Office of Project Delivery

UNIVERSITY of HAWAI'I SYSTEM

February 13, 2023

Mr. Scott Glenn, Director
State of Hawai`i, Office of Planning and Sustainable Development
Environmental Review Program
235 South Beretania Street, Room 702
Honolulu, Hawai`i 96813

SUBJECT: Final Environmental Assessment - Finding of No Significant Impact (FEA-FONSI)
Waikīkī Aquarium Water System Upgrade [TMK (1) 3-1-031:006]
Honolulu, O`ahu, Hawai`i

Dear Director Glenn:

With this letter, the University of Hawai`i (UH) transmits the Final Environmental Assessment and Finding of No Significant Impact (FEA-FONSI), dated February 2023. The Draft Environmental Assessment was published in the November 8, 2022 edition of *The Environmental Notice*. Comments received during the public comment period and UH's responses are included in the FEA-FONSI.

This transmittal is pursuant to requirements set forth in Hawai`i Chapter 343. As the proposing and approving agency, UH finds that the proposed action is not likely to have significant effects; and is therefore, issuing a FONSI.

Please publish notice of this FEA-FONSI in the next edition of *The Environmental Notice*. We have uploaded an electronic copy of this letter, the publication form, and the FEA-FONSI to your online submittal site. We are also providing the action summary, significance criteria, and other required information via the Environmental Notice online submittal platform.

Please contact our Consultant, Ms. Berna Senelly at (808) 954-4221 or bsenelly@oceanit.com if you have questions.

Sincerely,

Jan Gouveia
Vice President for Administration
University of Hawai`i

From: webmaster@hawaii.gov
To: DBEDT OPSD Environmental Review Program
Subject: New online submission for The Environmental Notice
Date: Wednesday, February 15, 2023 9:46:54 AM

Action Name

Waikīkī Aquarium Water System Update Plan

Type of Document/Determination

Final environmental assessment and finding of no significant impact (FEA-FONSI)

HRS §343-5(a) Trigger(s)

- (1) Propose the use of state or county lands or the use of state or county funds

Judicial district

Honolulu, Oʻahu

Tax Map Key(s) (TMK(s))

1-3-1-031:006

Action type

Agency

Other required permits and approvals

Special Management Area Major, Shoreline Setback Permit, Underground Injection Control Permit Permit

Proposing/determining agency

University of Hawaiʻi at Mānoa

Agency contact name

Brandon Shima

Agency contact email (for info about the action)

bshima@hawaii.edu

Email address or URL for receiving comments

WAq@Oceanit.com

Agency contact phone

(808) 956-0282

Agency address

2444 Dole Street, Bachman Hall 109H
Honolulu, HI 96822
United States
Map It

Was this submittal prepared by a consultant?

Yes

Consultant

Oceanit

Consultant contact name

Berna Senelly

Consultant contact email

WAq@oceanit.com

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Consultant address

828 Fort Street Mall
Suite 600
Honolulu, HI 96815
United States
Map It

Action summary

Upgrade wastewater discharge system to comply with regulatory requirements. The Proposed Action includes installation of a wastewater discharge/transfer sump and pumps, two (2) onsite injection wells and associated appurtenances and equipment for disposal of aquarium exhibit wastewater and upgrading the piping inside the existing building and the property. Three (3) pumps connected to the discharge/transfer sump will pump the wastewater from the sump to a filter house structure on the south side of the property for filtration prior to discharge into the two injection wells.

Reasons supporting determination

In accordance with the provisions set forth in Chapter 343, HRS, this Final EA has been determined to qualify for a Finding of No Significant Impact (FONSI). See Section 6.2 - Analysis Supporting the FONSI Decision.

Attached documents (signed agency letter & EA/EIS)

- WAq-Water-System-Upgrade-FINAL_Compiled_reduced.pdf

Shapefile

- The location map for this Final EA is the same as the location map for the associated Draft EA.

Authorized individual

Berna Senelly

Authorization

- The above named authorized individual hereby certifies that he/she has the authority to make this submission.

FINAL

ENVIRONMENTAL ASSESSMENT

Waikīkī Aquarium

Water System Upgrade

2777 Kalākaua Avenue

Honolulu, Hawai'i, 96815

TMK: (1) 3-1-031:006

Prepared for

University of Hawai'i at Manoa
Office of Project Delivery
2002 East-West Road
Honolulu, HI 96822

Prepared by

Oceanit
828 Fort Street Mall, Suite 600
Honolulu, HI 96813
February 2023

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ACRONYMS AND ABBREVIATIONS

%	Percent
§	Section
°	Degree(s)
amps	Amperes
AOC	Administrative Order of Consent
ATS	Automatic Transfer Switches
bgs	Below Ground Surface
BMP	Best Management Practice
BPBM	Bernice Pauahi Bishop Museum
BS	Beaches
CCH	City and County of Honolulu
CFR	Code of Federal Regulations
CWA	Clean Water Act
CZM	Coastal Zone Management
DAR	Division of Aquatic Resources, DLNR
dBA	Decibels
DDC	Department of Design and Construction
DLNR	State of Hawai'i Department of Land and Natural Resources
DOH	State of Hawaiʻi Department of Health
DOH-CWB	State of Hawai'i Department of Health, Clean Water Branch
DPP	City and County of Honolulu Department of Planning and Permitting
DPS	Distinct Population Segment
EA	Environmental Assessment
EBP	Environmentally Beneficial Project
EFH	Essential Fish Habitat
ENV	Department of Environmental Services
ERP	State of Hawaii, Office of Planning and Sustainable Development Environmental Review Program
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impacts
FR	Final Rule
ft	Foot or feet
ft/yr	Feet per Year
FWCA	Fish and Wildlife Coordination Act
GMSL	Global Mean Sea Level
GPD	Gallons per Day
GPM	Gallons per Minute

GPS	Global Positioning System
HAR	Hawai'i Administrative Rules
HDOA	Hawai'i Department of Agriculture
HECO	Hawaiian Electric Company
Hg	Mercury
HRS	Hawai'i Revised Statutes
ID	Identification
IWDP	Industrial Wastewater Discharge Permit
JaC	Jaucas
kW	Kilowatt
kVA	Kilo Volt-Ampere
m	Meter(s)
MBTA	Migratory Bird Treaty Act
mg/L	milligrams per liter
mJ/cm^2	Millijoules per Square Centimeter
MLCD	Marine Life Conservation District
NAAQS	National Ambient Air Quality Standards
NMFS	National Marine Fisheries Service
No.	Number
NOAA	National Oceanic and Atmospheric Administration
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
NSW	Natural Seawater
NTU	Nephelometric Turbidity Units
O&M	Operation and Maintenance
OCCL	Office of Conservation and Coastal Lands, DLNR
PacIOOS	Pacific Islands Ocean Observing System
PIFWSO	Pacific Islands Fish and Wildlife Service
PIRO	Pacific Islands Regional Office
PM	Particulate Matter
ROH	Revised Ordinances of Honolulu
RTE	Rare, Threatened, and Endangered
SIHP	State Inventory of Historic Places
SLR	Sea Level Rise
SLR-XA	Sea Level Rise Exposure Area
SLUD	State Land Use District
TMK	Tax Map Key
TSS	Total Suspended Solids
UH	University of Hawaii at Manoa
U.S.	United States

USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UV	Ultraviolet
WAq	Waikīkī Aquarium
WQC	Water Quality Certification
WQS	Water Quality Standards
ZOM	Zone of Mixing

SUMMARY SHEET

Type of Document:	Draft Environmental Assessment (DEA)
Project Name:	Waikīkī Aquarium Water System Upgrade
Applicant/Approving Agency:	University of Hawaʻi at Mānoa, Office of Project Delivery 2444 Dole Street, Bachman Hall 109H Honolulu, HI 96822 c/o Brandon Shima, Project Manager
Project Location:	Waikīkī Aquarium 2777 Kalākaua Ave Honolulu, HI, 96815
Tax Map Key (TMK):	(1) 3-1-031:006
Land Area:	102,210 square feet (2.35 acres)
State Land Use District (SLUD):	Urban (U)
Special Management Area:	Yes
County Zoning Designation:	P-2 General Preservation District
Project Summary:	Upgrade wastewater discharge system to comply with regulatory requirements. The Proposed Action includes installation of a wastewater discharge/transfer sump and pumps, two (2) onsite injection wells and associated appurtenances and equipment for disposal of aquarium exhibit wastewater and upgrading the piping inside the existing building and the property. Three pumps connected to the discharge/transfer sump will pump the wastewater from the sump to a filter house structure on the south side of the property for filtration prior to discharge into the two injection wells.
Regulatory Context:	Chapters 343 and 344, Hawaiʻi Revised Statutes (HRS) and Chapter 11-200.1, Hawaiʻi Administrative Rules (HAR)
Triggers for the EA:	Use of state or county land or the use of state or county funds.
Determination:	Finding of No Significant Impact (FONSI)
Estimated Cost:	$4.88 million
Time Frame:	Construction 2026 completion
Consultant:	Oceanit 828 Fort Street Mall, Suite 600 Honolulu, HI, 96813 WAq@oceanit.com

EXECUTIVE SUMMARY

This Environmental Assessment was conducted to assess potential environmental impacts associated with the proposed Waikiki Aquarium (WAq) Water System Upgrade. Much of WAq's aging water system infrastructure and wastewater discharge system were designed prior to modern Federal Clean Water Act regulations and do not meet current regulatory requirements. WAq presently discharges its native exhibit tank wastewater into the ocean through a permitted outfall roughly 150 feet (ft) offshore, and wastewater from non-native exhibit tanks is discharged into the City and County of Honolulu (CCH)'s wastewater collection system. This practice results in ocean water quality issues that do not meet current regulatory requirements and increases the production of noxious hydrogen sulfide at the pump facilities in the CCH wastewater collection infrastructure and wastewater treatment plant. The State of Hawaiʻi Department of Health (DOH) and CCH Department of Environmental Services (ENV) have filed notices of violation and cease and desist orders for the current practices.

The EA includes a discussion of the No Action alternative and the following alternatives:

- Preferred Alternative: Disposal of all effluent into on-site injection wells
- Alternative A: Filter and treat wastewater prior to being discharged into the existing ocean outfall
- Alternative B: Native exhibit wastewater filtered and treated prior to being discharged through ocean outfall; non-native exhibit wastewater filtered prior to being discharged into injection well.

The Preferred Alternative, hereafter referred to as Proposed Action, is intended to upgrade WAq's wastewater discharge system to comply with regulatory requirements by eliminating and ceasing the discharge of wastewater generated by WAq exhibits into the ocean and the CCH wastewater system. The Proposed Action includes the installation of a transfer sump and pumps, two onsite injection wells and associated appurtenances and equipment for disposal of aquarium exhibit wastewater and upgrading the piping inside the existing building and the property. Three pumps connected to a discharge/transfer sump will pump the wastewater from the sump to a pump house structure on the south side of the property for filtration prior to discharge into the two injection wells.

The alternatives analyses evaluated operation and maintenance efforts, ability to address regulatory compliance, cost, ease of permitting and construction, operational disruptions, and compatibility with future expansion and design modularity. The Proposed Action was selected because it met project objectives while surpassing Alternatives A and B and No Action in the alternatives analysis.

The following potentially impacted environments were evaluated for the Proposed Action and the No Action Alternative:

- Climate and topography
- Geology and soils
- Hydrogeology and water resources
- Ocean water quality
- Air and noise quality
- Climate change and sea level rise
- Flood, tsunami and hurricane hazards
- Terrestrial and marine biological resources
- Demographics and the economy
- Archaeological and cultural resources
- Public services and facilities

The Proposed Action is anticipated to have long term positive impacts on ocean water quality, benthic habitats and WAq infrastructure and operations. By eliminating wastewater disposal into the Marine Life Conservation District, the Proposed Action will improve ocean water quality and support healthy benthic habitats. Further, the Proposed Action will allow WAq to operate in compliance with Federal, State and City regulations, upgrade its on-site infrastructure, and support the overall operations and viability of this educational and recreational facility enjoyed by residents and visitors.

Potential negative impacts are limited to short-term effects related to construction. These impacts will be mitigated by employing construction Best Management Practices (BMPs) to eliminate or minimize impacts to maximum extent practicable, limiting activities to daytime hours, curtailing construction activities to avoid impacts on terrestrial and marine biological resources, coordinating with public agencies, and monitoring by qualified professionals, such as an archaeologist and a certified arborist.

No negative cumulative and secondary impacts are anticipated.

Hawaiʻi Administrative Rule (HAR) §11-200-11.2 establishes procedures for determining if a Finding of No Significant Impact (FONSI) is warranted. In accordance with the provisions set forth in Chapter 343, HRS, and HAR §11-200-11.2, this Final EA has determined that the Proposed Action will not have significant adverse impacts on the environment and qualifies for a Finding of No Significant Impact (FONSI).

1. STATEMENT OF PURPOSE AND NEED

The Waikīkī Aquarium (WAq) is located at the southern end of the world-famous Waikīkī Beach and welcomes more than 250,000 visitors annually. The WAq was established in 1904 and is the second oldest aquarium in the United States. It has been a part of University of Hawaiʻi (UH) since 1919 and moved to its present location in 1955. Its mission is to inspire and promote understanding, appreciation, and conservation of Pacific marine life. WAq is an important educational outreach facility and has won national awards for its exhibits and aquaculture methods. WAq presently displays fish and invertebrates in publicly viewable tanks and outdoor tide pool displays.

Much of WAq's aging water system infrastructure and wastewater discharge system were designed prior to modern Federal Clean Water Act regulations and do not meet current regulatory requirements. This has resulted in State and County regulatory citations. Although WAq has been in nearly constant operation since it moved to its current location, no improvements have been made to the wastewater disposal system in the last 20 years.

1.1 Background and Purpose

WAq's infrastructure is largely original and beyond its engineering life. The majority of the major infrastructure from 1955 remains in use today, including the salt water well which was constructed to supply the display tanks. WAq presently discharges native exhibits wastewater into the ocean through a permitted outfall roughly 150 feet (ft) offshore, and wastewater from non-native exhibits into the City and County of Honolulu (CCH) wastewater system. This results in water quality issues that cannot meet current and most likely future regulatory requirements related to water quality rules regarding surface waters.

Effluent discharged to the ocean is subject to NPDES permit limitations, which are based on HAR Chapter 11-54. Ocean disposal had not been compliant with the discharge permit conditions and current Federal Clean Water Act regulations. Further, disposal of salt water into the CCH's wastewater system results in collection and treatment problems within the CCH's wastewater infrastructure. Both the State of Hawaiʻi Department of Health (DOH) and CCH have filed notices of violation for current practices.

The purpose of the proposed wastewater system infrastructure upgrade is to fulfill the DOH Administrative Order on Consent (AOC), CCH Department of Environmental Services (ENV) Notice of Violation (NOV) (ENV 19-008), CCH ENV Industrial Wastewater Discharge Permit (IWDP) (Number [No.] 20219001) wastewater discharge requirements, and DOH National Pollutant Discharge Elimination System (NPDES) Permit No. HI 0020630 requirements. Oceanit has been retained to develop an improved Water System Infrastructure Design for exhibit operations at WAq and to provide an optimized wastewater discharge process that will comply with Federal, State, and CCH regulatory requirements.

Three alternatives to upgrade the water discharge system were evaluated to address WAq's water system deficiencies pursuant to Paragraph 42.a of the AOC. Appendix A, entitled "Waikīkī Aquarium Water System Upgrade Plan," summarizes findings and recommendations. UH selected Disposal of All Effluent into on-site Injection Wells, hereafter referred to as the Proposed Action, to bring WAq into compliance with DOH-approved discharge permits and CCH regulatory requirements as specified in the IWDP. UH formally notified DOH and CCH on its selection.

1.2 Project Site and Surrounding Area

WAq is located in Waikīkī on the south shore of the island of Oʻahu. The property lies at the Diamond Head end of Waikīkī and is surrounded by open space afforded by the Pacific Ocean and Kapiʻolani Park. The 2.35-acre parcel lies within the P-2 General Preservation District, the Special Management Area (SMA), and the Diamond Head Special District. A Marine Life Conservation District (MLCD) lies just offshore of WAq.

As depicted in Figure 1-1, the makai, or western, boundary of the property is adjacent to a popular public shoreline walkway that connects the Waikīkī Natatorium War Memorial to Queen's Surf Beach and Kalākaua Avenue. WAq is bounded by Kapiʻolani Park to the north and south, and by Kalākaua Avenue along its mauka or eastern boundary. Slightly further north is the Barefoot Beach Cafe, a casual cafe at Queen's Surf Beach. Slightly further south are the Kaimana Beach Hotel and San Souci (Kaimana) Beach. Further mauka, or east, of WAq are the Kapiʻolani Bandstand and Honolulu Zoo.

1.3 Scope and Authority

This Final Environmental Assessment (EA) was prepared for the proposed WAq's Water System Upgrade in accordance with HRS Chapter 343 and Revised Ordinances of Honolulu (ROH) Chapter 25, which specifies procedures for projects conducted within the Special Management Area (SMA). HRS Chapter 343 is triggered by the use of state or county land or the use of state or county funds. Further, pursuant to ROH Chapter 25, §25-1.3(1)(E), the "construction, reconstruction, demolition or alteration of the size of any structure" is considered "development" within the SMA. ROH §25.3.3(c) states that any proposed development within the SMA area requiring an SMA permit shall be subject to assessment. The CCH Department of Planning and Permitting (DPP) has determined that the project requires an SMA Major, the application for which requires an environmental disclosure document pursuant to HRS Chapter 343.

A Draft EA, published in *The Environmental Notice* on November 8, 2022, was prepared to determine impacts associated with the Proposed Action to develop mitigation measures for adverse impacts, and to determine whether any of the impacts are significant according to thirteen (13) criteria. The Draft EA findings and subsequent public comments confirm that no significant impacts are expected, and a Finding of No Significant Impacts (FONSI) is hereby issued. Preparation of the Draft EA and this Final EA - FONSI is in accordance with Hawaiʻi Administrative Rules (HAR) Title 11, Chapter 200.1.

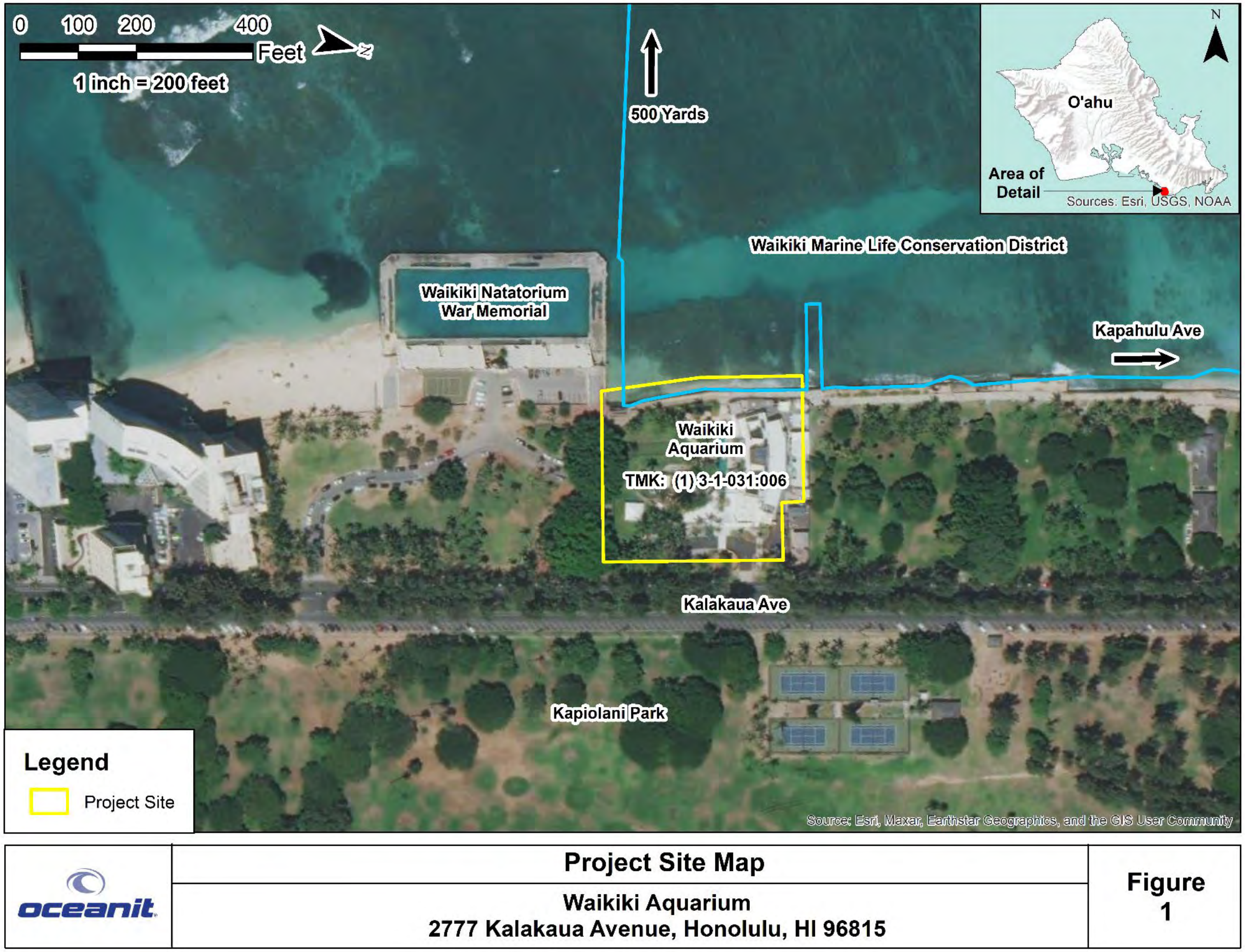

Figure 1-1: Project Location Map

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2. PROPOSED ACTION AND PROJECT ALTERNATIVES

2.1 Existing Conditions

2.1.1 Exhibits and Operations

WAq houses both native and non-native saltwater and freshwater species in approximately 60 public exhibits and behind the scenes holding tanks in operation at any given time. The largest display is a 70,000-gallon seawater pool, which houses one endangered Hawaiian Monk Seal. The Monk Seal pool has the capacity to house at least two seals, has done so in the past, and may again in the future. "Native Tanks" include tanks that house Native Hawaiian saltwater species and solitary non-breeding non-native animals that are unable to reproduce and therefore would not cause invasive species introduction when discharged to the ocean. "Non-Native Tanks" include those that house non-native animals or native animals which require live non-native feed. Hawaiian freshwater species are housed separately. Wastewater from native tanks is currently discharged through a nearshore outfall under an NPDES permit issued by the DOH. Wastewater from non-native and freshwater tanks is discharged into the CCH wastewater system. Figure 2-1 depicts existing conditions.

2.1.2 Water Intake Sources for Tanks

WAq utilizes three intake water sources totaling approximately 470,000 gallons per day (GPD), or approximately 325 gallons per minute (GPM), for the aquatic exhibits and holding tanks maintained at the facility at the present time.

2.1.2.1 Natural Seawater

Natural seawater (NSW) is the largest volume of daily water usage for the facility. The NSW is typically only used to supply the Monk Seal exhibit and the Monk Seal holding tanks in the back of the building. An average of 247,000 GPD of NSW is pumped into the facility at about 170 GPM. Natural seawater is obtained through two 8 inch-diameter pipes that extend approximately 180 ft from the shoreline. Natural seawater is filtered by ten fabric filter canisters in series, each comprising 3-layer filter bags that remove particulates 50, 10, and down to one micron size in series.

2.1.2.2 Well Saltwater

Salt water from an 80-ft deep on-site well provides an average of approximately 225,000 GPD to WAq. Well salt water has very low turbidity and total suspended solids (TSS) and is considered free of parasites and pathogens. The well water is anoxic and is aerated using two water pumps to raise the oxygen and degas the carbon dioxide before distribution to the aquatic exhibits and holding tanks. Prior to entering each individual exhibit, the aerated well water undergoes phos-ban filtration to remove phosphates and silicates. See Section 2.6 for more information regarding the well.

2.1.2.3 Freshwater

Freshwater from the CCH Board of Water Supply's (BWS) potable water supply comprises the smallest facility water intake at less than 2,000 GPD. Carbon filtration is used to remove chlorine immediately before introducing the water into the exhibits. WAq has four freshwater exhibits and up to ten (10) freshwater holding tanks in operation at a time.

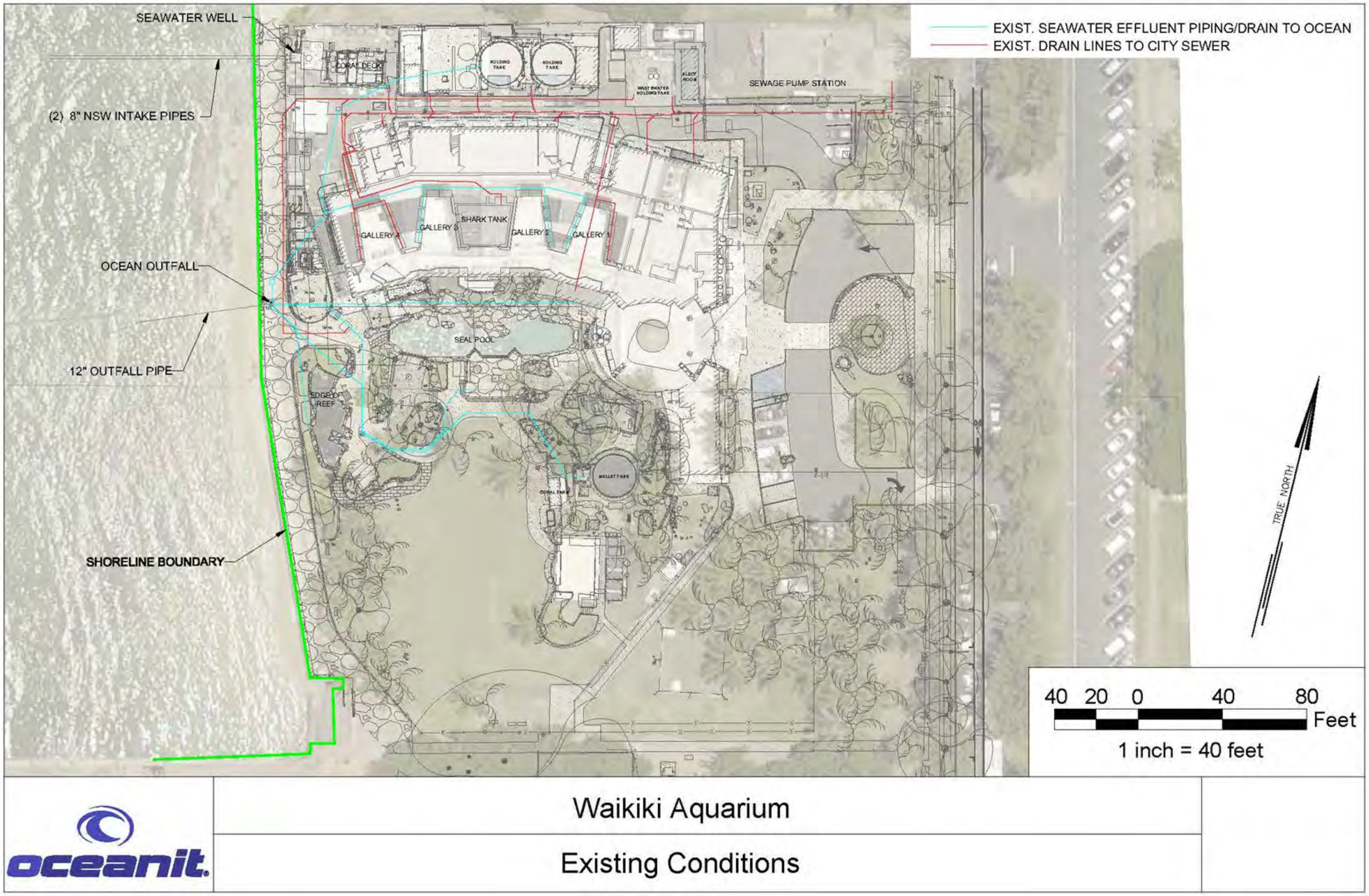


Figure 2-1: Existing Site Conditions

2.1.3 Water Discharge from Exhibits

Discharge wastewater from WAq originates from four main sources, including the seal pool, native exhibits, non-native exhibits, and freshwater exhibits.

2.1.3.1 Discharge into the Municipal Wastewater System

The CCH owns and operates the wastewater collection system that serves the Honolulu area. Wastewater from WAq and greater Waikīkī area is conveyed to the Sand Island Wastewater Treatment Plant through a system of pipes, wet wells, pump stations and force mains. The plant provides advanced primary treatment to an average of 75 million GPD of wastewater and discharges the treated wastewater into Māmala Bay through a deep ocean outfall.

An average of approximately 82,000 GPD of wastewater water from non-native animal and freshwater tanks is discharged into the CCH-owned and -operated wastewater collection system via the sewage pump station adjacent to WAq. In addition, about 42,000 to 76,500 gallons per week of filtered backwash water from the shark tank and seal pool is also discharged to the CCH wastewater system, depending on the frequency of filter cleaning during the particular week. In total, WAq's average daily wastewater discharge of approximately 90,000 GPD to the CCH sewer system accounts for ~0.12% of the total 75 million GPD of wastewater treated by the CCH Sand Island Treatment Plant.".

Due to concerns of saltwater corroding the CCH sewer pipes and increased hydrogen sulfide production along the wastewater collection system, the CCH issued an NOV (ENV 19-008) to WAq in August 2019 to cease saltwater discharge into City wastewater system. In April 2021, CCH issued IWDP No. 20219001R-001 granting permission to WAq to discharge industrial wastewater (saltwater wastewater) into the CCH wastewater system with conditions and discharge limits as set forth in the permit. Revisions to this permit are anticipated in the future.

2.1.3.2 Discharge into Māmala Bay in the Pacific Ocean

Wastewater from the seal pool and native saltwater exhibits is discharged through Outfall Serial No. 001 and flows directly into the Waikīkī MLCD, a 78-acre site established in 1988 (Figure 1-1) in which fishing and consumptive activities are regulated to conserve and replenish marine resources. Following strict standard operating procedures to prevent the introduction of non-native species into Hawaiian waters, only tanks that house native animals (e.g., Hawaiian Monk Seal and Hawaiian reef fishes) and solitary, non-breeding, non-native species (e.g., exhibits with one lone non-native individual) discharge to the ocean. WAq complies with Hawaiʻi Department of Agriculture (HDOA) issued Import Permits 20-02-O-A7445 and 20-02-O-A7446 that specify import conditions for specific species. An average of approximately 387,000 GPD of wastewater is discharged into Māmala Bay via a 12-inch diameter pipe approximately 150 ft offshore from the seawall.

Wastewater discharged into the ocean is regulated under DOH NPDES Permit No. HI 0020630. Under the NPDES permit, wastewater is required to comply with the permit and associated provisions of the Clean Water Act, as amended (33 United States Code 1251 et. Seq; the "Act"), as well as HRS Chapter 342D, and HAR Chapters 11-54 and 11-55. The existing NPDES permit identifies the Zone of Mixing (ZOM) for the discharge outfall.

2.2 Proposed Action

2.2.1 Objectives of the Proposed Action

The objectives of the Proposed Action are to upgrade WAq's wastewater discharge system to achieve the following objectives:

1) Eliminate the need to discharge wastewater via the ocean outfall;
2) Minimize or eliminate discharge into the CCH wastewater collection system;
3) Comply with Federal and State water quality discharge regulations and issued permit conditions; and
4) Accommodate an increase in WAq's saltwater supply to 800,000 GPD from its present 470,000 GPD in anticipation of future exhibits.

2.2.2 Description of the Proposed Action

Appendix A, Water System Upgrade Plan, describes the Proposed Action, which is Option 1 in the alternatives evaluation. The Proposed Action is to dispose all wastewater into two on-site injection wells, eliminating direct effluent discharge into the ocean and into the CCH wastewater system. Wastewater from native and non-native tanks will flow by gravity to an underground discharge/transfer sump, where it will be pumped to two drum screen filters housed in an above ground structure for filtration prior to being discharged into two injection wells adjacent the filter building. Seal pool discharge will be pumped directly to drum screen filters. The drum screen filters will filter the effluent down to 20 microns prior to being discharged into the injection wells. A conceptual schematic is shown in Figure 2-2 and the conceptual layout is illustrated in Figure 2-3.

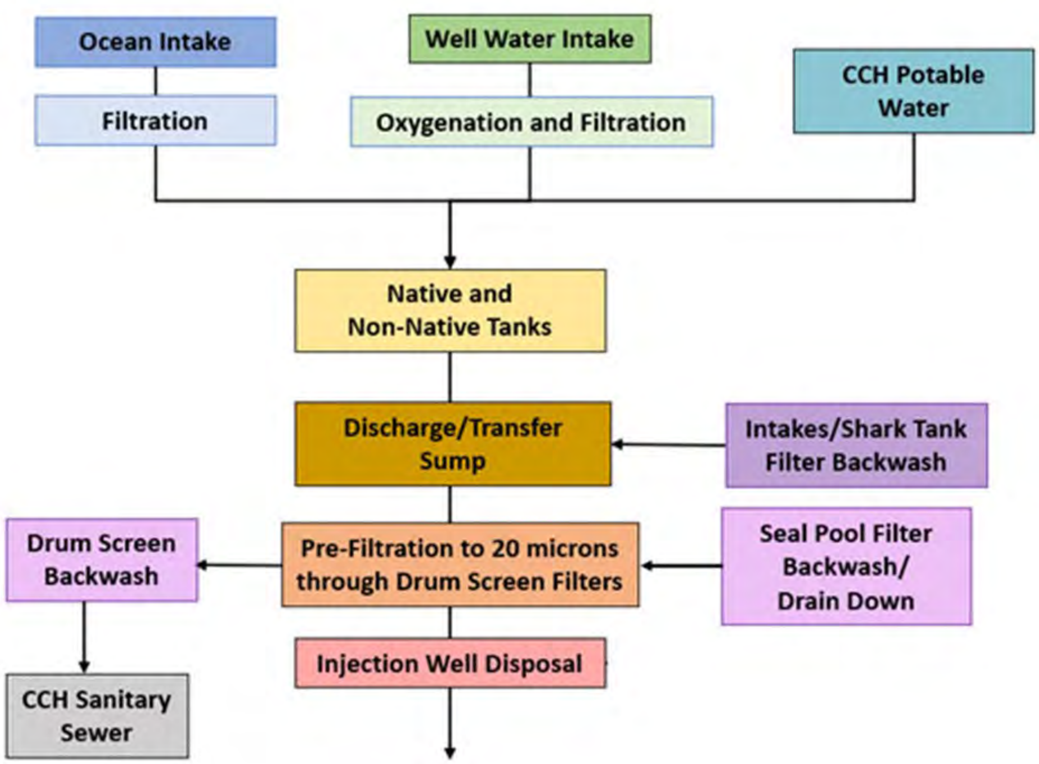


Figure 2-2: Conceptual Schematic of the Proposed Action

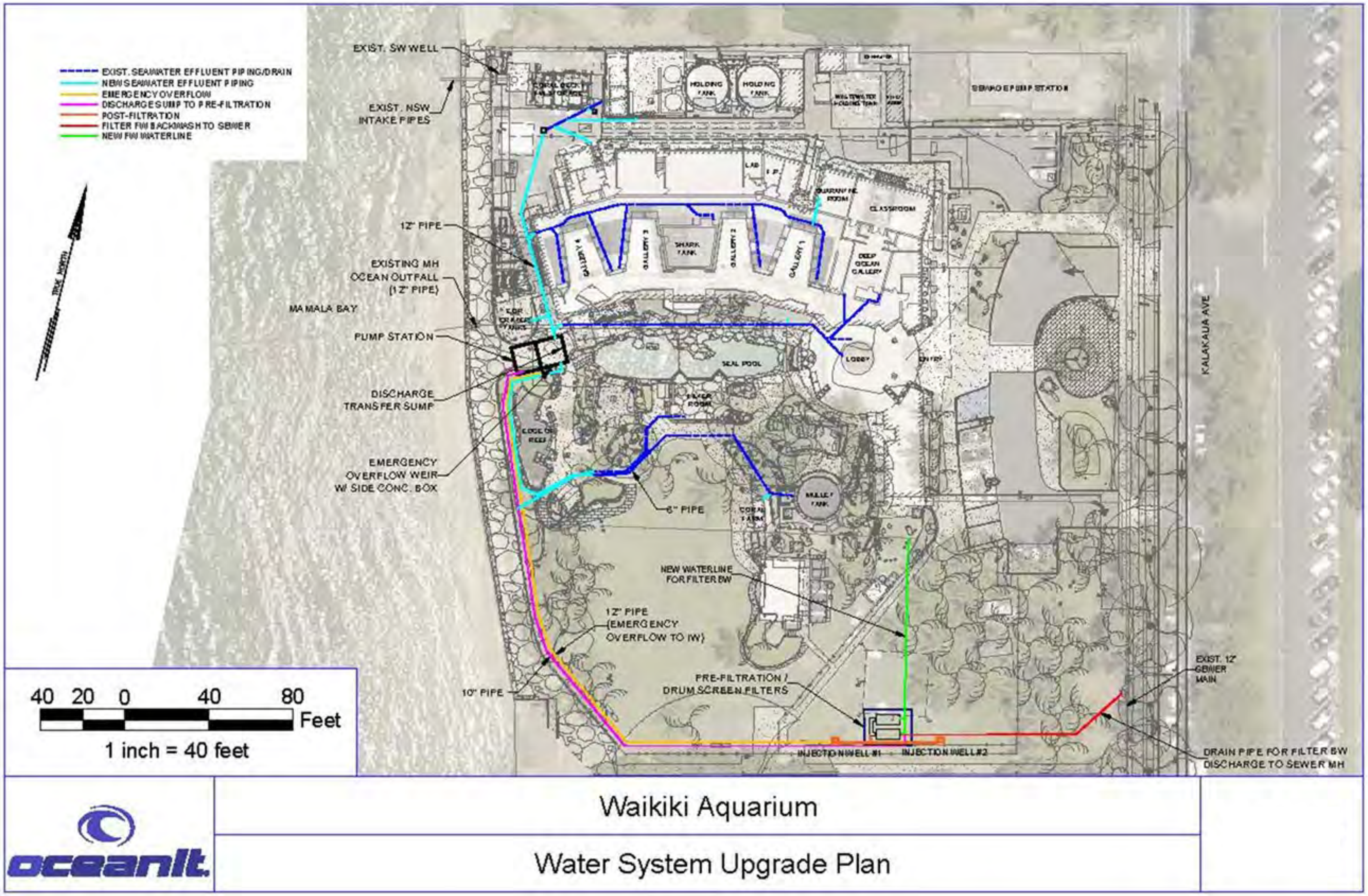


Figure 2-3: Proposed Layout for the Proposed Action – All Effluent Discharge Through Two Injection Wells

Other project characteristics are as follows:

- From an economic standpoint, the Proposed Action will have a positive short-term impact by creating direct and indirect employment related to construction. Further, it will allow WAq to comply with State and CCH environmental requirements while continuing operations and remaining financially viable. These effects will continue to promote Waikīkī as a visitor destination. Section 3.4.2 presents further discussion on the economy.

- The Proposed Action will not have any effects on demographics. In terms of other social -related impacts, the Proposed Action is consistent with and supportive of public policies and plans related to recreational resources and activities and the promotion of Waikīkī and Diamond Head as visitor and resident destinations. Section 3.4.1 discusses demographic impacts and public policies and plans are discussed in Section 4.

- An Archaeological and Literature Review and Field Inspection Report is presented in Appendix F and summarized in Section 3.4.3. The recommended project effect determination is "effect, with proposed mitigation commitments." At this time, development of an archaeological monitoring program with on-site monitoring following HAR Chapter 13-279 is recommended.

- No significant cultural impacts are anticipated as a result of the Proposed Action. The recommended project effect determination for the project area is "effect, with proposed mitigation commitments." On-site archaeological monitoring for mitigation purposes is recommended. The Cultural Impact Assessment is contained in Appendix G and summarized in Section 3.4.4.

- The Proposed Action is anticipated to have long term positive impacts on ocean water quality, benthic habitats and WAq infrastructure and operations. By eliminating wastewater disposal into the MLCD, the Proposed Action will improve ocean water quality and support healthy benthic habitats. Further, the Proposed Project will allow WAq to operate in compliance with Federal, State and City regulations, upgrade its on-site infrastructure, and support the overall operations and viability of this educational and recreational facility enjoyed by residents and visitors.

2.2.3 Design Characteristics

2.2.3.1 Discharge Sump

All wastewater from seawater and freshwater exhibit tanks will be routed to a subsurface discharge/transfer sump installed on the southwest side of the property in the lawn area next to the fence and promenade bounded by the seawall (Figure 2-3). The sump will be located below-grade. All seawater and freshwater effluent will flow by gravity to the sump. Wastewater collected in the discharge sump will be pumped to two drum screen filters housed in filter building located near the injection wells. Filtered water will flow by gravity to the injection wells for discharge (Appendix C, Waikīkī Aquarium Injection Wells).

The sump will be 15 ft x 12 ft in area and 6 ft deep. The sump will have one foot of freeboard to accommodate emergency overflow. In an emergency overflow event, water from the sump will spill over a weir at the top of the sump and into a concrete box, from where it will flow under gravity to the closest injection well. A sediment collection area at the bottom of the discharge sump will be included in the design to trap sediment. Periodic sediment removal will be required as part of the maintenance of the sump.

2.2.3.2 Drum Screen Filters

Filtration through drum screen filters will remove most solids to prevent injection wells from clogging and reduced performance over time. Three transfer sump pumps, only one of which will be in operation at any given time during normal operation, will pass wastewater through two drum screen filters that will pre-filter wastewater down to 20 microns prior to well injection. The drum screen filters will filter wastewater from the sump down to 20 microns to achieve a maximum TSS range of 20-25 milligrams per liter (mg/L), which is sufficiently below the maximum TSS loading recommended for well injection (30 mg/L).

Media filter backwash wastewater will also be filtered prior to discharge to the injection wells. Backwash from the intake filters and shark tank filters will be routed to the discharge sump while the backwash from the seal pool filters will bypass the discharge sump and be routed directly to filtration. Ocean discharge and the majority of exhibit discharge into the CCH wastewater system will be eliminated. Filter backwashing must be staggered to avoid sump overflows.

The drum screen filters will reside near the injection wellhead area. An above grade filter house will be constructed to protect the filters from the elements and provide the necessary head requirement to gravity feed the flow into the injection wells. To operate, the drum filters would require an electrical supply for the drum motors and high-pressure rinse pumps, a domestic freshwater supply to backflush the filters, and a sewer connection for the backwash wastewater. Reject water from the drum filters will be discharged to the wastewater system in the filter backwash.

2.2.3.3 Injection Wells

After filtration, wastewater will flow by gravity to two injection wells for discharge. Two injection wells will be drilled at least 50 ft apart along the southern boundary of WAq, as shown in Figure 2-3. The filtered wastewater will be injected into the caprock and dissipate into the saltwater aquifer. The proposed injection well design indicates solid PVC well casing down to 126 ft below ground surface (bgs) before it transitions to a 100-foot perforated well casing, so that wastewater will discharge between 126 – 226 ft bgs. Appendix C describes the proposed injection well system, and a conceptual profile of an injection well is provided in Figure 2-4.

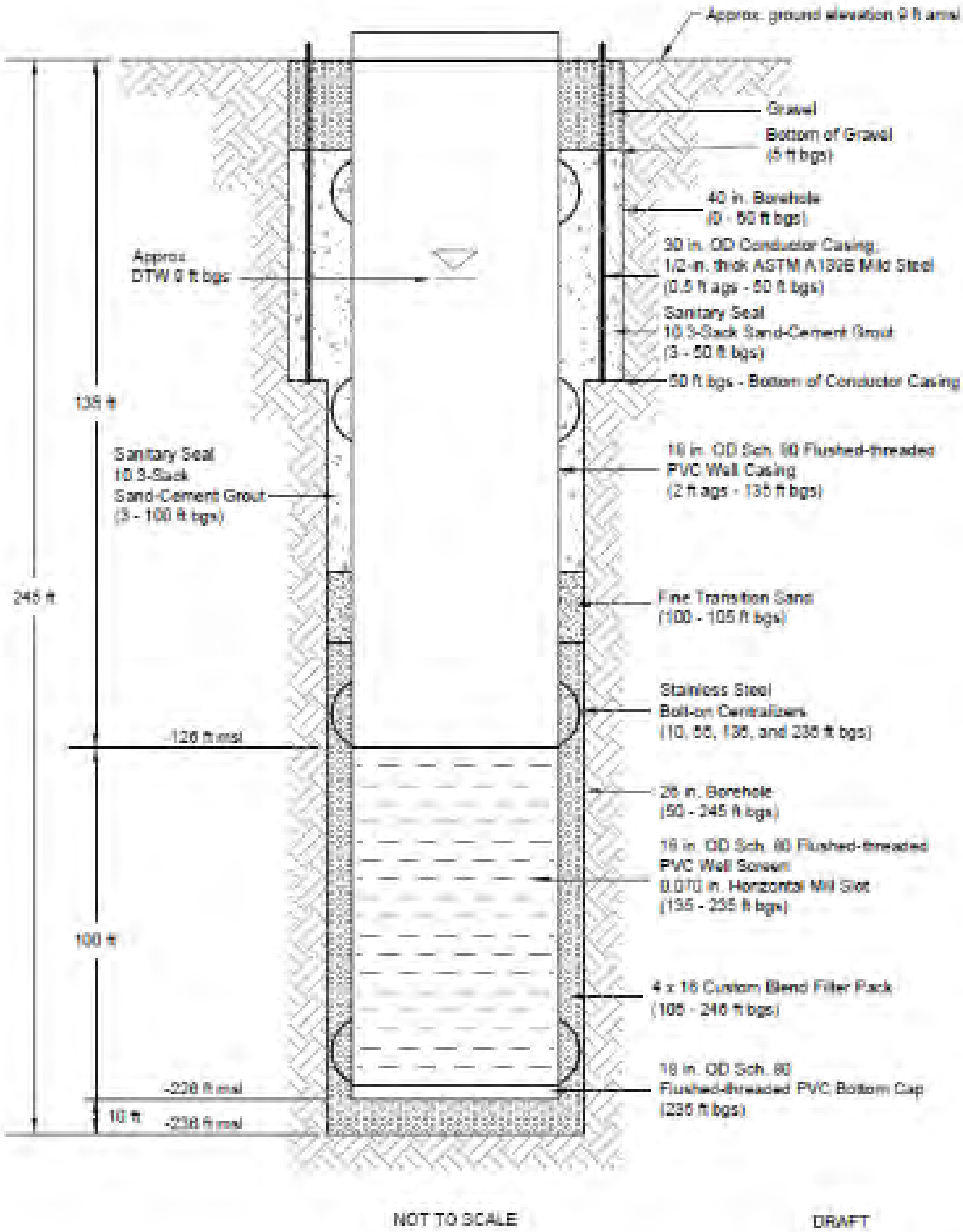
Inspection of the site geology indicates that the site is suitable for injection. The existing saltwater production well has a high specific capacity, which indicates high permeability in the area suitable for injection wells. More specific data on site geology will be collected when determining exact injection well locations and depth design to prevent cross contamination between source and discharge wells. The depth of each injection well will be approximately 245 ft below ground surface.

WAq is located makai, or seaward, of the Underground Injection Control (UIC) line, and is therefore over an exempted aquifer that will not be used for drinking water and is legally available for injection. Injection pressure is limited by the artesian pressure and there must be at least 50 ft of vertical separation between the bottom of the injection interval and the top of the basalt artesian aquifer. The caprock is over 900 ft thick at this location, and there will be sufficient vertical separation between the injection interval and the basalt confined aquifer. Gravity injection will give adequate disposal capacity without the need for pressure injection.

Two injection wells are recommended to achieve disposal of the target 800,000 GPD. Even though the current estimated daily flow rate at the aquarium is 470,000 GPD, the current NDPES Permit (HI 0020630) is based on average flow of 640,000 GPD. The design flow rate of 800,000 GPD is a 25% increase of the NDPES Permit allowance. It is noted that the proposed injection well discharge will cease discharge into the ocean and the NPDES permit will no longer be required. An application for approval from the DOH CWB Underground Injection Control Program has been submitted.

Based on the hydrogeological data and the capacity of the existing saltwater supply well (exceeding 800,000 GPD), it is anticipated that each of the two proposed injection wells will have the capacity to handle the future flow of 800,000 GPD. At any given time only one injection well will need to be operational whereas the other can be on standby. Periodic maintenance/cleaning of the injection wells should be performed to maintain their capacity. Should a third injection well be needed, the design will allow for the addition of a third injection well.

