of the existing location. The new stop gate is anticipated to have the same dimensions as the existing stop gate, which is 12 feet 4 inches by 7 feet 8 inches with a depth of approximately 17 feet. The existing stop gate structure would be removed and the hole would be filled with gravel.

2.3 Alternatives Considered But Not Carried Forward

Three additional alternatives were considered but not carried forward for further analysis. As previously stated in **Section 1.3**, the purpose of the proposed project is to protect the Sand Island WWTP outfall, critical State of Hawai'i and CCH infrastructure, which could have catastrophic consequences if damaged. Any option considered for placement on the shoreline must provide certain, durable protection of the backshore. A secondary consideration is to minimize beach narrowing and beach loss. The options considered must be technically feasible at the scale of the project site. Therefore, the following three alternatives, discussed below, were not carried forward for further analysis:

- Seawall
- Beach nourishment
- Beach nourishment with stabilizing structures

Seawall

A seawall is a vertical or sloping concrete, concrete-rubble-masonry, cement-masonry-unit, or sheet pile wall used to protect the land from wave damage and erosion. A seawall, if properly designed and constructed, is a proven, durable, and relatively low-maintenance shore protection method. Seawalls also have the advantage of having a relatively small footprint along the shoreline.

Unlike revetments, seawalls are not flexible structures, and their structural stability is dependent on the stability of their foundation. To avoid foundation problems, the seawall foundation should be well below the potential scour level, which requires extensive excavation. Additionally, the impervious and vertical face of a seawall results in very little wave energy dissipation. Incident wave energy is deflected upward, downward, and also seaward. Reflected wave energy can inhibit accretion of sand in front of the wall; therefore, seawalls are not generally considered a suitable option if maintaining a beach is desired. Since

the downward energy component can cause scour at the base of the wall, the foundation of a seawall is critical for its stability, particularly on a sandy and eroding shoreline. Ideally, a seawall would be constructed on a solid, non-erodible substrate.

A seawall is not appropriate shore protection at this site for the following reasons:

- There is not a solid substrate upon which to build the seawall and ensure a stable foundation.
- A seawall could inhibit maintenance of a sand beach at the site. For ultimate protection, the seawall would have to wrap around the southern point of Sand Island and extend to the east to prevent flanking.
- Regulatory agencies tasked with beach and shoreline management are also generally reluctant to permit the construction of seawalls due to concerns about potential impacts to beach resources.

Beach Nourishment

Beach nourishment involves placing quantities of suitable sand on a beach to widen the beach, remediate existing erosion, and protect the shore. Beach nourishment requires a supply of sand that is ideally similar in character to the native beach sand. While sand may seem like a plentiful resource, the reality is that good quality beach sand is in short supply in the Hawaiian Islands. Appropriate on-shore sources of sand are limited in supply, and overseas sources do not exist. Inland dune deposits have been used for some nourishment efforts, but the process of transport by wind preferentially selects a naturally fine grain size, and dune sand therefore tends to be composed of grains that are too fine for many beach applications. Although offshore sand deposits also tend to have grain sizes that are finer than many beaches, the use of offshore sand is technically feasible. Potential borrow sources require exploration using marine geophysical survey techniques to characterize deposit size, and extensive sampling to ensure adequate grain size characteristics. Recovery can be done using clamshell or hydraulic dredging methods. Although offshore sand mining has become a successful alternative to terrestrial sand mining, high costs, extensive permitting and regulatory constraints, and equipment requirements for the operation make it feasible for large, region-wide beach nourishment projects only.

As previously stated in **Section 1.3**, Sand Island is extremely unstable and has eroded hundreds of feet since 1955. Beach nourishment is not recommended as a shore protection alternative for the Sand Island WWTP outfall for the following reasons:

- A beach nourishment project would not alter the ongoing coastal processes that are causing this erosion. It is expected that any sand placed on the beach without stabilizing structures would quickly erode.
- Appropriate sand resources are difficult to find and have not been identified in the area. A comprehensive prospecting effort consisting of geophysical surveying and sampling would be necessary.

Beach Nourishment with Stabilizing Structures

Beach nourishment accompanied by the construction of sand stabilization structures, such as groins, to minimize sand movement can be an effective means for protecting both the beach resource and the

backshore fast land and structures. A series of groin structures accompanied by beach fill would create a stable, wide beach cell within the groins, stable fillets on the outside of each groin, and would reduce the loss of sand.

While this alternative could effectively address the erosion problems along the project site, the groins could disrupt sediment transport to the east and north, and may cause erosion in those areas. Avoiding possible downdrift erosion would require additional groins and extending the project along the length of sand beach to the east and also to the north. Additionally, as with **Beach Nourishment**, discussed above, this alternative would require the location of a suitable sand source.

Beach nourishment with stabilizing structures would require a State of Hawai'i and CCH partnership and extensive community and environmental review. The environmental impacts would be significantly greater because the project footprint would change from small and along the shoreline for a revetment, to large and in the water on the reef. Construction costs and regional impacts would be significantly greater. Additionally, beach nourishment with stabilizing structures does not guarantee shore protection. A large storm or hurricane could quickly erode the sand fill and backshore material and expose the outfall to potential damage. While this risk is small and may be acceptable for many shoreline areas, it is not recommended for critical infrastructure.

Beach nourishment with stabilizing structures is not recommended as a shore protection alternative for the Sand Island WWTP outfall for the following reasons:

- Due to the advanced and critical erosion condition and potential for catastrophic consequences if the outfall were damaged, a coastal protection structure would be recommended as a back-stop even if a regional beach nourishment project were implemented.
- Appropriate sand resources are difficult to find and have not been identified in the area. A comprehensive prospecting effort consisting of geophysical surveying and sampling would be necessary.
- An appropriate beach nourishment project would entail numerous groins and extend the length of the project area.
- The project would require construction of several rock groin structures on the reef, resulting in a significantly larger marine footprint and impacts.

CHAPTER 3: ENVIRONMENTAL SETTING, POTENTIAL IMPACTS, AND MINIMIZATION AND MITIGATION MEASURES

3.1 Climate and Air Quality

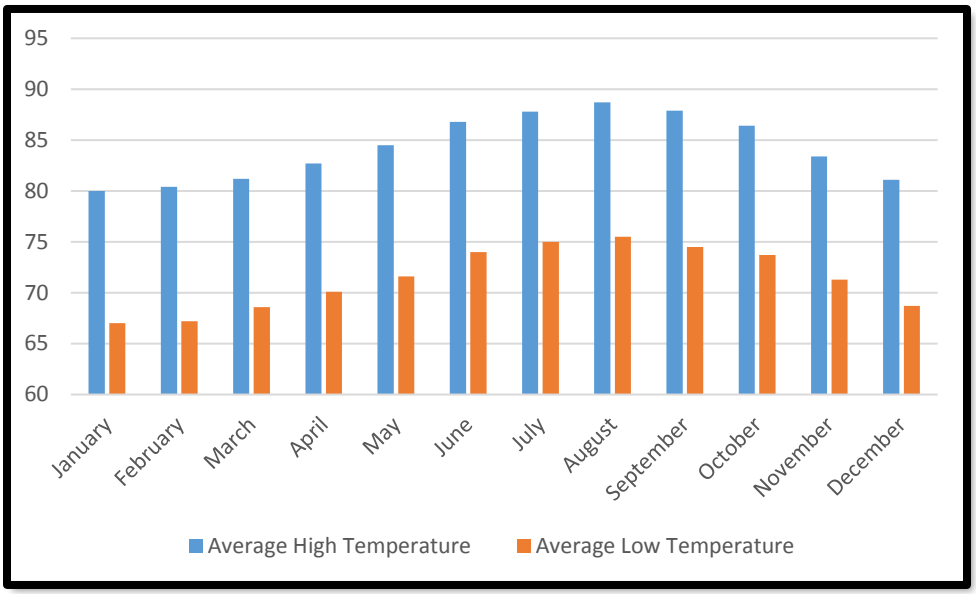
Existing Conditions

Climate

The Proposed Action is located on the south side of Sand Island, which is in Honolulu on the south side of the island of O'ahu. Honolulu experiences a hot, semi-arid climate with a mostly dry summer season due to a rain shadow effect. Temperatures in this area are moderate and equable throughout the year. This reflects the small seasonal variation in the energy received from the sun and the tempering effect of the surrounding Pacific Ocean. Being situated in the tropics, Hawai'i has a relatively uniform day length and temperature.

The Honolulu area has an average high temperature of 84.2 degrees Fahrenheit (°F) and an average low temperature of 71.4°F. The average temperature in Honolulu is 77.8°F. As shown in **Figure 3-1**, the warmest months are July, August, and September with average temperatures of 81.4°F, 82.1°F, and 81.2°F, respectively. The coolest months are January and February with average temperatures of 73.5°F and 73.8°F, respectively (WRCC, 2009). Honolulu averages approximately 24.66 inches of rain per year.

Figure 3-1. Honolulu Average Temperatures (°F)



Source: WRCC, 2009

The prevailing winds throughout the year in Hawai'i are the northeasterly trade winds. Trade wind frequency varies from more than 90% of the time during the summer season to only 50% in January, with

an overall frequency of 70%. Westerly, or Kona, winds occur primarily during the winter months, generated by low pressure systems near the islands.

Trade winds are produced by the outflow of air from the Pacific Anticyclone high pressure system, also known as the Pacific High. The center of this system is located well north and east of the Hawaiian chain and moves to the north and south seasonally. In the summer months, the center moves to the north, causing the 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 May.

Wind patterns of a more transient nature increase during the winter months. Winds from extra-tropical storms can be very strong from almost any direction, depending on the strength and position of the storm. Kona winds are generally from a southerly to southwesterly direction, and are sometimes associated with slow moving low pressure systems known as Kona lows situated to the west of the island chain. These storms are often accompanied by heavy rains.

Air Quality

The Clean Air Act of 1972 and its 1990 Amendments (CAA) and subsequent legislation regulate air emissions from area, stationary, and mobile sources. Both the U.S. Environmental Protection Agency (USEPA) and the State of Hawai'i have instituted Ambient Air Quality Standards (AAQS) to maintain air quality in the interest of public health and secondary public welfare.

At the present time, seven parameters are regulated: particulate matter, sulfur dioxide, hydrogen sulfide, nitrogen dioxide, carbon monoxide, ozone and lead. The Hawai'i AAQS are in some cases considerably more stringent than the comparable National Ambient Air Quality Standards (NAAQS). In particular, the Hawai'i 1-hour AAQS for carbon monoxide is four times more stringent than the comparable national limit. **Table 3-1** illustrates the NAAQS and State AAQS and the units of measure (micrograms per cubic meter, $\mu g/m^3$ and parts per million, ppm).

As described above, the prevailing winds throughout the year in Hawai'i are the northeasterly trade winds. These trade winds keep the air quality generally good. The Department of Health (DOH) operates a network of air quality monitoring stations at various locations around the state, including a station on Sand Island. The Sand Island station monitors $PM_{2.5}$ and O_3. In 2015, the highest concentration of $PM_{2.5}$ was 15.7 $\mu g/m^3$, and the 98th percentile was 11.5 $\mu g/m^3$. The annual average was 5.4 $\mu g/m^3$, and there were no occurrences of 24-hour concentrations greater than 35 $\mu g/m^3$ (the federal standard). The highest concentration of O_3 in 2015 was 0.052 ppm, and the annual average was 0.028 ppm. There were no instances of eight-hour averages greater than 0.075 ppm (the federal standard) (DOH, 2016). The largest sources of air pollution in the immediate project area are most likely associated with industrial activity and automobile traffic using the roadway network in the project area.

In addition to the NAAQS and the State AAQS, the DOH regulates fugitive dust. HAR Section 11-60.1-33, Fugitive Dust, states that no person shall cause or permit visible fugitive dust to become airborne without taking reasonable precautions, and no person shall cause or permit the discharge of visible fugitive dust beyond the property lot line on which the fugitive dust originates (DOH, 2014). This rule applies to construction projects and would, therefore, be applicable to the Proposed Action.

Table 3-1. State of Hawai'i and National Ambient Air Quality Standards

Pollutant	Units	Averaging Time	Maximum Allowable Concentration		
			National Primary	National Secondary	State of Hawaii
Particulate Matter <10 microns (PM_{10})	$\mu g/m^3$	Annual 24 Hours	- 150[a]	- 150[a]	50 150[b]
Particulate Matter <2.5 microns ($PM_{2.5}$)	$\mu g/m^3$	Annual 24 Hours	12[c] 35[d]	15[c] 35[d]	- -
Sulfur Dioxide (SO_2)	ppm	Annual 24 Hours 3 Hours 1 Hour	- - - 0.075[e]	- - 0.5[b] -	0.03 0.14[b] 0.5[b] -
Nitrogen Dioxide (NO_2)	ppm	Annual 1 Hour	0.053 0.100[f]	0.053 -	0.04 -
Carbon Monoxide (CO)	ppm	8 Hours 1 Hour	9[b] 35[b]	- -	4.4[b] 9[b]
Ozone (O_3)	ppm	8 Hours	0.070[g]	0.070[g]	0.08[g]
Lead	$\mu g/m^3$	3 Months Quarter	0.15[h] 1.5[i]	0.15[h] 1.5[i]	- 1.5[i]
Hydrogen Sulfide	ppb	1 Hour	-	-	25[b]

Notes:
[a]Not to be exceeded more than once per year on average over three years.
[b]Not to be exceeded more than once per year.
[c]Three-year average of the weighted annual arithmetic mean.
[d]98th percentile value averaged over three years.
[e]Three-year average of fourth-highest daily 1-hour maximum.
[f]98th percentile value of the daily 1-hour maximum averaged over three years.
[g]Three-year average of annual fourth-highest daily 8-hour maximum.
[h]Rolling 3-month average.
[i]Quarterly average.
Source: DOH, 2015

Potential Impacts

Only short-term construction-related impacts to air quality are anticipated with implementation of the Proposed Action. During construction, potential emission sources that may affect air quality at the Waiau Plant and substation include the following:

- Diesel and/or gasoline-powered construction equipment and motor vehicles would contribute to additional CO and CO_2 in the air.
- Fugitive dust emissions resulting from construction of the revetment and stop gate.

Because levels of criteria pollutants in Hawai'i are consistently below Federal and State AAQS, and because the prevailing trade winds rapidly carry pollutants offshore limiting the effect on receptors, increases in levels of criteria pollutants at the project site from construction activities are not expected to be significant. It is not anticipated that Federal or State AAQS would be exceeded during construction activities.

The Proposed Action would not add an emission source; therefore, there would be no impact to the existing air quality upon completion of construction.

Under the No-Action Alternative, no construction activities would occur and no additional emission sources would be added; therefore, there would be no impact to the existing air quality.

Minimization and Mitigation Measures

A dust control plan, to be approved by the DOH, would be developed and implemented to minimize fugitive dust during construction. The plan would include some or all of the following measures:

- Watering of active work areas
- Screening piles of materials from wind, if appropriate
- Cleaning nearby paved roads affected by construction
- Covering open trucks carrying construction materials
- Limiting areas to be disturbed at any given time
- Mulching or chemically stabilizing inactive areas that have been disturbed

Additionally, contractors would be required to maintain equipment with emissions controls.

3.2 Noise

Existing Noise Environment

Noise is defined as unwanted sound and is one of the most common environmental issues of concern to the public. A number of factors affect sound as it is perceived by the human ear. These include the actual level of the sound (i.e., noise), the frequencies involved, the period of exposure to the noise, and changes or fluctuations in the noise levels during exposure. The accepted unit of measure for noise levels is the decibel (dB).

The State of Hawaii regulates noise exposure in the following statutes and rules:

- HRS, Section 342F – Noise Pollution
- HAR, Section 11-46 – Community Noise Control
- HAR, Section 12-200.1 – Occupational Noise Exposure

The State of Hawai'i Community Noise Control Rule (HAR Chapter 11-46) defines three classes of zoning districts and specifies corresponding maximum permissible sound levels due to stationary noise sources such as air-conditioning units, exhaust systems, generators, compressors, pumps, etc. The Community Noise Control Rule does not address most moving sources, such as vehicular traffic noise, air traffic noise, or rail traffic noise. However, the Community Noise Control Rule does regulate noise related to construction activities, which may not be stationary.

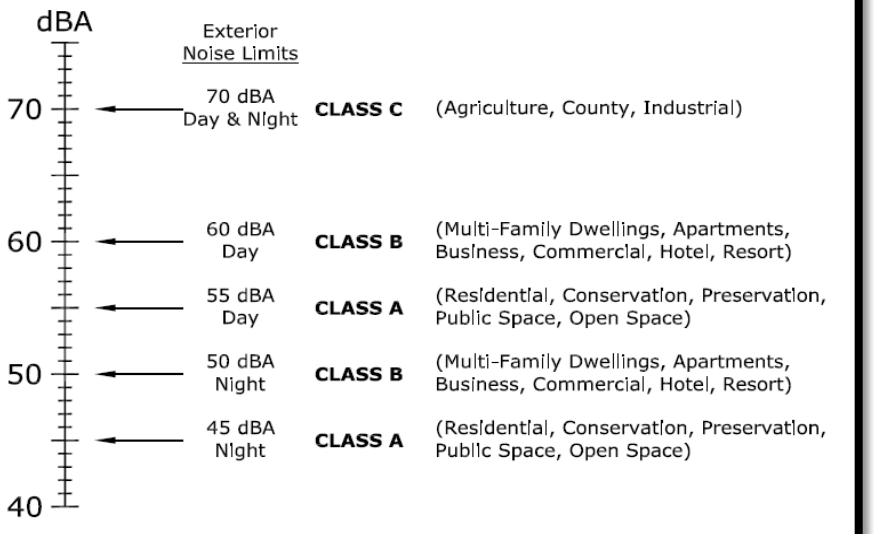
The maximum permissible noise levels are enforced by the DOH for any location at or beyond the property line and shall not be exceeded for more than 10% of the time during any 20-minute period. The specified noise limits which apply are a function of the zoning and time of day as shown in **Figure 3-2**. With respect to mixed zoning districts, the rule specifies that the primary land use designation shall be used to determine the applicable zoning district class and the maximum permissible sound level. In determining the maximum permissible sound level, the background noise level is taken into account by the DOH.

As discussed in **Section 4.2**, the Proposed Action is located in zone P-2, General Preservation District, which is Class A. The project site is subject to noise generated from the Sand Island WWTP. Other existing sources of noise include the following:

- Industrial activities from light industrial parcels east of the site, including auto repair and metals recycling;
- Traffic from nearby Sand Island Parkway; and
- Overflights of aircraft within the 70 DNL (decibel noise level) noise contour of the Honolulu International Airport.

Figure 3-2. Hawai'i Maximum Permissible Sound Levels for Various Zoning Districts

Zoning District	**Day Hours** (7 AM to 10 PM)	**Night Hours** (10 PM to 7 AM)
CLASS A Residential, Conservation, Preservation, Public Space, Open Space	55 dBA (Exterior)	45 dBA (Exterior)
CLASS B Multi-Family Dwellings, Apartments, Business, Commercial, Hotel, Resort	60 dBA (Exterior)	50 dBA (Exterior)
CLASS C Agriculture, Country, Industrial	70 dBA (Exterior)	70 dBA (Exterior)



Potential Impacts

Noise would be generated during construction by construction equipment used to build the revetment. Noise generation would be short-term and limited to the project area. Construction equipment may include excavators, trucks, and other heavy equipment. Earthmoving equipment (e.g., bulldozers and diesel-powered trucks) would probably be the loudest equipment used during construction. Typical noise emission levels for construction equipment is provided in **Table 3-2**.

Table 3-2. Typical Noise Emission Levels for Construction Equipment

Type of Equipment	Noise Level at 50 feet (dBA)
Air Compressor	81
Backhoe	80
Bulldozer	82
Chain Saw	85
Concrete/Grout Pumps	82
Crawler Service Crane (100-ton)	83
Dump Truck	88
Excavator	85
Front End Loader	80
Generator	81
Jackhammer (compressed air)	85
Lift Booms	85
Pick-Up Truck	55
Power-Actuated Hammer	88
Water Pump	76
Water Truck	55

Source: FHWA, 2015

The project area is located adjacent to Sand Island State Recreation Area (SRA) and approximately 500 feet from the nearest facilities associated with the improved portion of the SRA. Noise generated during construction could impact the enjoyment of visitors to the park. However, noise generated during construction would be similar in character and intensity as the existing noise conditions in the surrounding industrial areas. Therefore, impacts from construction noise would be less than significant.

The Proposed Action would not add a noise source; therefore, there would be no impact to the existing noise environment upon completion of construction.

Under the No-Action Alternative, no construction activities would occur and no additional noise sources would be added; therefore, there would be no impact to the existing noise environment.

Minimization and Mitigation Measures

Noise generated from construction activities and the use of machinery would be minimized by requiring contractors to adhere to state and county noise regulations. Construction activities would be conducted on weekdays and in daytime hours. The construction contractor would be required to obtain a Community Noise Permit from the DOH Indoor and Radiological Health Branch. In the event that work occurs after normal working hours (i.e., at night or on weekends), or if permissible noise levels are exceeded, the construction contractor would be required to obtain a Community Noise Variance and comply with any permit conditions.

3.3 Geology and Soils

Existing Conditions

Sand Island is a man-made feature created from material dredged during the construction of Honolulu Harbor in the 1940s. The dredged material was placed on a shallow reef flat composed of limestone reef material that includes hard reef rock, coral cobbles, and sand. **Figure 3-3** identifies the project site's geologic unit as Fill. As shown in **Figure 3-4**, the soil type is identified as FL, which is "fill land, mixed". FL soils consist of areas filled with material dredged from the ocean or hauled from nearby areas, garbage and debris, and general materials from other sources. This land type is used for urban development, including airports, housing areas, and industrial facilities (USDA, 1972).

Potential Impacts

Construction of the Proposed Action would include grading and site preparation for the new rock rubble-mound revetment. Short-term construction activities may include minor soil loss and erosion.

The Proposed Action would result in a rock rubble-mound revetment, which would protect the shoreline and the outfall pipeline from further erosion. Effects of the Proposed Action would be beneficial.

Under the No-Action Alternative, the revetment would not be constructed and the shoreline would continue to erode. The extent to which erosion would occur cannot be predicted, but because Sand Island is a man-made island consisting of dredged material from Honolulu Harbor, it is doubtful that the shoreline will reach a stabilized condition without any artificial protection. The continued erosion would potentially expose and compromise the outfall pipeline.

Figure 3-3. Geologic Units

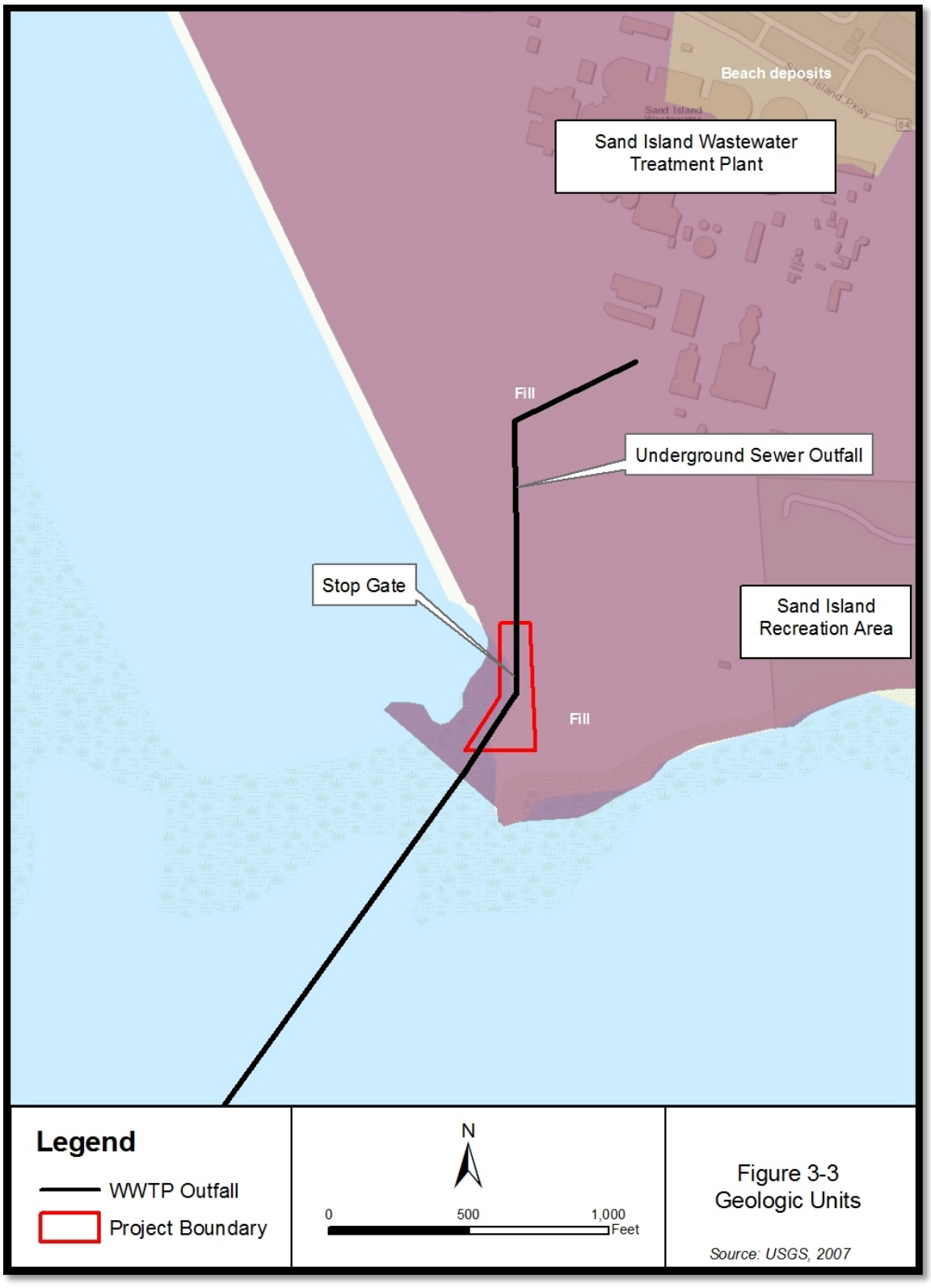
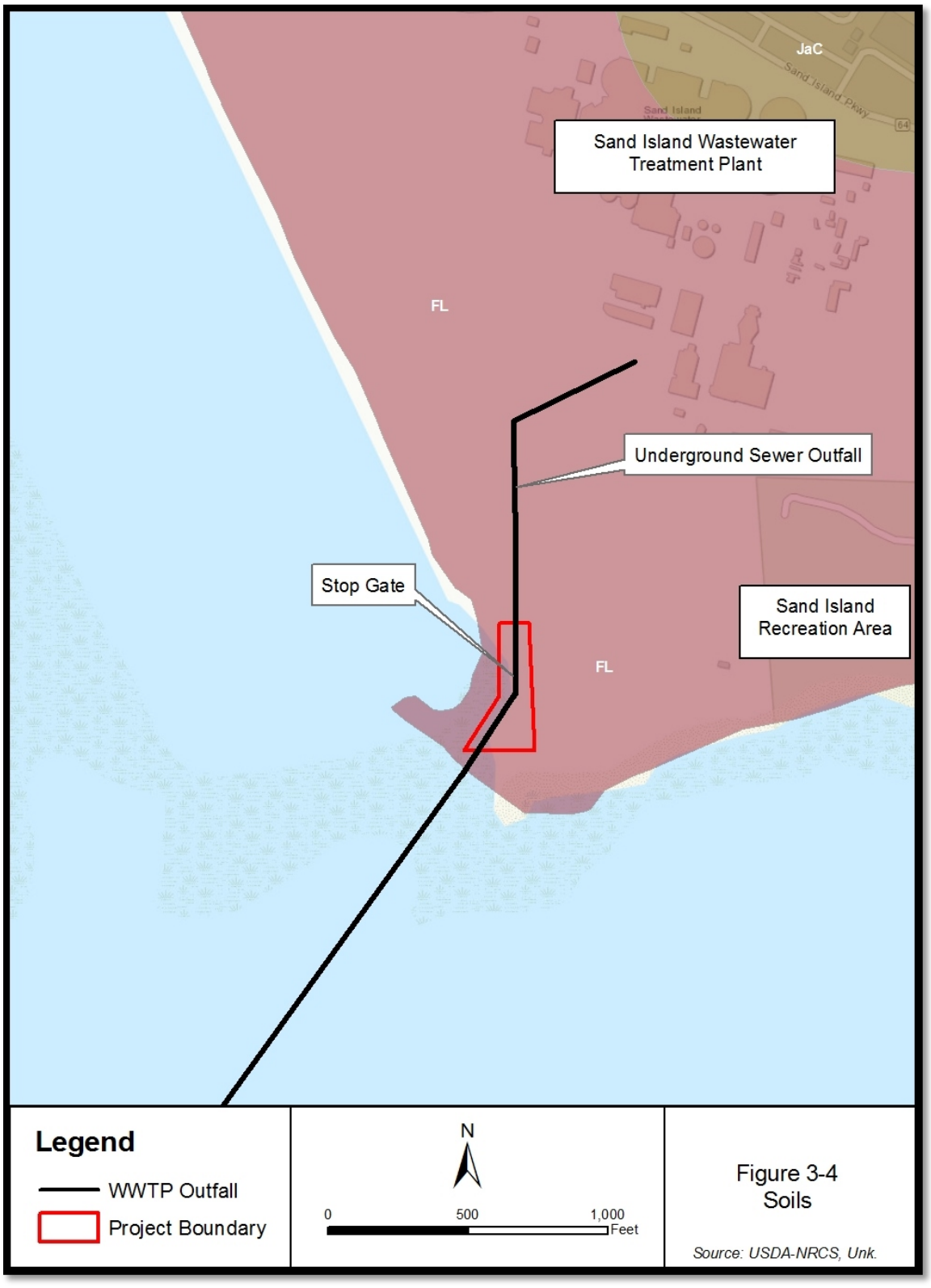


Figure 3-4. Soils



Minimization and Mitigation Measures

The CCH would obtain coverage under the NPDES General Permit for stormwater discharge associated with construction activities. As part of the permit process, the CCH would prepare a construction site BMP plan that would include an erosion and sediment control plan, a site-specific plan to minimize erosion of soil and discharge of other pollutants into State waters, and descriptions of measures that would minimize the discharge of pollutants via stormwater after construction is complete. BMPs would be installed prior to ground-disturbing activities and would be inspected and maintained throughout the construction period.

All construction would be in compliance with the standard general permit conditions set forth in the NPDES permit and with the CCH's *Rules Relating to Soil Erosion Standards and Guidelines* (CCH, 1999).

3.4 Natural and Man-Made Hazards

Existing Conditions

Floods

Flood zones are geographic areas that the Federal Emergency Management Agency (FEMA) has defined according to varying levels of flood risk. Flood zones are depicted on Flood Insurance Rate Maps. As shown in **Figure 3-5**, the majority of the project area is located in Flood Zones AE and VE. These areas have a 1% or greater chance of flooding and an additional hazard associated with storm waves (FEMA, 2014a).

Earthquakes

As a series of islands formed by volcanoes, the Islands of Hawai'i are very seismically active. Most of the earthquakes in Hawai'i occur on the Big Island and are associated with volcanic activity. However, other earthquakes are caused by the weight of the Hawaiian Islands on the Pacific lithosphere. Earthquakes that have been felt on O'ahu include the following: the magnitude 6.2 Honomu event (1973), the magnitude 6.5 Maui earthquake (1938), and the 6.8 Lanai earthquake (1871) (Freyer, G., 2009).

Hurricanes and Tropical Storms

The Hawaiian Islands are seasonally affected by Pacific hurricanes from June through the November. On average, there are between four and five tropical cyclones observed in the Central Pacific every year. The state has been affected by significant hurricanes over the years. These include Hiki (1950), Nina (1957), Dot (1959), Iwa (1982), Iniki (1992), and Iselle (2014) (HNN, 2016a). In addition to damaging winds and heavy rains, hurricanes cause heavy surf and wave action that can damage beach areas. According to a report presented at the International Union of Conservation of Nature World Conservation Congress, global climate change could mean that Hawai'i may experience more frequent and more severe hurricanes in the future (HNN, 2016b).

Tsunami

As shown in **Figure 3-6**, the project area is within the Tsunami Evacuation Zone. A tsunami involves the generation of a series of destructive ocean waves that can affect all shorelines. These waves can occur at any time with limited or no warning, and are most commonly generated by earthquakes in marine and coastal regions (NOAA, 2017).

Figure 3-5. Flood Zones

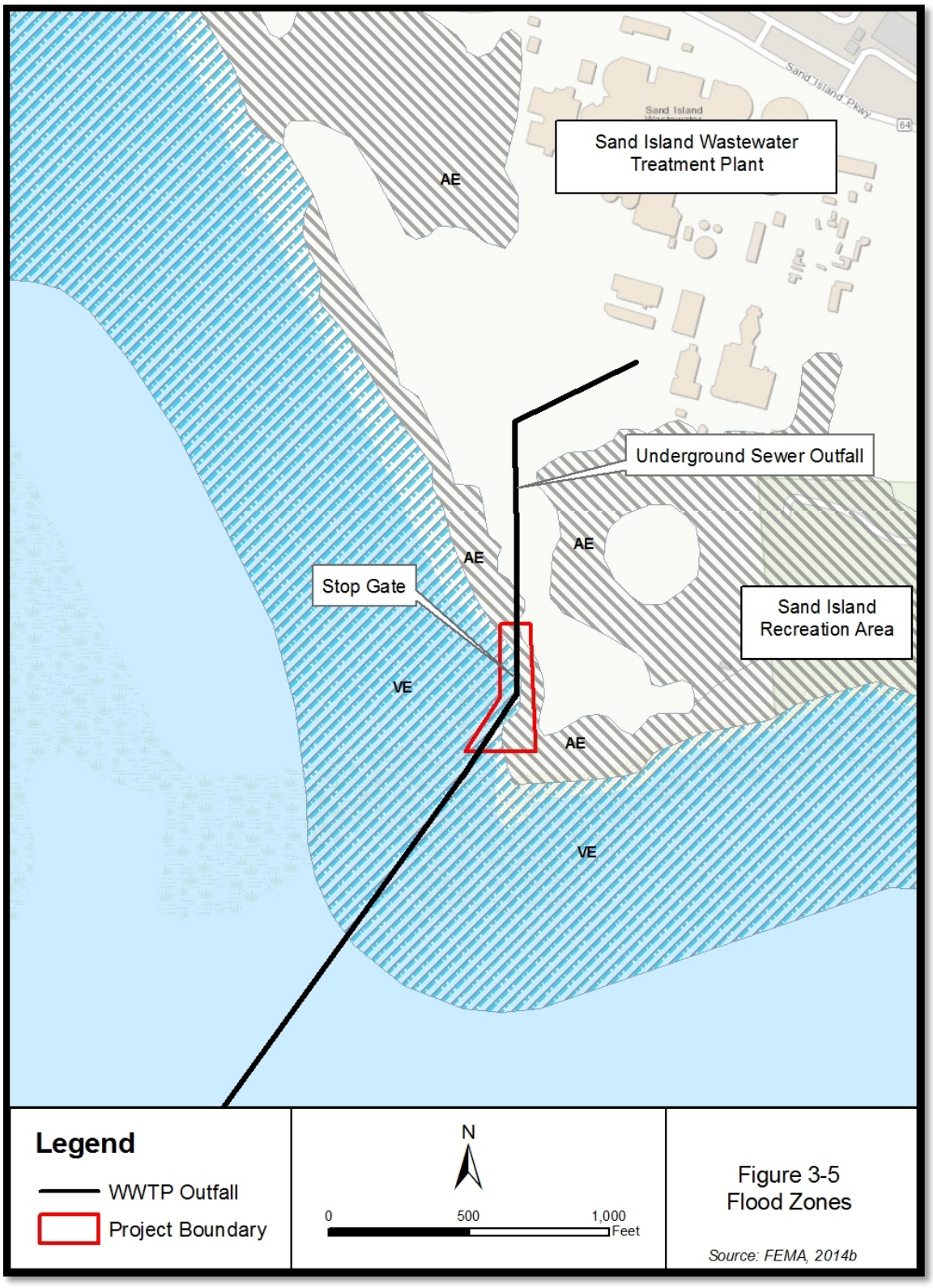
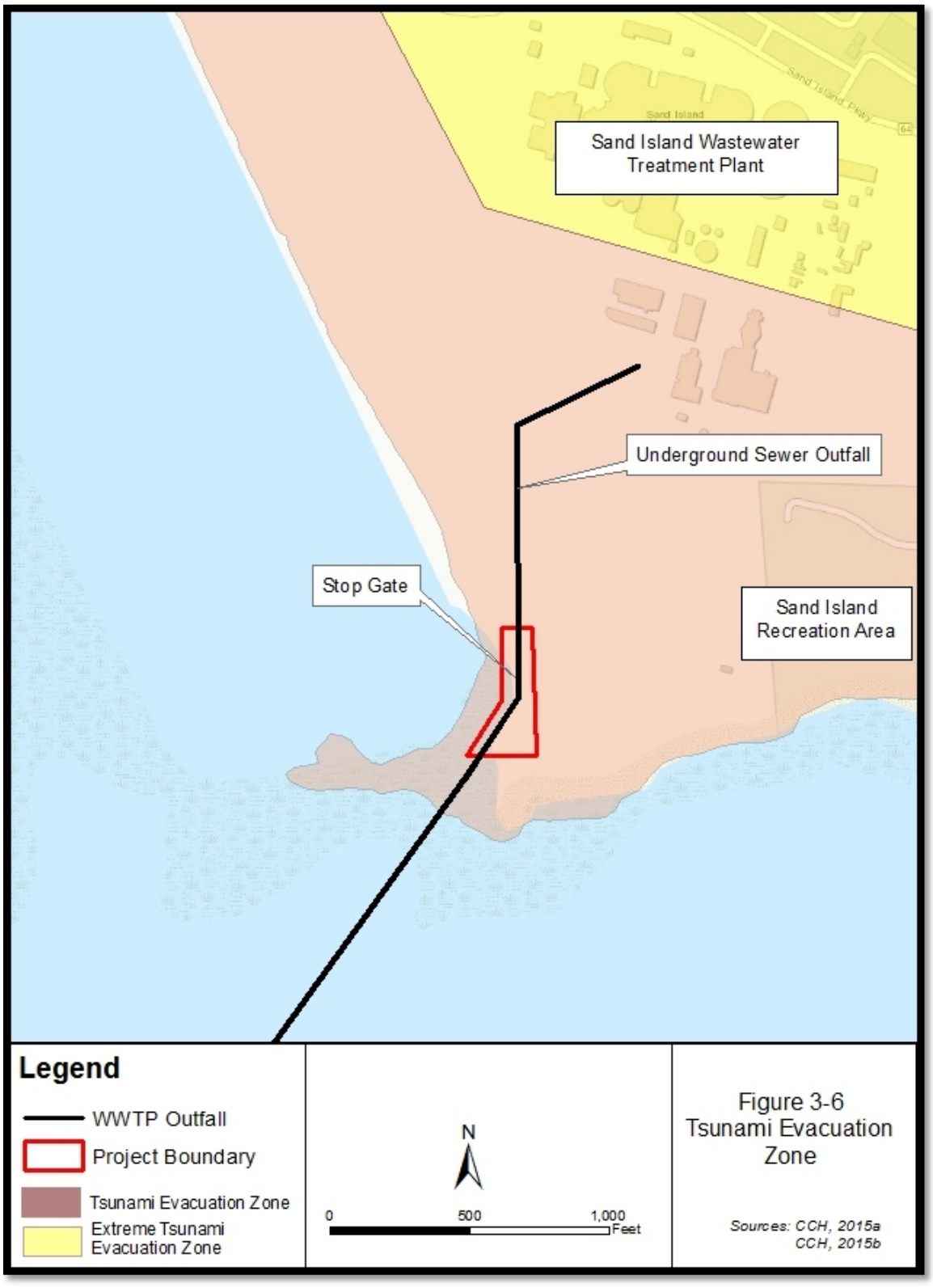


Figure 3-6. Tsunami Evacuation Zone



Climate Change and Sea Level Rise

Climate change is currently considered a threat to all coastal areas. Over time, changes due to sea level rise are anticipated to erode beaches and cause damage to low-lying areas. Stronger storms and more severe flooding also have the possibility as sea levels continue to rise.

Planning for sea level rise is challenging as there are several changing and unknown factors. The U.S. Army Corps of Engineers (USACE) has developed tools and references for guidance. With regard to long-range planning, the USACE highlights the following:

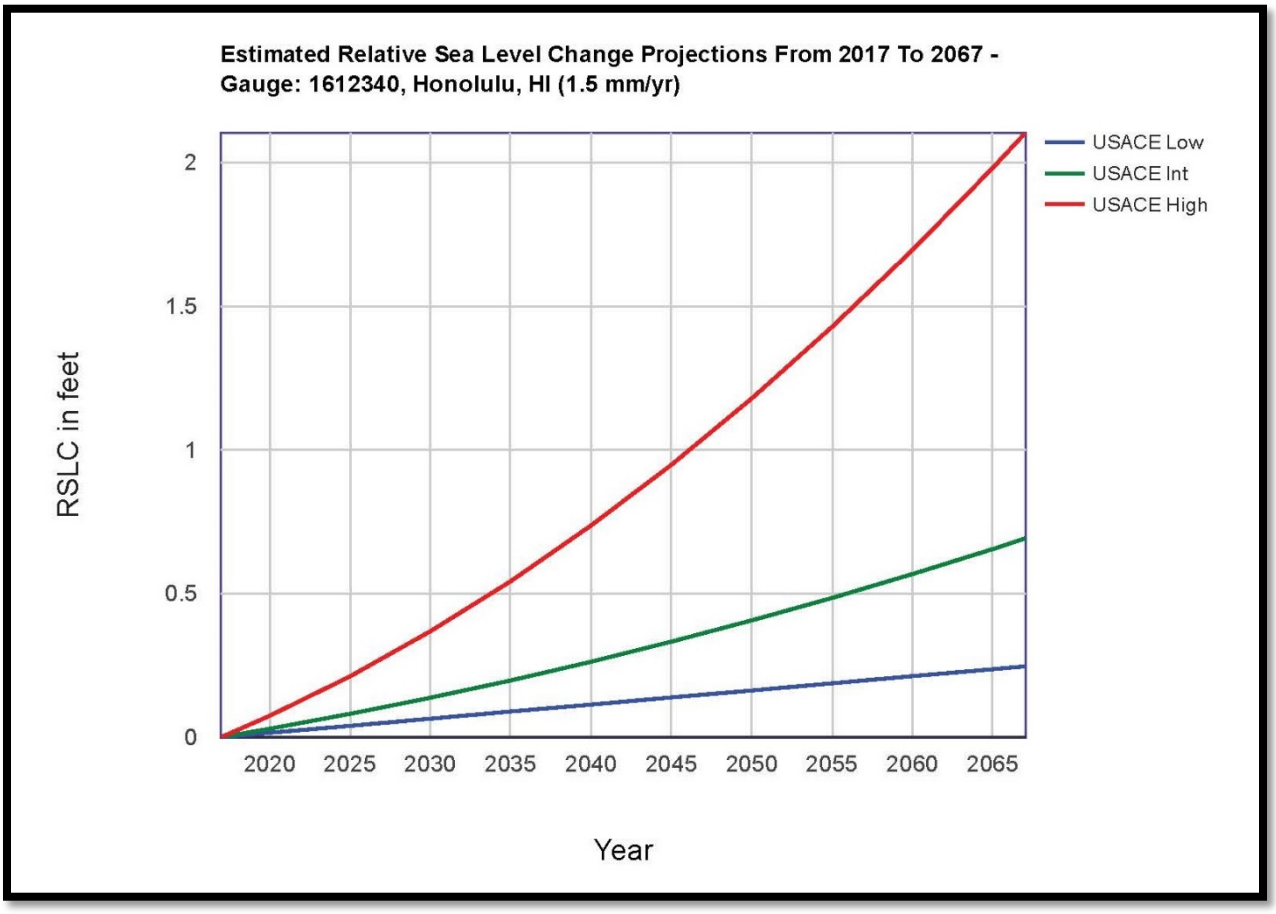
> *The climate for which the project was designed can change over the full lifetime of a project to the extent that stability, maintenance, and operation may be impacted, possibly with serious consequences, but also potentially with beneficial consequences* (USACE, 2014a).

The USACE supports a SMART (S: Specific; M: Measurable; A: Attainable; R: Risk Informed; T: Timely) planning approach, which is risk-informed, decision-focused planning that integrates planning and engineering when assessing sea level rise.

The Proposed Action was designed with stillwater level rise phenomena, including global sea level rise due to climate change and the potential influence of a mesoscale eddy, which is discussed in **Section 1.4, Tides and Water Level Rise**. A method for calculating global sea level rise was advanced by the USACE in their publication, *Sea Level Change Considerations for Civil Works Programs* (EC1165-2-212, October 2011). Sea level rise for Honolulu is calculated as 1.5 mm/year, and the National Research Council moderate sea level curve calculates a sea level rise of 1.35 feet over a 50 year period. For design purposes, this was adjusted to 1.5 feet to allow some additional compensation for the mesoscale eddy effect (Sea Engineering, 2017).

For this EA, the USACE Sea Level Rise Calculator (USACE, 2014b) was utilized to provide sea level rise projections through 2067, which allows for consideration of sea level rise for the design period of the revetment. However, it should be noted that actual life of the revetment may be longer. In addition, future planning work by CCH for other improvements beyond this design period will consider future additional data, trends, and projections that become available. **Figure 3-7** shows the output of the results for Honolulu between 2017 and 2067.

Figure 3-7. Sea Level Change Projections



Source: USACE, 2014b

In addition to the USACE tools and references, there are also ongoing efforts at the State and the CCH to evaluate changes that need to be made to current rules, regulations, and practice standards, with the ultimate goal of establishing a standard that can be implemented State-wide. The Interagency Climate Adaptation Committee (ICAC) is currently developing a Sea Level Rise Report to be completed by December 2017. The intent of this report is to serve as the framework for the State and the ICAC to address other climate-related threats and climate change adaptation priorities, ultimately leading to a Climate Adaptation Plan for the State of Hawai'i, which will be prepared by the State of Hawai'i Office of Planning (State of Hawai'i, 2016). The University of Hawai'i School of Ocean and Earth Science and Technology (UH SOEST) has also been studying sea level rise. UH SOEST has released preliminary projections of coastal flooding, groundwater inundation, and coastal erosion for O'ahu's non-rocky shorelines for 2035, 2050, 2075, and 2100.

Potential Impacts

Natural Hazards

Natural hazards cannot be controlled; rather, they can only be remediated for after the events occur. Construction of the revetment would not create conditions that would exacerbate natural hazards. The CCH Department of Emergency Management coordinates the emergency management activities and functions of the island of O'ahu with State, Federal, and other public and private organizations. In the event of a hurricane or tsunami, watches and/or warnings are issued by the Central Pacific Hurricane Center and the Pacific Tsunami Warning Center, respectively. In the event of a hurricane or tsunami warning, construction would halt until such time as the warning is lifted.