The locations of the injection wells were based on hydrogeological considerations, proximity to wastewater lines, and site logistics. The injection wells were placed as far from the intake production well as feasible to minimize the possibility of injectate contaminating the intake well. Separation from the intake well will be vertical as well as horizontal, meaning that the injection interval is lower (i.e., 126-226 ft bgs) than the intake of the production interval (i.e., 80 ft bgs). The well locations are also positioned in close proximity to the drum filters so that the filtered water can gravity flow into the well(s) to minimize pumping costs. Finally, the wells require adequate drilling space so that construction, maintenance and operation will not interfere with WAq operations. Figure 2-4 presents a facility well section.



Source: INTERA, 2021 (Appemdix C)

Figure 2-4: Facility Injection Well Section Concept - Injection Interval: Lower Caprock

2.2.4 Upgrades to Existing Electrical and Mechanical Systems

2.2.4.1 Electrical Upgrades

To serve all new electrical loads, a new circuit breaker and feeder will be needed from an existing distribution panel and backed up with the existing emergency power generator. The new electrical infrastructure would be sized to accommodate the maximum three discharge sump pumps, pre-filtration equipment, drum filters and all general power and lighting loads. A feeder would be routed from the electrical room to a distribution panelboard in an enclosed room near the sump pump station. The conduit will leave the main WAq building and go underground to the sump pumping station's panelboard.

The electrical panelboard will provide branch circuits for the three variable frequency drives (VFDs) that control the discharge sump pumps and all general power and lighting loads at the sump pumping station and the panelboard at the pre-filtration enclosure at the injection well location. The electrical feeder will be concrete-encased and routed underground in parallel with the proposed 10-inch water discharge piping to the panelboard that distributes power to the drum screen filters.

2.2.4.2 Mechanical Upgrades

A new underground pump vault (along the makai promenade fence next to the discharge/transfer sump vault) will be built to accommodate the sump pumps. An underground pump system will help with longevity and acoustics. The pump station will be designed with maintenance in mind and allow easy access to all equipment for replacement or servicing. Mechanical ventilation is necessary for any enclosed equipment buildings.

Each sump pump will have an associated VFD. The drum screen filters will require connections to domestic freshwater for filter cleaning and sewer line for filter backflush discharge.

2.2.5 Construction Characteristics

The construction Scope of Work for the Proposed Action includes:

- Construct and test two injection wells;
- Install drum screen filters and backwash station at the injection well head;
- Construct a drum screen filter building;
- Install a discharge sump, pumps, and feedback controls;
- Install new wastewater plumbing to reconfigure exhibit & filter backwash discharges to the discharge/transfer sump, drum screen filter backwash to sewer line;
- Install freshwater plumbing to supply drum screen filter backwash station; and
- Complete electrical work to connect new pumps and drum screen filters.

2.2.6 Summary of Projected Costs

The total cost of the project is estimated at $4.9 million The proposed water system upgrade project will be funded with state funds.

2.2.7 WAq Activities That Are Not Part of this EA

2.2.7.1 Environmentally Beneficial Project

In addition to water system discharge upgrades, as part of the AOC resolution agreement with DOH CWB, WAq developed an Environmentally Beneficial Project (EBP). The proposed EBP is the Waikīkī Aquarium Mixed Reality Exhibit, which will consist of large-scale high-resolution underwater video images featuring Hawaiʻi coral reef environments projected onto the walls of a theater space to give the visitor the sensation of being immersed in the marine environment. Animated graphics incorporated into the video will provide educational messaging about the variety of both local and global risks to coral reef ecosystems, and how the public can take actions to help restore and conserve critical nearshore coastal habitats important to coral reefs. Construction of the EBP will involve renovating an existing room in WAq but does not qualify as "development" under HRS Chapter 205A and therefore is not included in this DEA analysis.

2.2.7.2 Seawall Repairs

As a part of the pre-consultation process, DLNR Office of Conservation of Coastal Lands (OCCL) commented that the current condition the seawall fronting WAq should be addressed. As a separate project, UH is currently undertaking repairs to the seawall to repair voids as pictured in Figure 2-5. This repair effort is not part of the Water System Upgrade Plan and therefore not included in this EA analysis.

Figure 2-5: Seawall Repair That is Not Part of This Project

2.2.7.3 Water Supply System Upgrades and Other Improvements

Due to the age and conditions of the existing water supply infrastructure, WAq could potentially upgrade the existing water supply system in the future to prevent a system failure and to meet the needs of potential expansion and improvements in the future. The future water supply system upgrade project, should WAq decide to move forward with it, will be independent of the current Water (Discharge) System Upgrade project and is therefore not included in this EA analysis.

2.3 Project Alternatives

In addition to the Proposed Action, two additional Water System Upgrade Plan Alternatives and the No Action Alternative were evaluated to address WAq's water system deficiencies pursuant to Paragraph 42.a of the AOC and to meet project objectives. A detailed alternative analysis and comparison was performed and evaluated based on:

- Operation and maintenance efforts,
- How well they addressed regulatory violations and compliance,
- Construction cost,
- Ease of permitting and construction,
- WAq operations disruption during construction, and
- Compatibility with future expansion/design modularity

The additional alternatives are hereafter described.

2.3.1 Alternative A - Filter and treat wastewater prior to being discharged through the existing ocean outfall

Alternative A was designed to pass all seawater effluent (native and non-native) through a treatment system prior to discharge through the existing ocean outfall (Figures 2-6 and 2-7). All wastewater would be routed to a discharge sump prior to being pumped through the treatment system. Treatment includes effluent filtration and UV-treatment to eliminate non-native species, parasites, and pathogens and reduce excess nutrients prior to ocean discharge.

To meet water quality requirements for open ocean discharge into Māmala Bay, wastewater treatment will require pressure filtration and UV sterilization. The treatment system would be located adjacent to the discharge sump to the north in the lawn area along the fence and promenade. The treatment system equipment (pressure filters and UV units) would be placed in a new building adjacent to the sump.

Three pumps would move effluent from the sump to vertical pressure filters, with one of the pumps serving as a backup. The pumps will send wastewater through four vertical pressure filters filled with media that removes 95% of particulates 5 microns and larger. Should more stringent filtration be needed to meet water quality standards, there are other media options available that can remove 96% of particulates 1 micron and higher that could be used. Additional options are available to filter down to 0.1 microns using flocculation, but with significant additional costs. As planned, all four pressure filters would be in operation as long as total flow is

~425 GPM or above. However, three of the four filters will easily accommodate the target flow rate if one filter needs to be taken down for servicing.

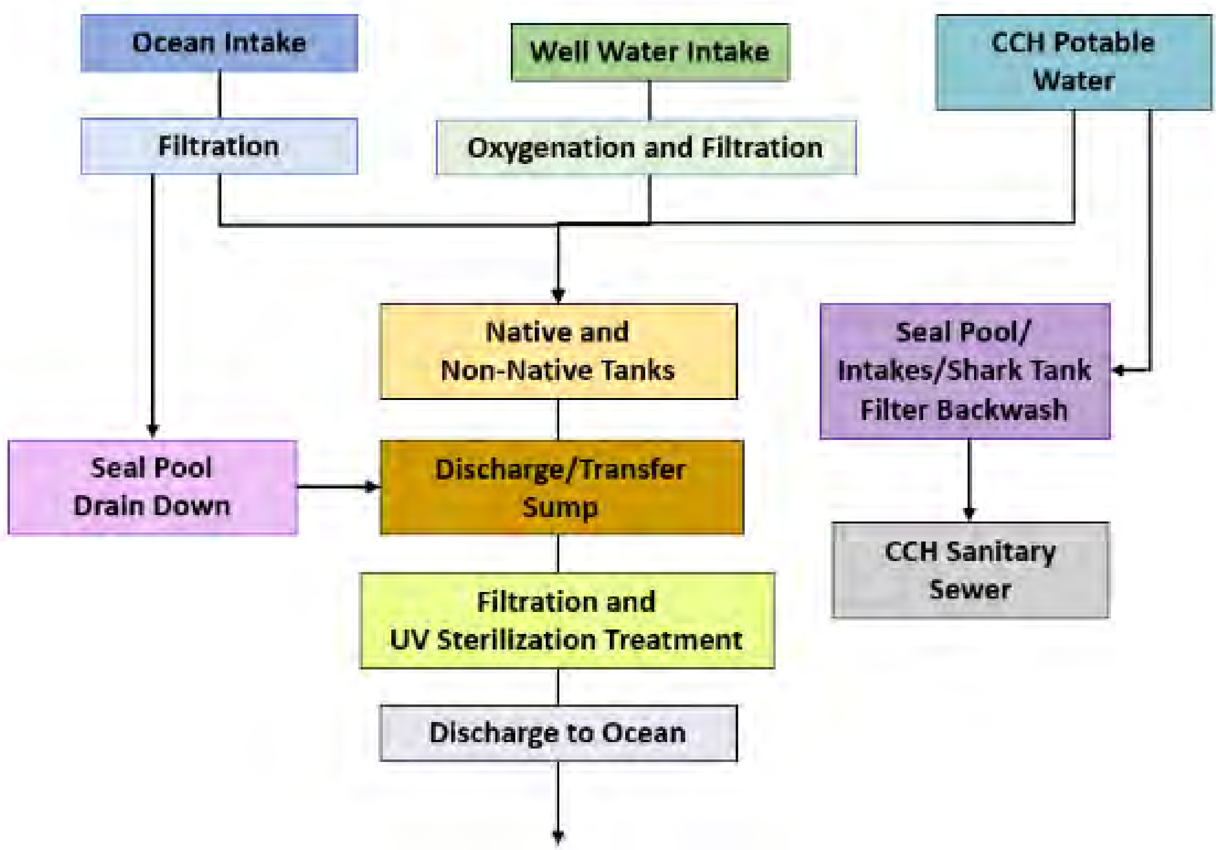


Figure 2-6: Conceptual Schematic of Alternative A

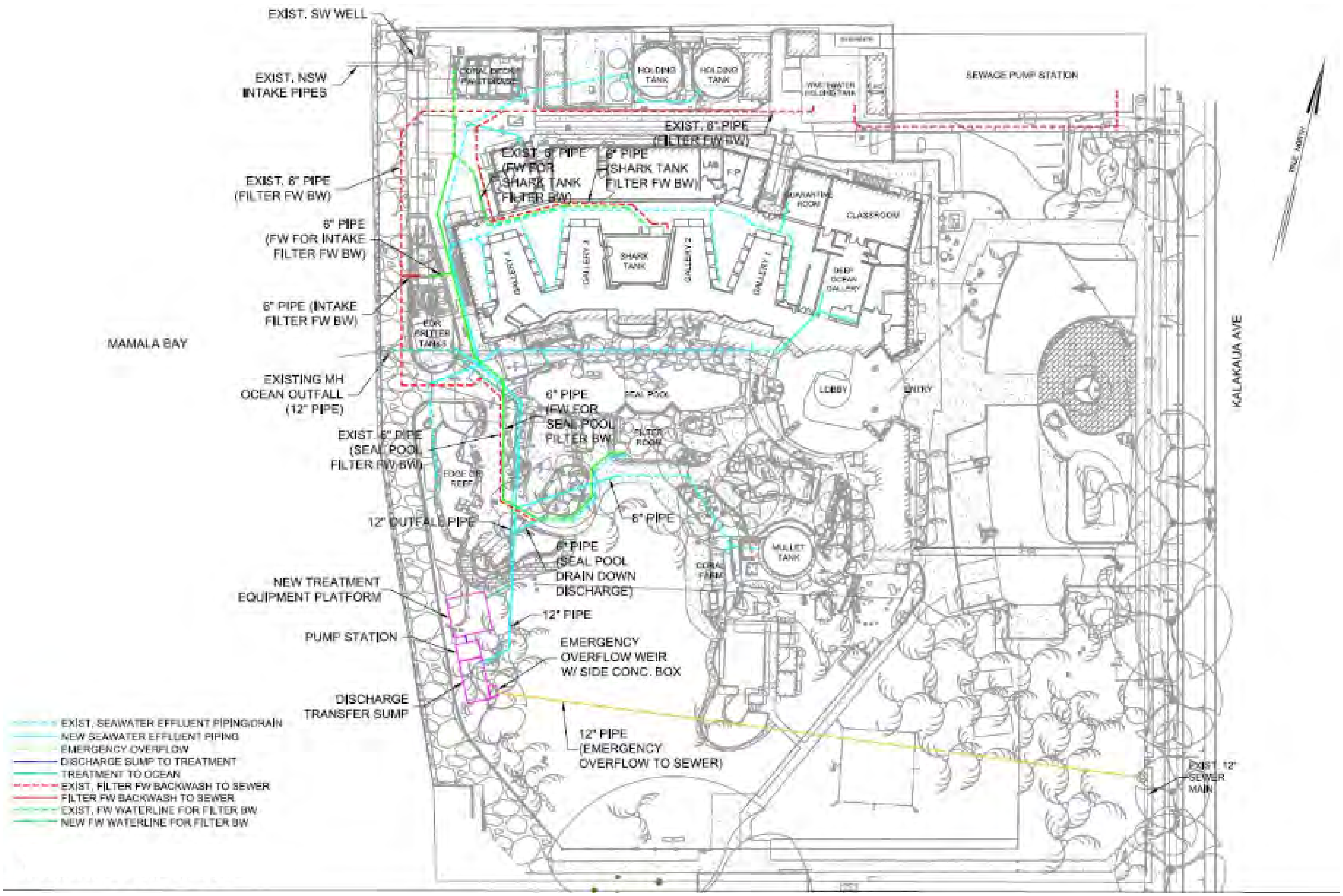


Figure 2-7: Proposed Layout for Alternative A - Filter and Treat Effluent Prior to Ocean Discharge

The filters will require regular maintenance (estimated approximately every three days) and will be back flushed to the sewer line using freshwater. Each backflush event (for all 4 filters) will result in about 8,200 gallons of freshwater being discharged to the wastewater system. An existing 12,000-gallon freshwater underground storage tank, installed to pump water to the Shark Exhibit filters during backflush, could be used for filter backflush but would need to be tied into the existing piping downstream of the booster pump to route water to the treatment system filters.

Three ultraviolet (UV) treatment units are recommended for sterilization. Each unit would provide a minimum UV exposure of 180 millijoules per square centimeter (mJ/cm^2). Two units are expected to be in use at a time to meet the maximum design flow, but the third UV unit would be installed for use during high flows (i.e., Monk Seal Exhibit "quick drops") and for redundancy during maintenance.

Alternative A was eliminated from consideration because operation, maintenance and energy costs would increase significantly from the present, and discharge into the open ocean would still occur. The ocean outfall would need to be maintained and all monitoring requirements of the NPDES permit would require continued compliance. The pumps required for this alternative are the largest of the three options and therefore would have the highest energy costs. Because of these factors, it was concluded that Alternative A was unlikely to have any advantages over the proposed action and Alternative A was eliminated.

2.3.2 Alternative B – Native exhibit wastewater filtered and treated prior to being discharged through ocean outfall; non-native exhibit wastewater filtered prior to being discharged into injection wells

Alternative B was a hybrid combination of the Proposed Action (injection wells for all effluent) and Alternative A (filtration and sterilization prior to ocean discharge for native effluent). In Alternative B, all saltwater discharged from native and monk seal tanks (i.e., "native effluent") would be filtered and treated prior to discharge into the existing ocean outfall. Non-native saltwater tank effluent (i.e., "non-native effluent") and freshwater exhibit effluent would be filtered and discharged into injection wells. Figure 2-8 illustrates the conceptual schematic, and Figure 2-9 depicts a possible layout. Two sumps, one to collect native effluent and the other for non-native effluent, would each have a dedicated pump station to direct wastewater to the treatment station and injection wells, respectively. Alternative B would require roughly the same amount of equipment and infrastructure for both the Proposed Action and Alternative A.

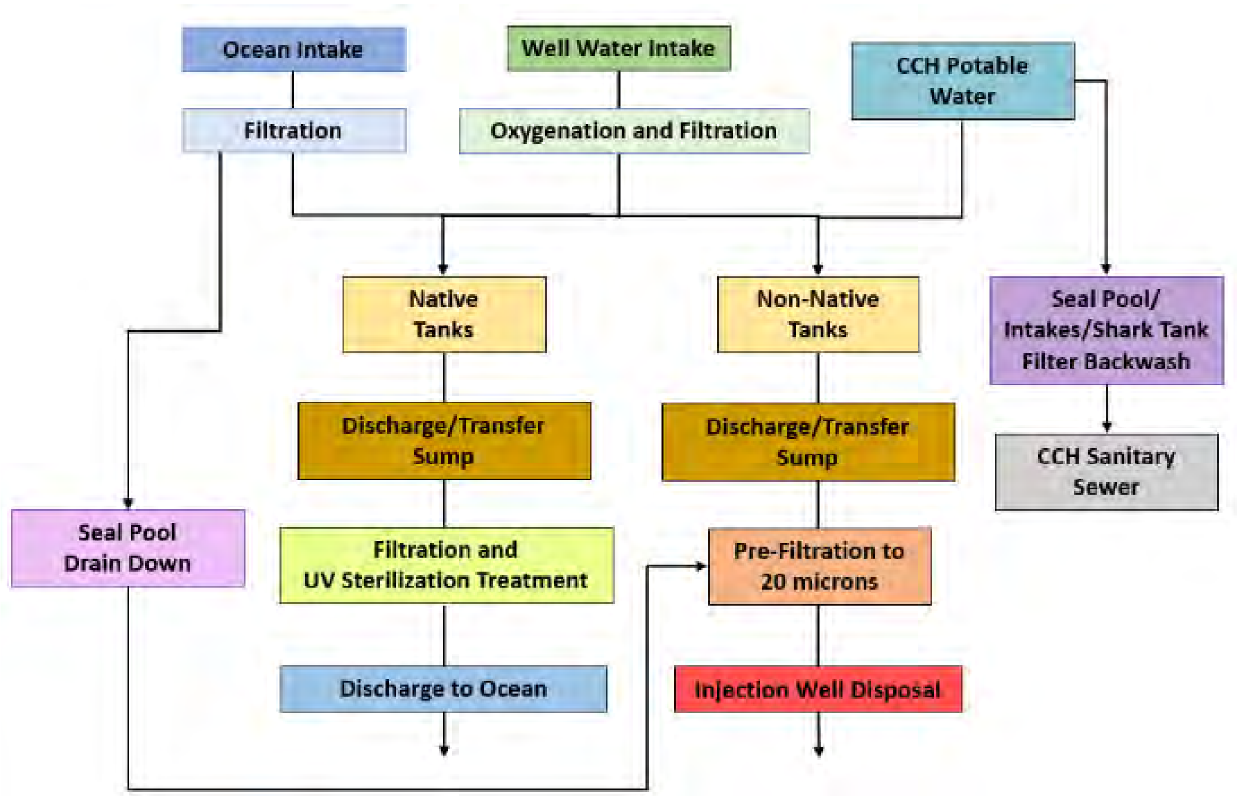


Figure 2-8: Conceptual Schematic of Alternative B

2.3.2.1 Raw Saltwater Effluent into -Ocean Outfall

Similar to Alternative A, raw saltwater effluent from native tanks would be redirected to a native discharge sump, pumped through pressure filters, and undergo UV sterilization before being discharged through the ocean outfall. The discharge sump dimensions, type and amount of filters, and UV sterilization configuration would be very similar to that in Alternative A, except the sump would be slightly smaller and sized to accommodate only 80% of the volume of the total effluent. The sump would also have an emergency overflow bypass to the CCH wastewater system. Treated water would be discharged through the existing ocean outfall.

The four vertical pressure filters, each 6 ft in diameter, will require an overhead clearance of 12 ft minimum to accommodate the filters with stands. Dryden Aqua AFM filter media is recommended for these filters to achieve acceptable water quality standards. Filter backflush will need to be routed to the CCH wastewater system. An existing 6-inch sewer line located just south of the proposed location of the native discharge treatment equipment pad will need to be tied into sewer piping to discharge filter backflush to sewer line.

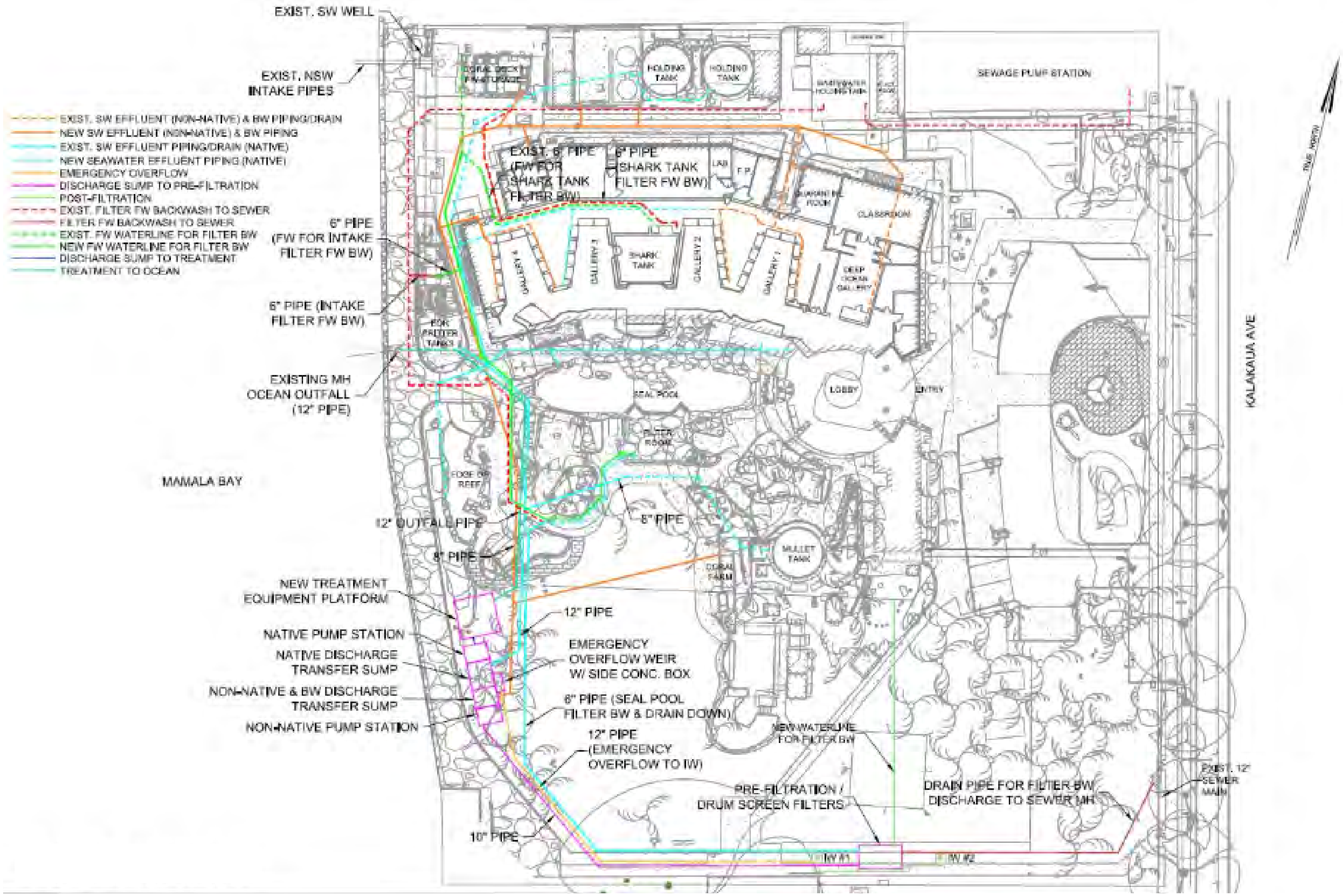


Figure 2-9: Proposed Layout for Alternative B – Native Effluent Discharged into Ocean, Non-Native Effluent Discharged into Injection Well

Three UV sterilizers will be downstream of the pressure filters. At the present, it is unclear whether the native species effluent would contain bacterial contamination that exceeds regulatory standards for discharge. If the native species effluent bacterial load is consistently below regulatory standards, then these UV units can be omitted from the treatment system. However, installation of the electrical requirements for the UV units is recommended in case they are needed in the future

2.3.2.2 Non-Native Exhibit Effluent Discharged into Injection Wells

Existing freshwater exhibit effluent and saltwater effluent discharge piping for all non-native species exhibits and holding tanks would be redirected to the non-native discharge sump, filtered, and sent to two injection wells. The two injection wells in Alternative B would be smaller in size than those specified in the Proposed Action due to the lower discharge volume from non-native only exhibits and tanks. The non-native sump would also be smaller in size than that of the Proposed Action and Alternative A due to the lower discharge flow. Two drum screen filters would pre-filter discharge to 20 microns prior to well injection. A sump pumping station would be designed to reside below grade next to the sump. The transfer pumps would direct non-native wastewater through the drum screen filters and into one injection well, with the other as a backup to ensure that WAq operations are not disrupted during well maintenance or repairs. Drum screen filters would be located at the injection wellhead area. An above grade filter building would be required to protect the filters and pumps from the elements.

Alternative B was eliminated from consideration because it involves the most infrastructure, which includes construction of two smaller new injection wells and pipelines for redirecting the discharge from non-native species exhibits to the injection well. The water distribution systems would be modified to accommodate the changes imposed by advanced treatment and discharge redirection. The complicated nature of Alternative B would require costs construction and maintenance higher than the Proposed Action and Alternative A. Electricity costs would be approximately the same as Alternative A. Due to higher construction and operation and maintenance costs, it was determined that Alternative B was unlikely have any advantages over the Proposed Action.

2.3.3 No Action Alternative

In the No Action Alternative, no upgrades to the wastewater discharge system for WAq would occur. WAq would continue to discharge wastewater directly into the MCLD through the existing ocean outfall and CCH wastewater system, thereby violating the AOC and regulatory requirements. Water quality exceedances in nearshore waters would continue, which may have negative effects on the sensitive MLCD area. If the AOC remains unaddressed, WAq will incur daily penalties for effluent exceedances of TSS, nutrients, and turbidity as specified in Paragraph 59 of the AOC. The costs associated with these penalties would be great and inhibit financial viability of WAq.

The No Action Alternative would not meet any of the project objectives, thus No Action Alternative is not considered a viable alternative.

2.3.4 Selection of the Preferred Alternative

In evaluating project alternatives, the following were key evaluation criteria:

- Aquarium Operations and Maintenance - How does the design option impact aquarium operation and maintenance requirements including manpower, complexity, and cost;

- Addresses DOH/City Violations - How well does design option address City sewer infrastructure and DOH NPDES requirements and concerns;
- Construction Cost - How the design option compares in terms of construction cost;
- Effluent Water Quality and Environmental Impacts - How the design option affects nearby water quality and ongoing regulatory permit requirements;
- Ease of Construction Permittability - How much effort is required to obtain required permits to construct the design option;
- Aquarium Disruption During Construction- How will the design option disturb aquarium operations during construction; and
- Future Expansion/Design Modularity - How compatible is the design option with modular expansion of the aquarium up to 800,000 GPD throughflow, can the design be implemented in future phases of expansion?

All criteria were evaluated by pairwise comparison, establishing a measure of weighted evaluation for the design options. Figure 2-10 presents the results of the alternatives evaluation and indicates how the Option 1 was selected as Proposed Action. As shown in this comparison, the Proposed Action rated highest in 1) Aquarium Operations and Maintenance, 2) Addresses DOH/City Violations, 3) Effluent Water Quality and Environmental Impacts, and 4) Aquarium Disruption During Construction.

Pairwise Weighted Design Option Evaluation Matrix

CRITERIA	CRITERIA PAIRWISE WEIGHTING FACTOR	PROJECT DESIGN OPTIONS: OPTION 1: Disposal of all effluent into injection wells		OPTION 2: All effluent treated and sterilized with ocean outfall disposal		OPTION 3: Native exhibit effluent disposal via ocean outfall, non-native water effluent disposal via injection wells	
		Value	Score	Value	Score	Value	Score
Aquarium Operations & Maintenace	19.0	3	57.1	2	38.1	1	19.0
Addresses DOH/City Violations	26.2	3	78.6	1	26.2	2	52.4
Construction Cost	9.5	2	19.0	3	28.6	1	9.5
Effluent Water Quality & Environmental Impacts	26.2	3	78.6	1	26.2	2	52.4
Ease of Construction Permitability	4.8	1	4.8	3	14.3	2	9.5
Aquarium Disruption during Construction	4.8	3	14.3	2	9.5	1	4.8
Future Expansion/Design Modularity	9.5	2.5	23.8	2.5	23.8	1	9.5
TOTAL	100.0		**276.2**		**166.7**		**157.1**
OVERALL RANK			1		2		3

Criertia Evaluation Values	
Highest Preference	3
	2
Lowest Preference	1

Figure 2-10: Weighted Comparison of Project Alternatives

3. AFFECTED ENVIRONMENT, POTENTIAL IMPACTS, AND PROPOSED MITIGATION MEASURES

This section discusses existing conditions, potential impacts and proposed mitigation measures for the physical and natural environment, natural hazards, ecological resources, the human environment, and public services and facilities. The analyses were conducted for the Proposed Action compared to the No Action Alternative as the baseline.

3.1 Physical and Natural Environment

3.1.1 Climate

3.1.1.1 Existing Conditions

The Hawaiian Island chain in the Pacific Ocean is one of the most remote land masses on Earth. A large eastern Pacific semi-permanent high-pressure cell to the north of the islands dictates much of air circulation patterns and climate in the region. This high-pressure cell produces northeasterly winds called trade winds over the Hawaiian Islands.

The average annual rainfall at the project area is approximately 23.5 inches per year (Giambelluca et al., 2013) with the most rain occurring during the wet season months of November through March. Relative humidity is usually about 70% (Giambelluca et al., 2014). The temperature in Honolulu is 74.7 degrees Fahrenheit (˚F) on average, with relatively stable temperatures throughout the year due to its close proximity to the ocean (Giambelluca et al., 2014). Tradewinds dominate throughout the majority of the year and blow toward the northeast. Kona winds and storms bring winds from the southwest and are most prevalent between October and April.

3.1.1.2 Potential Impacts and Proposed Mitigation Measures

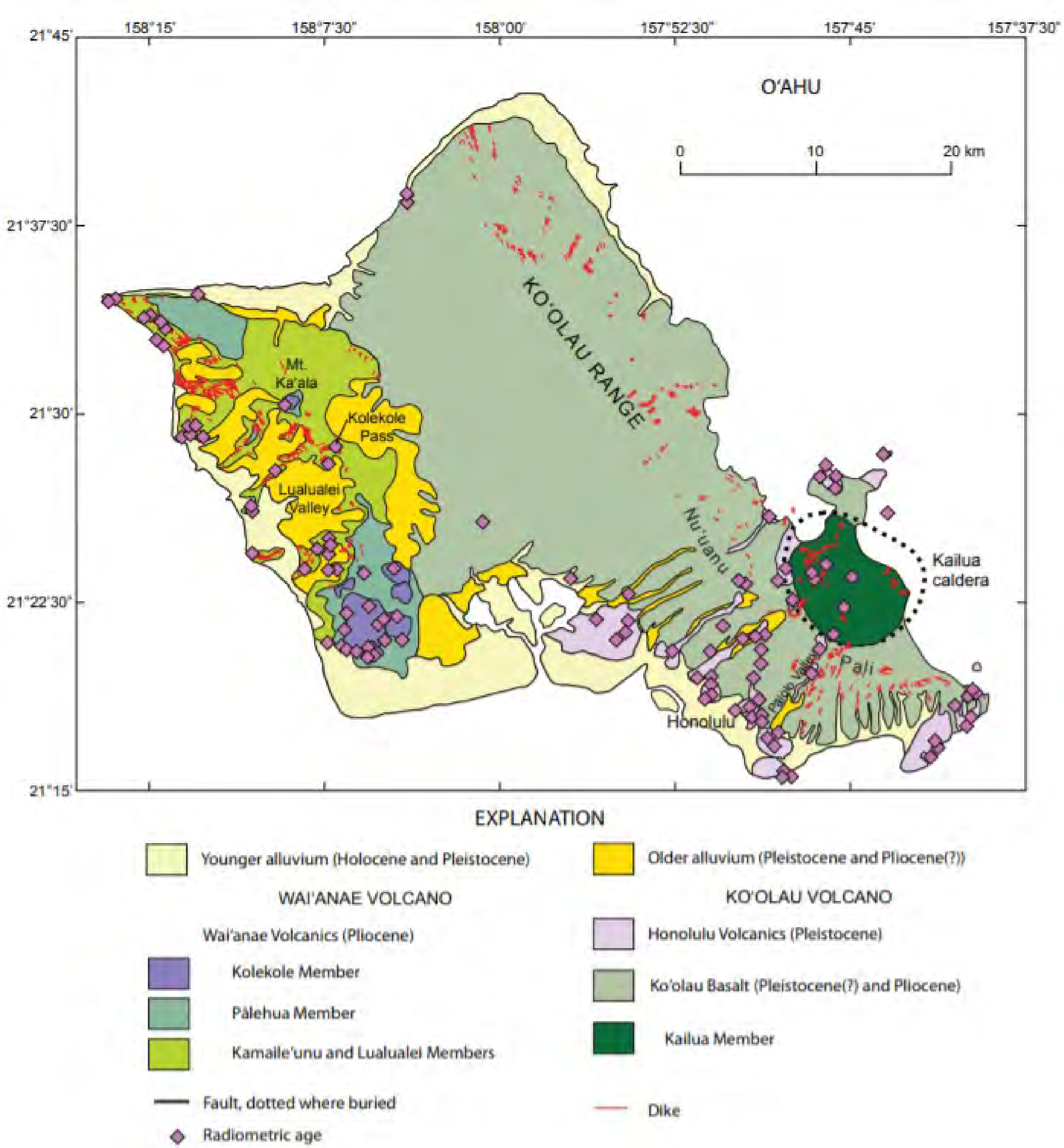
The proposed action will not impact climate in the area and no mitigation is required.

3.1.2 Geology and Soils

3.1.2.1 Existing Conditions

The island of O‘ahu was created by basaltic lava flows from the Wai‘anae and Ko‘olau shield volcanoes, which erupted approximately 3.0 – 1.78 million years ago (Sherrod et al., 2007). WAq is located in the caprock on the southern flank of the Ko‘olau Volcano. The Ko‘olau lavas are divided into Ko‘olau Basalt and Honolulu Volcanics. The Ko‘olau Basalt primarily consists of Pliocene-aged shield stage tholeiitic basalt. Ko‘olau Basalt underlies the project area. Figure 3-1 presents a geologic map of O‘ahu.

WAq is located on the caprock of the coastal plain of southern O‘ahu. Holocene and Pleistocene sedimentary caprock deposits directly underlay the project area and the Ko‘olau Basalt lies below the caprock. These deposits are generally called the Honolulu Caprock, which forms a coastal plain along the Waikīkī coast. The caprock is over 900 ft thick in the vicinity of WAq, as shown in Figure 3-2. The caprock in Honolulu is comprised of marine and terrestrial sediments along with some lava flows and pyroclastic deposits from the Honolulu Volcanics.



Source: Sherrod et al., 2007

Figure 3-1: Geologic Map of O'ahu

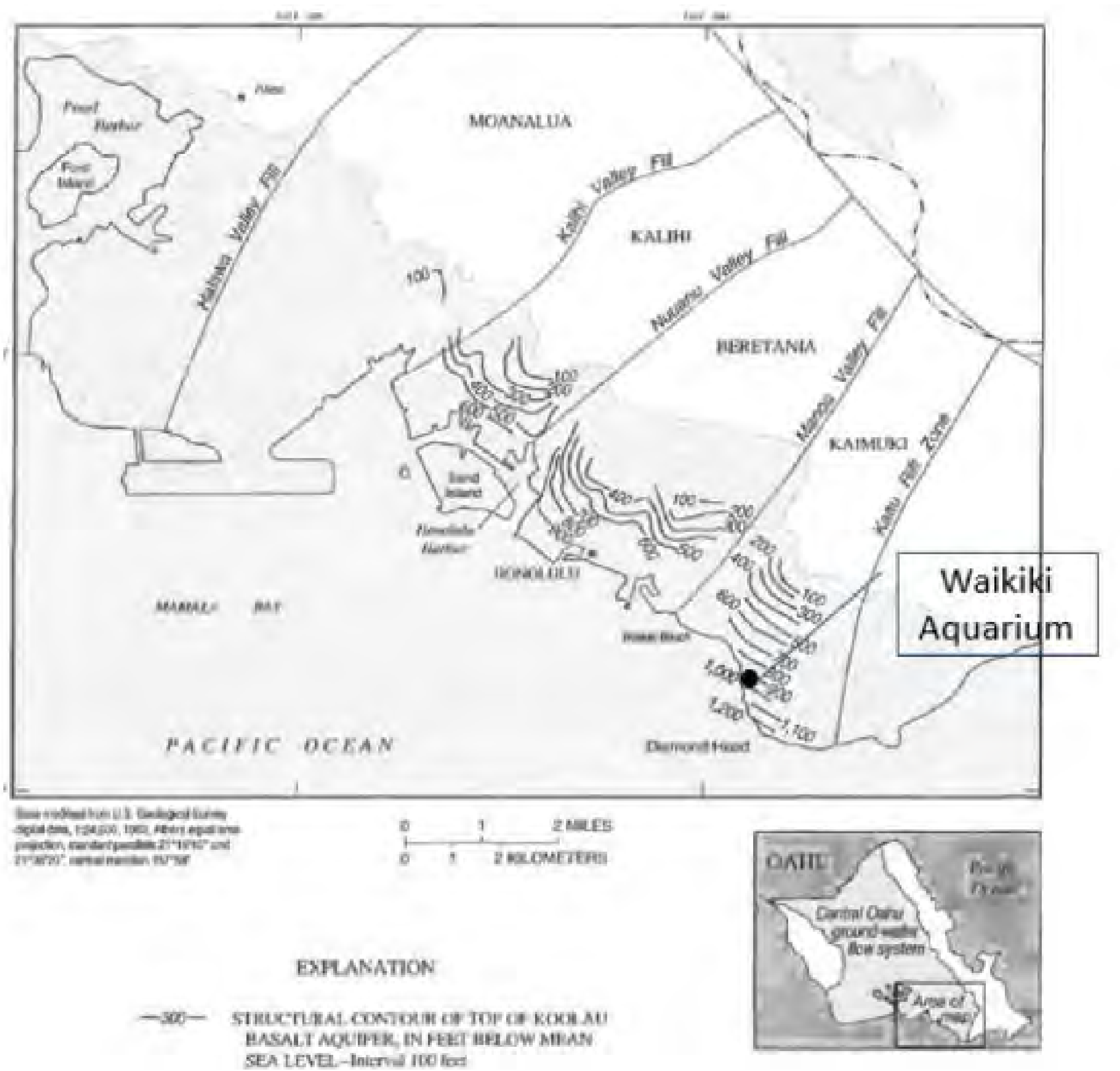


Figure 3-2: Caprock depths in the Honolulu Area (Oki, 1998)

Four subsurface boring cores were taken from the project site during a geotechnical engineering exploration to observe and evaluate subsurface conditions and the suitability of injection wells. Bore hole depth ranged between approximately 3–42 ft below existing ground surface (bgs). The borings encountered surface fill materials overlying beach deposits, lagoonal deposits, and apparent coral. The surface materials were 1-3 ft thick and were loose to medium dense clayey/silty sand and medium stiff to stiff clayey/sandy silt. Beach deposits occurred at approximately 8-10 ft bgs and consisted of loose to medium dense clayey gravel and very soft sandy clay. Lagoonal deposits found beneath the beach deposits extended down to 40.5 ft bgs and consisted of very loose to medium dense clayey gravel and very soft sandy clay. Lagoonal deposits are known to be highly compressible. Beneath the lagoonal deposits, medium hard to hard coral formation extended down to the maximum depth tested (approximately 42 ft bgs). For more information on moisture, plasticity, and other soil properties, please refer to Appendix B: Geotechnical Engineering Exploration: Waikīkī Aquarium Improvements and Wastewater System Upgrades.

According to the United States Geological Survey (USGS) map, the project area consists of Beaches (BS) on the makai half of the property and Jaucus Sand 0-15% (JaC) on the mauka side (Figure 3-3). These soil types are described as:

Beaches (BS) – Excessively drained soils with very low runoff. Frequent flooding and strongly saline.

Jaucus Sand, 0 t15 2% (JaC) MLRA 163- excessively drained soils with low runoff. Rare flooding and no ponding.

Figure 3-3: USDA NRCS Soils Map

Beaches soils are light-colored calcium carbonate sands derived from coral and seashells that are washed by ocean waves. Jaucas soils are similar but light brown, excessively drained, calcareous soils deposited from wind and water that occur adjacent to the ocean. Formerly, the Waikīkī area consisted of low elevation marsh wetlands and lagoons that were eventually reclaimed with dredged fill when Waikīkī was developed into an urban hot spot over the last 80 years.

3.1.2.2 Potential Impacts and Proposed Mitigation Measures

The Proposed Action will not affect the geology or soils of the area, which would also remain the same in the No Action Alternative. A hydrogeological evaluation of the area surrounding WAq concluded that the area is suitable for injection wells. The caprock at the site is between 900-1000 ft thick. The maximum allowable injection well depth would be 450 ft. The proposed injection wells are 245 ft deep. It is noted that WAq has an existing 80 ft-deep saltwater production well (State Well No. 3-1649-010) that was constructed in 1954, which is also indicative of the suitability for injection wells in the area. See Appendix C, Waikīkī Aquarium Injection Wells, for more information on injection wells impacts on geology and soils in the area.

3.1.3 Hydrogeology and Water Resources

3.1.3.1 Existing Conditions

WAq is situated on the sedimentary Honolulu Caprock formation, which forms a coastal plain along the Waikīkī Coast in the Pālolo Aquifer System. The caprock is over 900 ft thick in the vicinity of WAq and comprises marine and terrestrial sediments, some lava flows, and pyroclastic deposits. Koʻolau Basalt lies below the caprock. Hydraulic properties of these sedimentary formations can vary extensively; however, marine deposits (mainly calcareous) are generally more permeable than terrestrial deposits. The hydraulic properties of the sedimentary formations vary extensively. Marine sedimentary rocks are mostly calcareous and include limestone coral reefs, calcareous rubble and sand along with lagoonal sands and marls. The terrestrial deposits are more common in the valleys and the marine deposits are found on the coastal plain.

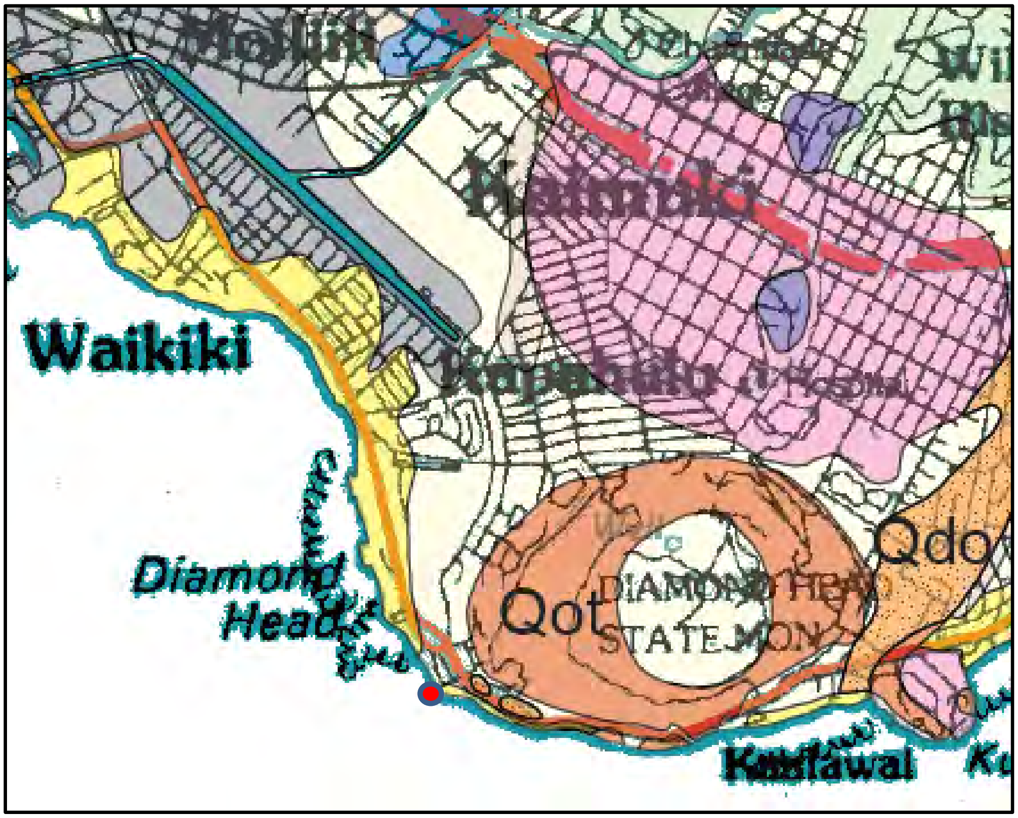
Hydraulic conductivity of in situ reef limestone varies from 100 to 20,000 feet/day and the hydraulic conductivity of lagoonal sands and mud varied from less than 1 to 500 feet/day. Injection wells developed in formations with higher hydraulic conductivity (equivalent to permeability) will have greater injection capacities.

Groundwater was encountered about 7.3 to 8.1 ft bgs during the field exploration conducted for the Proposed Action. Due to the proximity to the Pacific Ocean, groundwater levels likely vary with tidal fluctuation, seasonal precipitation, and other factors.

Figure 3-4 depicts the project site with a red dot. The surficial geology is caprock beach deposits and depicted in yellow. The orange, pink and blue areas are Honolulu Volcanics. The green is Koʻolau Basalt. The yellow and light green is caprock. The grey is artificial fill.

WAq is located within the Ala Wai Watershed, which is designated by the DLNR Division of Aquatic Resources (DAR) as DAR Watershed Code: 33007. The Ala Wai watershed is 19 square miles, with a maximum elevation of 3,051 ft. The watershed land use distribution is 0.9% agricultural, 40% conservation, 0% rural, and 59.1% urban. The Ala Wai watershed is 65.7% privately owned, while 9.5% is owned by the City and County of Honolulu, and the State owns 35% (Parham et al., 2008).

Ala Wai Stream is a perennial stream that occurs in the watershed. The total stream length is 30.4 miles and Ala Wai Stream has a terminal stream order of 3. At its closest point, Ala Wai Canal is approximately 0.6 miles away from the project site.



Source: Sherrod et al., 2007

Figure 3-4: Geologic map of the project site

3.1.3.2 Potential Impacts and Proposed Mitigation Measures

The Site is located makai of the Underground Injection Control (UIC) line, and therefore is in an exempted aquifer as defined by the DOH in the Hawaiʻi Administrative Rules (HAR Chapter 11-23; DOH, 1992). "Exempted" indicates that permitted injection is allowable. The underlying basalt aquifer is the downgradient end of the Pālolo Aquifer System. An application for a UIC permit has been submitted to the DOH Safe Water Drinking Branch.

The proposed action will not affect Ala Wai Canal or Stream; therefore, no mitigation measures or stream channel alteration permits are anticipated.

3.1.4 Ocean Water Quality

3.1.4.1 Existing Conditions

Water quality off of WAq in the MLCD is routinely monitored under NPDES Permit No. HI 0020630, which authorizes WAq to discharge wastewater from its saltwater exhibit tanks and pools and treated seal pool to Māmala Bay through Outfall Serial No. 001. The wastewater must be monitored at its outfall as well as within the designated ZOM pursuant of Water Quality Standards (WQS) (HAR Chapter 11-54) for open coastal waters. The NPDES permit requires water quality monitoring at the intake location, effluent outfall manhole, four ZOM locations, and two control locations (Figure 3-5). Sampling frequency and parameters are specified for each sampling location. Water quality parameters include enterococci, chlorine, total nitrogen (N), total phosphorus (P), ammonia, nitrate + nitrite, biological oxygen demand, total suspended solids (TSS), chlorophyll a, turbidity, pH, dissolved oxygen, and salinity.

Figure 3-5: ZOM Sampling Locations

Water quality data from 2008-2020 for total N (TN), total P (TP), ammonia nitrogen, and nitrate/nitrate from ZOM and control sites were taken as required by the NPDES permit. When compared to various State Standards, total Nitrogen within the ZOM is indistinguishable from TN as measured at the Control sites, and both fall within the Dry Open Coast standard. Total Phosphorus in the ZOM is slightly lower (particularly in the higher ranges) than within the Control samples, and both are lower than the Dry Open Coast State standard. Ammonia nitrogen is higher in the ZOM than at the Control sites and both are higher than the Dry Open Coast state standard. Control site NH4 is at concentrations equal to the State standard for Embayments and Wet Open Coast, but historically the ZOM samples exceed these values and are closer to the State standard for an Estuary. Nitrate plus nitrite values in the ZOM are slightly higher than the Dry Open Coast State standard. The Control sites are within the Dry Open Coast standards and do not display as much variance as the samples from the ZOM. Of these four parameters, only the Ammonia standard is significantly exceeded within the ZOM. The higher concentrations of ammonia are likely the result of metabolic byproducts generated by the invertebrates, fish, and marine mammals within the WAq.

3.1.4.2 Potential Impacts and Proposed Mitigation Measures

Impacts on nearshore receiving waters will be virtually eliminated as there will be no direct ocean discharge into the MLCD. Under the current regulatory requirements, the Proposed Action would eliminate the need for an NPDES permit and associated water quality monitoring requirements. Discharging WAq wastewater into injection wells would shift regulatory requirements and limitations to DOH Safe Drinking Water Branch as this department regulates injection wells in Hawaiʻi. Injection well discharge would introduce the wastewater at over 100 ft below ground surface, where it would dissipate into the saltwater aquifer and move laterally. Effects on the nearshore waters and the MLCD will be greatly minimized if not eliminated.

The injectate may affect the quality of groundwater discharged into the ocean and have a subsequent impact on Groundwater Dependent Ecosystems. To mitigate impact on coastal discharge, injectate will be roughly seawater quality with a salinity of 19,000mg/l chloride. The wastewater will be filtered with 30-micron drum screens to remove solids before injection and the effluent total suspended solids will be less than 20 mg/L. No sanitary wastewater will be discharged into the injection wells.

The injection wells are designed to be deeper than hydraulically and geologically necessary to minimize the impact of discharge to nearshore waters. WAq will routinely sample the wastewater to ensure that the drum screens are functioning correctly. The disposal interval of the wells will be at least 100 feet below sea level. This will result in longer travel distances and time before the injectate discharges into the ocean. There will be more dilution with naturally occurring groundwater and more opportunity for aquifer treatment. In addition, the injectate groundwater will discharge further offshore. The injectate will have the same salinity as seawater which is not significantly different from the groundwater in the aquifer. There are no other groundwater users in the vicinity.

To mitigate wastewater impacts associated with well drilling activities, well construction specifications will require the driller to have zero discharge and truck off drilling wastewater, thus HAR Chapter 11-55 Form I, NDPES General Permit Authorizing Discharges of Treated Process Wastewater Associated with Well Drilling Activities, will not be needed.

The injection wells will have no impact on Public Trust uses that refer to the maintenance of waters in their natural state, domestic water use of the general public, particularly drinking water, the exercise of Native Hawaiian traditional and customary (T&C) rights and reservations of water for Hawaiian Home Lands. Due to similarities to sea water, the groundwater discharge will not impact the maintenance of waters in their natural state. New filtration will minimally increase domestic water use. Native Hawaiian T&C rights deriving from Groundwater Dependent Ecosystems are not anticipated to be adversely affected.

Compared to the No Action Alternative in which exhibit effluent would continue to be discharged via the two disposal pipes, the Proposed Action should improve water quality within the nearshore area.

3.1.5 Topography

3.1.5.1 Existing Conditions

The topography of the project site is relatively flat. Ground surface elevations range from +6 to +9 ft above mean sea level.

3.1.5.2 Potential Impacts and Proposed Mitigation Measures

The proposed action will not alter the topography of the parcel. A new filter building will be constructed to house the drum screen filters. The discharge/transfer sump and pump vaults will be located below grade.

3.1.6 Air Quality

3.1.6.1 Existing Conditions

The United States Environmental Protection Agency (EPA) has national ambient air quality standards (NAAQS) for ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), 2.5-micron and 10-micron particulate matter (PM) ($PM_{2.5}$ and PM_{10}), and airborne lead. These ambient air quality standards establish the maximum concentrations of pollution considered acceptable for public health and welfare. The State of Hawaiʻi also has ambient air quality standards for five of the six criteria pollutants (excluding $PM_{2.5}$) and hydrogen sulfide, which is not included in NAAQS (DOH, 2020).

The project area is in EPA attainment zones for CO, NO_2, O_3, $PM_{2.5}$, PM_{10}, SO_2, and lead (EPA, 2014). In 2020, Hawaiʻi was in attainment with NAAQS annual averages of PM_{10}, $PM_{2.5}$, O_3, CO, and SO_2, based upon the calendar year 2020 average of annual mean values from 20 air quality stations, including six on Oʻahu, two on Maui, eleven on Hawaiʻi Island (four temporary), and one on Kauaʻi.

The Honolulu Station (AQS No. 150031001) is located approximately 3.5 miles northwest of the project site at 20m MSL. The station is located in downtown Honolulu in a busy commercial, business, and government district and measures CO, SO_2, $PM_{2.5}$, and PM_{10}. The tall, dense building structures in downtown Honolulu tend to create city pollution of warmer temperatures and turbulent winds within the city center; however, these are minimized by trade winds. The annual averages from this air quality station during the 2018-2020 calendar years did not exceed attainment, and no sites were in violation of the NAAQS (DOH, 2020).

During winter months when trade winds are absent and "Kona" winds blow from the southeast, vog from Hawaiʻi Island can bring increased levels of SO_2 and $PM_{2.5}$. Hawaiʻi's advisories for volcanic SO_2 and $PM_{2.5}$ have been customized for local conditions. Air monitoring stations in communities near Kīlauea Volcano on Hawaiʻi Island often exceed the NAAQS for SO_2 and occasionally $PM_{2.5}$. The EPA considers activities from the volcano a natural, uncontrollable event, and therefore the state requests exclusion from these NAAQS exceedances for attainment/non-attainment determination. Shorter exposure time intervals have also been adopted due to variable wind conditions, which can cause volcanic gas concentrations to change rapidly. DOH regulates fugitive dust, which can be released during earth-moving activities including removal of earth, excavation and fill, debris clearing, and vegetation grubbing.

3.1.6.2 Potential Impacts and Proposed Mitigation Measures

Construction and earth moving activities have the potential to generate fugitive dust in the short term time frame. Temporary degradation in air quality [e.g., increased levels of CO, nitrogen oxides, volatile organic compounds (VOCs)], and $PM_{2.5}$ and PM_{10} in the immediate project area may occur from emissions from construction equipment and personal vehicles. To minimize emissions, construction BMPs will be employed throughout the project. Most air quality impacts will occur during the construction and the contractor will comply with the provisions of HAR §11-60.1-33 on Fugitive Dust to keep dust and other air pollutants to the lowest levels practicable.

These include but are not limited to:

- Planning different phases of construction, focusing on minimizing the amount of airborne, visible fugitive dust-generating materials and activities, centralizing on-site vehicular traffic routes, and locating potential dust-generating equipment in areas of the least impact;
- Providing an adequate water source at the site prior to start-up of construction activities;
- Landscaping and providing rapid covering of bare areas, including slopes, starting from the initial grading phase;
- Minimizing airborne, visible fugitive dust from shoulders and access roads;
- Providing reasonable dust control measures during weekends, after hours, and prior to daily start-up of construction activities;
- Controlling airborne, visible fugitive dust from debris being hauled away from the project site;
- Properly tuning and maintaining construction equipment and vehicles;
- Limiting size and extent of exposed areas;
- Covering mounds of soil or fill;
- Watering work areas and unpaved work roads;
- Using wind/dust screens;
- Establishing a routine road cleaning and/or tire washing program; and
- Monitoring dust at the project boundary if significant dust generation is anticipated.

No long-term impacts to air quality are expected.

3.1.7 Noise

3.1.7.1 Existing Conditions

Existing ambient noise levels include vehicle traffic, aircraft, ongoing maintenance, construction equipment, surf, boats, and wind. In proximity of significant construction activity, noise levels can intermittently reach 80 decibels (dBA). The DOH regulates noise per HAR Chapter 11-46, "Community Noise Control," which establishes maximum permissible sound levels shown in Table 3-1. The rules provide for the prevention, control, and abatement of noise pollution from stationary noise sources and from equipment related to agricultural, construction, and industrial activities. The standards are intended to protect public health and welfare and to prevent the significant degradation of the environment and quality of life. DOH establishes acceptable levels of noise based on the ambient conditions (Class A-C) that would be anticipated in differing land uses situations (i.e., Zoning Districts) ranging from residential and business/resort, to industrial conditions.

The project site is in a Class A zoning district, as defined by HAR Chapter 11-46. HAR §11-46-7 grants the Director of the DOH the authority to issue permits to operate a noise source which emits sound more than the maximum permissible levels specified in Table 3-1 if it is in the public interest and subject to any reasonable conditions. Those conditions can include requirements to employ the best available noise control technology.

Table 3-1: Maximum Permissible Sound Levels in dBA

Zoning Districts	Daytime (7am – 10pm)	Nighttime (10pm-7am)
Class A	55	45
Class B	60	50
Class C	70	70

Notes:

1) *Class A zoning districts include all areas equivalent to lands zoned residential, conservation, preservation, public space, open space, or similar type.*
2) *Class B zoning districts include all areas equivalent to lands zoned for multi-family dwellings, apartment, business, commercial, hotel, resort, or similar type.*
3) *Class C zoning districts include all areas equivalent to lands zoned agriculture, country, industrial, or similar type.*
4) *The maximum permissible sound levels apply to any excessive noise source emanating within the specified zoning district, and at any point at or beyond (past) the property line of the premises. Noise levels may exceed the limit up to 10% of the time within any 20-minute period. Higher noise levels are allowed only by permit or variance issued under HAR §11-46-7 and §11-46-8.*
5) *For mixed zoning districts, the primary land use designation is used to determine the applicable zoning district class and the maximum permissible sound level.*
6) *The maximum permissible sound level for impulsive noise is 10 dBA (as measured by the "Fast" meter response) above the maximum permissible sound levels shown.*

3.1.7.2 Potential Impacts and Proposed Mitigation Measures

Short-term noise impacts associated with construction are anticipated with the Proposed Action. Project activities would involve drilling, moving heavy equipment and materials, and other construction activities. To mitigate noise emissions and community effects of noise emissions from construction activities, BMPs such as the following will be employed:

- Equipment operation on the shoreline will be limited between 7:00 AM and 7:00 PM. Noisier operations, such as truck hauling, could be limited to minimize disruption to beach users and condominium occupants;
- Equipment substitution will be used to ensure that the quietest locally available equipment is used (e.g, high insertion loss mufflers, fully enclosed engines, and rubber-tired equipment, if possible); and
- The use of horns will be prohibited.

Drilling operations may cause noise levels to exceed the allowable levels for more than 10% of the time within any twenty-minute period, in which case a Community Noise Permit from the DOH should be obtained. All construction activities and mechanical equipment needs to be under the allowable limit at or beyond the property line, if not, a community noise permit should be submitted. No night construction work will be permitted. No long-term noise related impacts from the Proposed Action are anticipated.

The No Action Alternative would not have short- or long-term noise impacts.

3.2 Natural Hazards

3.2.1 Climate Change and Sea Level Rise

3.2.1.1 Existing Conditions

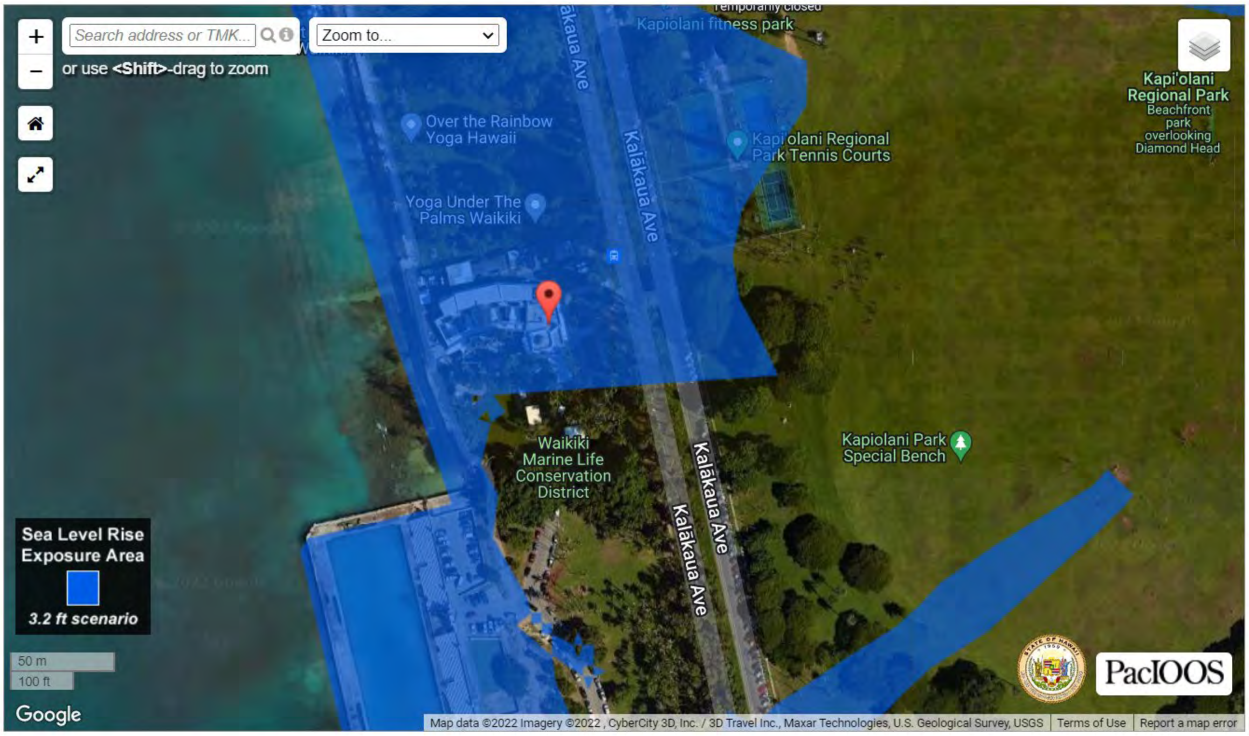
The Sea Level Rise (SLR) Exposure Area (SLR-XA) is a combination of three hazards including passive flooding, annual high wave flooding, and coastal erosion. Passive flooding modeling evaluates low-lying areas susceptible to flooding through elevation of ocean water level or groundwater level by SLR. Annual high wave flooding captures the distance wave runup and over wash will travel across the shoreline under high wave conditions. With SLR and higher water levels, offshore reefs will be less effective at dissipating incoming wave energy, which in turn results in greater wave size and energy impacts on the shoreline. Finally, coastal erosion modeling depicts the areas threatened by landward recession of the shoreline based on historical shoreline data.

According to their fifth assessment report (AR5), the Intergovernmental Panel on Climate Change (IPCC) predicts a worldwide SLR of 0.9 ft to 3.2 ft by the year 2100, depending on future efforts to mitigate for greenhouse gas emissions. The IPCC has outlined numerous impacts from this magnitude of sea level rise on coastal communities including beach erosion, inundation of land, increased flood and storm damage, saltwater intrusion into the freshwater lens aquifer, changes in precipitation, increased levels of land-based pollutants to coastal waters including sediments, nutrients and contaminants, and more frequent, longer, and more powerful El Niño and La Niña events (IPCC, 2014).

More recent studies by National Oceanic and Atmospheric Administration (NOAA) suggest that up to 3.2 ft of SLR could occur as early as the year 2060 under extreme scenarios. Under immediate scenarios, however, NOAA predicts 1.5 ft of rise in as early as the 2060s and 3.3 ft of rise by 2100 (Sweet et al. 2017). With uncertainties on the exact projections of SLR associated with greenhouse gas emission trajectories and the behavior of Earth's cryosphere, the State of Hawai'i Sea Level Rise Report (Hawai'i Climate Change Mitigation and Adaptation Commission, 2017) recommends the State to begin planning now for 3.2 ft of rise.

The majority of WAq parcel is within the 3.2 ft SLR-XA (Figure 3-6); only the southern end of the lawn area remains outside the 3.2 ft SLR-XA. Under the lowest 0.5 ft SLR scenario, both the southern end of the lawn area and the eastern end of the WAq parcel (i.e., the parking lot) are outside the 0.5 ft SLR-XA.

According to NOAA, based on mean sea level data from 1905 to 2021, the relative sea level trend from Honolulu Harbor (Station 1612340) is 1.55 mm/year with a 95% confidence interval of +/- 0.21 mm/year. This is equivalent to about a 1.7 ft-rise in 100 years (NOAA, 2022; Figure 3-7). Currently, a seawall fronts a 12-ft wide bike and pedestrian pathway, which separates WAq from the Pacific Ocean. The seawall is approximately +8.3 ft MSL high, and the elevation of the walkway is +7 ft MSL.



Source: PacIOOS, 2021. https://www.pacioos.Hawai'i.edu/shoreline/slr-Hawai'i/

Figure 3-6: Sea Level Rise Exposure Area (SLR-XA) 3.2 feet

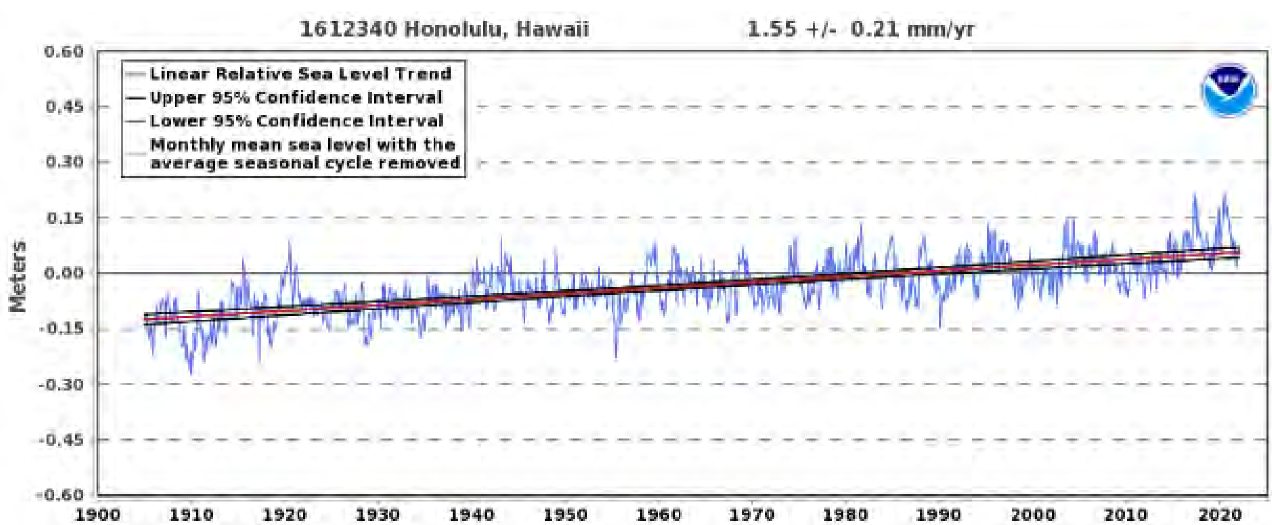


Figure 3-7: Relative Sea Level Trend Station 1612340, Honolulu HI

3.2.1.2 Potential Impacts and Proposed Mitigation Measures

The proposed project will not impact SLR nor increase WAq's degree of risk and exposure to SLR. Nevertheless, the Waikīkī region is particularly threatened by SLR due to its low elevation and proximity to the rising seas. As the main WAq building complex is entirely in the 3.2 SLR-XA, a long-term plan for adaptation or relocation may need to be developed for WAq.

3.2.2 Flood Hazards

3.2.2.1 Existing Conditions

Flood hazards for the project site are depicted on Flood Insurance Rate Map (FIRM) panel number 15003C0368G (effective date January 19, 2011). WAq is located in *Zone AE* (base flood elevation 8 ft) (Figure 3-8). Flood Zones AE are areas that present a 1% annual chance of flooding, with wave heights less than 3 ft.

3.2.2.2 Potential Impacts and Proposed Mitigation Measures

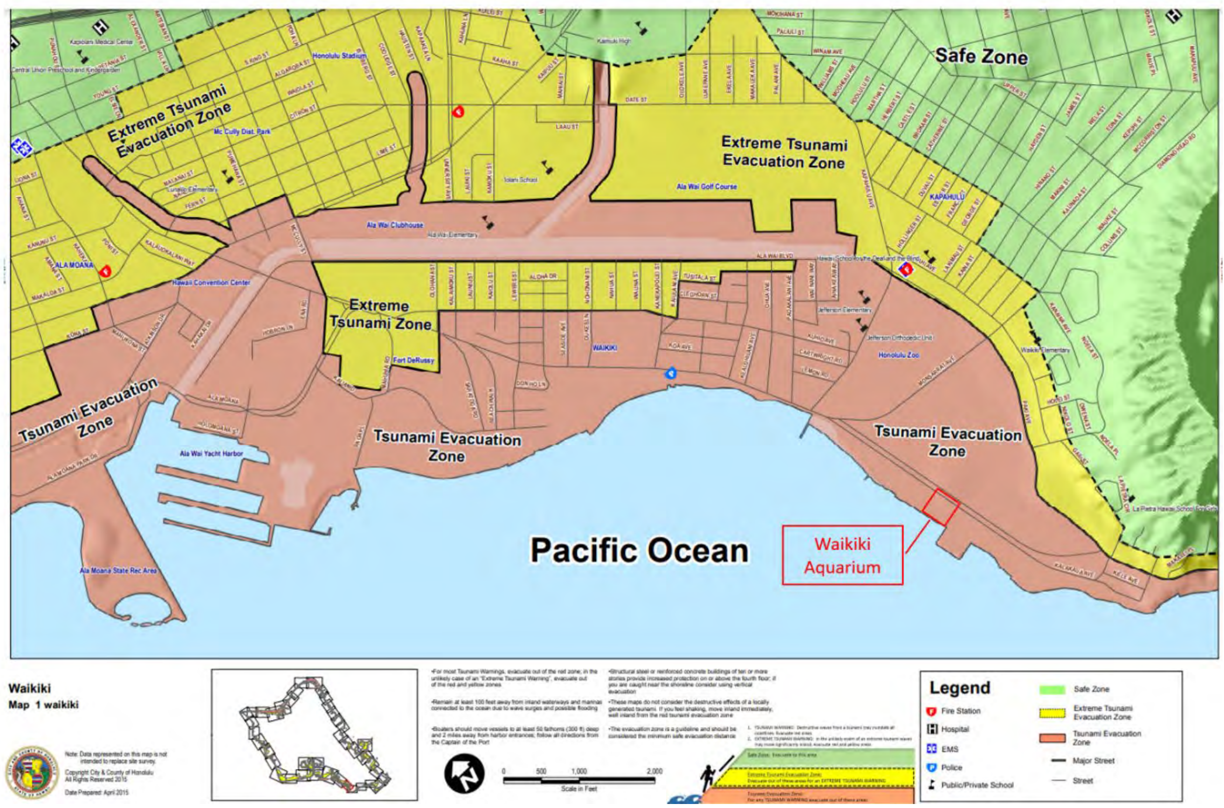
The proposed project will not change or impact flood zones. Site planning for proposed facilities and equipment should take the location of the parcel within the flood zone AE into consideration.

Figure 3-8: FIRM Map around WAq

3.2.3 Tsunami and Hurricane Hazards

3.2.3.1 Existing Conditions

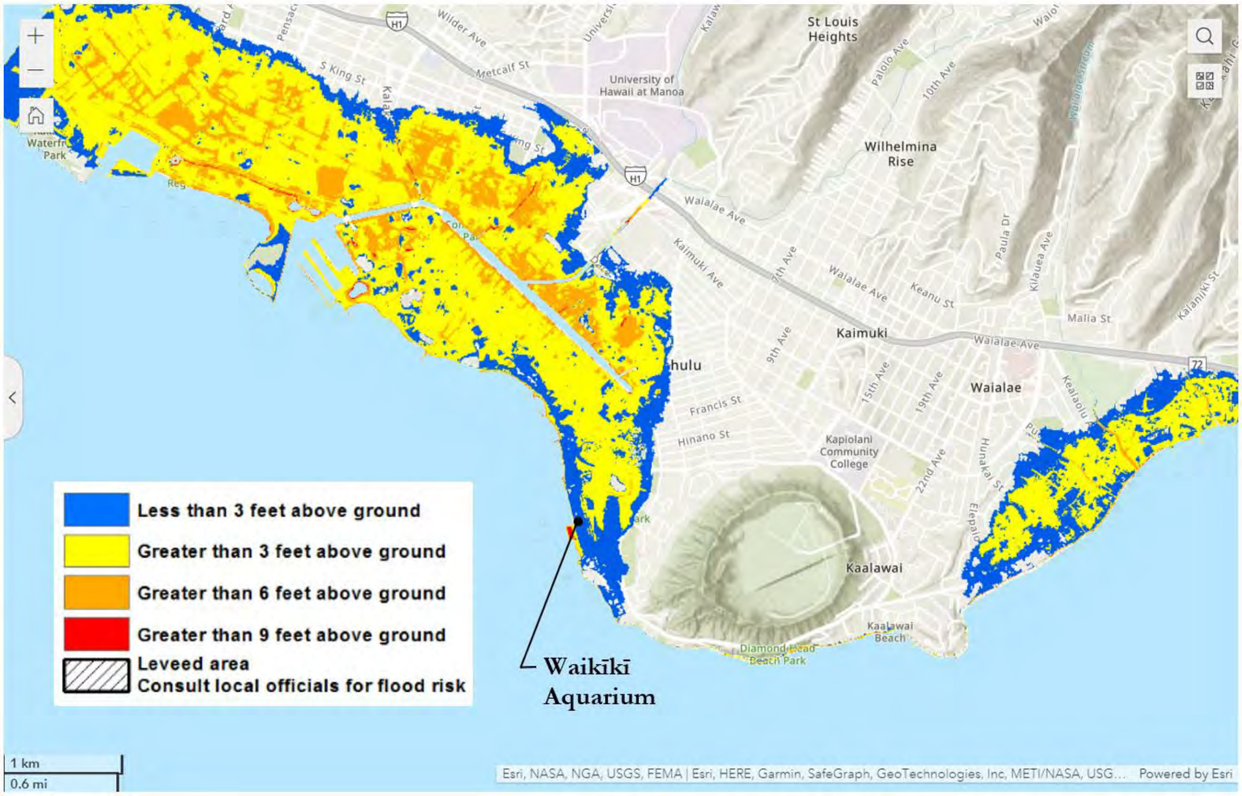
The project is located within the Tsunami Evacuation Zone (TEZ) (Figure 3-9). Occupants within these zones are required to evacuate and move to a safe zone in the event of a tsunami warning. Hurricanes are classified as tropical cyclones with violent winds, heavy rains, and abnormally high waves and storm tides. Hurricane season in Hawaiʻi occurs annually between the months of June through November, although large storms are rare. Hurricanes of note that have directly hit or caused great damage to the Hawaiian Islands include Hurricane Dot in 1959, Hurricane Iwa in 1982, and Hurricane Iniki in 1992. Although the occurrences of hurricanes in the islands are rare, storm surges and coastal flooding are expected to continue to become more severe and frequent with climate change predictions.



Source: City and County of Honolulu, 2015

Figure 3-9: Tsunami Evacuation Zone Map

Storm surge has the potential to extend miles inland from the immediate coastline. Based on review of the NOAA National Hurricane Storm Surge Hazard Maps, the WAq parcel is outside the storm surge flooding vulnerability area given Category 1 hurricanes. However, given Category 4 hurricanes, storm surge flooding will inundate the entire WAq parcel with water levels less than 3 ft above ground (Figure 3-10).



Source: NOAA, 2021. https://www.nhc.noaa.gov/nationalsurge/index.php

Figure 3-10: Storm Surge Risk Map, Category 4 Hurricane

3.2.3.2 Potential Impacts and Proposed Mitigation Measures

Implementation of the proposed project is not expected to alter flooding, tsunami or hurricane hazards to the project site and surrounding areas.

3.3 Ecological Resources

3.3.1 Terrestrial Biological Resources

3.3.1.1 Existing Conditions

The outdoor area at WAq is entirely landscaped, with planted native plants for educational purposes and ornamental landscaped vegetation. The terrestrial biological resources and a bird survey were conducted in the outdoor area of WAq, including the grassed lawn area and front of the building along Kalākaua Avenue. The Terrestrial Biological Resources Study is contained in Appendix D.

All vegetation at WAq is cultivated and landscaped, with numerous native plants on display for educational purposes. The most abundant plant species were naupaka kahakai (*Scaevola taccada)*, portia tree (or milo, *Thespesia populnea),* coconut trees (*Cocos nucifera*), ti leaf (*Cordyline fruticose*), and tree heliotrope (*Heliotropium arboretum*). One giant African Snail (*Achatina fulica*) was observed in the lawn area. No mammals or other macro fauna were observed.

A bird survey was conducted during the morning hours before the Aquarium opened in the lawn area. In addition to introduced common bird species to urban Honolulu, two white fairy tern (*Gygis alba*) nests were observed in separate milo trees (*Thesesia populnea*) near to the public restrooms and mullet tank. The milo trees that contained the nests were marked with blue tape on their trunk to designate them as white fairy tern nesting trees and warn tree maintenance crews of their presence. According to WAq staff at the time of the site visit, one nest had a recently fledged offspring (only one adult was observed), and the other nest had a 2-day old chick and an adult. The parent white fairy tern was observed feeding the chick during the site survey.

In pre-consultation with the U.S. Fish and Wildlife Service (USFWS) Pacific Islands Fish and Wildlife Office (PIFWO) about how the project pertains to Section 7 of the Endangered Species Act, the agency identified the following federally listed species that may occur or transit through or adjacent to the proposed project area:

- The endangered Hawaiian hoary bat (*Lasiurus cinereus semotus)*
- The endangered Hawaiian petrel (*Pteerodroma sanwichensis)*
- The threatened Newell's shearwater (*Puffinus auricularis newelli)*
- The endangered Hawaii distinct population segment (DPS) of band-rumped storm-petrel (*Oceanodroma castro)*
- The threatened Central North Pacific DPS of green sea turtle (*Chelonia mydas*).
- The endangered Hawaiian Monk Seal *(Neomonachus schauinslandi*)

Hawaiian hoary bats roost in exotic and native woody vegetation over 15 feet in height. Several trees within the project area are greater than 15 feet in height.

Hawaiian seabirds may pass through the project area during the day or night during the breeding, nesting, and fledging seasons that extends from March 1 to December 15. Outdoor and artificial lighting attracts seabirds and can result in seabird disorientation, fallout, and injury or mortality. Fledging birds are particularly vulnerable and would most likely pass through the site between September 15 through December 15.

Green sea turtles may nest on any sandy beach in the Pacific Islands and newly hatched turtles are known to become disoriented by artificial lighting. Although there is no sandy beach at or immediately adjacent to the project site, there are many sandy beaches near the project site. Due to the quantity of people that occupy Waikīkī beaches, sea turtle nesting near the project site is unlikely in the area.

3.3.1.2 Potential Impacts and Proposed Mitigation Measures

The construction and implementation of the Proposed Action may impact species identified in the previous section. During the pre-consultation process, the USFWS PIFWO, National Marine Fisheries Service (NMFS), and the State of Hawaiʻi Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DOFAW) were contacted for their input on the proposed project. Mitigation measures for the Hawaiian hoary bat, seabirds, and green sea turtle recommended by these organizations, as well as those developed in the preparation of this Draft EA, are hereafter summarized.

- **White Tern and Hoary Bat**

  Trees that have known White Tern (*Gygis alba)* nests should not be trimmed or disturbed during nesting season extending from February through June. Trees with the known White Tern nest will continue to be marked with a blue ribbon. It is recommended that, if tree trimming or removal is planned, a qualified biologist survey for the presence of White Terns prior to any action that could disturb the trees needs to be conducted. It was noted that White Tern pairs lay their single egg in a branch fork with no nest, and that eggs and chicks could be dislodged if the trees are nudged during construction.

  To avoid and minimize impacts to the Hawaiian hoary bat, woody plants greater than 15 feet tall shall not be disturbed, removed, or trimmed during bat birthing and pupping season, which extends from June 1 through September 15, and barbed wire should not be used for fencing. Construction of the sump and appurtenances will avoid disturbing as many mature trees as possible. In the present design, all pipeline excavations have been routed around areas with mature trees.

- **Hawaiian Monk Seal, Sea Turtles and Seabirds**

  The State endangered Hawaiian Monk Seal (*Monachus schauinslandi*) and threatened Green Sea Turtle (*Chelonia mydas*) could potentially be present or haul out on shore within the vicinity of the proposed project site. If either species is detected within 100 meters of the project area, all nearby construction operations would cease and not continue until the focal animal has departed the area on its own accord.

  To minimize impacts to seabirds and sea turtles and in consideration for social impacts, the project will avoid outdoor lighting and limit work during daylight hours. Additionally, design measures for the construction or operation of new structures and buildings adjacent to the beach will include tinting or the use of automatic window shades for exterior windows that face the beach, reducing the height of the exterior lighting to below three feet and pointed downward or away from the beach, and minimizing light intensity to the lowest level feasible.

- **Trees**

  The Tree Protection / Preservation Plan, as contained in Appendix E, recommends that a Certified Arborist be retained to perform quality assurance during construction, tree and root pruning, and the transplanting of trees. The Project Arborist shall establish a tree protection zone or barrier, limit construction under the tree crown, under a tree crown, and perform tree crown and root pruning. If damage should occur during demolition or construction, the Contractor shall immediately report any such injury to the Project Arborist. The Project Arborist and Contractor's Certified Arborist shall evaluate the injury and apply the appropriate treatment.

- **Native Plants**

  Native plant species for landscaping that are appropriate for the area, including climate suitable and historically occurring plants on the site, will be used for landscaping. Landscape designers will consult the Hawaiʻi-Pacific Weed Risk Assessment website to determine the potential invasiveness of plants proposed for use in the project.

- **Protection Against Invasive Species**

  Soil and plant material may contain invasive species that could harm native species and ecosystems, and may include fungal pathogens (e.g., Rapid ʻŌhiʻa Death), vertebrate and invertebrate pests (e.g., Little Fire Ants, Coconut Rhinoceros Beetle), or invasive plant parts.

  To minimize the presence of invasive species, the movement of plant or soil material between worksites, such as infill, will be minimized. All equipment, materials, and personnel should be cleaned of excess soil and debris to minimize the risk of spreading invasive species. Gear that may contain soil, such as work boots and vehicles, should be thoroughly cleaned with water and sprayed with 70% alcohol solution to prevent the spread of Rapid ʻŌhiʻa Death and other harmful fungal pathogens. A Certified Arborist will observe construction activity near the tree and will coordinate consultation with the Oʻahu Invasive Species Committee (OISC) as appropriate.

If these mitigation measures are followed, impacts to terrestrial resources and federally protected species are anticipated to be minimal.

3.3.2 Marine Biological Resources

3.3.2.1 Existing Conditions

MLCDs are designed to conserve and replenish marine resources and are intended to provide fish and aquatic life with a protected area to grow and reproduce. Specifically, MLCDs are established to protect the coastal waters of the islands including coral reefs and the extensive amount of biodiversity that thrives in these ecosystems. MLCDs are authorized under Chapter 190, HRS.

The ocean offshore of WAq is in the Waikīki Marine Life Conservation District (MLCD), a 78-acre site established in 1988 that stretches from Waikīkī Natatorium War Memoril on the east to the Kapahulu Groin on the west. The Waikīkī MLCD extends from the high-water mark to 500 yards offshore. Fishing and harassing sea life is prohibited, as well as removing sand, corals, or any geological features. Figure 1-1 shows the locational relationship of the WAq to the Waikīkī MLCD.

The USFWS PIFWO, NMFS, and DLNR were included in pre-consultation for this Draft EA. The USFWS PIFWO identified five Rare, Threatened, and Endangered (RTE) species that are protected by the Endangered Species Act (ESA) and may be found in the area.

- Hawaiian hoary bat (*Lasiurus cinereus semotus*);
- Endangered Hawaiian petrel (*Pterodroma sandwichesis*),
- Threatened Newell's shearwater (*Puffinus aricularis newelli*),
- Endangered Hawaii DPS of band-rumped storm petrel (*Oceanodroma castro*), and
- Threatened Central North Pacific DPS of Green sea turtle, *Chelonia mydas* (ESA)

3.3.2.2 Potential Impacts and Proposed Mitigation Measures

No in-water work will be done during construction, and therefore no short-term impacts to marine biological resources and threatened or endangered species are anticipated.

In the long term, the Proposed Action will have less impact on marine biological resources than the No Action Alternative. The Proposed Action will eliminate direct discharge into the Pacific Ocean, which should improve water quality and have a positive impact on marine biological resources in the nearshore area. The existing effluent pipeline has been in place for at least 50 years, has become encrusted with algae and organisms. It is not scheduled for removal.

To avoid impacts to sea turtles and Monk seals during construction, if these ESA species are observed within 100 meters of the aquarium (i.e. between the Natatorium groin to the east and an equal distance to the west) construction activities that generate significant noise above ambient levels will be discontinued until the animal voluntarily leaves the area. See Section 3.3.1.2 for potential impacts and proposed mitigation measures.

In the No Action Alternative, exhibit effluent will continue to discharge directly into the MLCD. Nutrients and turbidity entering the ZOM from the Aquarium would continue and could negatively affect the nearshore coral and marine ecosystems.

3.4 Human Environment

3.4.1 Demographics

3.4.1.1 Existing Conditions

The project site is located within the Urban Honolulu Census Designated Place (CDP), which encompasses 68.4 square miles. The Urban Honolulu CDP area has a population of 350,964. The median age is 43.9 years, with 6.8% of the population under 5 years old and 23.7% over 65 years old. Most of the population identify with two or more races (38.4%), and Asian and White people each comprise 24% of the population. Approximately 12.5% of the population is Native Hawaiian or Pacific Islander. About 93% of adults have a high school degree or higher. The median household income is $72,454. It is estimated that 10.7% of individuals live in poverty (U.S. Census Bureau, 2021).

3.4.1.2 Potential Impacts and Proposed Mitigation

The Proposed Action will not impact the Honolulu's population, nor would it alter demographics. No mitigation is required.

3.4.2 The Economy

3.4.2.1 Existing Conditions

Waikīkī is bounded on the north and west by the Ala Wai canal from Kapahulu Avenue to the ocean (including the Ala Wai Boat Harbor), on the east by Kapahulu Avenue and on the south by the ocean shoreline. This region features hotels, restaurants, and retail operations that cater to the visitor industry and is recognized by CCH as the Waikīkī Beach Special Improvement District. Waikīkī accounts for 4.1 percent of Hawai'i's total civilian jobs and contributed $345.4 million to Hawai'i State taxes in 2021. (State of Hawai'i Data Book 2021, Table 7.33 Contribution to the State's Economy by Statewide Visitor Industry and by Waikīkī: 2021).

The area east of Waikīkī complements this economic benefit generated by Waikīkī by providing educational, recreational, and open space resources, including WAq, Waikīkī Zoo, Kapi'olani Park and the iconic Diamond Head. Nestled between the ocean and the regional park, WAq is a popular destination for residents and visitors that showcases Pacific marine life. Much of this area is in the Diamond Head Special District designated by CCH.

3.4.2.2 Potential Impacts and Proposed Mitigation

The Proposed Action will have a positive short-term impact on the economy by creating direct and indirect employment related to construction.

The Proposed Action will allow WAq to comply with State and County environmental requirements while continuing operations and remain financially viable. From an economic perspective, these effects will continue to promote Waikīkī as a visitor destination.

3.4.3 Archeological Resources

3.4.3.1 Existing Conditions

The Archaeological Literature Review and Field Inspection Report is presented in Appendix F. Background research and previous archaeological findings in the vicinity indicate there is potential for traditional Hawaiian historic properties and human burials in the overall project area. Waikīkī was intensively used during the pre-contact and early historic period for habitation, agriculture, and aquaculture, and several heiau were once present. In the late 1900s, Waikīkī's landscape was radically modified and became the home of many wealthy businesspeople.

Near the project area are several instances of inadvertently discovered human burials reported on by staff of the Bernice Pauahi Bishop Museum (BPBM) at the Outrigger Canoe Beach Club. Further numerous human remains have been found in Kapiʻolani Park and along KalākauaAvenue.

In the mid-1990s, several human skeletal remains were inadvertently discovered at WAq during rebuilding and modification of a shark tank. No formal burial site was identified. It was speculated that the skeletal fragments were brought in with sand from Maui for construction work during the project.

Excavations were monitored for subsurface electrical infrastructure for a new sewer pumping station which documented a layer of natural beach sand, but no cultural layer was encountered; however, a trash pit, designated Site 6704, was recorded within Kalākaua Avenue, adjacent to the aquarium. The site consisted of bottles dating between the 1880s to 1920s, broken ceramic pieces, and butchered animal bone.

Archaeological monitoring was conducted in 2008 for electrical system upgrades in the northeast corner of the Waikīkī Aquarium. The soil stratigraphy primarily consisted of two layers of fill over a transitional layer, followed by Jaucus sand.

3.4.3.2 Potential Impacts and Proposed Mitigation

Based on archival research and the results of previous archaeological studies in and near WAq, there is potential for encountering subsurface historic properties, including human burials. Dune sands, which may contain human burials, are known to underlie historic fill deposits at approximately 15.0 to 100.0 cm (5.9 to 40.0 in) below ground surface in the northeast corner of the aquarium. Evidence of early twentieth century habitation may be encountered on the south side of the aquarium, which is near the former location of the Irwin family's stable. In addition to human burials, anticipated archaeological finds include traditional Hawaiian subsurface cultural deposits or artifacts, and historic features or artifacts associated with the Irwin residence. Finally, the Waikīkī Aquarium is over 50 years old and is a historic property; no State Inventory of Historic Places (SIHP) site number has been assigned.

The recommended project effect determination is "Effect, with proposed mitigation commitments." At this time, development of an archaeological monitoring program with on-site monitoring following HAR Chapter 13-279 is recommended.

3.4.4 Cultural Impacts

3.4.4.1 Existing Conditions

The Cultural Impact Assessment is contained in Appendix G. The Hawaiian cultural landscape can be described through moʻōlelo and wahi pana, or significant Hawaiian place names. Moʻōlelo may be myths, legends, proverbs, and events surrounding well-known individuals in Hawaiian history. The Project Area is situated in the ʻili (land division of an ahupuaʻa) of Kāneloa in Waikīkī. Ahupuaʻa Kāneloa can be translated as "tall Kāne". Waikīkī, which can be translated as "spouting water," is named for its former wetlands fed by numerous streams from the valleys of Makiki, Mānoa, and Pālolo.

In 1876 a group of business people, including Archibald Cleghorn, John O. Dominis, and James Makee, formed the Kapiʻolani Park Association. King David Kalākaua offered a 30-year lease of Kāneloa and Kapua (neighboring ʻili to the east) for the endeavor on the east side of Waikīkī, which was at the time crown land. Kalākaua dedicated the park in June of 1877 in honor to Queen Kapiʻolani. At this time, the east portion of the park was sparsely vegetated and sandy, while the western portion contained wetlands and streams. Consequently, the park development entailed road building, drainage, and extensive plantings of ironwood, banyan, date palm, and other trees.

The Waikīkī Aquarium was formerly located in Kapiʻolani Park, roughly 100 yards north of its current location. Constructed in 1904, it was known as the Honolulu Aquarium and was privately financed by Charles M. Cooke and James B. Castle and operated as part of the Honolulu Rapid Transit and Land Company. In 1919 the land lease expired and the Cooke Estate ceded the lease to the Territory of Hawaiʻi. The present day Waikīkī Aquarium was funded by the Territorial Legislature in 1949 and opened in 1955.

3.4.4.2 Project Impacts and Proposed Mitigation

No significant cultural impacts are anticipated as a result of the Proposed Action. As part of the CIA, the archaeologist contacted DLNR SHPD requesting contact information for individuals who might be interested in participating in the consultation process to determine if traditional cultural practices were being undertaken within the project area. In addition. a public notice was placed in the Office of Hawaiian Affairs Ka Wai Ola Newsletter. Furthermore, recent CIAs undertaken immediately adjacent to the WAq were reviewed to determine if traditional or customary cultural practices had been identified in the immediate vicinity of the project area. As of this writing, no response has been received from SHPD, nor has there been a response resulting from the Ka Wai Ola Newsletter Public Notice.

A further analytical framework for addressing the preservation and protection of cultural practices specific to Native Hawaiian communities resulted from a 2000 Hawaiʻi Supreme Court ruling [(in Ka Paʻakai O KaʻAina vs Land Use Commission. 94 Hawaii 31 (2001)]. In its decision, the court established a three-part analytical approach to identify, assess impacts, and mitigate impacts to traditional and customary native Hawaiian rights associated with a proposed action. The three-part analysis, based on current consultation, past consultations, and archival research, is applied to the Proposed Action as follows.

1. *The identity and scope of valued cultural, historical, or natural resources, including the extent to which traditional and customary native Hawaiian rights are exercised*: No valued cultural or historical resources, and no traditional and customary native Hawaiian rights are exercised within the project site.

2. *The extent to which those resources—including traditional and customary native Hawaiian rights—will be affected or impaired by the proposed action:* No traditional and customary native Hawaiian rights will be affected or impaired by the proposed action.

3. *The feasible action, if any, to be taken by the agency to reasonably protect native Hawaiian rights if they are found to exist:* No native Hawaiian rights related to cultural or historical resources have been found to exist within the project site.

As a result of this CIA, it was found that two historic properties are within the project parcel: the Waikīkī Aquarium (no SIHP site number designated) and SIHP 04729, which was speculated to be skeletal fragments brought into the aquarium with sand from Maui for construction. Outside the project area, along the beach to the north and south of WAq, numerous traditional Hawaiian human burials have been identified. Previous archaeological investigations in the vicinity have recorded in situ soils under fill layers. Consequently, there is potential for encountering traditional Hawaiian cultural deposits or human burials in the project area. Pursuant to HRS, §6E-8 and its implementing regulations at HAR §13-275-7(2), the recommended project effect determination for the project area, based on the research presented herein, is "effect, with proposed mitigation commitments." At this time on-site archaeological monitoring for mitigation purposes is recommended.

3.5 Public Services and Facilities

3.5.1 Recreational Facilities and Resources

3.5.1.1 Existing Conditions

Kapiʻolani Park is located across of Kalākaua Avenue and adjacent to WAq on its northern and southern boundaries. Encompassing 300 acres, Kapiʻolani Park is the largest public park in Hawaiʻi and contains the Honolulu Zoo, Waikīkī Shell, a bandstand, tennis and basketball courts, soccer fields, and large grassed areas used for active and passive recreational activities. The Waikīkī Natatorium War Memorial is located just southeast of WAq.

3.5.1.2 Potential Impacts and Proposed Mitigation Measures

All construction and operations will be contained on WAq property and will not affect any of the surrounding park. Further, in response to pre-consultation requests, the City and County Department of Parks and Recreation (DPR) noted that the Proposed Action should not impact DPR's properties. If deemed necessary, the project's contractor may need a DPR Right-of-Entry permit and will be sought. No other mitigation measures will be needed.

The Proposed Action will have a long-term positive impact on recreation uses by allowing WAq's operational stability, thereby continuing to enhance recreational features, and improving water quality along the adjacent shoreline, a popular resident and visitor recreational resources.

3.5.2 Solid Waste Treatment and Disposal

3.5.2.1 Existing Conditions

Solid waste disposal in the area is provided by CCH.

3.5.2.2 Potential Impacts and Proposed Mitigation Measures

Construction of the Proposed Action will result in drilling solids, cuttings, and fluids, which will be properly contained on-site during construction. Upon completion of construction, all construction waste will be properly disposed at the PVT landfill in Nānākuli, O‘ahu's only construction and demolition waste landfill. Alternative disposal of construction waste must be approved and permitted by the Department of Health.

The Proposed Action will not increase the long-term need for solid waste disposal.

3.5.3 Police and Fire Protection

3.5.3.1 Existing Conditions

The project area is within Honolulu Police Department (HPD) District 6, which encompasses the Waikīkī peninsula. The nearest police station is the Waikīkī substation, located 0.7 miles north of the project site at 2425 Kalākaua Avenue.

The nearest Honolulu Fire Department (HFD) fire station is Fire Station 07 located at 381 Kapahulu Avenue and less than a mile northeast from the project site.

3.5.3.2 Potential Impacts and Proposed Mitigation Measures

The Proposed Action will not impact HPD and HFD services during construction. Adequate notification will be made to the public and businesses in the event any road closures are required.

WAq will comply with HFD access to the property in accordance with NFPA 1, 2018 Edition, §18.2.3, and an approved water supply. Civil engineering drawings will be submitted to HFD for review and approval as a part of the building permit process.

3.5.4 Roadways and Public Transportation

3.5.4.1 Existing Conditions

Kalākaua Avenue is a busy thoroughfare, frequently used by residents and visitors traversing Waikīkī, Diamond Head, Kapi‘olani Park, Waikīkī Beach and adjacent areas. The project site is located on the makai side of Kalākaua Avenue, along TheBus route. The nearest bus stop fronts WAq on Kalākaua Avenue.

3.5.4.2 Potential Impacts and Proposed Mitigation Measures

As previously noted, adequate notification will be made to the public and businesses in the event of road closures. Mobilization and demobilization of construction equipment to and from the site for well drilling will be along the two-lane Kalākaua Avenue. To reduce traffic impacts, mobilization and demobilization will take place during non-peak traffic hours (e.g., 8:30 AM – 3:30 PM). Traffic control devices and/or road closures are not anticipated to be needed except very briefly for mobilization and demobilization. Once the construction equipment vehicles are onsite, they will be contained to WAq property and will not encroach on public roadways.