The Proposed Action would be designed to withstand the level of forces necessary to minimize the likelihood that an extreme event would damage the structure. The Proposed Action does not involve habitable uses nor will it encourage such uses. Therefore, there are no anticipated adverse impacts associated with natural hazards.

Under the No-Action Alternative, the revetment would not be constructed. Natural hazards would continue to create conditions for additional shoreline erosion, which could expose and compromise the outfall pipeline. Therefore, the No-Action Alternative could result in significant impacts to the outfall from increased erosion associated with natural hazards.

Climate Change and Sea Level Rise

Using tools and information made available by the USACE, the project site could be affected by sea level rise within the next 50 years. The USACE sea level rise calculator results in **Table 3-3** indicate that by 2067, the projected sea level rise is in the range of 0.25 to 2.10 feet. Climate change factors are also likely to increase nearshore wave action, which could exacerbate erosion and expose and compromise the outfall pipeline.

Table 3-3. Schedule of Sea Level Rise in Feet

Year	USACE Low	USACE Intermediate	USACE High
2017	0.00	0.00	0.00
2020	0.02	0.03	0.07
2025	0.04	0.08	0.21
2030	0.06	0.14	0.37
2035	0.09	0.20	0.54
2040	0.11	0.26	0.74
2045	0.14	0.33	0.95
2050	0.16	0.41	1.18
2055	0.19	0.48	1.43
2060	0.21	0.57	1.69
2065	0.24	0.65	1.98
2067	0.25	0.69	2.10

Source: USACE, 2014b

The Sand Island WWTP is located at elevation 8 feet above msl and is expected to remain above sea level into the next century, although it would be increasingly susceptible to coastal inundation and flooding due to storm surge and tsunamis. The Proposed Action would protect the outfall pipeline from potential increased nearshore wave action associated with climate change and sea level rise, as well as associated shoreline erosion, which would ensure the continued operation of the WWTP. Therefore, the Proposed Action would have a beneficial effect.

Under the No-Action Alternative, the revetment would not be constructed. The outfall pipeline would continue to be susceptible to shoreline erosion. Therefore, the No-Action Alternative could result in significant impacts to the outfall from shoreline erosion and wave action associated with climate change and sea level rise.

Minimization and Mitigation Measures

The revetment structure would be designed to withstand natural hazards. One advantage of revetments is that the rough porous rock surface and relatively flat slope of the structure tends to absorb wave energy, reduce wave reflection, and help to promote accretion of sand on a sandy beach. Damage from large waves is typically not catastrophic, and the revetment can still function effectively even if damage occurs. No further mitigation measures related to natural hazards are proposed.

State and City policies and regulations on sea level rise mitigation are still in the process of development. The CCH recognizes the threat of sea level rise and the importance of planning for its effects. Full support and participation will be provided towards the ongoing efforts to establish State-wide policies and regulations.

3.5 Water Resources

Existing Conditions

Groundwater

The State of Hawai'i DLNR Commission on Water Resources Management (CWRM) has established a groundwater hydrologic unit and coding system for groundwater resource management. The proposed project site is located within the Honolulu Sector, which is comprised of six Aquifer System Areas. The project site is located within the Kalihi Aquifer System (30103), which has an estimated yield of 9 million gallons per day (mgd).

Inland Surface Waters

There are no standing water bodies, streams, or other surface water features in the immediate vicinity of the project site.

Nearshore Waters

Nearshore waters within and adjacent to the project area are classified "Class A Marine Waters" (DOH, 2014b). As per HAR 11-54, Water Quality Standards, Class A Marine Waters are to be protected for recreational purposes and aesthetic enjoyment. Uses are permitted as long as the use is compatible with the protection and propagation of fish, shellfish, and wildlife, as well as with recreation (DOH, 2014c).

Wetlands

As shown in **Figure 3-8**, the project site is partially located within estuarine and marine wetlands (M2USN) and estuarine and marine (M1UBL). Both wetland types are part of the marine system, which consists of the open ocean overlying the continental shelf and its associated high-energy coastline. Marine habitats are exposed to the waves and currents of the open ocean and the water regimes are determined by the ebb and flow of oceanic tides. M2USN wetlands are located in the intertidal area where the substrate is flooded and exposed by tides, and there is an unconsolidated shore. Tides alternately flood and expose the substrate at least once daily. M1UBL wetlands are located in the subtidal area that is below the extreme low water and therefore continuously covered with tidal water. These wetlands also have an unconsolidated bottom (Cowardin et.al., 1979).

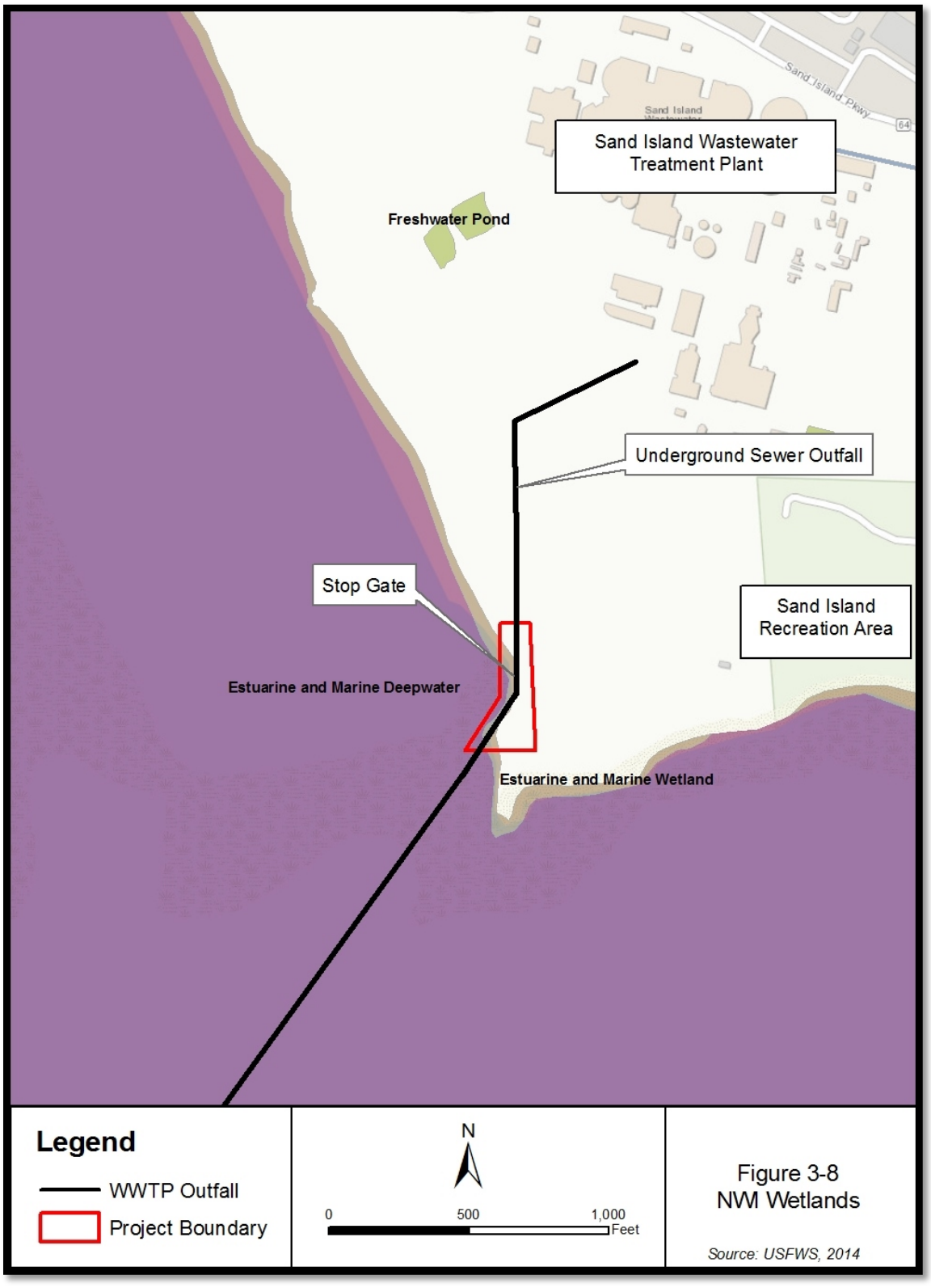
Potential Impacts

Excavation to prepare the site for construction has the potential to release sediment into the nearshore waters, which can temporarily increase turbidity. During construction, excavation and grading would be limited to that area which is necessary for construction of the revetment to minimize the erosion potential. Construction activities would also require dewatering. Water would be discharged on land away from the shoreline.

The Proposed Action is not expected to have adverse effects on groundwater or wetlands and would have no impacts to inland surface waters. The revetment would provide beneficial effects to the quality of nearshore waters since it would minimize shoreline erosion. The revetment would also protect the shoreline from wave action caused by storms or tsunami, which would decrease the amount of turbidity in the nearshore waters at the revetment site during these events.

Under the No-Action Alternative, the revetment would not be constructed. Existing conditions of water resources would remain, and the shoreline would continue to erode and cause turbidity in nearshore waters.

Figure 3-8. NWI Wetlands



Minimization and Mitigation Measures

The CCH would obtain coverage under the existing NPDES General Permit for stormwater discharge associated with construction activities. As part of the permit process, a construction site Best Management Practices (BMP) plan would be prepared and would include an erosion and sediment control plan, a site-specific plan to minimize erosion of soil and discharge of other pollutants into State waters, and descriptions of measures that would minimize the discharge of pollutants via stormwater after construction is complete. BMPs would be installed prior to ground-disturbing activities and would be inspected and maintained throughout the construction period.

The CCH would also obtain an NPDES Individual Permit Authorizing Discharges Associated with Construction Activity Dewatering. As part of the permit process, a site-specific dewatering plan would be prepared that would include the following: a description of proposed dewatering operations from startup to termination of the discharge, a maintenance program, sediment handling and disposal plan, monitoring and visual inspection program, cessation of discharge plan, and effluent control plan.

Other permits that CCH would obtain include those for compliance with Sections 401 and 404 of the Clean Water Act, as well as Section 10 of the Rivers and Harbors Act. CCH would comply with all permit conditions, which would minimize potential impacts to water quality.

All project activities would be in compliance with the applicable requirements of HAR Chapter 11-54, Water Quality Standards, and HAR Chapter 11-55, Water Pollution Control, including State antidegradation policy and water quality criteria. All construction would be in compliance with the conditions set forth in the NPDES permit and with the CCH's *Rules Relating to Soil Erosion Standards and Guidelines* (CCH, 1999). The construction contractor would be required to employ 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 or in 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 would be confined to the immediate area of construction, and no construction material shall be stockpiled in the water. Turbidity containment barriers would be installed and maintained to control and contain construction-generated turbidity. The water area around the construction site would be visually monitored, and if monitoring suggests that the turbidity standards are being exceeded, construction would be suspended until the condition is corrected.

3.6 Biological Resources

Existing Conditions

Flora

A pedestrian flora survey was conducted of the project area on March 3, 2017 and was documented in a Biological Resources Survey Report, included as **Appendix C**. As identified in **Table 3-4**, the majority of the vegetation observed during the survey is non-native species with the exception of 'aki'aki (*Sporobolus virginicus*). The vegetation in the survey area consists of two vegetation types: coastal strand and mixed grassland and shrubland. No threatened or endangered flora species were identified during the survey.

Table 3-4. Plant Species Observed In and Near the Project Area

Family	Scientific Name and Authorship	Hawaiian and/or Common Name	Status
MONOCOTS			
Poaceae	*Bothriochloa pertusa* (L.) A.Camus	pitted beardgrass	X
	Cenchrus ciliaris L.	buffelgrass	X
	Eragrostis amabilis (L.) Wight & Arn.	lovegrass	X
	Sporobolus virginicus (L.) Kunth	ʻakiʻaki, ʻaki, mahiki, māhikihiki, mānienie, mānienie ʻakiʻaki, mānienie māhikihiki, mānienie maoli, seashore rushgrass, seashore dropseed	I
DICOTS			
Asteraceae	*Pluchea indica* (L.) Less.	Indian fleabane, Indian pluchea, marsh fleabane	X
Chenopodiaceae	*Atriplex semibaccata* R.Br.	Australian saltbush	X
Fabaceae	*Leucaena leucocephala* (Lam.) de Wit	koa haole, ēkoa, lilikoa	X
	Prosopis juliflora (Sw.) DC.	algaroba, mesquite	X
	Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	algaroba, mesquite, kiawe	X
Malvaceae	*Sida ciliaris* L.	N/A	X

LEGEND: I- indigenous, X- non-native; N/A – not available
Source: SWCA, 2017

Fauna

A pedestrian fauna survey was conducted of the project area on March 3, 2017 during morning hours when wildlife are most likely to be active (see **Appendix C**). Visual and auditory observations were included in the survey. All observed birds, mammals, reptiles, amphibians, and invertebrate species were noted during the survey. Acoustic surveys for the Hawaiian hoary bat (*Lasiurus cinereus semotus*) were not conducted, although areas of suitable habitat for roosting and foraging were noted during the survey.

Existing terrestrial fauna on the site and within the project vicinity is limited primarily to introduced pest species common to urban environments. The following subsections describe the different faunal groups observed in the project vicinity.

Birds

Most of the bird species observed in the project vicinity are species commonly found in disturbed, low- to mid-elevation areas on Oʻahu. In all, 12 bird species were documented, as shown in **Table 3-5**.

Table 3-5. Birds Observed In and Near the Project Area

Common Name	Scientific Name	Status	MBTA
Black-bellied plover	*Pluvialis squatarola*	M	Yes
Cattle egret	*Bubulcus ibis*	NN	Yes
Common myna	*Acridotheres tristis*	NN	No
Common waxbill	*Estrilda astrild*	NN	No
Northern cardinal	*Cardinalis cardinalis*	NN	Yes
Pacific golden-plover	*Pluvialis fulva*	M	Yes
Red-vented bulbul	*Pycnonotus cafer*	NN	No
Red-crested cardinal	*Paroaria coronata*	NN	No
Spotted dove	*Streptopelia chinensis*	NN	No
Ruddy turnstone	*Arenaria interpres*	M	Yes
White tern	*Gygis alba*	ST	Yes
Zebra dove	*Geopelia striata*	NN	No

Notes: Status: ST = State Threatened, M = Migrant, NN = Non-Native Permanent Resident
MBTA = Protected under the Migratory Bird Treaty Act
Source: SWCA, 2017

Of the birds observed, one species – the white tern (*Gygis alba*) – is classified as threatened by the State of Hawai'i on the island of O'ahu. The white tern is indigenous to Hawai'i and is the official bird of the CCH. The white tern is found mainly in the Northwest Hawaiian Islands as well as the island of O'ahu. White terns typically feed by surface diving over the ocean, preying mostly on juvenile goatfish and flying fish. There are an estimated 250 pairs of white tern on O'ahu, mainly observed between Kapi'olani Park and 'Iolani Palace. On O'ahu, white terns most commonly nest in banyans (*Ficus* spp.), monkeypod (*Albizia saman*), mahogany (*Swietenia mahogany*), and kukui (*Aleurites moluccana*), although other tree species have also been documented for nesting and roosting. The white tern lays eggs directly on branches; thus, eggs and flightless chicks are highly vulnerable to tree trimming and removal activities (Vanderwerf, 2003).

A total of six species observed during the survey are protected by the Migratory Bird Treaty Act (MBTA).

Terrestrial Mammals

The endangered Hawaiian hoary bat is the only native terrestrial mammal species that is still extant within the Hawaiian Islands (USFWS, 1998). Hawaiian hoary bats are known to occur on O'ahu in native, non-native, agricultural, and developed landscapes. Hawaiian hoary bats forage in open, wooded, and linear habitats with a wide range of vegetation types. These animals are insectivores and are regularly observed foraging over streams, reservoirs, and wetlands up to 300 feet offshore. (USDA-NRCS, 2009; USFWS, 1998). The Hawaiian hoary bat could forage over all the vegetation types and ocean in the project vicinity. Hawaiian hoary bats generally roost in trees greater than 16 feet tall with dense canopy foliage or in a subcanopy when canopy is sparse, with open access for launching into flight (Gorresen et. al, 2013; USDA-NRCS, 2009). Although the Hawaiian hoary bat was not observed, it is an insectivore and is regularly observed foraging over streams, reservoirs, and wetlands (USDA-NRCS, 2009). Although there were no trees in the survey area greater than 16 feet, two tree species – Kiawe (*Prosopis* sp.) and ironwood (*Casuarina equisetifolia*) – occur outside the survey area and could provide suitable roost habitat for the

Hawaiian hoary bat. In addition, the vegetation types in the project vicinity would be considered suitable bat foraging habitat.

The project area is adjacent to the Sand Island SRA, where it is common to find feral cats (*Felis catus*) and stray dogs (*Canis familiaris*). No other mammals were observed during the survey. Although the small Indian mongoose (*Herpestes javanicus*), house mouse (*Mus musculus*), and rats (*Rattuss* spp.) were not detected, they are likely to occur in the project area.

Marine Fauna

A marine biological resources survey was conducted on March 14, 2017 (see **Appendix C**). A qualitative marine snorkel survey method was used, which focused on marine fauna (corals, fishes, and macroinvertebrates) and invasive algae within 150 feet of the shoreline. The marine environment in the project area borders a man-made island and much of the intertidal shoreline consists of man-made materials or rock brought in from other areas for riprap. Many of the hard surfaces in the subtidal part of the marine project area are also man-made materials (e.g., cement pilings, metal posts, and imported basalt rocks). There is no natural reef structure, and hard surfaces were almost entirely covered with algal turf with no macroalgae present. None of the marine fauna species recorded during the survey are federal- or state-listed threatened, endangered, proposed listed, or candidate species. None of the algal species identified are considered invasive.

Several native fishes were observed, which are listed in **Table 3-6**. All fishes observed during the survey were associated with hard substrata, especially those with structural complexity. The fishes were observed moving freely throughout the area where they could find shelter.

Large marine invertebrates were very uncommon. Smaller invertebrates observed included three individual sea cucumbers (*Actinopyga mauritiana)* in the shoreward part of the survey area, and three individual small urchins (*Echinometra mathaei)* located together on a single rock. No snails or barnacles were observed. A special search was conducted for coral species. Three coral species were observed in five different locations within the survey area. These species and their location are listed in **Table 3-7**.

Marine Mammals and Turtles

The endangered Hawaiian monk seal (*Neomonachus schauinslandicritical*) and threatened green sea turtle (*Chelonia mydas*) were not observed during the survey; however, these animals may haul out or bask on the beach or be found in the marine waters nearby. The project area includes critical marine habitat for the Hawaiian monk seal, which extends from the shoreline seaward to the 656-foot depth contour.

Table 3-6. Fish Species Observed in the Project Area

Scientific Name	Hawaiian and/or Common Name	Location	Abundance
Zanclus comutus	Moorish idol	Hard outcrops	+++
Kuhlia sp.	Āholehole	Hard outcrops	+++
Abudefduf abdominalis	Mamo	Hard outcrops	++
Acanthurus triostegus	Manini	Hard outcrops	++
Thalassoma duperrey	Saddle wrasse	Rocky peninsula	+
Naso sp.	Surgeon fish (juvenile)	Rocky peninsula	+
Mulloidichthys flavolineatus	Weke ʻā (juvenile)	Hard outcrops	+++
Albula glossodonta	ʻOīʻo (juvenile)	Hard outcrops	+
Acanthurus nigrofuscus	Brown surgeon fish (juvenile)	Rocky peninsula	+
Thalassoma purpureum	Surge wrasse (juvenile)	Rocky peninsula	+
Abudefduf sordidus	Kūpipi	Hard outcrops	++

Notes: +++ = High; ++ = Medium; + = Low
Source: SWCA, 2017

Table 3-7. Coral Species Observed in the Survey Area

Number	Species	Depth (meters at low tide)	Distance from Shoreline (meters)
1	*Leptastrea purpurea*	0.75	19.5
2	*Leptastrea purpurea*	0.75	36.5
3	*Palythoa caesia*	0.50	14.5
4	*Pocillipora damicornis*	0.50	7.0
5	*Leptastrea purpurea*	0.30	3.5

Source: SWCA, 2017

Terrestrial Reptiles and Amphibians

No reptiles or amphibians were detected during the survey. No terrestrial reptiles or amphibians are native to Hawai'i.

Insects and Other Invertebrates

No native invertebrates were observed during the survey. Non-native invertebrates observed include the Spot-winged glider dragonfly (*Pantala hymenaea*) and an unidentified blue butterfly.

Potential Impacts

Flora

Construction of the Proposed Action would remove all vegetation within the project area. However, none of the flora species within the project area are designated as threatened or endangered and all but one species is non-native. 'Aki'aki is an indigenous grass that responds well after an area is disturbed, and the

clearing and removal of non-native vegetation such as kiawe will typically result in the natural recruitment of 'aki'aki grass. Therefore, construction of the Proposed Action could be beneficial.

Upon completion of construction, there would be no impacts to flora species.

Under the No-Action Alternative, no construction would occur; therefore, there would be no impacts to flora species.

Fauna

Terrestrial Fauna

Construction of the Proposed Action would have limited short-term impacts to the existing animals and birds that reside or forage within the project vicinity. The majority of the species observed during the survey are common throughout urban areas of Honolulu and can temporarily relocate or forage in nearby areas during the construction period. Therefore, impacts to terrestrial fauna species during construction of the Proposed Action would be insignificant.

Upon the completion of construction, there would be no impacts to terrestrial wildlife and birds that reside or forage within the project vicinity.

Under the No-Action Alternative, no construction would occur and no changes would be made to the shoreline. Therefore, there would be no impacts to terrestrial wildlife or birds.

Marine Fauna

Construction of the Proposed Action would have limited short-term impacts to the existing marine fauna species that reside within the nearshore and subtidal marine environment within and adjacent to the project area due to in-water work and turbidity. None of the algal species are considered invasive; therefore, construction activities would not contribute to the spread of invasive algae. None of the marine fauna species are threatened or endangered. Therefore, impacts to marine fauna species during construction of the Proposed Action would be insignificant.

Upon completion of construction, the revetment would provide beneficial effects to the quality of nearshore waters since it would minimize shoreline erosion. The revetment would also protect the shoreline from wave action caused by storms or tsunami, which would decrease the amount of turbidity in the nearshore waters at the revetment site during these events. The improvement in water quality and decrease of potential turbidity would provide a beneficial effect on marine fauna species that reside in the nearshore and subtidal marine environment within and adjacent to the project area.

Under the No-Action Alternative, no construction would occur and no changes would be made to the shoreline. Therefore, there would be no impacts to marine fauna.

Special-Status Species

One state-threatened species, the white tern, was observed in the project vicinity. Three additional federally and state endangered or threatened fauna may occur in the area based on the availability of suitable habitat: the Hawaiian hoary bat, Hawaiian monk seal, and green sea turtle. Other threatened and

endangered species were considered initially, but dismissed from further analysis because of the lack of suitable habitat or because the project area is out of the habitat range.

White Tern

During construction of the Proposed Action, the white tern may be temporarily displaced from the project area. The white tern, which is likely limited to a few foraging individuals in the project vicinity since there are no suitable trees for nesting, is expected to find suitable foraging habitat in nearby areas. The temporary displacement of these individuals at the project site is not expected to affect individual survival or overall species populations.

Upon completion of construction, there would be no impacts to white terns.

Under the No-Action Alternative, no construction would occur and there would be no impacts to the white tern.

Hawaiian Hoary Bat

During construction of the Proposed Action, the Hawaiian hoary bat may be temporarily displaced from the project area. Since there are no suitable trees for roosting in the project area, it is expected that the presence of any bats would be likely limited to a few foraging individuals. The temporary displacement of these individuals at the project site is not expected to affect individual survival or overall species populations.

Upon completion of construction, there would be no impacts to the Hawaiian hoary bat.

Under the No-Action Alternative, no construction would occur and there would be no impacts to the Hawaiian hoary bat.

Hawaiian Monk Seal and Green Sea Turtle

Hawaiian monk seals and green sea turtles typically avoid human activity; therefore, it is unlikely that monk seals and turtles would frequent the project area during construction activities. Construction of the Proposed Action may temporarily displace these species, but long-term effects are not expected. Monk seals and turtles that haul out and bask on Sand Island are expected to find suitable beach in nearby areas. The temporary displacement of these individuals at the project site is not expected to affect individual survival or overall species populations. Additionally, protected species BMPs would be implemented during construction.

Upon completion of construction, the revetment would occupy approximately 300 feet of shoreline, thereby reducing the availability of basking sites for monk seals and turtles. However, there is over a mile of suitable basking habitat available north and east of the project site. Therefore, impacts to the Hawaiian monk seal and green sea turtle would be insignificant.

Under the No-Action Alternative, no construction would occur and no changes would be made to the shoreline. Therefore, there would be no impacts to the Hawaiian monk seal or the green sea turtle.

Birds Protected Under the Migratory Bird Treaty Act

Six bird species federally protected under the MBTA were identified in the project vicinity during the survey. These species consist of the black-bellied plover, Pacific golden plover, ruddy turnstone, white tern, cattle egret, and northern cardinal, as shown in **Table 3-5**, above.

Construction of the Proposed Action may temporarily displace some of these bird species, but long-term effects are not expected. These birds, which are likely limited to a few individuals in the project vicinity, are expected to find suitable foraging habitat in nearby areas. The temporary displacement of these individuals at the project site is not expected to affect individual survival or overall species populations.

Upon completion of construction, there would be no impacts to birds protected under the MBTA.

Under the No-Action Alternative, no construction would occur and there would be no impacts to birds protected under the MBTA.

Minimization and Mitigation Measures

There are no minimization or mitigation measures proposed for terrestrial flora and fauna, and none are expected to the required.

The minimization and mitigation measures proposed for water resources, described in **Section 3.5, Water Resources**, would also minimize impacts to marine fauna species. No other minimization or mitigation measures are proposed for marine fauna, and none are expected to be required.

The following minimization and mitigation measures are proposed to reduce potential impacts to special status species, including the white tern, Hawaiian hoary bat, and Hawaiian monk seal and green sea turtle:

- Tree removal and trimming would be conducted during fall and early winter when white tern breeding is at its lowest.
- Trees would be inspected for white tern eggs or chicks prior to tree removal.
- Any fences that are erected during construction would have barbless top-strand wire to prevent entanglements of the Hawaiian hoary bat on barbed wire. If fences are present, the top strand of barbed wire would be removed or replaced with barbless wire.
- No trees taller than 15 feet would be trimmed or removed between June 1 and September 15 when juvenile Hawaiian hoary bats that are not yet capable of flying may be roosting in the trees.
- Construction activities would not occur in a Hawaiian monk seal or green sea turtle is in or within 150 feet of the construction area. Construction will only begin after the animal voluntarily leaves the area. If a monk seal/pup pair is present, a 300-foot buffer would be observed.
- If a Hawaiian monk seal or sea turtle is noticed after work has begun, that work would be allowed to continue only if, in the best judgement of the project supervisor, that there is no way for the activity to adversely affect the animal(s).
- Any construction-related debris that may impose an entanglement threat to monk seals and turtles would be removed from the construction area at the end of each day and at the conclusion of construction.
- Workers would not attempt to feed, touch, ride, or otherwise intentionally interact with any listed species.

3.7 Cultural Resources

Existing Conditions

Cultural Practices and Traditional Uses

The project site is located on artificially created land that was submerged by the ocean until Sand Island was created from dredged material in the 1940s. Vegetation near the project site is mostly kiawe trees, which is an introduced and invasive species and is not associated with cultural gathering or use activities. The artificial creation and of the project site is not conducive to the presence of wahi pana (storied place) or other sites associated with cultural practices. Sand Island is not used for traditional, customary, or cultural practices.

Archaeological and Historic Resources

A portion of Sand Island was formerly known as Quarantine Island and is the site of the old quarantine station that was used to quarantine the shiploads of immigrants who came to Hawai'i to work on the plantations between 1888 and the turn of the 20th century (Leong, L., 2012). The site of the old quarantine station was used as a U.S. Army internment camp following the attack on Pearl Harbor until March 1943. In 1945, the internment camp was re-opened for use as a prisoner of war (POW) camp. No evidence of the wartime detention center exists today (Rosenfeld, A., 2015).

Today, Sand Island is a man-made island created by the disposal of dredged material from the improvements to Honolulu Harbor in the early 1900s and the seaplane runway in the early 1940s. There are no sites on Sand Island that are listed on the State of Hawai'i Register of Historic Places or the National Register of Historic Places (SHPD, 2016; NPS, 2014). Since the island is man-made, it is highly unlikely that pre-historic (archaeological) or historic resources exist in the project area.

Potential Impacts

Construction of the revetment would not disturb traditional sacred sites or traditional cultural objects; would not result in the degradation of resources used by native Hawaiians for subsistence or traditional cultural practices; would not obstruct landforms or wayfinding features; and would not result in loss of access to the shoreline or other areas customarily used by Hawaiians and others for resource gathering or traditional cultural practices. Therefore, the potential for adverse effects on traditional and cultural practices is not anticipated. Additionally, as stated above, since the island is man-made, it is highly unlikely that pre-historic or historic resources exist in the project area. Therefore, there will be no impact on archaeological and historic resources.

Under the No-Action Alternative, no construction activities would occur; therefore, there would be no impact to cultural practices or archaeological and historic resources.

Minimization and Mitigation Measures

No mitigation is proposed since there would be no adverse impacts to traditional cultural practices, archaeological, or historic resources. However, in the case of an inadvertent discovery of human remains, all work would stop in the area and the Honolulu Police Department (HPD) and State Historic Preservation Division (SHPD) would be notified.

3.8 Socioeconomic Characteristics

Existing Conditions

The Sand Island WWTP is the largest WWTP on Oahu. It serves metropolitan Honolulu from Salt Lake in the west to Kuli'ou'ou in the east, as shown in **Figure 3-9**. The Sand Island WWTP service area includes the central business district, Waikiki, and numerous other tourist attractions, and is home to approximately 75% of the jobs statewide. The facility serves a combined urban resident and visitor population of approximately 403,000. The Sand Island WWTP outfall is critical infrastructure for the City of Honolulu as it discharges an average of 66 million gallons of effluent per day.

Potential Impacts

Construction of the revetment would not increase the population of the area, nor would it impact environmental justice populations. Construction would result in temporary, positive economic activity in the form of construction jobs and material procurements.

The Proposed Action is necessary to ensure that the Sand Island WWTP outfall is not exposed and potentially compromised by ongoing shoreline erosion. The Sand Island WWTP outfall is critical infrastructure for the City of Honolulu as it discharges an average of 66 million gallons of effluent per day. The revetment would not change the use of the area and does not have the potential to create changes to land use in the surrounding area or affect growth of the surrounding population. Overall, the Proposed Action would be beneficial to the community as it would ensure the continued operation of the outfall.

The No-Action Alternative would have no impact on area demographics or economic conditions. The outfall pipeline would continue to be susceptible to shoreline erosion. The progressive shoreline erosion at the outfall site is a serious threat that could eventually expose and compromise the outfall pipeline. Therefore, the No-Action Alternative could result in significant impacts to the outfall, and therefore the population that it serves.

Minimization and Mitigation Measures

No minimization or mitigation measures are proposed or expected to be required.

Figure 3-9. Sand Island WWTP Service Area

Source: CCH, 2016

3.9 Public Facilities and Services

Existing Conditions

Parks and Recreation Areas

Sand Island SRA is an approximately 141-acre coastal recreational area managed by the DLNR – DSP. Approximately 97 acres of Sand Island SRA lies to the east of the project site. This portion of the SRA is a developed park area with picnic tables, barbeque grills, campgrounds, open lawn passive recreation areas, baseball diamonds, exercise and play apparatus, multi-use paths, covered pavilions, shade trees, and comfort stations. The park provides a wide sand beach that is over a half mile long. The remaining 44 acres are located to the west of the project area. The area includes a marine education training center, boat ramp, canoe pavilion, and parking at the mouth of the Kapalama Basin Kalihi Channel. There is also a BMX track operated by Island BMX on Hawai'i State Park land via a long-standing agreement with DSP.

There are no other parks or recreation areas within the project vicinity.

Utilities

There are no electric, cable, phone, or water utilities serving the project site. The project site is the location of the existing Sand Island WWTP outfall pipe. The areas adjacent to the project site, including the Sand Island SRA, the Island BMX track, and the Sand Island WWTP do have utility service, including electric, phone, water, and wastewater. Electric service to Sand Island is provided by the Hawaiian Electric Company (HECO). Water service is provided by the CCH Board of Water Supply (BWS). Wastewater service is provided by the Sand Island WWTP. Telephone, cable, and internet services are provided by both Hawaiian Telcom and Oceanic Time Warner Cable/Spectrum.

Solid Waste Disposal

Solid waste collection, transport, and disposal operations are the responsibility of the CCH Department of Environmental Services Refuse Division. Solid waste is collected and disposed of at either the Waimānalo Gulch Landfill in the 'Ewa district or the H-Power facility at Campbell Industrial Park. PVT Land Company operates a privately owned and operated, licensed solid waste facility for recovery of recyclable materials and disposal of construction and demolition materials: the PVT Landfill. The PVT Landfill accepts waste on a pre-arranged basis from registered contractors. Waste loads are screened to remove recyclable materials and the remaining wastes are landfilled.

Emergency Services

Police

Police protection is provided by the Honolulu Police Department (HPD). The project site is located in District 5 – Kalihi, Section 3, which covers the areas of Kalihi Kai, Palama, and Sand Island. It is served by the Kalihi Substation located at 1865 Kamehameha IV Road, approximately 5.3 miles north of the project site.

Fire

Fire protection is provided by the Honolulu Fire Department (HFD). The project site is a part of Battalion 1 and is served by the Kalihi Kai Fire Station located at the corner of Nimitz Highway and Waiakamilo Road, approximately 3.0 miles north of the project site.

Medical

The project site is located in urban Honolulu within proximity to several major medical facilities. Kuakini Medical Center, located at 347 North Kuakini Street, is approximately 4.8 miles northeast of the project site. Queen's Medical Center, located at 1301 Punchbowl Street, is approximately 5.2 miles east of the project site. Straub Clinic and Hospital is approximately 5.4 miles east of the project site at 888 South King Street. Kaiser Hospital, located at 3288 Moanalua Road, is approximately 5.6 miles north-northwest of the project site.

Emergency medical service is provided by the CCH Emergency Services Department, Emergency Medical Services Division. The Department has 20 ambulance units and two Rapid Response units in two districts. All ambulance units are designated as advanced life support units, meaning they are staffed by at least two people. The project area is served by District 1, which includes the western region of O'ahu.

Potential Impacts

Parks and Recreation Areas

Beach use and lateral access at the revetment site would be restricted during construction. However, this disruption would be temporary. All construction equipment would get to the site from the Sand Island WWTP and would not traverse the improved portion of the Sand Island SRA. The improved portion of the Sand Island SRA would not be affected and would be open for public use. During construction, there would be an increase in noise and dust from short-term construction activities; however, the impacts would be temporary and minimized to the extent possible. In addition, noise generated during construction would be similar in character and intensity as the existing noise conditions in the surrounding industrial areas and those at the Island BMX track. Therefore, impacts to parks and recreation areas from construction of the Proposed Action would be less than significant.

The Proposed Action would not have an adverse impact on recreational resources. The revetment would be located outside of the improved area of the Sand Island SRA, but would be along the shoreline and accessible by users of the park. Although the proposed revetment would encroach on land set aside to the DLNR – DSP, there would be no conversion of the area from recreational use. The new revetment should cause little change to the recreational use and safety of the beach. It is possible that fishermen may use the revetment for shoreline fishing.

Under the No-Action Alternative, the revetment would not be constructed and there would be no impact to parks and recreation areas.

Utilities

During construction, the contractor would utilize a portion of a 14-acre vacant site on the south side of the Sand Island WWTP as the contractor yard and staging area. It is expected that the contractor would require utility services, including electric, water, phone, and internet. The existing utility systems have

adequate capacity to meet the utility requirements during construction. Construction personnel would be provided with Port-a-Johns at the construction staging area within the Sand Island WWTP.

Upon completion of construction, the Proposed Action would not result in the use of any utilities. The Proposed Action would have a beneficial impact on the wastewater utility by protecting the existing Sand Island WWTP outfall pipe.

Under the No-Action Alternative, no construction activities would occur and there would be no impacts to utilities. However, the No-Action Alternative would not provide shoreline protection at the Sand Island WWTP outfall pipe's ocean entry and erosion would likely continue. Any additional erosion could result in exposure of the outfall pipe, which could compromise the outfall. Therefore, the No-Action Alternative could have an adverse effect on the wastewater utility.

Solid Waste Disposal

Construction activities associated with the Proposed Action would result in the generation of small amounts of construction debris and excess soil, which would be disposed of at the PVT Landfill in accordance with CCH and State DOH regulations and provisions of the PVT facility license. Non-construction solid waste would be collected and disposed of at either of the City's landfills.

Upon completion of construction, the Proposed Action would not result in the generation of solid waste.

Under the No-Action Alternative, there would be no construction; therefore, the No-Action Alternative would not result in the generation of solid waste.

Emergency Services

Emergency vehicle access would be maintained throughout construction. It is not anticipated that construction activities would result in an increase in calls for fire, police, or medical services. However, if an incident were to occur during construction that required fire, police, or medical attention, the level of demand could be met by the existing fire, police, and emergency medical services force.

Upon completion of construction, the Proposed Action would not result in an increase in calls for fire, police, or medical services.

Under the No-Action Alternative, no construction activities would occur and there would be no impacts to emergency services.

Minimization and Mitigation Measures

The selected contractor would be required to implement BMPs for construction activities to minimize erosion, dust, and noise impacts to the Sand Island SRA. BMPs to be used in this project would include erosion control, fugitive dust management, and the use of equipment installed with mufflers.

No minimization or mitigation measures are proposed for utilities, solid waste disposal, or emergency services.

3.10 Transportation and Traffic

Existing Transportation System

The project site is located along the shoreline on the southern side of Sand Island. Sand Island Parkway (State Highway 64) is the major thoroughfare serving Sand Island. It is the continuation of Sand Island Access Road, which extends from Nimitz Highway across the Bascule Bridge, which crosses the Kalihi Channel. The majority of the traffic on Sand Island is generated by surrounding activities, including the transportation of shipping containers from Honolulu Harbor to other locations, the U.S. Coast Guard Station – Honolulu, a number of small businesses and industries located on the island, and visitors to the Sand Island SRA and associated facilities.

Potential Impacts

There would be a temporary increase of traffic on Sand Island Access Road and Sand Island Parkway as stone and construction materials are brought to the staging area, which would be located at the Sand Island WWTP. There would be a minor increase of traffic between Nimitz Highway and the Sand Island WWTP during construction as workers travel to and from the project staging area. All access to the project site would be through a gate on the south side of the Sand Island WWTP and via a construction easement from the State. There would be no impact to traffic east of the Sand Island WWTP during construction.

Upon completion of construction, traffic on Sand Island Access Road and Sand Island Parkway would go back to pre-existing conditions.

Under the No-Action Alternative, no construction activities would occur and there would be no impact to the existing transportation system.

Minimization and Mitigation Measures

The contractor would be required to keep all construction vehicles in proper operating condition and ensure that material loads are properly secured to prevent dust, debris, leakage, or other adverse conditions from affecting public roadways. The contractor would be required to obtain a permit from the State Department of Transportation to transport oversized and/or overweight materials and equipment on State highways. All construction materials and equipment would be transferred to and from the project staging area and project site during off-peak traffic hours (8:30 a.m. to 3:30 p.m.) to minimize potential disruption to traffic on the local streets. No other minimization or mitigation measures are proposed.

3.11 Visual Resources

Existing Scenic and Visual Environment

The project site is located on the south shore of Sand Island just west of the improved portion of the Sand Island SRA. The *Primary Urban Center Development Plan* (CCH, 2004) identifies two mauka-makai significant panoramic views from Sand Island, as shown in **Figure 3-10**: (1) Sand Island to Punchbowl, and (2) Sand Island to Kamehameha Schools. There are also two panoramic views of which Sand Island is within the viewshed: (1) the view from the Honolulu International Airport Runway on Lagoon Drive towards Diamondhead, and (2) the view from the west end of Kaka'ako Waterfront Park towards Honolulu Harbor. All of these views are identified on **Figure 3-10**. The distance of the project site from Lagoon Drive is

approximately 2.4 miles; the distance of the project site from Kaka'ako Waterfront Park is approximately 1.0 mile.

Potential Impacts

Construction of the Proposed Action would introduce construction equipment and activity along a part of the shoreline that is generally not frequented. Although construction activities would be visible from the more populated, improved portion of the Sand Island SRA, the project area is not in the viewshed of the significant panoramic views from or to Sand Island, as identified in **Figure 3-10**. Additionally, the more scenic resources are east of Sand Island. Therefore, it is expected that visitors to Sand Island SRA looking to enjoy the scenic resources would be looking to the east from the Sand Island SRA, which is the opposite direction of the project site. Therefore, impacts to the existing scenic and visual environmental would be less than significant.

The Proposed Action, limited in scope to the construction of a rock rubble mound revetment along the shoreline, is not anticipated to affect the aesthetic and visual character of the surrounding area. The revetment is a sloping boulder structure that rises to an elevation of 10.5 feet, approximately 4 feet above ground elevation. It would present a new, visible structure along this shoreline. The nature of the structure, however, is similar to the degraded boulder revetment that currently exists at the site. There are no backshore uses or structures at the project site whose viewplanes would be affected.

Under the No-Action Alternative, there would be no construction and no changes to the existing visual character of the shoreline. Therefore, there would be no impact to the existing scenic and visual environment.

Minimization and Mitigation Measures

No minimization or mitigation measures are proposed or expected to be required.

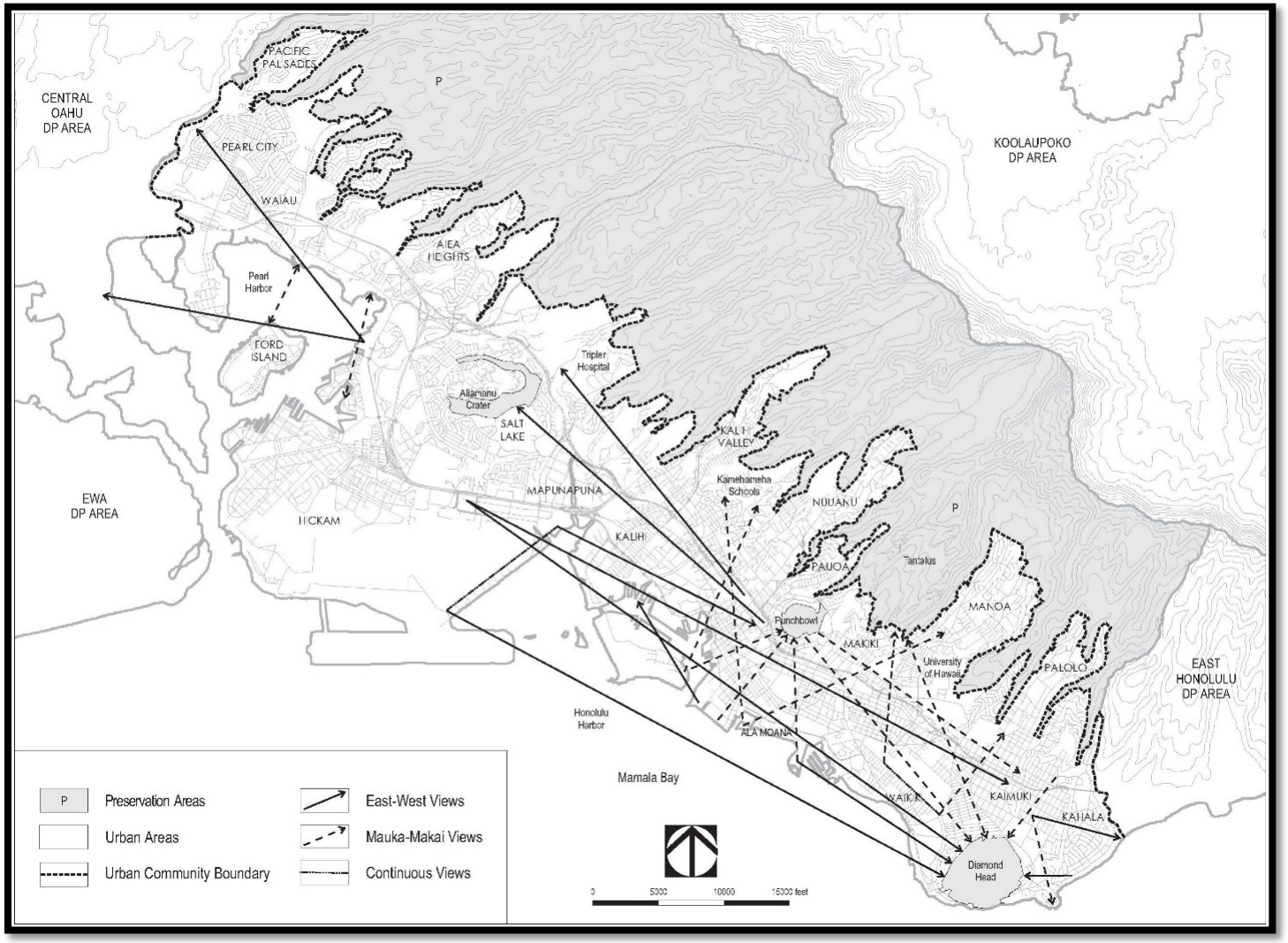
3.12 Cumulative Effects

Cumulative effects refer to impacts on the environment that result from the incremental effect of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such actions. Cumulative effects can result from individually minor yet collectively significant actions taking place over a period of time. Land use in the vicinity of the Proposed Action is comprised of park land and industrial. No other past, present, or planned actions associated with these land uses have been identified that would contribute to cumulative effects for any resources. Therefore, no significant cumulative effects would be anticipated from implementation of the Proposed Action.

3.13 Irretrievable and Irreversible Commitment of Resources

Implementation of the Proposed Action would not result in the irretrievable and irreversible commitment of resources other than the financial resources, fuel, and other consumable materials required for construction.