The proposed action will not affect the public bus route or stop.

3.5.5 Water and Wastewater System and Services

3.5.5.1 Existing Conditions

Fresh, potable water is provided to the project site by the City and County of Honolulu Board of Water Supply (BWS).

Wastewater services from WAq are provided by CCH ENV. Sewer gravity mains run to and from WAq and along Kalākaua Avenue, and several force mains are concentrated on the northwest corner of the parcel. Two sewer manholes are located on the east side of the parcel. A CCH Sewage Pump Station is located near the northeast corner of the WAq parcel. Figure 3-11 illustrates the wastewater system in the project environs.

Source: City and County of Honolulu DPP, 2022

Figure 3-11: Honolulu Sewer Utilities Map

3.5.5.2 Potential Impacts and Proposed Mitigation Measures

No private water wells for consumption, stormwater, and sewage will be constructed. This project will use approximately 4,000 GPD for the rinsing/backwashing of the drum screen filters. This is not expected to be a significant impact on the water system, nor will it significantly impact conservation efforts related to new and existing infrastructure. BWS Cross-Connection Control and Backflow Prevention requirements will be followed.

No discharge will enter State surface waters, so an NPDES permit is not required. The wastewater will be contained via injection wells, and necessary BMP's will be in place to contain any discharge.

No impacts will occur on the stormwater containment system and water conservation efforts. No modifications will be made to the current freshwater drinking supply.

The Proposed Action will have no impact on Public Trust uses related to the maintenance of waters in their natural state, domestic water use of the general public, particularly drinking water, and the exercise of Native Hawaiian traditional and customary (T&C) rights. New filtration will minimally increase domestic water use. Native Hawaiian T&C rights deriving from Groundwater Dependent Ecosystems are not anticipated to be adversely affected.

The Proposed Action would eliminate saltwater discharge into the CCH wastewater system. Discharge into the CCH wastewater system will be limited to only freshwater filter backwash of the drum screen filters, and only minimal saltwater will enter the wastewater system when drum screens are rinsed. This change would comply with current CCH IWDP regulations.

The injection wells will be installed makai (seaward) of the Underground Injection Control (UIC) line and therefore not contaminate drinking water sources. A UIC permit application has been submitted to the DOH SDWB, and all conditions of the permit will be followed to mitigate environmental impacts. Effluent will be discharged more than 100 ft bgs.

The wells are designed with over 500 feet of vertical separation from the underlying basalt aquifer. Wastewater will be filtered, and total suspended solids will be less than 20 mg/L. No sanitary wastewater will be discharged into the injection wells. The water will be discharged into the caprock aquifer which DOH classifies as non-potable due to the high salinity levels. There are no drinking water or domestic wells in the vicinity.

3.5.6 Electrical, Telephone, and Cable Television Services

3.5.6.1 Existing Conditions

Local electrical service is provided by Hawaiian Electric Company (HECO). Cable, telephone, and internet services in Waikīkī are provided by Spectrum and Hawaiian Telcom.

3.5.6.2 Potential Impacts and Proposed Mitigation Measures

Energy will be consumed to operate the equipment associated with the injection well drilling, testing, and construction. To serve additional electrical loads required for the water system upgrades, a new circuit breaker and feeder would be needed from an existing distribution panel and backed up with the existing emergency power generator. The new electrical infrastructure would be sized to accommodate the maximum three discharge sump pumps, pre-filtration equipment, and all general power and lighting loads. A feeder would be routed from the electrical room to a panelboard at the sump pump station. The conduit will leave the main WAq building and go underground to the sump pumping station's panelboard.

The electrical panelboard will provide branch circuits for the three variable frequency drives (VFDs) that control the discharge sump pumps and all general power and lighting loads at the sump pumping station and the panelboard at the pre-filtration enclosure at the injection well location. The electrical feeder will be concrete-encased and routed underground in parallel with the proposed 10-inch water discharge piping to the panelboard that distributes power to the drum screen filters.

No impacts to telephone or cable services are expected from the proposed action. Some utility lines within the aquarium property may need to be moved to install the upgraded water discharge system infrastructure and underground pumphouse. To mitigate underground interference with new infrastructure, any subsurface construction activities will be preceded by geophysical clearance, such as ground penetrating radar.

3.6 Potential Cumulative and Secondary Impacts

The Proposed Action is not part of a larger action and would not contribute to cumulative adverse environmental effects on the environment, nor would it generate substantial secondary impacts, such as population changes or effects on public facilities.

4. RELATIONSHIP TO LAND USE PLANS, POLICIES, AND CONTROLS

4.1 Section 401, State Certification of Water Quality

The purpose of the Section 401 Water Quality Certification (WQC) is to provide states with power to protect the water quality of federally regulated waters. A Section 401 WQC permit is required when the action needs a federal permit, license, certificate, approval, registration, or statutory exemption, and may result in any discharge of a pollutant into navigable waters. In Hawai'i, water quality standards are enforced by the State of Hawai'i Department of Health (DOH) under HAR Title 11, Chapter 54. These water quality standards are reviewed every three years.

The proposed action would eliminate native effluent discharge into the open ocean, thus aligning with Section 401 WQC goals and would bring WAq into compliance with DOH-approved discharge permits pursuant to Paragraph 42.b. of the AOC. With no direct open ocean discharge, under the current regulatory requirements, the need for the current continuous NPDES permit requirement and the associated water quality monitoring may be avoided. Discharging WAq wastewater into injection wells would shift regulatory requirements to the DOH Safe Drinking Water Branch.

4.2 State Land Use

HRS Chapter 205-2 establishes a Land Use Commission (LUC) that classifies all lands in the state into four major State Land Use Districts (SLUD): Urban, Rural, Agriculture, and Conservation. The State LUC is responsible for determining the boundaries of each district and any reclassifications or amendments to districts.

The project area lies in the Urban district which contains activities or uses provided by ordinances or regulations of the county where the urban district is situated and are generally areas where there is a "city-like" amount of people, infrastructure, and services. Land uses in urban districts are governed by the county government. The Proposed Action is consistent with the current Urban designation.

4.3 Hawaiʻi Coastal Zone Management

Coastal Zone Management (CZM), as codified under Chapter 205A, HRS, is a public initiative that integrates resource, ecosystem and place-based management of coastal resources. CZM also balances the needs of economic development and conservation of resources in a sustainable manner. The Federal CZM Program was created through passage of the CZM Act of 1972. The Hawaiʻi CZM Program was approved by the federal government in 1978 and the state in 1977 and is codified under HRS Chapter 205A."

Hawaiʻi's CZM Program is the State's resource management policy umbrella and guiding perspective for the design and implementation of allowable land and water uses and activities. The CZM Program focuses its work on the complex resource management problems of coastal areas in the part of the State that are under the highest stress. Within a framework of cooperation among federal, state, and local levels, the Hawaiʻi CZM Program employs a wide variety of regulatory and non-regulatory techniques to address coastal issues and uphold environmental law. These techniques include stewardship, planning, permitting, education and outreach, technical assistance to local governments and permit applicants, policy development and implementation, and identification of emerging issues and exploration of solutions.

The CZM Program identifies 10 objectives and policies (HRS §205A-2 (b):

(b) Objectives

(1) Recreational Resources
(2) Historic Resources
(3) Scenic and Open Space Resources
(4) Coastal Ecosystems
(5) Economic Uses
(6) Coastal Hazards
(7) Managing Development
(8) Public Participation
(9) Beach Protection
(10) Marine Resources

Guidelines for Special Management Areas are set forth in HRS §205A-26 and are discussed further in Section 4.6.

4.4 Oʻahu General Plan

The Oʻahu General Plan sets forth the City's objectives and broad policies for long-range development of the island. The General Plan was adopted in 1977 and amended several times. The most recent amendment was adopted by the City Council on December 1, 2021, as Resolution 21-23, CD1, and was signed by the mayor on January 14, 2022. As a guide for all levels of government, private enterprise, neighborhood and citizen groups, organizations, and individual citizens, the General Plan delineates strategies for 11 key areas including (1) population, (2) balanced economy, (3) the natural environment and resource stewardship, (4) housing and communities, (5) transportation and utilities, (6) energy systems, (7) physical development and urban design, (8) public safety and community resilience, (9) health and education, (10) culture and recreation, and (11) government operations and fiscal management.

The proposed project supports Natural Environment and Resource Stewardship objectives and policies of the Oʻahu General Plan, which aim to protect the island's natural resources and environmental quality by eliminating direct exhibit wastewater discharge into the ocean, thereby improving water quality and protecting the sensitive offshore marine ecosystem. In addition, the Proposed Action supports the Health and Education objective by ensuring the longevity of WAq, an important educational facility that promotes understanding, appreciation, and conservation of Pacific marine life.

4.5 Primary Urban Center Development Plan (2004)

The project site is located in the Primary Urban Center Community Plan area. In 2004, the CCH Department of Planning and Permitting published the Primary Urban Center (PUC) Development Plan, which is currently undergoing revision. A draft plan of an updated PUC is currently in a public comment period. Adoption of the final PUC Development Plan is anticipated by the end of 2022.

The PUC is the most populous area in the State of Hawaiʻi and encompasses major economic activity hubs, including Downtown Honolulu and Waikīkī, stretching from Kahala to Pearl City along the southern coastline of Oʻahu. The vision of the PUC through 2035 includes:

- Protect and enhance Honolulu's natural, cultural, and scenic resources;
- Create livable neighborhoods with business centers, parks, plazas, and walkable streets;
- Provide in-town housing choices for people of all ages and incomes;
- Make Honolulu the Pacific's leading city and travel destination; and
- Create a balanced transportation system that provides excellent mobility for residents and visitors (CCH DPP, 2004).

The PUC Development Plan identifies the following panoramic views and vistas:

- The Koʻolau and Waiʻanae mountain ranges and their foothills;
- The Pacific Ocean, Pearl Harbor's East Loch, Ford Island, Honolulu Harbor, Keʻehi Lagoon and Kewalo Basin, and their respective shorelines; and
- The craters of Leahi (Diamond Head), Puowaina (Punchbowl), and Aliamanu.

The Pacific Ocean, the Leahi (Diamond Head) crater, and the Waikīkī shoreline are visible from WAq. The proposed filter building is a one-story structure that will be able to be seen from Kalākaua Avenue. The rest of the infrastructure and injection wells will be located underground and will not affect view plains.

WAq is a landmark destination east of the famous Waikīkī Beach strip. Improvements to WAq, such as those from the Proposed Action, will help to support Honolulu as the "Pacific's leading city and travel destination".

4.6 Special Management Area

The Shoreline Management Area (SMA) extends inland from and along the shoreline. SMA in each county shall be as shown on such maps filed with the authority as of June 8, 1977, pursuant to HRS § 205A-23. Act 16, Session Laws of Hawaii 2020, which amended HRS Chapter 205A, was enacted on September 15, 2020. Each county authority is tasked with reviewing developments with the SMA. As established in Chapter 25 of the ROH, "special controls on development within an area along the shoreline are necessary to avoid permanent loss of valuable resources and foreclosure of management options, and to ensure that adequate public access is provided to public owned or used beaches, recreation areas, and natural reserves, by dedication or other means".

4.6.1 Objectives, Policies and Guidelines

The objectives policies and guidelines hereafter discussed are contained in HRS §205A-2 and §205A-26 and are the basis for analysis of uses, activities or operations within the SMA.

4.6.1.1 Recreational Resources

Objective: Provide coastal recreational opportunities accessible to the public.

Relevant policies:

- Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value.

- Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources.
- Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters

The proposed action will support coastal recreational opportunities by eliminating direct effluent discharge into the ocean, which will result in improved water quality for coastal recreational activities.

4.6.1.2 Historic Resources

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

Relevant policies:

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

An archaeology literature review and field survey study was conducted to determine whether there would be significant impacts to historical or archeological resources under the Proposed Action. A cultural impact assessment was conducted to evaluate cultural practices in the area. The Proposed Action is not anticipated to have impacts on existing historic and cultural resources within the project area.

4.6.1.3 Scenic and Open Space Resources

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

Relevant Policies:

- Identify valued scenic resources in the coastal zone management area.
- Ensure that new developments are compatible with their visual environments by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline.
- Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources.

The Proposed Action will comply with Diamond Head Special District Design Guidelines, which sets forth landscaping and height parameters and is discussed in Section 4.10.

4.6.1.4 Coastal Ecosystems

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

Relevant policies:

- Exercise overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources.
- Improve the technical basis for natural resource management.
- Preserve valuable coastal ecosystems of significant biological or economic importance, including reefs, beaches, and dunes.

- Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs.
- Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

The Proposed Action supports the objective to protect valuable coastal ecosystems. Implementation of the Proposed Action will eliminate wastewater discharge into the ocean, thereby minimizing disruption and degradation of the nearshore coastal water ecosystems. Further, water quality is expected to improve by eliminating the point source discharges.

4.6.1.5 Economic Uses

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

Relevant policies:

- Concentrate coastal dependent development in appropriate areas;
- Ensure that coastal development and coastal related development are located, designed, and constructed to minimize exposure to coastal hazards and adverse social, visual, and environmental impacts in the coastal zone management area; and
- Direct the location and expansion of coastal development to areas designated and used for that development and permit reasonable long-term growth at those areas, and permit coastal development outside of designated areas when:
  - Use of designated locations is not feasible;
  - Adverse environmental effects and risks from coastal hazards are minimized; and
  - The development is important to the State's economy.

The Proposed Action is anticipated to have long-term beneficial economic impacts to the community and the State by providing much needed discharge upgrades that will allow WAq to stay in operation. WAq is a popular tourist destination, attracting more than 250,000 visitors a year from all around the world. Thus, by prolonging the life of WAq infrastructure and operation, the Proposed Action will have a positive effect on Honolulu's economy. Further, the Proposed Action will occur in an already developed location and construction of additional pump house structures will be designed in compliance with the Diamond Head Special Design District, as discussed in section 4.9.

4.6.1.6 Coastal Hazards

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

Relevant policies:

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

A limited amount of ground surface is expected to be exposed temporarily during construction of the pump house and injection wells. Exposed soils are susceptible to erosion, especially if it rains heavily during site work periods. Adverse impacts would be minimized or avoided because of both temporary and permanent erosion and sedimentation control measures during ground disturbing and trenching activities. Construction wastewater from drilling activities will be hauled off site and will not be discharged on site or offshore. All proposed work shall comply with State and City and County erosion control standards and requirements. The project complies with the requirements of the Federal Flood Insurance Program.

4.6.1.7 Managing Development

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

Relevant policy: Communicate the potential short- and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

In accordance with the public review process established by HRS Chapter 343, this Draft EA will be distributed to federal, state, and county agencies, utilities, community organizations and leaders for a 30-day response period. In addition, the availability of this Draft EA will be announced in The Environmental Notice published by OPSD ERP that will initiate a required 30-day public review period. Comments received will be incorporated in the Final EA.

4.6.1.8 Public Participation

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

Relevant policy: Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal related issues, developments, and government activities.

Pre-consultation on the Draft EA is discussed in Section 5. In addition to requesting pre-consultation comments from agencies, organizations and individuals, the project team made a presentation to the Diamond Head / Kapahulu / St. Louis Heights Neighborhood Board No. 5. Public comments related to the Environmental Assessment will be encouraged and addressed. The Contractor will also be required to coordinate with community and stakeholders before and during construction.

4.6.1.9 Beach Protection

Objective: Protect beaches and coastal dunes for public use and recreation.

Relevant policies:

- Minimize the construction of public shoreline hardening structures, including seawalls and revetments, at sites having sand beaches and at sites where shoreline hardening structures interfere with existing recreational and waterline activities.
- Minimize grading of and damage to coastal dunes.

The Proposed Action does not involve construction of shoreline hardening structures nor will it affect coastal dunes.

4.6.1.10 Marine and Coastal Resources

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

Relevant policies:

- Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial.

- Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency.
- Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone.
- Promote research, study, and understanding of ocean and coastal processes, impacts of climate changes and sea level rise, marine life, and other ocean resources to acquire and inventory information necessary to understand how coastal development activities relate to and impact ocean and coastal resources.
- Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

No work will take place in the marine environment and it is anticipated that impacts will be minimal during the construction phase with proper construction BMPs are in place. In the long term, the Proposed Action will have a positive effect on marine and coastal resources by eliminating wastewater discharge into the ocean and directing it into on-site injection wells.

4.6.2 Review Guidelines

ROH §25-3.2 sets forth review guidelines to ensure reasonable terms and conditions related to several factors, as follows. Table 4-1 discusses the relevance of the Proposed Action to the guidelines.

Table 4-1: Relationship of the Proposed Action to SMA Review Guidelines

Guideline	Relationship to Proposed Action
A(1) Adequate access, by dedication or other means, to publicly owned or used beaches, recreation areas and natural reserves is provided to the extent consistent with sound conservation principles	The Proposed Action will not alter public access to public resources.
A(2)Adequate and properly located public recreation areas and wildlife preserves are reserved;	The Proposed Action will not affect public recreation and wildlife preserves.
A (3) Provisions are made for solid and liquid waste treatment, disposition and management that will minimize adverse effects upon special management area resources	The Proposed Action is designed to eliminate the discharge of effluent into the MLCD.
A (4) Alterations to existing landforms and vegetation; except crops, and construction of structures shall cause minimum adverse effect to water resources, beaches, coastal dunes, and scenic and recreational amenities and minimize impacts from of floods, landslides, erosion, siltation or failure in the event of earthquake	The Proposed Action will improve ocean water quality by eliminating effluent discharge into the ocean.
B (1) The development will not have any significant adverse environmental or ecological effect except as any adverse effect is minimized to the extent practicable and clearly outweighed by public health	The Proposed Action will have a positive effect on environmental and ecological conditions due to the cessation of discharging effluent into Māmala Bay.

Guideline	Relationship to Proposed Action
and safety, or compelling public interest. Those adverse effect shall include but not be limited to the potential cumulative impact of individual developments, each of which taken by itself might not have a significant adverse effect and the elimination of planning options;	
B (2) The development is consistent with the objectives and policies set forth in and area guidelines contained in HRS 205A-26	Consistency with Section 25 3.1 and HRS 205A-26 are herein discussed.
B (3) The development is consistent with the county general plan, community plan and zoning, provided that a finding of consistency shall not preclude concurrent processing where a general plan, community plan, or zoning amendment may also be required.	Discussions of the Proposed Project's relationship to the Oʻahu General Plan, the Primary Urban Center Development Plan and zoning are provided in, respectively, Sections 4.5, 4.6 and 4.9.
C (1) Minimize dredging, filling or otherwise altering any bay, estuary, salt marsh, river mouth, slough or lagoon	The Proposed Action does not involve alterations to any body of water.
C (2) Minimize any development that would reduce the size of any beach or other area usable for public recreation	Beaches and public recreation areas will not be affected by the Proposed Action
C (3) Minimize any development that would reduce or impose restrictions upon public access to tidal and submerged lands, beaches, portions of rivers and streams within the special management area and the mean high tide line where there is no beach;	The Proposed Action will not affect public access to areas subject to tidal fluctuations.
C (4) Minimize any development that would substantially interfere with or detract from the line of sight toward the sea from the state highway nearest the coast; and	The Proposed Action will not alter view planes and mauka – makai lines of sight.
C (5) Any development that would adversely affect water quality, existing areas of open water free of visible structures, existing and potential fisheries and fishing grounds, wildlife habitats, or potential or existing agricultural uses of land.	The Proposed Project will improve ocean water quality by eliminating effluent discharge into ocean.

4.6.3 Procedural Guidelines

The Proposed Action is in the designated the special management area as established in Chapter 25, ROH; therefore, pursuant to ROH §25.1.3(1)(E), the "construction, reconstruction, demolition or alteration of the size of any structure" is considered "development. Pursuant to ROH §25-1-3, "structure" includes any "building, road, pipe, flume, conduit, siphon, aqueduct, telephone line and electric power transmission tower and distribution line." Thus, the installation of underground utilities, discharge transfer sump, pump station, pre-filtration drum screen filter building, and two permanent injection wells constitute "development" within the SMA Area. Pursuant to ROH §25.3.3(c), any proposed development within the SMA area requiring an SMA permit shall be subject to an assessment.

The CCH DPP has determined that the Proposed Action requires an SMA Major, the application of which requires an environmental disclosure document pursuant to HRS Chapter 343. An application for an SMA Major Permit will be submitted to the City and County of Honolulu Department of Planning and Permitting (DPP), accompanied by a Final EA FONSI.

Figure 4-1 shows a certified shoreline survey for the property.

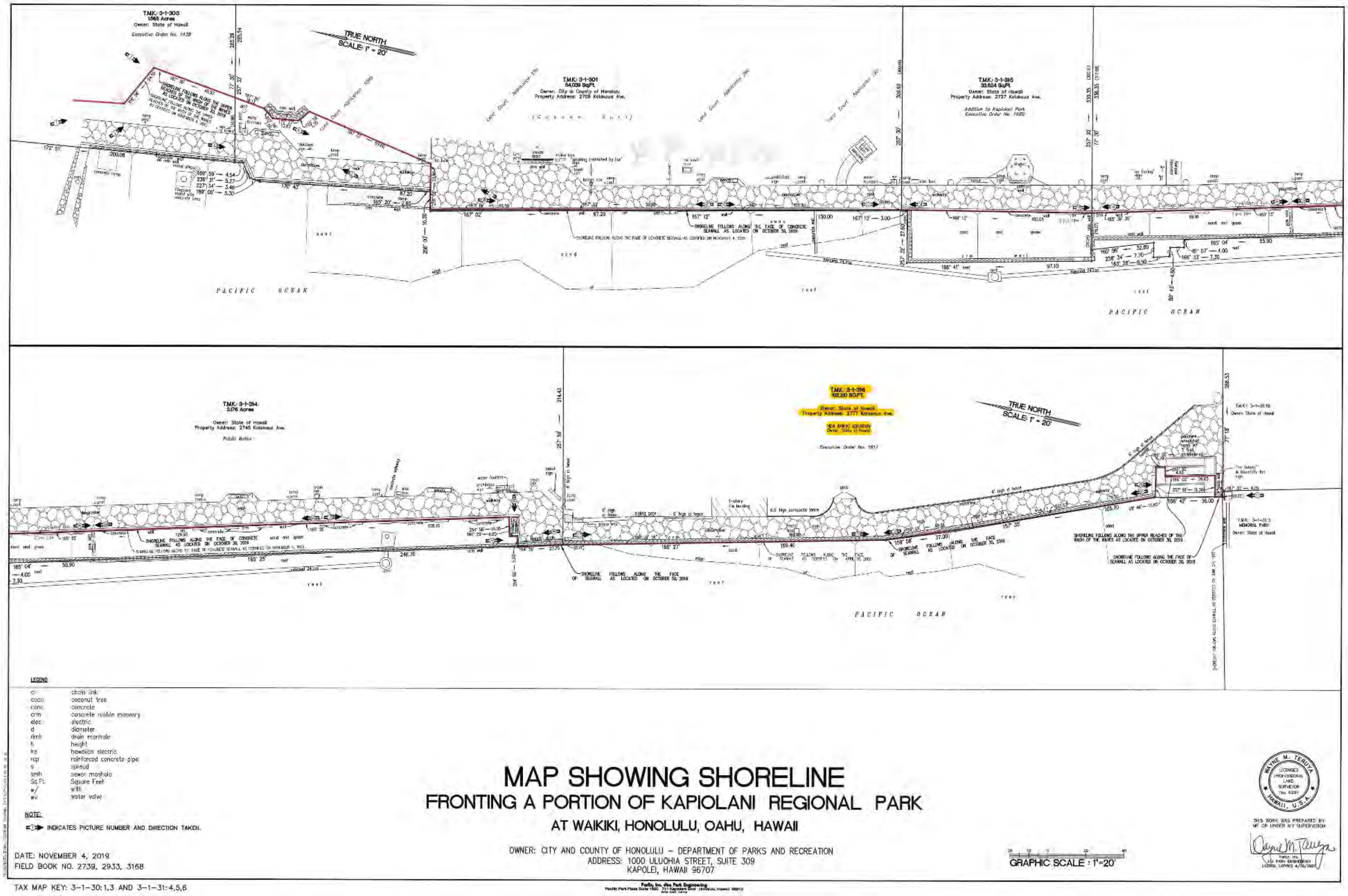


Figure 4-1 Certified Shoreline Map

4.7 City and County of Honolulu Zoning

The project area is zoned P-2, General Preservation. The Proposed Action is consistent with the uses permitted in P-2 and will not require zoning changes and zoning-related permits.

4.8 Shoreline Setback

According to Chapter 23, ROH, "it is a primary policy of the city to protect and preserve the natural shoreline, especially sandy beaches; to protect and preserve public pedestrian access laterally along the shoreline and to the sea; and to protect and preserve open space along the shoreline. It is also a secondary policy of the city to reduce hazards to property from coastal floods." The shoreline setback line is established at 40 feet inland from the certified shoreline.

The sump and some appurtenances and piping required for the water system upgrade falls within the 40 ft setback line. Therefore, a Shoreline Setback permit will be required. The Proposed Action meets the criteria for granting a shoreline setback variance according to Public Interest Standard pursuant to ROH §23-1.8(b)(2), ROH. This section states that the director may grant a variance for "an activity or structure that is necessary for or ancillary to facilities or improvements by a public agency…; provided that the proposal is the practicable alternative which best conforms to the purpose of this chapter and the shoreline setback rules." The same provision includes "Public interest" to mean principally, "of benefit to the general public, as determined by the director."

4.9 Diamond Head Special District

WAq lies in the Diamond Head Special District. The objectives of this special district include:

a. To preserve existing prominent public views and the natural appearance of Diamon Head by modifying construction projects that would diminish these resources.

b. To preserve and enhance the park-like character of the immediate slopes of the Diamond Head monument, which includes Kapiolani Park. (ROH §21-9.40-1)

The project site is located within the core of this special district. Design guidelines relevant to the are related to landscaping and height.

- If tree removal occurs for trees over six inches in diameter, a minor permit needs to be issued.
    - As discussed in Section 3.3.1.2, a certified arborist will be retained to perform quality assurance during construction and oversee tree and root pruning, and the transplanting of trees. Every effort will be made to protect the health and viability of existing trees. If tree removal is necessary, an application for a minor permit will be submitted.
- There is a height limit of 25 feet in certain designated areas.
    - The project site is outside the height limitation area. Nevertheless, the Proposed Action will comply with height limitations. The building for the two drum screen filters will be located at the eastern

portion of the property along the Diamond Head fence and will be visible. Its measurements will be approximately 30 ft long X 21 ft wide X 14 ft tall, well within the 25-foot height limit.

4.10 Permits and Approvals

State of Hawaiʻi

Coastal Zone Management Consistency Determination (State Office of Planning and Sustainable Development)
Underground Injection Control Permit (DOH CWB)
NPDES Notice of Intent Form C (DOH CWB)
Community Noise Control Permit (DOH Indoor and Radiological Health Branch)
Archaeological Monitoring Plan (DLNR SHPD)

City and County of Honolulu

Special Management Area Major Permit (CCH DPP)
Shoreline Setback (CCH DPP)
Diamond Head Special Design District Minor Permit (Tree Removal) (CCH DPP)
Site Engineering (Trenching/Stockpile/Grading/Grubbing) Permits (CCH DPP)
Building Permit (CCH DPP)
Right-of-Entry Permit (DPR)

5. CONSULTATION

5.1 Pre-Consultation Requests and Comments

Forty-four requests for pre-consultation comments were sent regarding this Draft EA. Twenty-two responses were received. Table 5-1 lists agencies, organizations and individuals to whom pre-consultation requests were sent, and indicates who submitted comments. Appendix H contains pre-consultation comments and responses.

Table 5-1: List of Consultation Agencies, Organizations and Individuals and Comments Received

Agency / Organization / Individual Included in Consultation and Draft EA Notification	Submitted Pre-Consultation Comments	Submitted Comments to Draft EA
Federal		
Fish and Wildlife Service Pacific Islands Office	X	
National Marine Fisheries Services Pacific Islands Regional Office	X (2)	
Army Corps of Engineers Honolulu District, Regulatory Office	X	
U.S. Environmental Protection Agency Pacific Southwest, Region 9		
State of Hawai‘i		
Department of Accounting and General Services Office of the Comptroller	X	X
Department of Business, and Economic Development and Tourism		
Office of Planning and Sustainable Development Coastal Zone Management Program	X	X
Department of Health Environmental Management Division, Clean Water Branch	X	
Department of Health Safe Drinking Water Branch Environmental Management Division	X	
Department of Health Environmental Health Administration		
Department of Health Indoor and Radiological Health Branch	X	
Department of Land & Natural Resources State Historic Preservation District		
Department of Land & Natural Resources Division of Aquatic Resources	X	

Agency / Organization / Individual Included in Consultation and Draft EA Notification	Submitted Pre-Consultation Comments	Submitted Comments to Draft EA
Department of Land & Natural Resources Engineering Division	X	X
Department of Land & Natural Resources Office of Conservation & Coastal Lands	X	X
Department of Land & Natural Resources Land Division	X	
Department of Land & Natural Resources Division of Forestry and Wildlife	X	X
Department of Transportation		X
Office of Hawaiian Affairs		
University of Hawaiʻi at Mānoa Water Resources Research Center	X	
Department of Agriculture Office of the Chairperson		
City and County of Honolulu		
Board of Water Supply Project Review Section	X	
Emergency Services Department.		
Department of Environmental Services	X	
Department of Facility Maintenance		
Department of Planning and Permitting	X	
Department of Parks and Recreation	X	
Department of Transportation Services		
Honolulu Fire Department	X	
Honolulu Police Department Division 6 Administrative Office	X	
Diamond Head / Kapahulu / St. Louis Heights Neighborhood Board No. 5	X	
Other		
U.S. Representative Ed Case		
U.S. Senator Brian Schatz		
U.S. Senator Mazie Hirono		
State Representative Bertrand Kobayashi		
State Senator Stanley Chang		
Councilmember Tommy Waters		
Friends of Waikīkī Aquarium		

Agency / Organization / Individual Included in Consultation and Draft EA Notification	**Submitted Pre-Consultation Comments**	**Submitted Comments to Draft EA**
Kaimana Beach Coalition		
Friends of the Natatorium		
Kapiʻolani Park Preservation Society		
The Nature Conservancy in Hawaiʻi		
Sierra Club of Hawaiʻi Oʻahu Group		
Surfrider Foundation, Oʻahu Chapter		
Waikīkī Beach Special Improvement District Association		

5.2 Presentation to the Diamond Head / Kapahulu / St. Louis Heights Neighborhood Board No. 5

On July 14, 2022, a presentation on the Proposed Action was made to the Diamond Head / Kapahulu / St. Louis Heights Neighborhood Board No. 5. The following summarizes the discussion:

- Increased use of drinking water?
  - Project will need a potable water connection for backwashing of drum screen filters.
- Effect on underground water system?
  - Project is makai of injection line and outside aquifers used for drinking water. Coordinating with DOH Safe Drinking Water Branch for applicable permit.
- Permeability study on soils?
  - Conducted a hydrogeologic study that was the basis for location and design of injection wells.
- Study includes king tides and sea level rise?
  - Part of Draft EA.
- Contact with Friends of Natatorium?
  - Included in the pre-consultation requests.

6. REASONS SUPPORTING FINDING OF NO SIGNIFICANT IMPACT

6.1 Finding of No Significant Impact (FONSI)

In accordance with the provisions set forth in Chapter 343, HRS, the proposed action was evaluated based on criteria established in HAR §11-200-11.2. Based on the analysis discussed hereafter in Section 6.2, the proposed project has been determined to qualify for a Finding of No Significant Impact (FONSI).

6.2 Analysis Supporting the FONSI Decision

HAR §11-200-11.2 establishes procedures for determining if an EIS should be prepared or if a FONSI is warranted and lists the following criteria to be used in making that determination. In most instances, an action shall be determined to have a significant effect on the environment if it:

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

   The Proposed Action would not cause the loss or destruction of natural, historic, or cultural resource. Archeological monitoring will be conducted during all dredging and ground disturbing activities. Although unlikely, if human osteological remains or any potential culturally significant features are accidentally unearthed during dredging, site work would cease and SHPD would be contacted in compliance with HRS Chapter 6E. Processes outlined in existing State regulations, specifically HAR Title 13, Chapter 300 (Section 33 and Section 40), would be employed following discovery. Construction BMPs will be in place to monitor and avoid impacts on natural resources.

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

   The Proposed Action will have a beneficial impact by ending the practice of disposing wastewater into the ocean outfall. It will not curtail the range of beneficial uses of the environment.

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

   The Proposed Action conforms with and is consistent with Chapter 344, HRS State Environmental Policy, to conserve the natural resources and enhance the quality of life. Construction activities proposed under the Proposed Action are not expected to have adverse impacts to the surrounding natural resources and would be planned to minimize any short-term impacts. Long term project impacts will have a beneficial effect on the ocean environment.

4. *Substantially adversely affects the economic or social welfare of the community or State*

   The Proposed Action would generate short-term economic vitality for the community by providing temporary construction opportunities for the duration of project construction. No significant impacts on the economic or social welfare of the community or the State are anticipated under the Proposed Action.

5. *Substantially adversely affects public health*

   The Proposed Action would have no significant adverse effects on public health.

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

   The Proposed Action will not induce secondary impacts or negatively impact public facilities.

7. *Involves a substantial degradation of environmental quality*

   The Proposed Action is intended to improve environmental quality in the nearshore ocean as direct discharge into the ocean will be eliminated. Impacts on nearshore receiving waters will be virtually eliminated as there will be no direct ocean discharge into the MLCD. Injection well discharge would introduce the wastewater at over 120 ft below ground surface, where it would dissipate into the saltwater aquifer and move laterally. Effects on the nearshore and the MLCD will be greatly minimized if not eliminated.

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

   The Proposed Action is not anticipated to result in cumulative effects; therefore, it would not involve a commitment to larger actions.

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

   The Proposed Action is not anticipated to have substantial effects on a rare, threatened, or endangered species, or any critical habitat. No threatened or endangered plant or animal or marine species nor candidate species were found during the flora, fauna, and marine survey of the project site. Regarding the possibility of proximity to critical habitat, construction BMPs, a certified arborist, and coordination with public agencies will minimize the possibility of potential impacts to the biological resources within the project site during the construction period.

10. *Substantially adversely affect air or water quality or ambient noise levels*

    No significant impacts on the area's long-term air or water quality or ambient noise levels are anticipated to result from the Proposed Action. BMPs will be implemented to minimize temporary impacts during construction activities. Dust abatement measures will be used to reduce potential impact to air quality. In addition, construction noise that exceeds DOH guidelines will be mitigated to reduce the potential of noise levels exceedances.

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 Proposed Action would not affect environmentally sensitive areas, such as a floodplain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, freshwater, or coastal waters and does not include construction of new structures that would be prone to damage by being located in an environmentally sensitive area.

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

    The Proposed Action would not adversely affect the visual aesthetics of the areas identified in City and County or State plans and studies. The filter building will be designed and constructed to comply with the Diamond Head Special District guidelines. Temporary construction-related visual impacts are expected; however, all visual disturbances will be restored to pre-construction condition at the end of the construction phase.

13. *Requires substantial energy consumption*

The Proposed Action will not require substantial energy consumption. The electrical system to serve additional electrical loads required for the water system upgrades is designed for efficient use and distribution.

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Appendix A:

Water System Upgrade Plan Waikīkī Aquarium

Note: Appendices contained in this 2021 report have been updated and incorporated in the Draft EA

Water System Upgrade Plan

Waikiki Aquarium

2777 Kalakaua Avenue
Honolulu, Hawaiʻi, 96815
TMK: (1) 3-1-031:006

Prepared for:

University of Hawaiʻi at Manoa
Office of Project Delivery
2002 East-West Road
Honolulu, HI 96822

Prepared by:

Oceanit Laboratories, Inc.
828 Fort Street Mall, Suite 600
Honolulu, HI 96813

November 2021

Authorized Signatory

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Andrew Rossiter, Ph.D. Date
Director of Waikiki Aquarium

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ACRONYMS AND ABBREVIATIONS

%	Percent
amps	Amperes
AOC	Administrative Order of Consent
ATS	Automatic Transfer Switches
bgs	Below Ground Surface
CCH	City and County of Honolulu
DOH	State of Hawaiʻi Department of Health
ENV	Department of Environmental Services
Ft	Foot/Feet
GPD	Gallons per Day
GPM	Gallons per Minute
HAR	Hawaiʻi Administrative Rules
HECO	Hawaiian Electric Company
IWDP	Industrial Wastewater Discharge Permit
kW	Kilowatt
kVA	Kilo Volt-Ampere
M	Million
mg/L	milligrams per liter
mJ/cm^2	Millijoules per Square Centimeter
MLCD	Marine Life Conservation District
N	North
NE	Northeast
NEC	National Electrical Code
No.	Number
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
NSW	Natural Seawater
NW	Northwest
O&M	Operation and Maintenance
PVC	Poly Vinyl Chloride
SW	Southwest
TSS	Total Suspended Solids
UH	University of Hawaiʻi
UIC	Underground Injection Control
U.S.	United States
USACE	United States Army Corps of Engineers
UV	Ultraviolet
VFD	Variable Frequency Drive
WAq	Waikiki Aquarium
ZOM	Zone of Mixing

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1. INTRODUCTION

Oceanit was contracted by the University of Hawaiʻi (UH) to prepare a Water System Upgrade Plan to ensure that Waikiki Aquarium's (WAq) water system infrastructure and effluent comply with Federal, State, and County regulatory requirements.

1.1 Purpose and Objectives

The purpose of the water system infrastructure upgrade is to fulfill the State of Hawaiʻi Department of Health (DOH) Administrative Order on Consent (AOC), City and County of Honolulu (CCH) Department of Environmental Services (ENV) Notice of Violation (NOV) (ENV 19-008), CCH ENV Industrial Wastewater Discharge Permit (IWDP) (Number [No.] 20219001) effluent discharge requirements, and DOH National Pollutant Discharge Elimination System (NPDES) Permit No. HI 0020630 requirements. The current water supply for the Aquarium is about 470,000 gallons per day (GPD) and the upgraded working system will be designed for a water use target of 800,000 GPD to accommodate future improvements and master plan.

1.2 Site Description

The Waikiki Aquarium is located on the south shore of the island of Oʻahu next to the Natatorium and Kaimana Beach Park (Figure 1-1). Honolulu's aquarium was established in 1904 and is the second oldest aquarium in the United States (U.S.). Waikiki Aquarium has been a part of UH since 1919 and moved to its present location in 1955. The aquarium is an important educational outreach facility with an international reputation for its display quality and was the first aquarium in the world to successfully cultivate and display a number of corals, invertebrates, and fishes. The aquarium presently displays fish and invertebrates in publicly viewable tanks and outdoor tide pool displays and an endangered Hawaiian Monk Seal in an outdoor pool. The Aquarium underwent an extensive ($3.2M) renovation and modernization in 1992-1994, although no improvements were made to the effluent disposal system at that time.

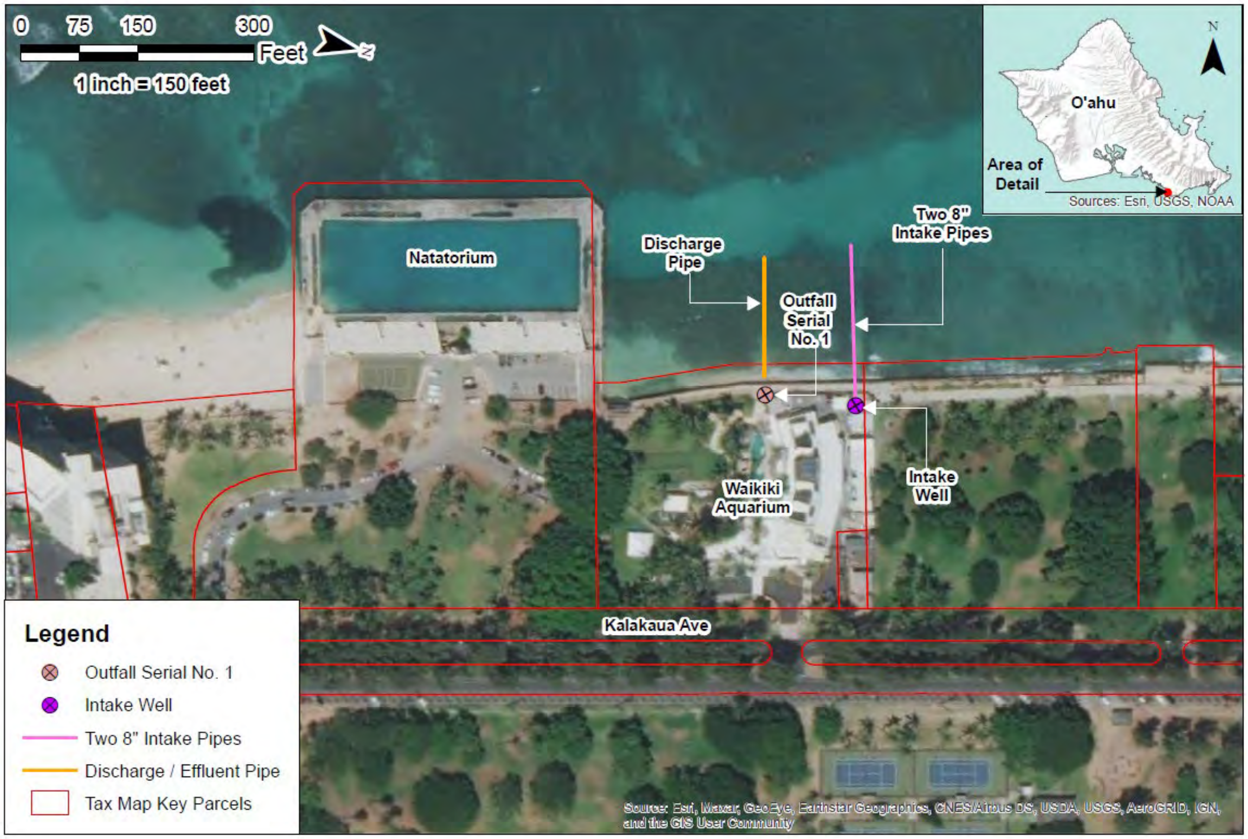

Figure 1-1: **Project Site Map**

2. EXISTING FACILITIES AND SURROUNDING ENVIRONMENT

2.1 Existing Exhibits and Operation

The WAq houses a population of both native and nonnative saltwater and some freshwater species of animals in approximately 60 public exhibits and behind the scenes holding tanks that are in operation at any given time. The largest display is a 70,000-gallon seawater pool, which houses an endangered Hawaiian Monk Seal. "Native Tanks" include tanks that house Native Hawaiian species and solitary non-breeding, non-native animals. Tanks that house native animals may also include one or two nonnative animals that are unable to reproduce and therefore cannot cause invasive species introduction when discharged to the ocean. "Non-Native Tanks" house non-native animals and native and non-native animals that require any live non-native feed. Hawaiian freshwater animals are housed separately.

2.2 Water Intake Sources for Tanks

The Waikiki Aquarium utilizes three intake water sources totaling approximately 470,000 GPD (~325 gallons per minute [GPM]) for the aquatic exhibits and holding tanks maintained at the facility. Each source is listed and described in further detail below.

- Natural seawater (NSW) from the ocean;
- Salt water from an on-site well; and
- Fresh water from the CCH potable water system.

2.2.1 Natural Seawater

Natural seawater (NSW) is the largest volume of daily water usage for the facility. An average of approximately 247,000 GPD of NSW is pumped into the facility at about 170 GPM. Natural seawater (NSW) is obtained from the nearshore area through two 8 inch-diameter pipes with the intake location approximately 180 feet (ft) from the seawall. NSW is filtered by ten bag filter canisters in series, each comprised of 3-layer filter bags, that remove particulates 50, 10, and down to one (1) micron in size in series. The filtered NSW is supplied to the saltwater tanks in the main building and the monk seal exhibit. About 98 percent (%) (average of 241,000 GPD) of the total amount of filtered NSW is supplied to the Hawaiian monk seal exhibit, and the rest of the overall volume of NSW (~6,000 GPD) goes to the other aquatic exhibits. The NSW intake is turned off when the monk seal is not on site.

The original NSW intake system for the Waikiki Aquarium was built in the 1950s and was upgraded in 1992 to its current configuration. The 1992 upgrade modified the offshore seawater intake piping by adding perforated polyethylene pipe intakes to the seaward end of the two 8-inch pipes, upgraded on-shore piping between the intake pipes and the new pump room to poly vinyl chloride (PVC), and added three horizontal sand filters. In addition, filter backflush drain tanks and associated piping were added. Since 1992, the three sand filters have been abandoned and NSW is now filtered through ten filter bag canisters in series, as described above. However, the majority of the 1950s vintage asbestos concrete NSW intake piping remains in place (approximately 160 linear ft).

2.2.2 Well Salt Water

The second saltwater source is from an 80-ft deep on-site well which provides an average of approximately 225,000 GPD. Well salt water has very low turbidity and total suspended solids (TSS) and is considered free of parasites and pathogens. However, well water is anoxic at the source and therefore is aerated using two water pumps to raise the oxygen and degas the carbon dioxide before distribution to the exhibits. The aerated well water then goes to the indoor and outdoor aquatic exhibits and holding tanks. Prior to entering each individual exhibit, the aerated well water undergoes phos-ban filtration to remove phosphates and silicates. See Section 2.6 for more information regarding the well.

2.2.3 Freshwater

Freshwater from the CCH Board of Water Supply's potable water supply comprises the smallest facility intake at less than 2,000 GPD. Carbon filtration is used to remove chlorine immediately before introducing the water into the exhibits. The aquarium has four freshwater exhibits and up to ten (10) freshwater holding tanks.

2.3 Water Discharge from Exhibits

Discharge water from the aquarium originates from four main sources: seal pool, native exhibits, non-native exhibits, and freshwater exhibits. The seal pool and native saltwater exhibits are discharged through Outfall Serial No. 001 into Mamala Bay in the Pacific Ocean. Water from non-native tanks and freshwater exhibits is discharged to the City sewer system. The filter backwash water from the shark tank, seal pool, and a 20-ft holding tank is also discharged to the City sewer system.

2.3.1 Discharge into the Municipal Sanitary Sewer

An average of approximately 82,000 GPD of effluent water from non-native animal and freshwater exhibits is discharged into the CCH-owned wastewater collection system via the sewage pump station adjacent to the Waq. In addition, about 42,000 to 76,500 gallons per week of filter backwash water from the shark tank and seal pool are also discharged to the CCH sewer system, depending on the frequency of filter cleaning during the week. The CCH owns and operates the wastewater collection system that serves the Honolulu area. Wastewater from the Aquarium and greater Waikiki area is conveyed to the Sand Island Wastewater Treatment Plant through a system of pipes, wet wells, pump stations and force mains. The plant treats an average of 75,000,000 GPD of wastewater and discharges the treated effluent to Mamala Bay through a deep ocean outfall. Waikiki Aquarium wastewater discharge accounts for only 0.1% of the total amount of wastewater treated by the Sand Island Treatment Plant.

Due to concerns of saltwater corroding the CCH sewer pipes and increased hydrogen sulfide production along the wastewater collection system, the CCH issued a NOV (ENV 19-008) to the Waikiki Aquarium in August 2019 to cease saltwater discharge into City sewer system (see Section 1.3.1). In February 2021, CCH issued IWDP No. 20219001R-001 granting permission to WAq to discharge industrial wastewater (salt water effluent) into the CCH sewer system with conditions and discharge limits as set forth in the permit (see Section 1.3.1). Revisions to this permit are anticipated in the future.

2.3.2 Discharge into Mamala Bay in the Pacific Ocean

Following strict standard operating procedures to prevent the introduction of non-native species into Hawaiian waters, only tanks that house native animals (e.g., Hawaiian Monk Seal and Hawaiian reef fishes) and solitary, non-breeding, non-native species (e.g., exhibits with one lone non-native individual) discharge to the ocean. An average of approximately 387,000 GPD of effluent water is discharged through Outfall Serial No 001 into Mamala Bay via a 12-inch diameter pipe approximately 150 ft offshore from the seawall. The existing NPDES permit identifies the Zone of Mixing (ZOM) for the discharge outfall.

2.4 Offshore Marine Environment

The ocean discharge occurs near the east end of the Waikiki Beach next to the historical Waikiki Natatorium War Memorial, about 150 ft from the shoreline. The discharge point is within the Marine Life Conservation District (MLCD) controlled by the Department of Land and Natural Resources' Division of Aquatic Resources. The MLCD extends from the groin at the end of Kapahulu Avenue to the *ewa* (west) wall of the Natatorium, and from the Waikiki Aquarium seawall 500 yards offshore or to the edge of the fringing reef, whichever is greater. The waters in the discharge area within the MLCD are classified as Class AA. In general, no zones of mixing are allowed in Class AA waters.

A reef flat extends out from the Waikiki Aquarium seawall about 35 yards to a dredged channel and continues on the other side of the channel. Most fish in this area are found along the channel's hard bottom areas on the shoreline side (which has several small caves), along the Natatorium wall, and near the exposed parts of the reef on the channel's seaward side. The channel itself is about eight ft deep, and depths above the reef flat are generally less than four ft. At the seaward end of the fringing reef, a dredged channel forms a shore parallel feature. Currents in the area are weak and are mainly driven by winds and tides and the presence of this channel may help in moving the effluent out of the ZOM.

The reef flat throughout the MLCD consists mostly of rubble and coralline algae with some small patches of live coral. Sediment covers the bottom, so visibility is best when there is little or no wave action. Most of the reef flat has little bottom relief, and fish are more concentrated in areas where relief increases somewhat. At the outer edge of the reef, the bottom drops off sharply to about 15 to 20 ft. Numerous arches, crevices and other features are found here, along with an abundance of fish.

2.5 Geotechnical Environment

The project site is underlain by beach deposits and alluvium according to geologic maps and Jaucas (JaC) sand and Beaches (BS) soils according to the U.S. Soil Conservation Service. Beaches soils are light-colored calcium carbonate sands derived from coral and seashells that are washed by ocean waves. Jaucas soils are similar but light brown, excessively drained, calcareous soils deposited from wind and water that occur adjacent to the ocean. Formerly, the Waikiki area consisted of low elevation marsh wetlands and lagoons that were eventually filled with man-made fills when Waikiki was developed into an urban hot spot over the last 80 years (Kokua, 2021).

Four subsurface boring cores were taken from the project site during a geotechnical engineering exploration to observe and evaluate subsurface conditions. Depth ranged between approximately 3 – 42 ft below existing ground surface (bgs). The borings encountered surface fill materials overlying beach deposits, lagoonal deposits, and apparent coral. The surface materials were 1-3 ft thick and were loose to medium dense clayey/silty sand and medium stiff to stiff clayey/sandy silt. Beach deposits occurred at approximately 8-10 ft bgs and consisted of loose to medium dense clayey gravel and very soft sandy clay. Lagoonal deposits found beneath the beach deposits extended down to 40.5 ft bgs and consisted of very loose to medium dense clayey gravel and very soft sandy clay. Lagoonal deposits are known to be highly compressible. Beneath the lagoonal deposits, medium hard to hard coral formation extended down to the maximum depth tested (approximately 42 ft bgs). For more information on moisture, plasticity, and other soil properties, please refer to Attachment A (Kokua, 2021).

The topography of the project site is relatively flat. Ground surface elevations range from +6 to +9ft above mean sea level. Groundwater was encountered about 7.3 to 8.1 ft bgs during the field exploration; however, due to the close proximity of the site to the Pacific Ocean, groundwater depth is expected to vary with tidal fluctuations (Kokua, 2021).

2.6 Hydrogeological Environment

Waikiki Aquarium is located on top of a sedimentary Honolulu Caprock formation, which forms a coastal plain along the Waikiki Coast in the Palolo Aquifer System. The caprock is over 900 ft thick and comprised of marine and terrestrial sediments, some lava flows, and pyroclastic deposits. Ko‘olau Basalt lies below the caprock. Hydraulic properties of these sedimentary formations can vary extensively; however, marine deposits (mainly calcareous) are generally more permeable than terrestrial deposits.

A hydrogeological evaluation of the area adjacent to the Aquarium was conducted by a professional geologist to investigate the possibility of using injection wells for the overflow discharges (Intera, 2021; Attachment B). The aquarium has an existing 80 ft-deep saltwater production well (State Well No. 3-1649-010) that was constructed in 1954. The well has 46 ft of 12-inch solid casing. According to the Commission on Water Resource Management well index, the database on wells in Hawai‘i, the saltwater well was tested at 1,150 GPM with 2.7 ft of drawdown and has a high specific capacity. Although, the database does not indicate when the well was tested, it was most likely tested in 1954 after its initial construction. Although has not been tested in recent years, it is anticipated that the well performance has decreased over the years from natural aging processes.

2.7 Electrical System

The existing electrical system was inspected by a professional electrical engineer (Kraig Otani & Associates, LLC) on March 6, 2020. Based on this inspection, a detailed electrical evaluation of the existing electrical system is included in Attachment C (Kraig Otani & Associates, LLC, 2020).

Electricity to the facility is provided by underground Hawaiian Electric Company (HECO) service originating from a handhole off the sidewalk fronting the aquarium and routed to a HECO transformer. Power is routed through a metering switchboard to two distribution panels in the electrical room that feed a network of panel boards to provide all power to the aquarium.

Per the National Electrical Code (NEC), Section 220.87, 125% of the maximum demand over a 12-month period needs to be added to determine if new load can be added to the existing electrical service, which brings the current electrical load to 279.0 kilo volt-Ampere (kVA). The Waikiki Aquarium's maximum electrical demand load is approximately 223 kVA. The main HECO circuit breaker is rated at 500 kVA, leaving about 221.0 kVA of additional capacity off of the HECO transformer for upgrades.

Adjacent and to the north of the electrical room, an emergency 400 kilowatt (kW) generator is housed in a stainless-steel weatherproof housing. Diesel fuel for the generator is stored in a base tank underneath the generator. Two automatic transfer switches (ATS) within the electrical room allow the HECO power source to automatically transfer to and from the emergency generator if the HECO power source becomes unavailable. The emergency generator has the capacity to provide all power to the aquarium. The existing generator and its fuel tank were originally sized to run at full load for roughly 24 hours. The existing facility load, according to HECO, is running at around 50% of the generator load capacity. The new loads would increase the facility load to roughly 75% of generator load capacity. At 75%, the generator runtime is estimated at 32 hours. See Attachment C for a load evaluation.

Based on conversation with WAq staff, not all power needs are being met, specifically in the seal pool filter room and areas south of the main building. It is suspected that the problems are due to the long runs from the distribution panels in the Electrical Room and under sized electrical wiring/conductors. To address the problems and power needs throughout the WAq, the electrical wiring/conductors may need to be upsized to handle the loads at facilities/systems further away from the distribution panels. An electrical assessment should be performed to further investigate and confirm the issue.

2.8 Mechanical System

The existing mechanical system was inspected by a professional engineer on March 6, 2020 (Okahara and Associates, Inc., 2020; Attachment D). Observations and assessments of existing mechanical systems are summarized below:

- The **main electrical room** on the northeast (NE) corner of the property is mechanically cooled by a wall-mounted propeller exhaust fan. The fan is thermostatically controlled. The fan currently is too close to the front of the switchboard and is not code compliant. Any future electrical upgrades would need to address this issue.
- **Coral propagation tanks** are located on the north (N) and northwest (NW) ends of the property, directly on top of the freshwater reservoir. All piping and piping appurtenances are plastic. The propagation tanks are indirectly connected to a 12-inch x 12-inch sewer inlet. An outdoor backwash pump (end-suction, 25 horsepower, Fybroc pump) sends water from the

freshwater reservoir to the shark tank sand filters. The 12-inch x 12-inch sewer inlet that receives discharge from the coral propagation tanks does not appear to be code compliant as it is located outdoors and susceptible to catching rainwater and runoff.

- **The natural seawater pump house** is located below grade in the NW corner of the property. The pumphouse contains two end-suction type, 25 horsepower Fybroc pumps which send water to a series of 10 canister bag filters via two 6-inch pipes. The pump house is ventilated by a roof-mounted exhaust fan.
- **Aeration pumps** are located in the NW corner of the property, just north of the natural seawater pump house.
- The **well-water pump house** is located on the west end of the property and houses two pumps, a well water sump, and three sand filters. The pumps draw water from the well water sump and distribute it throughout the Aquarium. Only one pump is currently in operation. Well water sump receives water from the deep saltwater well via gravity. Sand filters were intended to filter incoming NSW but are not currently in use. With only one pump in operation, the redundancy safeguard is not present and should be addressed with future upgrades. The condition and size of the gravity pipe that connects the well water sump and saltwater well in unknown and may be restricting the water supply from the saltwater well. Further investigation will be needed to assess the condition of the pipe.
- The **canister bag filter array** is outdoors on the west end of the property, just east of the well water pump house. Ten filter bags are connected in parallel to filter the natural seawater. All NSW goes through the array before getting distributed throughout the WAq. This system is maintenance intensive and requires frequent filter changes.
- The **Edge of Reef pump house** is on the west end of the property, just south of the well water pump house. It contains three pumps, three canister bag filters, and a surge tank. All pumps and filters serve the Edge of Reef exhibit. A surge tank is mounted on the roof of the pump house but is not currently in use.
- The **Seal Pool pump room** is located just south of the seal pool and lies below grade. The pump house contains two circulation pumps, three sand filters, and an aeration pump. The monk seal pool is currently running without a backup pump or redundancy safeguards. New upgrades should incorporate pump redundancy in case a pump breaks or needs to be serviced.
- **Shark tank pumps** are installed in the main aquarium building behind the shark tanks. Two 15 horsepower and one 3 horsepower pumps are equipped with sand filters that are cleared by the backwash pump. The shark tank is currently running without a backup pump, eliminating the redundancy safeguard. New upgrades should incorporate pump redundancy in case a pump breaks or needs to be serviced.
- **Aquarium building drains** are routed in open grated trenches and plastic pipes. The drains are split into sewer and ocean drains. Open sewer and ocean trench drains run adjacent to each other, creating a hazard if an overflow of the sewer trench drain overflows gets into the

ocean drain. If this occurs, non-native effluent will discharge into the ocean. All drains should be placed with hard plastic piping to reduce the risk of spills.

2.9 Limitations and Deficiencies

Numerous limitations and deficiencies of the existing systems were identified by WAq staff and from field investigations. Limitations and deficiencies are described below.

1) Intake flow rates for the NSW are at or near capacity. Intake pipes installed in the 1950s are well beyond their engineering life. Although not part of the wastewater discharge upgrade, intake should be addressed with future upgrades.
2) Intake from onsite saltwater well is limited by the size of existing pipes and pump – additional saltwater must come from an onsite well which must be aerated, degassed, and go through phosphorous and dissolved metal flocculation and filtration before use.
3) The use of two intake water sources (well and NSW) requires two different filtration methods to assure water quality.
4) Old and outdated infrastructure of most of the existing systems has potential of failures should be upgraded.
5) There is limited square footage at the Aquarium to accommodate changes. Sizes and locations of new equipment and facilities need to be carefully considered.
6) Existing underground utilities will post potential conflicts with new lines or piping. Rerouting or relocation of existing utilities may be necessary.
7) Electrical wiring/conductor insufficiently sized, causing power issues would need to be upgraded.
8) Existing electrical and mechanical infrastructure is currently not setup to accommodate exhibit upgrades or expansion, would need to be upgraded.

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3. DESIGN OPTION DEVELOPMENT & ANALYSIS

Three design concepts to upgrade the Aquarium's water system were developed based on communication with Aquarium staff, site visits, geotechnical and hydrogeological studies, and inputs from electrical, mechanical, hydrogeological, geotechnical, and aquarium specialists. Specialized reports prepared for the project are attached to this report. The design options were analyzed by a comparison system which identified and evaluated key criteria expected to be the most applicable for design option comparison. The numerical values associated with each criterion were used in the weighted scoring and comparison of the design options to quantify each alternative. The design option with the highest ranked score was recommended as the preferred alternative to advance to design. The alternatives matrix is discussed in further details in following sections.

The following section will detail three options proposed to upgrade the existing effluent discharge system and ensure compliance with NPDES and City IWDP permits. Key design option goals were to enable the aquarium effluent discharge system to:

1) Maintain compliance with Federal and State water quality discharge regulations and issued permits;
2) Address the CCH violation regarding saltwater discharge into the sanitary sewer system; and
3) Accommodate an increase in the Aquarium's saltwater supply to 800,000 GPD from its present 467,000 GPD in anticipation of future displays.

To satisfy the above goals, three design options were developed:

- **<u>Option 1:</u>** All saltwater effluent from both native and non-native exhibits is disposed via two on-site injection wells;
- **<u>Option 2:</u>** All saltwater effluent from both native and non-native exhibits is filtered and sterilized prior to discharge through the existing ocean outfall; and
- **<u>Option 3:</u>** Native exhibit effluent will be filtered, treated, and discharged through the existing ocean outfall and non-native exhibit effluent will be discharged via two on-site injection wells (smaller in size than those in Option 1).

The three design options were evaluated based on effluent disposal options with 800,000 GPD throughflow, which is the assumed maximum throughflow using the existing intake water scheme. Through the course of investigations related to water throughflow, additional improvements common to all options would be recommended in order to modernize the water system.

In addition to these key goals, additional specifications to the design criteria for all options were to provide redundancy of pumps, filters, and discharge capability. There are currently eight media (sand) filters located at the aquarium: three at the seawater intake (currently not in operation), two at the shark tank, and three at the Monk Seal pool. Freshwater is used to backwash the shark tank filters and seawater is used to backwash the seal pool filters. Both freshwater and seawater backwash effluent will be filtered and disposed of into the injection wells for Options 1 and 3. All three options will filter all effluent with a sieve size of 20 microns or less before discharge to the ocean or injection well.

Life support equipment redundancy is important to ensure aquarium operations can remain in working order during maintenance, equipment failure, and to accommodate extra flow such as during the seal pool drain down. Upgrades to the intake system are not discussed in this report as part of the wastewater discharge upgrade, but due to the age and limitations of the existing system, the intake system should be considered for future upgrades. The effluent disposal options described below include suggested redundancies.

The three options are described in Sections 3.1-3.3 below. An evaluation procedure to compare design options using the project goals and critical design criteria was developed to suggest a preferred design option. The evaluation procedure and associated matrix are described in Section 3.4.

3.1 Option 1: Disposal of All Effluent into Injection Wells

Option 1 will dispose of all effluent to two on-site injection wells. All effluent from exhibit tanks will be routed to a discharge/transfer sump, where it will be pumped through drum screens and filtered down to 20 microns before being discharged into two on-site injection wells. The purpose of filtration is to remove the larger solids to prevent the clogging of the injection wells and reducing their performance over time. Media filter backwash effluent will also be filtered prior to discharge to the injection wells (Figure 3-1). The backwash from the intake filters and shark tank filters will be routed to the discharge sump while the backwash from the seal pool filters will bypass the discharge sump and routed directly to filtration before discharge to the injection wells. This option would eliminate direct ocean discharge and saltwater going into the CCH sanitary sewer system.

During seal pool cleaning, the drain down effluent from the pool would be discharged directly to filtration before being discharged to the injection wells. The intake, distribution, and disposal system equipment will be sized for the projected water use. All components of the water distribution system will be redesigned to handle the projected flow into future expanded exhibits. A conceptual site layout plan of Option 1 is included in Attachment E as Figure 1. Design components of Option 1 are summarized in the following sections.

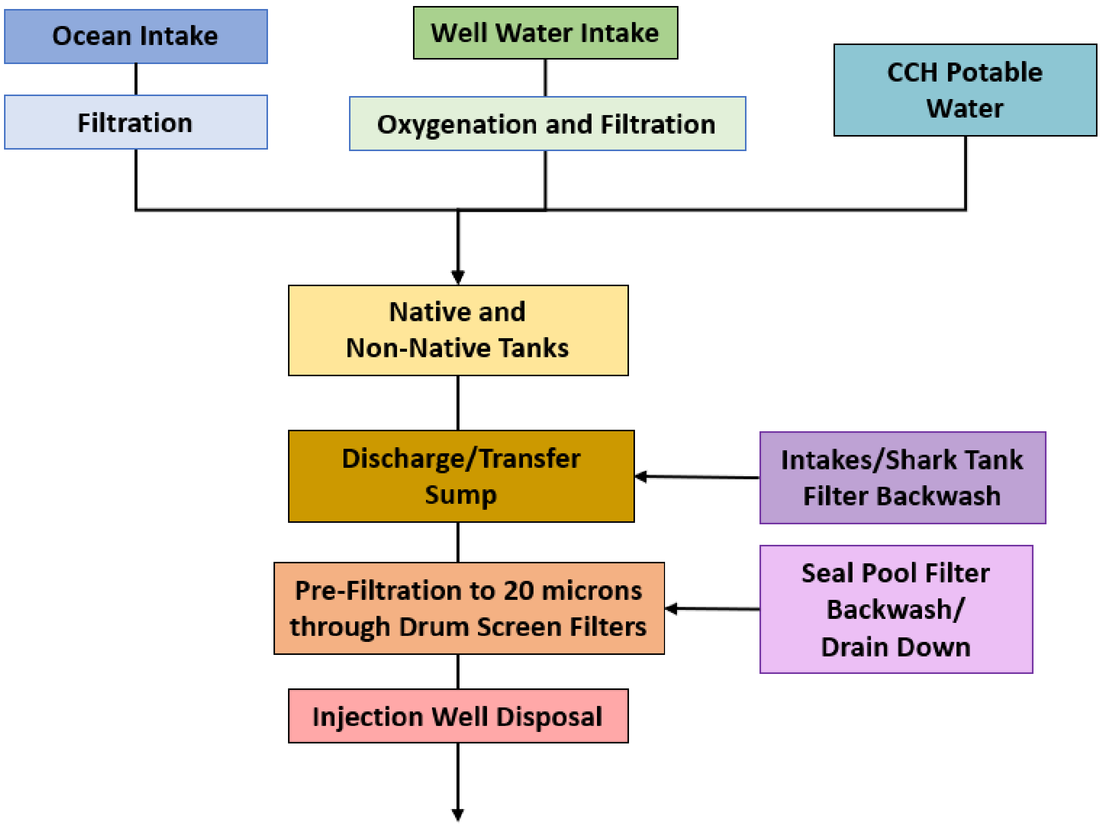

Figure 3-1: Conceptual Schematic of Option 1

3.1.1 Discharge Sump

Existing seawater effluent/discharge piping from native and non-native exhibits and tanks will be intercepted and routed to a 16 ft x 8 ft x 6 ft deep, 5,750-gallon below grade concrete discharge / transfer sump by gravity. The sump would be installed on the southwest side of the property in the lawn area next to the fence and promenade (Attachment E; Figure 1). The size and volume of the sump is based on a residence time of approximately 8.5 minutes at an average flow of 556 GPM (target flow rate to achieve 800,000 GPD) and at the maximum water level of five ft from the bottom of the sump. The top one ft of the sump is for freeboard and set aside for emergency overflow, which will be directed to an injection well. The emergency overflow water from the sump would spill over a 4-ft wide x 6 inch-high weir at the top of the sump and into a concrete box where a 12-inch pipe is connected to discharge the emergency overflow to an injection well. Within the discharge sump, a sediment collection area at the bottom of the sump will be part of the design. Periodic sediment removal would be required as part of the maintenance of the sump.

Seawater effluent collecting in the discharge sump would be pumped to the filter house, where it would pass through the drum screen filters before discharging to the injection wells. Transfer sump discharge pumps (Fybroc 1630 Series End Suction Centrifugal, or similar), each rated at 425 GPM, will transfer effluent to the drum screen filters. Under normal conditions, two pumps would be sufficient to accommodate the seawater supply target of 556 GPM. To ensure redundancy and possible high flow conditions, a third pump should be installed. The additional pump will accommodate flows during times when pump maintenance is necessary. All three pumps should be rotated for operation regularly to prolong their service life.

3.1.2 Drum Screen Filters

Two drum screen filters (CM-Aqua Technologies Model HEX-XT-5T or similar), each of which can accommodate 650 GPM flow, will reside at the injection wellhead area. An above grade filter house would be constructed to protect the filters from the elements and to provide the necessary head requirement to gravity feed the flow into the injection wells. Transfer sump discharge pumps (Fybroc 1630 Series End Suction Centrifugal, or similar), each rated at 425 GPM, will transfer effluent to the drum screen filters. The drum screen filters will filter the effluent from the sump down to 20 microns to achieve an average TSS range of 20-25 milligrams per liter (mg/L). This TSS concentration is under the maximum TSS loading recommended for well injection (30 mg/L). To operate, the drum filters would require an electrical supply for the drum motors and high-pressure rinse pumps, a domestic freshwater supply to backflush the filters, and a sewer connection for the backwash effluent.

3.1.3 Injection Wells

After passing through the discharge sump and drum screen filters, filtered effluent will flow by gravity to injection well heads for discharge. Two injection wells will be drilled at least 50 ft apart along the southern boundary of the Aquarium (Attachment E; Figure 1). The injected water will dissipate into the saltwater aquifer.

Inspection of the site geology indicates that it is suitable for injection (Attachment B). The existing saltwater production well has a high specific capacity, which indicates high permeability in the area suitable for injection wells. More specific data on site geology will be collected when determining exact injection well locations and depth design to prevent cross contamination between source and discharge wells. Each injection well will be approximately 250 ft deep, with 100 ft of solid 18-inch nominal diameter Schedule 80 casing and 100 ft of slotted 18-inch nominal diameter Schedule 80 casing. A test injection well would be constructed and tested first. If results from the test injection well show a lower permeability than expected, then a third injection well may be needed for Option 1. See Attachment B for more details on the hydrogeological environment and injection well analysis.

3.1.4 Upgrades to Existing Electrical and Mechanical Systems

3.1.4.1 Electrical Upgrades Required

To serve all new electrical loads for Option 1, a new circuit breaker and feeder would be needed from an existing distribution panel and backed up with the existing emergency power generator. The new electrical infrastructure would be sized to accommodate the maximum three discharge sump pumps, pre-filtration equipment, and all general power and lighting loads. It is estimated that the new circuit breaker at existing distribution panel “EB” will be sized between 150 to 175 amps.

A short (1-2 hour) power outage to a portion of the facility would be required to install the new circuit breaker and feeder into the electrical room. From the electrical room, the feeder would be routed to a panelboard located at the sump pumping station through an existing spare 4-inch conduit that runs behind the electrical room and the main aquarium building, before being routed on the exterior of the building to the southwest (SW) corner. The conduit will leave the main aquarium building and go underground to the sump pumping station's panelboard.

The electrical panelboard will provide branch circuits for the three variable frequency drives (VFDs) that control the discharge sump pumps and all general power and lighting loads at the sump pumping station and the panelboard at the pre-filtration enclosure at the injection well location. The electrical feeder will be concrete-encased and routed underground in parallel with the proposed 10-inch water discharge piping to the panelboard that distributes power to the drum screen filters. All required junction boxes, conduit, and connections in support of the control and instrumentation signals and communication feedback/status and interlocks needed will be included in the electrical engineering drawings should this option be chosen (Kraig Otani & Associates, LLC, 2020; Attachment C).

3.1.4.2 Mechanical Upgrades Required

A new underground pump station building (along the makai promenade fence next to the discharge/transfer sump) will be needed to accommodate the sump pumps. An underground pump system will help with longevity and acoustics. The pump station should be designed with maintenance in mind and allow easy access to all equipment for replacement or servicing. Mechanical ventilation is necessary for any enclosed equipment buildings.

Each sump pump will be sized for 425 GPM and have an associated VFD. The drum screen filters will require connections to domestic freshwater and sewer. Further investigation is required to determine the extent of the pipe replacement and possibilities for phasing (Okahara and Associates, 2020; Attachment D). Since the conditions and exact alignments of the underground utilities are unclear on as-built drawings, an assessment probably cannot be made until they are exposed by excavation.

3.1.5 Anticipated Effects

3.1.5.1 Impacts on Receiving Waters

Impacts on nearshore receiving waters will be virtually eliminated as there will be no direct ocean discharge into the MLCD. Under the current regulatory requirements, Option 1 would eliminate the need for an NPDES permit and associated water quality monitoring requirements.

Discharging aquarium effluent into injection wells would shift regulatory requirements and limitations to Department of Health Safe Drinking Water Branch as this department regulates injection wells in Hawai‘i. Injection well discharge would introduce the effluent at over 200 ft below ground surface, where it would dissipate into the saltwater aquifer and move laterally. Effects on the nearshore and the MLCD will be greatly minimized if not eliminated.

Discharge into the CCH sanitary sewer system would be limited to only freshwater filter backwash of the drum screen filters; and only minimal saltwater will enter the sanitary sewer system when drum screens are rinsed. This change would comply with current CCH IWDP regulations.

3.1.5.2 Costs, Operation, and Maintenance

Option 1 is the simplest of the options with the least amount of mechanical equipment and associated maintenance. Pump motor sizes are much smaller than those required for Options 2 and 3, therefore mechanical construction and electricity costs would be the lowest of the options. Temporary closure of the aquarium to install mechanical upgrades would be needed (Okahara and Associates, 2020; Attachment D). Overall, operation and maintenance efforts are expected to be reduced and NPDES water quality monitoring requirements will likely become unnecessary.

3.2 Option 2: Filter and treat all saltwater effluent prior to ocean outfall disposal

Option 2 requires all seawater effluent (native and non-native) to pass through a treatment system then flow through the existing ocean discharge system. Effluent would be filtered and ultraviolet (UV)-treated to eliminate non-native species, parasites, and pathogens and reduce TSS, ammonia nitrogen, and nitrate/nitrite concentrations prior to discharging into the ocean. This option would minimize saltwater going into the CCH sanitary sewer system. Only filter backwash with associated saltwater carryover would be enter the CCH sewer system

Seawater effluent would be re-routed to a discharge sump and then pumped through a treatment system prior to flowing through the existing ocean discharge location (Figure 3-2). The discharge sump and treatment system equipment (i.e., pressure filters and UV units) would require an approximately 20 ft x 20 ft area with a concrete pad foundation and 12 ft high enclosure. A conceptual site plan of Option 2 is included as Figure 2 in Attachment E.

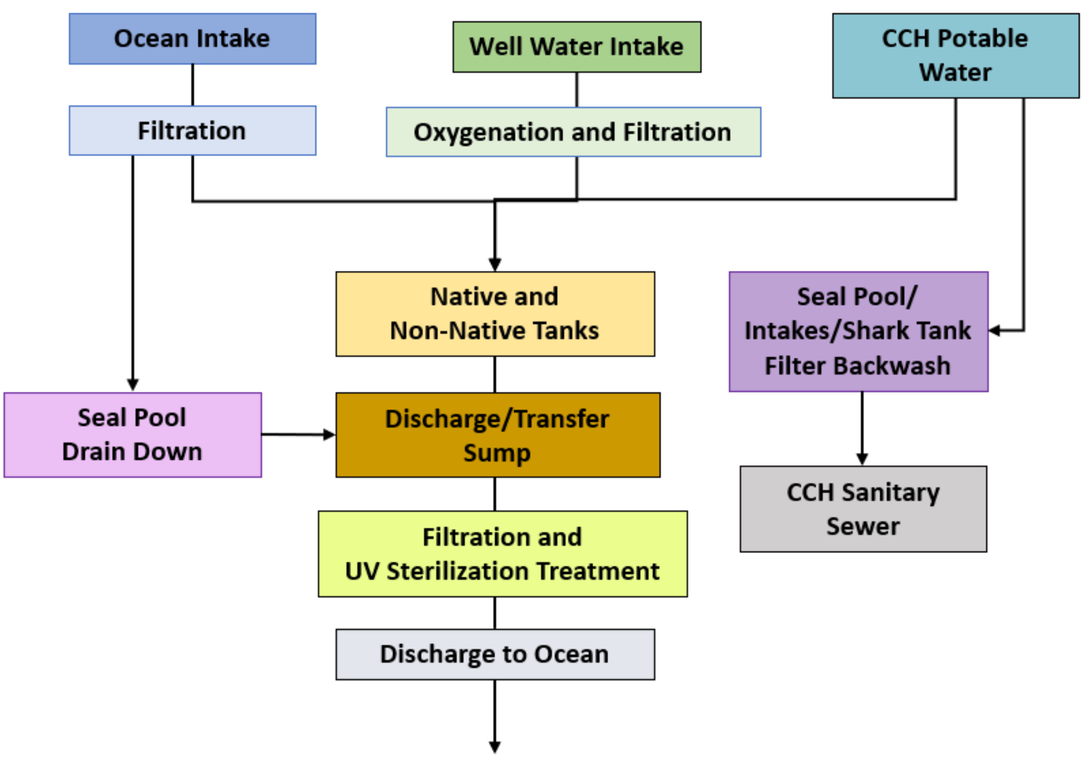

Figure 3-2: Conceptual Schematic of Option 2

3.2.1 Discharge Sump

Similar to Option 1, the existing seawater effluent/discharge piping will be intercepted and routed to a 16-ft x 8-ft x 6-ft deep below grade concrete discharge sump by gravity. The sump would be installed on the west side of the property in the lawn area, in the same location as Option 1 (Attachment E; Figure 2). The discharge sump should have an emergency overflow by-pass directed to the CCH sewer. The emergency overflow weir and pipe are the same as those described in Option 1 but will connect and discharge to a sewer manhole along Kalakaua Avenue. After being collected in the discharge sump, effluent water will be pumped to a treatment system.

3.2.2 Treatment System – Vertical Pressure Filters and UV Sterilization

Effluent treatment will include pressure filters and UV sterilization through three treatment system pumps. The treatment system would be located adjacent to the discharge sump to the north in the lawn area along the fence and promenade. The treatment system equipment (pressure filters and UV units) would be placed on a concrete pad approximately 20 ft x 20 ft in area. The system should be protected from the elements with sufficient ventilation and sound insulation.

Three pumps (Fybroc 1630 Series End Suction Centrifugal, close-coupled), each rated to accommodate 425 GPM are needed for pressure filtration. Two pumps can accommodate the expected 556 GPM flow, with a third pump to ensure redundancy. Each pump will be outfitted with VFDs and feedback controlled by sump levels and flows. The treatment system will be able to provide flow ranges between 425 GPM (one pump) to 1,275 GPM (3 pumps). The pumps would send water through four vertical pressure filters (Paragon Model SS-PRV72, or equivalent) approximately 6 ft in diameter and 8 ft tall. Dryden Aqua AFM filter media is recommended for these filters as it has excellent filtration capability, does not harbor microbial growth, and does not require replacement. Dryden AFM Grade 1 media removes 95% of particulates 5 microns and larger, which should be sufficient to meet WQ standards. Should more stringent filtration be needed, AFM Grade 0 media that removes 96% of particulates 1 micron and above could be used. Additional options are available to filter down to 0.1 microns using flocculation, but with additional cost.

The pressure filters would require sufficient freshwater lines as well as connections to the CCH sanitary sewer to be installed to allow for regular freshwater backflushing. The backflushing discharge would be pumped to the existing 12,000-gallon wastewater holding tank prior to being routed to the sewer.

Pressure-filtered effluent would then be directed to UV sterilization. Three Albright Ultraviolet Everest Series Model #PEL32A161008A or similar are recommended. Each unit would provide a minimum UV exposure of 180 millijoules per square centimeter (mJ/cm^2) at a design flow of 425 GPM, so two units are expected to be in use at a time with the third present as a redundancy measure.

3.2.3 Upgrades to Existing Mechanical and Electrical Systems

3.2.3.1 Electrical Upgrades

To serve all new electrical loads for Option 2, a new circuit breaker and feeder from an existing distribution panel would be needed and backed up with the existing emergency power generator. The new electrical infrastructure would be sized to accommodate the maximum three discharge sump pumps, treatment equipment, and all general power and lighting loads. It is estimated that the new circuit breaker at existing distribution panel "EB" would need to be sized between 250 to 300 amps.

All electrical lines would originate from the electrical room. A feeder would be routed to the treatment system's panelboard through an existing spare 4-inch conduit that runs behind the electrical room and the main aquarium building, before being routed on the exterior of the building to the SW corner. A concrete-encased conduit will be routed underground from the main aquarium building and to the treatment system's panelboard. The treatment system panelboard would provide branch circuits for the UV sterilization equipment, general power, and lighting loads at the treatment system enclosure. From the treatment system panelboard, a feeder would then be routed underground to the sump pumping station panelboard.

The electrical panelboard would provide branch circuits for the three VFDs that control the discharge sump pumps and all general power and lighting loads at the sump pumping station (Kraig Otani & Associates, LLC, 2020; Attachment C).

3.2.3.2 Mechanical Upgrades

A new underground pump station building would be needed to accommodate the three discharge sump pumps. Each discharge sump pump would be sized for 425 GPM. The treatment system of four vertical pressure filters and three UV sterilizers would be housed in an above grade building. Vertical pressure filters would require connections with motorized valves to the existing backwash pump that serves the shark tank filters. Motorized valves would be needed to open and close backwash pump discharge branches going to the various sets of filters. Filter backwash would need to be connected to the existing sanitary sewer system. Upgrades to pumps and piping may be necessary (Okahara and Associates, 2020; Attachment D).

3.2.4 Anticipated Effects

3.2.4.1 Impacts on Receiving Waters

Option 2 is aimed at improving the quality of the ocean discharge by filtering and sterilizing effluent to remove most of the suspended solids, bacteria, and nutrients generated from the exhibit tanks before the water is discharged. Due to the complexity of reducing nitrogenous waste concentrations in the waste effluent stream, additional effort for both system design as well as operation and maintenance would be required. A potential design inclusion to treat nitrogenous waste concentration is to use raw effluent to feed algae tanks that can naturally utilize nitrogenous waste compounds and reduce their dissolved levels in water. Regular monitoring and adjustments may be required to ensure that NPDES requirements are met for some nitrogen compounds. The resulting ocean discharge would still be regulated by a NPDES permit with all the monitoring requirements. However, saltwater discharge to the CCH sewer system would be greatly reduced, with only limited saltwater carryover with freshwater filter backwashing.

3.2.4.2 Costs, Operation, and Maintenance

Option 2 includes three pumps, four vertical pressure filters, and three UV sterilizers that would require regular mechanical maintenance. The pumps in Option 2 are the largest of the three options and would result in the highest energy costs. Temporary closure of the aquarium to install upgrades would be needed. The water distribution systems would be modified to accommodate the changes imposed by the required treatment facility. Intakes and outfalls would be controlled by pump and valve systems. A separate water treatment/filtration system would be needed to treat the total amount of effluent with the necessary pipes, pumps, and control valves to ensure high quality ocean discharge. The ocean outfall would need to be maintained and all monitoring requirements of the resulting NPDES permit would require continued compliance. Overall, the effort required for operation and maintenance of the system will increase significantly.

3.3 Option 3: Disposal of native exhibit water via ocean outfall and nonnative exhibit water via injection wells

Option 3 is a hybrid combination of Option 1 (injection wells) and Option 2 (advanced filtration and sterilization). In Option 3, all saltwater discharged from native and monk seal tanks (herein referred to as "native effluent") would be filtered and treated prior to discharge into the existing ocean outfall. Non-native saltwater tank effluent (herein referred to as "non-native effluent") and freshwater exhibit effluent would be discharged into injection wells (Figure 3-3). This option would reduce ocean discharge and minimize saltwater going into the CCH sanitary sewer system. Only freshwater filter backwash with associated saltwater carryover would be enter the CCH sewer system.

Two discharge sumps would be required to collect raw effluent from native tanks and non-native tanks. The sumps would be housed below ground at the same location as that described in Option 1 and Option 2 (Attachment E; Figure 3). Non-native and native discharge piping would be separated and routed to their respective sumps. This may be most effectively achieved if the native and non-native pipes are routed side-by-side in the same trench where practicable, and then routing the pipes to their respective discharge sumps.

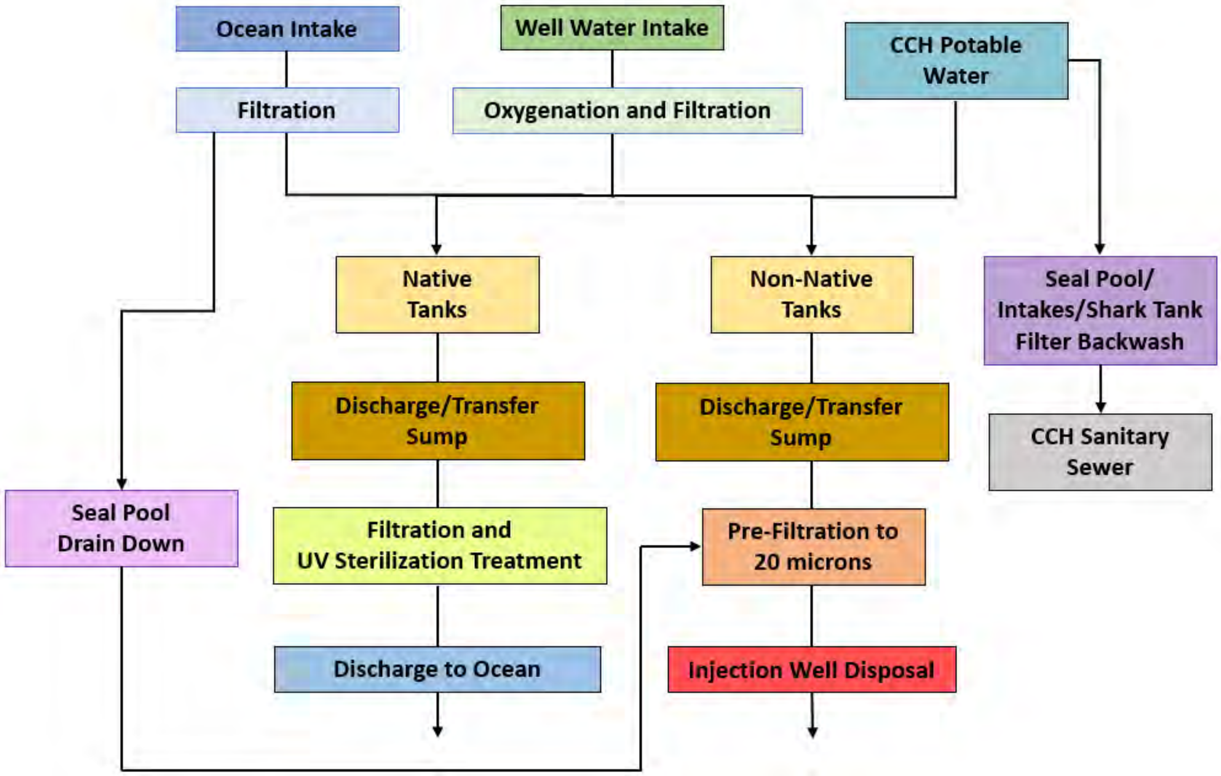

Figure 3-3: Conceptual Schematic of Option 3

3.3.1 Native Exhibit Effluent Treated by Filtration

Like Option 2, raw saltwater effluent from native tanks would be redirected to a native discharge sump, pumped through pressure filters, and undergo UV sterilization before being discharged through the ocean outfall. The maximum flow of native seawater will be approximately 445 GPM (about 80% of the 556 GPM treated in Option 2). The discharge sump dimensions, type and number of filters, and UV sterilization configuration would be very similar to that in Option 2, as this configuration can accommodate flow rates from 325 – 1,100 GPM. Treated water would be discharged through the existing ocean outfall.

3.3.2 Non-native Exhibit Effluent Discharged to Injection Wells

Existing freshwater exhibit effluent and saltwater effluent discharge piping for all non-native species exhibits and holding tanks would be redirected to a non-native discharge sump, prefiltered, and sent to two injection wells. The two injection wells in Option 3 would be smaller in size than Option 1's injection wells due to the lower discharge volume from non-native only exhibits and tanks. The non-native sump would also be smaller in size than that of Option 1 and Option 2 due to the lower discharge flow. Two drum screen filters (CM-Aqua Technologies Drum Screen Filters Model HSX-X2-2T or similar) would pre-filter discharge to 20 microns prior to well injection. A sump pumping station would be designed to reside below grade next to the sump. The transfer pumps would direct non-native effluent through the drum screen filters and into one injection well, with the other as a backup to ensure that aquarium operations are not disrupted during well maintenance or repairs. Drum screen filters would be located at the injection wellhead area. An above grade filter house would be required to protect the filters and pumps from the elements.

3.3.3 Upgrades to Existing Electrical and Mechanical Systems

3.3.3.1 Electrical Upgrades

Option 3 would require new electrical infrastructure to be sized to accommodate a maximum of five discharge sump pumps, treatment system, pre-filtration equipment, and all general power and lighting loads. It is estimated that the new circuit breaker at existing distribution panel "EB" would be sized between 250 to 300 amps. The sump pumping station's panelboard will need branch circuits for five VFDs that would control the native and non-native discharge sump pumps. The VFDs would incorporate sump level and flow signals to control its operations. The sump pump panelboard would also provide general power and power for lighting loads at the sump pumping station, as well as a feeder to the pre-filtration enclosure panelboard at the injection wells. The electrical feeder to the pre-filtration enclosure would be encased in concrete-cased conduit and routed underground in parallel to the proposed 4-inch non-native water discharge piping, as described in Option 1.

3.3.3.2 Mechanical Upgrades

Mechanical requirements for native seawater discharge include four vertical pressure filters and three UV sterilizers. The native seawater discharge sump pump would be sized for 350 GPM. The setup for native discharge mechanical upgrades would be similar to Option 2.

Mechanical requirements for non-native discharge include two discharge sump pumps and two drum screen pre filters. The non-native discharge sump pumps would be sized for 150 GPM.

Option 3 has separate native and non-native seawater discharge systems and therefore requires nearly double the amount of mechanical equipment. Upgrades to pumps and pipes would likely be necessary (Okahara and Associates, LLC, 2020; Attachment D).

3.3.4 Anticipated Effects

3.3.4.1 Impacts on Receiving Waters

In Option 3, effluent water quality would be significantly improved, reducing impacts on the receiving water and ZOM environment. An NPDES permit and ZOM monitoring requirements would still be required for the ocean discharge. Injection wells would be regulated by the Department of Health Safe Water Drinking Branch. Only minimal saltwater from filter backwash would be discharged into the CCH sewer system.

3.3.4.2 Construction, Operation, and Maintenance

Option 3 involves construction of two smaller new injection wells and pipelines for redirecting the discharge from nonnative species exhibits to the injection well. The water distribution systems would be modified to accommodate the changes imposed by advanced treatment and discharge redirection.

The complicated nature of Option 3 would require higher construction and maintenance costs than Options 1 and 2. Electricity costs would be approximately the same as Option 2.

3.4 Design Option Evaluation

The three design options were evaluated to address outstanding effluent discharge water quality issues: elimination of saltwater effluent discharge to the sanitary sewer system and compliance of ocean outfall effluent discharge water quality with permit requirements. While there has been discussion of abandoning the existing aquarium site and rebuilding the aquarium at an alternative site, that scenario is not considered as a design option in this report.

To evaluate design options, a pairwise rating system was established with key design criteria identified. A pairwise rating matrix evaluated all the criteria weighted by their relative importance to the project objectives. Based on pairwise comparisons, the three design options were ranked from best to worst relative to each criterion. The following section summarizes the details and results of the design option evaluation process.

3.4.1 Design Option Evaluation Criteria

The key evaluation criteria identified were:

- Aquarium Operations and Maintenance - How does the design option impact aquarium operation and maintenance requirements including manpower, complexity, and cost;
- Addresses DOH/City Violations - How well does design option address City sewer infrastructure and DOH NPDES requirements and concerns;
- Construction Cost - How the design option compares in terms of construction cost;
- Effluent Water Quality and Environmental Impacts - How the design option affects nearby water quality and ongoing regulatory permit requirements;
- Ease of Construction Permittability - How much effort is required to obtain required permits to construct the design option;
- Aquarium Disruption During Construction- How will the design option disturb aquarium operations during construction; and
- Future Expansion/Design Modularity - How compatible is the design option with modular expansion of the aquarium up to 800,000 GPD throughflow, can the design be implemented in future phases of expansion?

All criteria were evaluated by pairwise comparison, establishing a measure of weighted evaluation for the design options. Each criterion pair was compared and given a score depending on the relative importance of the criteria. Each criterion would receive points based on the following system:

"1" - criterion A is more important than criterion B

"0.5" - criterion A is equally important as criterion B

"0" - criterion A is less important than criterion B

The points are summed for each criterion and a Weighting Factor was established based on the percentage of points awarded to each criterion. The criterion with the highest Weighting Factor is deemed to be the most important criterion for the purposes of design option evaluation. A summary of the criteria pairwise comparison is below in Figure 3-4.

PAIRWISE MATRIX TO DETERMINE WEIGHTING FACTORS

			Criterion B									
			1	2	3	4	5	6	7			
			Aquarium Operations & Maintenace	Addresses DOH/City Violations	Construction Cost	Effluent Water Quality & Environmental Impacts	Ease of Construction Permitability	Aquarium Disruption during Construction	Future Expansion/Design Modularity	Total	Rank	Weighting Factor
Criterion A	1	Aquarium Operations & Maintenace		0	1	0	1	1	1	4	2	19.0
	2	Addresses DOH/City Violations	1		1	0.5	1	1	1	5.5	1	26.2
	3	Construction Cost	0	0		0	0.5	1	0.5	2	3	9.5
	4	Effluent Water Quality & Environmental Impacts	1	0.5	1		1	1	1	5.5	1	26.2
	5	Ease of Construction Permitability	0	0	0.5	0		0.5	0	1	4	4.8
	6	Aquarium Disruption during Construction	0	0	0	0	0.5		0.5	1	4	4.8
	7	Future Expansion/Design Modularity	0	0	0.5	0	1	0.5		2	3	9.5
									Total	21		100

Figure 3-4: Pairwise Criteria Comparison

Reviewing the 'Rank' column shows the relative importance of each criterion. The most important ranked criteria addressed outstanding regulatory issues:

- Addresses DOH/City Violations (1) and
- Effluent Water Quality and Environmental Impacts (1).

The remaining criteria were ranked in order of decreasing importance:

- Aquarium Operations and Maintenance (2),
- Construction Cost (3),
- Future Expansion/Design Modularity (3),
- Aquarium Disruption during Construction (4), and
- Ease of Construction Permittability (4).

3.4.2 Design Option Evaluation Matrix

The three project design options were evaluated for each of the criteria identified above. For each criterion, the project design options were ranked from highest preference (3) to lowest preference (1), with each option assigned a value of 1, 2, or 3. Scores were tallied by multiplying the criterion pairwise Weighting Factor by the assigned value. Scores are totaled for each design option, and the total scores constitute the weighted option evaluation scores. The highest score represents the highest preferred design option based on the pairwise criteria weighting. Figure 3-5 shows the design option evaluation matrix and results summary.

3.4.2.1 Operation and Maintenance

Design options were evaluated based on complexity of system design, components, operation and maintenance (O&M), and necessary technical expertise of aquarium staff. Options with straight forward designs, availability of skilled staff, and simple O&M are scored higher.

Aquarium operation and maintenance for Option 1 was deemed to be most advantageous because there are the fewest elements of effluent transfer and treatment equipment to maintain. Similarly, Option 2 requires less pieces of equipment to maintain than Option 3.

3.4.2.2 Address of DOH and City Water Quality Violations

Each of these design options resolves outstanding effluent disposal issues with City and DOH; however, Option 1 will be the most preferable because there is the least potential for discharges in violation of water quality requirements. Option 3 presents a lesser potential for discharge quality violations than does Option 2.

3.4.2.3 Construction Cost

Conceptual design option construction costs are summarized below in Table 3-1. Preference was given to the lowest construction cost.

Table 3-1 Conceptual Design Option Construction Costs

Design Option	Description	Estimated Cost
1	Disposal of all effluent to injection wells	$6,720,000
2	All effluent treated and sterilized with ocean outfall disposal	$6,060,000
3	Native exhibit effluent to ocean outfall, Nonnative exhibit effluent to injection wells	$7,350,000

3.4.2.4 Effluent Water Quality and Environmental Impacts

Design options were evaluated based on the level of impact on the environment, available infrastructure, surrounding sensitive areas, recreational, ecological, and other resources that will require in depth studies and disclosures. Options that do not involve extensive environmental analysis are preferable.

Effluent disposal via injection wells was deemed to have a lesser impact on habitat than ocean outfall disposal as well as necessitating less water quality regulation. Therefore, for effluent water quality and environmental impacts, the design options were ranked in order of quantity of ocean outfall discharge.

3.4.2.5 Ease of Construction Permittability

A variety of regulatory permits will be required for construction of all options. Construction activity seaward the highwater line requires Section 10 United States Army Corps of Engineers (USACE) and DOH Section 401 permits. Any construction or land use within the Special Management Area and the shoreline setback will require CCH permits. Discharge into coastal waters and injection wells will require State permits. Construction permit requirements and the complexity and duration of obtaining them were used in ranking the options.

Due to the necessity of obtaining discharge permits from DOH for each injection well constructed, the level of effort for pre-construction permitting of the design options was determined by the number of injection wells included in each option. Option 2 was the most preferable with no injection well construction.

3.4.2.6 Disruption to Aquarium Operations

Disruption to aquarium operations during construction was determined by the location and amount of space needed for the construction of design option elements. Attachment E, Figures 1-3 show conceptual site work required to trench for new pipes and excavate for new sumps as well as locations for new equipment and features. While the locations shown in the figures may be relocated prior to the final design, the scope of disruption during and post construction may be ascertained. Option 1 requires the least amount of space and is therefore ranked as the most preferable option.