Figure 3-10. Significant Panoramic Views



Source: CCH, 2004

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CHAPTER 4: RELATIONSHIP TO STATE AND COUNTY LAND USE PLANS AND POLICIES

4.1 State Planning Documents

The Hawai'i State Plan

The Hawai'i State Plan, codified as HRS Chapter 226, provides goals, objectives, policies, and priorities for the State. The Hawai'i State Plan also provides a basis for determining priorities, allocating limited resource, and improving coordination of State and County plans, policies, programs, projects, and regulatory activities. It establishes a set of themes, goals, objectives, and policies that are meant to guide the State's long-range growth and development activities. The Proposed Action is consistent with the following applicable objectives and policies:

Section 226-11. *Objectives and policies for the physical environment – land-based, shoreline, and marine resources.*

(a) Planning for the State's physical environment with regard to land-based, shoreline, and marine resources shall be directed towards achievement of the following objectives:
(1) Prudent use of Hawai'i's land-based, shoreline, and marine resources.
(2) Effective protection of Hawai'i's unique and fragile environmental resources.
(b) To achieve the land-based, shoreline, and marine resources objectives, it shall be the policy of this State to:
(3) Take into account the physical attributes of areas when planning and designing activities and facilities.
(4) Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.
(8) Pursue compatible relationships among activities, facilities, and natural resources.

Discussion: The Proposed Action is located directly on the shoreline on the southern side of Sand Island in an area that has been subject to erosion. The Proposed Action would build a revetment to protect the shoreline from further erosion.

Section 226-12. *Objective and policies for the physical environment – scenic, natural beauty, and historic resources.*

(a) Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawai'i's scenic assets, natural beauty, and multi-cultural/historical resources.
(b) To achieve the scenic, natural beauty, and historic resources objective, it shall be the policy of the State to:
(1) Promote the preservation and restoration of significant natural and historic resources.
(5) Encourage the design of developments and activities that complement the natural beauty of the islands.

Discussion: The Proposed Action is located directly on the shoreline on the southern side of Sand Island in an area that has been subject to erosion. The Proposed Action would build a revetment to protect the shoreline from further erosion. The revetment would be designed in such a manner to be unobtrusive to the natural beauty of the area.

Section 226-13. *Objectives and policies for the physical environment – land, air, and water quality.*

(a) Planning for the State's physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives:
(1) Maintenance and pursuit of improved quality in Hawai'i's land, air, and water resources.
(b) To achieve the land, air, and water quality objectives, it shall be the policy of the State to:
(5) 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 Action would build a revetment that would protect the existing Sand Island WWTP outfall pipe from extreme wave and storm events and climate change factors, including sea level rise, that are likely to increase the nearshore wave exposure of the outfall.

Section 226-15. *Objectives and policies for facility systems – solid and liquid wastes.*

(a) Planning for the State's facility systems with regard to solid and liquid wastes shall be directed towards the achievement of the following objectives.
(1) Maintenance of basic public health and sanitation standards relating to treatment and disposal of solid and liquid wastes.

Discussion: The Proposed Action is a preemptive action to ensure that the existing Sand Island WWTP outfall pipe does not become exposed due to erosion, which could lead to maintenance issues with the pipe.

Section 226-109. *Climate change adaptation priority guidelines.*

Priority guidelines to prepare the State to address the impacts of climate change, including impacts to the areas of agriculture; conservation lands; coastal and nearshore marine areas; natural and cultural resources; education; energy; higher education; health; historic preservation; water resources; the built environment, such as housing, recreation, transportation; and the economy shall:
(1) Ensure that Hawai'i's people are educated, informed, and aware of the impacts climate change may have on their communities;
(2) Encourage community stewardship groups and local stakeholders to participate in planning and implementation of climate change policies;
(3) Invest in continued monitoring and research of Hawai'i's climate and the impacts of climate change on the State;
(4) Consider native Hawaiian traditional knowledge and practices in planning for the impacts of climate change;
(5) Encourage the preservation and restoration of natural landscape features, such as coral reefs, beaches and dunes, forests, streams, floodplains, and wetlands, that have the inherent capacity to avoid, minimize, or mitigate the impacts of climate change;

(6) Explore adaptation strategies that moderate harm or exploit beneficial opportunities in response to actual or expected climate change impacts to the natural and built environments;

(7) Promote sector resilience in areas such as water, roads, airports, and public health, by encouraging the identification of climate change threats, assessment of potential consequences, and evaluation of adaptation options;

(8) Foster cross-jurisdictional collaboration between County, State, and Federal agencies and partnerships between government and private entities and other nongovernmental entities, including nonprofit entities;

(9) Use management and implementation approaches that encourage the continual collection, evaluation, and integration of new information and strategies into new and existing practices, policies, and plans; and

(10) Encourage planning and management of the natural and built environments that effectively integrate climate change policy.

Discussion: The CCH supports the Hawai'i State Plan Climate Change Adaption Priority Guidelines and acknowledges the importance of planning for potential impacts. Full support and participation will be provided towards ongoing efforts to better understand, plan, and ultimately adapt to Hawai'i's changing climate.

State Land Use Law

Hawai'i was the first of the fifty States to have a State Land Use Law and a State Plan. Today, Hawai'i remains unique among the fifty states with respect to the extent of control that the state exercises in land use regulation. The state has four classifications: Agricultural, Conservation, Rural, and Urban. The State Land Use Law HRS, Chapter 205 initially set the boundaries for the four classifications: Urban, Agricultural, Conservation, and Rural.

Discussion:

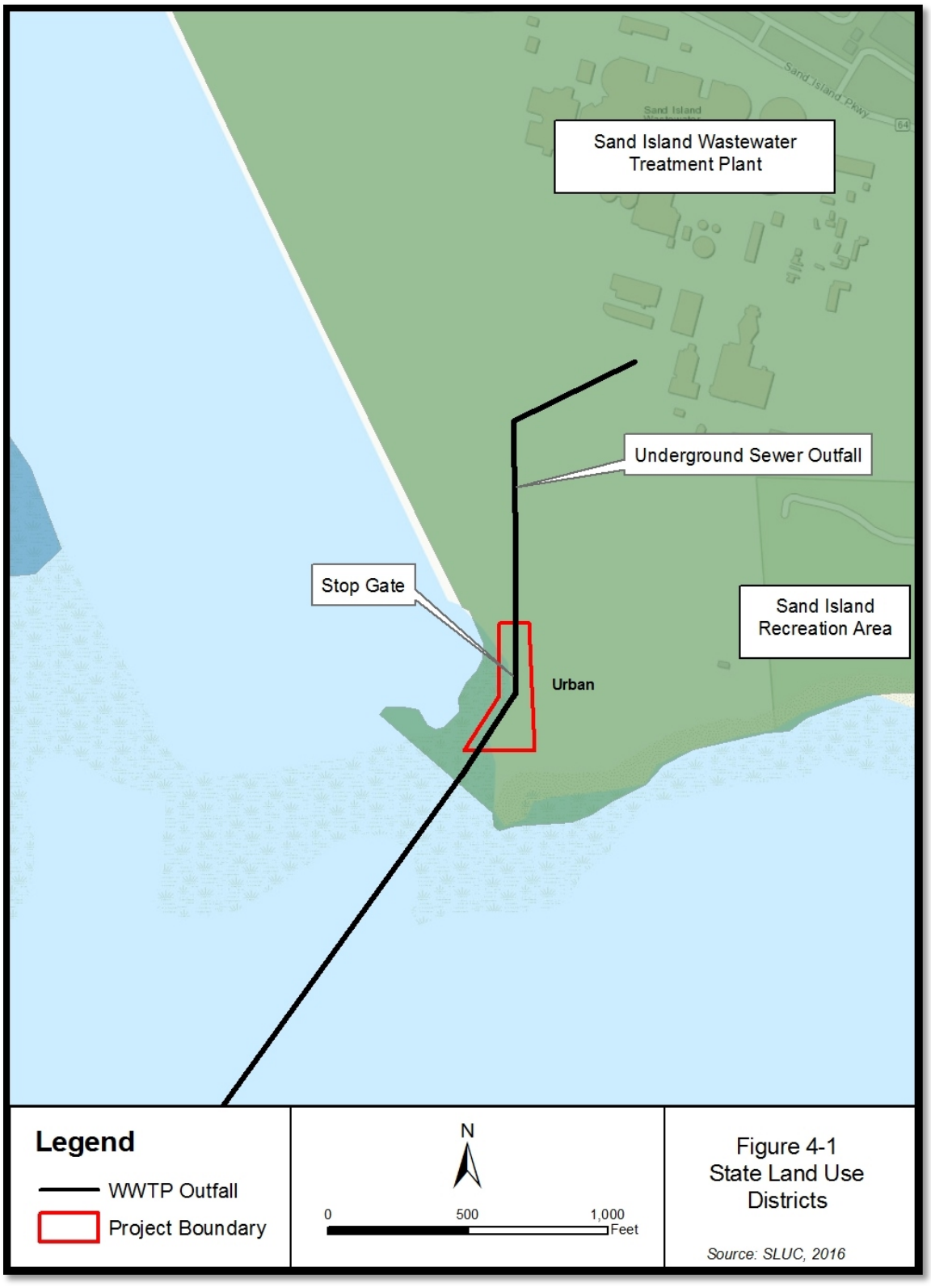
Figure 4-1 identifies the project site as located in the Urban state land use district. However, it must be noted that the land and marine waters makai of the certified shoreline are considered a part of the Conservation state land use district. Therefore, a portion of the project site is located within the Conservation district in the Resource Subzone (DLNR, 2011).

The Urban land use district permits "any and all uses permitted by the counties." The CCH Zoning and Land Use Ordinance, as discussed in **Section 4.2**, delineates the project site as within the P-2 zone, or General Preservation District. Any use of the P-2 zoning district requires a Conditional Use Permit – Minor.

As defined in HAR §13-5-24 and §13-5-22, shoreline erosion control, including revetments, is a permitted use in the Resource subzone of the Conservation district, provided the following:

1. The use would not adversely affect beach processes or lateral public access along the shoreline.
2. Public facilities 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 (DLNR, 2011).

Figure 4-1. State Land Use Districts



Any shoreline erosion control structures require a Shoreline Certification and a Conservation District Use Permit. A Shoreline Certification and Conservation District Use Permit will be obtained by the project proponent. Therefore, the Proposed Action is consistent with the State Land Use Law.

Hawai'i Coastal Zone Management Program, HRS 205A

The National Coastal Zone Management (CZM) Program was created with the passage of the Coastal Zone Management Act of 1972 (CZMA). Hawai'i's CZM Program, established pursuant to HRS Chapter 205A, as amended, is administered by the State of Hawai'i Office of Planning and provides for the beneficial use, protection, and development in the State's coastal zone. The objectives and policies of the Hawai'i CZM Program encompass a wide array of concerns including impacts to recreational resources, historic and archaeological resources, coastal scenic resources and open space, coastal ecosystems, coastal hazards, and the management of development. The Hawai'i CZM area includes all lands within the State and the areas seaward to the extent of the State's management jurisdiction. Therefore, the proposed project site is located within the CZM area. The Proposed Action is consistent with the following applicable objectives and policies of the Hawai'i CZM Program:

(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:

(B) 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.

(C) Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources.

Discussion: The project site is located within the CZM area. The Proposed Action, which includes building a revetment, would protect the shoreline from further erosion, which would improve the shoreline open space and scenic resource. The revetment would be designed to be compatible with the visual environment and would not affect the existing public view to and along the shoreline.

(9) *Beach* protection

OBJECTIVE:

Protect beaches for public use and recreation.

POLICIES:

(C) Minimize the construction of public erosion-protection structures seaward of the shoreline.

Discussion: Although a portion of the revetment would be constructed seaward of the shoreline, the encroachment is a requirement to ensure the most erosion protections. Additionally, this encroachment would be minimized to the extent practicable.

4.2 City and County of Honolulu Planning Documents

O'ahu General Plan

The *O'ahu General Plan* (1992) was last amended in 2002 (CCH, 2002). The General Plan is a comprehensive statement of objectives and policies that set forth the long-range aspirations of O'ahu's residents and the strategies of actions to achieve them. The General Plan is a guide for all levels of government, private enterprise, neighborhood and citizen groups, organizations, and individual citizens in eleven areas of concern:

I. Population
II. Economic activity
III. Natural environment
IV. Housing
V. Transportation and utilities
VI. Energy
VII. Physical development and urban design
VIII. Public safety
IX. Health and education
X. Cultural and recreation
XI. Government operations and fiscal management

The Proposed Action is relevant and consistent with the following applicable goals, objectives, policies, and actions of the *O'ahu General Plan:*

***(V)** Transportation and Utilities*

OBJECTIVE C: To maintain a high level of service for all utilities.

POLICY 1: Maintain existing utility systems in order to avoid major breakdowns.

Discussion: The Proposed Action would build a revetment over the existing Sand Island WWTP Outfall pipeline, which would protect the outfall from being exposed by erosion and the subsequent dangers of being exposed to wave action, tsunamis, and hurricanes.

OBJECTIVE D: To maintain transportation and utility systems which will help O'ahu continue to be a desirable place to live and visit.

POLICY 1: Give primary emphasis in the capital-improvement program to the maintenance and improvement of existing roads and utilities.

Discussion: The Proposed Action is included in and would be funded by the capital-improvement program.

City and County of Honolulu Zoning and Land Use Ordinance

The ROH Chapter 21, Land Use Ordinance, contains ordinances regulating the utilization of land in the CCH. Chapter 21 of the ROH is also referred to as the zoning ordinance and includes the establishment of zoning districts and zoning district regulations in Article 3.

Discussion: As shown in **Figure 4-2**, the project site is located within the P-2 zone, or General Preservation District. The purpose of the preservation district is to preserve and manage major open space and recreation lands and lands of scenic or other natural resource value. The P-2 designation is provided to lands that are designated Urban by the state, but are suited to the functions of providing visual relief and contrast to the city's built environment or serving as outdoor space for the public's use and enjoyment. Allowable uses of the P-2 zoning district are use of historic structures and joint development. Any use of the P-2 zoning district requires a Conditional Use Permit – Minor.

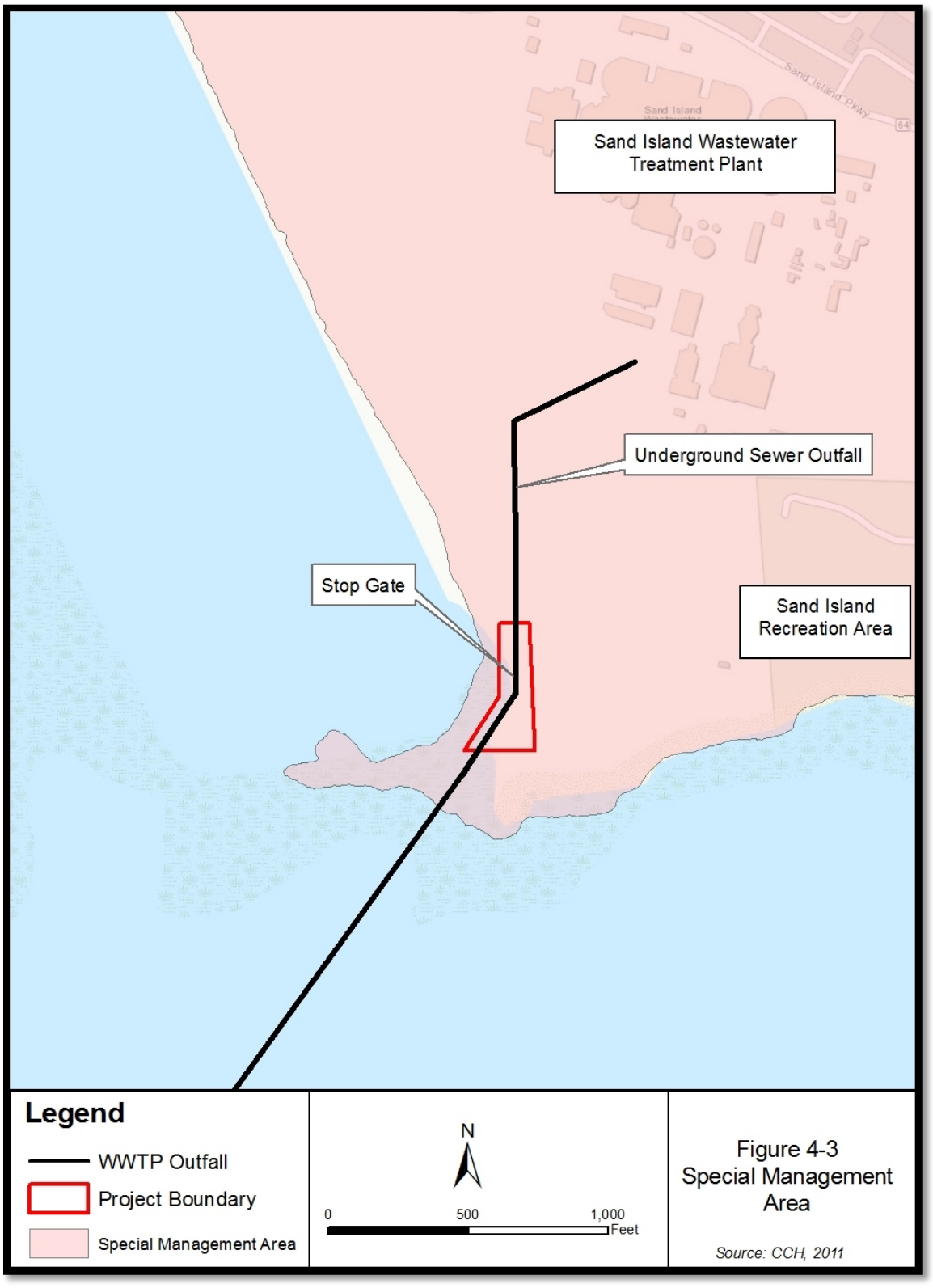
City and County of Honolulu Special Management Area

Pursuant to the Hawai'i CZM Program, HRS 205A, the counties have enacted ordinances establishing Special Management Areas (SMA). The CCH enacted its SMA ordinance as Chapter 25 of the ROH. Any "development" within the geographically defined SMA with a valuation of greater than $500,000 requires an SMA Use Permit. The permit is processed by the CCH Department of Planning and Permitting, requires a public hearing, and must be approved by the Honolulu City Council by resolution. Proposed developments are evaluated for consistency with the CZM objectives and policies, as discussed in **Section 4.1**, as well as the SMA guidelines set forth in HRS 205A.

Discussion: As shown in **Figure 4-3**, the project site is located within the SMA. An SMA Use Permit will be obtained by the project proponent. Therefore, the Proposed Action is consistent with the SMA.

Figure 4-2. Honolulu Zoning

Figure 4-3. Special Management Area



Primary Urban Center Development Plan

The project site is located within the PUC Development Plan area, which extends from downtown Honolulu to Pearl City in the west and to Waialae-Kahala in the east. The *Primary Urban Center Development Plan* (CCH, 2004) provides a vision for the PUC in the areas of land use, transportation, infrastructure, and public facilities. It also provides policies and guidelines for achieving that vision. The Proposed Action is consistent with the following relevant guidelines, policies, and principles contained in the *Primary Urban Center Development Plan:*

4.2 Wastewater System

> *POLICY: Implement adequate and timely upgrades/expansion of wastewater treatment facilities to meet the growth demands of the PUC.*

Discussion: The Proposed Action would build a revetment over the existing Sand Island WWTP Outfall pipeline, which would protect the outfall from being exposed by erosion and the subsequent dangers of being exposed to wave action, tsunamis, and hurricanes. Although the Proposed Action would not upgrade or expand the capacity of the outfall, the protection the revetment would provide would eliminate the need for excessive future maintenance. Therefore, the Proposed Action is consistent with the *Primary Urban Center Development Plan.*

The Land Use Map (A.5: PUC – Central) identifies the lands of where the project site is located as Major Parks and Open Space. This designation refers to larger land areas and recreational facilities that contribute to the PUC's open space network. The Proposed Action would have not subdivide or otherwise impact this area.

CHAPTER 5: FINDINGS AND CONCLUSIONS

5.1 Significance Criteria

HAR 11-200 provides significance criteria for which all projects in Hawai'i are assessed. These significance criteria and their relationship to the Proposed Action are as follows:

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

There are no significant flora or fauna that would be lost due to emplacement of the proposed revetment. No threatened or endangered species would be impacted by the Proposed Action. No known cultural resources are located on the site, nor are any expected to be discovered.

(2) Curtails the range of beneficial uses of the environment.

The Proposed Action would have no impact on public access to the shoreline. In addition, there would be no significant change in lateral access along the shore, nor would there be any impact to fishing on the flat reef seaward of the project site.

(3) Conflicts with the State's long-term environmental policies or goals and guidelines as expressed in HRS 344 and any revisions thereof and amendments thereto, court decisions, or executive orders.

State waters would not be impacted by the Proposed Action in any way with the exception of possible short-term turbidity during construction.

(4) Substantially affects the economic, social welfare, or cultural practices of the community or State.

The Proposed Action would have no adverse social or economic impacts. The Proposed Action would have a significant positive social and economic impact by preventing damage to the only wastewater outfall servicing Honolulu.

(5) Substantially affects public health.

The Proposed Action would have some temporary, minor impacts on air, noise, and water quality during construction; however, these impacts would be minimized to the extent practicable by the employment of BMPs and compliance with permit conditions. The Proposed Action would not result in any post-construction or long-term effects on public health. The Proposed Action would protect the Sand Island WWTP outfall pipe. If this outfall pipe becomes compromised, it could discharge into the nearshore waters, which could create a public health hazard. Therefore, construction of the revetment and protection of the outfall is beneficial to public health.

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

The Proposed Action would not alter the existing land use pattern; therefore, there would be no secondary impacts, such as population changes or effects on public facilities.

(7) Involves a substantial degradation of environmental quality.

Other than short-term construction impacts, the Proposed Action would not result in impacts that can be expected to degrade the environmental quality in the project area. Rather, the Proposed Action would help prevent nearshore turbidity due to erosion of the shoreline. Additionally, the Proposed Action would have a significant positive impact to environmental quality through protection of the outfall to prevent a potential discharge of wastewater along the coastline should the outfall become damaged due to exposure.

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

The proposed project is a standalone project and would have no cumulative impacts or commitments for larger actions.

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

The Proposed Action would not substantially affect rare, threatened, or endangered species or habitat.

(10)Detrimentally affects air and water quality or ambient noise levels.

Construction of the Proposed Action would have minor, short-term impacts to air and water quality and ambient noise levels. The construction contractor would be required to develop and implement a dust control plan, to be approved by the DOH, that would minimize fugitive dust during construction. Additionally, the construction contractor would be required to maintain equipment with emissions controls.

With regard to water quality, the construction contractor would be required to employ 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 or in 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 would be confined to the immediate area of construction, and no construction material shall be stockpiled in the water. Turbidity containment barriers would be installed and maintained to control and contain construction-generated turbidity. The water area around the construction site would be visually monitored, and if monitoring suggests that the turbidity standards are being exceeded, construction would be suspended until the condition is corrected.

Noise generated during construction would be similar in character and intensity as the existing noise conditions in the surrounding industrial areas. Noise would be minimized by requiring contractors to adhere to State and County noise regulations and any permit conditions.

(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 revetment is designed to protect the outfall pipeline and prevent shoreline erosion during direct impact by a hurricane. Thus, the revetment is not likely to suffer damage.

(12)Substantially affects scenic vistas and viewplanes identified in County or State plans or studies.

The revetment is a sloping boulder structure that rises to an elevation of 10.5 feet, approximately 4 feet above ground elevation. It would present a new, visible structure along this shoreline. The nature of the structure, however, is similar to the degraded boulder revetment that currently exists at the site. There are no backshore uses or structures at the project site whose viewplanes would be affected. Additionally, the project area is not in the viewshed of the significant panoramic views from Sand Island.

(13)Requires substantial energy consumption.

Other than the energy expended during construction, the Proposed Action would require no additional energy consumption.

5.2 Anticipated Finding of No Significant Impact

Based on the significance criteria set forth in HAR 11-200 and discussed in **Section 5.1**, it is anticipated that the Proposed Action will not have a significant effect on the environment and that a Finding of No Significant Impact (FONSI) will be filed with the State of Hawai'i Office of Environmental Quality Control following the public comment period.

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CHAPTER 6: AGENCIES AND ORGANIZATIONS CONSULTED

The following agencies and organizations were consulted during the preparation of the Draft EA. Those who formally replied are indicated by a red asterisk (*). All written comments received during the early consultation period of the Draft EA and responses are included in **Appendix A**.

6.1 Pre-Assessment Consultation

Federal

- U.S. Army Corps of Engineers *
- U.S. Fish and Wildlife Service *
- National Marine Fisheries Service

State of Hawai'i

- Department of Business, Economic Development & Tourism
- Office of Planning *
- Department of Health (DOH), Clean Water Branch *
- DOH, Environmental Planning Office *
- DOH, Clean Air Branch
- DOH, Indoor and Radiological Health Branch *
- Department of Accounting and General Services *
- Department of Land and Natural Resources (DLNR), Division of Aquatic Resources *
- DLNR, Division of Forestry and Wildlife
- DLNR, Division of State Parks
- DLNR, Office of Coastal and Conservation Lands
- DLNR, Engineering Division *
- DLNR, Division of Boating and Ocean Recreation *
- DLNR, State Historic Preservation Division
- DLNR, Land Division *
- Department of Transportation (DOT), Highways Division *
- DOT, Airports Division
- DOT, Harbors Division *

City and County of Honolulu

- Office of the Mayor
- Department of Emergency Management
- Emergency Services Department
- Department of Environmental Services
- Department of Parks and Recreation
- Department of Planning and Permitting *
- Department of Transportation Services *

- Honolulu Board of Water Supply *
- Honolulu Fire Department *
- Honolulu Police Department *
- Honolulu City Council, District 7
- Kalihi-Palama Neighborhood Board No. 15

Non-Governmental Organizations (NGOs)

- Sierra Club of State of Hawai'i
- State of Hawai'i Audubon Society
- The Outdoor Circle
- Hawai'i's Thousand Friends
- Na Kama Kai
- The Nature Conservancy of Hawai'i
- Conservation Council for Hawai'i
- KAHEA – The Hawaiian Environmental Alliance

CHAPTER 7: LIST OF CONTRIBUTORS

Table 7-1 identifies the personnel that contributed to the completion of this EA:

Table 7-1. Contributors to the Environmental Assessment

Name	Role
SSFM International, Inc.	
Westley K.C. Chun	Project Manager
Jennifer M. Scheffel	Primary Author
SWCA Environmental Consultants	
Jaap Eijzenga	QA/QC, Biological Resources Reconnaissance Report
Francis Quitazol	Field Lead and Primary Author, Biological Resources Reconnaissance Report
Sea Engineering, Inc.	
Marc Ericksen	Primary Author, Coastal Assessment

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CHAPTER 8: REFERENCES

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APPENDIX A

Pre-Assessment Consultation Letter and Responses

A-1 Pre-Assessment Consultation Letter

A-2 Comment Letters Received and Responses to Comments

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A-1 Pre-Assessment Consultation Letter

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SSFM International

<< DATE >>

SSFM 2010_057

<< NAME >>
<< AGENCY/ORGANIZATION >>
<< STREET ADDRESS >>
<< CITY, STATE ZIP >>

SUBJECT: **Sand Island Wastewater Treatment Plant Outfall**
Shoreline Revetment Project
Tax Map Key (TMK): (1) 1-5-041:006 and (1) 1-5-041:003
Pre-Assessment Consultation for Environmental Assessment

Dear << SALUTATION >>,

The City and County of Honolulu, Department of Environmental Services (ENV) proposes to construct a new revetment structure at the location of the Sand Island Wastewater Treatment Plant (WWTP) Outfall structure along the shoreline on the southwest point of Sand Island in Honolulu, Hawai‘i (see Attachment, Figure 1).

Project Background

The Sand Island WWTP 84-inch ocean outfall extends approximately 1,450 feet from the treatment plant to a transition point on the Sand Island shoreline where it extends offshore for 12,500 feet. As part of an outfall mapping and condition inspection project conducted in 2011 and 2012, dramatic erosion and recession of the shoreline was documented. Although the existing rock revetment for the outfall that was constructed at approximately the same time as the outfall (1975) continues to offer some protection for the shoreline, it is in a degraded condition. The landward portion of the outfall is only covered by gravel and compacted fill, while in the offshore direction, the outfall is buried in a 13-feet 4-inch wide trench excavated into the fossil reef, lined with sheet piles overlain and protected by Class “C” and Class “B” stone. Therefore, the land portion of the outfall is relatively unarmored and vulnerable to damage should the section become exposed to wave activity.

While the existing revetment has likely contributed to slowing the recent erosion rate, it does not offer substantial protection for the on-land portion of the buried outfall, placing the outfall at risk. Extreme wave and shore events can cause rapid erosion and damage to the shoreline. During such an event, the damage can occur over a short time span, possibly overnight. Climate change factors, including sea level rise, are likely to increase the near-shore wave exposure of the outfall. Additionally, the existing revetment structure will likely continue to degrade. Any significant damage to the structure will probably cause an increase in shoreline erosion near the stop gate structure.

The Sand Island WWTP outfall is critical infrastructure for the City of Honolulu as it discharges an average of 66 million gallons of effluent per day. The progressive shoreline erosion is a serious potential threat that could eventually expose and compromise the outfall pipeline.

Project Description

The proposed revetment would be approximately 450 feet long and would armor the shoreline to prevent further erosion. The revetment is proposed to extend from the approximate location where the outfall extends into the ocean northward along the shoreline to the dredged channel, as shown in the attached Project Location Map. The revetment structure would be an un-cemented rock rubble mound that would be built using boulder size rocks (see Attachment, Figure 2).

All construction would take place above the pipeline design elements; the original trench elements, including sheet piling, rocking, and the pipeline itself will not be disturbed. The revetment will follow the pipeline alignment for approximately 300 feet along the shoreline from its entry point into the ocean, at which point it will turn landward for approximately 150 feet, see Attachment, Figure 3. The extensive landward return is to prevent flanking erosion of the structure, as the existing shore protection will likely continue to degrade with time. The southern shoreline of Sand Island at this location is reasonably protected by a natural beach with a good volume of sand. However, overtopping will likely occur due to the low grade elevations, and much of the area landward of the new structure can be expected to be awash during such an event. The landward slope and embedment of the structure will prevent significant damage to the shoreline and the outfall.

The City and County of Honolulu, Department of Design and Construction (DDC), on behalf of ENV, has contracted SSFM International, Inc., to prepare an Environmental Assessment (EA) for compliance with State environmental regulations under Hawai‘i Revised Statutes (HRS) Chapter 343 and Hawai‘i Administrative Rules (HAR) Title 11, Chapter 200. This letter and attachments are being provided to solicit any comments, concerns, or regulatory requirements that you may have in regards to this project. We would greatly appreciate your cooperation in providing us with written comments within 30 days of the date of this letter. If you have any questions on this matter or the proposed project, please feel free to contact me at (808) 356-1273 or by email at jscheffel@ssfm.com.

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

cc: Cindy Masuoka (DDC)

Attachment: **Figure 1.** Project Location Map
Figure 2. Proposed Revetment Section
Figure 3. Proposed Revetment Design Layout

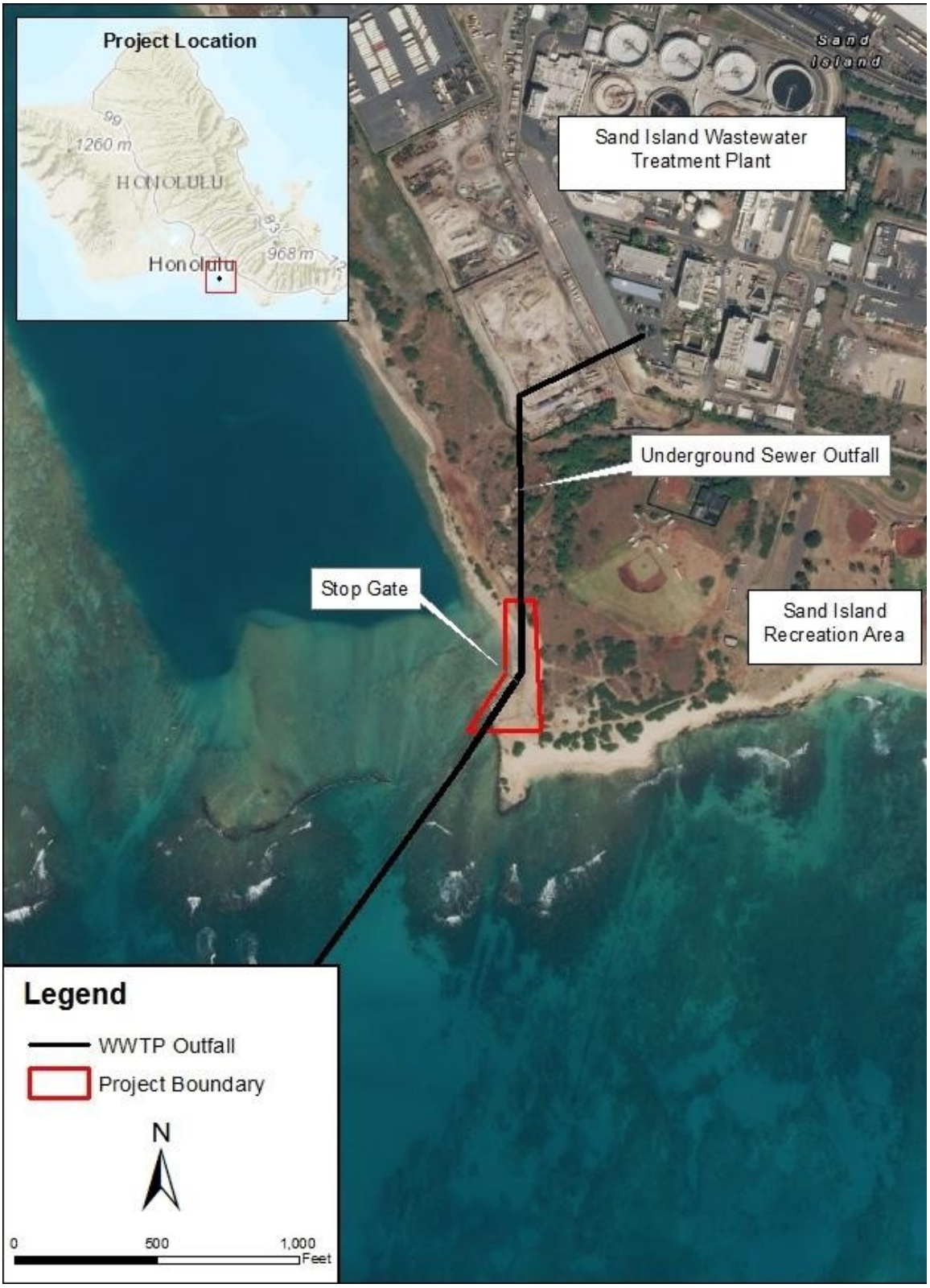

Figure 1. Project Location Map

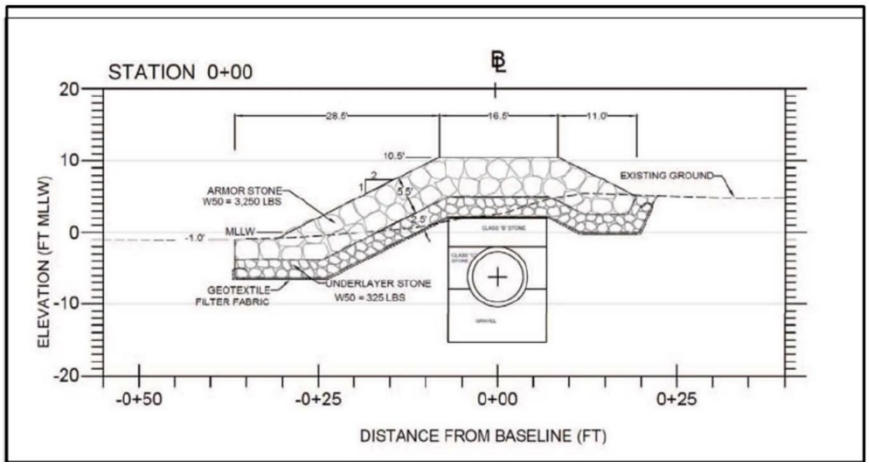

Figure 2. Proposed Section for WWTP Outfall Revetment Improvements

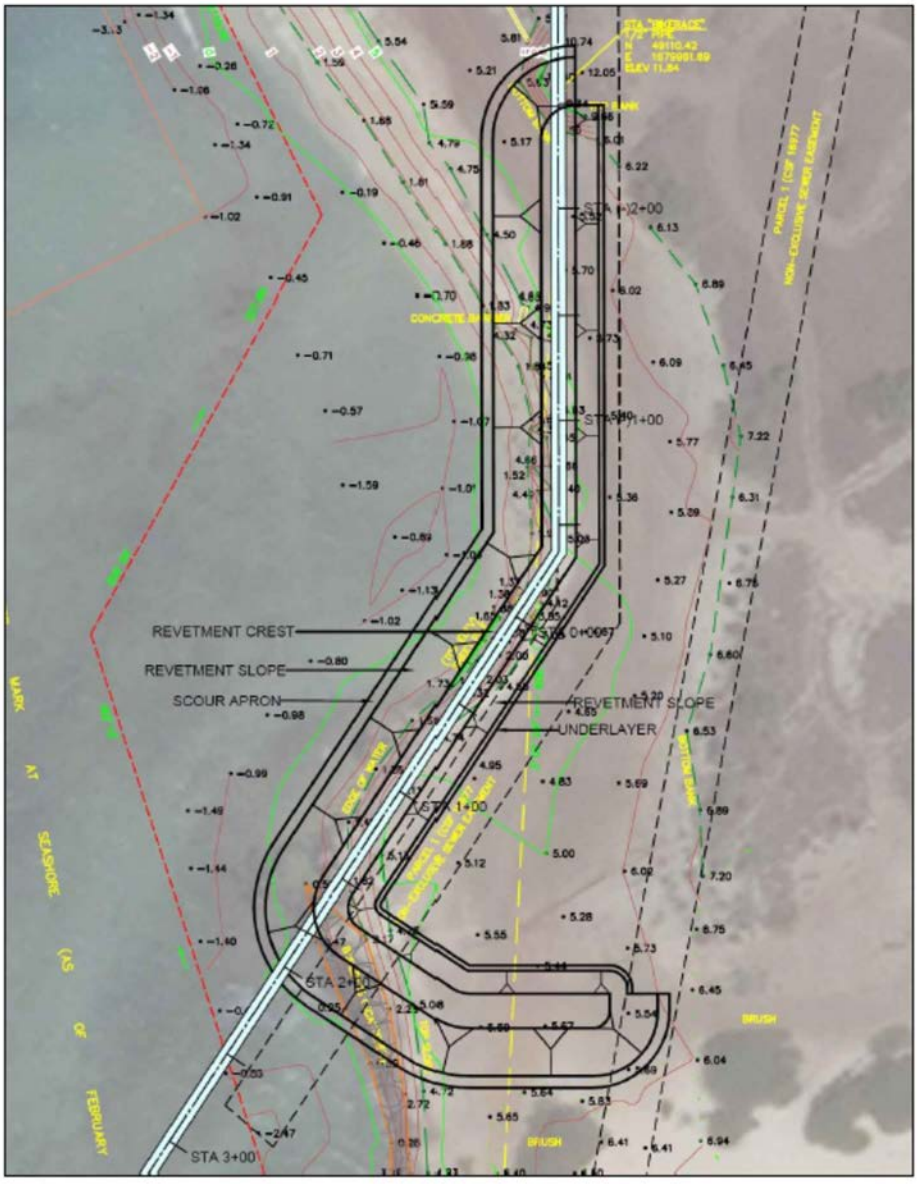

Figure 3. Proposed Revetment Design Layout

A-2 Comment Letters Received and Responses to Comments

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DAVID Y. IGE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

RECEIVED
FEB 7 2017
JMS

In reply, please refer to:
File:

FILE COPY

January 30, 2017

Ms. Jennifer M. Scheffel
SSFM International
501 Sumner Street, Suite 620
Honolulu, HI 96817

Dear Ms. Scheffel:

Thank you for your submittal requesting comments to the Pre-Assessment Consultation for Environmental Assessment for the Sand Island Wastewater Treatment Plant Outfall, TMK: (1) 1-5-041:006 and (1) 1-5-041:003.

Project activities shall comply with the following Administrative Rules of the Department of Health:

- Chapter 11-46 Community Noise Control
- Chapter 11-501 Asbestos Requirements

Should you have any questions, please contact me at (808) 586-4700.

Sincerely,

Jeffrey M. Eckerd
Program Manager
Indoor and Radiological Health Branch

SSFM International

March 10, 2017

SSFM 2010_057

Mr. Jeffrey M. Eckerd, Program Manager
State of Hawai'i Department of Health
Indoor and Radiological Health Branch
PO Box 3378
Honolulu, HI 96801-3378

SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
Tax Map Key (TMK): (1) 1-5-041:006 and (1) 1-5-041:003
Response to Comments on Pre-Assessment Consultation for Environmental Assessment

Dear Mr. Eckerd:

Thank you for your letter dated January 30, 2017 regarding the subject project. We offer the follow response to your comments.

Project activities will comply with HAR Chapter 11-46, Community Noise Control, as well as HAR Chapter 11-501, as applicable.

Your January 30th letter, along with this response, will be included in the Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation review process.

Should you have any additional comment or questions regarding the proposed project, please contact me at (808) 356-1273 or by email at jscheffel@ssfm.com.

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

cc: Cindy Masuoka (DDC)

501 Sumner Street | Suite 620 | Honolulu, Hawaii 96817 | Tel 808.531.1308 | Fax 855.329.7736 | www.ssfm.com
Planning | Project & Construction Management | Structural, Civil & Traffic Engineering

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:
File:

EPO 17-025

January 31, 2017

RECEIVED
FEB 03 2017
JMS
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FILE COPY

Ms. Jennifer M. Scheffel
Sr. Environmental Planner
SSFM International, Inc.
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817
Email: jscheffel@ssfm.com

Dear Ms. Scheffel:

SUBJECT: Pre-Assessment Consultation (PAC) for Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
TMK: (1) 1-5-041:006 and () 1-5-041:003

The Department of Health (DOH), Environmental Planning Office (EPO), acknowledges receipt of your PAC to our office on January 26, 2017.

In the development and implementation of all projects, EPO strongly recommends regular review of State and Federal environmental health land use guidance. State standard comments and available strategies to support sustainable and healthy design are provided at: http://health.hawaii.gov/epo/landuse. Projects are required to adhere to all applicable standard comments.

EPO has recently updated the environmental Geographic Information System (GIS) website page. It now compiles various maps and viewers from our environmental health programs. The eGIS website page is continually updated so please visit it regularly at: http://health.hawaii.gov/epo/egis.

EPO also encourages you to examine and utilize the Hawaii Environmental Health Portal at: https://eha-cloud.doh.hawaii.gov. This site provides links to our e-Permitting Portal, Environmental Health Warehouse, Groundwater Contamination Viewer, Hawaii Emergency Response Exchange, Hawaii State and Local Emission Inventory System, Water Pollution Control Viewer, Water Quality Data, Warnings, Advisories and Postings.

We suggest you review the requirements of the Clean Water Branch (HAR, Section 11-54-1.1, -3, 4-8) and/or the National Pollutant Discharge Elimination System (NPDES) permit (HAR, Chapter 11-55) at: http://health.hawaii.gov/cwb. If you have any questions, please contact the Clean Water Branch, Engineering Section at (808) 586-4309 or cleanwaterbranch@doh.hawaii.gov. If your project involves waters of the U.S., it is highly recommended that you contact the Army Corps of Engineers, Regulatory Branch at: (808) 835-4303.

Please note that all wastewater plans must conform to applicable provisions of the Department of Health's Administrative Rules, Chapter 11-62, "Wastewater Systems". We reserve the right to review the detailed wastewater plans for conformance to applicable rules. Should you have any questions, please review online guidance at: http://health.hawaii.gov/wastewater and contact the Planning and Design Section of the Wastewater Branch at (808) 586-4294.

You may also wish to review the draft Office of Environmental Quality Control (OEQC) viewer at: http://eha-web.doh.hawaii.gov/oeqc-viewer. This viewer geographically shows where some previous Hawaii Environmental Policy Act (HEPA) {Hawaii Revised Statutes, Chapter 343} documents have been prepared.

In order to better protect public health and the environment, the U.S. Environmental Protection Agency (EPA) has developed a new environmental justice (EJ) mapping and screening tool called EJSCREEN. It is based on nationally consistent data and combines environmental and demographic indicators in maps and reports. EPO encourages you to explore, launch and utilize this powerful tool in planning your project. The EPA EJSCREEN tool is available at: http://www.epa.gov/ejscreen.

Hawaii's climate is changing. Sea level rise and the associated coastal impacts have the potential to harm an array of natural and built environments in Hawaii. For additional information on projected sea level rise in Hawaii, EPO recommends that you visit the following informative links:

- State of Hawaii Climate Adaptation Portal: http://climateadaptation.hawaii.gov
- University of Hawaii, Manoa, School of Ocean and Earth Sciences and Technology, Coastal Geology Group: http://www.soest.hawaii.edu/coasts/index.html
- US Environmental Protection Agency – Climate Impacts on Coastal Areas: https://www.epa.gov/climate-impacts/climate-impacts-coastal-areas

We request that you utilize all of this information on your proposed project to increase sustainable, innovative, inspirational, transparent and healthy design. Thank you for the opportunity to comment.