3.4.2.7 Future Expansion/Design Modularity

The Aquarium has expressed the intent to scale up aquarium throughflow through increased water use for existing exhibits and introduction of new exhibits. Each of the design options requires multiple pieces of equipment for effluent transfer and filtration. In addition, equipment redundancy must be built into the system design to allow for continuous system functionality. For this reason, each of the design options has the ability to scale with increasing effluent flow requirements. The design option equipment specifications balance the effluent flow requirements with monthly aquarium activities, and the reasonable capacities of sumps and filtration equipment. The design options were evaluated based on the ease at which they could be scaled up with incremental increases in throughflow. The ability to implement a modular design could manifest in a lower up front construction cost if the minimum amount of equipment was purchased at the time of construction and/or an easier transition to higher throughflow upon upgrade of the intake water system. Option 3 was ranked least preferable in this regard due to the need to balance aquarium flow requirements between two modes of effluent disposal (ocean outfall and injection well). Options 1 and 2 were deemed comparable because they both involve installation of additional pieces of equipment and/or wells. An equivalent effort is estimated to upgrade each of the design options.

Pairwise Weighted Design Option Evaluation Matrix

		PROJECT DESIGN OPTIONS					
CRITERIA	CRITERIA PAIRWISE WEIGHTING FACTOR	OPTION 1: Disposal of all effluent into injection wells		OPTION 2: All effluent treated and sterilized with ocean outfall disposal		OPTION 3: Native exhibit effluent disposal via ocean outfall, non-native water effluent disposal via injection wells	
		Value	Score	Value	Score	Value	Score
Aquarium Operations & Maintenace	19.0	3	57.1	2	38.1	1	19.0
Addresses DOH/City Violations	26.2	3	78.6	1	26.2	2	52.4
Construction Cost	9.5	2	19.0	3	28.6	1	9.5
Effluent Water Quality & Environmental Impacts	26.2	3	78.6	1	26.2	2	52.4
Ease of Construction Permitability	4.8	1	4.8	3	14.3	2	9.5
Aquarium Disruption during Construction	4.8	3	14.3	2	9.5	1	4.8
Future Expansion/Design Modularity	9.5	2.5	23.8	2.5	23.8	1	9.5
TOTAL	100.0		**276.2**		**166.7**		**157.1**
OVERALL RANK			1		2		3

Criertia Evaluation Values	
Highest Preference	3
	2
Lowest Preference	1

Figure 3-5: Design Option Evaluation Matrix

Option 1 was ranked as the highest preferred design option, followed by Option 2 then 3.

4. PREFERRED OPTION

Based on the Design Option Evaluation Analysis, the preferred option for the Waikiki Aquarium System Upgrade Plan was ***Option 1: Disposal of all effluent into injection wells.*** Option 1 was selected as it would eliminate ocean discharge and minimize saltwater effluent to the CCH sewer, therefore eliminating the need for an NPDES permit and making the effluent to City sewers compliant with CCH requirements. Option 1 was the most straightforward of all the options considered that met all project criteria. In addition, Option 1 would be able to accommodate additional effluent flows should future exhibits and Aquarium expansions be put in place.

4.1 Option Feasibility and Logistics

4.1.1 Upgrades to Facilities – *Injection Wells*

The existing saltwater production well indicates that the site geology is suitable for injection. The high permeability shall be considered during injection well location and depth design to prevent cross contamination between source and discharge wells. It is currently feasible from a regulatory and technical viewpoint for the Aquarium to dispose of wastewater in injection wells. Despite this, injection wells are becoming more controversial in Hawaiʻi due concerns about nearshore pollution due to the County of Maui vs. Hawaiʻi Wildlife Fund U.S. Supreme Court Case. In this case, settled on 23 April 2020, the Supreme Court declared that point source discharges to navigable waters through groundwater are regulated by the Clean Water Act.

The Aquarium is located makai (seaward) of the Underground Injection Control (UIC) line, and therefore is in an exempted aquifer that will not be used for drinking water. An aquifer makai of the UIC line is exempted from being used as a drinking water source and therefore can be legally available for injection. The Aquarium sits on top of a saltwater caprock aquifer overlaying a confined basalt aquifer as defined by the Hawaiʻi Administrative Rules (HAR §11-23). Injection pressure is limited by the artesian pressure and there must be at least 50 ft of vertical separation between the bottom of the injection interval and the top of the basalt artesian aquifer. The caprock is over 1,000 ft thick at this location, so there will be enough vertical separation between the injection interval and the basalt confined aquifer. Gravity injection will give adequate disposal capacity without the need for pressure injection. Two injection wells are recommended to achieve disposal of 80,000 GPD, one active and one standby. A standby well is required because the active disposal well will gradually lose capacity due to accumulation of solids and microbiological action and to ensure no disruption of aquarium operations during well maintenance and repairs. The wells will require cleaning at regular intervals.

Constraints on the location of the injection wells include hydrogeological considerations, proximity to wastewater lines, and site logistics. The injection wells should be as far from the intake production well as feasible to minimize the possibility of injectate cross-contaminating the production well. Separation should be vertical as well as horizontal, meaning that the injection interval should be lower than the production interval. The well locations should also ideally be designed so that aquarium wastewater can gravity flow into the well(s) to minimize pumping costs. Finally, the well sites must have adequate drilling space and must not interfere with long term operation of the aquarium. The completed wells will have a subsurface completion so the operational wells will not unduly interfere with aquarium operations. However, if total suspended solids treatment is incorporated into the final design, these filter units will likely be placed above ground at the wellhead site.

4.1.2 Impacts on Receiving Waters and City Sewer System

The current impact on nearshore receiving waters will be reduced significantly as there will be no direct ocean discharge. Discharge into the CCH sanitary sewer system will be limited to only freshwater filter backwash of the drum screen filters, and only minimal saltwater will enter the sanitary sewer system when drum screens are rinsed. This change would comply with current CCH IWDP regulations. Under the current regulatory requirements, the need for the continuous NPDES permit requirement and the associated water quality monitoring may be avoided, resulting in savings and reduced regulatory oversight.

Injection well discharge will introduce the effluent into the ocean at a depth more than 60 ft. The injected water will dissipate into the aquifer and move laterally into the ocean. The discharge will daylight at about the 60 ft depth, reducing impacts on nearshore and the MLCD. Discharging aquarium effluent into one or more injection wells also would shift regulatory requirements and limitations. Injection wells in Hawaiʻi are regulated by the DOH Safe Drinking Water Branch.

4.2 Construction, Operation, and Maintenance

This option involves construction of the two new injection wells and pipelines for discharge. The ocean intake will be retained, the ocean outfall will be abandoned or repurposed, and operations may be slightly simplified. The initial cost of this option is high due to expense of the distribution system upgrades, well construction and piping modifications. Operation and maintenance efforts are expected to be reduced due to savings from water quality monitoring and ocean outfall maintenance. There will be some changes expected to pump modifications and electrical system. The final design and electrical and mechanical needs will be designed to accommodate other future aquarium improvements and upgrades.

4.3 Anticipated Upgrades Intake Water Systems

Corresponding upgrades to intake water systems are expected with increased discharge volumes. The projected well water intake anticipated for future upgrades and improvements is more than two and half times the existing amount. Currently, the intake from the salt water well seems to be limited by the size of existing intake pipes and pump. The NSW intake flow would also increase almost 50% from 246,421 GPD to 360,000 GPD. In perfect working conditions, the existing 8- inch NSW intake is sufficient to provide this capacity. However, the intake asbestos pipes presently in use appear to be installed in the 1950s or earlier and well beyond their engineering life. Therefore, the pumps and delivery pipes would likely need to be upgraded to accommodate the new flow. The new water distribution system, water treatment facilities and controls need to be also upgraded, as necessary. A new system of treatment, pumps, controls, and effluent delivery lines to accommodate the full flow must be designed and constructed to direct water to the injection wells. Details of water intake upgrades are beyond the scope of this Water System Upgrade Plan, which focuses on discharge only.

5. REFERENCES

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Appendix B:

Geotechnical Engineering Exploration

GEOTECHNICAL ENGINEERING EXPLORATION

WAIKIKI AQUARIUM IMPROVEMENTS AND
WASTEWATER SYSTEM UPGRADES
2777 KALAKAUA AVENUE
TMK: 3-1-031: 006
HONOLULU, OAHU, HAWAII

JUNE 24, 2021

Prepared for:
OCEANIT

PROJECT NO. 030421-00

Kokua Geotech LLC
Soil and Foundation Engineering

June 24, 2021
Project No. 030421-00

Oceanit
828 Fort Street Mall, Suite 600
Honolulu, Hawaii 96813

Attention: Mr. Jordan Moniuszko

Subject: **Geotechnical Engineering Exploration**
Waikiki Aquarium Improvements and Wastewater System Upgrades
2777 Kalakaua Avenue
TMK: 3-1-031: 006
Honolulu, Oahu, Hawaii

Dear **Mr. Moniuszko**:

We are pleased to submit this report entitled "Geotechnical Engineering Exploration, Waikiki Aquarium Improvements and Wastewater System Upgrades, 2777 Kalakaua Avenue, TMK: 3-1-031: 006, Honolulu, Oahu, Hawaii" prepared for the design of the project.

The purpose of our field exploration and this report was to observe and evaluate the general subsurface conditions at accessible locations at the project site to formulate geotechnical recommendations to assist in the design of the project. Our work was performed in general accordance with the scope of services outlined in our fee proposal dated March 9, 2021.

Our findings and recommendations are summarized as follows:

1. Our field exploration at the project site generally encountered surface fill materials overlying beach deposits, lagoonal deposits, and apparent coral formation extending down to the maximum depth explored of about 42 feet below the existing ground surface. The surface fill materials encountered generally consisted of loose to medium dense clayey/silty sand and medium stiff to stiff clayey/sandy silt and were estimated to be about 1 to 3 feet thick.

   Beach deposits were encountered underlying the surface fill materials to depths ranging from about 8 to 10 feet below the existing ground surface and generally consisted of loose to medium dense sand with a little silt and gravel. Lagoonal deposits generally consisting of very loose to medium dense clayey gravel and very soft sandy clay were encountered underlying the beach deposits to a depth of about 40.5 feet below the existing ground surface.

It should be noted that the lagoonal deposits encountered at the project site are highly compressible when subjected to new loads. Below the highly compressible lagoonal deposits, our field exploration generally encountered apparent medium hard to hard coral formation extending down to the maximum depth explored of about 42 feet below the existing ground surface.

2. We encountered groundwater in our borings at depths ranging from about 7.3 to 8.1 feet below the existing ground surface at the time of our field exploration. Due to the proximity of the project site to the Pacific Ocean, groundwater levels are expected to vary with tidal fluctuations. In addition, groundwater levels may change due to seasonal precipitation, surface water runoff, and other factors.

3. We anticipate that installation of the new pumping station and piping will generally consist of trench excavation, pipe bedding and placement, and trench backfill. Based on an anticipated excavation depth of about 12 feet below the existing ground surface, we believe that dewatering may be needed.

4. Based on the results of our field exploration, we believe the near-surface soils would not provide adequate foundation support for the proposed pumping station without appreciable settlements and differential settlements under the anticipated loads. Therefore, we recommend utilizing a deep foundation system consisting of micropiles to support the proposed pumping station.

5. Based on availability of local equipment, we envision a micropile system with a minimum grout bulb diameter of 5.5 inches (minimum drill bit size) may be used for foundation support of the new pumping station structure. We recommend designing each micropile based on an allowable compressive load capacity of 30 kips for the 5.5-inch diameter micropiles.

6. We anticipate the load supporting capacity of the micropile foundation would be derived primarily from skin friction between the micropile shaft and the coralline materials anticipated underlying the project site. We also recommend using permanent steel casing for the micropiles that extend through the loose/soft, compressible beach and lagoonal deposits to the top of the coralline materials.

7. To achieve the allowable compressive load capacity of 30 kips with a factor of safety of 2, we believe the 5.5-inch diameter micropiles would need a minimum bonded zone of 20 feet below the permanent casing and extend a minimum of about 10 feet into the underlying coralline materials encountered in our boring at a depth of about 41 feet below the existing ground surface.

8. Based on our borings at the project site, excavations for the project may encounter loose to medium dense sandy soils with little to no cohesion. In general, we believe the sides of open excavations will generally be unstable unless properly sloped or shored and that temporary cut slopes for open cut excavations may not be practical. Therefore, it appears the trench walls would have to be cut near vertical necessitating the use of shoring during construction.

9. In general, the excavated on-site soils may be re-used as a source of general fill, provided they are free of vegetation, deleterious materials, and rock fragments greater than 3 inches in maximum dimension.

10. The construction plans and specifications for the project should be forwarded to us for review to determine whether the recommendations contained in this report are adequately reflected in those documents. If this review is not made, Kokua Geotech LLC cannot assume responsibility for misinterpretation of our recommendations.

11. Kokua Geotech LLC should also be retained to monitor the micropile installation, site grading, utility line installation and backfill, and other aspects of earthwork construction to determine whether the recommendations of this report are followed. The recommendations presented herein are contingent upon such observations.

    If the actual exposed subsurface soil conditions encountered during construction differ from those assumed or considered in this report, Kokua Geotech LLC should be contacted to review and/or revise the geotechnical recommendations presented herein.

Detailed discussion of our findings and geotechnical engineering recommendations are contained in the body of this report. We appreciate the opportunity to be of service for this project. Should you have any questions concerning this report, please contact our office.

Very truly yours,

Kokua Geotech LLC

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Xiaobin (Tim) Lin, P.E.
President

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HONOLULU, OAHU, HAWAII

SECTION 1.0 INTRODUCTION

We have performed a geotechnical engineering exploration for the *Waikiki Aquarium Improvements and Wastewater System Upgrades* project in Honolulu on the Island of Oahu, Hawaii. The location of the project and general vicinity are shown on the Project Location Map, Plate 1.

The purpose of our exploration was to observe and evaluate the general subsurface conditions at accessible locations at the project site to formulate geotechnical recommendations to assist in the design of the project. This report summarizes the findings and presents our geotechnical recommendations resulting from our site reconnaissance, field exploration, laboratory testing, and engineering analyses for the project. The findings and recommendations presented herein are subject to the limitations noted at the end of this report.

1.1 PROJECT CONSIDERATIONS

The project generally involves improvements and wastewater system upgrades at the existing Waikiki Aquarium at 2777 Kalakaua Avenue in the Waikiki area of Honolulu on the Island of Oahu, Hawaii. Based on the information provided, we understand the improvements and upgrades will generally include a new pumping station, discharge sump, IW pre-filtration equipment pad, 10-inch piping, new seawater discharge piping, and three new injection wells. A layout of the project site is shown on the Site Plan, Plate 2.

Based on the information provided, we understand the new pumping station will have an invert depth of approximately 12 feet below the existing ground surface. In addition, we anticipate excavation depths on the order of about 5 to 12 feet may be required for installation of the new 10-inch piping and new seawater discharge piping. It should be noted that permeability testing to assist in the design of the new injection wells were not included in our scope of work for the project.

1.2 PURPOSE AND SCOPE OF WORK

The purpose of our geotechnical engineering exploration was to generally explore and evaluate the subsurface soil conditions at accessible locations at the project site to provide geotechnical recommendations to assist in the design of the project. Our work was performed in general accordance with our fee proposal dated March 9, 2021. The scope of work for this exploration included the following items:

1. Coordination of boring stake-out and utility clearances by our engineer.
2. Mobilization and demobilization of a truck-mounted drill rig and two operators to and from the project site.
3. Drilling, hand augering, and sampling of four boreholes extending to depths ranging from about 3 to 42 feet below the existing ground surface.
4. Performance of Dynamic Cone Penetrometer (DCP) testing at the hand auger location to evaluate the relative consistency of the subsurface materials encountered.
5. Coordination of the field exploration and logging of the boreholes by our field engineer.
6. Laboratory testing of selected samples obtained during the field exploration as an aid in classifying the materials and evaluating their engineering properties.
7. Analyses of the field and laboratory data to formulate geotechnical recommendations for design of the project.
8. Preparation of this report summarizing our work on the project and presenting our findings and recommendations.

Detailed descriptions of our field exploration methodology are presented in the following section and the Log of the Boring in Appendix A. Results of the laboratory tests performed are presented in Appendix B. Results of the DCP tests performed are presented in Appendix C.

END OF INTRODUCTION

SECTION 2.0 SITE CHARACTERIZATION AND FINDINGS

2.1 GENERAL SITE GEOLOGY

The project site is generally located on the southeastern flank of the Koolau Volcano on the Island of Oahu. Based on the geologic maps of the Island of Oahu (Stearns, 1939 and Sherrod and others, 2007), the general area of the project sites is underlain by Beach Deposits (Qbd) and Alluvium (Qa).

During the Pleistocene Epoch, a time period that began about 2.6 million years ago and lasted until about 11,700 years ago, sea levels fluctuated in response to the cycles of continental glaciation. As the glaciers grew and advanced, less water was available to fill the oceanic basins such that sea levels fell below the present stands of the sea. When the glaciers melted and receded, an excess of water became available such that the sea levels rose to above the present sea level.

The higher sea level stands caused the formation of deltas and fans of accumulated terrigenous sediments in the heads of old bays, accumulated reef deposits at correspondingly higher elevations, and deposited lagoonal/marine sediments in the quiet waters protected by fringing reefs. The processes of landform erosion, sediment deposition, and reef development were affected by these glacio-eustatic sea level fluctuations.

When the sea level was relatively lower, the erosional base level was correspondingly lower and stream valleys were carved deeper into the Island's basaltic rock, the fringing coastal sediments, and the offshore reef deposits. Also, during periods of relatively lower sea level, the sub-aerial exposure of calcareous marine sediments caused consolidation and cementation of the deposits to form hardened calcareous deposits.

Placement of near-surface man-made fills associated with the development of urban areas within the last 80 years has brought the Honolulu Coastal Plain to its present form. In the early part of this century, much of the Waikiki area consisted of low elevation marsh wetlands. As the City of Honolulu grew and the Waikiki area was urbanized, man-made fills were placed to reclaim the marshy areas and lagoons for development. It should be noted that much of the resulting fill materials placed are of poor quality in terms of supporting heavy structural loads.

The surface soils underlying the project sites are classified as Beaches (BS) and Jaucas Sand (JaC) by the U.S. Soil Conservation Service in their publication "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii" (1972). The Beaches (BS) soil type is described as light-colored sands derived from coral and seashells that are washed and rewashed by ocean waves. Similarly, the Jaucas Sand soil type is described as light brown, excessively drained, calcareous soils that occur in narrow strips on coastal plains adjacent to the ocean that developed in wind and water deposited sand from coral and seashells.

2.2 SITE DESCRIPTION

The project site is at the existing Waikiki Aquarium located at 2777 Kalakaua Avenue in the Waikiki area of Honolulu on the Island of Oahu, Hawaii. This facility is generally bordered by Sans Souci State Recreational Park to the north, Waikiki War Memorial Natatorium to the south, Kalakaua Avenue to the east, and the Pacific Ocean to the west. In general, this facility includes aquarium and lobby building structures, numerous aquatic tank structures, water features, comfort station, and access driveway and parking areas.

In general, the topography of the project site appears to be relatively flat. Based on topographic survey information provided, we anticipate existing ground surface elevations to range from roughly +6 to +9 feet Mean Sea Level (MSL).

At the time of our field exploration, the existing building and tank structures were generally surrounded by concrete walkways, mown lawn grass, and various landscaping plants. Exposed surface soils at the site were observed to generally consist of brownish tan beach sand.

2.3 FIELD EXPLORATION

We explored the subsurface conditions at the project site by drilling, hand augering, and sampling four borings, designated as Boring Nos. 1 through 4, extending to depths ranging from approximately 3 to 42 feet below the existing ground surface. Boring Nos. 1 through 3 were drilled utilizing a truck-mounted drill rig equipped with continuous flight augers, while Boring No. 4 was advanced using hand auger and Dynamic Cone Penetrometer (DCP) testing equipment due to an abundance of underground utility lines in the area. The approximate boring and DCP test locations are shown on the Site Plan, Plate 2.

Our engineer classified the materials encountered in the boring by visual and textural examination in the field in general accordance with ASTM D2488, Standard Practice for Description and Identification of Soils, and monitored the drilling operations on a near continuous (full-time) basis. These classifications were further reviewed visually and by testing in the laboratory. Soils were classified in general accordance with ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System). Graphic representations of the materials encountered are presented on the Log of Borings, Appendix A.

Soil samples were obtained in general accordance with ASTM D1586 by driving a 2-inch OD standard penetration sampler with a 140-pound hammer falling 30 inches. In addition, relatively undisturbed soil samples were obtained in general accordance with ASTM D3550 by driving a 3-inch OD Modified California sampler using the same hammer and drop. The blow counts needed to drive the sampler the second and third 6 inches of an 18-inch drive are shown as the “Sampling Resistance” on the Log of Boring at the appropriate sample depths. The blow counts may need to be factored to obtain the Standard Penetration Test (SPT) blow counts.

It should be noted that hollow stem augers were used to advance Boring No. 1 to the maximum auger depth of about 30 feet below the existing ground surface. Since very soft/loose soil conditions were encountered at this depth, probing operations were implemented within the borehole to determine the approximate depth to stiff/dense soil conditions. Probing operations generally consisted of driving a pointed steel probing tip with a 140-pound hammer falling 30 inches. The blow counts needed to drive the probing tip 12 inches are shown on the Logs of Borings at the appropriate sample depths.

In addition, a 2-inch diameter PVC water pipe was encountered and damaged during our drilling operations at Boring No. 3 at a depth of about 1.5 feet below the existing ground surface. This pipe was subsequently repaired, and the water system chlorinated.

The DCP tests were performed at the hand auger locations by driving a 1.5-inch diameter 45-degree steel cone tip with a 15-pound hammer falling 20 inches in vertical height. The blow counts were recorded per every or near 1-inch of penetration and converted to standard penetration resistance (SPT) using correlation between Penetration Index (PI) and SPT, developed by Sowers and Hedges. Results of the DCP tests performed are presented in Appendix C.

2.4 LABORATORY TESTING

Moisture Content (ASTM D2216) and Unit Weight (ASTM D2937) determinations were performed on selected samples as an aid in the classification and evaluation of soil properties. The test results are presented on the Log of the Boring at the appropriate sample depths.

Two Atterberg Limits tests (ASTM D4318) were performed on selected soil samples to evaluate the liquid and plastic limits. The samples tested had Plasticity Indices (PIs) of 26 and 16 and plotted as low plasticity clay (CL) on a Standard Plasticity Chart. The test results are summarized on the Logs of Borings at the appropriate sample depths. Graphic presentations of the Atterberg Limits test results are provided on Plate B-1.

Three Sieve Analysis tests (ASTM C117 and C136) were performed on selected soil samples to evaluate the gradation characteristics of the soil and to aid in soil classification. Graphic presentations of the grain size distributions are provided on Plate B-2.

One, one-inch Ring Swell test was performed on a relatively undisturbed (natural) sample to evaluate the swelling potential of the on-site soils. A swell test result of 0.5 percent was observed for the sample under a surcharge pressure of 60 pounds per square foot (psf). These test results indicate the on-site soils have low swelling potential when subjected to moisture fluctuations. The Ring Swell test results are summarized on Plate B-2.

2.5 SUBSURFACE CONDITIONS

Our borings generally encountered surface fill materials overlying beach deposits, lagoonal deposits, and apparent coral formation extending down to the maximum depth explored of about 42 feet below the existing ground surface. In addition, Boring No. 3 was located on an existing pavement surface and generally encountered an approximate 3-inch thick layer of asphaltic concrete overlying the surface fill materials. The surface fill materials encountered generally consisted of loose to medium dense clayey/silty sand and medium stiff to stiff clayey/sandy silt and were estimated to be about 1 to 3 feet thick.

Beach deposits were encountered underlying the surface fill materials to depths ranging from about 8 to 10 feet below the existing ground surface and generally consisted of loose to medium dense sand with a little silt and gravel. Lagoonal deposits generally consisting of very loose to medium dense clayey gravel and very soft sandy clay were encountered underlying the beach deposits to a depth of about 40.5 feet below the existing ground surface.

It should be noted that the lagoonal deposits encountered at the project site are highly compressible when subjected to new loads. Below the highly compressible lagoonal deposits, our field exploration generally encountered apparent medium hard to hard coral formation extending down to the maximum depth explored of about 42 feet below the existing ground surface.

We encountered groundwater in our borings at depths ranging from about 7.3 to 8.1 feet below the existing ground surface at the time of our field exploration. Due to the proximity of the project site to the Pacific Ocean, groundwater levels are expected to vary with tidal fluctuations. In addition, groundwater levels may change due to seasonal precipitation, surface water runoff, and other factors.

2.6 SEISMIC DESIGN CONSIDERATIONS

Based on the International Building Code, 2012 Edition (IBC 2012) and American Society of Civil Engineers Standard ASCE/SEI 7-10 (ASCE 7-10), the project site may be subject to seismic activity, and seismic design considerations will need to be addressed. Based on the subsurface materials encountered at the project site and the geologic setting of the area, we anticipate the project site may be classified from a seismic analysis standpoint as being a "Soft Soil Profile" site corresponding to a Site Class E soil profile type based on Chapter 20 of ASCE 7-10.

Based on Site Class E, the following seismic design parameters were estimated and may be used for seismic analysis of the project.

SUMMARY OF SEISMIC DESIGN PARAMETERS	
Mapped MCE Spectral Response Acceleration, S_S	0.579g
Mapped MCE Spectral Response Acceleration, S_1	0.170g
Site Class	E
Site Coefficient, F_a	1.542
Site Coefficient, F_v	3.291
Design Spectral Response Acceleration, S_{DS}	0.595g
Design Spectral Response Acceleration, S_{D1}	0.372g
Peak Ground Acceleration, PGA	0.266g
Site Modified Peak Ground Acceleration, PGA_M	0.364g

Based on the IBC 2012, the project site may be subjected to seismic activity and should be evaluated for soil liquefaction potential. In general, the subsurface information from our field exploration indicates that the site is underlain by surface fill materials and overlying beach deposits generally consisting of loose to medium dense sand with a little silt and gravel and lagoonal deposits consisting of very loose to loose clayey gravel and very soft sandy clay to a depth of about 41 feet below the existing ground surface. In general, these loose sandy soils can be considered potentially liquefiable during a seismic event.

Based on the Atterberg Limits conducted on some of these soils, the liquid limits of the soils are in excess of 35, which is the maximum number for the soils to be considered potentially liquefiable (Youd, et. al, 2001). In addition, soils with a Plasticity Index (PI) greater than 7 are considered to have a clay-like behavior and are generally not susceptible to liquefaction (AASHTO LRFD Bridge Design Specifications, 2017 and Boulanger, Idriss, 2006).

Based on the results of our laboratory testing program, we believe that the loose to very loose lagoonal deposits encountered in our borings are not susceptible to liquefaction because of the clayey nature (more cohesive soil properties) of the granular soils encountered, especially the clayey gravel (GC) and sandy clay (CL) soil classifications. In general, we anticipate very loose sandy soils with little to no cohesion may be present underlying the project site; however, we believe that these materials occur in isolated pockets and are not continuous across the entire site.

END OF SITE CHARACTERIZATION AND FINDINGS

SECTION 3.0 DISCUSSION AND RECOMMENDATIONS

Based on the results from our field exploration, the project site is generally underlain by surface fill materials overlying beach deposits, lagoonal deposits, and apparent coral formation extending down to the maximum depth explored of about 42 feet below the existing ground surface. The surface fill materials encountered generally consisted of loose to medium dense clayey/silty sand and medium stiff to stiff clayey/sandy silt and were estimated to be about 1 to 3 feet thick.

Beach deposits were encountered underlying the surface fill materials to depths ranging from about 8 to 10 feet below the existing ground surface and generally consisted of loose to medium dense sand with a little silt and gravel. Lagoonal deposits generally consisting of very loose to medium dense clayey gravel and very soft sandy clay were encountered underlying the beach deposits to a depth of about 40.5 feet below the existing ground surface.

It should be noted that the lagoonal deposits encountered at the project site are highly compressible when subjected to new loads. Below the highly compressible lagoonal deposits, our field exploration generally encountered apparent medium hard to hard coral formation extending down to the maximum depth explored of about 42 feet below the existing ground surface.

We encountered groundwater in our borings at depths ranging from about 7.3 to 8.1 feet below the existing ground surface at the time of our field exploration. Due to the proximity of the project site to the Pacific Ocean, groundwater levels are expected to vary with tidal fluctuations. In addition, groundwater levels may change due to seasonal precipitation, surface water runoff, and other factors.

Based on the information provided, we understand the planned improvements and upgrades to the aquarium facility will generally include a new pumping station, discharge sump, IW pre-filtration equipment pad, 10-inch piping, new seawater discharge piping, and three new injection wells. we understand the new pumping station will have an invert depth of approximately 12 feet below the existing ground surface. In addition, we anticipate excavation depths on the order of about 5 to 12 feet may be required for installation of the new 10-inch piping and new seawater discharge piping.

We anticipate that installation of the new pumping station and piping will generally consist of trench excavation, pipe bedding and placement, and trench backfill. Based on an anticipated excavation depth of about 12 feet below the existing ground surface, we believe that dewatering may be needed.

Based on the results of our field exploration, highly compressible recent lagoonal deposits are anticipated at depths of about 8 to 10 feet below the existing ground surface. Therefore, we anticipate relatively significant ground settlements may occur when new fills and structures are placed over these highly compressible soils, with resulting distress to the structures.

Based on the above, we believe the near-surface soils would not provide adequate foundation support for the proposed pumping station without appreciable settlements and differential settlements under the anticipated loads. Therefore, we recommend utilizing a deep foundation system to support the proposed pumping station. Based on our evaluation, we recommend the deep foundation support system consist of micropiles extending through the loose/soft, compressible beach and lagoonal deposits and deriving load bearing support from the underlying coralline materials anticipated at greater depths.

In general, the excavated on-site soils may be re-used as a source of general fill, provided they are free of vegetation, deleterious materials, and rock fragments greater than 3 inches in maximum dimension. Imported fill materials, if required, should consist of non-expansive structural fill material, such as crushed coral or basalt.

Detailed discussion of these items and our geotechnical recommendations for design of the new pumping station, slabs-on-grade, trench excavation, backfilling, dewatering, and other geotechnical aspects of the project are presented in the following sections.

3.1 NEW PUMPING STATION

Based on the information provided, we understand the new pumping station will have an invert depth of approximately 12 feet below the existing ground surface. As discussed above, we believe the near-surface soils would not provide adequate foundation support for the proposed pumping station without appreciable settlements and differential settlements under the anticipated loads. Therefore, we recommend utilizing a deep foundation system to support the proposed underground pumping station.

Based on our evaluation, we recommend the deep foundation support system consist of micropiles extending through the loose/soft, compressible beach and lagoonal deposits and deriving load bearing support from the underlying coralline materials anticipated at greater depths.

3.1.1 NEW PUMPING STATION FOUNDATIONS

In general, a micropile consists of a small diameter (usually less than 12 inches) drilled and grouted pile with steel reinforcing. The micropile foundation typically is constructed by drilling a borehole, placing reinforcing steel in the hole, and grouting the borehole. Micropiles are desirable because they can be installed readily in access restrictive environments and in numerous soil types and ground conditions. In addition, installation of the micropiles generally causes minimal disturbance to the adjacent structures, the adjacent soils, and the environment.

Based on availability of local equipment, we envision a micropile system with a minimum grout bulb diameter of 5.5 inches (minimum drill bit size) may be used for foundation support of the new pumping station structure. We recommend designing each micropile based on an allowable compressive load capacity of 30 kips for the 5.5-inch diameter micropiles. The allowable compressive load capacity for the micropiles is for supporting dead-plus-live loads and may be increased by one-third (1/3) for transient loads, such as wind or seismic forces.

Based on the anticipated subsurface conditions at the project site, we anticipate the load supporting capacity of the micropile foundation would be derived primarily from skin friction between the micropile shaft and the coralline materials anticipated underlying the project site. We also recommend using permanent steel casing for the micropiles that extend through the loose/soft, compressible beach and lagoonal deposits to the top of the coralline materials. The permanent steel casing should have an outside diameter (OD) of about 5.5 inches (same as the grout bulb size) and should provide confinement to the micropile in the area where moment demand on the micropile is greatest.

To achieve the allowable compressive load capacity of 30 kips with a factor of safety of 2, we believe the 5.5-inch diameter micropiles would need a minimum bonded zone of 20 feet below the permanent casing and extend a minimum of about 10 feet into the underlying coralline materials encountered in our boring at a depth of about 41 feet below the existing ground surface.

Based on topographic survey information provided, we anticipate existing ground surface elevations to range from roughly +6 to +9 feet Mean Sea Level (MSL). Therefore, we recommend a minimum micropile tip elevation of about -44 feet MSL based on a total micropile length of about 51 feet installed on an assumed working grade of about +7 feet MSL. Based on these assumptions, our recommendations pertaining to the preliminary micropile allowable load capacities and lengths are presented in the following table:

SUMMARY OF MICROPILE FOUNDATIONS				
Micropile <u>Diameter</u> (inch)	**Allowable Compressive <u>Load Capacity</u>** (kips)	**Minimum Micropile <u>Tip Elevation</u>** (feet MSL)	**Minimum Bonded Zone <u>Length</u>** (feet)	**Total Estimated Micropile <u>Length</u>** (feet)
5.5	30	-44	20 feet and 10 feet min. into hard coralline materials	51

Notes:

1. Min. Tip Elevation and Total Estimated Micropile Length assumes working grade of +7 feet MSL
2. Permanent casing should be used below the pumping station invert to the top of bonded zone
3. Minimum Bonded Zone Length is the length of micropile below the bottom of permanent casing

To facilitate the micropile drilling and ensure the quality of the grouting, we recommend advancing the steel casing to the bottom of the micropile during the drilling operation. The steel casing may be withdrawn during the grouting operation while a minimum of 5 feet of grout head is maintained above the bottom of the casing at all times. The steel casing should be withdrawn above the design casing depth and plunged back to the design casing depth.

Lateral loads imposed on the foundations should be resisted by the passive earth pressure acting against the near-vertical faces of the foundation caps. Lateral load resistance contribution from the micropile should be discounted due to the relatively small diameter of the foundation element. Passive earth pressure against the near-vertical faces of the foundation caps may be estimated using an equivalent fluid pressure of 350 and 150 pounds per cubic foot (pcf) for above and below groundwater conditions, respectively.

Settlements of the micropiles will result primarily from elastic compression of the micropile member and subgrade response. We estimate the total settlement of the micropile-supported foundations to be 0.5 inches or less with differential settlements between micropiles not exceeding about one-half of the total settlement. We believe these settlements are essentially elastic and should occur as the loads are applied.

In order to determine whether the contractor’s methods of micropile installation are adequate and to determine the ultimate compressive load capacity, we recommend performing one pre-production compressive load test on a sacrificial micropile.

In general, the purpose of the pre-production load test on a micropile is to fulfill the following objectives:

- To examine the adequacy of the methods and equipment proposed by the contractor to install the micropiles to the depths required.

- To confirm or modify the estimated minimum depth of the micropiles by determining the ultimate grout-to-soil bond stress.
- To assess the contractor's method of drilling and grouting.

In general, the pre-production load test should be performed in accordance with ASTM D1143. Based on experience, we believe the load test should be conducted no earlier than 7 days after completion of the micropile installation to allow the grout adequate time to cure. Two (or four) additional micropiles may be used for reaction during the compressive load testing of the pre-production load test micropile. The reaction micropiles may be installed to depths as deep as the load test micropile to provide adequate reaction in uplift (to be determined by the contractor).

The load test micropile should be loaded gradually to at least 200 percent of the allowable design load in compression. We recommend holding the maximum test load (200 percent of the design load) for a minimum of 4 hours depending on the recorded movements of the load test micropile. The pre-production load test is an integral part of the design of the micropile foundation system. Therefore, we recommend a Kokua Geotech LLC representative observe the pre-production load test.

In addition to the pre-production load test, we also recommend performing pullout tests (proof tests) on selected micropiles during construction to confirm the load carrying capacity of the installed micropiles. We recommend testing a minimum 10 percent of the total number of micropiles for pullout. The pullout tests should consist of subjecting the micropile to at least 133 percent of the design load. The micropile should be loaded in 12.5% design load increments, and each load should be held for at least 5 minutes. The maximum test load should be held for a minimum of 10 or 60 minutes. Pullout test on the selected micropiles is an integral part of the design of the micropile foundation system. Therefore, we recommend conducting the pullout tests under the observation of a Kokua Geotech LLC representative.

A specialty contractor experienced in the construction of a micropile foundation system (minimum five projects) should perform the installation of the micropiles. Due to the specialized nature of the micropile foundation construction, observation and testing of the micropile foundation system should be designated as a "Special Inspection" item. Therefore, a Kokua Geotech LLC representative (Special Inspector) should be present to observe the geotechnical aspects of the micropile foundation construction and testing.

3.1.2 NEW PUMPING STATION LATERAL EARTH PRESSURES

The new pumping station should be designed to resist lateral earth pressures due to the adjacent soils and surcharge effects caused by loads adjacent to the walls. The recommended lateral earth pressures for the design of the new pumping station, expressed in equivalent fluid pressures of pounds per square foot per foot of depth (pcf), are presented in the following table.

LATERAL EARTH PRESSURES FOR DESIGN OF RETAINING STRUCTURES			
Level Backfill Condition	**Earth Pressure Component**	**Active** (pcf)	**At-Rest** (pcf)
Above Groundwater	Without Hydrostatic Pressure	40	60
Below Groundwater	With Hydrostatic Pressure	82	91
	Without Hydrostatic Pressure	19	29

The values provided in the table above assume that on-site soils and/or structural fill materials will be used to backfill around the new pumping station. It is assumed that the backfill around the new pumping station will be compacted to between 90 and 95 percent relative compaction per ASTM D1557. Over compaction of the retaining structure backfill should be avoided.

In general, an active condition may be used only for walls that are free to deflect by as much as 0.5 percent of the structure height. If the top of the structure is not free to deflect beyond this degree, the structure should be designed for the at-rest condition. These lateral earth pressures do not include hydrostatic pressures that might be caused by groundwater trapped behind the structures.

Surcharge stresses due to areal surcharges, line loads, and point loads within a horizontal distance equal to the depth of the structure should be considered in the design. For uniform surcharge stresses imposed on the loaded side of the structure, a rectangular distribution with a uniform pressure equal to 33 percent of the vertical surcharge pressure acting over the entire height of the structure, which is free to deflect (cantilever), may be used in the design.

For structure walls that are restrained, a rectangular distribution equal to 50 percent of the vertical surcharge pressure acting over the entire height of the structure may be used for design. Additional analyses during design may be needed to evaluate the surcharge effects of point loads and line loads.

Dynamic lateral earth forces due to seismic loading will need to be considered in the design of the retaining structures. Seismic loading is used to estimate the dynamic lateral earth pressure based on a peak ground acceleration (PGA or a_{max}) of 0.364g. The table below summarizes the dynamic lateral earth forces acting on the structure walls in the event of an earthquake versus the estimated wall displacements.

Please note that the values provided in the table only apply to level backfill conditions, where H is the height of the wall in feet. The resultant force should be assumed to act through the mid-height of the wall. The dynamic lateral earth forces are in addition to the static lateral earth pressures provided previously.

DYNAMIC LATERAL EARTH FORCES FOR RETAINING STRUCTURES	
Lateral Movement (inches)	Dynamic Lateral Earth Forces (H^2 pounds per linear foot)
0.5	32.8

DYNAMIC LATERAL EARTH FORCES FOR RETAINING STRUCTURES	
Lateral Movement (inches)	Dynamic Lateral Earth Forces (H^2 pounds per linear foot)
1.0	26.4
1.5	21.5
2.0	17.4
Note: H is the height of the retaining structure in feet.	

3.2 SLABS-ON-GRADE

We anticipate that concrete slabs-on-grade will be utilized for the new equipment pads at the project site. Our laboratory test results indicate the on-site clayey soils have low expansion potential when subjected to moisture fluctuations. To provide uniform bearing conditions and reduce the potential for changes in the moisture content of the slab subgrade clayey soils, we recommend capping the slab subgrade with a minimum 6-inch thick layer of non-expansive structural fill material. The structural fill should be compacted to a minimum of 90 percent relative compaction.

Structural fill should be imported, non-expansive granular material, such as crushed coral or basalt. The structural fill should be well-graded from coarse to fine with particles no larger than 3 inches in largest dimension. The material should have a CBR value of 20 or higher and a swell potential of 1 percent or less when tested in accordance with ASTM D1883. The material should also contain between 10 and 30 percent particles passing the No. 200 sieve.

Prior to placing the non-expansive structural fill, we recommend scarifying the subgrade soils to a depth of about 10 inches, moisture-conditioning the soils to above the optimum moisture content, and compacting to a minimum of 90 percent relative compaction. The underlying subgrade soils and structural fill should be wetted and kept moist until the final placement of slab concrete. Saturation and subsequent yielding of the exposed subgrade due to inclement weather and poor drainage may require over excavation of the soft areas and replacement with structural fill.

The thickened edges of slabs adjacent to unpaved areas should be embedded at least 12 inches below the lowest adjacent grade. It should be emphasized that the areas adjacent to the slab edges should be backfilled tightly against the edges of the slabs with relatively impervious soils. These areas should also be graded to divert water away from the slabs and to reduce the potential for water ponding around the slabs.

3.3 OPEN TRENCH (CUT-AND-COVER) METHOD FOR PIPING

We envision the new underground piping planned for the project would likely be installed using conventional open trench (cut-and-cover) methods. Based on the information provided, we understand the new pumping station will have an invert depth of approximately 12 feet below the existing ground surface. In addition, we anticipate excavation depths on the order of about 5 to 12 feet will be required for installation of the new 10-inch piping and new seawater discharge piping.

3.3.1 EARTH PRESSURE LOADS ON PIPES

Loads on buried pipes are influenced by the width of the trench, the size of the pipes, the unit weight of backfill material, and the friction resistance between the backfill material and the trench walls. To calculate the vertical loads on the buried utility pipe, we recommend that an average unit weight of 110 pounds per cubic feet (pcf) for the backfill material and a coefficient of friction of 0.3 be used. Earth forces acting upon the pipe generally increase rapidly with the width of the trench. Therefore, the width of the trench should be kept to a minimum. Traffic loads on the buried pipes should also be considered for the portion of the pipes located in roadway areas.

3.3.2 TRENCH EXCAVATION

All excavations should be made in accordance with applicable Occupational Safety and Health Administration (OSHA) and state regulations. The contractor should determine the method and equipment to be used for the excavations, subject to practical limits and safety considerations. In addition, the excavations should comply with the applicable federal, state, and local safety requirements. The contractor should be responsible for trench shoring design and installation.

As mentioned above, we anticipate excavation depths up to about 12 feet deep may be required for installation of the new pumping station and piping. Based on our borings, trench excavations will likely encounter beach deposits generally consisting of loose to medium dense sand with a little silt and gravel. In addition, these excavation may encounter lagoonal deposits generally consisting of very loose to medium dense clayey gravel and very soft sandy clay.

It is anticipated that most of the material may be excavated with normal heavy excavation equipment. However, deep excavations and excavations encountering boulders and hard coral formation may require the use of hoerams. It should be noted that coral formations typically contain localized hard and crystallized zones. Therefore, we anticipate that some difficult excavation conditions may arise in localized areas during construction when the coral formation is encountered.

The contractor must exercise care to avoid over-ripping, which would disrupt the structure of the coral formation, resulting in a potential loss of bearing strength for improvements in the vicinity. Contractors should be encouraged to examine the site conditions and the subsurface data to make their own reasonable and prudent interpretation.

3.3.3 TRENCH EXCAVATION SUPPORT

We anticipate excavation depths up to about 12 feet below the existing ground surface will be required for the installation of the new pumping station and piping. Where excavations greater than 5 feet in depth are planned, temporary shoring or sloping and benching should be used. Based on our borings at the project site, these excavations may encounter loose to medium dense sandy soils with little to no cohesion. Therefore, the sides of open excavations will generally be unstable unless properly sloped or shored.

Based on our site observations, we believe that temporary cut slopes for open cut excavations may not be practical. Therefore, it appears the trench walls would have to be cut near vertical necessitating the use of shoring during construction.

The excavation support and shoring system used must comply with applicable safety requirements. The contractor should be solely responsible for the adequacy and safety of the shoring installation. The contractor's representative should be on-site at all times during excavation and construction work for the opportunity to promptly observe changing or unforeseen conditions, such as, high groundwater, inappropriate construction sequence or techniques, etc., which may affect the shoring stability.

Excavated soils should not be stockpiled closer than a horizontal distance equal to the depth of the excavation from the edge of the excavation to reduce the potential for excessive ground movement.

It is important to install adequate shoring and to maintain it tight against the excavation walls with proper bracing during construction. The properly braced shoring is essential to reduce the potential for appreciable lateral movements of the adjacent ground into the excavation, which may result in potential settlement or distress to adjacent structures or other improvements.

It must be noted that some minor movements of the shoring system and the adjacent ground may still occur due to changes in earth stresses during excavation. Due to the complexity of the stress changes, it is difficult to accurately estimate the magnitude of movement. The magnitude also depends greatly upon workmanship, such as how quickly and tightly the shoring and bracing supports are installed, the subsurface conditions, the size of the excavation, and the rate of excavation.

Therefore, it is important to realize that the excavation shoring should be installed properly and as early as practical. The adjacent ground should be continuously monitored for cracks, dips and/or other indications of movements with instruments until the trench excavations are finally backfilled.

3.3.4 PIPE BEDDING

The stress distribution against the bottom of a pipe has a significant effect on the load supporting capacity of the pipe. Therefore, the pipe bedding is an important design consideration. In general, we recommend providing granular bedding consisting of 6 inches of open-graded gravel, such as No. 3 Fine gravel (ASTM C33, No. 67 gradation), under the pipes for uniform support.

In addition, open-graded gravel (ASTM C33, No. 67 gradation) should also be used for the initial trench backfill up to about 12 inches above the pipes (or groundwater level) to provide adequate support around the pipes. It is critical to use a free-draining material, such as open-graded gravel, to reduce the potential for formation of voids below the haunches of pipes and to provide adequate support for the sides of the pipes. Improper trench backfill could result in backfill settlement and pipe damage. Where groundwater is encountered, the bedding should be wrapped on all sides by non-woven filter fabric (Mirafi 180N or equivalent).

We envision soft and/or loose soils may be encountered at or near the invert elevations along portions of the new utility lines. Therefore, we recommend providing a subgrade stabilization layer consisting of 18 inches of No. 2 Rock (ASTM C 33, No. 4 gradation) wrapped in a non-woven filter fabric (Mirafi 180N or equivalent) below the bedding layer for uniform support, if soft and/or loose soils are encountered. The stabilization layer should extend beyond the sides of the pipe a minimum width of one-fourth the outside diameter of the pipe or 12 inches, whichever is greater.

Before the placement of bedding material, a Kokua Geotech LLC representative should observe the excavated trench bottom to confirm that firm materials are exposed at the bottom of the trench or whether the installation of a stabilization layer is needed.

3.3.5 TRENCH BACKFILL

As discussed above, the first zone of backfill extending from the bedding material to at least 12 inches above the top of the pipes (or groundwater level) should consist of open-graded gravel, such as No. 3 Fine gravel (ASTM C33, No. 67 gradation) to reduce the compaction effort required and resulting stresses on the pipe.

The trench backfill from 12 inches above the top of the pipes (or groundwater level) to the finished subgrade may consist of the excavated on-site soils provided that they are free of deleterious materials (vegetation) and are screened of particles greater than 3 inches in largest dimension.

Imported fill materials, if required, should consist of non-expansive structural fill material, such as crushed coral or basalt. The structural fill should be well-graded from coarse to fine with particles no larger than 3 inches in largest dimension. The material should have a CBR value of 20 or higher and a swell potential of 1 percent or less when tested in accordance with ASTM D1883. The material should also contain between 10 and 30 percent particles passing the No. 200 sieve.

3.3.6 TRENCH BACKFILL PLACEMENT AND COMPACTION REQUIREMENTS

The backfill materials consisting of the on-site soils should be moisture-conditioned to above the optimum moisture content, placed in level lifts not exceeding 8 inches in loose thickness, and compacted to a minimum of 90 percent relative compaction. The upper 3 feet below the finished pavement grade in areas subjected to vehicular traffic should be compacted to a minimum of 95 percent relative compaction.

The backfill materials consisting of open-graded gravel, such as No. 3 Fine gravel (ASTM C33, No. 67 gradation), should generally be placed in level lifts not exceeding 8 inches in loose thickness and compacted to a firm surface.

Imported non-expansive structural fill materials, if required, should be moisture-conditioned to above the optimum moisture, placed in level lifts of about

8 inches in loose thickness, and compacted to a minimum of 90 percent relative compaction. Aggregate base course materials, if required, should be moisture-conditioned to above the optimum moisture content, placed in level lifts not exceeding 8 inches in loose thickness, and compacted to a minimum of 95 percent relative compaction.

Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same soil determined in accordance with ASTM D1557. Optimum moisture is the water content (percentage by dry weight) corresponding to the maximum dry density.

3.3.7 SETTLEMENTS

Primary settlement of new utility lines are normally caused by the difference in the unit weight of the lighter excavated original earth and the heavier compacted backfill material placed over the pipes. The net increase in loading will cause settlement of the underlying subsoils below the trench invert. Based on our calculations, primary settlement on the order of less than 0.5 inches is anticipated for the project.

The above estimate assumes that proper construction procedures and good workmanship will be engaged during construction. Additional settlement could occur if improper trench support is used.

3.4 DEWATERING

During our field exploration, we encountered groundwater at depths ranging from about 7.3 to 8.1 feet below the existing ground surface. Due to the relatively shallow groundwater levels encountered at the project site, we anticipate that the pumping station and piping to be installed may extend below the groundwater level. Therefore, dewatering of the excavation may be necessary for this installation.

In general, dewatering operations should be conducted in such a manner that dewatering will not cause areal ground subsidence, which may cause potential damage to the nearby existing structures. Therefore, consideration should be given to a dewatering system that includes a cut-off wall to reduce the volume of water to be removed within the excavation and to reduce the areal extent of groundwater drawdown outside of the excavation.

Because the excavation dewatering may involve the discharge of groundwater from the dewatering operation into adjacent drainage systems, a National Pollutant Discharge Elimination System (NPDES) permit may be necessary. The contractor should consult their independent consultant or the State of Hawaii, Department of Health for the latest regulations and information pertaining to the NPDES permit application.

Based on our borings, we anticipate the project site is generally underlain by loose to dense beach deposits and very loose to loose lagoonal deposits to a depth of about 40.5 feet below the existing ground surface. Due to the heterogeneous nature of these materials, the actual subsurface soil permeability may range broadly and also vary locally in terms of orders of magnitude. The permeability of the subsurface materials at the sites may be considered moderately to highly permeable based on the materials encountered. Therefore, the contractor should pay special attention to the site-specific dewatering plan for the proposed excavations.

3.5 PRECONSTRUCTION DISTRESS SURVEY AND MONITORING

Due to the close proximity of the planned excavations to existing structures at the project site and the anticipated dewatering operations, we recommend performing a preconstruction distress survey to document the existing conditions prior to the start of construction. The survey should include photographs and detailed descriptions of pre-existing distresses.

In addition, implementation of a monitoring program for building movement is recommended for the project. The monitoring program should consist of the installation of structure monitoring points on the existing building footing columns that are in close proximity to the planned excavations to measure changes in the vertical and horizontal position during the monitoring period.

Prior to the start of construction, the monitoring points should be surveyed to establish initial readings for the monitoring points. Benchmarks should be established for the survey work. Surveyed readings of the monitoring points should be taken daily during construction and weekly subsequent to construction until the contract completion date. The survey readings should be submitted promptly for review.

3.6 DESIGN REVIEW AND CONSTRUCTION OBSERVATION SERVICES

The construction plans and specifications for the project should be forwarded to us for review to determine whether the recommendations contained in this report are adequately reflected in those documents. If this review is not made, Kokua Geotech LLC cannot assume responsibility for misinterpretation of our recommendations.

Kokua Geotech LLC should also be retained to monitor the micropile installation, site grading, utility line installation and backfill, and other aspects of earthwork construction to determine whether the recommendations of this report are followed. The recommendations presented herein are contingent upon such observations. If the actual exposed subsurface soil conditions encountered during construction differ from those assumed or considered in this report, Kokua Geotech LLC should be contacted to review and/or revise the geotechnical recommendations presented herein.

END OF DISCUSSION AND RECOMMENDATIONS

SECTION 4.0 LIMITATIONS

This report has been prepared for the exclusive use of Oceanit and their project consultants for specific application to the design of the *Waikiki Aquarium Improvements and Wastewater System Upgrades* project in accordance with generally accepted geotechnical engineering principles and practices. No warranty is expressed or implied. If any part of the project concept is altered or if subsurface conditions differ from those described in this report, then the information presented herein shall be considered invalid, unless the changes are reviewed, and any supplemental or revised recommendations issued in writing by Kokua Geotech LLC.

The analyses and report recommendations are based in part upon information obtained from the field boring and the assumption that subsurface conditions do not vary significantly from those observed in the boring. Variations of the subsurface conditions beyond the field boring may occur, and the nature and extent of these variations may not become evident until construction is underway. If variations then appear evident, Kokua Geotech LLC should be notified so that we can re-evaluate the recommendations presented herein.

The owner/client should be aware that unanticipated soil conditions are commonly encountered. Unforeseen subsurface conditions, such as perched groundwater, soft deposits, hard layers or cavities, may occur in localized areas and may require additional probing or corrections in the field (which may result in construction delays) to attain a properly constructed project. Therefore, a sufficient contingency fund is recommended to accommodate these possible extra costs.

The field boring locations indicated herein is approximate, having been estimated by taping from visible features shown on the Site Plan transmitted by Oceanit on March 4, 2021. Elevations of the borings were estimated from spot elevations shown on topographic survey plans transmitted by Oceanit on June 11, 2021. The field boring locations and elevation should be considered accurate only to the degree implied by the methods used.

SECTION 4.0 LIMITATIONS

The stratification breaks shown on the graphic representations of the boring depict the approximate boundaries between soil types and, as such, may denote a gradual transition. Water level data from the boring was measured at the time of drilling. However, groundwater levels may change due to seasonal precipitation, tidal fluctuation, surface water runoff, and other factors. These data have been reviewed and interpretations made in the formulation of this report.

This report has been prepared solely for the purpose of assisting the design engineers in the design of the project. Therefore, this report may not contain sufficient data, or the proper information, to serve as a basis for detailed construction cost estimates.

This geotechnical engineering exploration conducted at the project site was not intended to investigate the potential presence of hazardous materials existing at the project site. It should be noted that the equipment, techniques, and personnel used to conduct a geo-environmental exploration differ substantially from those applied in geotechnical engineering.

END OF LIMITATIONS

CLOSURE

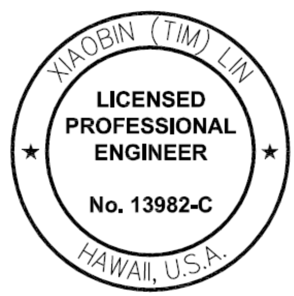
The following plates and appendices are attached and complete this report:

This report concludes our scope of work outlined in our fee revised proposal dated March 9, 2021. If you have any questions regarding this report or if any part of the report is not clear, please contact our office.

Respectfully submitted,

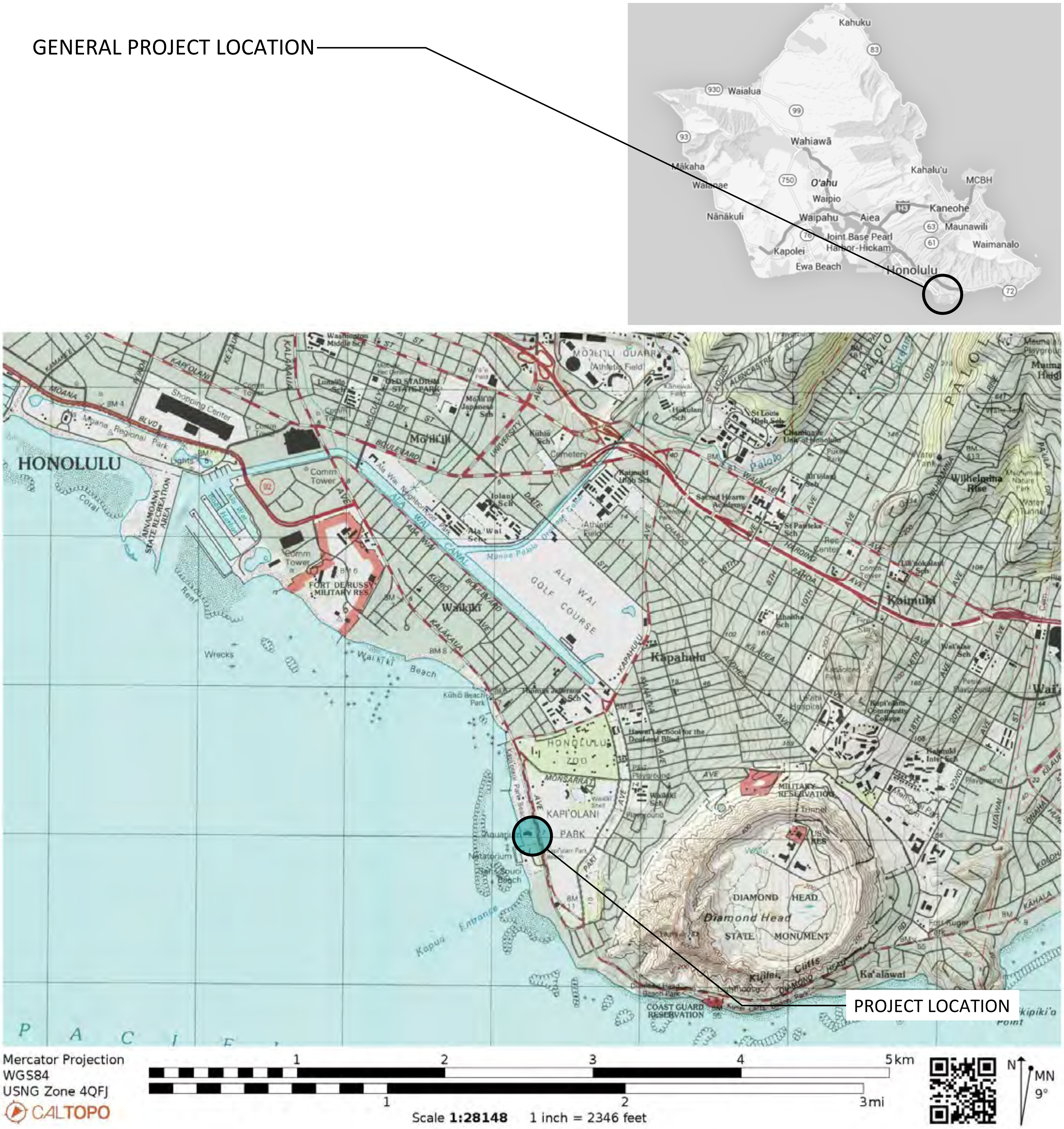
Kokua Geotech LLC

Xiaobin (Tim) Lin, P.E.
President



THIS WORK WAS PREPARED BY
ME OR UNDER MY SUPERVISION.
(MY LICENSE EXPIRES 4/30/2022)

PLATES

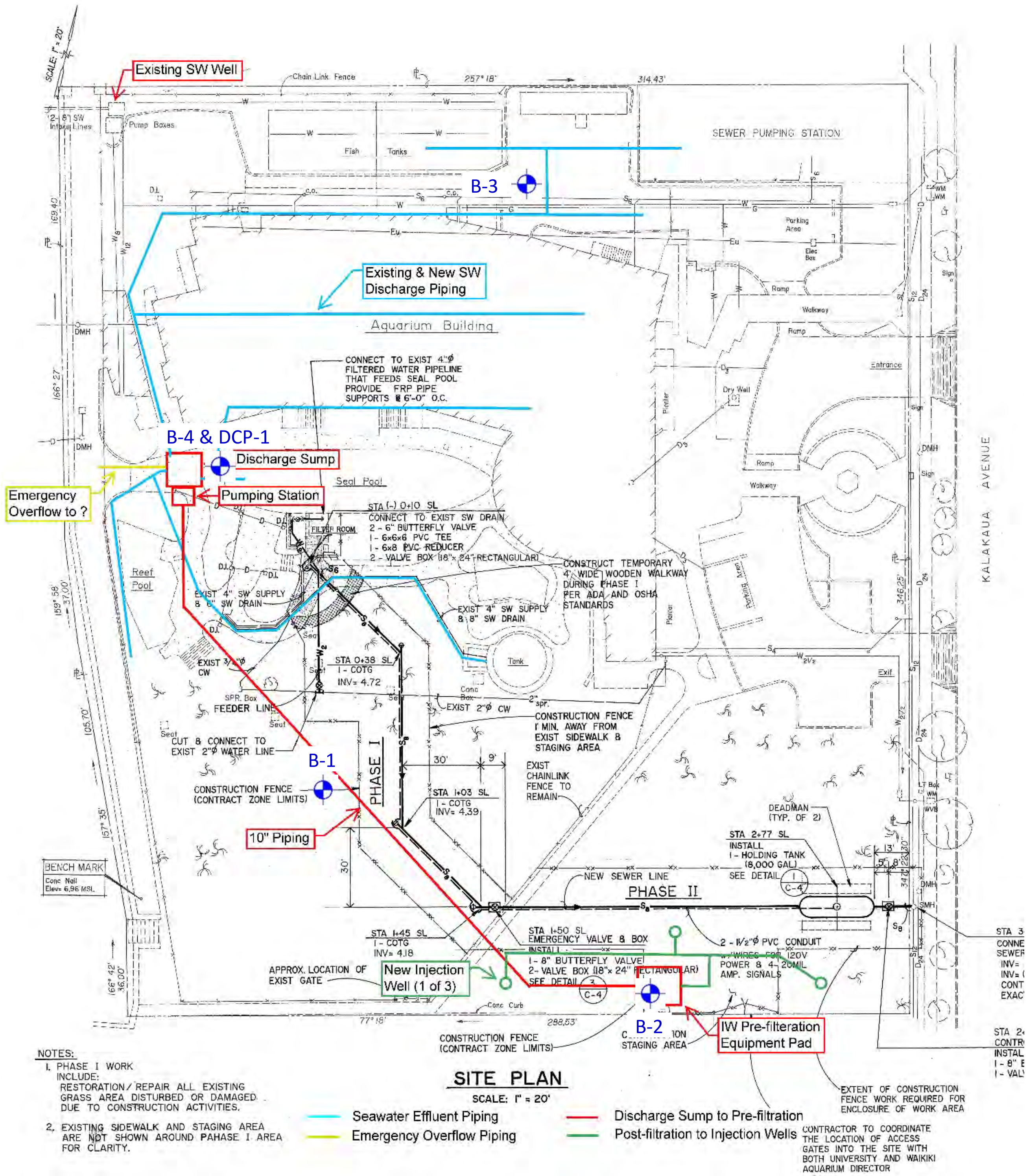


PROJECT LOCATION MAP

WAIKIKI AQUARIUM IMPROVEMENTS AND
WASTEWATER SYSTEM UPGRADES
2777 KALAKAUA AVENUE
HONOLULU, OAHU, HAWAII

PROJECT NO.: 030421-00	**PLATE**
DATE: JUNE 2021	**1**

Kokua Geotech LLC
Soil and Foundation Engineering



REFERENCE: SITE PLAN TRANSMITTED BY OCEANIT ON MARCH 4, 2021

APPROXIMATE BORING & DCP TEST LOCATION

SITE PLAN

WAIKIKI AQUARIUM IMPROVEMENTS AND WASTEWATER SYSTEM UPGRADES
2777 KALAKAUA AVENUE
HONOLULU, OAHU, HAWAII

Kokua Geotech LLC
Soil and Foundation Engineering

PROJECT NO.: 030421-00	**PLATE** 2
DATE: JUNE 2021	

APPENDIX A

Project: **Waikiki Aquarium** Project Location: **2777 Kalakaua Avenue, Honolulu, Oahu, Hawaii** Project Number: **030421-00**	**Kokua Geotech LLC** 94-974 Pakela Street, Suite 109 Waipahu, HI 96797 (808) 397-6974	Key to Logs of Borings Sheet 1 of 1

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
1	2	3	4	5	6	7	8	9	10	11	12

COLUMN DESCRIPTIONS

1 Elevation (feet): Elevation (MSL, feet).
2 Depth (feet): Depth in feet below the ground surface.
3 Sample Type: Type of soil sample collected at the depth interval shown.
4 Sample Number: Sample identification number.
5 Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
6 U.S.C.S: Type of material encountered.
7 Graphic Log: Graphic depiction of the subsurface material encountered.
8 MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
9 Pocket Pen./Torvane, tsf: the reading from Poecket Penetrometer or Torvane.
10 Water Content, %: Water content of the soil sample, expressed as percentage of dry weight of sample.
11 Dry Unit Weight, pcf: Dry weight per unit volume of soil sample measured in laboratory, in pounds per cubic foot.
12 Remarks and Other Tests: Other Tests

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS

Asphaltic Concrete (AC)
Lean CLAY, CLAY w/SAND, SANDY CLAY (CL)
Coral Formation
Clayey GRAVEL (GC)
SILT, SILT w/SAND, CLAYEY SILT (MH)
SILT, SILT w/SAND, SANDY SILT (ML)
Clayey SAND (SC)
Silty SAND (SM)
Poorly graded SAND (SP)
Poorly graded SAND with Silt (SP-SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS

Auger sampler
Grab Sample
3-inch OD Modified California w/ brass liners
PQ Coring
Probing w/ Pointed Tip
2-inch OD unlined split spoon (SPT)

OTHER GRAPHIC SYMBOLS

Water level (at time of drilling, ATD)
Water level (after waiting)
Minor change in material properties within a stratum
Inferred/gradational contact between strata
? Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

Project: **Waikiki Aquarium**	**Kokua Geotech LLC**	Log of Boring No. 1
Project Location: **2777 Kalakaua Avenue, Honolulu, Oahu, Hawaii**	94-974 Pakela Street, Suite 109	Sheet 1 of 2
Project Number: **030421-00**	Waipahu, HI 96797 (808) 397-6974	

Date(s) Drilled **5/13/21**	Logged By **JL**	Checked By **AJF**
Drilling Method **CF Auger**	Drill Bit Size/Type **6-inch Hollow Stem Auger**	Total Depth of Borehole **42.0 feet**
Drill Rig Type **Yellow Acker II**	Drilling Contractor **Kokua Geotech LLC**	Approximate Surface Elevation **+7 feet MSL***
Groundwater Level and Date Measured **7.3 feet @ 16:33 5/13/21**	Sampling Method(s) **SPT**	Hammer Data **140 lbs. with 30-inch drop**
Borehole Backfill **Soil Cuttings and Gravel**	Location **See Site Plan (Plate 2)**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
7	0				SC		Brown CLAYEY SAND, loose to medium dense, moist (fill)				
					SP		Tan SAND with traces of silt and gravel (coralline), loose, moist (fill/beach deposit)				
			1	9					12		
							grades to medium dense				
			2	13					8		Sieve -#200= 1.9%
2	5										
			3	13					8		
					GP-GC		Light gray SANDY GRAVEL (coralline) with a little clay, medium dense, wet (lagoonal deposit)				
-3	10										
			4	15					29		
					GC		Gray CLAYEY GRAVEL (coralline) with some sand, very loose (lagoonal deposit)				
-8	15										
			5	3					39		
-13	20						grades to light gray				
			6	2					48		LL=49, PI=26
					CL		Light gray SANDY CLAY with a little gravel (coralline), very soft (lagoonal deposit)				
-18	25										

Project: **Waikiki Aquarium** Project Location: **2777 Kalakaua Avenue, Honolulu, Oahu, Hawaii** Project Number: **030421-00**	**Kokua Geotech LLC** 94-974 Pakela Street, Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of Boring No. 1 Sheet 2 of 2
Date(s) Drilled **5/13/21**	Logged By **JL**	Checked By **AJF**
Drilling Method **CF Auger**	Drill Bit Size/Type **6-inch Hollow Stem Auger**	Total Depth of Borehole **42.0 feet**
Drill Rig Type **Yellow Acker II**	Drilling Contractor **Kokua Geotech LLC**	Approximate Surface Elevation **+7 feet MSL***
Groundwater Level and Date Measured **7.3 feet @ 16:33 5/13/21**	Sampling Method(s) **SPT**	Hammer Data **140 lbs. with 30-inch drop**
Borehole Backfill **Soil Cuttings and Gravel**	Location **See Site Plan (Plate 2)**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
-18	25		7	WOH/18"	CL		Light gray SANDY CLAY with a little gravel (coralline), very soft (lagoonal deposit)		45		LL=35, PI=16
					GC		Light gray CLAYEY GRAVEL (coralline) with some sand, very loose (lagoonal deposit)				
-23	30		8	2					42		
				5							
				4							
				3							
-28	35			5							
				4							
				14							
				4							
				5							
-33	40			20			Light tan CORAL, moderately weathered, medium hard to hard (coral formation)				
				50							
							Boring terminated at approximately 42.0 feet below the existing ground surface *Elevations of borings estimated from Topographic Survey information provided by Oceanit on June 11, 2021				
-38	45										
-43	50										

Project: **Waikiki Aquarium** Project Location: **2777 Kalakaua Avenue, Honolulu, Oahu, Hawaii** Project Number: **030421-00**	**Kokua Geotech LLC** 94-974 Pakela Street, Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of Boring No. 2 Sheet 1 of 1

Date(s) Drilled **5/13/21**	Logged By **JL**	Checked By **AJF**
Drilling Method **CF Auger**	Drill Bit Size/Type **4-inch Solid Stem Auger**	Total Depth of Borehole **11.5 feet**
Drill Rig Type **Yellow Acker II**	Drilling Contractor **Kokua Geotech LLC**	Approximate Surface Elevation **+7 feet MSL***
Groundwater Level and Date Measured **7.5 feet @ 18:45 5/13/21**	Sampling Method(s) **SPT**	Hammer Data **140 lbs. with 30-inch drop**
Borehole Backfill **Soil Cuttings and Gravel**	Location **See Site Plan (Plate 2)**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
7	0				ML		Brown SANDY SILT, medium stiff to stiff, dry to moist (fill)				
			1	11					12		
					SP-SM		Tan SAND with a little silt and gravel (coralline), loose to medium dense, moist (beach deposit)				
			2	10					20		Sieve -#200= 6.4%
2	5										
			3	11					31		
					GC		Gray CLAYEY GRAVEL (coralline) with some sand, very loose, wet (lagoonal deposit)				
-3	10										
			4	3					40		
							Boring terminated at approximately 11.5 feet below the existing ground surface				
-8	15										
-13	20										
-18	25										

Project: **Waikiki Aquarium** Project Location: **2777 Kalakaua Avenue, Honolulu, Oahu, Hawaii** Project Number: **030421-00**	**Kokua Geotech LLC** 94-974 Pakela Street, Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of Boring No. 3 Sheet 1 of 1
Date(s) Drilled **5/13/21**	Logged By **JL**	Checked By **AJF**
Drilling Method **CF Auger**	Drill Bit Size/Type **4-inch Solid Stem Auger**	Total Depth of Borehole **3.0 feet**
Drill Rig Type **Yellow Acker II**	Drilling Contractor **Kokua Geotech LLC**	Approximate Surface Elevation **+6.5 feet MSL***
Groundwater Level and Date Measured **Not Encountered**	Sampling Method(s) **SPT**	Hammer Data **140 lbs. with 30-inch drop**
Borehole Backfill **Gravel and AC Patch**	Location **See Site Plan (Plate 2)**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
6.5	0						3-inch ASPHALTIC CONCRETE				
		SPT	1	13	MH		Brown CLAYEY SILT with some sand and gravel (coralline), medium stiff, moist (fill)		13		Sw.= 0.5%
					SP-SM		(2-inch PVC pipe encountered) Tan SAND with a little silt and gravel (coralline), medium dense, moist (beach deposit)				
							Boring terminated at approximately 3 feet below the existing ground surface				
1.5	5										
-3.5	10										
-8.5	15										
-13.5	20										
-18.5	25										

C:\Users\ajfel\Dropbox\My PC (DESKTOP-QSPB1HD)\Desktop\Working\PROJECTS\2021 Series\030421-00.Waikiki Aquarium Improv and Wastewater System Upgrades\LOGS\Waikiki Aquarium LOGS.bg4[KG 12-29-18.tpl]

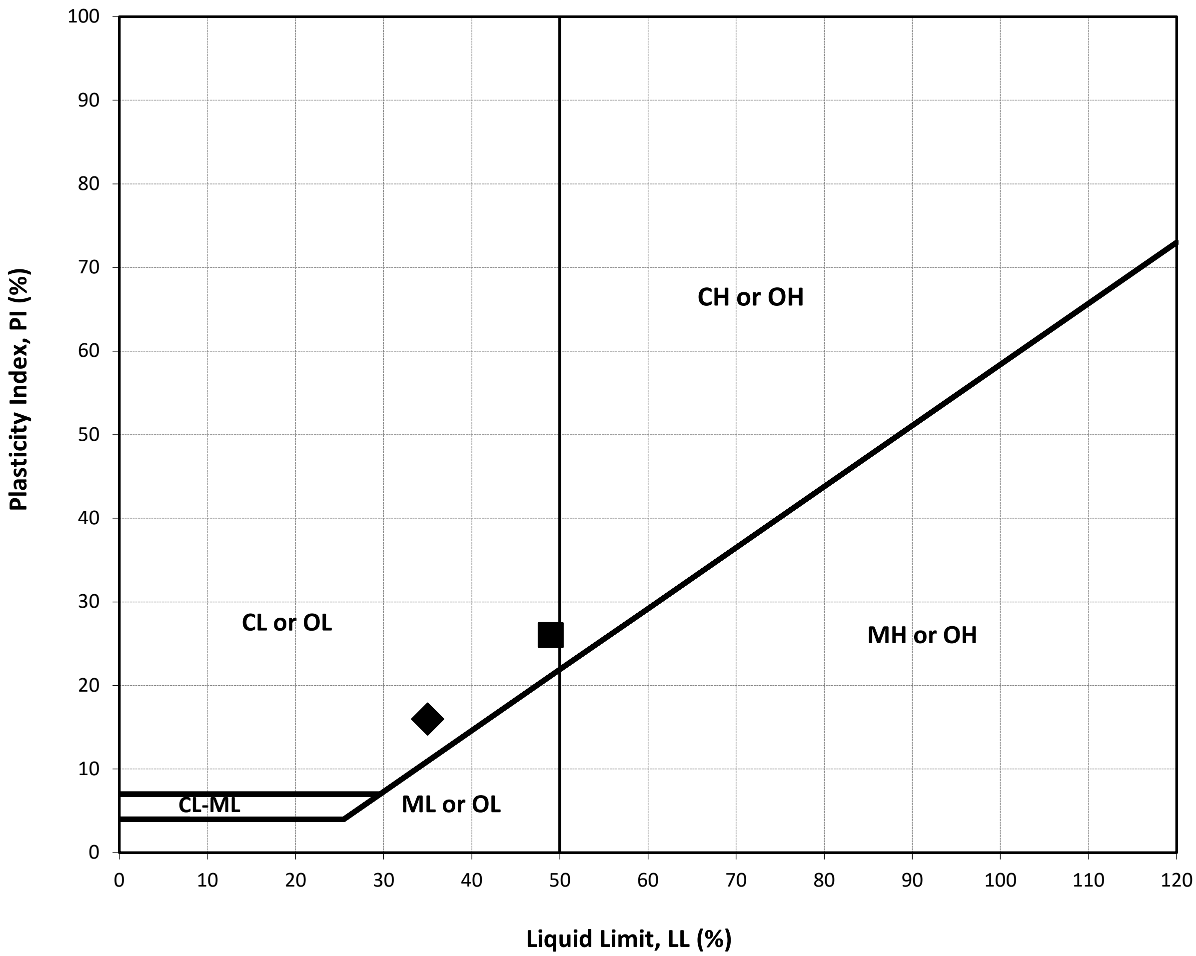
Project: **Waikiki Aquarium** Project Location: **2777 Kalakaua Avenue, Honolulu, Oahu, Hawaii** Project Number: **030421-00**	**Kokua Geotech LLC** 94-974 Pakela Street, Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of Boring No. 4 Sheet 1 of 1
Date(s) Drilled **5/17/21**	Logged By **JL**	Checked By **AJF**
Drilling Method **Hand Auger**	Drill Bit Size/Type **4-inch Solid Stem Auger**	Total Depth of Borehole **12.5 feet**
Drill Rig Type **N/A**	Drilling Contractor **Kokua Geotech LLC**	Approximate Surface Elevation **+8 feet MSL***
Groundwater Level and Date Measured **8.1 feet @ 15:45 5/17/21**	Sampling Method(s) **SPT**	Hammer Data **DCP - 15 lbs. with 20-inch drop**
Borehole Backfill **Soil Cutting and Gravel**	Location **See Site Plan (Plate 2)**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
8	0				SM		Tan SILTY SAND with some gravel (coralline), medium dense, moist (fill)				
		X	1						8		Sieve -#200= 15.2%
		X	2		SP		Tan SAND with traces of silt and gravel (coralline), loose to medium dense, moist (beach deposit)		8		
3	5	X	3						9		
				DCP							
							▼ grades medium dense to dense, wet				
-2	10	X	4		GC		Gray CLAYEY GRAVEL (coralline) with some sand, loose (lagoonal deposit)		19		
							Boring terminated at approximately 12.5 feet below the existing ground surface				
-7	15										
-12	20										
-17	25										

C:\Users\ajfel\Dropbox\My PC (DESKTOP-QSPB1HD)\Desktop\Working\PROJECTS\2021 Series\030421-00.Waikiki Aquarium Improv and Wastewater System Upgrades\LOGS\Waikiki Aquarium LOGS.bg4[KG 12-29-18.tpl]

APPENDIX B

PLASTICITY CHART



Symbol	Sample	Depth (feet)	Material Description	USCS	LL	PL	PI
■	B-1	20.0 to 21.5	Light gray CLAYEY GRAVEL with some sand	GC	49	23	26
◆	B-1	25.0 to 26.5	Light gray SANDY CLAY with a little gravel	CL	35	19	16

SUMMARY OF ATTERBERG LIMITS (ASTM D4318) TEST RESULTS

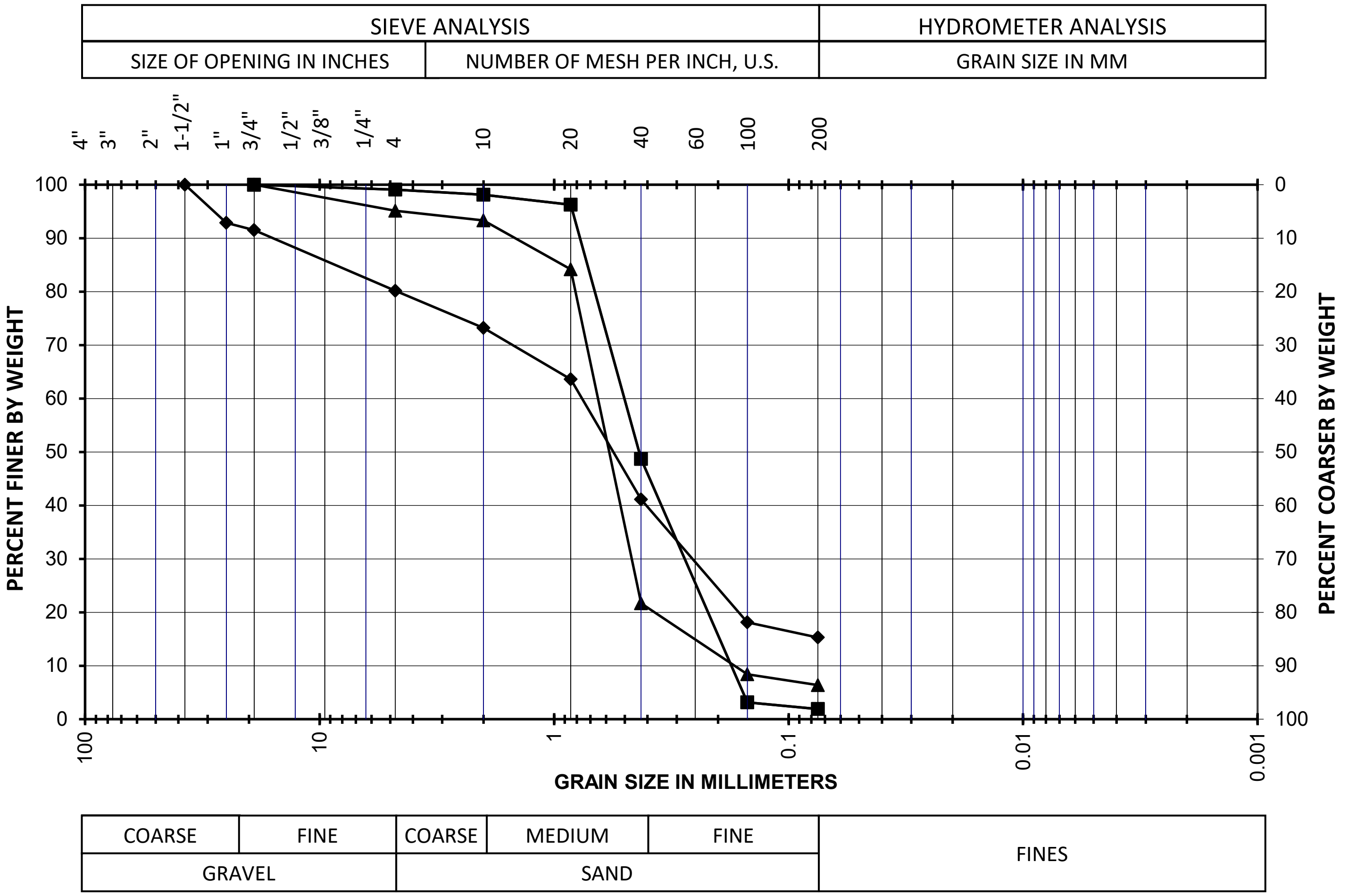
Kokua Geotech LLC
Soil and Foundation Engineering

WAIKIKI AQUARIUM IMPROVEMENTS AND
WASTEWATER SYSTEM UPGRADES
2777 KALAKAUA AVENUE
HONOLULU, OAHU, HAWAII

PROJECT NO.: 030421-00

DATE: JUNE 2021

PLATE
B-1



Symbol	Sample	Depth (feet)	USCS	Description
■	B-1	3.0 to 4.5	SP	Tan SAND with traces of silt and gravel
▲	B-2	3.0 to 4.5	SP-SM	Tan SAND with a little silt and gravel
◆	B-4	1.0 to 2.0	SM	Tan SILTY SAND with some gravel

SUMMARY OF GRAIN SIZE DISTRIBUTION (ASTM C117 & C136) TEST RESULTS

WAIKIKI AQUARIUM IMPROVEMENTS AND
WASTEWATER SYSTEM UPGRADES
2777 KALAKAUA AVENUE
HONOLULU, OAHU, HAWAII

Kokua Geotech LLC
Soil and Foundation Engineering

PROJECT NO.: 030421-00

DATE: JUNE 2021

PLATE
B-2

Location	Depth (feet)	Test Type	Soil Description	Dry Density (pcf)	Moisture Contents Initial (%)	Moisture Contents Air-Dried (%)	Moisture Contents Final (%)	Ring Swell (%)
B-3	1.0 to 2.5	Natural	Brown CLAYEY SILT with some sand and gravel	108.6	18.0	7.0	20.0	0.5

Note: Sample tested was relatively undisturbed (natural) in a 2.4-inch diameter by 1-inch high ring. Sample was then air-dried overnight followed by saturating for a minimum of 24 hours under a surcharge pressure of 60 psf.

SUMMARY OF RING SWELL TEST RESULTS

WAIKIKI AQUARIUM IMPROVEMENTS AND WASTEWATER SYSTEM UPGRADES
2777 KALAKAUA AVENUE
HONOLULU, OAHU, HAWAII

Kokua Geotech LLC
Soil and Foundation Engineering

PROJECT NO.: 030421-00

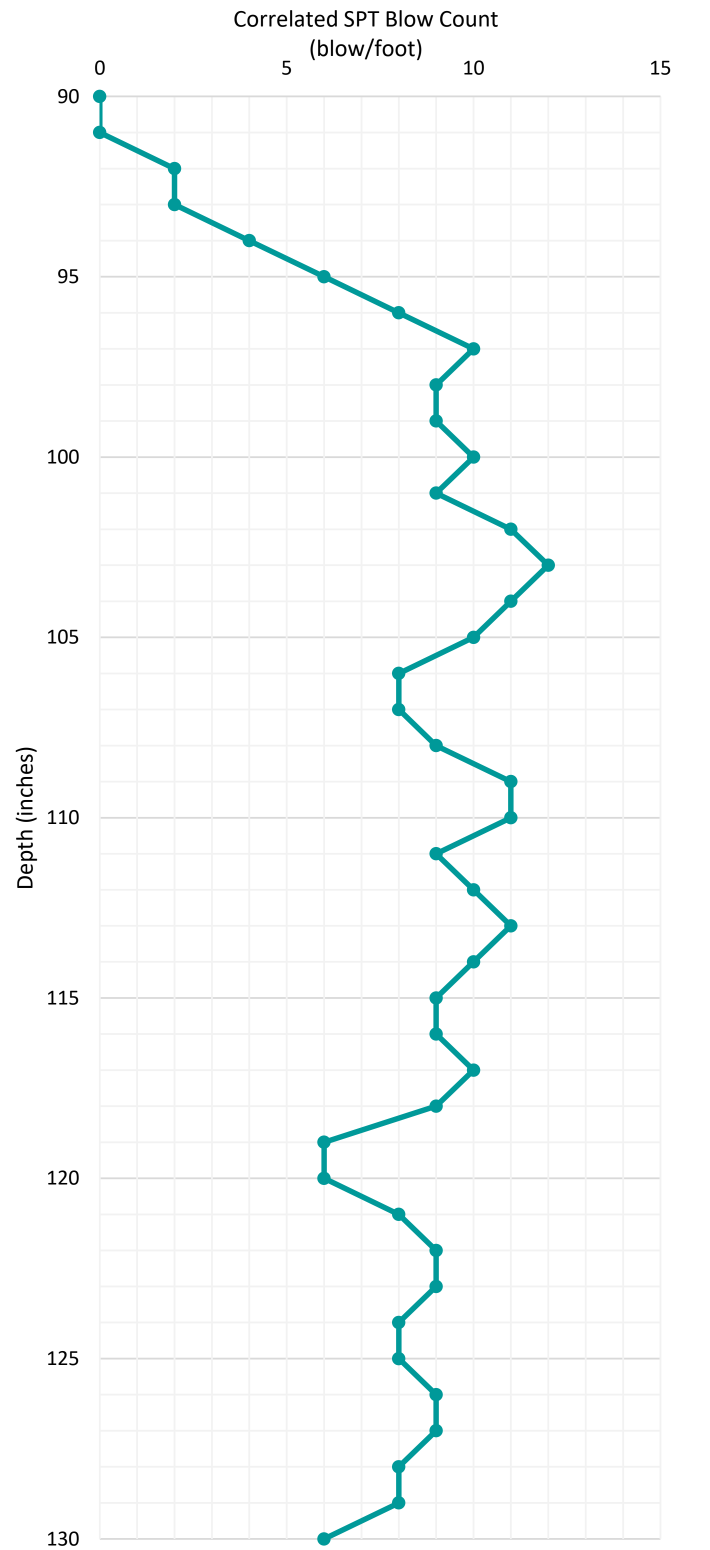
DATE: JUNE 2021

PLATE B-3

APPENDIX C

Kokua Geotech LLC Soil and Foundation Engineering	WAIKIKI AQUARIUM IMPROVEMENTS AND WASTEWATER SYSTEM UPGRADES 2777 KALAKAUA AVENUE HONOLULU, OAHU, HAWAII	LOG OF DCP **1**

No. of Blows	**Depth of Penetration** (inches)	**Correlated CBR**	**Correlated SPT Blow Count** (blow/foot)
0	90	0.0	0
1	91	0.0	0
1	92	1.3	2
1	93	1.3	2
4	94	2.5	4
5	95	3.7	6
9	96	4.9	8
10	97	6.2	10
5	98	5.5	9
10	99	5.5	9
7	100	6.2	10
9	101	5.5	9
11	102	6.9	11
12	103	7.6	12
10	104	6.9	11
7	105	6.2	10
6	106	4.9	8
7	107	4.9	8
9	108	5.5	9
11	109	6.9	11
8	110	6.9	11
9	111	5.5	9
10	112	6.2	10
11	113	6.9	11
7	114	6.2	10
8	115	5.5	9
8	116	5.5	9
10	117	6.2	10
6	118	5.5	9
5	119	3.7	6
6	120	3.7	6
7	121	4.9	8
8	122	5.5	9
7	123	5.5	9
6	124	4.9	8
7	125	4.9	8
8	126	5.5	9
6	127	5.5	9
7	128	4.9	8
5	129	4.9	8
5	130	3.7	6



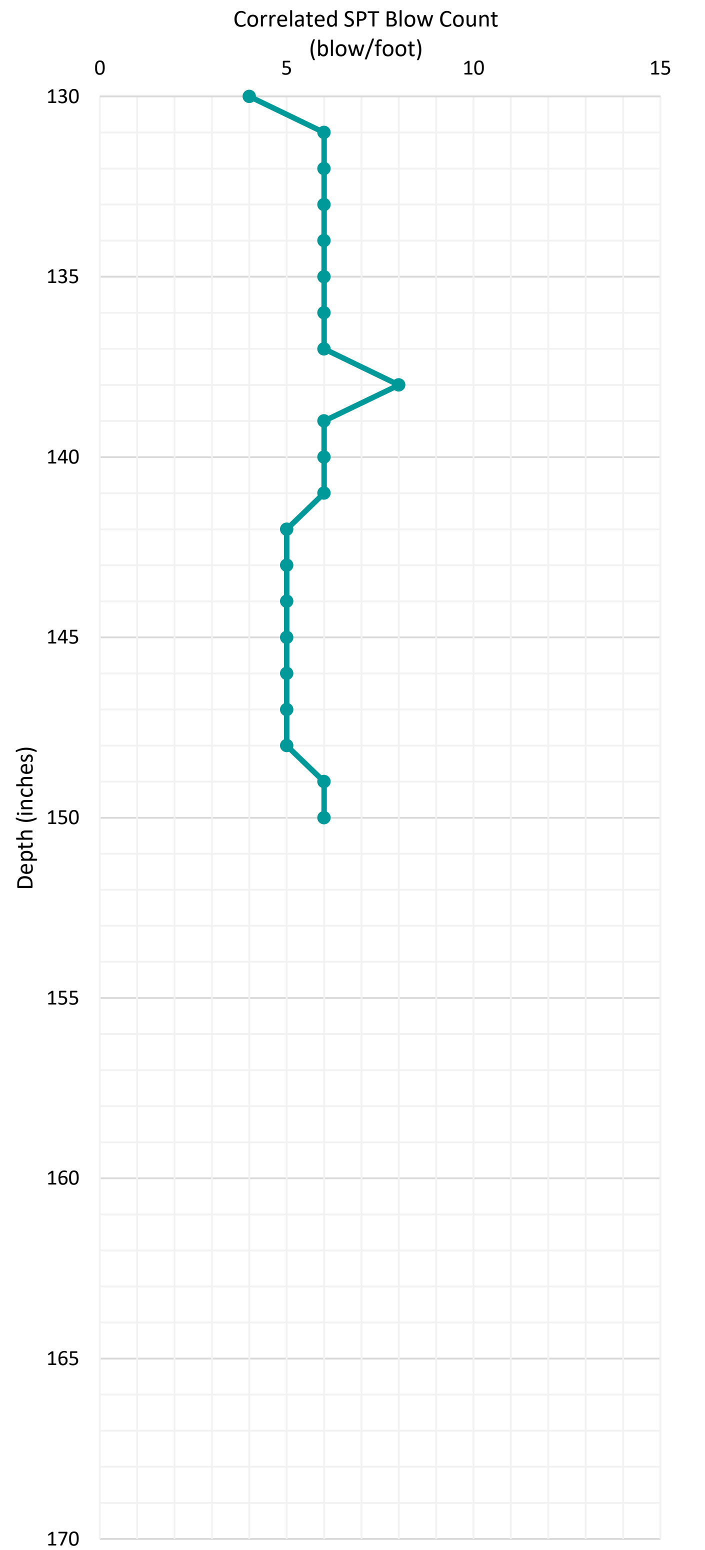
Project No.:	030421-00	Total Depth:	7.5 to 12.5 feet	**PLATE**
Date Started:	5/17/2021	Probing Equipment:	DCP H-4202SX	**C-1**
Date Completed:	5/17/2021	Size of Cone Tip:	1.5 inch diameter with 45^{o} cone	
Logged By:	ZYH	Driving Energy:	15 lb. steel mass falling 20 inches	

Kokua Geotech LLC
Soil and Foundation Engineering

WAIKIKI AQUARIUM IMPROVEMENTS AND
WASTEWATER SYSTEM UPGRADES
2777 KALAKAUA AVENUE
HONOLULU, OAHU, HAWAII

LOG OF DCP
1

No. of Blows	Depth of Penetration	Correlated CBR	Correlated SPT Blow Count
	(inches)		(blow/foot)
5	130	2.5	4
4	131	3.7	6
5	132	3.7	6
5	133	3.7	6
4	134	3.7	6
5	135	3.7	6
4	136	3.7	6
6	137	3.7	6
6	138	4.9	8
5	139	3.7	6
5	140	3.7	6
3	141	3.7	6
3	142	3.1	5
3	143	3.1	5
4	144	3.1	5
3	145	3.1	5
3	146	3.1	5
3	147	3.1	5
4	148	3.1	5
4	149	3.7	6
5	150	3.7	6



Project No.:	030421-00	Total Depth:	7.5 to 12.5 feet
Date Started:	5/17/2021	Probing Equipment:	DCP H-4202SX
Date Completed:	5/17/2021	Size of Cone Tip:	1.5 inch diameter with 45° cone
Logged By:	ZYH	Driving Energy:	15 lb. steel mass falling 20 inches

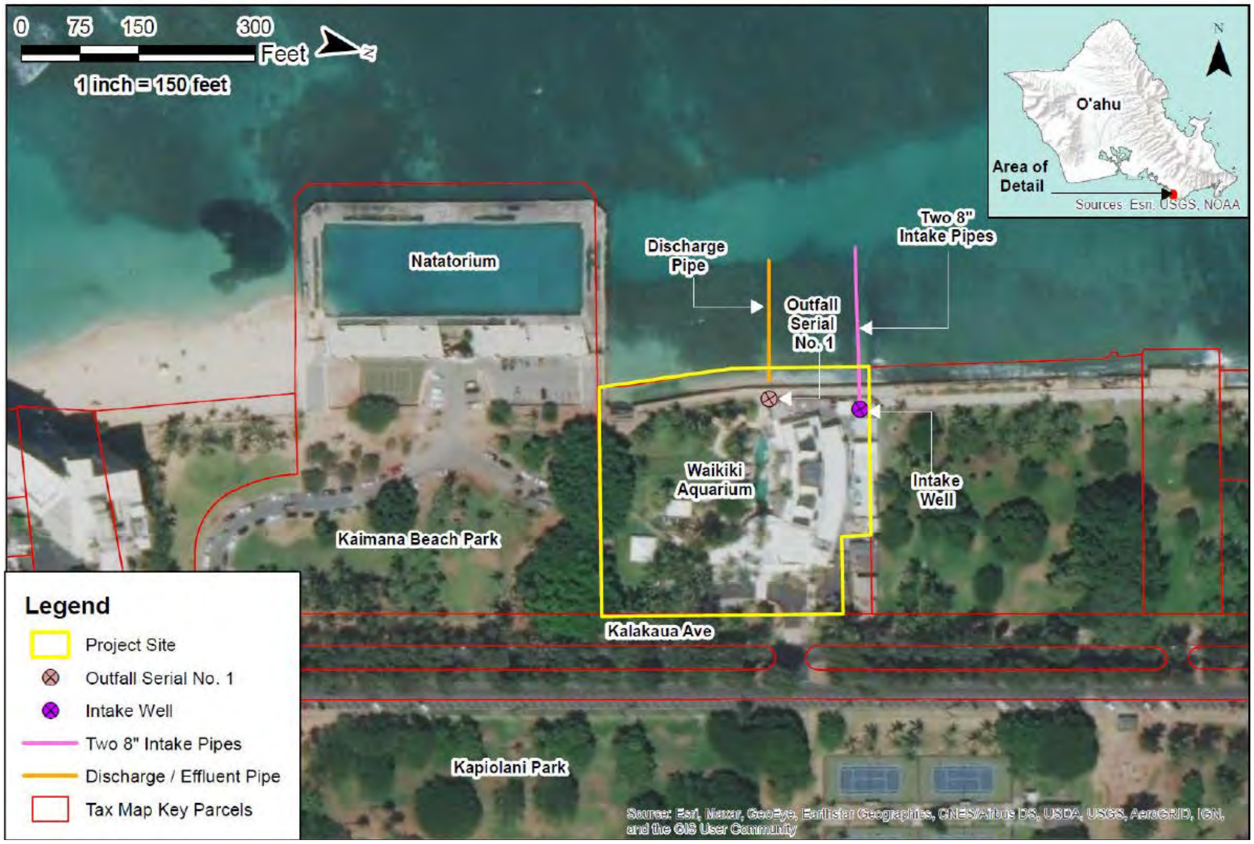
PLATE
C-2

Appendix C:

Waikīkī Aquarium Injection Wells

FINAL REPORT

Waikīkī Aquarium Injection Wells



Prepared for:
Oceanit Laboratories, Inc.
828 Fort Street Mall, Suite 600
Honolulu, HI 96813

Prepared by:

INTERA Incorporated
74 Kihapai Street
Kailua, HI 96734

August 2022

DRAFT REPORT
Waikīkī Aquarium Injection Wells

Report Date: August 31, 2022

Prepared for:
Oceanit Laboratories, Inc.
828 Fort Street Mall, Suite 600
Honolulu, HI 96813

Prepared by:
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74 Kihapai Street
Kailua, HI 96734

This work was prepared by me or under my supervision

______________________________ December 31, 2022
Signature Expiration date

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ACRONYMS AND ABBREVIATIONS

BWS	Board of Water Supply, Honolulu
CCH	City and County of Honolulu
DEA	Draft Environmental Assessment
DOH	Department of Health
GDE	Groundwater Dependent Ecosystem
GPM	Gallons per minute
HAR	Hawaiʻi Administrative Rules
mg/L	Milligrams per liter
NPDES	National Pollution Discharge Elimination System
Oceanit	Oceanit Laboratories Inc.
PSI	Pounds per square inch
Site	Waikīkī Aquarium
T&C	Traditional and customary
TSS	Total suspended solids
UH	University of Hawaiʻi
UIC	Underground Injection Control
UV	ultraviolet

1.0 INTRODUCTION

Oceanit Laboratories Inc. (Oceanit) is preparing a Draft Environmental Assessment (DEA) regarding the upgrade of the water system at the Waikīkī Aquarium (the Aquarium or Site). The purpose of this upgrade is to ensure that the water system infrastructure complies with regulatory requirements. The University of Hawaiʻi (UH) contracted Oceanit to develop an improved Water System Infrastructure Design for exhibit operations and to provide an optimized effluent discharge process that will comply with Federal, State, and City and County of Honolulu (CCH) regulatory requirements. Oceanit asked INTERA Incorporated (INTERA) to provide hydrogeologic services.