Mahalo nui loa,

Laura Leialoha Phillips McIntyre, AICP
Program Manager, Environmental Planning Office

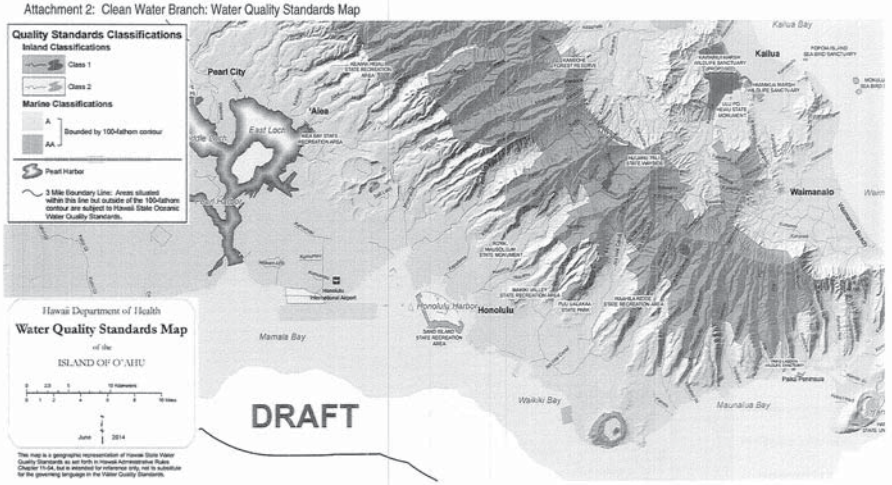
LM:nn

Attachment 1: Environmental Health Management Web App Snipit of Project Area: http://health.hawaii.gov/epo/egis
Attachment 2: Clean Water Branch: Water Quality Standards Map
Attachment 3: Wastewater Branch: Recycled Water Use Map of Project Area
Attachment 4: OEQC viewer (of past EA's, EIS's in area)
Attachment 5: U.S. EPA EJSCREEN Report for Project Area

c: DOH: WWB, CWB {via email only}

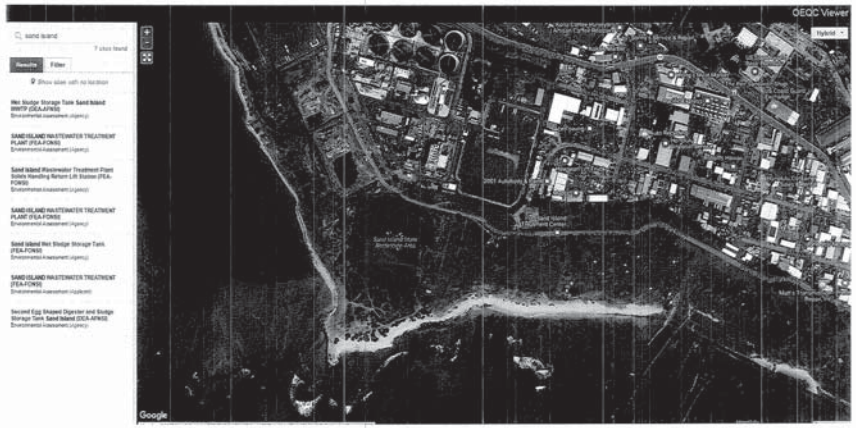
Attachment 1: Environmental Health Management Web App Snipit of Project Area: http://health.hawaii.gov/epo/egis

Attachment 2: Clean Water Branch: Water Quality Standards Map



Attachment 3: Wastewater Branch: Recycled Water Use Map of Project Area

Attachment 4: OEQC viewer (of past EA's, EIS's in area)



Attachment 5: U.S. EPA EJSCREEN Report for Project Area

EPA United States Environmental Protection Agency

EJSCREEN Report (Version 2016)

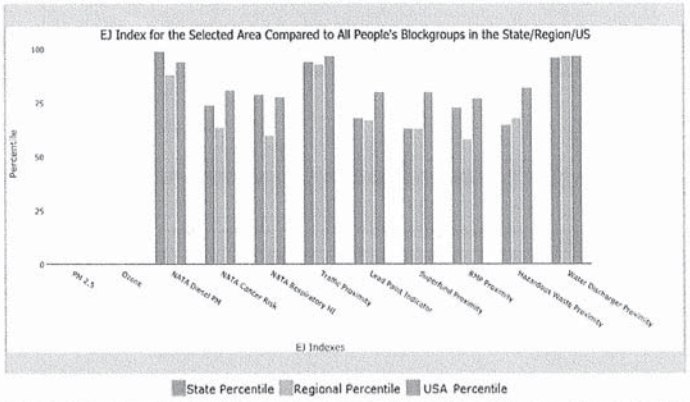
1 mile Ring Centered at 21.301039,-157.883824, HAWAII, EPA Region 9

Approximate Population: 28

Input Area (sq. miles): 3.14

| WWTP Outfall Shoreline Revetment Project (The study area contains 1 blockgroup(s) with zero |

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
EJ Indexes			
EJ Index for PM2.5	N/A	N/A	N/A
EJ Index for Ozone	N/A	N/A	N/A
EJ Index for NATA* Diesel PM	99	88	94
EJ Index for NATA* Air Toxics Cancer Risk	74	64	81
EJ Index for NATA* Respiratory Hazard Index	79	60	78
EJ Index for Traffic Proximity and Volume	94	93	97
EJ Index for Lead Paint Indicator	68	67	80
EJ Index for Superfund Proximity	63	63	80
EJ Index for RMP Proximity	73	58	77
EJ Index for Hazardous Waste Proximity*	65	68	82
EJ Index for Water Discharger Proximity	96	97	97



This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

EPA United States Environmental Protection Agency

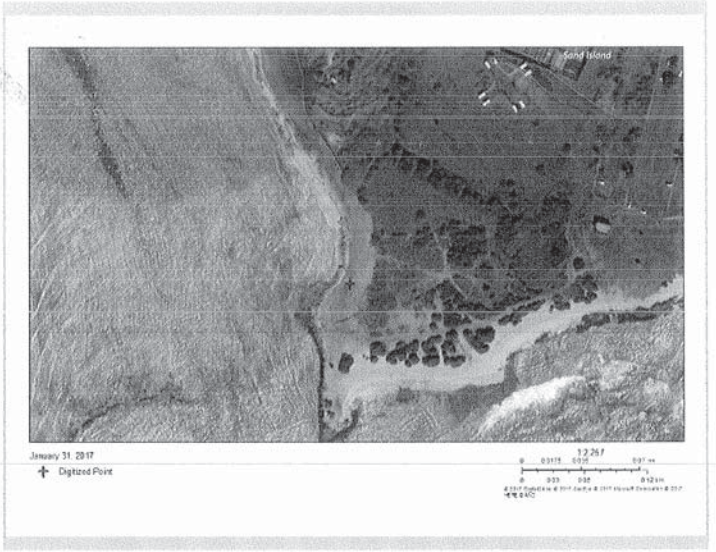
EJSCREEN Report (Version 2016)

1 mile Ring Centered at 21.301039,-157.883824, HAWAII, EPA Region 9

Approximate Population: 28

Input Area (sq. miles): 3.14

| WWTP Outfall Shoreline Revetment Project (The study area contains 1 blockgroup(s) with zero |



Sites reporting to EPA	
Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	0
National Pollutant Discharge Elimination System (NPDES)	1

EPA United States Environmental Protection Agency

EJSCREEN Report (Version 2016)

1 mile Ring Centered at 21.301039,-157.883824, HAWAII, EPA Region 9

Approximate Population: 28

Input Area (sq. miles): 3.14

I WWTP Outfall Shoreline Revetment Project (The study area contains 1 blockgroup(s) with zero p

Selected Variables	Value	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Environmental Indicators							
Particulate Matter (PM 2.5 in µg/m³)	N/A	N/A	N/A	9.37	N/A	9.32	N/A
Ozone (ppb)	N/A	N/A	N/A	51	N/A	47.4	N/A
NATA* Diesel PM (µg/m³)	3.26	0.149	100	0.978	95-100th	0.937	95-100th
NATA* Cancer Risk (lifetime risk per million)	48	34	92	43	60-70th	40	70-80th
NATA* Respiratory Hazard Index	1.7	1	90	2	<50th	1.8	50-60th
Traffic Proximity and Volume (daily traffic count/distance to road)	5200	990	94	1100	94	590	97
Lead Paint Indicator (% Pre-1960 Housing)	0.18	0.16	62	0.24	54	0.3	48
Superfund Proximity (site count/km distance)	0.069	0.098	60	0.15	49	0.13	54
RMP Proximity (facility count/km distance)	0.2	0.19	77	0.57	47	0.43	55
Hazardous Waste Proximity* (facility count/km distance)	0.11	0.14	66	0.14	66	0.11	73
Water Discharger Proximity (facility count/km distance)	1.4	0.34	97	0.2	99	0.31	96
Demographic Indicators							
Demographic Index	68%	52%	91	47%	78	36%	87
Minority Population	80%	77%	44	58%	70	37%	84
Low Income Population	56%	26%	93	36%	78	35%	82
Linguistically Isolated Population	42%	6%	99	9%	98	5%	98
Population With Less Than High School Education	14%	9%	79	17%	53	14%	62
Population Under 5 years of age	2%	6%	10	7%	13	6%	14
Population over 64 years of age	10%	15%	26	13%	48	14%	37

* The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing, comprehensive evaluation of air toxics in the United States. EPA developed the NATA to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that NATA provides broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the NATA analysis can be found at: https://www.epa.gov/national-air-toxics-assessment.

+ The hazardous waste environmental indicator and the corresponding EJ Index will appear as N/A if there are no hazardous waste facilities within 50 km of a selected location.

For additional information, see: www.epa.gov/environmentaljustice

EJSCREEN is a screening tool for pre-decisional use only. It can help identify areas that may warrant additional consideration, analysis, or outreach. It does not provide a basis for decision-making, but it may help identify potential areas of EJ concern. Users should keep in mind that screening tools are subject to substantial uncertainty in their demographic and environmental data, particularly when looking at small geographic areas. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports. This screening tool does not provide data on every environmental impact and demographic factor that may be relevant to a particular location. EJSCREEN outputs should be supplemented with additional information and local knowledge before taking any action to address potential EJ concerns.

January 31, 2017 3/3

SSFM International

March 10, 2017 SSFM 2010_057

Ms. Laura Leialoha Phillips McIntyre, AICP, Program Manager
State of Hawaii Department of Health
Environmental Planning Office
P.O. Box 3378
Honolulu, HI 96801

SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
Tax Map Key (TMK): (1) 1-5-041:006 and (1) 1-5-041:003
Response to Comments on Pre-Assessment Consultation for Environmental Assessment

Dear Ms. McIntyre:

Thank you for your letter dated January 31, 2017 (EPO 17-025) regarding the subject project. We offer the following response to your comments.

The Draft Environmental Assessment (EA) will include a review of the standard comments provided via the Department of Health, Environmental Planning Office website. Furthermore, we appreciate your information regarding available online resources, and we will utilize these resources during the preparation of the Draft EA. A copy of the Draft EA will be provided when published.

Your January 31st letter, along with this response, will be included in the Draft EA. We appreciate your participation in the pre-assessment consultation review process.

Should you have any additional comment or questions regarding the proposed project, please contact me at (808) 356-1273 or by email at jscheffel@ssfm.com.

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

cc: Cindy Masuoka (DDC)

501 Sumner Street | Suite 620 | Honolulu, Hawaii 96817 | Tel 808.531.1308 | Fax 855.329.7736 | www.ssfm.com
Planning | Project & Construction Management | Structural, Civil & Traffic Engineering

DAVID Y. IGE
GOVERNOR

RODERICK K. BECKER
Comptroller

AUDREY HIDANO
Deputy Comptroller

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810-0119

(P)1032.7

FEB 1 2017

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FEB - 6 2017
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FILE COPY

Ms. Jennifer M. Scheffel
Senior Environmental Planner
SSFM International
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Ms. Scheffel:

Subject: Pre-Assessment Consultation for Environmental Assessment for
Sand Island Wastewater Treatment Plant Outfall
Shoreline Revetment Project
TMK: (1) 1-5-041: 006 and (1) 5-1-041: 003

Thank you for the opportunity to comment on the subject project. The Department of Accounting and General Services has no facilities in or near the project area, and we have no comments or concerns regarding this project at this time.

If you have any questions, your staff may call Ms. Gayle Takasaki of the Public Works Division at 586-0584.

Sincerely,

RODERICK K. BECKER
Comptroller

SSFM International

March 10, 2017

SSFM 2010_057

Mr. Roderick K. Becker, Comptroller
State of Hawa‘i Department of Accounting and General Service
PO Box 119
Honolulu, HI 96810-0119

SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
Tax Map Key (TMK): (1) 1-5-041:006 and (1) 1-5-041:003
Response to Comments on Pre-Assessment Consultation for Environmental Assessment

Dear Mr. Becker:

Thank you for your letter dated February 1, 2017 regarding the subject project. We note that the Department of Accounting and General Services has no facilities in or near the project area, and has comments or concerns regarding the project.

Your February 1st letter, along with this response, will be included in the Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation review process.

Should you have any additional comment or questions regarding the proposed project, please contact me at (808) 356-1273 or by email at jscheffel@ssfm.com.

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

cc: Cindy Masuoka (DDC)

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
TELEPHONE: (808) 529-3111 · INTERNET: www.honolulupd.org

KIRK CALDWELL
MAYOR

OUR REFERENCE MT-DK

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JMS

LOUIS M. KEALOHA
CHIEF
CARY OKIMOTO
JERRY INOUYE
DEPUTY CHIEFS
FILE

FILE COPY

February 1, 2017

Ms. Jennifer M. Scheffel
Senior Environmental Planner
SSFM International, Inc.
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Ms. Scheffel:

This is in response to your letter of January 24, 2017, requesting comments a Pre-Assessment Consultation, Environmental Assessment, for the Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment project.

Based on the information provided, this project should have no significant impact on the services or operations of the Honolulu Police Department at this time.

If there are any questions, please call Major Crizalmer Caraang of District 5 (Kalihi) at 723-8202.

Thank you for the opportunity to review this project.

Sincerely,

CARY OKIMOTO
Acting Chief of Police

By
MARK TSUYEMURA,
Management Analyst VI
Office of the Chief

Serving and Protecting With Aloha

SSFM International

March 10, 2017

SSFM 2010_057

Mr. Cary Okimoto
City and County of Honolulu
Honolulu Police Department
801 South Beretania Street
Honolulu, HI 96813

SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
Tax Map Key (TMK): (1) 1-5-041:006 and (1) 1-5-041:003
Response to Comments on Pre-Assessment Consultation for Environmental Assessment

Dear Mr. Okimoto:

Thank you for your letter dated February 1, 2017 regarding the subject project. We note that the Honolulu Police Department does not anticipate any significant impact on the services or operations of the Department.

Your February 1st letter, along with this response, will be included in the Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation review process.

Should you have any additional comment or questions regarding the proposed project, please contact me at (808) 356-1273 or by email at jscheffel@ssfm.com.

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

cc: Cindy Masuoka (DDC)

From: Tatum, Alton L CTR (US) <Alton.L.Tatum@usace.army.mil>
Sent: Friday, February 03, 2017 4:44 PM
To: Jennifer Scheffel
Cc: Heidsiek, Carol A CIV USARMY (US)
Subject: POH-2017-00032 (Sand Island Wastewater Treatment Plant (WWTP) Outfall Shoreline Revetment, Island of Oahu, HI)

Ms. Jennifer Scheffel,

Your project has been assigned Department of the Army File No. POH-2017-00032 and is currently assigned to Ms. Carol Heidsiek (PROJECT MANAGER). You may contact her at (808) 835-4306 or via email at Carol.A.Heidsiek@usace.army.mil.

If you have not received a response from the above project manager within 30 days, please contact our main office (808) 835-4303 or email at CEPOH-RO@usace.army.mil.

ALTON L. TATUM
Administrative Assistant, Regulatory Office USACE-Honolulu District Bldg 252 Fort Shafter, HI 96858-5440
Phone: (808)-835-4303
Fax: (808)-835-4126

SSFM International

March 10, 2017 SSFM 2010_057

Mr. Alton L. Tatum, Administrative Assistant
Regulatory Office
U.S. Army Corps of Engineers – Honolulu District
Building 252
Fort Shafter, HI 96858-5440

SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
Tax Map Key (TMK): (1) 1-5-041:006 and (1) 1-5-041:003
Response to Comments on Pre-Assessment Consultation for Environmental Assessment

Dear Mr. Tatum:

Thank you for your email dated February 3, 2017 regarding the subject project. We will work with Ms. Carol Heidsiek regarding project concerns and permitting needs.

Your February 3rd email, along with this response, will be included in the Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation review process.

Should you have any additional comments or questions regarding the proposed project, please contact me at (808) 356-1273 or by email at jscheffel@ssfm.com.

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

cc: Cindy Masuoka (DDC)

HONOLULU FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

636 South Street
Honolulu, Hawaii 96813-5007
Phone: 808-723-7139 Fax: 808-723-7111 Internet: www.honolulu.gov/hfd

KIRK CALDWELL
MAYOR

MANUEL P. NEVES
FIRE CHIEF

LIONEL CAMARA JR.
DEPUTY FIRE CHIEF

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JMS
FILE

February 7 2017

Ms. Jennifer Scheffel
Senior Environmental Planner
SSFM International, Inc.
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Ms. Scheffel:

Subject: Preassessment Consultation for Environmental Assessment
Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
Tax Map Keys: 1-5-041: 003 and 006

In response to your letter dated January 24, 2017, regarding the above-mentioned subject, the Honolulu Fire Department determined that there will be no significant impact to fire department services.

Should you have questions, please contact Acting Battalion Chief Jarin Wong of our Fire Prevention Bureau at 723-7151 or jwong1@honolulu.gov.

Sincerely,

Socrates D. Bratakos

SOCRATES D. BRATAKOS
Assistant Chief

SDB/SY:bh

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SSFM International

March 10, 2017

SSFM 2010_057

Mr. Cary Okimoto
City and County of Honolulu
Honolulu Police Department
801 South Beretania Street
Honolulu, HI 96813

SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
Tax Map Key (TMK): (1) 1-5-041:006 and (1) 1-5-041:003
Response to Comments on Pre-Assessment Consultation for Environmental Assessment

Dear Mr. Okimoto:

Thank you for your letter dated February 1, 2017 regarding the subject project. We note that the Honolulu Police Department does not anticipate any significant impact on the services or operations of the Department.

Your February 1st letter, along with this response, will be included in the Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation review process.

Should you have any additional comment or questions regarding the proposed project, please contact me at (808) 356-1273 or by email at jscheffel@ssfm.com.

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel

Jennifer M. Scheffel
Sr. Environmental Planner

cc: Cindy Masuoka (DDC)

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 768-4730 • Internet: www.honolulu.gov

KIRK CALDWELL
MAYOR

MARK K. KIKUCHI, P.E.
ACTING DIRECTOR

JON Y. NOUCHI
DEPUTY DIRECTOR

SSFM INTERNATIONAL, INC.
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TP1/17-678533R

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February 13, 2017

Ms. Jennifer M. Scheffel
Senior Environmental Planner
SSFM International, Inc.
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Ms. Scheffel:

SUBJECT: Pre-Assessment Consultation Draft Environmental Assessment for the Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project, Sand Island, Oahu, Hawaii

This is in response to your letter dated January 24, 2017, requesting our comments, concerns or regulatory requirements for the subject project. When appropriate, incorporate the following comments:

1. Construction materials and equipment should be transferred to and from the project site during off-peak traffic hours (8:30 a.m. to 3:30 p.m.) to minimize any possible disruption to traffic on the local streets.

2. The area Neighborhood Board, as well as the area residents, businesses, emergency personnel (fire, ambulance and police), Oahu Transit Services, Inc. (TheBus), etc., should be kept apprised of the details of the proposed project and the impacts that the project may have on the adjoining local street area network.

Thank you for the opportunity to review this matter. Should you have any questions, please contact Renee Yamasaki of my staff at 768-8383.

Very truly yours,

Mark K. Kikuchi, P.E.
Acting Director

cc: Cindy Masuoka, Department of Design and Construction

SSFM International

March 10, 2017

SSFM 2010_057

Mr. Mark K. Kikuchi, P.E., Acting Director
City and County of Honolulu
Department of Transportation Services
650 South King Street, 3rd floor
Honolulu, HI 96813

SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
Tax Map Key (TMK): (1) 1-5-041:006 and (1) 1-5-041:003
Response to Comments on Pre-Assessment Consultation for Environmental Assessment

Dear Mr. Kikuchi:

Thank you for your letter dated February 13, 2017 (TP1/17-678533R) regarding the subject project. We offer the following response to your comments.

The construction contractor will be required to transport construction materials and equipment to and from the project staging area during off-peak traffic hours (8:30 a.m. to 3:30 p.m.) to minimize disruption to traffic on local streets.

The Neighborhood board, emergency services departments, and Oahu Transit Services were sent a pre-assessment consultation letter. Comment letters and responses will be included in the Draft Environmental Assessment.

Your February 13th letter, along with this response, will be included in the Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation review process.

Should you have any additional comment or questions regarding the proposed project, please contact me at (808) 356-1273 or by email at jscheffel@ssfm.com.

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

cc: Cindy Masuoka (DDC)

DAVID Y. IGE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

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FORD N. FUCHIGAMI
DIRECTOR

Deputy Directors
JADE T. BUTAY
ROSS M. HIGASHI
EDWIN H. SNIFFEN
DARRELL T. YOUNG

IN REPLY REFER TO:
HWY 2295
HWY-CM 2.4085

February 10, 2017

Ms. Jennifer M. Scheffel
SSFM International, Inc.
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Ms. Scheffel:

Subject: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
Tax Map Key: (1) 1-5-10:006 and (1) 1-5-041:003
Pre-Assessment Consultation for Environmental Assessment

The subject project is not expected to significantly impact the State highway facility. However, a permit from the Department of Transportation, Highways Division, is required for the transport of oversized and/or overweight materials and equipment on State highway facilities.

Should you have any questions, please call Mr. John Williams, Acting Engineering Program Manager, Construction and Maintenance Branch, Highways Division at (808) 587-2183 or through email at John.Williams@hawaii.gov.

Sincerely,

SCOT T. URADA
Highways Administrator

SSFM International

March 10, 2017

SSFM 2010_057

Mr. Scott T. Urada, Highways Administrator
State of Hawai'i Department of Transportation
869 Punchbowl Street
Honolulu, HI 96813

SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
Tax Map Key (TMK): (1) 1-5-041:006 and (1) 1-5-041:003
Response to Comments on Pre-Assessment Consultation for Environmental Assessment

Dear Mr. Urada:

Thank you for your letter dated February 10, 2017 (HWY 2295, HWY-CM 2.4085) regarding the subject project. We offer the following response to your comments.

We note that the project is not expected to significantly impact the State highway facility. The construction contractor will be required to obtain a permit from the Department of Transportation, Highways Division, for the transport of oversized and/or overweight materials and equipment on State highway facilities.

Your February 10th letter, along with this response, will be included in the Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation review process.

Should you have any additional comment or questions regarding the proposed project, please contact me at (808) 356-1273 or by email at jscheffel@ssfm.com.

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

cc: Cindy Masuoka (DDC)

501 Sumner Street | Suite 620 | Honolulu, Hawaii 96817 | Tel 808.531.1308 | Fax 855.329.7736 | www.ssfm.com
Planning | Project & Construction Management | Structural, Civil & Traffic Engineering

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com

February 16, 2017

SSFM INTERNATIONAL, INC.
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KIRK CALDWELL, MAYOR

BRYAN P. ANDAYA, Chair
ADAM C. WONG, Vice Chair
DAVID C. HULIHEE
KAPUA SPROAT
KAY C. MATSUI

ROSS S. SASAMURA, Ex-Officio
FORD N. FUCHIGAMI, Ex-Officio

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

ELLEN E. KITAMURA, P.E.
Deputy Manager and Chief Engineer

Ms. Jennifer M. Scheffel
SSFM International
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Ms. Scheffel:

Subject: Your Letter Dated January 24, 2017 Requesting Comments on the Environmental Assessment for the Sand Island Wastewater Treatment Plant Outfall Project - Tax Map Key: 1-5-041: 003 & 006

Thank you for the opportunity to comment on the proposed shoreline revetment project.

The Board of Water Supply does not have any comments regarding this project.

If you have any questions, please contact Robert Chun, Project Review Branch of our Water Resources Division at 748-5443.

Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

Water for Life . . . Ka Wai Ola

SSFM International

March 10, 2017

SSFM 2010_057

Mr. Ernest Y.W. Lau, P.E., Manager and Chief Engineer
Board of Water Supply
630 South Beretania Street
Honolulu, HI 96843

SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
Tax Map Key (TMK): (1) 1-5-041:006 and (1) 1-5-041:003
Response to Comments on Pre-Assessment Consultation for Environmental Assessment

Dear Mr. Lau:

Thank you for your letter dated February 16, 2017 regarding the subject project. We note that the Board of Water Supply does not have any comments regarding the proposed project.

Your February 16th letter, along with this response, will be included in the Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation review process.

Should you have any additional comment or questions regarding the proposed project, please contact me at (808) 356-1273 or by email at jscheffel@ssfm.com.

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

cc: Cindy Masuoka (DDC)

OFFICE OF PLANNING
STATE OF HAWAII

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

DAVID Y. IGE
GOVERNOR

LEO R. ASUNCION
DIRECTOR
OFFICE OF PLANNING

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http://planning.hawaii.gov/

Ref. No. P-15489

February 22, 2017

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Ms. Jennifer M. Scheffel
Senior Environmental Planner
SSFM International, Inc.
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Ms. Scheffel:

Subject: Pre-Assessment Consultation for Environmental Assessment - Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
TMK: (1) 1-5-041: 006 and (1) 1-5-041: 003

Thank you for the opportunity to provide comments on this pre-assessment consultation request for the preparation of a Draft Environmental Assessment (Draft EA) on the Sand Island Wastewater Treatment Plant outfall shoreline revetment. The pre-consultation review material was transmitted to our office via letter dated January 24, 2017.

It is our understanding that the City and County of Honolulu, Department of Environmental Services, in conjunction with the Department of Design and Construction, proposes to expand a rock revetment currently in place that protects an 84-inch ocean outfall. The pipeline extends 1,450 feet from the Sand Island Wastewater Treatment Plant. The existing rock revetment continues to offer some protection for the shoreline, however it is in a degraded condition and does not offer substantial protection for the on-land portion of the buried outfall, placing the outfall at risk.

The proposed revetment would be approximately 450 feet long and would expand and reinforce the existing shoreline revetment to prevent further erosion. The improved revetment structure would be an un-cemented rock rubble mound that will follow the original trench area and include the sheet piling, rocking and will not disturb the existing pipeline outfall.

The Office of Planning (OP) has reviewed the transmitted material and has the following comments to offer:

1. Pursuant to Hawaii Administrative Rules (HAR) § 11-200-10(4) – general description of the action's technical, economic, social, and environmental characteristics; this project must demonstrate that it is consistent with a number of state environmental, social, economic goals, and policies for land use. Hawaii Revised Statutes (HRS)

Chapter 226, the Hawaii State Planning Act provides goals, objectives, policies, and priority guidelines for growth, development, and the allocation of resources throughout the state in areas of state interest.

The analysis on the Hawaii State Planning Act should also include a discussion on the project's ability to meet all of the goals, objectives, policies, and priority guidelines or clarify where it is in conflict with them. If any of these themes are not applicable to the project, the Draft EA should affirmatively state such determination. The most efficient method is summarizing these in tabular form, followed by discussion paragraphs.

2. The coastal zone management (CZM) area is defined as "all lands of the State and the area extending seaward from the shoreline to the limit of the State's police power and management authority, including the U.S. territorial sea" (see HRS § 205A-1, the definition of "coastal zone management area").

   HRS Chapter 205A-5(b) requires all state and county agencies to enforce the CZM objectives and policies. The Draft EA should include an assessment as to how the proposed action conforms to the goals and objectives of the Hawaii CZM program as listed in HRS § 205A-2. Compliance with HRS § 205A-2 is an important component for satisfying the requirements of HRS Chapter 343.

3. The proposed project site is located within the special management area (SMA). Structures are prohibited in the shoreline area without a variance except as provided in HRS § 205A-44(b). Please consult with the Department of Planning and Permitting, City and County of Honolulu for the requirements of SMA use and shoreline setbacks.

4. This project occurs within the coastal area and may involve work that could require federal permits or approvals. The national Coastal Zone Management Act (CZMA) requires that federal actions be consistent with approved state coastal programs enforceable policies. Federal actions are defined by this act as activities performed by a federal agency; activities that require federal permits or approvals; or state and local government projects that receive federal financial assistance.

   If this project requires federal permits, it may be subject to a CZMA Federal Consistency review. OP is the lead state agency with the authority to conduct Federal Consistency reviews. Please contact our office on the policies and procedures for this review.

5. Pursuant to HAR § 11-200-10 – the identification and summary of impacts and alternatives considered; in order to ensure that the natural resources and coastal areas within the State of Hawaii remain protected, the Draft EA should summarize the potential impact to nearshore marine resources and actions proposed to ensure the coastal ecosystems are protected and potential hazards mitigated. The marine water quality classification, should be considered when developing mitigation measures to protect the coastal ecosystem.

   The Draft EA should detail proposed safeguards and best management practices used to protect water quality, and prevent sediment, soils, and construction debris from impacting the marine ecosystem. Furthermore, the Draft EA should discuss alternatives other than the hardening shoreline with a new revetment structure along the Sand Island shoreline to protect the wastewater treatment plant outfall pipeline.

If you have any questions regarding this comment letter, please contact Joshua Hekekia of our office at (808) 587-2845.

Sincerely,

Leo R. Asuncion
Director

SSFM International

March 10, 2017 SSFM 2010_057

Mr. Leo R. Asuncion, Director
State of Hawai'i Office of Planning
235 South Beretania Street, 6th floor
Honolulu, HI 96813

SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
Tax Map Key (TMK): (1) 1-5-041:006 and (1) 1-5-041:003
Response to Comments on Pre-Assessment Consultation for Environmental Assessment

Dear Mr. Asuncion:

Thank you for your letter dated February 22, 2017 regarding the subject project. We offer the follow response to your comments.

The Draft Environmental Assessment (EA) will include a full analysis of the proposed project's consistency with State and County Land Use Plans and Policies, including the Hawai'i State Planning Act and the Coastal Zone Management Act (CZMA).

With regard to the Special Management Area (SMA), we have sent a pre-assessment consultation letter to the City and County of Honolulu Department of Planning and Permitting (DPP). As of this date, we have not received a response. However, we will consult with the DPP regarding SMA permit requirements and anticipate submitting an SMA Assessment Application after publication of the Final EA.

The proposed project will require a Section 404 and Section 10 permit from the U.S. Army Corps of Engineers (USACE). A CZMA Consistency Determination will be prepared in conjunction with the USACE permitting process. We will coordinate this process with the State Office of Planning.

The Draft EA will provide an analysis of potential impacts to nearshore marine resources and will propose potential minimization and mitigation measures. Minimization measures may include, but not necessarily be limited to, daily inspection of equipment for conditions that could cause spills or leaks; cleaning of equipment prior to operation near or in the water; proper location of storage, refueling, and servicing sites away from the water; implementation of adequate on-site spill response procedures; installation of turbidity containment barriers, visual inspection of nearshore waters during construction, and stormy weather preparation plans.

The Draft EA will include a discussion of alternatives other than the rock rubble mound revetment. A copy of the Draft EA will be provided when published.

Your February 22nd letter, along with this response, will be included in the Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation review process.

501 Sumner Street | Suite 620 | Honolulu, Hawaii 96817 | Tel 808.531.1308 | Fax 855.329.7736 | www.ssfm.com
Planning | Project & Construction Management | Structural, Civil & Traffic Engineering

Should you have any additional comments or questions regarding the proposed project, please contact me at (808) 356-1273 or by email at jscheffel@ssfm.com.

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

cc: Cindy Masuoka (DDC)

From: McCarthy, Nadiera <nadiera_mccarthy@fws.gov>
Sent: Friday, February 24, 2017 8:58 AM
To: Jennifer Scheffel
Cc: Dan Polhemus
Subject: Sand Island Shoreline Revetment Project, pre-assessment comments
Attachments: Final BMPs For Work in Aquatic Environment 2014.doc

In reply refer to: 2017-CPA-0041

Ms. Scheffel-

The U.S. Fish and Wildlife Service (Service) has received the notice of intent for the City and County of Honolulu, Department of Environmental Services (ENV) proposal to construct a new revetment along the shoreline at the southwest point of Sand Island near the Sand Island Treatment Wastewater Treatment Plant (WWTP). At this time an Environmental Assessment (EA) has not been completed and project construction alternatives have not been provided. Although Federal funds will not be used, the construction in the submerged habitat will require a permit from the U.S. Army Corps of Engineers, and at that time will require review under the Fish and Wildlife Coordination Act of 1934 [16 U.S.C. 66 *et seq*.; 48 Stat. 401], as amended (FWCA); the Clean Water Act of 1977 [33 U.S.C. 1251 *et seq*.; 91 Stat. 1566] (CWA); the Endangered Species Act of 1973 [16 U.S.C. 1531 *et seq*.; 87 Stat. 884], as amended (ESA); and other authorities mandating the Service's review and recommendations to conserve trust resources.

The January 2017 notice from SSFM International identifies that in-water work will occur in order to prevent further degradation of the existing protection structures, submerged and on land, and to prevent potential shoreline erosion by future wave action. The provided overview did not describe how each action would be executed or if any of the construction activities would occur from the submerged side of the seawall, in addition to placement of heavy machinery on the land side. The description also did not identify where any excavated material, if part of the plan, would be placed for disposal or distribution.

We look forward to reviewing the Draft EA in the future and in the interim have provided a list of Best Management Practices that would address concerns related to shoreline construction and the avoidance of impacts to resources.

If there are questions regarding these comments, please contact Nadiera Sukhraj (Nadiera_McCarthy@fws.gov) at 808-792-9400 and reference 2017-CPA-0041.

Sincerely,

Nadiera Sukhraj

><> ><> ><> ><> ><>

Nadiera Sukhraj, Ph.D
Aquatic Ecosystems Conservation
U.S. Fish and Wildlife Service
300 Ala Moana Blvd, Rm 3-122
Honolulu, HI 96850
E-mail: Nadiera_McCarthy@fws.gov
Phone: 808-792-9410

U.S. Fish and Wildlife Service
Recommended Standard Best Management Practices

The U.S. Fish and Wildlife Service (USFWS) recommends the following measures to be incorporated into project planning to avoid or minimize impacts to fish and wildlife resources. Best Management Practices (BMPs) include the incorporation of procedures or materials that may be used to reduce either direct or indirect negative impacts to aquatic habitats that result from project construction-related activities. These BMPs are recommended in addition to, and do not over-ride any terms, conditions, or other recommendations prepared by the USFWS, other federal, state or local agencies. If you have questions concerning these BMPs, please contact the USFWS Aquatic Ecosystems Conservation Program at 808-792-9400.

1. Authorized dredging and filling-related activities that may result in the temporary or permanent loss of aquatic habitats should be designed to avoid indirect, negative impacts to aquatic habitats beyond the planned project area.

2. Dredging/filling in the marine environment should be scheduled to avoid coral spawning and recruitment periods, and sea turtle nesting and hatching periods. Because these periods are variable throughout the Pacific islands, we recommend contacting the relevant local, state, or federal fish and wildlife resource agency for site specific guidance.

3. Turbidity and siltation from project-related work should be minimized and contained within the project area by silt containment devices and curtailing work during flooding or adverse tidal and weather conditions. BMPs should be maintained for the life of the construction period until turbidity and siltation within the project area is stabilized. All project construction-related debris and sediment containment devices should be removed and disposed of at an approved site.

4. All project construction-related materials and equipment (dredges, vessels, backhoes, silt curtains, etc.) to be placed in an aquatic environment should be inspected for pollutants including, but not limited to; marine fouling organisms, grease, oil, etc., and cleaned to remove pollutants prior to use. Project related activities should not result in any debris disposal, non-native species introductions, or attraction of non-native pests to the affected or adjacent aquatic or terrestrial habitats. Implementing both a litter-control plan and a Hazard Analysis and Critical Control Point plan (HACCP – see http://www.haccp-nrm.org/Wizard/default.asp) can help to prevent attraction and introduction of non-native species.

5. Project construction-related materials (fill, revetment rock, pipe, etc.) should not be stockpiled in, or in close proximity to aquatic habitats and should be protected from erosion (*e.g*., with filter fabric, etc.), to prevent materials from being carried into waters by wind, rain, or high surf.

6. Fueling of project-related vehicles and equipment should take place away from the aquatic environment and a contingency plan to control petroleum products accidentally spilled during the project should be developed. The plan should be retained on site with the person responsible for compliance with the plan. Absorbent pads and containment booms should be stored on-site to facilitate the clean-up of accidental petroleum releases.

7. All deliberately exposed soil or under-layer materials used in the project near water should be protected from erosion and stabilized as soon as possible with geotextile, filter fabric or native or non-invasive vegetation matting, hydro-seeding, etc.

SSFM International

March 10, 2017 SSFM 2010_057

Ms. Nadiera Sukhraj, Ph.D.
Aquatic Ecosystems Conservation
U.S. Fish and Wildlife Service
300 Ala Moana Blvd, Room 3-122
Honolulu, HI 96850

SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
Tax Map Key (TMK): (1) 1-5-041:006 and (1) 1-5-041:003
Response to Comments on Pre-Assessment Consultation for Environmental Assessment

Dear Ms. Sukhraj:

Thank you for your email dated February 24, 2017 (2017-CPA-0041) regarding the subject project. We offer the following response to your comments.

The Environmental Assessment (EA) is in progress and is expected to be completed in Summer 2017. The EA will include proposed alternatives.

We have submitted a pre-assessment consultation letter to the U.S. Army Corps of Engineers (USACE), and have received an Army File Number. We will be coordinating with the USACE as the EA progresses. Upon the completion of the EA and Final Design, DDC/ENV will prepare and submit permit applications for authorization under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act.

Construction of the proposed revetment structure is expected to occur from the shore. Any excavated material would be stored at the contractor yard at the Sand Island Wastewater Treatment Plant and disposed of at the PVT Landfill if not reused. The construction contractor would be required to employ best management practices (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 or in 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 would be confined to the immediate area of construction, and no construction material would be stockpiled in the water. Turbidity containment barriers shall be installed and maintained to control and contain construction-generated turbidity. The water area around the construction site shall be visually monitored, and if monitoring suggests that the turbidity standards are being exceeded, construction shall be suspended until the condition is corrected.

We have reviewed the BMPs that you have provided and will implement them into the project to minimize impacts, as applicable. A copy of the Draft EA will be provided for your review when published.

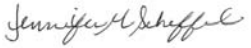
501 Sumner Street | Suite 620 | Honolulu, Hawaii 96817 | Tel 808.531.1308 | Fax 855.329.7736 | www.ssfm.com
Planning | Project & Construction Management | Structural, Civil & Traffic Engineering

Your February 24th email, along with this response, will be included in the Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation review process.

Should you have any additional comments or questions regarding the proposed project, please contact me at (808) 356-1273 or by email at jscheffel@ssfm.com.

Mahalo,

SSFM INTERNATIONAL, INC.



Jennifer M. Scheffel
Sr. Environmental Planner

cc: Cindy Masuoka (DDC)

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

February 27, 2017

SSFM International, Inc.
Attn: Ms. Jennifer M. Scheffel, Sr. Environmental Planner via email: jscheffel@ssfm.com
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Ms. Scheffel:

SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR) Land Division distributed or made available a copy of your report pertaining to the subject matter to DLNR Divisions for their review and comments.

At this time, enclosed are comments from the (a) Division of Boating & Ocean Recreation, (b) Engineering Division, (c) Division of Aquatic Resources, and (d) Land Division – Oahu District on the subject matter. Should you have any questions, please feel free to call Lydia Morikawa at 587-0410. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)
cc: Central Files

RECEIVED
LAND DIVISION
2017 FEB -3 AM 10:55
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

January 30, 2017

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources
X Div. of Boating & Ocean Recreation
X Engineering Division
__Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
LOCATION: Honolulu, Island of Oahu; TMK: (1) 1-5-041:003 and 006
APPLICANT: City and County of Honolulu, Department of Environmental Services

Transmitted for your review and comment is information on the above-referenced project. We would appreciate your comments on this project.. Please submit any comments by **February 22, 2017**.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Lydia Morikawa at 587-0410. Thank you.

Attachments

( ) We have no objections.
(X) We have no comments.
( ) Comments are attached.

Signed:
Print Name: Edward R. Underwood
Date: 2/2/17

cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

RECEIVED
LAND DIVISION
2017 FEB -6 AM 10:40
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

'17 JAN 31 PM 11:47 ENGINEERING

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

January 30, 2017

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources
X Div. of Boating & Ocean Recreation
X Engineering Division
___Div. of Forestry & Wildlife
___Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
LOCATION: Honolulu, Island of Oahu; TMK: (1) 1-5-041:003 and 006
APPLICANT: City and County of Honolulu, Department of Environmental Services

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If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Lydia Morikawa at 587-0410. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(X) Comments are attached.

Signed: _____

Print Name: Carty S. Chang, Chief Engineer
Date: 2/1/17

cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Tsuji
Ref: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a designated Flood Hazard.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood Hazard Zone designations can be found using the Flood Insurance Rate Map (FIRM), which can be accessed through the Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT).

Be advised that 44CFR reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may take precedence over the NFIP standards as local designations prove to be more restrictive. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7253.
- Kauai: County of Kauai, Department of Public Works (808) 241-4846.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: 2/1/17

DAVID Y. IGE
GOVERNOR OF HAWAII

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LAND DIVISION
2017 FEB -6 AM 11:04
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NATURAL RESOURCES
STATE OF HAWAII

RECEIVED
FEB - 1 2017
Division of Aquatic Resources
DAR 5467

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

January 30, 2017

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources
X Div. of Boating & Ocean Recreation
X Engineering Division
___Div. of Forestry & Wildlife
___Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

JK

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
LOCATION: Honolulu, Island of Oahu; TMK: (1) 1-5-041:003 and 006
APPLICANT: City and County of Honolulu, Department of Environmental Services

Transmitted for your review and comment is information on the above-referenced project. We would appreciate your comments on this project.. Please submit any comments by **February 22, 2017.**

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Lydia Morikawa at 587-0410. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(X) Comments are attached.

Signed: Bruce S. Anderson

Print Name: Bruce S. Anderson, Ph.D. DAR Administrator
Date: 2/3/17

cc: Central Files

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
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
DIVISION OF AQUATIC RESOURCES
1151 PUNCHBOWL STREET, ROOM 330
HONOLULU, HAWAII 96813

Date: 02-01-2017
DAR #5467

MEMORANDUM
TO: Bruce S. Anderson, DAR Administrator
DATE: 1/31/17
FROM: Jo-Anne N. Kushima, Aquatic Biologist
SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project

Comment	Date Request	Receipt	Referral	Due Date
	01-30-17	02-01-17	02-01-17	02-22-17

Requested by: DLNR/ Land Division Russell Tsuji Lydia Morikawa

Summary of Proposed Project

Title: Pre-Assessment Consultation for Environmental Assessment for Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project

Project by: City & County of Honolulu, Department of Environmental Services

Location: Honolulu, island of Oahu; TMK (1) 1-5-041:003 and 006

Brief Description:
The Sand Island WWTP outfall is critical infrastructure for the City Of Honolulu. It discharges an average of 66 million gallons of effluent per day. The existing revetment has likely contributed to slowing the erosion rate, but it does not offer substantial protection for the on-land portion of the buried outfall. This puts the outfall at risk. Any significant damage to the structure would probably cause increased shoreline erosion near the stop gate structure.

The progressive shoreline erosion is a serious potential threat that could eventually expose and compromise the outfall pipeline.

The applicant proposes to build a revetment approximately 450 feet long that would armor the shoreline and prevent further erosion.

Comments:
The Division of Aquatic Resources (DAR) requests an electronic copy of the Draft Environmental Assessment (EA) upon its publication. We will review the information provided on the Draft EA and provide comments at that time.

Thank you for sending DAR the notification letter for the Pre-Assessment Consultation for Environmental Assessment for the proposed Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project. Comments on the proposed project are forthcoming.

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

RECEIVED
LAND DIVISION
2017 FEB -6 AM 10:51
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

January 30, 2017

MEMORANDUM

TO:

DLNR Agencies:
X Div. of Aquatic Resources
X Div. of Boating & Ocean Recreation
X Engineering Division
__ Div. of Forestry & Wildlife
X Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
LOCATION: Honolulu, Island of Oahu; TMK: (1) 1-5-041:003 and 006
APPLICANT: City and County of Honolulu, Department of Environmental Services

Transmitted for your review and comment is information on the above-referenced project. We would appreciate your comments on this project.. Please submit any comments by **February 22, 2017**.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Lydia Morikawa at 587-0410. Thank you.

Attachments

The proposed revetment is outside the easement area for the outfall, and the area has been set aside to the Division of State Parks, DLNR under EO 2704. Therefore, a land disposition from the Land Board for the additional area is required, further subject to the concurrence of the Division of State Parks, DLNR.

( ) We have no objections.
( ) We have no comments.
(x) Comments are attached.

Signed: Darlene Bryant-Takamatsu
Print Name: Darlene Bryant-Takamatsu
Date: 2/3/17

cc: ~~Central Files~~

March 10, 2017 SSFM 2010_057

Mr. Russell Y. Tsuji, Land Administrator
State of Hawai'i Department of Land and Natural Resources
Land Division
PO Box 621
Honolulu, HI 96809

SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
Tax Map Key (TMK): (1) 1-5-041:006 and (1) 1-5-041:003
Response to Comments on Pre-Assessment Consultation for Environmental Assessment

Dear Mr. Tsuji:

Thank you for your transmittal letter dated February 27, 2017 regarding the subject project. We appreciate you distributing our pre-assessment consultation letter throughout the Department of Land and Natural Resources. We note that the Division of Boating and Ocean Recreation does not have any comments. We provide the following responses to comments from the Engineering Division, Division of Aquatic Resources, and Land Division – O'ahu District.

Engineering Division
The Flood Hazard Zone designation(s) for the project area will be included in the Draft Environmental Assessment (EA). The proposed project will comply with the local flood ordinance, as applicable.

Division of Aquatic Resources
We will provide an electronic copy of the Draft EA when published. We look forward to seeing your comments on the proposed project.

Land Division – O'ahu District
The DDC will coordinate with the Land Board and the Department of Land and Natural Resources, Division of State Parks to obtain a land disposition.

Your February 27th letter, along with this response, will be included in the Draft EA. We appreciate your participation in the pre-assessment consultation review process.

501 Sumner Street | Suite 620 | Honolulu, Hawaii 96817 | Tel 808.531.1308 | Fax 855.329.7736 | www.ssfm.com
Planning | Project & Construction Management | Structural, Civil & Traffic Engineering

Should you have any additional comments or questions regarding the proposed project, please contact me at (808) 356-1273 or by email at jscheffel@ssfm.com.

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

cc: Cindy Masuoka (DDC)

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

02032PGH.17

February 28, 2017

Ms. Jennifer M. Scheffel
Senior Environmental Planner
SSFM International, Inc.
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Mr. Scheffel:

SUBJECT: Comments on Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
Tax Map Key (TMK): (1) 1-5-041:006 and (1) 1-5-041:003
Pre-Assessment Consultation for Environmental Assessment

The Department of Health (DOH), Clean Water Branch (CWB), acknowledges receipt of your letter, dated January 24, 2017, 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).

FILE COPY

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

ALEC WONG, P.E., CHIEF
Clean Water Branch

GH:ctt

c: DOH-EPO [via e-mail only]
Ms. Cindy Masuoka [via e-mail cmasuoka@honolulu.gov only]

SSFM International

March 13, 2017 SSFM 2010_057

Mr. Alec Wong, P.E., Chief
State of Hawai'i Department of Health
Clean Water Branch
PO Box 3378
Honolulu, HI 96801-3378

SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
Tax Map Key (TMK): (1) 1-5-041:006 and (1) 1-5-041:003
Response to Comments on Pre-Assessment Consultation for Environmental Assessment

Dear Mr. Wong:

Thank you for your letter dated February 28, 2017 (02032PGH.17) regarding the subject project. We offer the following response to your comments.

The Environmental Assessment (EA) will include an adequate review of the standard comments provided via the Department of Health's website.

1. The proposed project will be designed in compliance with the applicable Administrative Rules of the Department of Health, including Chapters 11-54 and 11-55.

2. National Pollutant Discharge Elimination System (NPDES) and related permits will be identified and addressed in the Draft EA.

3. The project will involve work within waters of the US. A pre-assessment consultation letter has been sent to the U.S. Army Corps of Engineers, and the project has been assigned an Army File Number and a project manager. We will continue to coordinate with the USACE and will submit an application for a Section 404 and Section 10 permit upon completion of the EA process and final design.

4. Discharges associated with the project will comply with the applicable State Water Quality Standards contained in the Administrative Rules of the Department of Health, including Chapters 11-54 and 11-55.

5. The project will be designed to be consistent with the State's position regarding sustaining water quality and beneficial uses of State waters.

   a. The project does not include any paving or landscaping.
   b. The Draft EA will include a discussion on water quality and the beneficial uses of State waters. The project will be designed to minimize impacts on natural resources and water quality.
   c. The project does not include landscaping or associated irrigation.

501 Sumner Street | Suite 620 | Honolulu, Hawaii 96817 | Tel 808.531.1308 | Fax 855.329.7736 | www.ssfm.com
Planning | Project & Construction Management | Structural, Civil & Traffic Engineering

d. The project does not include paving or landscaping.
e. There is no existing stormwater infrastructure at the project site.

Your February 28th letter, along with this response, will be included in the Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation review process.

Should you have any additional comments or questions regarding the proposed project, please contact me at (808) 356-1273 or by email at jscheffel@ssfm.com.

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

cc: Cindy Masuoka (DDC)

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 768-8000 • FAX: (808) 768-6041
DEPT. WEB SITE: www.honoluludpp.org • CITY WEB SITE: www.honolulu.gov

KIRK CALDWELL
MAYOR

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MAR 0 6 2017
JMS
KATHY K. SOKUGAWA
ACTING DIRECTOR
TIMOTHY F. T. HIU
ACTING DEPUTY DIRECTOR
2017/ELOG-221(ST)
FILE

March 2, 2017

Ms. Jennifer M. Scheffel
SSFM International
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Ms. Scheffel:

SUBJECT: Pre-Assessment Consultation
Draft Environmental Assessment
Shoreline Revetment Project - Sand Island Wastewater Treatment Outfall
1039 and 1240 Sand Island Parkway - Sand Island
Tax Map Key 1-5-41: 3 and 6

This responds to your request for comments on the forthcoming Draft Environmental Assessment (DEA) which is to be prepared for the subject Project.

We note that the proposed shoreline protection structure will require a Shoreline Setback Variance and Special Management Area Use Permit, pursuant to Chapters 23 and 25, Revised Ordinances of Honolulu. We also request that a section of the DEA include a discussion on sea level rise and its possible implications on the function and longevity of the proposed Project, as well as the overall operation of the Sand Island Wastewater Treatment Plant. We will provide further comment when the draft document is submitted.

Should you have any questions, please contact Steve Tagawa of our staff at 768-8024.

Very truly yours,

FOR Kathy K. Sokugawa,
Acting Director

cc: DDC, Cindy Masuoka

FILE COPY

SSFM International

March 13, 2017

SSFM 2010_057

Ms. Kathy K. Sokugawa, Acting Director
City and County of Honolulu
Department of Planning and Permitting
650 South King St, 7th floor
Honolulu, HI 96813

SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
Tax Map Key (TMK): (1) 1-5-041:006 and (1) 1-5-041:003
Response to Comments on Pre-Assessment Consultation for Environmental Assessment

Dear Ms. Sokugawa:

Thank you for your letter dated March 2, 2017 [2017/ELOG-221 (ST)] regarding the subject project. We offer the following response to your comments.

Upon completion and publication of the Final Environmental Assessment (EA), the City and County of Honolulu Department of Design and Construction will submit applications for a Shoreline Setback Variance and Special Management Area Use Permit.

The Draft EA will include a section on sea level rise and its implications for the proposed project, as well as the overall operation of the Sand Island Wastewater Treatment Plant. We will provide a copy of the Draft EA for your review once published.

Your March 2nd letter, along with this response, will be included in the Draft EA. We appreciate your participation in the pre-assessment consultation review process.

Should you have any additional comments or questions regarding the proposed project, please contact me at (808) 356-1273 or by email at jscheffel@ssfm.com.

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

cc: Cindy Masuoka (DDC)

DAVID Y. IGE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HARBORS DIVISION
79 S. Nimitz Highway
HONOLULU, HAWAII 96813-4898

FORD N. FUCHIGAMI
DIRECTOR

Deputy Directors
JADE T. BUTAY
ROSS M. HIGASHI
EDWIN H. SNIFFEN
DARRELL T. YOUNG

IN REPLY REFER TO:
HAR-EP
8432.17

RECEIVED
MAR 13 2017
JMS
FILE COPY

March 7, 2017

Mrs. Jennifer M. Scheffel
Senior Environmental Planner
SSFM International
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Mrs. Scheffel:

Subject: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project, Tax Map Key: (1) 1-5-041:006 and (1) 1-5-041:003, Pre-Assessment Consultation for the Environmental Assessment

Thank you for your letter dated January 24, 2017 informing us of the subject project and environmental assessment. The proposed action does not seem to affect Department of Transportation, Harbors Division's facilities. We recommend consulting the U.S. Coast Guard and harbor operators in the vicinity to identify potential impacts to their operations. We have no additional comments at this time.

If you have further questions, please have your staff call Ms. Sandra Rossetter of the Harbors Division Planning Section at 587-1886.

Aloha,

DARRELL T. YOUNG
Deputy Director
Department of Transportation, Harbors Division

SSFM International

March 13, 2017

SSFM 2010_057

Mr. Darrell T. Young, Deputy Director
State of Hawai'i Department of Transportation
Harbors Division
79 S. Nimitz Highway
Honolulu, HI 96813-4898

SUBJECT: Sand Island Wastewater Treatment Plant Outfall Shoreline Revetment Project
Tax Map Key (TMK): (1) 1-5-041:006 and (1) 1-5-041:003
Response to Comments on Pre-Assessment Consultation for Environmental Assessment

Dear Mr. Young:

Thank you for your letter dated March 7, 2017 (HAR-EP 8432.17) regarding the subject project. We note that the State of Hawai'i Department of Transportation, Harbors Division does not have any comments at this time.

We have sent a pre-assessment consultation letter to the U.S. Coast Guard and will coordinate with harbor operators in the vicinity of the project to minimize impacts to harbor operations during construction.

Your March 7th letter, along with this response, will be included in the Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation review process.

Should you have any additional comments or questions regarding the proposed project, please contact me at (808) 356-1273 or by email at jscheffel@ssfm.com.

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

cc: Cindy Masuoka (DDC)

APPENDIX B

Coastal Assessment Report

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Coastal Assessment for Sand Island Shore Protection
Honolulu, Hawaii

March 2017

Prepared for:
SSFM
501 Sumner Street
Suite 620
Honolulu, HI 96817

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

Job No. 25571

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1. INTRODUCTION

Sand Island is a five-hundred-acre barrier island located within Honolulu Harbor, transformed in the 1940s into its present shape using dredged material obtained during construction of Honolulu Harbor. Sand Island houses the Sand Island Wastewater Treatment Plant (SIWWTP), which is operated by the City & County of Honolulu Department of Environmental Services. Wastewater effluent from the treatment plant is disposed of by an 84-inch diameter pipeline to an offshore outfall. The approximate location of the pipe, obtained from the construction drawings, is shown on Figure 1-1.

Design of the active pipeline in 1973 included a "stop gate" near the shoreline. The stop gate consists of a concrete housing with horizontal dimensions 7-ft 8-in alongshore by 12-ft 4-in cross shore. Per the construction drawing detail (Figure 1-2), the concrete housing is 17-ft 2-in high, sitting on a 12-ft 8-in by 12-ft 4-in base. The top of the concrete housing is approximately 3.5 ft above mean sea level (msl), and the 84-inch diameter effluent discharge pipe passes through the concrete housing. In the offshore direction, the pipeline is buried in a 13-ft 4-in wide trench that was excavated into the fossil reef and lined with sheet pile (Figure 1-3). The top of the pipe is approximately 7.5 ft below the top of the sheet pile. The trench is filled with stone to further protect the pipe. Figure 1-4 shows the construction drawing detail of the pipe inshore of the stop gate. The drawing shows the top of the pipe to be approximately 2.2 ft below grade; however, it is not clear what "grade" was at the time of construction. The profile view of the pipe shows the top of the pipe to be at elevation -3 ft msl for 1,000 ft inshore of the stop gate, and this is the basis for assumptions later in this report.

City workers noted that shoreline erosion has occurred in the vicinity of the stop gate. At the time of construction, the stop gate was located more than 150 ft inshore of the shoreline. At present, the stop gate is located at the waterline, creating concern that continued shoreline erosion, particularly in conjunction with a potential tropical storm, might endanger the pipe and result in effluent discharge at the shoreline.

The City is proposing to protect the shoreline to prevent damage to the outfall pipe, and is preparing the required design, environmental assessment and permit documents. This coastal assessment describes the shoreline condition, oceanographic environment, proposed and alternative shore protection, and possible impacts.

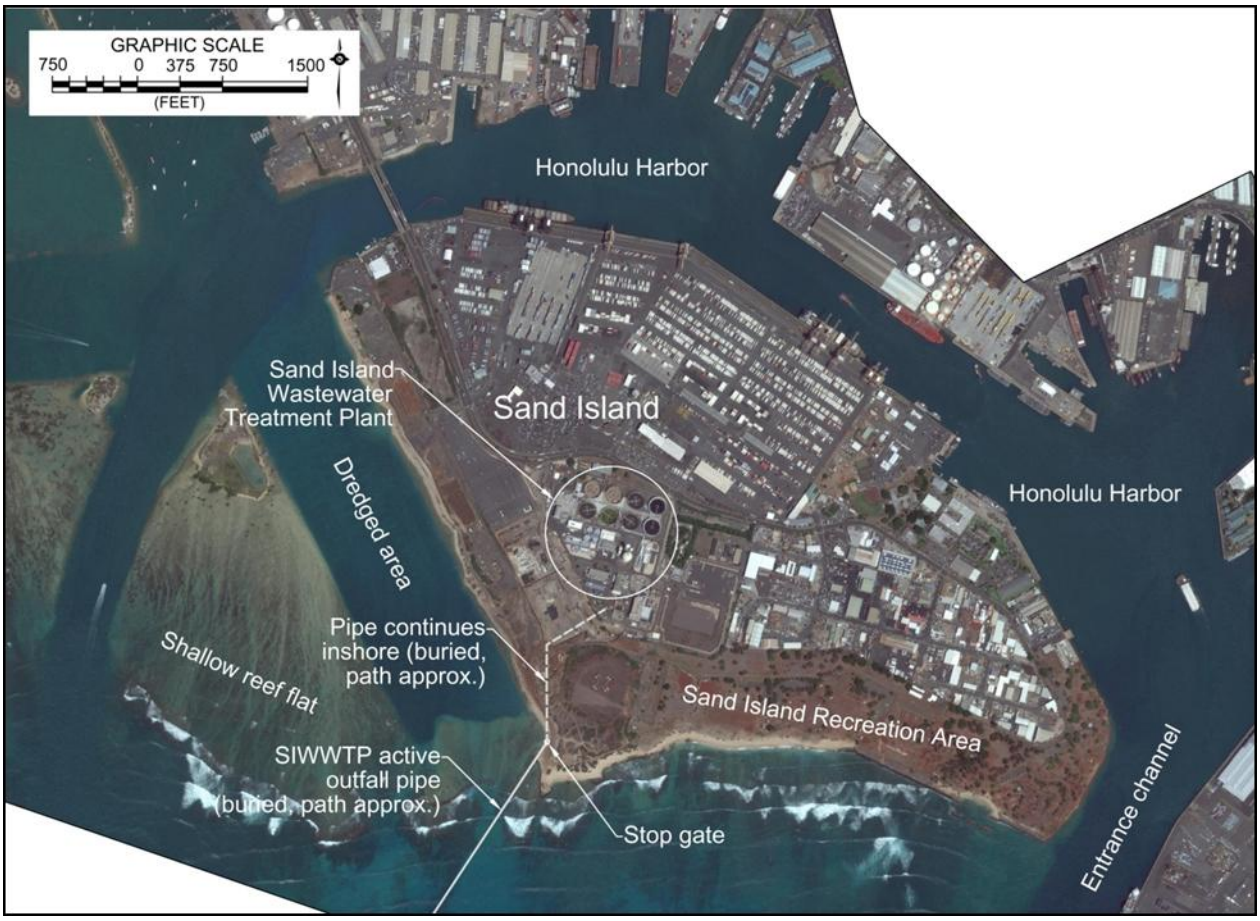


Figure 1-1. Sand Island Wastewater Treatment Plant shoreline

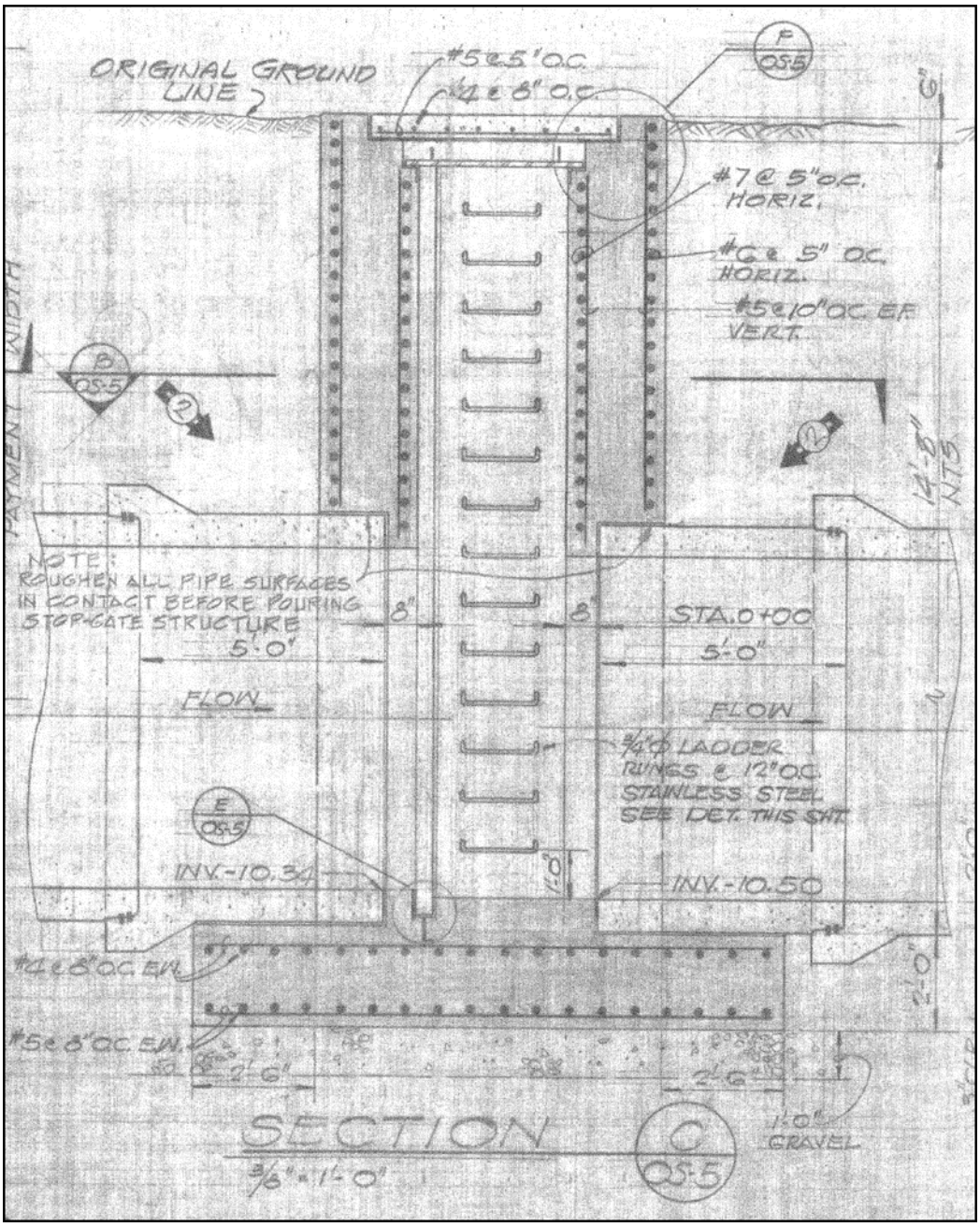


Figure 1-2. Section detail of stop gate housing

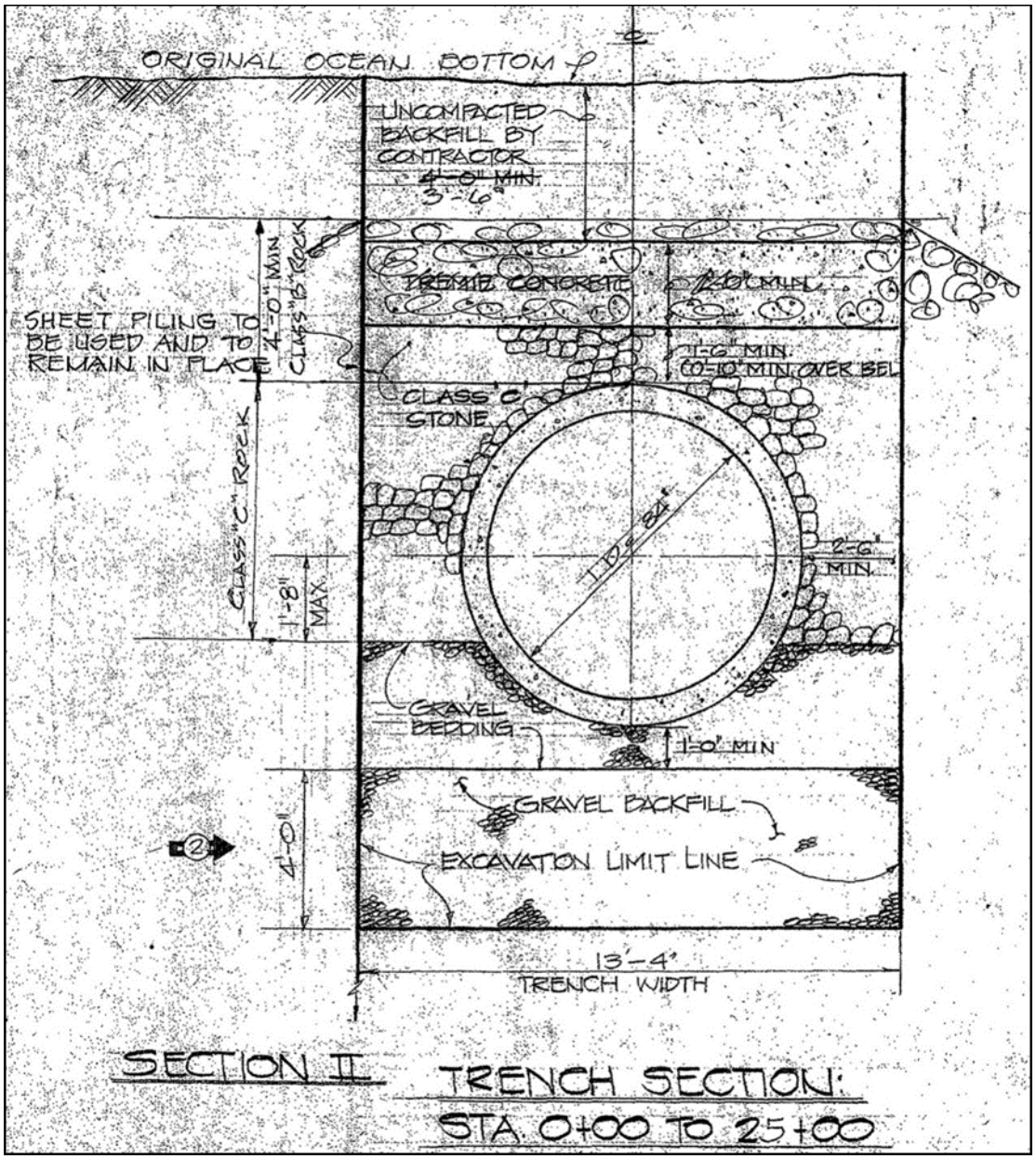


Figure 1-3. Section detail of active pipeline offshore of stop gate (STA 0+00)

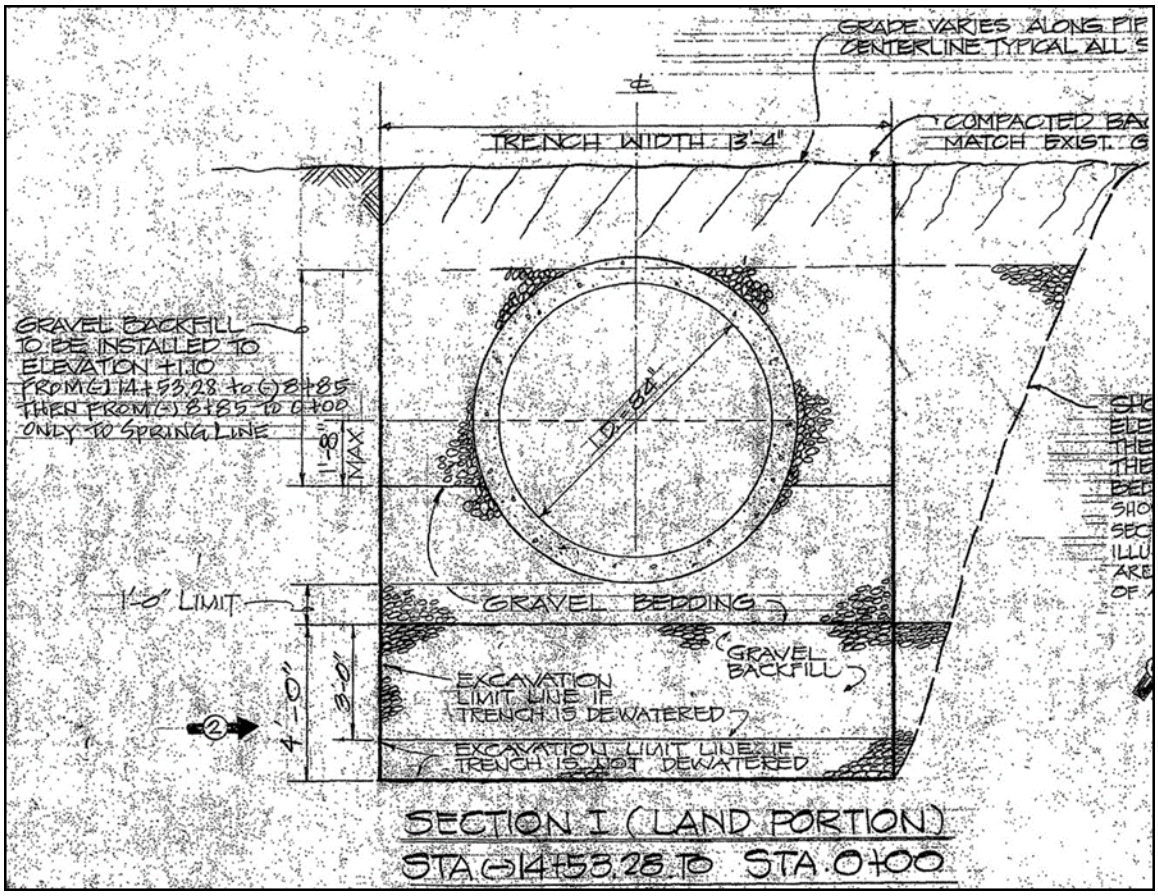


Figure 1-4. Section detail of active pipeline inland of step gate (STA 0+00)

2. PROJECT SITE DESCRIPTION

2.1 Topographic Survey

A topographic survey in the vicinity of the stop gate valve was conducted by R.M. Towill Corporation in October, 2014 (Figure 2-1). The survey included the placement of two control points (Table 2-1). The topographic survey indicates a beach berm elevation of approximately 5 feet, and a near shore reef flat elevation of approximately -0.5 feet. The survey also shows that the portion of the pipeline within approximately 150 feet of the stop gate, extending both inshore and offshore, is at the current waterline.

Table 2-1. Control Points (HSP, Zone 3 NAD83 (1993))

Control Point	Description	Northing (ft)	Easting (ft)	Elevation (ft MLLW)
Sta "Bikerace"	1/2-in pipe	49,110.42	1,679,961.69	11.84
Sta "AC"	40D Nail	48,505.09	1,679,929.59	5.82

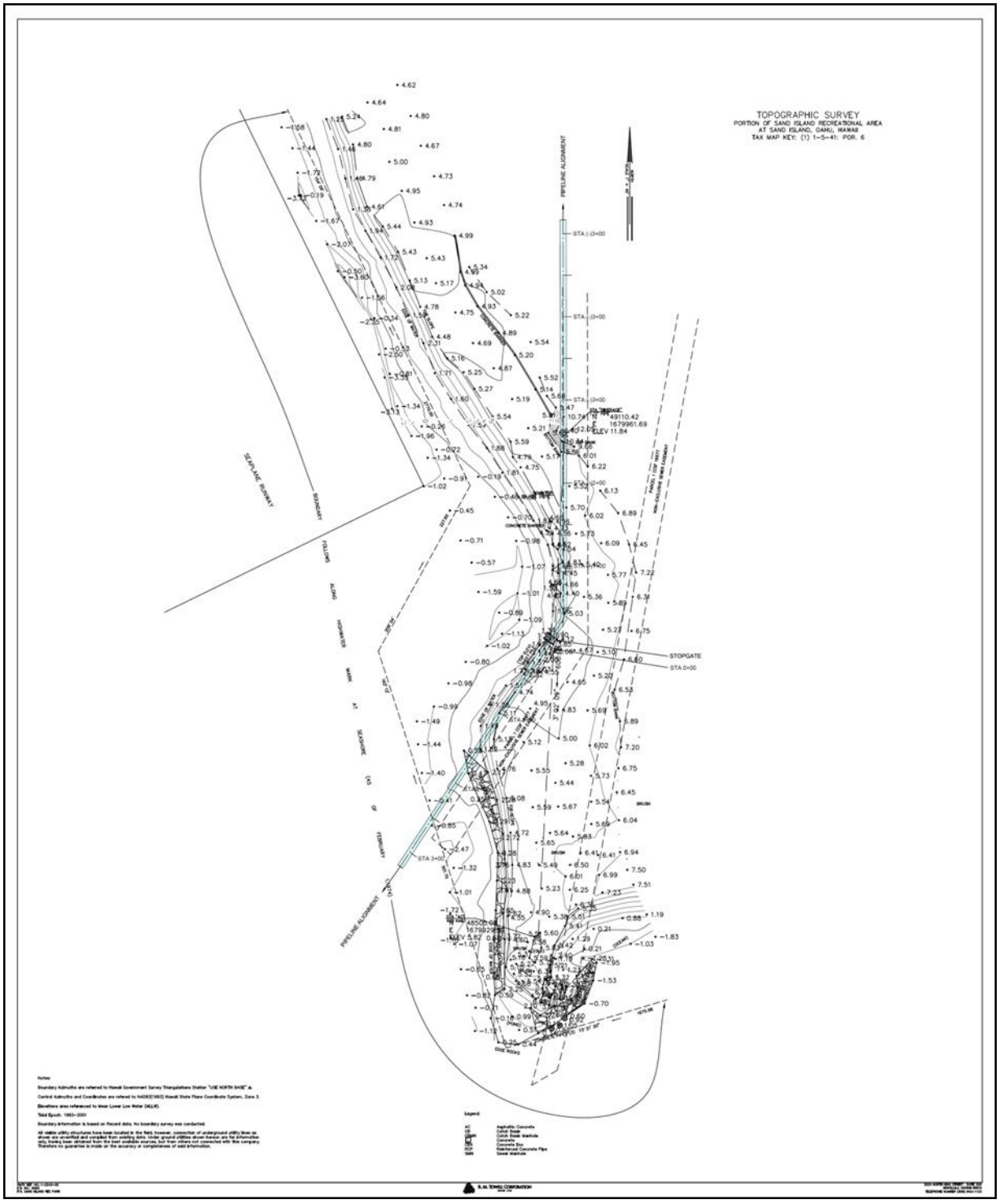


Figure 2-1. Topographic survey of the project site; partial pipeline alignment has been added to the R.M. Towill Corporation drawing.

2.2 Shoreline Description

The project area is located on the southwest side of Sand Island. Figure 2-2 is an aerial photograph and overview of nearshore features at the project site, showing the extent of the revetment that protects the shoreline south of the stop gate manhole, the reef flat, and the dredged seaplane channel. Figure 2-3 shows details around the stop gate, including the pipeline alignment and stationing. The project shoreline borders the broad fringing reef that terminates at the edge of one of the dredged seaplane channels. The reef extends to a distance of about 500 ft offshore of the southern tip of Sand Island. A set of concrete barriers curves across the outer part of the reef flat. The concrete barriers are in poor condition, and offer no real protection for the shoreline. The bathymetry off the reef flat is uneven, with two shallow channels flanked by rock reef. Early maps and photographs of the area show a very broad fringing reef, likely several thousand feet in width, bordering a shallow lagoon that was used for salt production. Keehi lagoon was extensively dredged in the 1940's to produce the network of seaplane runway channels. The channels are approximately 1,000 ft in width, and mostly used for navigation at present. The dredge spoils were used, in part, to construct the John Rodgers Airport – now the Honolulu International Airport. Sand Island itself was formed from spoils from the dredging of Honolulu Harbor. There is little natural shoreline left in this region, and modifications include the excavation and placement of the SIWWTP outfall pipe, the rock revetment that extends to the southern tip of Sand Island, and the line of single concrete armor blocks that form a partial barrier across the fringing reef. The concrete barriers were an early attempt at shore protection.

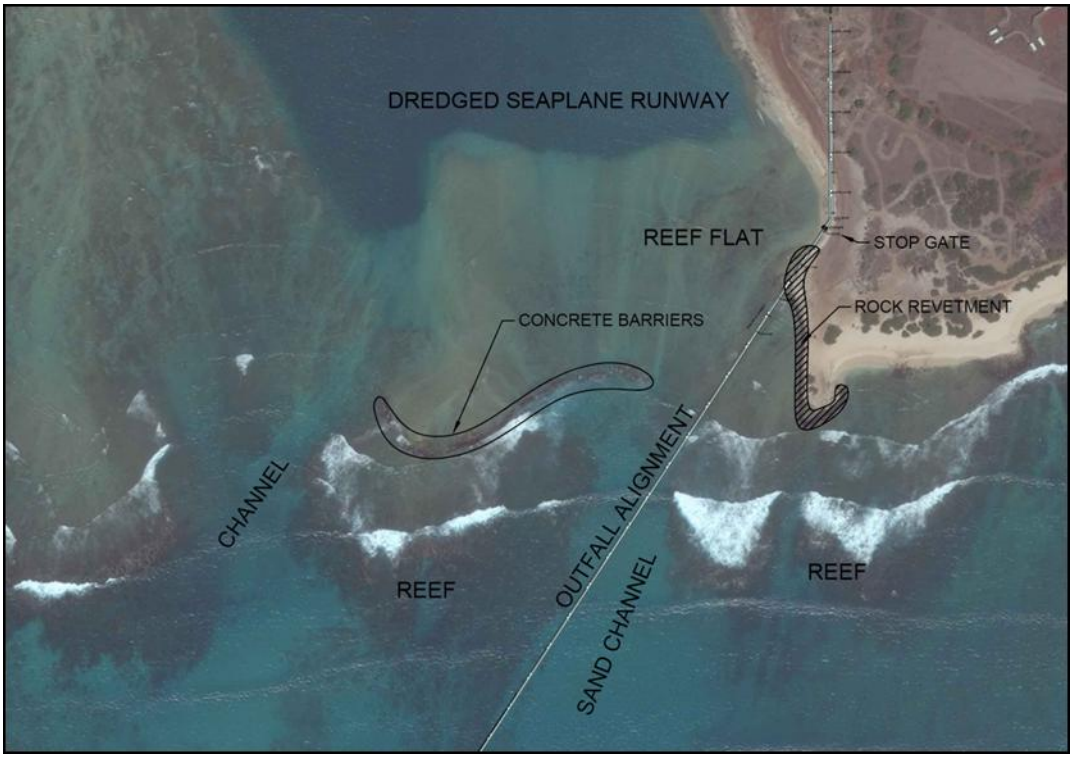


Figure 2-2. Nearshore features at the project site

Figure 2-3. Features near the project site

The extensive coastal erosion that has occurred at the site has slowed in recent years. Figure 2-4 is a photograph taken near Station 0+50 of the outfall, and shows the stop gate manhole as well as overview of the general shoreline morphology. The basalt cobbles in the foreground (between Sta 0+00 and 0+50) are not native material, and are likely derived from cobble fill eroded from the pipe trench (i.e. Class "B" rock, see Figure 1-3). The upper swash and beach berm are composed of coralline gravel either transported across the fringing reef or derived from eroded fill material. The low berm height and gravel sediment are indicative of small but persistent waves. Figure 2-5 is in the same general area as Figure 2-4, but shows a portion of formerly buried steel sheet pile that was used to line the pipe trench, and exposure of basalt cobble fill. Figure 2-6 shows the stop gate structure and shoreline to the south.

Figure 2-4. Beach conditions at the project site; note basalt cobbles, gravel berm, and stop gate manhole (3/2/2017)

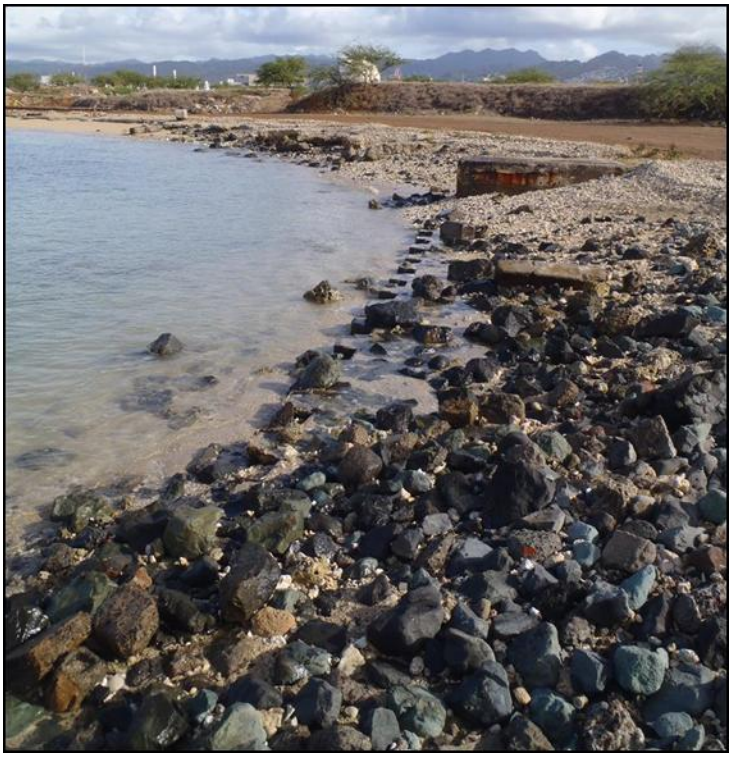


Figure 2-5. Sheet pile and basalt cobbles at trench edge, Sta 0+40; note sheet pile (11/15/2012)

Figure 2-6. Stop gate structure at the waterline and shoreline to the south (3/2/2017)

The shoreline between Station 1+00 and 2+00 is a small salient dominated by basalt boulders, pile butts, and other debris. The boulders are remnants of the revetment that is extremely degraded in this area (Figure 2-7). Station 2+00 is the approximate location where the pipeline trench extends offshore. Figure 2-8 is a view along the pipeline alignment, from approximately Station 1+50 towards Station 2+00, showing the path of the pipeline trench into the water.

Figure 2-7. Shoreline conditions at Station 1+50

Figure 2-8. View offshore along pipeline alignment from Station 1+50; degraded basalt rock revetment

North of the stop gate manhole, the beach is composed of a wide variety of materials, including basalt and coral cobbles, concrete debris, scarps of lithified sediment, and a gravel berm that runs along much of the shore and defines the upper reach of typical wave action. The back shore is composed of red clay fill. Figure 2-9 is indicative of the typical beach morphology. Figure 2-10 shows the southern tip of Sand Island and the shoreline extending to the east.

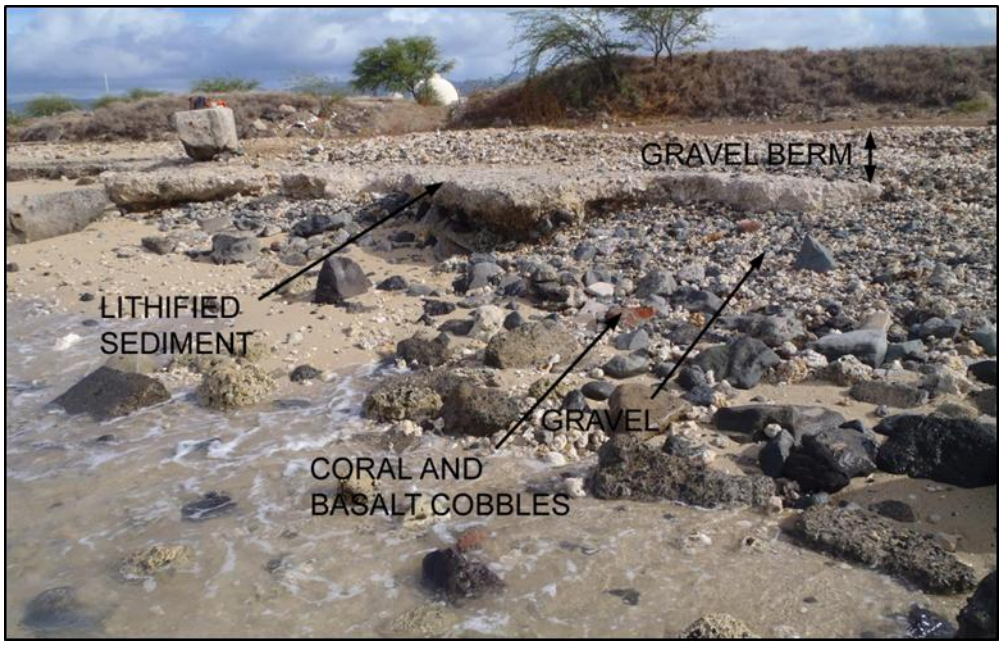


Figure 2-9. Typical beach morphology north of stop gate, Station (-)1+50

Figure 2-10. Beach to the east (3/2/2017)

2.3 Bottom Substrate Investigation

The shallow water substrate bordering the shoreline at the project site was investigated on October 13, 2014 using a water-jet probe. The purpose of the jet probing investigation was to determine the substrate composition at the site, which is an important design consideration. The fringing coral reefs that form much of the nearshore may appear to be hard ground, but are often composed of highly variable layers and pockets of sand, gravel, coral cobbles, and various thicknesses of hard limestone. Water jet probing is an effective and direct method to determine sand thickness and bottom composition. Composition of the substrate can be determined by feel as the probe is pushed into the bottom. However, the coralline cobble that appears to form most of the substrate at the site is difficult to penetrate, and can give highly variable results.

Figure 2-11 shows the probe results in plan view, including the probe locations and thickness contours. Most of the substrate fronting the shoreline appears to be composed of layers of sand, gravel and coral rubble (or cobble). Few of the probes indicated a hard bottom, and some of those probes may be showing impenetrable cobble layers. Two hard bottom areas are shown in Figure 2-11, one near the stop gate (Station 0+00) and one to the north at Station 3+00 (note: jet probe stationing is different from pipeline construction stationing, with positive north from the stop gate manhole). The northern area was visible as hard coralline reef material, with no overlying sediment except on the beach face. However, inspection of the hard bottom showed that it is a relatively thin layer, approximately 0.5 to 1 ft in thickness, and was broken up in places. It is likely that it previously had a greater areal extent, but became broken and eroded due to exposure.

For shore protection design purposes, the substrate is considered to be an erodible substrate, and will require a toe configuration designed to resist scouring.

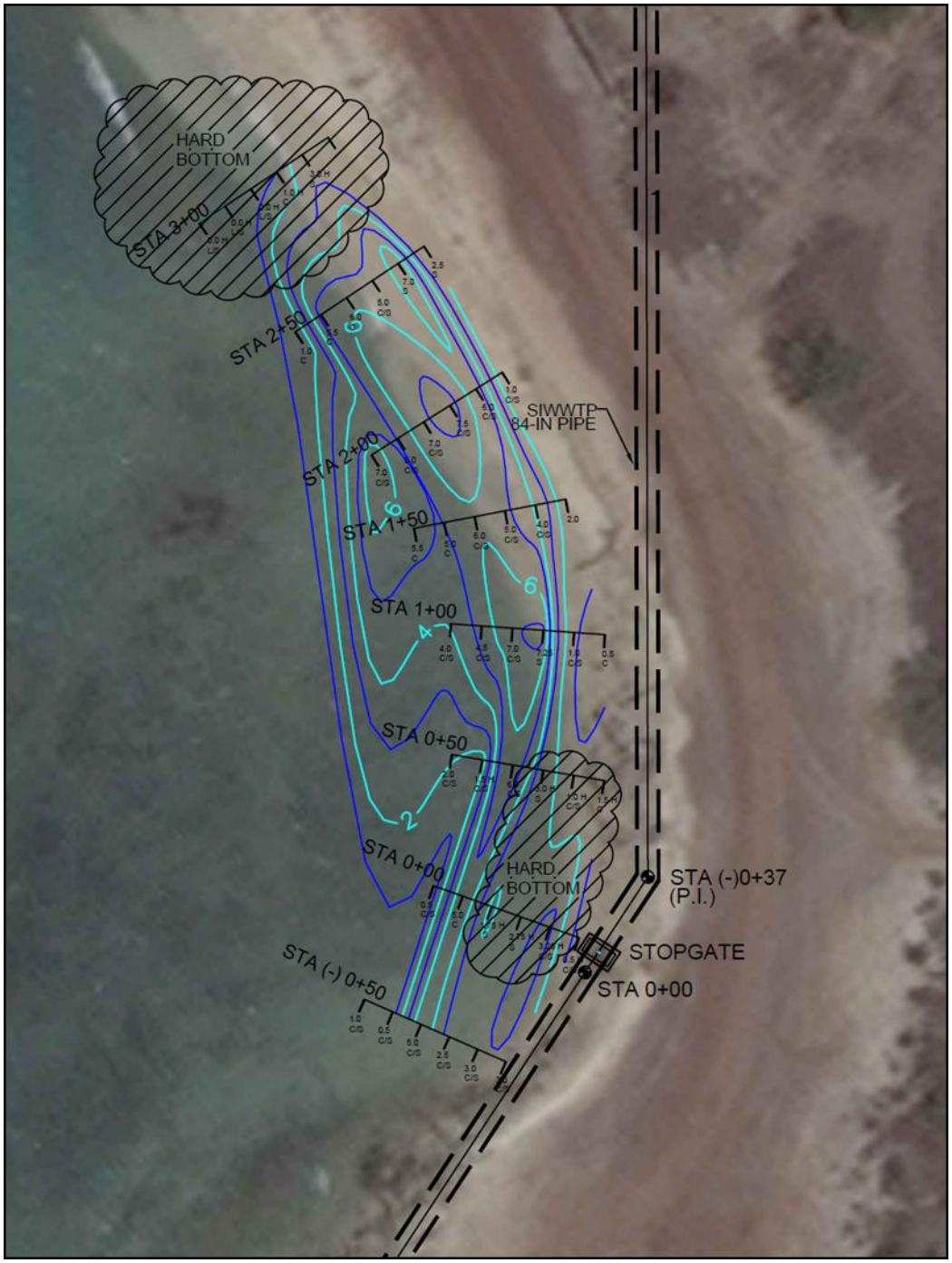


Figure 2-11. Jet probe results showing probe locations, probe depth contours, and potential hard bottom areas.

2.4 Historical Shoreline Analysis

Historical shoreline analyses are a common method for determining the stability of a shoreline. The analyses are performed by digitizing key shoreline features from a series of aerial or satellite images. In this analysis, the beach toe, indicated by a sharp change in color and contrast, was

used as the shoreline reference feature. The beach toe typically marks a defined step in the beach slope at the approximate position of mean lower low water (mllw). The locations of the beach toe lines can then be compared to show movement of the shoreline. The present aerial photographic historical shoreline analysis was performed using a series of aerial images from 1955 through 2012. Sources of aerial imagery were the University of Hawaii Coastal Geology Group, NOAA National Ocean Service, and MapMart (see Table 2-2). The 2012 image is geo-referenced, which means that it is positioned in a real-world coordinate system. In this case the reference system is Hawaii State Plane, NAD83, Zone 3, U.S. survey feet. All other images were referenced to a different coordinate system or none at all. The 2012 image was therefore used as the base image for referencing the other images to the State Plane coordinate system. Identifiable features, such as building corners or tanks, were selected on each image, and then the images were rotated, scaled, and translated so that the selected features aligned with the same features on the 2012 image. Due to development of Sand Island, common features between the two early images and the 2012 images were not found, so the 1955 was referenced to the 1968 image, which in turn was referenced to 1982 image. The positions of the 1955 and 1968 images thus contain the most uncertainty; however, the dramatic changes that have occurred since then make the relative accuracies insignificant.

The aerial images with digitized shorelines are shown in the following figures. For reference, the shoreline digitized from the 2012 satellite image is also shown in each figure.

Figure 2-12 presents an aerial photograph of the project site in 1955. Construction of Sand Island was complete at the time; however, there was little in the way of on-land development yet. The most prominent shoreline feature was a tongue of sand that extended over 1,000 ft west of the 2012 shoreline. In the vicinity of the stop gate (not yet constructed), the shoreline was about 165 ft wide measured from the 2012 shoreline. By 1968, the tongue of sand had diminished greatly, and was at most about 280 ft from the 2012 shoreline (Figure 2-13). The shoreline alongside the stop gate location, however, had experienced little change since 1955. The erosion of the sand tongue exposed what appears to be an S-shaped array of blocks apparently used as shore protection, which were likely in place prior to the 1955 image.

The 1975 photograph shown in Figure 2-14 was taken during construction of the Sand Island WWTP and installation of the present-day pipeline. The figure shows the trench and pipeline extending south from the stop gate location. The figure also shows armoring around the southern tip of the island, something that was not visible in the 1968 photograph. A small amount of sand can be seen on the west side of the pipeline trench. Also, seen in Figure 2-14 is a considerable amount of construction activity taking place both on-land and in-water. This report does not consider the shoreline in this photograph to be valid, based on the modifications taking place during construction.

Table 2-2. Sources of aerial imagery

Source	Imagery dates
Univ. of Hawaii Coastal Geology Group	1955 (month unknown) February 1968 March 1975 December 1982 December 2005
NOAA National Ocean Service	June 12, 2000
Digital Globe/MapMart	October 12, 2012

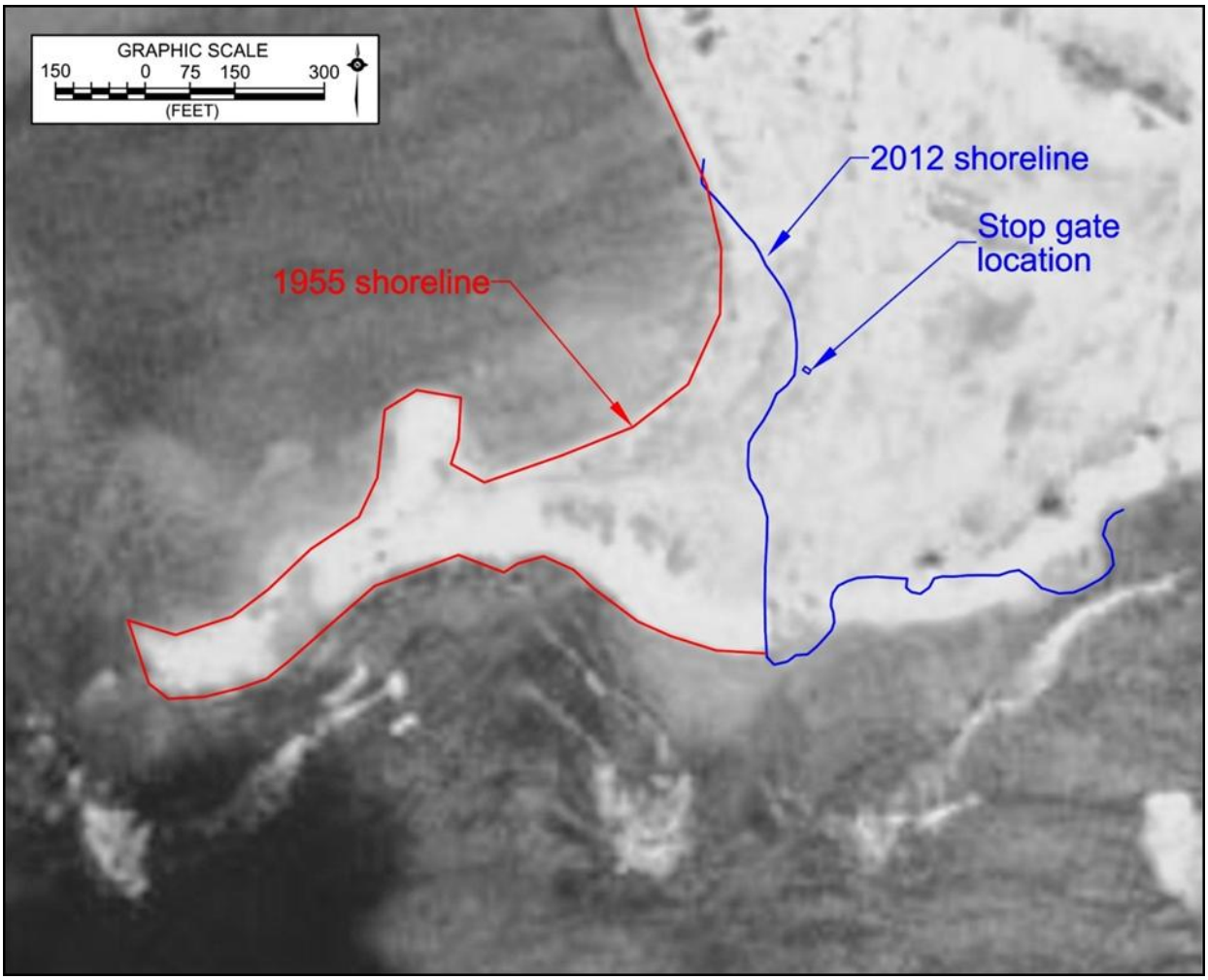


Figure 2-12. 1955 aerial photograph with 1955 and 2012 shorelines

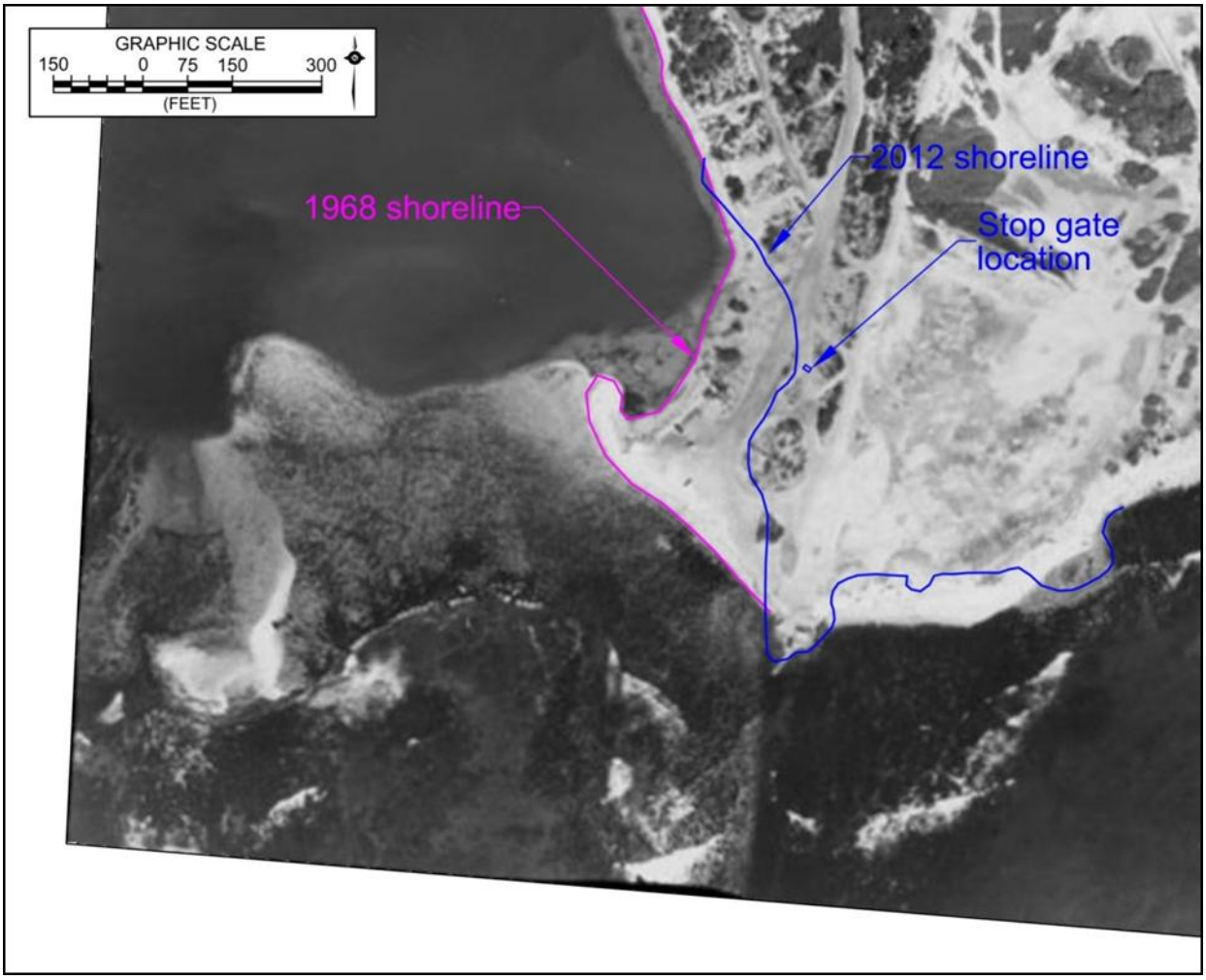


Figure 2-13. 1968 aerial photograph with 1968 and 2012 shorelines

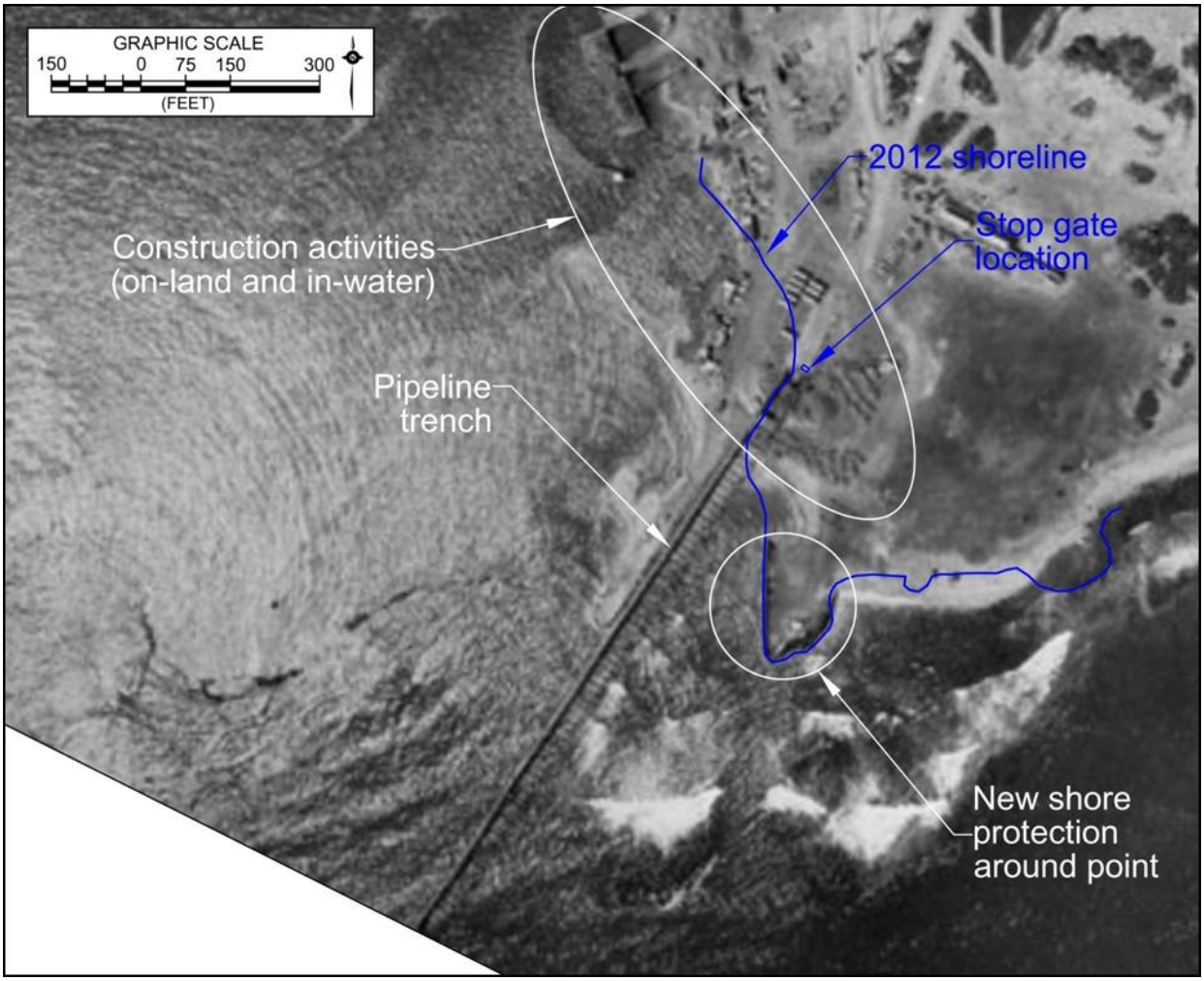


Figure 2-14. 1975 aerial photograph with 2012 shoreline

The 1982 aerial photograph shown in Figure 2-15 shows that the tongue of sand had disappeared, and the shoreline opposite the stop gate had decreased to only 65 ft wide. The stop gate and present-day pipeline were in place, and shore protection that had been constructed south of the stop gate location and around the tip of the island had been extended northward. The shoreline continued to recede, and by 2000 (Figure 2-16), was only several feet wider than in 2012. The shore protection south of the stop gate location, however, appeared to have been effective. The 2005 shoreline, shown in Figure 2-17, indicates minor erosion between 2000 and 2005, and the shoreline was effectively in the same location as the 2012 shoreline.

Figure 2-18 shows the six historical shorelines overlaid on the 2012 satellite image. The path of the active pipe is shown on the figure and can be seen to pass under the beach face for more than 100 ft directly north of the stop gate.

The Coastal Geology Group, as part of their Coastal Hazard Mapping program, produced a historical shoreline erosion map for the south-facing shoreline at the Sand Island Recreation Area using historical shorelines from February 1949 to December 2005 . They found the western 300 ft of shoreline was eroding with average annual rates of up to about 1.8 ft/yr. The

most dramatic erosion occurred between the years 1968 and 1982, consistent with the shoreline changes found in this report.

To update the erosion analysis, a topographic survey was conducted on March 2, 2017 to locate the current position of the beach toe. Figure 2-19 shows the current beach toe position compared to the 2012 position. The survey indicates that the shoreline continued to erode between 2012 and 2017: north of the stop gate, the shoreline receded up to 20 feet; the stop gate structure itself is more exposed; the revetment south of the stop gate is further breached; and the beach to the east has eroded approximately 10 feet.

Figure 2-15. 1982 aerial photograph with 1982 and 2012 shorelines

Figure 2-16. 2000 aerial photograph with 2000 and 2012 shorelines

Figure 2-17. 2005 aerial photograph with 2005 and 2012 shorelines

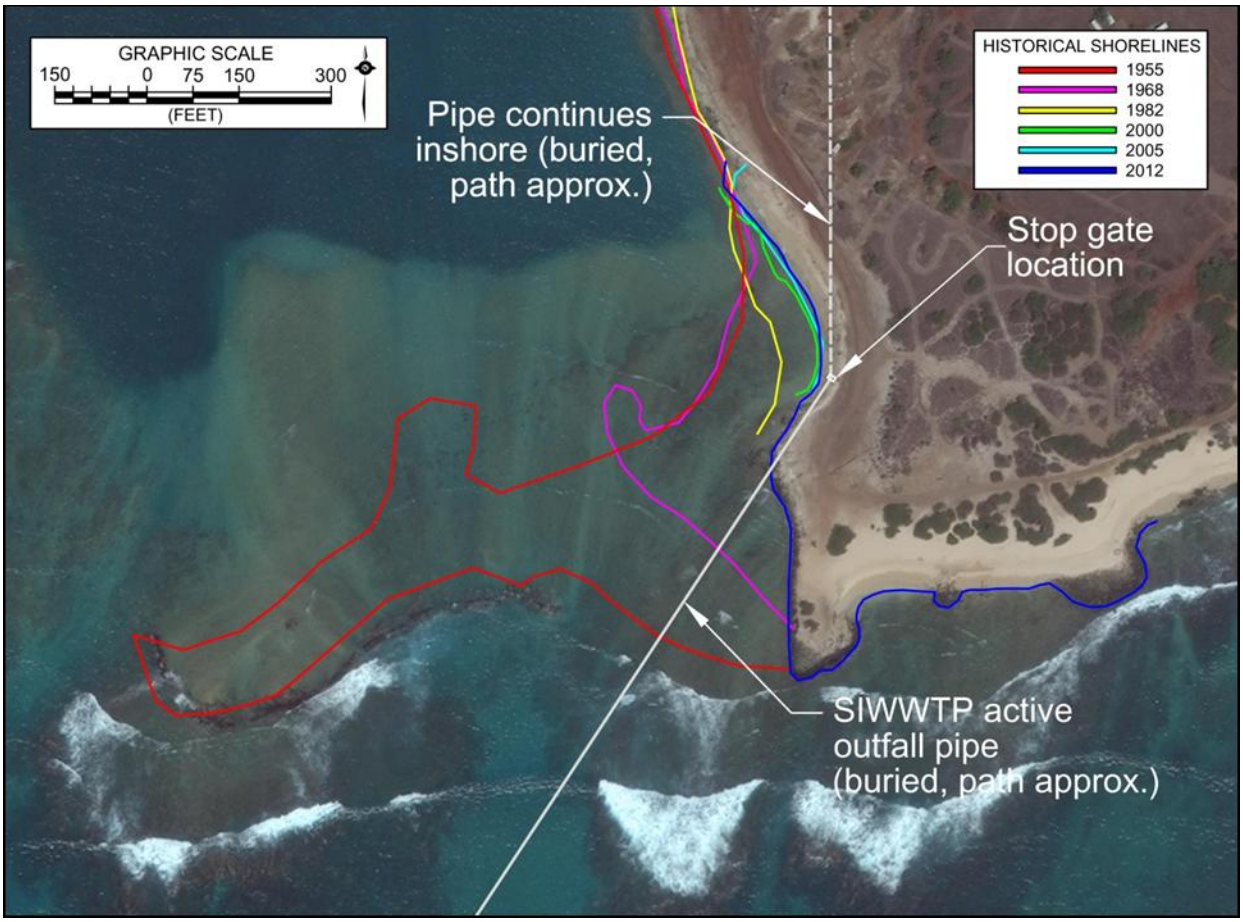


Figure 2-18. 2012 satellite photograph with historical shorelines

Figure 2-19. March 2, 2017 beach toe position

2.5 Erosion Hazard

The south shore of Oahu underwent substantial modifications during the construction of Honolulu Harbor and the Reef Runway, including the construction of Sand Island. The historical analysis shows that the shoreline appears to have been reacting to the modifications. Figure 2-18 presented a compilation of historical shorelines from 1955 through 2012. The figure shows the dramatic erosion that occurred between 1955 and 2000. Waves and currents have likely washed sand into the large dredge channel to the northwest, where it is lost from the beach system. Between 2000 and 2012 only minor erosion occurred. Between 2012 and 2017, however, significant additional erosion occurred. The shoreline is man-made, and there is no certainty that stability will ever occur naturally. Predicted sea level rise will likely result in future shoreline erosion, and very little sand was observed on the reef in the vicinity of the project site.

Figure 2-18 and Figure 2-19 illustrate that the shoreline erosion has progressed to the stop gate and is beginning to expose the structure. Any further erosion may begin to remove cover material and expose the trench, and possibly damage the outfall. The outfall is considered critical infrastructure. It is the only wastewater outfall servicing the Honolulu area. Failure or damage to the outfall could have catastrophic health, environmental and economic consequences.

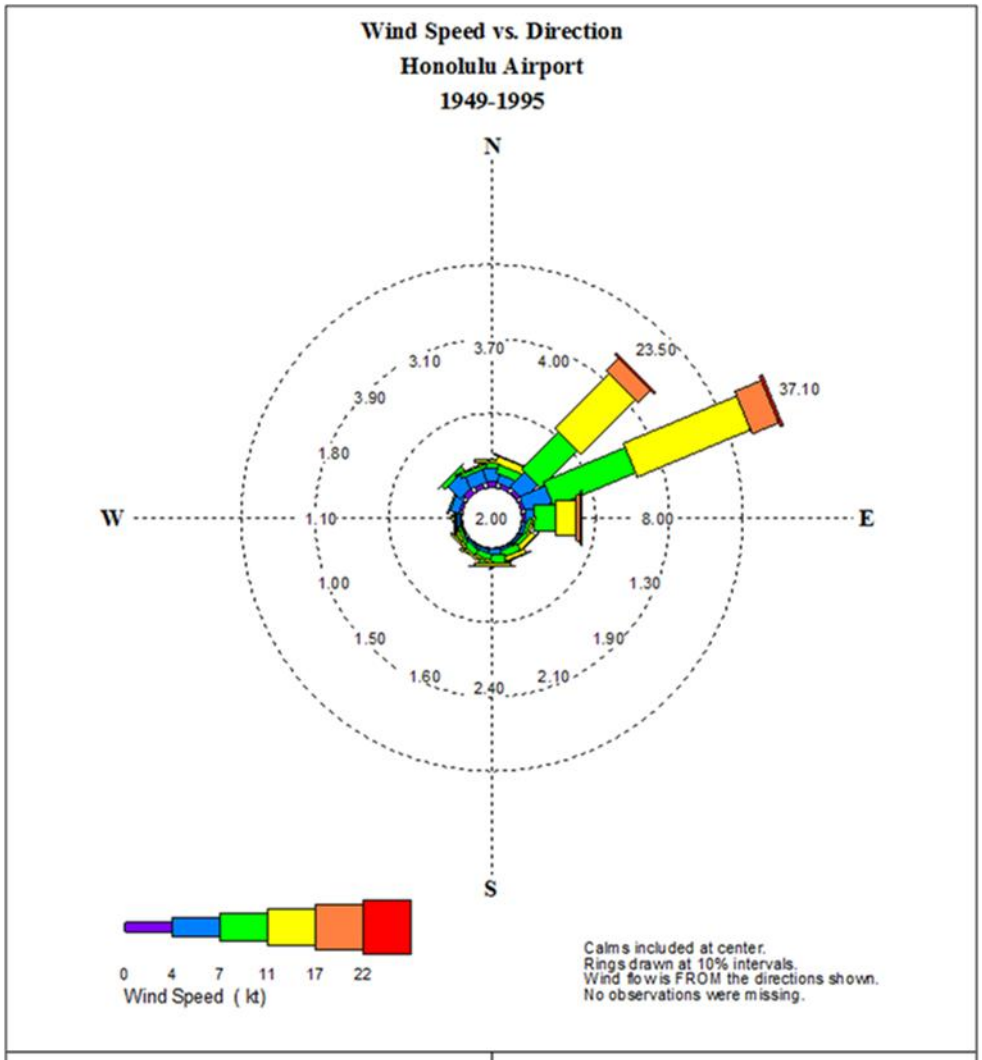
3. OCEANOGRAPHIC SETTING

3.1 Winds

The prevailing winds throughout the year in Hawaii are the northeasterly 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 70%. Westerly, or Kona, winds occur primarily during the winter months, generated by low pressure systems near the islands. Figure 3-1 shows a wind rose diagram applicable to the project site based on wind data recorded at Honolulu International Airport between 1949 and 1995.

Trade winds are produced by the outflow of air from the Pacific Anticyclone high pressure system, also known as the Pacific High. The center of this system is located well north and east of the Hawaiian chain and moves to the north and south seasonally. In the summer months, the center moves to the north, causing the tradewinds to be at their strongest from May through September. In the winter, the center moves to the south, resulting in decreasing trade wind frequency from October through April. During these months, the average monthly trade wind frequency of occurrence decreases to about 50%.

Wind patterns of a more transient nature increase during the winter months. Winds from extra-tropical storms can be very 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. At Honolulu Airport, gusts resulting from these storms have on several occasions exceeded 60 mph. Kona winds are generally from a southerly to southwesterly direction, and are sometimes associated with slow moving low pressure systems known as Kona lows situated to the west of the island chain. These storms are often accompanied by heavy rains.



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

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

TOTAL OBS = 134736 MISSING OBS = 0

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

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

CALM OBS = 2695 PERCENT CALM = 2.00

Figure 3-1. Frequency of occurrence of wind speed and direction, Honolulu Airport

3.1.1 *Extreme Winds*

The annual maximum 2-minute averaged wind speeds were available for the NOAA weather station at Honolulu International Airport for the 44-year period from 1969 to 2012. Results are presented in Table 3-1. Annual maximum 2-minute wind speeds at Honolulu International Airport, ordered by wind speed. Some of the annual maxima shown are associated with specific storm events, most notably, the highest value of 46 miles per hour in November of 1982 which

was the result of 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.

Table 3-1. 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

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 3-2.

The report Hurricanes in Hawaii (Haraguchi, 1984), prepared for the U. S. Army Corps of Engineers, Honolulu Engineer District, presents a hypothetical hurricane model and a series of worst-case scenarios for the Hawaiian Islands. The model hurricane is defined as the probable hurricane that will strike Hawaii in the future, based on the characteristics of storms that have previously approached or struck the islands. The worst-case hurricane characteristics are derived from a subjective analysis of the data from 20 significant hurricanes in the Central Pacific and an understanding of the basic atmospheric and oceanic conditions surrounding the Hawaiian Islands.

Haraguchi estimated the model hurricane wind speed in the vicinity of the Hawaiian Islands to be 75 miles per hour. This value falls beyond the 100-year return period wind predicted by the extreme value distribution for Honolulu, shown in Table 3-2 By comparison, the maximum 2-

minute averaged wind recorded at Honolulu International Airport in the last 44 years (1969 to 2012) was 46 miles per hour, which is equivalent to the 50-year wind speed from Table 3-2.

Table 3-2. Extreme value distribution return 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

3.2 Waves

3.2.1 *Prevailing Waves*

The wave climate in Hawaii is typically characterized by four general wave types. These include northeast trade wind waves, southern swell, North Pacific swell, and Kona wind waves (Figure 3-2. Common wave types and approach directions in Hawaii). Tropical storms and hurricanes also generate waves that can approach the islands from virtually any direction. Unlike winds, 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 high 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-southeast and is centered on the east-northeast direction. Although the Sand Island area is sheltered from the direct approach of trade wind waves by island shadowing, a significant portion of the trade wind wave energy reaches the area by diffracting around the southeast end of the island, and contributes to generally rough offshore sea conditions 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 periods of 14 to 20 seconds. Depending on the positions and tracks of the southern hemisphere storms, southern swells approach between the southeasterly and southwesterly directions. Sand Island is directly exposed to swell from the southerly direction.

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. Periods vary between 12 and 20 seconds, depending on the location of the storm. Sand Island is well sheltered by island shadowing from swell approach from the north and northwest, but is somewhat exposed to waves from a more westerly direction.

Kona storm waves also directly approach the south shore; however, these waves are fairly infrequent, occurring only about 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 about 17 feet. The waves during this event had a significant impact on the south and west shores of the islands.

As noted by the historical significance of Hurricanes Iwa (1982) and Iniki (1992), severe tropical storms and hurricanes have the potential to generate extremely large waves that can affect the south coast of Oahu.

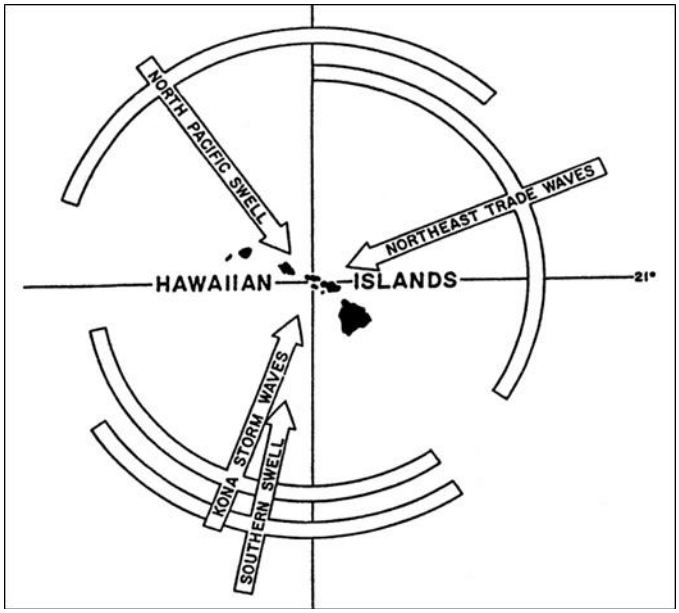


Figure 3-2. Common wave types and approach directions in Hawaii

3.3 Tide and Water Level Rise

Water depth at the shoreline is a critical element in coastal engineering design. Deeper water allows higher wave heights to reach the shore, and coastal design must be adjusted accordingly. The most obvious water depth fluctuations are the daily tides, however other important phenomena occur, including storm surge during hurricanes, wave setup during high wave events, and both short and long term changes in ocean elevation. During severe storm events a "super

elevation" of the water level at the shore may occur. The rise in stillwater level along the shore during a hurricane or other storm event is due to a combination of the astronomical tide, wave setup, and storm surge due to reduced atmospheric pressure and wind stress.

The tides in Hawaiian waters 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 data for Honolulu Harbor, which is applicable to the project site, are as follows:

	MLLW Datum
Mean Higher High Water	1.90 ft.
Mean High Water	1.44 ft.
Mean Sea Level	0.82 ft.
Mean Low Water	0.16 ft.
Mean Lower Low Water	0.00 ft.

During high wave events, the nearshore water level may be elevated above the tide level by the action of breaking waves offshore. This water level rise, termed *wave setup*, may be as much as 10 to 12% of the breaker height. Thus, the water level could be elevated an estimated 1 to 2 feet during severe storm wave conditions.

During hurricane conditions, with high winds and very low pressures, an additional water level rise due to wind stress and reduced atmospheric pressure can occur. Termed storm *surge*, this rise can potentially add another 1 to 2 feet to the stillwater level. For example, during the 1992 passage of Hurricane Iniki over Port Allen Harbor on the island of Kauai, a National Weather Service tide gauge recorded a water level rise of 4.9 feet above the predicted tide elevation.

The possible stillwater level rise at the project site is an important design parameter because nearshore wave heights are limited by the water depth. Water level rise due to wave setup or storm surge, added to high tide levels, will therefore increase the size of nearshore waves.

3.3.1 *Other Stillwater Level Rise Phenomena*

3.3.1.1 Mesoscale Eddies

Hawaii is subject to periodic extreme tide levels due to large oceanic eddies that have recently been recognized and that sometimes propagate through the islands. These eddies, termed mesoscale eddies (Merrifield, 2004) produce tide levels that can be on the order of 0.5 ft higher than normal for periods up to several weeks.

It is now widely accepted among Hawaii coastal scientists and engineers that a 2003 erosion event that damaged the shoreline at Ka`anapali, 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 (Firing and Merrifield, 2004). 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 about 0.5 ft and a diameter of roughly 186 miles.

3.3.1.2 Global Sea Level Rise

It is widely recognized that global warming has caused a world-wide acceleration in sea level rise. Estimates vary widely, but a 3-foot rise by the end of the present century is in use as a reasonable figure (Fletcher, 2009). However, sea level rise predictions in the Hawaiian Islands are not clear, and the state-of-the-science is in early stages. For example, there are indications that the effect in the islands will be delayed due to the remote location of the archipelago.

4. COASTAL HAZARDS

4.1 Extreme Deepwater Waves

4.1.1 *Extreme Waves*

The three major wave types that affect the south shore are trade wind waves, southern swell and Kona storm waves. Extreme southern swell and Kona storm waves, as well as hurricane waves are of most concern for design purposes. Southern swell and Kona storm waves occur frequently enough that extreme values of these waves can be predicted. Hurricanes are infrequent events in Hawaii, and are treated separately.

The WaveWatchIII hindcast model was used to produce hourly records of wave and wind conditions for the 12-year period from 1997 through 2008. These data were used as a statistical basis for generating extreme wave return period information using the Gumbel extreme value distribution. The return period, or recurrence interval value is a useful concept for engineering design, as it forms a statistical, yet intuitive basis for establishing a level of design criteria.

Table 4-1 lists the yearly highest wave heights (in rank order) and associated peak wave period for 1997 through 2008 for both southern swell and Kona storm waves. The wave heights are significant wave heights, Hs (the average of the highest third of the waves), and the wave peak periods (Tp) are derived from the wave spectrum peak (the wave frequency band with the highest energy).

The Gumbel extreme value distribution was applied to the annual maximum wave heights listed in Table 4-1 in order to determine recurrence interval wave heights. Recurrence interval wave heights are listed in Table 4-2 and shown in graphical form in Figure 4-1.

The character of southern swell and Kona storm waves is quite different. While the largest southern swell has wave periods between 14 and 18 seconds, Kona storm waves all have wave periods below 10 seconds. The minor differences in southern swell wave height for the ranked waves in Table 4-1 translate into a steep return period versus wave height chart in Figure 4-1, and effectively little difference between the 25, 50, and 100-year wave heights. Conversely, the broad spread in Kona storm wave heights in Table 4-1 produces significant differences in the 25, 50, and 100-year wave heights shown in Figure 4-1 and Table 4-2.

Table 4-1. Yearly largest wave heights (1997-2008)

Rank	Southern Swell Wave Height (Hs,ft)	Southern Swell Wave Period (Tp,s)	Kona Storm Wave Height (Hs,ft)	Kona Storm Wave Period (Tp,s)
1	6.2	18.5	10.9	7.6
2	5.5	16.4	9.1	6.7
3	5.5	16.4	7.6	7.6
4	5.4	16.4	7.6	7.6
5	5.3	16.4	6.7	7.6
6	5.2	16.4	5.4	6.7
7	5.2	16.4	5.0	7.6
8	5.1	16.4	4.5	5.2
9	5.1	14.4	3.0	5.9
10	5.0	16.4	2.9	9.8
11	4.8	16.4	2.9	7.6
12	3.3	14.4	2.8	5.9

Table 4-2. Recurrence interval wave height

Recurrence Interval (yrs)	Southern Swell Wave Height (ft)	Kona Storm Wave Height (ft)
1	5.2	5.5
2	5.5	7.1
5	5.7	9.1
7	5.8	9.9
10	5.9	10.7
15	6.1	11.6
20	6.2	12.3
25	6.2	12.8
30	6.3	13.2
40	6.4	13.8
50	6.4	14.4
75	6.6	15.3
100	6.6	15.9

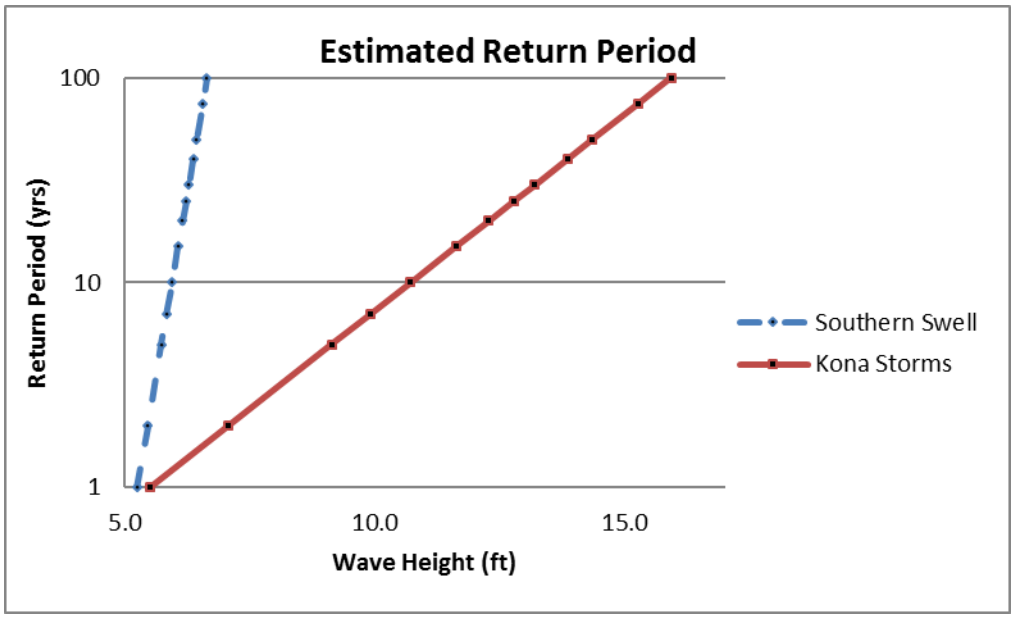


Figure 4-1. Return period wave heights for southern swell and Kona storm waves

4.2 Hurricanes

The term "hurricane" is used for tropical cyclonic storms with wind speeds above 64 kts (73.6 mph). Hurricane strength tropical cyclones in the North Pacific Ocean west of the dateline are called "typhoons". Hurricanes in the United States are categorized using the Saffir-Simpson hurricane intensity scale based on sustained wind speed. The wind speeds refer to a one-minute average wind speed measured 10 meters above the ground.

Table 4-3 shows the range of maximum sustained wind speeds and approximate minimum central pressures for each hurricane category. Category 5 hurricanes are the most severe hurricanes with sustained wind speeds greater than 135 knots.

Table 4-3. Saffir-Simpson Hurricane Scale

Saffir-Simpson Category	Max. Sustained Wind Speed (kts)	Min. Central Pressure (mbs)
1	64 – 82	>980
2	83 – 95	979 – 965
3	96 – 113	964 – 945
4	114 – 135	944 – 920
5	136+	<920

Note: Classification by central pressure has been superseded, and it is now done by wind speed alone. The estimates of central pressure that accompany each category are for reference only.

Hurricanes are infrequent in Hawaiian waters. Figure 4-2 (from UH-SOEST website) shows hurricane, tropical storm, and tropical depression tracklines within 200 miles of Hawaii coastlines between 1949 and 1997. Only five of the storms reached hurricane intensity. The most recent historical hurricanes that caused significant damage in Hawaii were Hurricane Iniki

(1992) and Hurricane Iwa (1982). Hurricane Iniki passed directly over and Hurricane Iwa passed within 30 miles of the island of Kauai. Hurricane Iniki approached Kauai from the south and was physically small but intense when it made landfall. Hurricane Iwa approached Kauai from the southwest and was a physically large Category 1 hurricane when it passed northwest of the island. While Iwa was a Category 1 event throughout its life near the islands, Iniki approached as a Category 4 and reverted to Category 3 just before landfall on Kauai.

The 2014 hurricane season was notable for the passage of three hurricanes near the islands, with one (Hurricane Iselle) scoring a direct hit on August 7 on the east shore of Hawaii island at tropical storm intensity, with winds of 70 mph. Hurricane Julio passed north of the Hawaiian Islands as a tropical storm, causing little damage. Hurricane Ana passed south of the Hawaiian Islands in October, 2014, and caused little damage although large waves were recorded on the south shore. Although these hurricanes resulted in little damage on Oahu, minor changes in their tracks could have resulted in very different results, and they serve as reminders of the State's vulnerability.

Hurricanes Iniki and Iwa have been well-studied, and the characteristics of these storms were significantly different. Table 4-4 summarizes the general characteristics of the two storms. Hurricane Iwa was not as intense as Hurricane Iniki near the Hawaiian Islands, with less pressure differential and lower wind speeds, but it had a much larger horizontal dimension, with an estimated radius of maximum wind of 51 nautical miles (n.m.) compared to 13 n.m. for Iniki.

The most recent wind and wave modeling for the two hurricanes (Cheung *et al*, 2003) computed maximum significant wave heights (Hs) of 44 ft for Iniki at a location just offshore of the Poipu area on Kauai, and 54 ft for Iwa, illustrating that wind speed is not the only factor of importance for wave generation. The peak wave periods of the two storms were 11.8 sec for Iniki and 14 sec for Iwa.

The maximum wave height generated from a particular storm is not just dependent on wind speed, but on other hurricane parameters as well. In particular, the radius of the hurricane will determine the fetch length available for wave generation. The forward velocity is also important as the track line direction can influence the location and trajectory of the largest waves within the storm, and the track speed can influence wave growth if, for example, the storm allows waves to escape from the generating area (a slow storm), keeps the waves growing inside the storm by matching the wave group speed (a "captured fetch"), or outruns the generated waves (a fast storm).

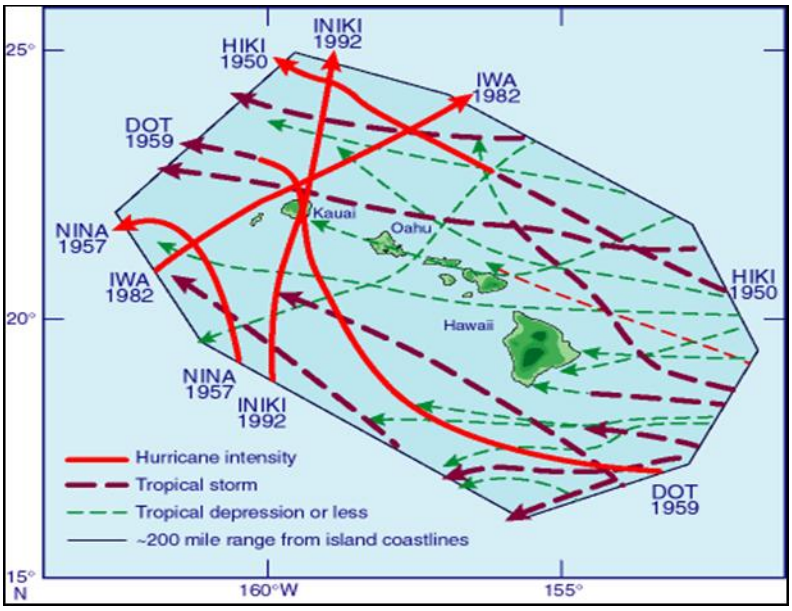


Figure 4-2. Historical hurricanes in Hawaii (from UH-SOEST)

Table 4-4. Characteristics of Hurricanes Iwa and Iniki (Cheung et al, 2003)

	Iwa 1982	Iniki 1992
Forward Direction near Hawaii (^{o}TN)	055	010
Max. Sustained Surface Wind Speed (knots)	80	116
Min. Sea Level Pressure (mbs)	964	938
Forward Speed (knots)	39	28
Radius of Max. Wind Speed (n.m.)	51	13
Wave Height (Hs, ft)	54	44
Wave Peak Period (s)	14	11.8

4.2.1 *Model Hurricanes*

The relatively infrequent occurrence of hurricanes in the Hawaiian Islands means that statistical representations of occurrence are not practical for design purposes. Instead, hurricanes are modeled, often using a historical storm as a basis. The physical characteristics of a hurricane can be modified in order to provide extreme scenarios. For example, the central pressure can be reduced to increase the wind speeds, and the track line can be moved so that the largest wave heights affect the project area.

Hurricane wind models calculate wind speeds based on the pressure parameters of the hurricane (Figure 4-3). The profile slope is the pressure gradient, dP/dr. The cyclostrophic wind is the theoretical wind speed based on the pressure gradient, and is the balance between the centripetal force directed toward the center of the hurricane, and the force due to the pressure gradient:

$$V^2_{cr} = r\, dP/\rho_a\, dr$$

where,

V_{cr} = cyclostrophic wind

P = atmospheric pressure

r = radial distance from the hurricane center

ρ_a = air density.

The radius of maximum cyclostrophic winds (R_c) occurs at the location where r dP/dr (and V_{cr}) is at a maximum value.

The introduction of the Coriolis parameter, based on hurricane latitude, gives the *gradient wind* equation:

$$V^2_g + f\, rV_g = r\, dP/\rho_a\, dr$$

where f is the Coriolis parameter:

$$f = 2\omega \sin \varphi$$

and,

ω = angular speed of the earth, and

φ = latitude of the hurricane.

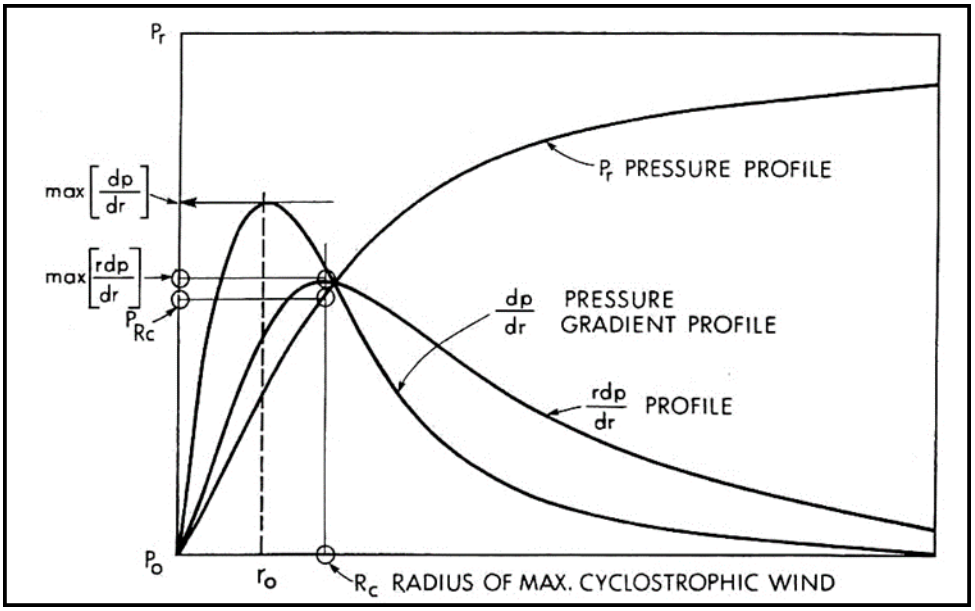


Figure 4-3. Hurricane pressure and pressure gradient profiles (from Bretschneider)

The above example equations (from Bretschneider, 1984) result in a more or less symmetrical wind field around the center of the hurricane. Applying a forward velocity to the hurricane will skew the wind velocity field to have greater wind speeds in the forward direction of the hurricane - resulting in the dangerous semicircle of the hurricane.

The report Hurricanes in Hawaii (Haraguchi, 1984), prepared for the U. S. Army Corps of Engineers, Honolulu Engineer District, presents a hypothetical hurricane model and a series of worst-case scenarios for the Hawaiian Islands. The model hurricane is defined as the probable hurricane that will strike Hawaii in the future, based on the characteristics of storms that have previously approached or struck the islands. The worst-case hurricane characteristics are derived from a subjective analysis of the data from 20 significant hurricanes in the Central Pacific and an understanding of the basic atmospheric and oceanic conditions surrounding the Hawaiian Islands.

The original design storm for the SIWWTP outfall was a hurricane with a maximum probable wave height (Hmax) of 46 ft, with a wave period of 11.7 seconds. The design significant wave height (Hs) was 27 ft (R.M.Towill Corp., 1972, 1976).[1]

The 2009 *Makani Pahili* (Hawaiian for *strong winds*) event was a pilot study by the Federal Emergency Management Agency (FEMA) for a catastrophic hurricane response plan for Honolulu. A number of theoretical model hurricanes were developed for the study by University of Hawaii researchers. The FEMA hurricanes had maximum winds of Category 5 (+135 kts) that reduced to Category 4 wind speeds at landfall.

[1] Note: Hmax and Hs are statistical representations of wave height, where Hmax is the largest wave likely to occur, and Hs is the average of the highest 1/3 of the waves for a particular event.

The FEMA model hurricane generating the largest wave heights at the project site is termed F1R in this report, and was used in a previous SEI study to model outfall pipeline stability (SEI, 2014: *Sand Island Hurricane Modeling Report*). It is modeled on the general characteristics of Hurricane Iniki, and is similar to model hurricanes used by Kennedy *et al* (2012). The trackline of F1R is shown in Figure 4-4. As shown in the figure, the hurricane eye passes west of Oahu, but the maximum winds and waves on the east side of the eye directly impact the south and west shores.

Table 4-5 is a comparison of available hurricane parameters from real and model hurricanes, including Hurricanes Iwa and Iniki, the Haraguchi model hurricane, the original hurricane derived SIWWTP design wave, and the F1R hurricane.

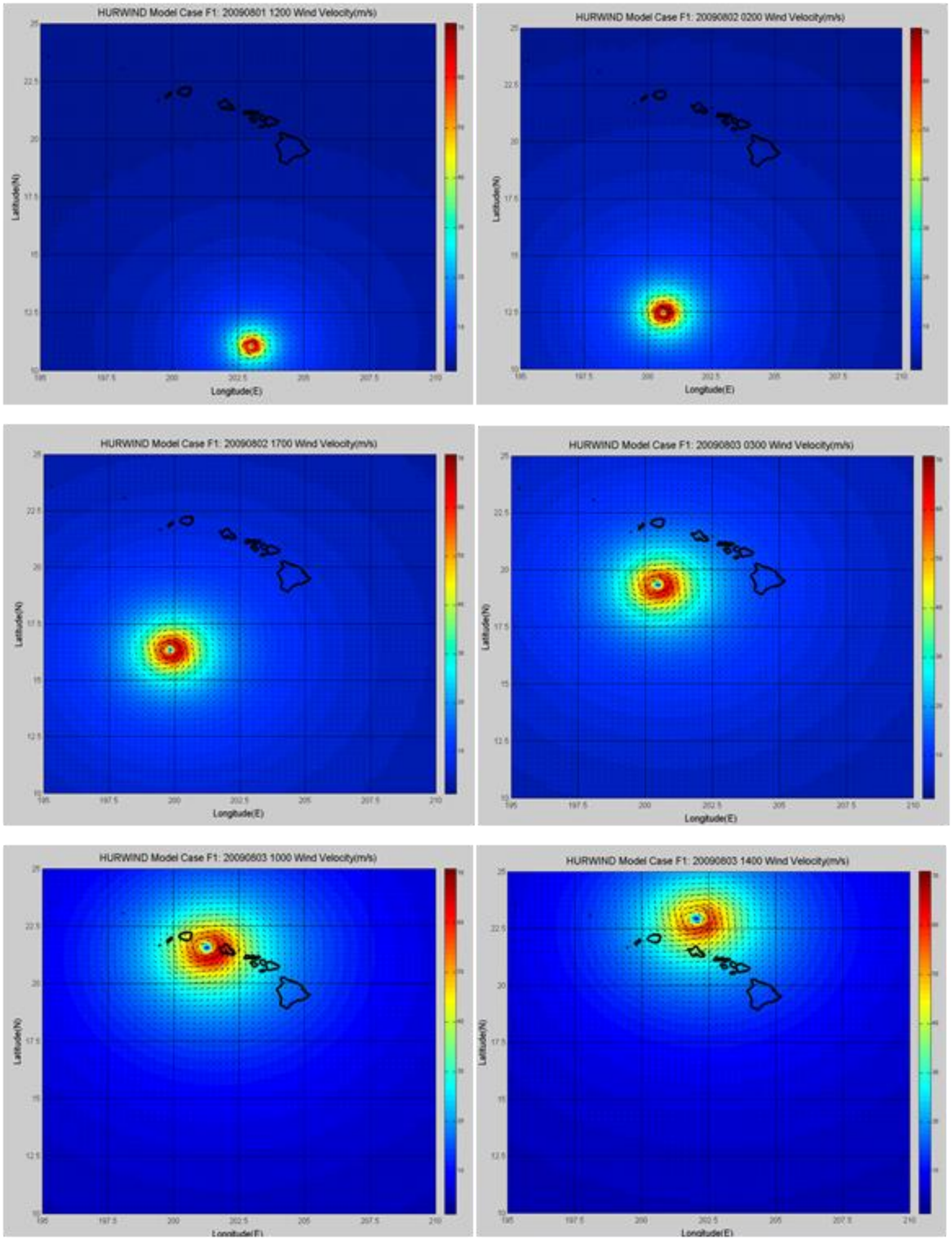


Figure 4-4. Trackline of FEMA Hurricane F1R

Table 4-5. Comparison of real and model hurricane parameters

Hurricane Scenario	Min Central Pressure (mbs)	Eye Diameter (nm)	Max wind (kts)	H_{max} (ft)	H_s (ft)	T_p (s)	Approach Direction
Iwa	964	51	80	-	54	14.9	SW
Iniki	938	13	116	-	44	11.8	SSW
Haraguchi Model	979	20	65-80	-	-	-	SW
SIWWTP Design	-	-	-	46	27	11.7	approx. S
F1R (cpa)	940	13	130	-	52.7	14.3	SSW

4.3 Still Water Level Rise

Storms and large waves produce storm surge and wave setup that results in elevated water levels at the shoreline. During prevailing, annual conditions this water level rise can be on the order of a foot above the tide level. However, during extreme events, the still water level rise can be significantly greater.

During high wave events, the nearshore water level may be elevated above the tide level by the action of breaking waves offshore. This water level rise, termed *wave setup*, may be as much as 10 to 12% of the breaker height. Thus, the water level could be elevated an estimated 1 to 2 feet during severe storm wave conditions.

During hurricane conditions, with high winds and very low pressures, an additional water level rise due to wind stress and reduced atmospheric pressure can occur. Termed storm *surge*, this rise can potentially add another 1 to 2 feet to the stillwater level. For example, during the 1992 passage of Hurricane Iniki over Port Allen Harbor on the island of Kauai, a National Weather Service tide gauge recorded a water level rise of 4.9 feet above the predicted tide elevation.

The possible stillwater level rise at the project site is an important design parameter because nearshore wave heights are limited by the water depth. Water level rise due to wave setup or storm surge, added to high tide levels, will therefore increase the size of nearshore waves.

4.4 Tsunami and Coastal Hazards

The Honolulu Harbor vicinity was inundated by the tsunamis of 1946, 1952, and 1960 with flood heights of 2 feet, 2 feet, and 13 feet, respectively (Loomis, 1976; USGS, 2002). These measurements were recorded in the Kakaako area immediate east of the harbor entrance. The tsunami hazard is high along the Sand Island coastline, where the coastal slopes are low (USGS, 2002). The USGS overall flood hazard assessment is moderate to high (5) with high ratings for storms and tsunamis.

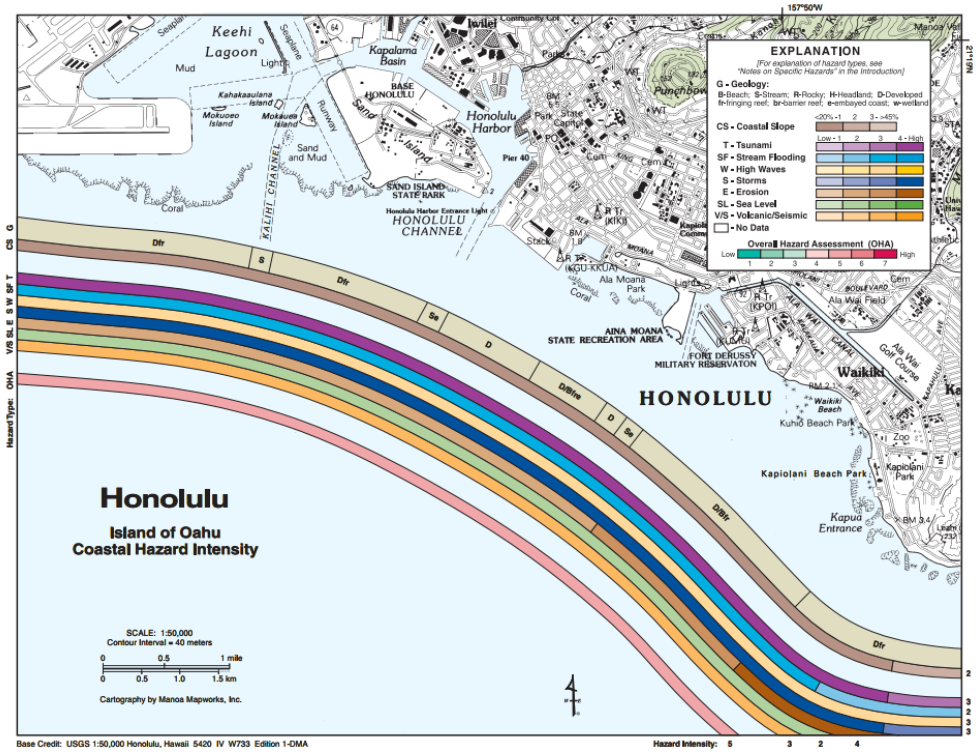


Figure 4-5. Honolulu hazard map (USGS, 2002)

4.5 Flood Insurance Rating

The National Flood Insurance Program, administered by the Federal Emergency Management Agency (FEMA) produces maps identifying flood hazards and risks. Figure 4-6. Flood hazard designations with the project site shown in red (FEMA) shows the flood hazard map for the project. The map indicates that the beach and nearshore reef are rated as Flood Zone VE. Zone VE designates areas subject to inundation by the 1% annual chance flood event with additional hazards due to storm-induced velocity wave action, with a base flood elevation of 12 feet. The map indicates that the area inland of the subject property is Flood Zone AE. Zone AE designates areas subject to inundation by the 1% annual chance flood event with a BFE of 8 feet.

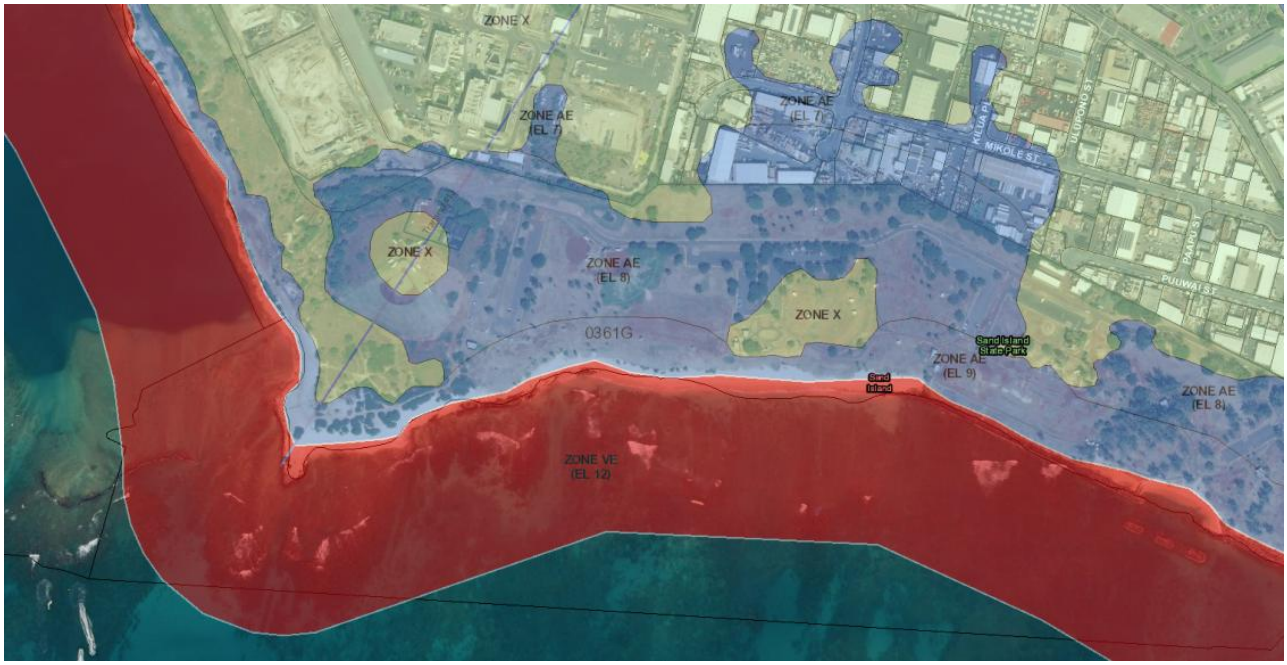


Figure 4-6. Flood hazard designations with the project site shown in red (FEMA)

5. SHORE PROTECTION ALTERNATIVES

5.1 Introduction

Shoreline stabilization or protection for erosion control and prevention of property and structure damage can take various forms and be done in many ways, depending on the project purpose and objectives, site specific coastal processes and physical characteristics, environmental considerations, construction issues, regulatory permitting requirements, and of course budget. The following site specific planning considerations are considered applicable to this study.

- *Purpose and Objectives* – prevent erosion and recession of the shoreline in order to protect the Sand Island ocean outfall.
- *Physical Conditions* – manmade, severely eroded shoreline, partially armored with abundant debris. Directly exposed to potentially large waves, history of failed shore protection structures.
- *Environmental Considerations* – altered and impacted coastal and marine environment with dredge channels, trenches, reef fill, shore protection debris. Limited public use.
- *Regulatory Permitting* – any proposed shoreline protection within the project site would require a full suite of Federal, State, and County permits. Any work in the water would be subject to Department of the Army (DA) Section 10 and Section 404 permit requirements. At the State level, a Hawaii Department of Land and Natural Resources Conservation District Use Permit (CDUP), a Hawaii Department of Health Section 401 Water Quality Certification (WQC), and State CZM Program Consistency Review would be required. The project may also require permits from the City & County of Honolulu, including a Special Management Area (SMA) permit and/or Shoreline Setback Variance (SSV), as well as review by federal environmental resource agencies (e.g., NOAA-NMFS, USFWS). A shoreline certification would also likely be required.

Shoreline stabilization and protection measures include the following general categories:

- Shoreline hardening (revetments, seawalls, sheet pile bulkheads)
- Sand stabilizing/retention structures (groins, breakwaters)
- Beach nourishment (with and without stabilizing structures)
- Temporary measures (vegetation, erosion skirts, sandbags, geotubes, rock mattresses)

The project objective is to protect critical State and City infrastructure. Any option considered for placement on the shoreline must provide certain, durable, protection of the backshore. A secondary consideration is to minimize beach narrowing and beach loss. The options must also be technically feasible at the scale of the project site. Potential options discussed in this report include 1) no action, 2) seawall, 3) revetment, 4) beach nourishment, and 5) beach nourishment with stabilizing structures. These options are described below.

5.2 No Action

The No-Action alternative involves leaving the shoreline in its current state, subject to possible continuing shoreline erosion and storm wave damage. The shoreline has eroded several hundred feet since 1955. A recent shoreline survey shows that the erosion has continued between 2012 and 2017. Approximately 300 feet of the buried outfall alignment is currently at the waterline. Several feet of the stop gate are exposed. Storm waves could cause rapid shoreline erosion and damage the pipeline. Damage to the pipeline could lead to discharge of wastewater directly on

the shoreline, with possible severe impacts to ocean water quality, closure of beaches, negative news reporting globally, and substantial declines in tourism.

There are no alternative outfalls that could be used, and no means of relocating the present outfall. The No Action alternative could result in failure or damage to the outfall which could have catastrophic health, environmental and economic consequences.

5.3 Seawall

A seawall is a vertical or sloping concrete, concrete-rubble-masonry (CRM), cement-masonry-unit (CMU), or sheet pile wall used to protect the land from wave damage and erosion. A seawall, if properly designed and constructed, is a proven, durable, and relatively low-maintenance shore protection method. Seawalls also have the advantage of having a relatively small "footprint" along the shoreline.

The impervious and vertical face of a seawall results in very little wave energy dissipation. Incident wave energy is deflected upward, downward, and also seaward. Reflected wave energy can inhibit accretion of sand in front of the wall; therefore, seawalls are not generally considered a suitable option if maintaining a beach is desired. Since the downward energy component can cause scour at the base of the wall, the foundation of a seawall is critical for its stability, particularly on a sandy and eroding shoreline. Ideally, a seawall should be constructed on solid, non-erodible substrate.

Seawalls are not flexible structures, and their structural stability is dependent on the stability of their foundations. To avoid foundation problems, the seawall foundation should be well below the potential scour level, and this typically requires extensive excavation.

A seawall is not appropriate shore protection at this site because a solid substrate on which to found the seawall is not present, the seawall could inhibit maintenance of a sand beach at the site, and a seawall would have to wrap around the point and extend to the east to prevent flanking. Regulatory agencies tasked with beach and shoreline management are also generally reluctant to permit the construction of seawalls due to concerns about potential impacts to beach resources.

5.4 Revetment

A revetment is a sloping, un-cemented structure constructed of wave-resistant material. The most common method of revetment construction is to place a layer of armor stone, sized according to the design wave height, over an underlayer of smaller rock that sits atop filter fabric. The underlayer is designed to distribute the weight of the armor layer and to prevent loss of fine shoreline material through voids in the revetment. Revetments in Hawaii are typically built on a slope of 1.5 to 2 horizontal to 1 vertical to ensure stability. Toe scour protection can be provided by excavating to place the toe on solid substrate where possible, constructing the foundation as much as practical below the maximum depth of anticipated scour, or extending the toe to provide a scour apron of excess stone. It is important that the armor stone be carefully chosen and placed in a keyed and fitted manner to minimize gaps between stones, which increases the durability of the structure.

One major advantage of a revetment is that the rough porous rock surface and relatively flat slope of the structure will tend to absorb wave energy, reduce wave reflection, and help to promote accretion of sand on a sandy beach when sufficient sand volume is available in the littoral environment. Additional advantages of revetments are that construction is relatively simple, construction material is readily available, and localized damage can be easily repaired by placement of additional armor stone. Should toe scour occur, the structure can settle and readjust without major failure. Damage from large waves is typically not catastrophic, and the revetment can still function effectively even if damage occurs. Properly designed and constructed rock revetments are durable, flexible, and highly resistant to wave damage.

A disadvantage of a revetment is that it has a significantly larger footprint than a seawall.

A revetment is the preferred shore protection method for the outfall for several reasons:

- High durability, flexibility and strength.
- Suitability in areas of erodible substrate.
- Porous surface allows accretion of sand.
- A revetment call provide protection over the top and backside of the outfall.

5.5 Beach Nourishment

Beach nourishment involves placing quantities of suitable sand on a beach to widen the beach, remediate existing erosion and protect the shore. Beach nourishment requires a supply of sand that is ideally similar in character to the native beach sand. While sand may seem like a plentiful commodity, the reality is that good quality beach sand is in short supply in the Hawaiian Islands. Appropriate onshore sources of sand are limited in supply, and overseas sources do not exist. Inland dune deposits have been used for some nourishment efforts, but the process of transport by wind preferentially selects a naturally fine grain size, and dune sand therefore tends to be composed of grains that are too fine for many beach applications. Although offshore sand deposits also tend to have grain sizes that are finer than many beaches, the use of offshore sand is technically feasible. Potential borrow sources require exploration using marine geophysical survey techniques to characterize deposit size, and extensive sampling to ensure adequate grain size characteristics. Recovery can be done using clamshell or hydraulic dredging methods. Both the exploration and dredging efforts are expensive.

The historical shoreline analysis presented in Section 2.4 illustrated that the southwest tip of Sand Island is extremely unstable and has eroded hundreds of feet since 1955. The topographic survey conducted on March 2, 2017 indicates that the shoreline along the pipe alignment has eroded an additional 10 feet since 2012. A beach nourishment project would not alter the ongoing coastal processes that are causing this erosion. It is expected that any sand placed on the beach without stabilizing structures would quickly erode. Beach nourishment is therefore not an appropriate shore protection alternative for the outfall.

5.6 Beach Nourishment with Stabilizing Structures

Beach nourishment accompanied by the construction of sand stabilization structures, such as groins, to minimize sand movement can be an effective means for protecting both the beach resource and the backshore fast land and structures. A series of groin structures accompanied by beach fill would create a stable, wide beach cell within the groins, stable fillets on the outside of

each groin, and would reduce the loss of sand. An example of beach nourishment with stabilizing T-head groin structures is shown in Figure 5-1.

While this alternative could effectively address the erosion problems along the project site, the groins could disrupt sediment transport to the east and north, and may cause erosion. Avoiding possible downdrift erosion would require additional groins and extending the project along the length of sand beach to the east, and also to the north.

Implementing a beach nourishment project would require location of a suitable sand source. Finding an appropriate source of beach sand has become a significant problem for projects in the Hawaiian Islands and would require substantial field survey work. Offshore sand mining has become a successful alternative to terrestrial sand mining; however, high costs, extensive permitting and regulatory constraints, and equipment requirements for the operation make it feasible for large, region-wide beach nourishment projects only. A project of this scale would require State and City partnership, and extensive community and environmental review. The environmental impacts would be substantially greater because the project footprint would change from small and along the shoreline for a revetment, to large and in the water on the reef. Construction costs and regional impacts would be significantly greater.

Beach nourishment, even with stabilizing structures, does not guarantee shore protection. A large storm or hurricane could quickly erode the sand fill and backshore material, and expose the outfall to damage. While this risk is small and may be acceptable for many shoreline areas, it is not recommended for critical infrastructure such as the Sand Island outfall, that could have catastrophic consequences if damaged.

Beach nourishment with stabilizing structures is not recommended as a shore protection alternative for the Sand Island outfall for several reasons:

- Due to the advanced and critical erosion condition and potential for catastrophic consequences, a coastal protection structure would be recommended as a back-stop even if a regional beach nourishment project were implemented;
- Appropriate sand resources are difficult to find, and have not been identified in the area. A comprehensive prospecting effort consisting of geophysical surveying and sampling would be necessary;
- An appropriate beach nourishment project would entail numerous groins and extend the length of the project area;
- The project would require construction of several rock groin structures on the reef, resulting in a significantly larger marine footprint and impacts.

Figure 5-1. Iroquois Point beach nourishment with stabilizing T-head groins

6. RUBBLE MOUND REVETMENT DESIGN

6.1 Introduction

As discussed above, the recommended shore protection alternative for the site is a rock revetment. The design of coastal structures, such as a protective revetment for the SIWWTP outfall, requires the determination of design wave conditions. The design stillwater level is a critical parameter for nearshore design as it is a major factor for determining depth-limited wave heights. The stillwater level is a function of the incident deepwater wave conditions and breaking wave height, as well as wind speeds and atmospheric pressure during hurricane conditions. Wave behavior is also complex, with deepwater waves determined by growth and decay factors in generating regions such as hurricanes, and shallow water behavior dramatically influenced by approach direction and bathymetry.

These wave transformations are mathematically complex, and calculations over broad areas and complex bathymetry require the use numerical computer models. The following models were used in this study:

WaveWatchIII

WaveWatch III (WW3- Tolman 1997, 1999a, 2009) is a wave generation model that was used to predict the growth and propagation of waves within the hurricane model. WW3 is computationally efficient, with a relatively coarse grid size (1° latitude X 1.25° longitude), however its accuracy falters in shallow water.

SWAN

Simulating WAves Nearshore (SWAN) was used to propagate the hurricane waves on a 50-m (167-ft) grid from the 16m (52.5 ft) depth contour to shore.

Bouss 2D

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/ 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.

Bouss2D 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.

CMS Flow and CMS Wave

CMS-Wave is a component of the Coastal Modeling System developed by the US Army Corps of Engineers Coastal and Hydraulics Laboratory. It is a two-dimensional wave spectral transformation model that employs a forward-marching, finite-difference method to solve the wave action conservation equation. It is a phase-averaged model, which neglects changes in the wave phase in calculating wave and other nearshore processes. The CMS Wave model was used to calculate wave setup.

6.2 Design Deepwater Wave Height

The deepwater design wave selected for the project is generated by a close approach of the FEMA hurricane termed F1R. The wave has a significant wave height (Hs) of 52.7 ft, a peak period (Tp) of 14.3 seconds, with approach from 200 degrees (Figure 6-1 and Figure 6-2).

This design wave represents an extreme event with a small probability of occurrence. However, it is modeled after a known event (Hurricane Iniki), and the deepwater wave height occurrence was actually exceeded by Hurricane Iwa (see Table 4-4). The SIWWTP outfall is critical infrastructure for Honolulu, and cannot be allowed to be compromised, even by rare extreme events.

Figure 6-3 is a bathymetry profile and corresponding wave heights as modeled by the SWAN program in a shore-perpendicular transect off the project site. The figure shows wave heights decreasing as they approach the shore due to energy losses from wave spreading and bottom friction (note: the origin on the horizontal axis is the offshore model boundary). The model indicates that the breaking wave height is 45.3 feet (13.8m). Breaking criterion were adapted from Goda (2000), using the spectral wave criterion of (Hs)peak that compensates for changes in the wave spectra due to initial breaking of the long wave period "tail" of the wave spectrum.

Table 6-1 is a summary of the deepwater breaking wave parameters.

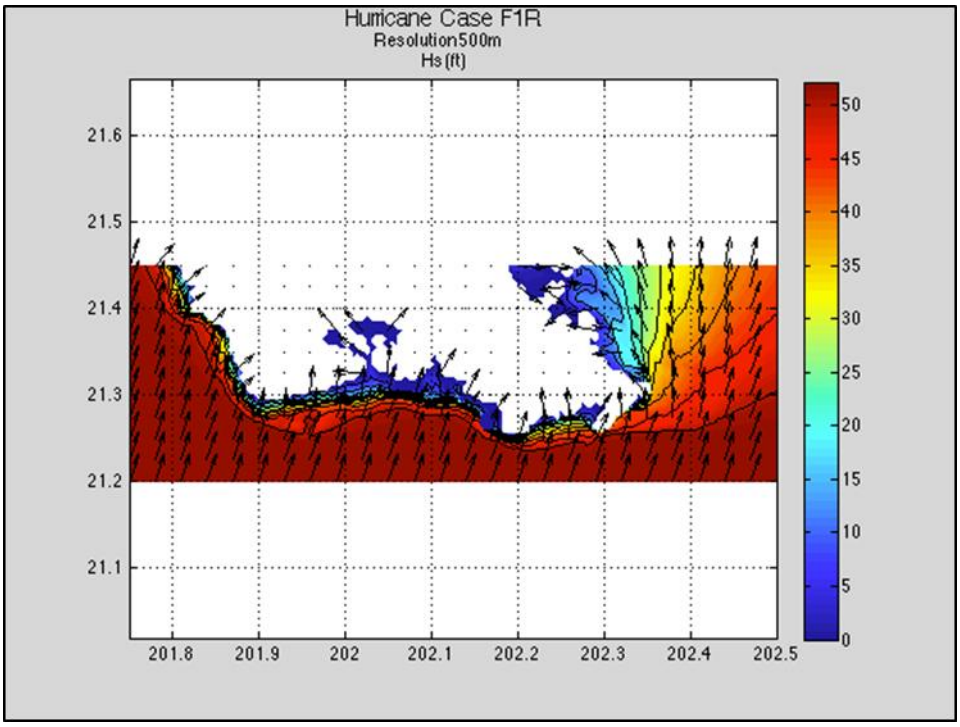


Figure 6-1. Wave approach vectors, deepwater design wave

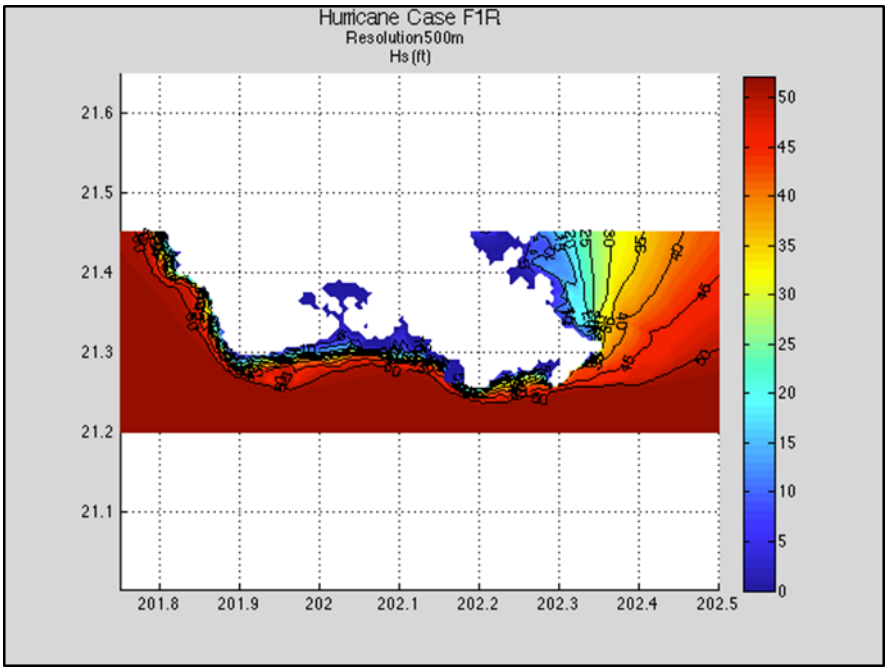


Figure 6-2. Wave height contours, deepwater design wave

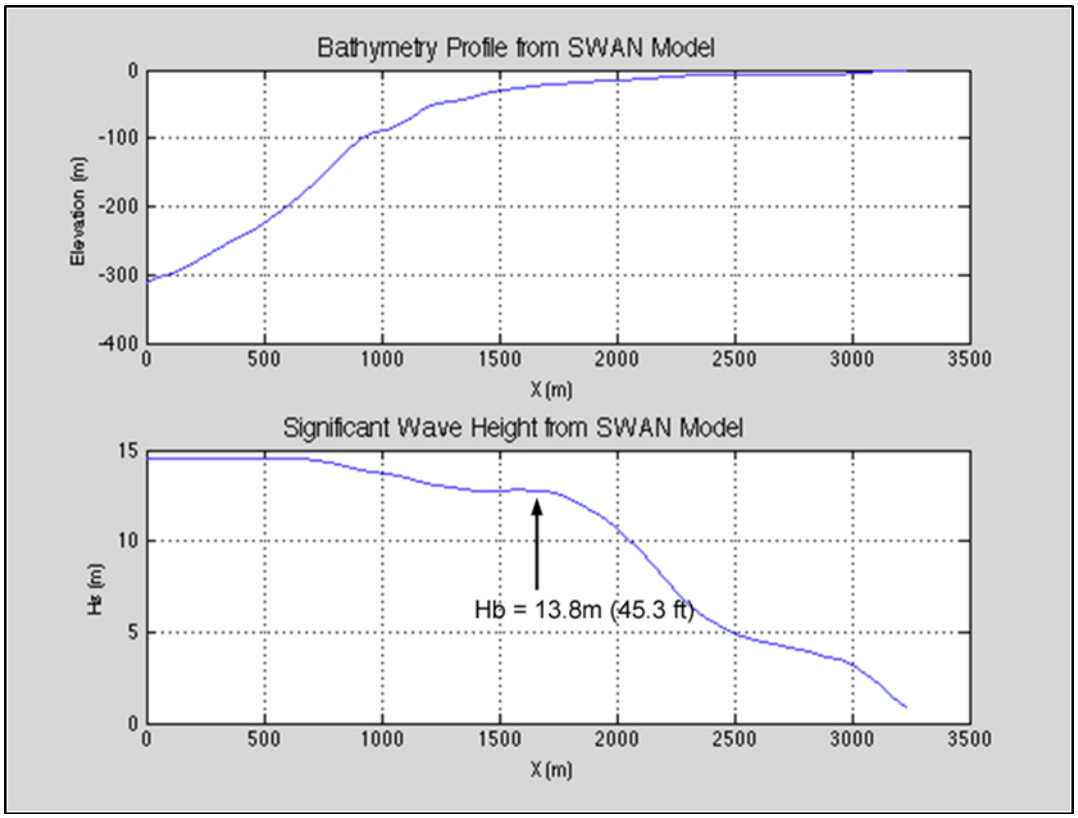


Figure 6-3. Bathymetry profile (top), and corresponding wave heights profiled off the project site

Table 6-1. Deepwater wave parameters (Hurricane F1R)

Deepwater Wave Height (Hs)	52.7 ft (16.1m)
Peak Wave Period (Tp)	14.3 s
Breaking Wave Height (Hs)peak	45.3 ft (13.8m)

6.3 Design Stillwater Level

In the present analysis, the total stillwater level rise considered is a linear combination of:

1) Astronomical tide (Sa),
2) Sea level rise due to atmospheric pressure reduction (Sp),
3) Wind tide caused by wind stress (Sx and Sy),
4) Wave set-up on the beach as a result of the breaking waves (Sw).

or,

$$S = Sa + Sp + Sx + Sy + Sw$$

The combination of Sp, Sx and Sy is defined as storm surge. Outside of the breaking surf zone, the stillwater level is composed of storm surge added to the tide level. Wave setup (Sw) is a phenomenon caused by wave breaking, and occurs only inside the surf zone.

As global sea level rise and the local mesoscale eddy phenomenon are also important long term considerations, they are also included as part of the stillwater level rise calculations.

The total water level rise in this report is therefore a combination of astronomical tide, storm surge, wave setup, and adjustments for global sea level rise and mesoscale eddy phenomena. In Hawaii, wave setup is typically the largest contributor to the stillwater level rise.

For design purposes, an astronomical tide (Sa) of 1.9 feet (Mean Higher High Water) is considered appropriate due to the frequency of occurrence of this level of high tide.

All cyclonic storms, and tropical storms and hurricanes in particular, have a central zone of lowered atmospheric pressure that causes an upward "bulge" of the water surface in the lower pressure areas. The pressure reduction rise (SP) is a regional effect that is a maximum at the storm center and a minimum at the periphery of the storm. It is calculated using the following equation:

$$S_P = 1.14 (P_N - P_r)$$

where,

P_N = normal atmospheric pressure (29.92 inches of mercury) and

P_r = storm pressure at radial distance *r* from the center.

The distance *r* is assumed to be the radius of maximum winds (13nm), and Pr is calculated to be 28.55 in-Hg (966.8 mb). The stillwater level rise due to the low-pressure effect of the hurricane is:

$$S_P = 1.14 (29.92 – 28.55) = 1.6 \text{ ft}$$

Wind setup (Sx + Sy) was estimated at 0.3 ft using methodology presented by C. L. Bretschneider (1967).

The design storm surge is therefore 1.9 feet, which is a combination of pressure setup and wind setup.

Wave setup (Sw) was determined using the numerical model CMS Wave. Figure 6-4 shows contours of wave setup at the project site and the surrounding area. At the location of the stop gate manhole, wave setup is 2.0 ft (0.6 m). The figure shows a considerable increase in wave setup, to 2.6 ft (0.8 m) at the beach locations to the east. The relatively deep water of the dredged seaplane runway, as well as the connected channels of Keehi Lagoon and Honolulu Harbor, dampen the influence of wave setup in the coastal areas of the lagoon, including the project site.

Other stillwater level rise phenomena that should be considered for long term design are global sea level rise due to climate change, and the potential influence of a mesoscale eddy.

A method for calculating global sea level rise was advanced by the U.S. Army Corps of Engineers, *Sea Level Change Considerations for Civil Works Programs* (EC1165-2-212, October 2011). Using the present rate of sea level rise for Honolulu (1.5 mm/yr) and the National Research Council (NRC) moderate sea level rise curve (NRC-II), a sea level rise of 1.35 ft is calculated over a 50-year period (the year 2065). Adjusting to 1.5 ft will allow some additional compensation for the mesoscale eddy effect.

Table 6-2 lists the stillwater level rise parameters and the total rise at the site under the design hurricane conditions.

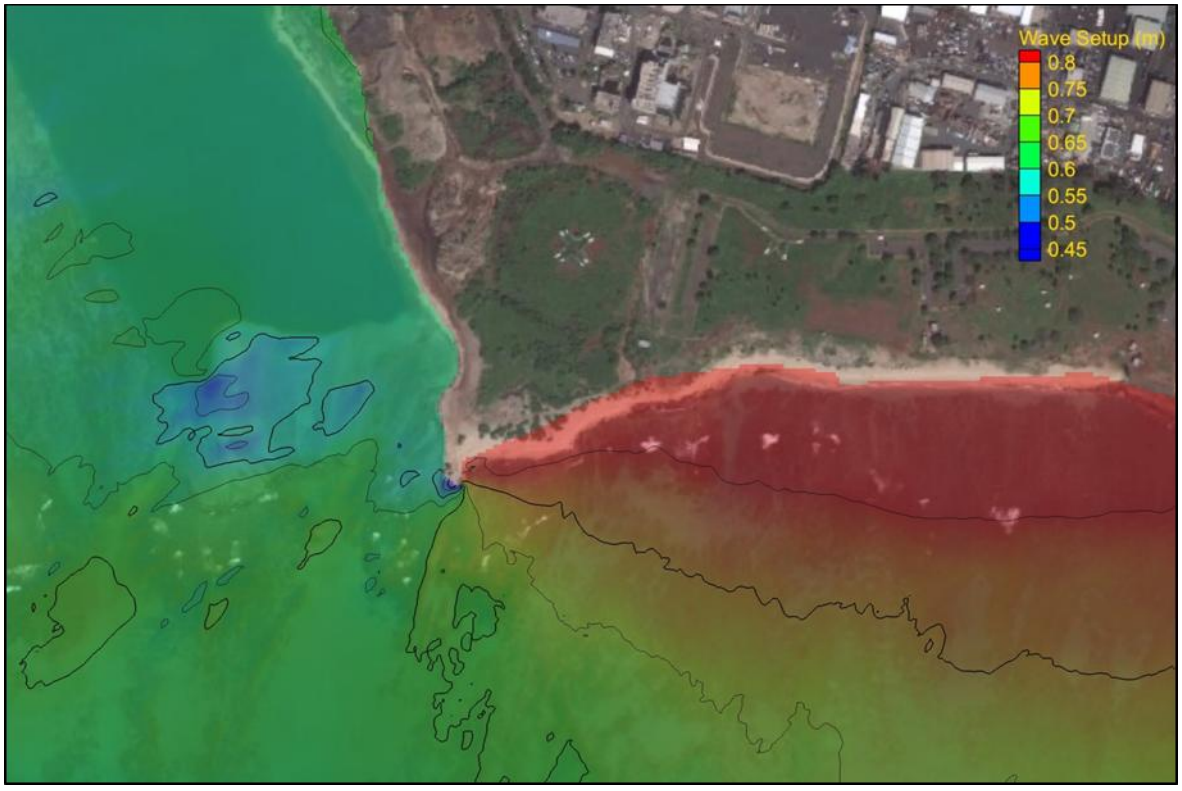


Figure 6-4. Wave setup calculated by CMS-Wave

Table 6-2. Design Stillwater level rise

Parameter	Stillwater Rise (ft - MLLW)
Tide (MHHW)	1.9
Storm Surge	1.9
Wave Setup	2.0
Other Phenomena (Global Sea Level Rise)	1.5
Total Stillwater Level Rise	**7.3**

6.4 Nearshore Wave Transformations and Design Wave

Because waves break in water depths proportional to their height, waves in shallow water are necessarily limited in size. Wave heights are generally highest at the offshore breaking point and gradually diminish in size as the bottom depths decrease. Attenuation of wave height in the on-shore direction is due to the combination of wave breaking and friction. Large storm waves will initially break offshore in deep water, then reform and continue shoreward as progressively smaller waves, with wave breaking occurring several times before reaching the shore. The wave height at the shoreline is therefore dependent on the water level at the shoreline.

The phenomena of wave shoaling, wave refraction, wave reflection, and wave diffraction have pronounced effects in very shallow water with complex bathymetric features. Figure 6-5 shows wave crests from the Bouss2D model that shows the transformation of wave patterns in shallow water and near the project site. The figure shows two zones of wave spreading separated by a zone of convergence. Of note is a pattern of waves in shallow water that approach the shoreline from the northwest at a 90-degree angle to the regular wave crests – an apparent reflection effect.

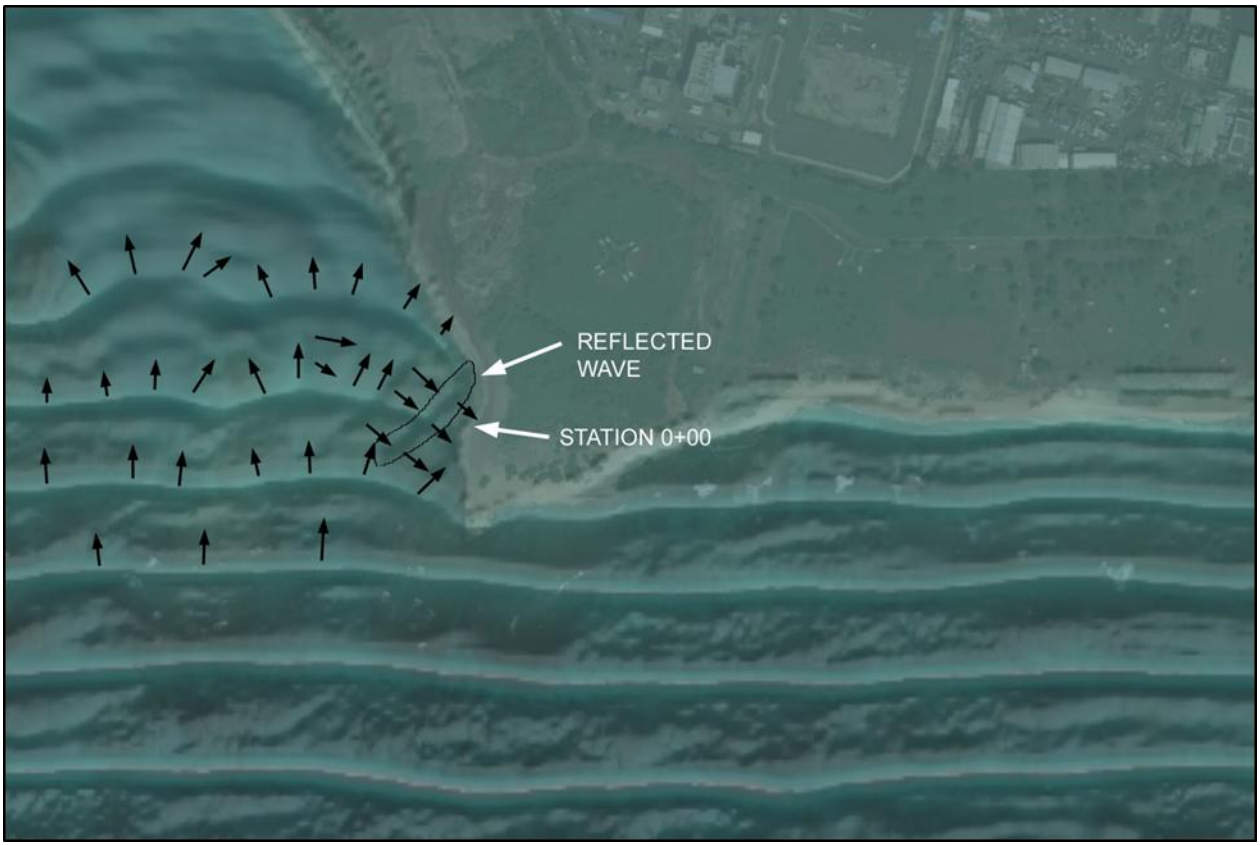


Figure 6-5. Wave transformations and patterns in shallow water (note: arrows show wave direction only)

Figure 6-6 shows wave height contours at the site as modeled by Bouss2D for design wave conditions and indicating a modeled wave height between 4.9 ft (1.5 m) and 6.6 ft (2 m) immediately offshore of Station 0+00.

Figure 6-7 is a detail from the topographic survey conducted by R.M.Towill Corp., and indicating that the water depths offshore of the stop gate manhole are relatively flat, with a nominal depth of -1 ft MLLW. The height of waves in shallow water is limited by the water depth and the *breaker height index* is the ratio of wave height to water depth. It varies as function of wave steepness and steepness of the bathymetric approach. A conservative estimate of depth limited wave height uses a breaker height index of 0.78:

$$Hb/db = 0.78$$

Where,

Hb = breaking wave height

db = depth of wave breaking

Using the total design stillwater level rise from Table 6-2, and adding the nominal water depth from the topographic drawing gives a breaking depth of 8.3 ft. Applying the breaker height index of 0.78 results in a design wave height of 6.47 ft. This is consistent with model calculated wave heights shown in Figure 6-6.

These results are conservative, but come from the application of a worst-case hurricane, and include the application of a sea level rise forecast that is 50-years distant. Table 6-3 is a summary of the design wave parameters.

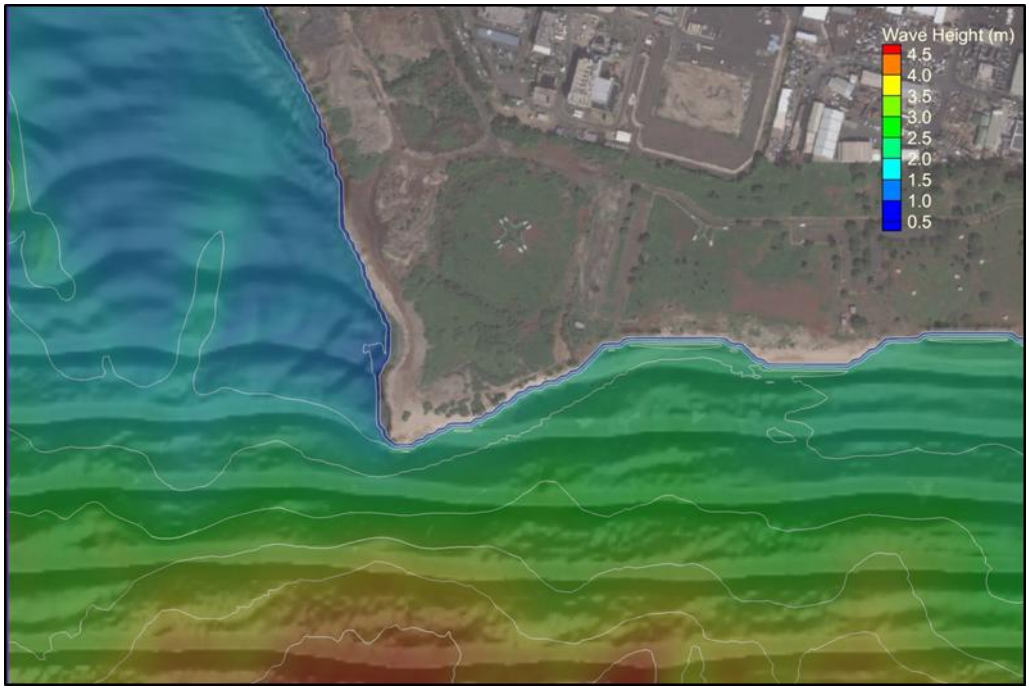


Figure 6-6. Wave height transformation at the project site from Bouss2D model

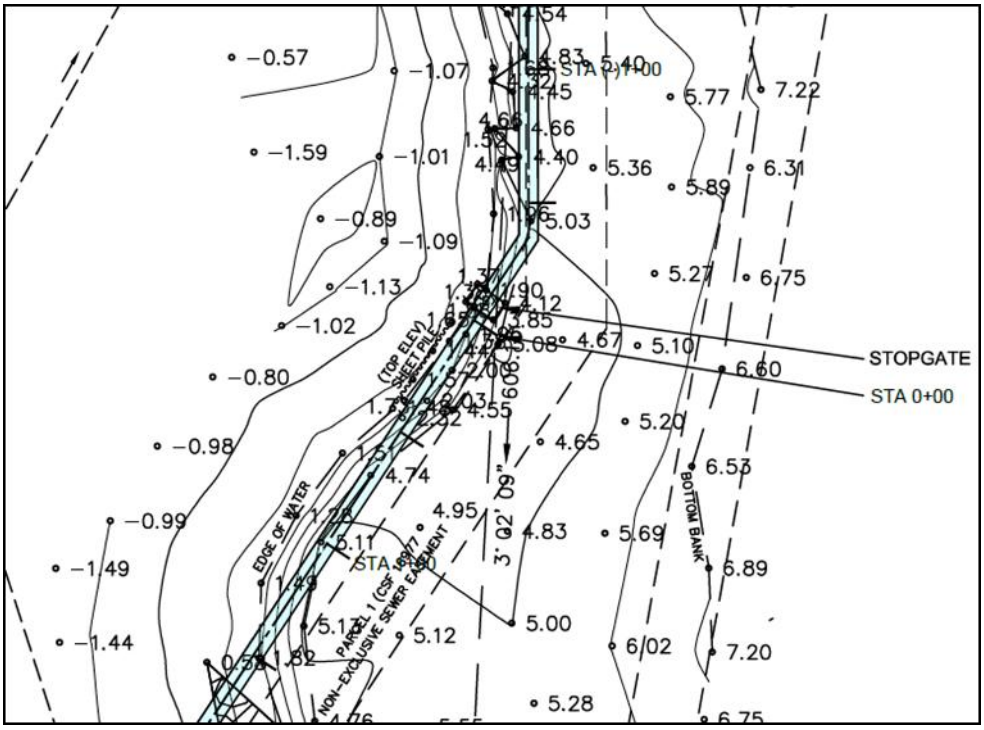


Figure 6-7. Topographic survey detail showing water depth at the project site

Table 6-3. Design wave summary

Parameter	Design Conditions
Deepwater Wave Height/Period	52.7 ft / 14.3 sec
Breaking Wave Height	45.3 ft
Total Stillwater Level Rise	7.3 ft
Nominal Water Depth (MLLW Datum)	1 ft
Design Water Depth	8.3 ft
Design Wave Height	6.5 ft

6.5 Armor Stone Specifications: Size and Layer Thickness

The median weight (W_{50}) of armor stone required is determined by:

$$W_{50} = w_r H^3 / K(S_r - 1)^3 \cot\theta$$

Where,

w_r = unit weight of stone (use 160 lbs/cu ft for basalt quarrystone)
H = design wave height (H = 6.5 ft)
K = stability coefficient (use 2.0)
S_r = specific gravity of the stone (2.5)
θ = side slope (use 1V to 2 H)

The armor unit nominal diameter is determined by:

$$D = (W_{50} / w_r)^{1/3}$$

Armor layer thickness is twice the nominal diameter. Unit weight and armor unit diameter are given in Table 6-4.

Table 6-4. Armor unit weight and nominal diameter

Design Wave Height (ft)	W_{50} (lbs)	Armor Unit Diameter (ft)	Layer Thickness (ft)
6.5	3,250	2.73	5.5

The allowable armors stone weight range is from 0.75 x W_{50} to 1.25 x W_{50}, or 2,440 lbs to 4,070 lbs.

The underlayer stone is nominally 10 percent of the armor stone range (note: the lower end of the range is expanded somewhat to increase stone packing density and improve stone availability and cost), or 150 to 400 lbs.

6.6 Design Section

The design section for the shore protection revetment is shown in Figure 6-8. Primary considerations for the design include:

- All construction is to take place above the pipeline design elements: the original trench elements, including sheet pile, rocking, and the pipeline itself are not disturbed;
- Although the much of the substrate is composed of scour resistant coralline cobbles, it is considered an erodible substrate and will require a scour apron;
- The structure will be overtopped during design conditions. A wide crest is necessary to protect the pipeline and pipeline trench, and help diminish wave overtopping.

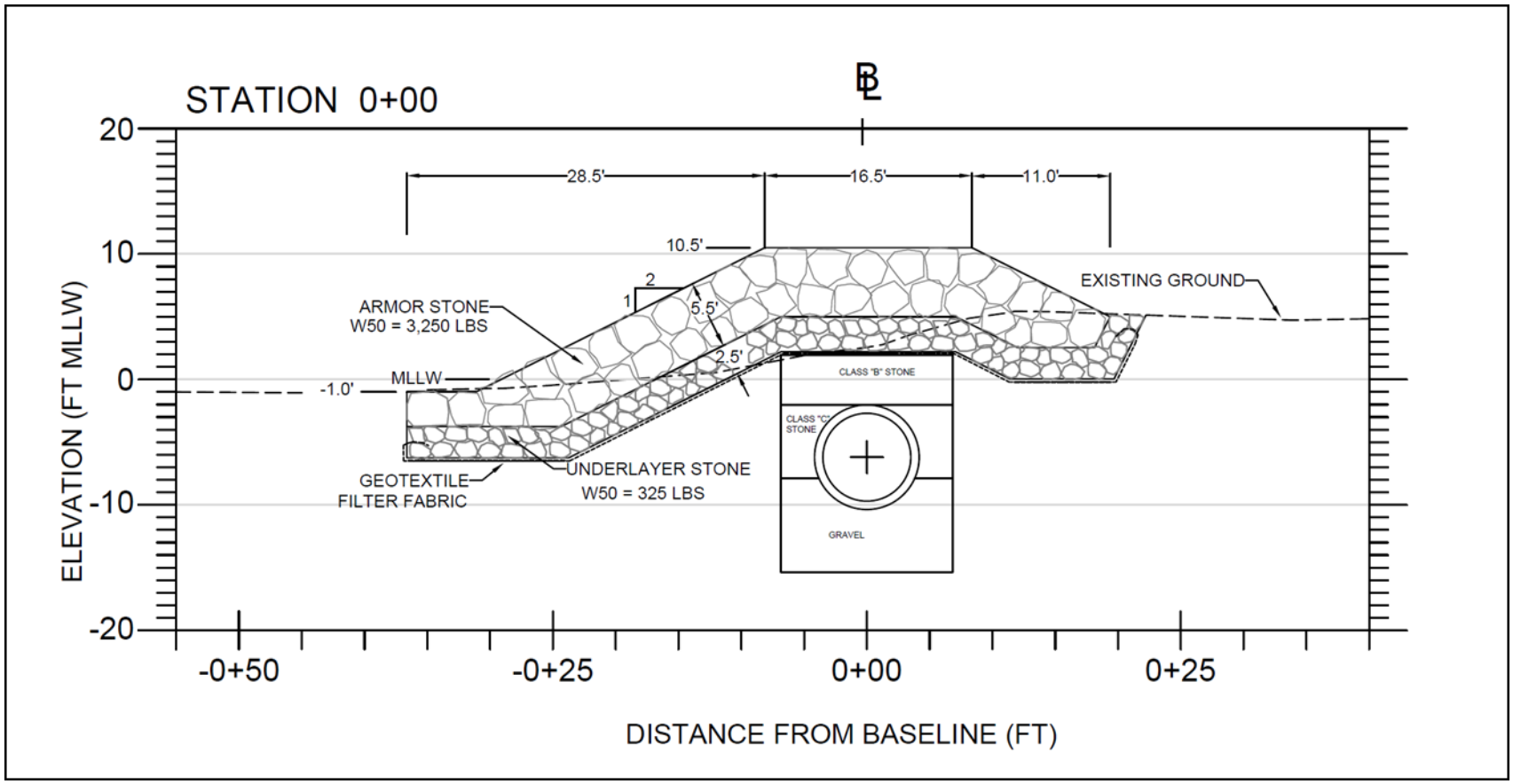


Figure 6-8. Revetment design typical section

6.7 Design Layout

The design layout for the revetment is shown in Figure 6-9. The revetment follows the pipeline alignment from Station (-)2+50 to Station 1+50, where it returns landward for approximately 150 ft. The extensive landward return is to prevent flanking erosion of the structure, as the existing shore protection will likely continue to degrade with time. The southern shoreline of Sand Island at this location is reasonably protected by a natural beach with a good volume of sand. However, overtopping will likely occur during a design condition due to the low-grade elevations, and much of the area landward of new structure can be expected to be awash during such an event. The landward slope and embedment of the structure will prevent significant damage.

The structure terminates at the northern end (Station (-)2+50) at a topographic high, where the entire structure can be embedded. Flanking at this end of the structure is unlikely due to the low wave activity in the seaplane channel.

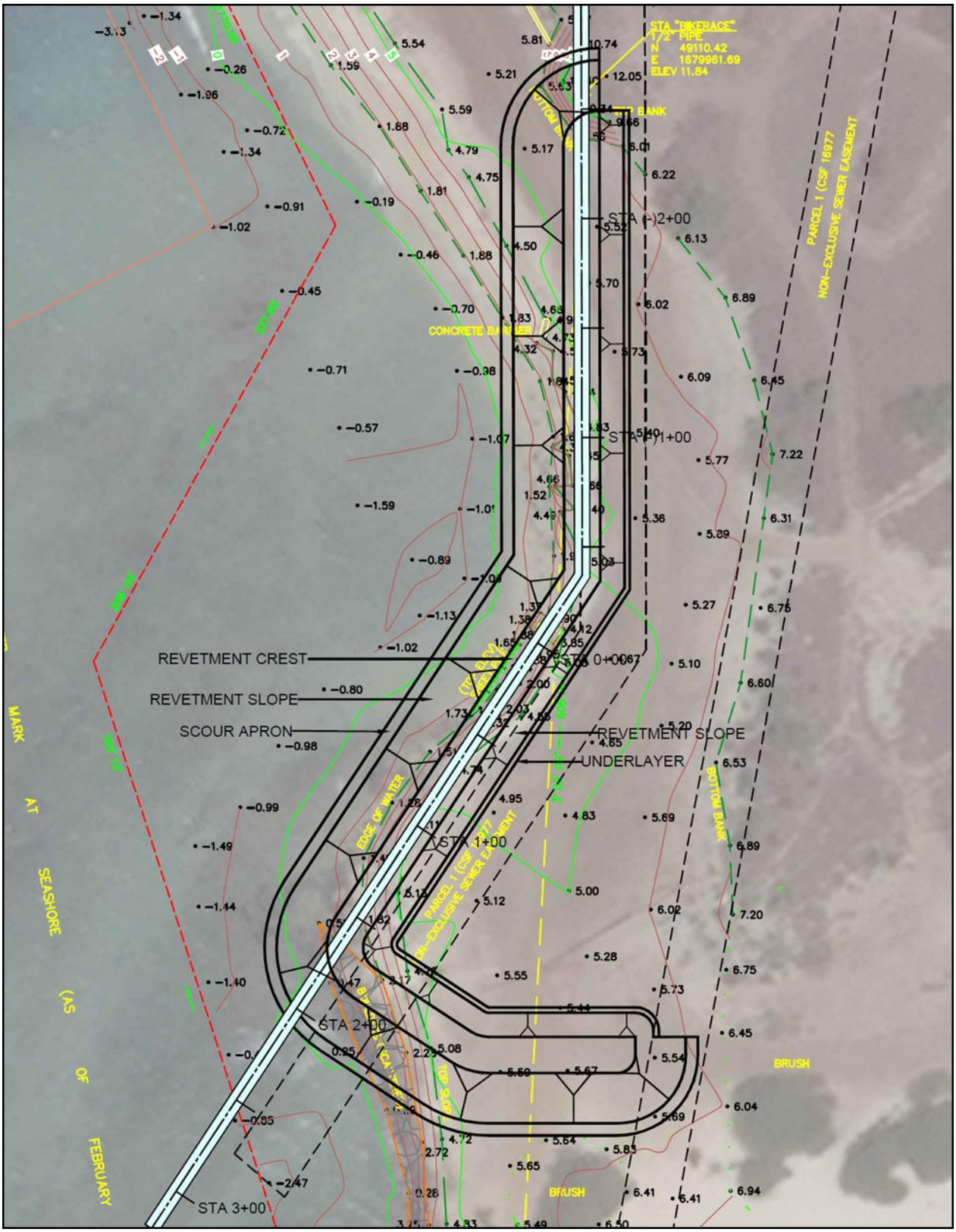


Figure 6-9. Revetment design layout

7. PROJECT IMPACTS

The project site is located in a highly altered and impacted coastal environment. Sand Island, including the project shoreline, were created by placement of dredge material on the fringing reef during dredging and excavation of Honolulu Harbor. Dredged seaplane runway channels cut through the fringing reef to the east. Boulders and concrete debris remain on the reef and shoreline, remnants of past efforts to stem hundreds of feet of shoreline erosion that has occurred since 1955. Construction of the outfall pipeline itself required trenching through the reef and beach, and placement of rock fill, sheet pile, and the concrete stop gate. Thus, the shoreline is presently in an eroded, degraded state that is hazardous for beach and shoreline users. Further erosion could result in damage to the outfall that could have catastrophic health, environmental and economic consequences.

The proposed revetment shore protection is not expected to negatively alter existing conditions at the site or have negative impacts on the environment. The revetment is limited to the approximate 400 feet of pipeline alignment that is presently threatened with erosion. The revetment will halt shoreline erosion along this alignment. As both ends of the revetment are embedded into the existing backshore ground, the revetment should not alter the shoreline or coastal processed to the north, south or east. There should be no marine impacts other than short term turbidity during construction.

Impacts are further addressed in terms of the following significance criteria as presented in *Hawaii Administrative Rules Title 11 Department of Health Chapter 200 Environmental Impact Statement Rules.*

(1) *"Irrevocable commitment to loss or destruction of any natural or cultural resource."* There are no significant flora or fauna which would be lost due to emplacement of the revetment. No threatened or endangered species would be impacted by the project. No known cultural resources are located on the site.

(2) *"Curtails the range of beneficial uses of the environment."* There will be no impact on public access to the shoreline. There will be no significant change in lateral access along the shore. There will be no impact to fishing on the reef flat seaward of the project site.

(3) *"Conflicts with the state's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders."* State waters will not be impacted by the project in any way, with the exception of possible short term turbidity during construction.

(4) *"Substantially affects the economic or social welfare of the community or state."* The project would have no adverse social or economic impact to the state. The project would have significant positive social and economic impact by preventing damage to the only wastewater outfall servicing Honolulu.

(5) *"Substantially affects public health."* The project has no adverse public health impacts, and would have positive health impacts by prevent damage to the outfall, and consequence discharge of wastewater along the coastline.

(6) *"Involves substantial secondary impacts, such as population changes or effects on public facilities."* The project will have no impact on public services or facilities, or result in population changes.

(7) *"Involves a substantial degradation of environmental quality."* The project will have no significant long-term adverse environmental impacts nor will it degrade environmental quality. The project will not permanently degrade water quality, nor impact marine flora and fauna. The project would have significant positive impact to environmental quality by preventing discharge of wastewater along the coastline.

(8) *"Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions."* The revetment would be a stand-alone project, with no cumulative impacts or commitment for larger actions.

(9) *"Substantially affects a rare, threatened, or endangered species or it habitat."* The project will not affect rare, threatened, or endangered species or its habitat.

(10) *"Detrimentally affects to air or water quality or ambient noise levels."* No debris, petroleum products, or other construction-related substances or materials will be allowed to flow, fall, leach or otherwise enter the coastal waters. All construction material will be free of contaminants or pollutants. Best Management Practices will be adhered to during construction to minimize environmental pollution and damage. There will be some additional noise above ambient during construction resulting from equipment operation.

(11) *"Affects or is likely to suffer damage by being 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 revetment is designed to protect the outfall pipeline and prevent shoreline erosion during direct impact by a hurricane. Thus, the revetment is not likely to suffer damage.

(12) *"Substantially affects scenic vistas and view planes identified in county or state plans or studies."* The revetment is a sloping boulder structure that rises to an elevation of 10.5 feet, approximately 4 feet above ground elevation. It will present a new, visible structure along this shoreline. The nature of the structure, however, is similar to the degraded boulder revetment that current exists at the site. There are no backshore uses or structures at the project site whose view planes would be affected.

(13) *"Requires substantial energy consumption."* Construction of the revetment will require consumption of energy. However, once constructed, it would not entail any long-term commitment to energy use.

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APPENDIX C

Biological Resources Survey Report

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SWCA®
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Biological Resources Survey Report for the Sand Island Revetment Project

Submitted to

SSFM International

Prepared by

SWCA Environmental Consultants

March 2017

BIOLOGICAL RESOURCES SURVEY REPORT FOR THE SAND ISLAND REVETMENT PROJECT

Prepared for

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SWCA Project No. 32818

March 2017

EXECUTIVE SUMMARY

SSFM International requested that SWCA Environmental Consultants (SWCA) conduct a terrestrial and marine biological resources survey in support of the Sand Island Revetment project. The project is located on the southwest point of Sand Island on the island of Oʻahu. This report summarizes the results of the biological resources survey.

SWCA conducted the terrestrial biological resources survey on March 3, 2017, using a pedestrian survey method. All vascular plant species and their relative abundance, as well as vegetation types, were recorded. Wildlife were surveyed for in the morning hours from 08:30 to 09:45 when wildlife species are most likely to be active.

The vegetation types and plant species identified during the survey are not considered unique. One indigenous plant species was observed—a grass species, *Sporobolus virginicus*—but it is not a federal- or state-listed threatened or endangered species, a species proposed for listing, or a candidate species. No federal-or state-listed endangered plant species were observed in and around the survey area. Therefore, the proposed project is not expected to have a significant, adverse effect on terrestrial vegetation.

No federal- or state-listed endangered birds were observed in and around the waterways of the survey area. However, one state-listed species—the threated white tern (*Gygis alba*)—was observed flying over the survey area, but no nesting activity was observed at the revetment site. The Hawaiian hoary bat (*Lasiurus cinereus semotus*)—a federal- and state-listed endangered mammal and the only native terrestrial mammal species that is still extant within the Hawaiian Islands (U.S. Fish and Wildlife Service 1998)—was not observed, and although suitable habitat for this species exists in the survey area, the hoary bat was never historically observed on or near the survey area and therefore it is not likely to occur. Other federal- or state-listed terrestrial faunal species with potential to occur on the island of Oʻahu are not likely to occur in the survey area because it is either outside the range of the species or because appropriate habitat is not found in the survey area. The survey area does not overlap critical habitat of any listed terrestrial faunal species. Therefore, the proposed project is not expected to have a significant, adverse effect on terrestrial wildlife.

SWCA conducted the marine biological resources survey on March 14, 2017. A qualitative marine snorkel survey was used for this survey, with a focus on marine fauna (corals, fishes, and macroinvertebrates) and invasive algae observed within 150 feet from shoreline.

None of the marine fauna recorded in the marine survey area are federal- or state-listed threatened, endangered, proposed listed, or candidate species. Several native fishes and a few invertebrates were observed; however, reef-building corals were very uncommon and scattered amongst the hard surfaces imported to reduce erosion. These hard surfaces were almost entirely covered with algal turf with no macroalgae present. No invasive algae species were recorded during the survey. This finding is significant because construction activities can enhance the spread of invasive algae. Because no invasive algal species or threatened or endangered marine species were recorded in the area, the proposed project is not expected to have a significant, adverse effect on biological marine resources.

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1. INTRODUCTION

SSFM International (SSFM) requested that SWCA Environmental Consultants (SWCA) conduct water quality, waters of the U.S., and marine and terrestrial biological resources surveys for the Sand Island Revetment project on Sand Island on the island of O‘ahu. The project involves construction improvements to the Sand Island Wastewater Treatment Plant (WWTP) Ocean Outfall Stop Gate Structure. This report summarizes the findings of the terrestrial biological resources survey conducted by SWCA Botanist Danielle Frohlich and Wildlife Biologist James Breeden on March 3, 2017, and the marine survey conducted by SWCA Biologists Dr. Robert Kinzie III and Bryson Luke on March 14, 2107. The results of the surveys will support the preparation of a state environmental assessment (EA) and various permits.

2. DESCRIPTION OF THE SURVEY AREA

The project is located on the southwest point of Sand Island (TMK 1-5-041:003 and 1-5-041:006) in Honolulu, O‘ahu. Sand Island is a human-made island built in the early twentieth century on preexisting reef flats along the south and west sides of Honolulu Harbor. Parts of the island were constructed from dredge spoils as the Honolulu Harbor was enlarged and maintained. At one time, Sand Island was connected to the O‘ahu shoreline west of Kapalama Basin, then separated again when the Kalihi Ship Channel was reopened (AECOS 1979). By the 1940s, the island was more or less in its present configuration. Today, access to Sand Island is by a bascule bridge at the western end of the island.

SSFM proposes to construct a 450-foot-long rock revetment to armor the shoreline and to prevent further shoreline erosion. The revetment is proposed to extend from the approximate location where the outfall extends into the ocean, northward along the shoreline to the dredge channel. The survey area for the terrestrial survey covered the linear length of the revetment (450 feet, including 250 feet of shoreline) and the immediate vicinity, totaling 2.50 acres (Figure 1). The area is currently armored with basalt riprap at the seaward end and transitions to concrete rubble and sand eastward. The survey area is bordered on the east end by the Sand Island Recreation Area, which served as the point of entry for the survey team. Because Sand Island is human-made, its topography is flat, and its landscape is relatively barren sand and ruble with primarily common non-native vegetation coverage. To characterize the surrounding marine environment, the survey area for the marine survey was roughly 150 feet from the shoreline near the proposed revetment and totaled approximately 4.25 acres (see Figure 1).

The mean annual rainfall for the survey areas is approximately 22.2 inches (563.3 millimeters). Rainfall is typically higher in December and lower in June through August (Giambelluca et al. 2103). The Honolulu International Airport (HNL) recorded higher-than-average rainfall from December 2016 through March 2017 (National Oceanic and Atmospheric Administration [NOAA] 2016). The average temperatures range from a low of 70 degrees Fahrenheit to an average high of 85 degrees Fahrenheit (NOAA 2016). Weather conditions during the surveys were moderate, with light variable winds, mostly sunny skies, and moderate temperature of approximately 76 degrees Fahrenheit.

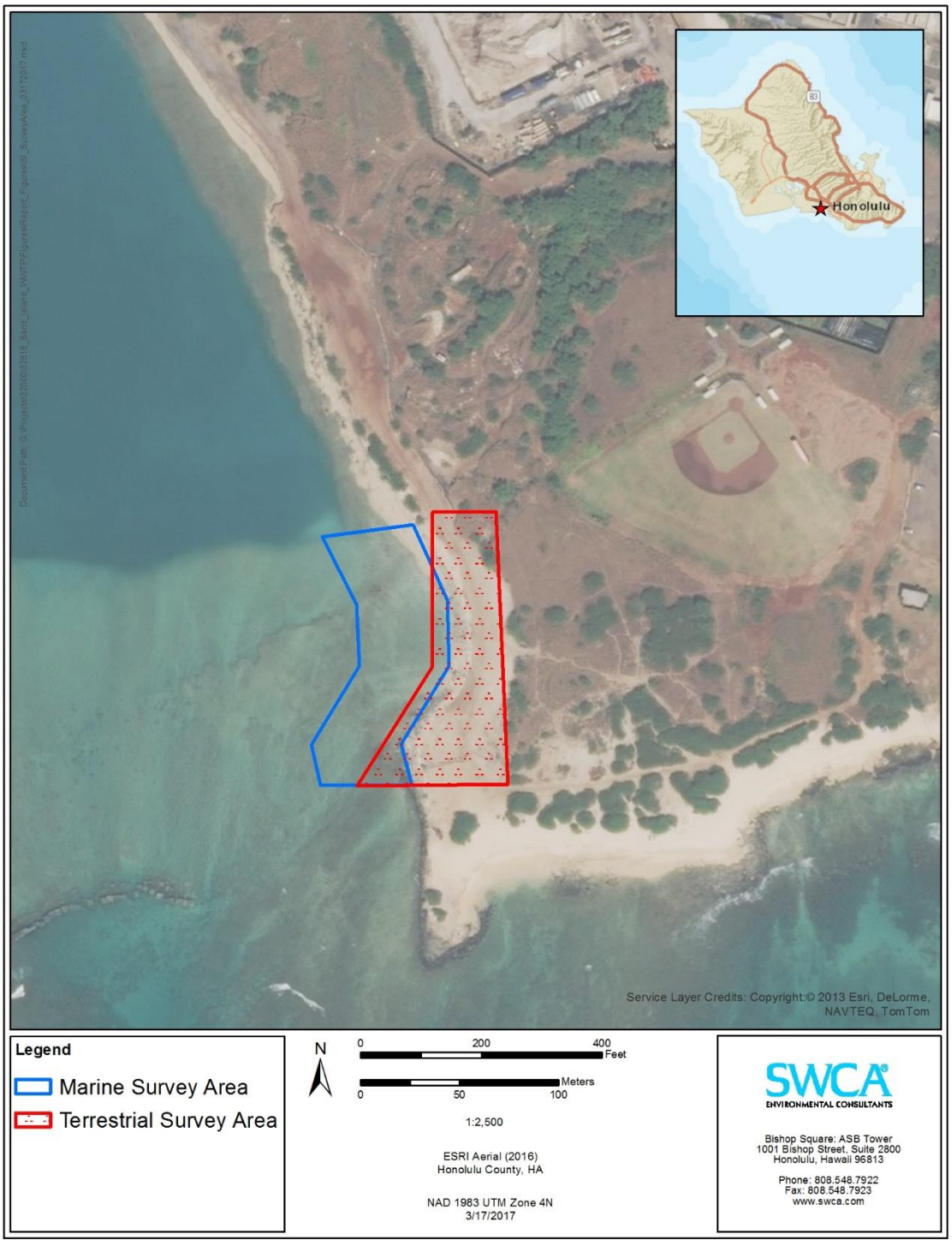

Figure 1. Marine and terrestrial survey areas.

3. METHODS

Before conducting the surveys, SWCA reviewed available scientific and technical literature regarding natural resources in and near the survey areas. This literature review encompassed a thorough search of referenced scientific journals, technical journals and reports, environmental assessments, environmental impact statements, relevant government documents, U.S. Fish and Wildlife Service (USFWS) online data, and unpublished data that provide insight into the area's natural history and ecology. SWCA also reviewed available geospatial data, aerial photographs, and topographic maps of survey areas.

SWCA conducted the terrestrial biological resources survey on March 3, 2017, and the marine biological resources survey on March 14, 2017.

3.1. Terrestrial Survey

3.1.1. Flora

SWCA conducted a pedestrian flora survey to document all vascular plant species and vegetation types in the terrestrial survey area. Areas more likely to support native plants (e.g., rocky outcrops and shady areas) were more intensively examined. The survey team walked the entire linear length of the proposed revetment (450 feet, including 250 feet of shoreline) and the immediate vicinity, totaling 2.5 acres. A global positioning system (GPS) unit was used to navigate the survey area, and a digital camera was used to document vegetation species and types.

Plants recorded during the survey are indicative of the season ("rainy" versus "dry") and the environmental conditions at the time of the survey. It is likely that additional surveys conducted at a different time of the year would result in minor variations in the species of plants observed.

3.1.2. Fauna

SWCA conducted the terrestrial fauna survey in the morning from 08:30 to 09:45 when wildlife were most likely to be active. Visual and auditory observations were included in the survey, and visual surveys were conducted with the use of binoculars. All observed birds, mammals, reptiles, amphibians, and invertebrate species were noted during the survey. Acoustic surveys for the federal- and state-listed endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) were not conducted, although areas of suitable habitat for roosting and foraging were noted during the survey.

3.2. Marine Survey

SWCA conducted the marine snorkel survey from 12:30 to 13:45. The tide was low (approximately -5 centimeters at 11:30), winds were out of the south, and the surf was small (less than 30 centimeters). Conditions were sunny but hazy. Even though the surf was small, visibility was low in the sandy areas because of suspended sediment.

The snorkel survey began at the survey area's midpoint because this area was easy to access via a sand beach. The survey proceeded north from this point (hereinafter referred to as *shoreward*) to the project boundary, then proceeded south past the entry point to the southern (hereinafter referred to as *seaward*) project boundary, and then back to the survey area's midpoint. Areas with bare sand bottom or areas with sand with unconsolidated cobbles and rubble were surveyed quickly, because these areas had no evidence of large fauna.

The bottom of the marine survey area generally consists of a hard bottom. This bottom is likely the remnants of the original fringing reef upon which Sand Island was constructed. The hard bottom is interrupted by sandy areas, cobbles embedded in sand, and hard outcrops.

The sand areas are not arranged in a pattern of channels that are typical of a natural reef coastline. The sand areas contribute a higher percentage cover close to the channel, or close to the shore in some areas. The hard outcrops are both natural (probably limestone) and human-made and are either discarded concrete pilings or basalt boulders emplaced along the shoreline, especially in the seaward half of the survey area. Other hard items including old tires, metal posts, and other waste occur in the survey area. Most of the hard surfaces, whether small cobbles, large limestone structures, or the submerged human-made hard substrate, are covered with algal turf.

4. RESULTS

4.1. Terrestrial Survey

4.1.1. Flora

No federal- and state-listed threatened, endangered, or candidate plant species proposed for listing were observed in the survey area. In all, 10 plant species were recorded in the survey area during the survey (Table 1). Of these, only one species—ʻakiʻaki grass (*Sporobolus virginicus*)—is native to Hawaiʻi. This indigenous species is common throughout the Hawaiian Islands (Wagner et al. 1999).

Table 1. Plant Species Observed in the Survey Area

Family	Scientific Name and Authorship	Hawaiian and/or Common Name	Status
MONOCOTS			
Poaceae	*Bothriochloa pertusa* (L.) A. Camus	Pitted beardgrass	Non-native
	Cenchrus ciliaris L.	Buffelgrass	Non-native
	Eragrostis amabilis (L.) Wight & Arn.	Lovegrass	Non-native
	Sporobolus virginicus (L.) Kunth	ʻAkiʻaki, ʻaki, mahiki, māhikihiki, mānienie, mānienie ʻakiʻaki, mānienie māhikihiki, mānienie maoli, seashore rushgrass	Indigenous
DICOTS			
Asteraceae	*Pluchea indica* (L.) Less.	Indian fleabane, Indian pluchea, marsh fleabane	Non-native
Chenopodiaceae	*Atriplex semibaccata* R. Br.	Australian saltbush	Non-native
Fabaceae	*Leucaena leucocephala* (Lam.) de Wit	Koa haole, ēkoa, lilikoa	Non-native
	Prosopis juliflora (Sw.) DC.	Algaroba, mesquite	Non-native
	Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	Algaroba, mesquite, kiawe	Non-native
Malvaceae	*Sida ciliaris* L.	–	Non-native

Notes: The taxonomy and nomenclature used in this table are in accordance with Wagner et al. (1999), Wagner and Herbst (2003), and Staples and Herbst (2005). Recent name changes are those recorded in Wagner et al. (2012).

The vegetation in the survey area consists of two vegetation types: 1) coastal strand and 2) mixed grassland and shrubland.

Coastal Strand Vegetation

Coastal strand vegetation occurs in the survey area as a narrow band along shorelines in the survey area and is influenced by salt spray, constant wind, high light intensity, high temperature, and shifting sands. As a result, the plants found here are adapted to these environmental stresses. The most common shrub species in this vegetation type are Indian fleabane *(Pluchea indica)*, kiawe *(Prosopis pallida)*, and algaroba *(Prosopis juliflora).* Australian saltbush *(Atriplex semibaccata)* is a common herbaceous species in this vegetation type (Figure 2).

Figure 2. Coastal strand vegetation in the survey area. Plant species pictured here are kiawe and Australian saltbush.

Mixed Grassland and Shrubland

The mixed grassland and shrubland vegetation type is found inland of the narrow band of coastal strand vegetation and shares some components with it. The substrate is sandy in some places, and in other places it is reddish-brown clay soil. The area is generally open, with buffelgrass *(Cenchrus ciliaris)* covering large areas. Scattered in this vegetation type are thickets made up of kiawe and algaroba (Figure 3). The low-lying herbaceous species *Sida ciliaris* can also occasionally be seen.

Figure 3. Mixed grassland and shrubland vegetation in the survey area. Plant species pictured here are buffelgrass, kiawe, and algaroba.

4.1.2. Fauna

No federal- and state-listed threatened, endangered, or candidate terrestrial wildlife species were found during the pedestrian surveys. However, the state threatened white tern (*Gygis alba*) was observed flying over the survey area. The endangered Hawaiian hoary bat was not observed, and although suitable habitat for this species exists in the survey area, the hoary bat was never historically observed on or near the survey area and therefore it is not likely to occur.

Birds

Most of the bird species observed in the survey area are species commonly found in disturbed, low- to mid-elevation areas on O‘ahu. In all, 12 bird species were documented (Table 2). Of these, one species—the white tern—is classified as threatened by the State of Hawai‘i on the island of O‘ahu. In all, six species observed during the survey are protected by the Migratory Bird Treaty Act (MBTA).

Table 2. Bird Species Observed in and Near the Survey Area

Scientific Name	Common Name	Status	MBTA
Acridotheres tristis	Common myna	NN	–
Arenaria interpres	Ruddy turnstone	M	X
Bubulcus ibis	Cattle egret	NN	X
Cardinalis cardinalis	Northern cardinal	NN	X
Estrilda astrild	Common waxbill	NN	–

Table 2. Bird Species Observed in and Near the Survey Area

Scientific Name	Common Name	Status	MBTA
Geopelia striata	Zebra dove	NN	–
Gygis alba	White tern	ST	X
Paroaria coronata	Red-crested cardinal	NN	–
Pluvialis fulva	Pacific golden-plover	M	X
Pluvialis squatarola	Black-bellied plover	M	X
Pycnonotus cafer	Red-vented bulbul	NN	–
Streptopelia chinensis	Spotted dove	NN	–
	Total	**12**	**6**

Status: ST = state threatened, M = migrant, NN = non-native permanent resident; MBTA = protected under the Migratory Bird Treaty Act.

Mammals

The endangered Hawaiian hoary bat is the only native terrestrial mammal species that is still extant within the Hawaiian Islands (USFWS 1998). Although the Hawaiian hoary bat was not observed during the survey and was never historically observed on or near the survey area, the Hawaiian hoary bat is an insectivore and is regularly observed in less developed areas foraging over streams, reservoirs, and wetlands (U.S. Department of Agriculture 2009). Therefore, the waterways and vegetation types in the survey area are considered suitable bat foraging habitat.

The survey area is adjacent to the Sand Island Recreation Area, where it is common to find feral cats (*Felis catus*) and stray dogs (*Canis familiaris*). No other mammals were observed during the pedestrian survey. Although the small Indian mongoose (*Herpestes javanicus*), house mouse (*Mus musculus*), and rats (*Rattus* spp.) were not detected, they are likely to occur in the survey area because of the proximity to development and the recreation area.

Marine Mammals and Turtles

The survey area does encompass Hawaiian monk seal (*Neomonachus schauinslandi*) critical marine habitat but does not encompass any other designated or proposed critical habitat for threatened or endangered species.

The endangered Hawaiian monk seal and threatened green sea turtle (*Chelonia mydas*) were not observed during the survey; however, these animals may haul out or bask on the beach or be found in the marine waters nearby. The survey area's critical marine habitat for the Hawaiian monk seal extends from the shoreline seaward to the 656-foot (200-meter) depth contour.

Reptiles and Amphibians

All of the terrestrial reptiles or amphibians in Hawai‘i are non-native introductions. No reptiles and amphibians were detected during the survey.

Insects and Other Invertebrates

No native invertebrates were observed during the survey. Non-native invertebrates observed include the spot-winged glider dragonfly (*Pantala hymenaea*) and an unidentified blue butterfly.

4.2. Marine Survey

4.2.1. Algae

All the algal turf contained trapped sand and silt worked into the structure, making identification problematic (Figure 4). Throughout the area, some small emergent (a few centimeters in height) macroalgal species were recorded, including the bacterial *Lyngbya*, the calcifying green algae *Halimeda* and *Neomeris*, and the non-calcifying *Codium edule* and *Dictyosphaeria versluysii.* The introduced red alga *Acanthophora spicifera* also rose above the turf level, but was usually heavily colonized by smaller filamentous algae. None of the algal thali were taller than a few centimeters, so there was no appearance of macroalgal beds. The invasive algae *Gracilaria salicornia, Kappaphycus* sp./*Eucheuma* sp., and *Avrainvillea amadelpha* were not seen.

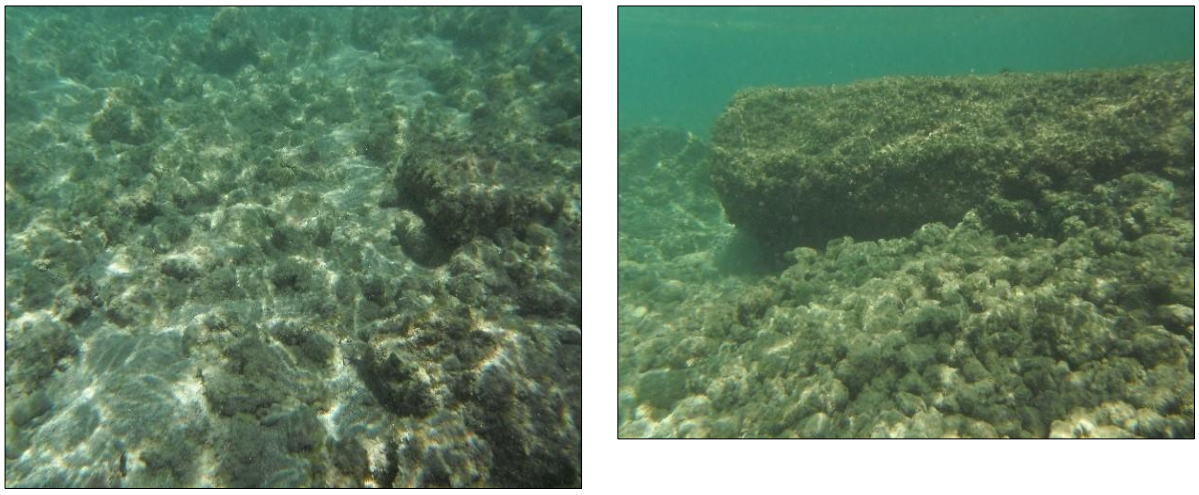

Figure 4. Sand bottom with embedded cobbles covered with algal turf (left). Large algal turf–covered structure is probably limestone or other fill material (right).

4.2.2. Fauna

Large marine invertebrates were very uncommon. Three individual sea cucumbers (*Actinopyga mauritiana*) were seen in the shoreward parts of the survey area, and all were associated with hard substrata. Three individual small urchins (*Echinometra mathaei*) were found together on a single rock. All three were in deep cavities; therefore, it is likely that more of these urchins were in the survey area in cryptic habitats. The paucity of visible invertebrates was striking. Even in the intertidal portions of the boulder riprap, snails and barnacles were not seen. A special search was conducted for coral species, and five coral species were observed in the survey area (Table 3).

Table 3. Coral Species Observed in the Survey Area

Number	Species	Depth (meters at low tide)	Distance from Shoreline (meters)
1	*Leptastrea purpurea*	0.75	19.5
2	*Leptastrea purpurea*	0.75	36.5
3	*Palythoa caesia*	0.50	14.5
4	*Pocillopora damicornis*	0.50	7.0
5	*Leptastrea purpurea*	0.30	3.5

Given the paucity of invertebrates and low density of macroalgae, the fish fauna was surprisingly diverse. Most individuals were small and were likely juveniles. Except for a few species, the numbers were low. All fishes seen were associated with hard substrata, especially those with structural complexity. The complex peninsula that juts into the survey area about midway along the length was particularly rich in fishes. The fishes located at the hard outcrops were observed anywhere in the survey area where a large rocky outcrop provided shelter. In all, 11 fish species were recorded in the survey area (Table 4). Generally, these fishes moved freely throughout the area where they could find shelter. The fishes located in the peninsula area appeared to be more sedentary and were less commonly seen than those in the hard outcrops.

Table 4. Fish Species Observed in the Survey Area

Scientific Name	Hawaiian and/or Common Name	Location	Abundance
Zanclus cornutus	Moorish idol	Hard outcrops	+++
Kuhlia sp.	Āholehole	Hard outcrops	+++
Abudefduf abdominalis	Mamo	Hard outcrops	++
Acanthurus triostegus	Manini	Hard outcrops	++
Thalassoma duperrey	Saddle wrasse	Rocky peninsula	+
Naso sp.	Surgeon fish (juvenile)	Rocky peninsula	+
Mulloidichthys flavolineatus	Weke ʻā (juvenile)	Hard outcrops	+++
Albula glossodonta	ʻOīʻo (juvenile)	Hard outcrops	+
Acanthurus nigrofuscus (?)	Brown surgeon fish (juvenile)	Rocky peninsula	+
Thalassoma purpureum (?)	Surge wrasse (juvenile)	Rocky peninsula	+
Abudefduf sordidus	Kūpipi	Hard outcrops	++

5. DISCUSSION AND RECOMMENDATIONS

5.1. Terrestrial Survey

5.1.1. Flora

Overall, the vegetation in the survey area is disturbed from previous and current land use activities. The vegetation types and species identified are not considered unique. Approximately 90% of the plant species recorded during the survey are not native to the Hawaiian Islands. The one native species observed—ʻakiʻaki grass—is indigenous (found in Hawaiʻi and elsewhere) and is common throughout the Hawaiian Islands. No threatened or endangered plants were found during the survey, and no designated plant critical habitat occurs in the area. Therefore, the proposed project is not expected to have a significant, adverse effect on flora (botanical) resources.

5.1.2. Fauna

One state threatened species—the white tern—was recorded in the survey area. Three additional federally and state endangered or threatened fauna that may occur in the survey area based on the available habitat are the Hawaiian hoary bat, Hawaiian monk seal, and green sea turtle. Other threatened and endangered species were considered initially but dismissed from further analysis because of a lack of suitable habitat or because the survey area is out of their habitat range.

Birds

WHITE TERN

One white tern was observed flying over the survey area during the field survey. The white tern is listed by the state as threatened for the island of Oʻahu. On Oʻahu, white terns most commonly nest in banyans (*Ficus* spp.), monkeypod (*Albizia saman*), mahogany (*Swietenia mahogany*), and kukui (*Aleurites moluccana*), although other tree species have also been documented for nesting and roosting (Vanderwerf 2003). The white tern lays eggs directly on branches; therefore, eggs and flightless chicks are highly vulnerable to tree trimming and removal activities (Vanderwerf 2003).

Although white terns are tolerant of people and noise, the following actions are recommended to avoid impacts to this species:

- Tree removal and trimming should be conducted during fall and early winter, when white tern breeding is at its lowest (Vanderwerf 2003).
- Trees should be inspected for white tern eggs or chicks prior to tree removal.

MIGRATORY BIRD TREATY ACT

SWCA observed six bird species federally protected under the MBTA during this survey. These species consist of the ruddy turnstone, cattle egret, northern cardinal, white tern, pacific golden-plover, and black-bellied plover (see Table 2). Of these, the black-bellied plover, Pacific golden plover, and ruddy turnstone do not nest in Hawaiʻi. The recommendations for the state threatened white tern is discussed in the previous section. Construction in the survey area may temporarily displace some of these bird species, but long-term effects are not expected. These birds (likely limited to a few individuals) are expected to find

suitable foraging habitat in nearby areas. The temporary displacement of these individuals in the survey area is not expected to affect individual survival or the overall populations of these species.

Mammals

HAWAIIAN HOARY BAT

Hawaiian hoary bats are known to occur on O‘ahu in native, non-native, agricultural, and developed landscapes (U.S. Department of Agriculture 2009; USFWS 1998). Hawaiian hoary bats forage in open, wooded, and linear habitats with a wide range of vegetation types. These animals are insectivores and are regularly observed foraging over streams, reservoirs, and wetlands up to 300 feet (100 meters) offshore (U.S. Department of Agriculture 2009). The Hawaiian hoary bat could forage over all the vegetation types and the ocean within the survey area, but there are no historic records of this species in the survey area. Hawaiian hoary bats typically roost in trees greater than 16 feet (5 meters) tall with dense canopy foliage or in subcanopy when canopy is sparse, with open access for launching into flight (U.S. Department of Agriculture 2009). Although there are no trees in the survey area greater than 16 feet (5 meters) tall, two tree species—kiawe (*Prosopis* sp.) and ironwood (*Casuarina equisetifolia*)—outside the survey area could provide suitable roost habitat for the Hawaiian hoary bat.

Although the proposed project would unlikely adversely affect the Hawaiian hoary bat, the following actions are recommended as a conservative impact avoidance measure:

- Any fences that are erected as part of the project should have barbless top-strand wire to prevent entanglements of the Hawaiian hoary bat on barbed wire. No fences within the survey area were observed with barbed wire during the survey; however, if fences are present, the top strand of barbed wire should be removed or replaced with barbless wire.
- No trees taller than 15 feet (4.6 meters) should be trimmed or removed as a result of this project between June 1 and September 15, when juvenile bats that are not yet capable of flying may be roosting in the trees.

Implementation of these guidelines are expected to avoid all direct impacts to Hawaiian hoary bats.

HAWAIIAN MONK SEAL AND GREEN SEA TURTLE

Hawaiian monk seals spend most of their life at sea, but they also rely on land habitat for resting, molting, pupping, nursing, and avoiding marine predators. Monk seals can often be seen hauling-out on sand, corals, and volcanic rock to rest during the day and to give birth, preferring protected beaches surrounded by shallow waters when pupping (National Marine Fisheries Service [NMFS] 2015a). Pupping has been observed in a variety of terrestrial coastal habitats mostly consisting of sandy, protected beaches adjacent to shallow sheltered aquatic areas (NMFS 2015b).

Approximately 85% of the Hawaiian monk seal population occurs in the northwestern Hawaiian Islands. The main Hawaiian Islands subpopulation was estimated at 150–200 individuals in 2011 (personal communication, C. Littnan, NMFS, August 18, 2015). Seal abundance in the northwestern Hawaiian Islands subpopulation remains in decline. The main Hawaiian Islands subpopulation is experiencing increasing abundance and reproductive success, which are thought to be a result of a lower overall seal density and a lack of large predators that compete for food and kill pups (NMFS 2007). Trends in abundance may also be linked to changes in ocean productivity that are determined by various climate patterns (NMFS 2015b).

The following actions are recommended as conservative impact avoidance measures:

- Construction activities should not occur if a Hawaiian monk seal or green sea turtle is in the construction area or within 150 feet (46 meters) of the construction area. Construction should only begin after the animal voluntarily leaves the area. If a monk seal or pup pair is present, a 300-foot (91-meter) buffer should be observed.
- If a Hawaiian monk seal or green sea turtle is noticed after work has begun, that work may continue only if, in the best judgment of the project supervisor, there is no way for the activity to adversely affect the animal.
- Any construction-related debris that may pose an entanglement threat to monk seals and turtles should be removed from the construction area at the end of each day and at the conclusion of the construction project.
- Workers should not attempt to feed, touch, ride, or otherwise intentionally interact with any listed species.

5.2. Marine Survey

Not only does the survey area border a human-made island, much of the intertidal shoreline consists of human-made materials or else rock brought in from other areas for riprap. In the subtidal part of the survey area, the human influence is also strong, with many of the hard surfaces consisting of cement pilings, metal posts, or imported basalt rocks. There is no natural reef structure. In fact, reef building corals were very uncommon, scattered, and small (less than 5 centimeters). Although every hard surface was covered in algal turf, there were no macroalgae present. In similar shallow water projects in O‘ahu, the invasive algae *Gracilaria salicornia, Kappaphycus* sp./*Eucheuma* sp., and *Avrainvillea amadelpha* are of concern because construction activities can fragment these plants and enhance their spread. These invasive species were not seen during the survey.

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