The Waikīkī Aquarium is located on south shore of Oʻahu next to the War Memorial Natatorium and Kaimana Beach Park (Figure 1). The Aquarium is owned and operated by UH. The Site is located between the Pacific Ocean and Kalākaua Avenue. The Waikīkī Aquarium houses both native and nonnative saltwater animals and some freshwater species in approximately 60 public exhibits and behind-the-scenes holding tanks that are in operation at any given time. Roughly half of the water for aquarium operations is drawn from a nearshore ocean intake, and most of the balance is drawn from a salt water well located near the shore. A small amount of freshwater is also used. Currently, effluent water from native exhibits is discharged through a nearshore outfall under a National Pollution Discharge Elimination System (NPDES) permit issued by the Department of Health (DOH), and effluent from non-native exhibits is discharged into the CCH sanitary sewer system.

The Oceanit design and planning team considered three options for wastewater disposal.

- Option 1: All effluent from both native and non-native exhibits is filtered and disposed via two on-site injection wells
- Option 2: All effluent from both native and non-native exhibits is filtered and ultraviolet (UV)-treated and sterilized prior to discharge through the existing ocean outfall; and
- Option 3: Native exhibit effluent will be filtered, treated, and discharged through the existing ocean outfall and non-native exhibit effluent will be filtered and discharged via two on-site injection wells (smaller in size than those in Option 1).

The preferred option is Option 1 and is intended to dispose of all effluent into two on-site injection wells, thereby eliminating direct discharge into the ocean and greatly reducing discharge to the CCH wastewater system. Sanitary wastewater and limited amounts of filter backwash from the Aquarium will still be discharged into the CCH wastewater system.

This report describes the geology, hydrogeology, and proposed injection well design. This report is not intended to be a full basis of well design report. Although there is some discussion of design criteria, the scope is intended to . describe initial investigations into potential geological and hydrological impacts and mitigation of potential impacts.

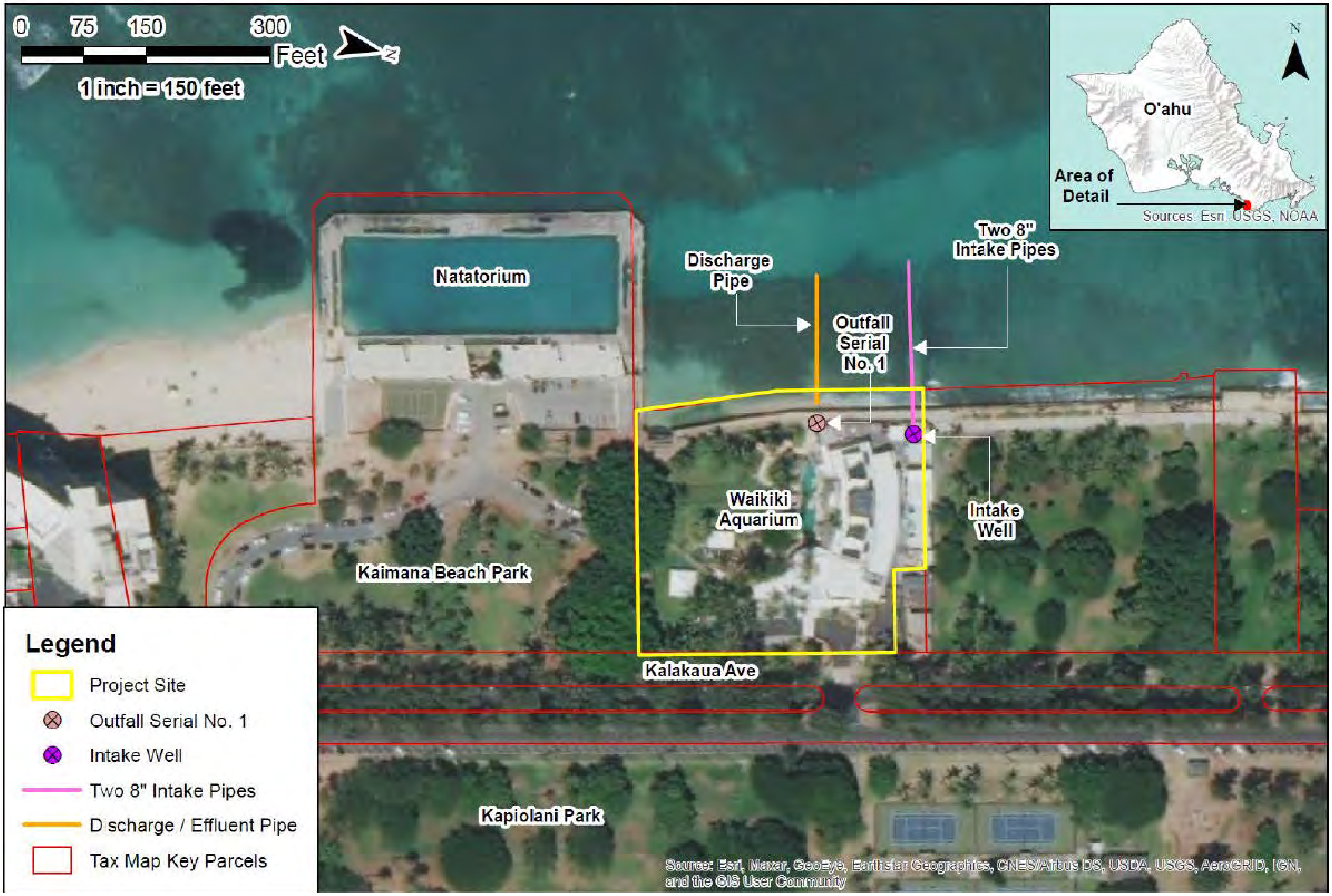


Figure 1. Project site map.

2.0 GEOLOGY AND HYDROGEOLOGY

Oʻahu is comprised of two shield volcanoes. The Waiʻanae Volcano is in the west and the Koʻolau to the east. Other formations are the Honolulu Volcanics and sedimentary deposits including the Caprock. The project Site is located on the Honolulu coastal plain of southeastern Oʻahu, Hawaiʻi. There are two primary hydrostratigraphic units in the subsurface at the Site. The uppermost formation is a sedimentary sequence of reef limestones and marine lagoonal muds called the Caprock. Underlying the Caprock formation is the Koʻolau Basalt formation. Figure 2 is a generalized geologic map of Oʻahu, and Figure 3 is a geologic map of the Site (Sherrod and others, 2007).

The Koʻolau lavas are divided into Koʻolau Basalt and Honolulu Volcanics. The Koʻolau Basalt primarily consists of Pliocene-aged shield stage tholeiitic basalt (Langenheim and Clague, 1987). The Honolulu Volcanics are composed of rejuvenated stage lava flows and vent deposits scattered around southeastern Oʻahu. They are composed of more than 35 vents with alkalic rocks that erupted over the past 1 million years. Prominent Honolulu Volcanic features include Diamond Head and Sugar Loaf. Honolulu Volcanics lava flows and vent deposits have been found in the vicinity of the Aquarium (Diamond Head is ⅓ mile to the east) and there is a possibility that flows or pyroclastics from the Honolulu Volcanics will be found in the injection well borings.

The Aquarium is located on the Caprock of the coastal plain of southern Oʻahu. Holocene and Pleistocene sedimentary Caprock deposits directly underlay the Site. The Caprock is composed of a wedge of a diverse mixture of marine and terrestrial sediments. The Caprock is a sedimentary sequence of reef limestones and marine/lagoonal muds that reflect historic changes in sea level and the resulting variations in depositional environments along the coastline. Marine sedimentary rocks are mostly calcareous and include limestone coral reefs, calcareous rubble, and sand, along with lagoonal sands and marls (Hunt, 1995; Finstock, 1996). Terrestrial sediments include alluvium, colluvium and talus varying from estuarine muds to calcareous dune sands. In general, the marine deposits are more permeable than the terrestrial deposits. The terrestrial deposits are more common in the valleys, and the marine deposits are found on the coastal plain. The Caprock is over 900 feet thick in the vicinity of the Aquarium (Figure 4; Palmer, 1946; Wentworth, 1951; Oki, 1997) with the Koʻolau Basalt lying unconformably below the Caprock. The surficial geology in the area are Holocene beach deposits (Sherrod and others, 2007).

The hydraulic properties of the Caprock vary extensively. Hunt (1995) reported that the hydraulic conductivity of in situ reef limestone varies from 100 to 20,000 feet/day and the hydraulic conductivity of lagoonal sands and mud varied from less than 1 to 500 feet/day. In general, the marine deposits are more permeable than the terrestrial deposits. Injection wells developed in formations with higher hydraulic conductivity (equivalent to permeability) will have greater injection capacities.

The Site is located makai of the Underground Injection Control (UIC) line, and therefore is in an exempted aquifer as defined by the DOH in the Hawaiʻi Administrative Rules (HAR §11-23; DOH, 1992). "Exempted" indicates that permitted injection is allowable. The underlying basalt aquifer is the downgradient end of the Pālolo Aquifer System.

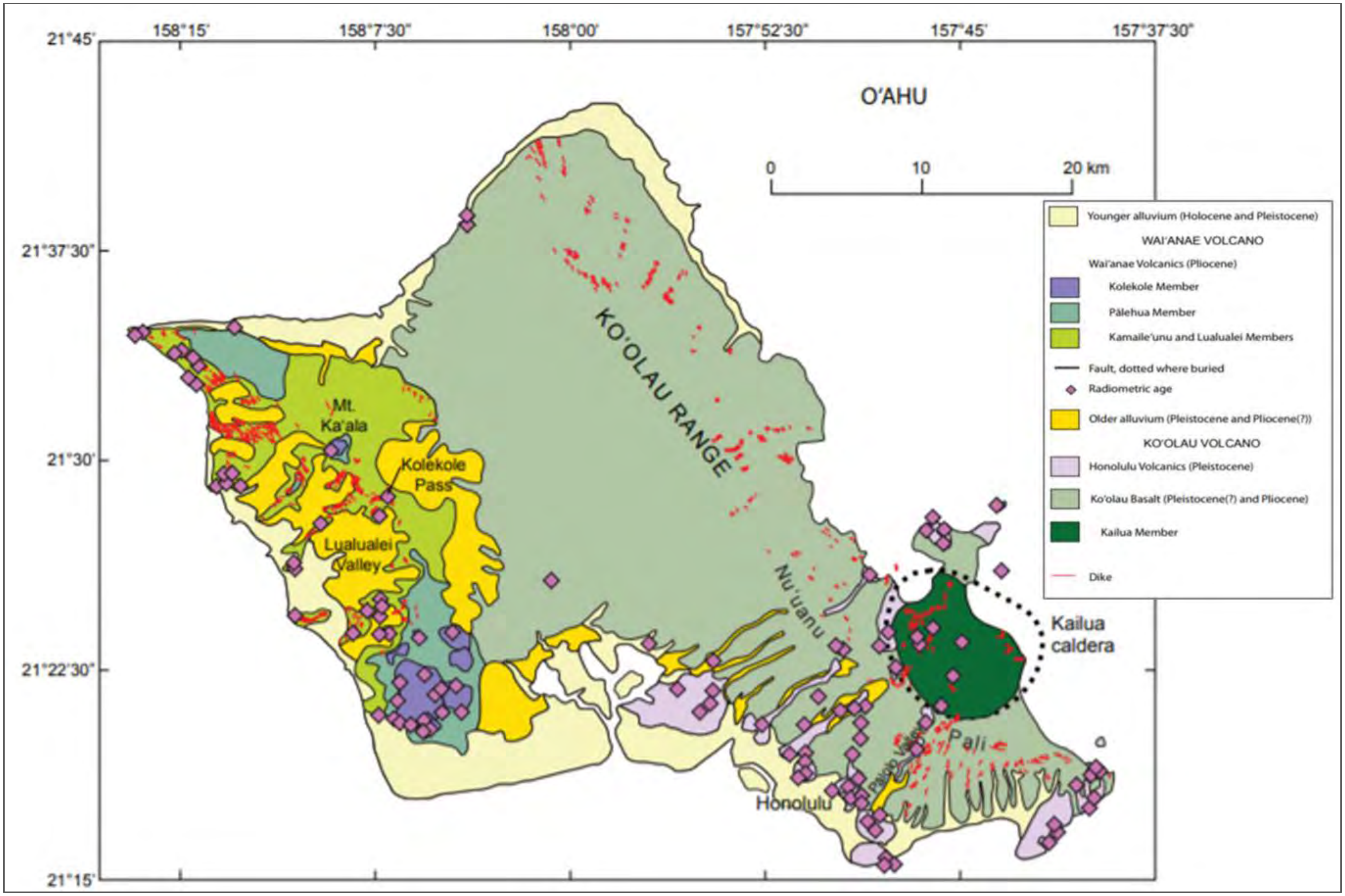
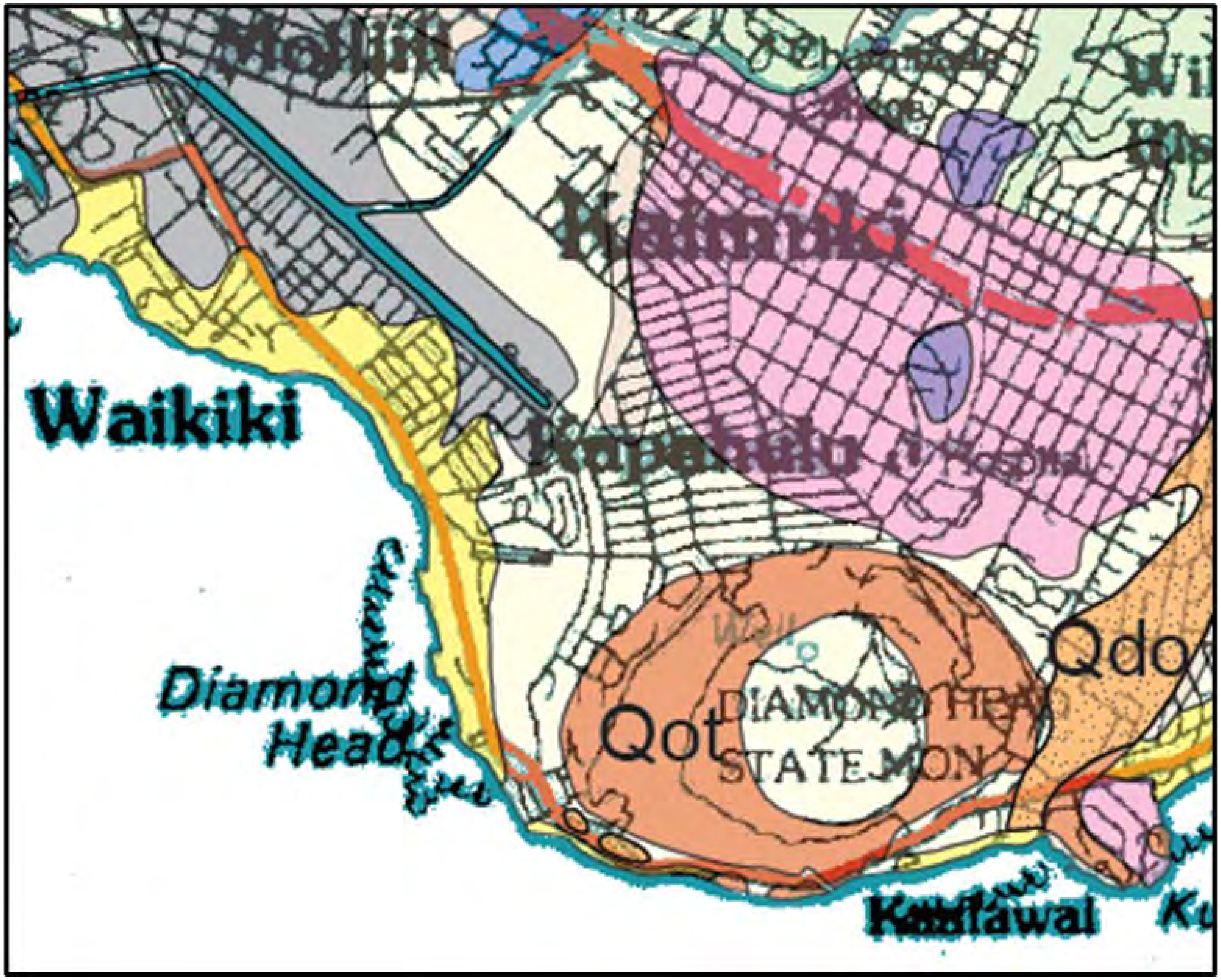


Figure 2. Geologic map of O‘ahu (from Sherrod and others 2007).



Note: The red dot shows the project site. The surficial geology is Caprock beach deposits (yellow). The orange, pink and blue areas are Honolulu Volcanics. The green is Ko'olau Basalt. The yellow and light green is Caprock. The grey is artificial fill.

Figure 3. Geologic map of the project site (from Sherrod and others 2007).

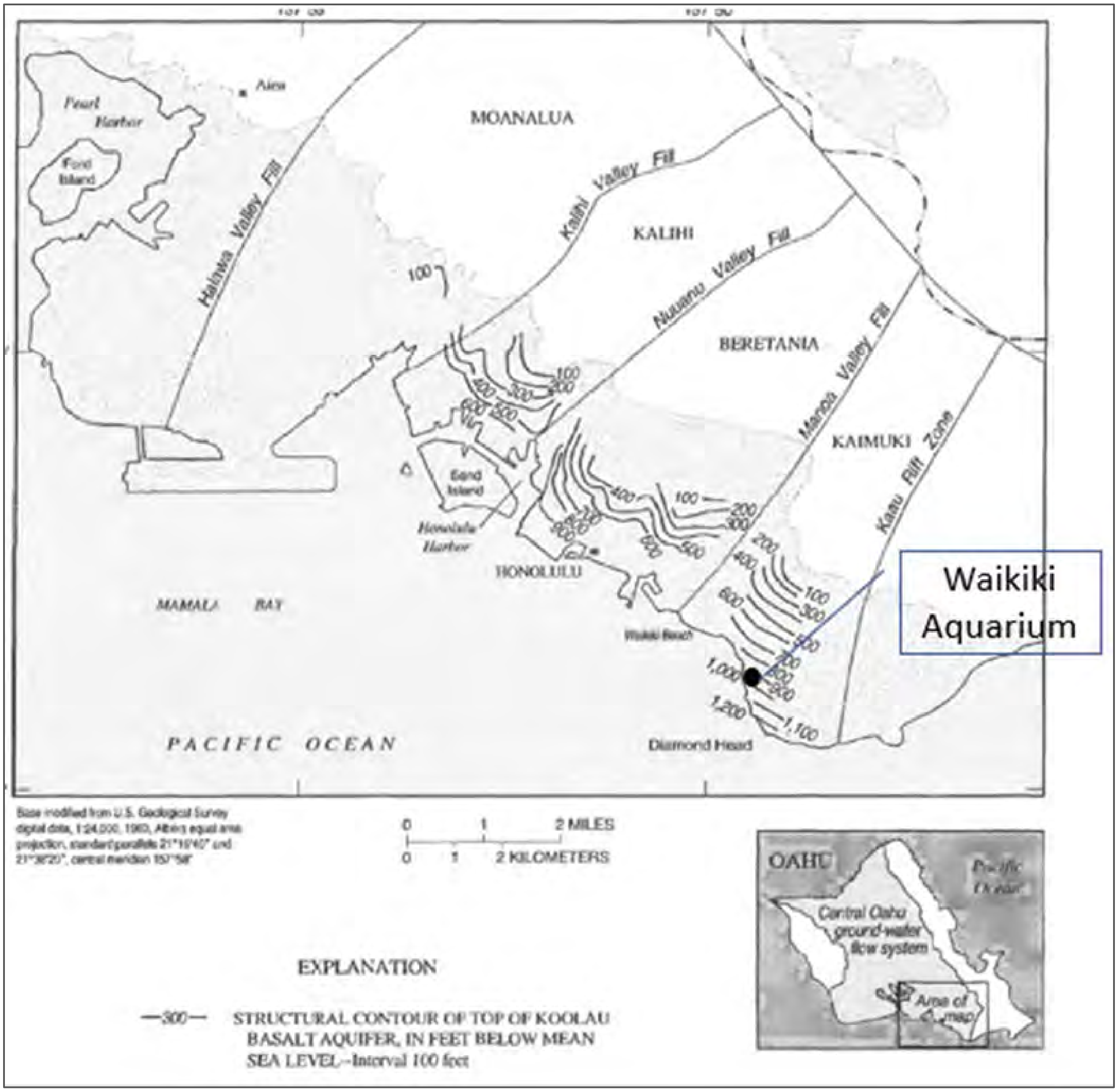


Figure 4. Caprock depths in the Honolulu area (from Oki 1998).

3.0 WELL DESIGN

The well design will conform to Hawaiʻi Well Construction & Pump Installation Standards, 2nd Edition (HDLNR, February 2004); and the requirements in HAR Chapter 11-23. In addition, the well design will conform to the requirements of the DOH Safe Drinking Water Branch Approval-to-Construct permit. The following sections provide specific detail on the regulatory requirements, capacity requirements, injectate treatment and quality, and the need to avoid discharge to nearshore waters.

Figure 5 shows the proposed well design. Each injection well will be from 245 to 345 feet deep with 135 feet of solid 18-inch polyvinyl chloride (PVC) casing and from 100 to 200 feet of slotted 18-inch PVC casing. The proposed injection interval will be between 126 and 326 feet below sea level. The actual well depth and length of slotted casing will be chosen based on the geology during construction, but the solid cased interval will still be at least 100 feet below sea level.

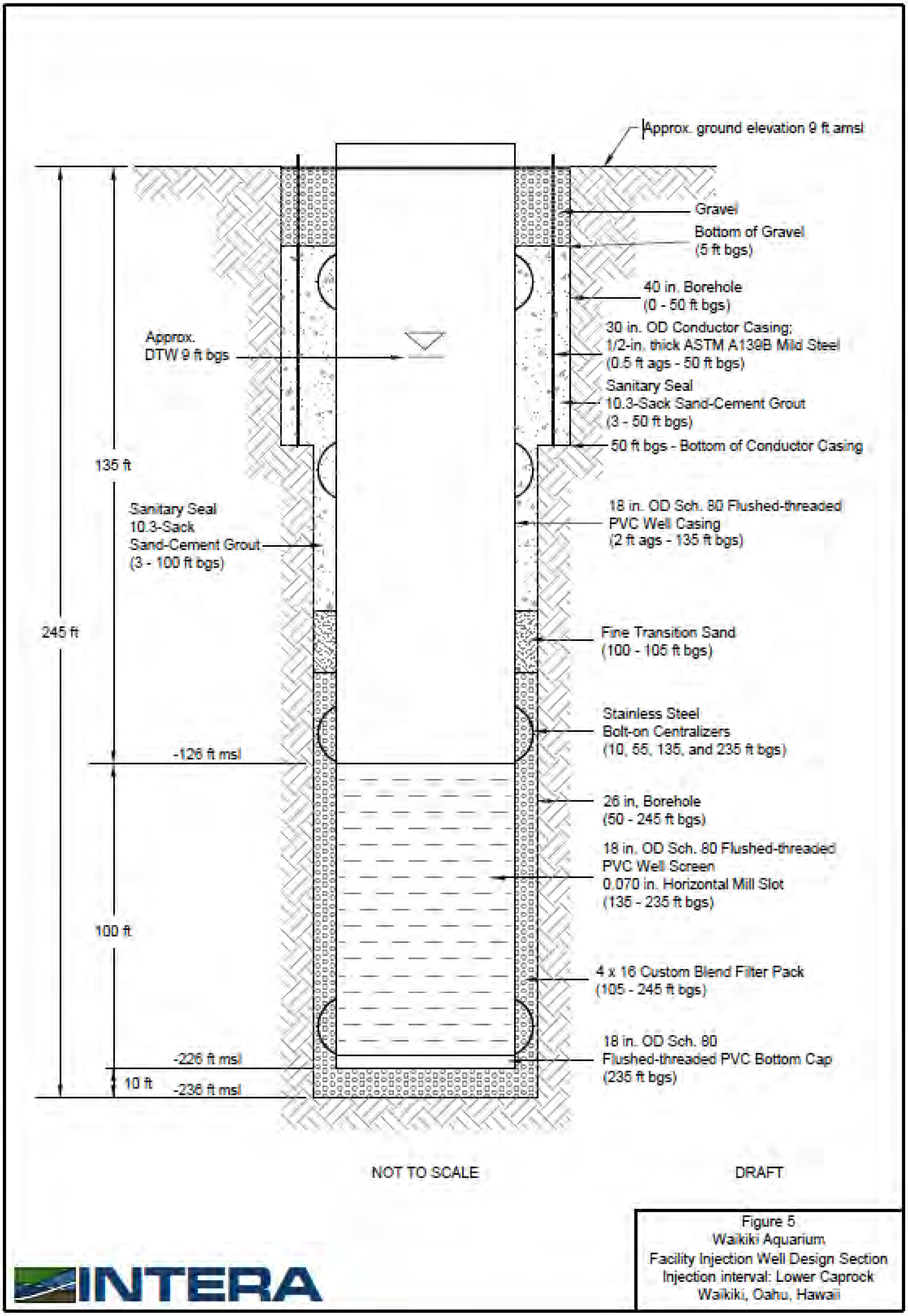


Figure 5. Proposed well design.

3.1 Regulatory Requirements

The Site is located makai of the UIC line, and therefore is in an exempted aquifer as defined by the DOH (HAR §11-23; DOH 1992). It is legal to construct a permitted injection well in an exempted aquifer. The injection interval is in the Caprock aquifer overlying an artesian aquifer. There are two hydrogeologic regulatory requirements in HAR §11-23 that will affect the final design of the wells, including maximum well depth and injection pressure.

3.1.1 Maximum Well Depth

The first requirement concerns the maximum allowable depth of the well into the Caprock and the need for a deep exploratory borehole. If the ratio of the depth of the proposed injection well to the estimated depth of Caprock less than 50 feet or is 1:2 or less (Table 1), the applicant need not extend the depth of the injection well or wells to verify Caprock thickness, prior to completion of the shallower proposed depth. Otherwise, HAR §11-23 requires at least 50 feet of vertical separation of Caprock between the bottom of the injection interval and the top of the artesian aquifer.

The Caprock is between 900 and 1,000 feet thick at the Waikīkī Aquarium (Figure 4), indicating that the maximum allowable injection well depth, without physically verifying the Caprock depth, is 450 feet. The maximum depth in the UIC permit application is 345 feet deep, so the planned depth is in compliance with the depth portion of HAR §11-23.

Table 1 Well depths and corresponding Caprock depths.

Proposed injection well depth (ft)	150	200	250	300	350	400	450	500
Minimum depth of Caprock (ft)	350	450	550	650	750	850	950	1050

3.1.2 Injection Pressure

The second requirement concerns the injection pressure. The injection pressures, as measured at the well head, must remain below the hydrostatic pressure of the artesian aquifer or 2 pounds per square inch (PSI), whichever is greater. Injection at the Waikīkī Aquarium injection wells will be via gravity flow at atmospheric pressure (0 PSI), so the Aquarium will comply with the injection pressure rules.

3.2 Other Design Considerations

3.2.1 Capacity

On-site injection wells should have adequate capacity for the aquarium's wastewater disposal. The average projected discharge from the Aquarium wastewater system is 580 gallons per minute (GPM) and the maximum discharge is 594 GPM. The Caprock Aquifer has a high hydraulic conductivity, so injection capacity is anticipated to be high. The Aquarium has an existing saltwater production well (well no. 3-1649-010). The well was drilled in 1954 and is 85 feet deep with 46 feet of 12-inch solid casing. It was originally tested at 1,150 GPM with 2.7 feet of drawdown (CWRM, 2021). The specific capacity of this well was extremely high, indicating that on-site injection wells may have similarly high injection capacities. The available data indicate that the injection wells should have adequate capacity for 594-GPM discharge.

3.2.2 Injectate Water Quality

The water quality of the injectate is important in designing an injection well. Total suspended solids (TSS) and the potential more microbial growth will affect the long-term performance of the injection wells. All wells, including injection wells, tend to decline in capacity over time. Extra capacity must be designed to account for the gradual decline.

The Waikīkī Aquarium generates three types of aquarium wastewater:

1. Native species tank discharge;
2. Non-native species tank discharge; and
3. Freshwater tank discharge.

These wastewater types originate from six parts of the Aquarium facility (Figure 6). Supply water for the aquarium comes from three sources:

1. Natural seawater pumped directly from the ocean that is filtered and mainly used to supply the seal pool;
2. Saltwater from an on-site well that is aerated to raise the oxygen and to degas the carbon dioxide before distribution to the indoor and outdoor aquatic exhibits and holding tanks; and
3. Fresh water from the Honolulu Board of Water Supply (BWS).

Carbon filtration is used to remove chlorine from the BWS water immediately before introduction of freshwater in the exhibits. The various types of water are used in the following six exhibit areas or holding/propagating tanks:

1. Holding tanks north of the Aquarium building with native and nonnative species in separate tanks.
2. The Aquarium building with native, nonnative and freshwater exhibits.
3. Critter tanks with native and non-native species
4. Seal Pool (native)
5. The reef pool with native exhibits.
6. Mullet and coral tanks (native)

These six parts of the aquarium contain the following types of aquarium wastewater:

- Saltwater from tanks containing native species
- Saltwater from tanks containing non-native species

- Freshwater discharge
- Filter backwash from aquarium filters
- Seal pool drainage and wash water

All sanitary wastewater from restrooms and sinks will continue to be discharged into the CCH sanitary sewer.

The Aquarium does not propose to chlorinate the Aquarium wastewater before injection, but chlorine bleach is used to clean the seal pool. The aquarium uses an average of 0.75 gallons of household bleach per week, which is equivalent to 0.14 kg sodium hypochlorite per week. Table 2 shows the historical chemical analysis of the native-species wastewater discharged via the ocean outfall. The chemical analysis of the wastewater discharged into the injection wells after project completion will be different because of more effective filtration.

Figure 7 shows a schematic diagram of the waste stream from the source to the injection wells. The design team has decided that the wastewater will be filtered with 30-micron drum screens to remove solids before injection. The effluent TSS solids will be less than 20 milligrams per liter (mg/L). Also, the wells are designed with 18-inch casing and 100 feet of open hole to provided injection capacity in the long term.

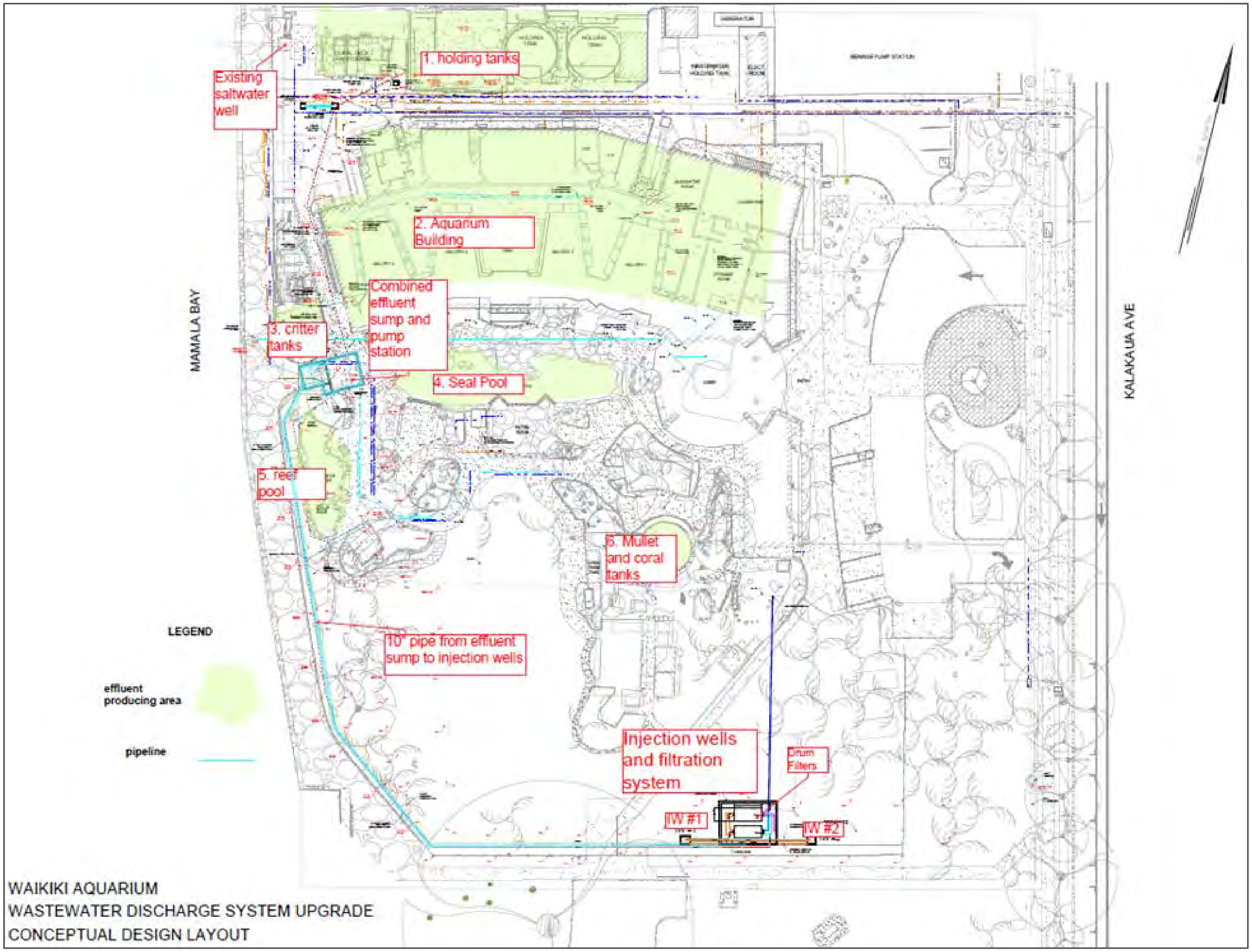


Figure 6. Site plan showing the six effluent-producing area (highlighted in light green).

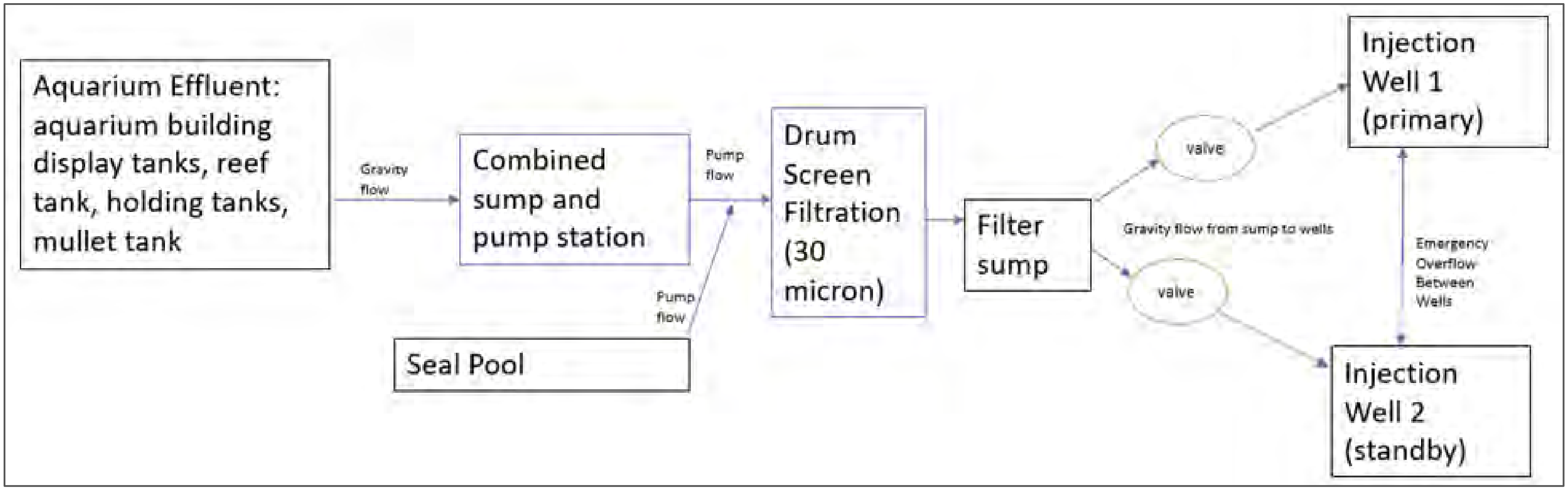


Figure 7. Waste stream schematic.

Table 2 Discharge chemistry of wastewater from Waikīkī Aquarium.

Month	PO4-3 (µg-P/L)	NO3- + NO2- (µg-N/L)	NH4+ (µg-N/L)	Si (µg-Si/L)	TP (µg-P/L)	TN (µg-N/L)	Turbidity (NTU)	Salinity (ppt)	Chl a (µg/L)
Aug-15	27.0	122.7	35.7	3428.1	33.5	352.3	0.36	34.279	0.194
Oct-15	27.6	179.6	16.0	889.2	36.2	376.2	0.51	34.572	0.114
Dec-15	26.6	149.3	20.2	1565.5	31.9	271.6	0.34	34.528	0.183
Feb-16	29.7	168.4	16.5	1120.6	38.4	374.7	0.37	34.732	0.93
Apr-16	38.1	222.9	14.6	1168.4	44.9	346.1	0.16	34.404	0.458
Jun-16	28.5	252.7	24.0	1034.4	36.6	429.4	0.67	34.668	0.247
Aug-16	19.2	162.8	42.3	839.2	29.4	377.8	0.23	35.038	0.075
AVERAGE:	**28.1**	**179.7**	**24.2**	**1435.1**	**35.8**	**361.1**	**0.38**	**34.603**	**0.314**

3.2.3 Coastal Discharge

An additional regulatory design consideration is the County of Maui v. Hawaiʻi Wildlife Fund U.S. Supreme Court case, which may require injection wells that ultimately discharge into the ocean to also obtain Clean Water Act NPDES permits. The U.S. Supreme Court issued an opinion on wastewater injection wells in Maui (U.S. Supreme Court, 2020). The Court adopted a "functional equivalent" test and identified a number of factors for the lower courts to consider when determining whether a discharge to groundwater is the functional equivalent to a direct discharge to navigable waters (Pacific Ocean). At the time of this document, the final regulatory outcome of the decision is not known.

Despite that uncertainty of the regulatory outcome, the injection wells are designed to be deeper than hydraulically and geologically necessary to minimize the impact of discharge to nearshore waters. The disposal interval of the wells will be at least 100 feet below sea level. The deeper discharge interval will result in longer travel distances and time before the injectate discharges into the ocean. There will be more opportunity for dilution with naturally occurring groundwater and more opportunity for aquifer treatment. In addition, the injectate groundwater will discharge further offshore.

3.3 Operation

Injection well operation is not, strictly speaking, a design consideration, but it is an issue that the Aquarium should consider. The injection well system will have two wells, one operational and one standby. A standby well is essential because water disposal capacity is a critical function for maintaining the aquarium habitats. As mentioned previously, all wells will gradually decline in performance, and it is important to monitor the performance so that plans can be made for cleaning or maintenance. By "decline in performance" we mean that injection water levels will gradually increase.

General recommendations are as follows:

1. Measure depth to water in the wells during injection on a monthly basis. The purpose is to have a record of changes in well performance. If operational experience shows little change in depth to water this could be changed to quarterly. These data will provide a basis of planning for well cleaning.
2. Alternate the operational wells on a regular basis. This will ensure that the performance and operational status of both wells is known.
3. Based on the performance determined in recommendation 1, plan and budget for well cleaning. At this time, we cannot predict how often the wells will need cleaning. This will be a function of the original well performance, actual nutrient flux affecting microbial growth and actual TSS entering the well.

4.0 POTENTIAL IMPACTS AND MITIGATION

The injection wells are anticipated to have no significant adverse effect on groundwater resources and coastal discharge.

4.1 Impacts to Coastal Discharge

Potential Impact

The injectate may affect the water quality of groundwater discharging into the ocean and this may have a subsequent impact on Groundwater Dependent Ecosystems (GDEs). GDEs include springs and seeps, submarine groundwater discharge, karst systems, and deep-rooted plant communities (phreatophytes). All of these ecosystem uses may impact traditional and customary (T&C) uses. Known T&C uses are along the coastal zone and are heavily dependent on GDEs. For example, limu gathering and fishing are known practices in Waikīkī.

Conclusion

The injection will have minimal impact on coastal discharge and GDEs and downgradient water-related T&C uses. There will be a slight improvement from current conditions when the new water system is complete because (1) The NPDES ocean outfall discharge will be terminated and (2) The new water system will include more effective filtration.

Mitigation Factors

- The injectate fluid will be roughly seawater quality (19,000 mg/L chloride) in terms of salinity. The density and salinity of the injectate will not be significantly different from the seawater.
- The wastewater will be filtered. The wastewater will be filtered with 30-micron drum screens to remove solids before injection. The effluent TSS will be less than 20 mg/L.
- No sanitary wastewater will be discharged into the injection wells.
- The Waikīkī Aquarium will routinely sample the effluent water to ensure that the drum screens are functioning correctly.
- The disposal interval of the wells will be at least 100 feet below sea level. This will result in longer travel distances and time before the injectate discharges into the ocean. There will be more dilution with naturally occurring groundwater and more opportunity for aquifer treatment. In addition, the injectate groundwater will discharge further offshore.

4.2 Impacts to Drinking Water and Domestic Water Use

Potential Impact

The injectate may affect drinking water or domestic water use.

Conclusion

The injection will have no impact on drinking water or domestic water use because the receiving aquifer is not used for domestic or drinking purposes.

Mitigation Factors

- The Site is located makai of the UIC line, and therefore is in an exempted aquifer as defined by the DOH (HAR §11-23; DOH 1992). To provide further protection, the injection wells are regulated by the UIC Program of the DOH Safe Drinking Water Branch. The injection wells will be compliant with DOH policy, permit conditions, and rules in HAR §11-23, further reducing any adverse effects.
- The wells are designed with over 500 feet of vertical separation from the underlying basalt aquifer. The upgradient part of the basalt aquifer (Pālolo Aquifer System) is used for drinking water purposes, but the underlying portion is to saline for drinking water purposes.
- The wastewater will be filtered. The wastewater will be filtered with 30-micron drum screens to remove solids before injection. The effluent TSS will be less than 20 mg/L.
- No sanitary wastewater will be discharged into the injection wells.
- The water will be discharged into the Caprock aquifer, and the Caprock aquifer is classified by the DOH as non-potable because salinity levels are too high for drinking water purposes.
- There are no drinking water or domestic wells in the vicinity.
- The Waikīkī Aquarium will routinely sample the effluent water to ensure that the drum screens are functioning correctly.

4.3 Impacts to Aquifer and other Groundwater Users

Potential Impact

The injectate may affect the aquifer or other groundwater users.

Conclusion

The injection will have minimal impact on the aquifer and no impact on other groundwater users.

Mitigation Factors

- The injectate fluid will be roughly the same quality (19,000 mg/L chloride) in terms of salinity as the receiving aquifer. Therefore, the density and salinity of the injectate will not be significantly different from the groundwater in the aquifer.
- There are no other groundwater users in the vicinity, so there will be no impact to other users.

4.4 Impacts to Public Trust Uses

Potential Impact

The injectate may affect Public Trust water uses. According to Hawaii's state constitution, water resources are held in trust by the State for the benefit of the people. The following four public trusts are recognized: (1) maintenance of waters in their natural state; (2) domestic water use of the general public, particularly drinking water; (3) the exercise of Native Hawaiian T&C rights; and (4) reservations of water for Hawaiian Home Lands.

Conclusion

The injection will have no impact on Public Trust uses.

Mitigation Factors

1. As stated in in Section 4.1, groundwater withdrawals will not significantly impact the maintenance of waters in their natural state. GDEs are an important aspect of this Public Trust use. Groundwater withdrawals are not expected to significantly affect coastal groundwater discharge.
2. As addressed in Section 4.2, the project will not affect domestic water use.
3. Native Hawaiian T&C rights deriving from GDEs will not be affected as GDEs are not anticipated to be adversely affected.
4. There are no reservations for Hawaiian Home Lands in the Honolulu Caprock.

4.5 Impacts to Visual Resources

Potential Impact

The injection wells will impact visual resources at Kapi'olani Park and the Aquarium.

Conclusion

The wells will not be visible after construction is completed; therefore, there will be no impact to visual resources.

Mitigation Factors

The wells will be completed in a vault below ground surface.

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Appendix D:

Terrestrial Biological Resources Study

ATTACHMENT D

Terrestrial Biological Resources Study

Waikīkī Aquarium Water System Upgrade

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EXECUTIVE SUMMARY

The outdoor area of the Waikīkī Aquarium (WAq) is entirely landscaped, with planted native plants for educational purposes and ornamental landscaped vegetation. On May 18, 2022, a terrestrial biological resources and a bird survey were conducted at WAq. The survey took place in the outdoor area of WAq, including the grassed lawn area and front of the building along Kalakaua Avenue. They survey spanned from the fence boundary line along beach walkway to the property line along Kalakaua Avenue on the southern side of the property.

All vegetation at WAq is cultivated and landscaped, with numerous native plants on display for educational purposes. The most abundant plant species were *naupaka kahakai* (*Scaevola taccada)*, portia tree (or milo, *Thespesia populnea),* coconut trees (*Cocos nucifera*), ti leaf (*Cordyline fruticose*), and tree heliotrope (*Heliotropium arboretum*). One giant African Snail (*Achatina fulica*) was observed in the lawn area. No mammals or other macro fauna were observed.

A bird survey was conducted during the morning hours before the Aquarium opened in the lawn area. In addition to introduced common bird species to urban Honolulu, two (2) white fairy tern (*Gygis alba*) nests were observed in separate milo trees (*Thesesia populnea*) near to the public restrooms and mullet tank. The milo trees that contained the nests were marked with blue tape on their trunk to designate them as white fairy tern nesting trees and warn tree maintenance crews of their presence. According to WAq staff, at the time of the site visit on May 18, 2022, one nest had a recently fledged offspring (only one adult was observed), and the other nest had a 2-day old chick and an adult. The parent white fairy tern was observed feeding the chick during the site survey.

There were no protected flora or fauna species within the surveyed project area; however, pre-consultation with the PIFWO identified the following federally listed species that may occur or transit through the proposed project area:

- The endangered Hawaiian hoary bat (*Lasiurus cinereus semotus)*
- The endangered Hawaiian petrel (*Pteerodroma sanwichensis)*
- The threatened Newell's shearwater (*Puffinus auricularis newelli)*
- The endangered Hawaii distinct population segment (DPS) of band-rumped storm-petrel (*Oceanodroma castro)*
- The threatened Central North Pacific DPS of green sea turtle (*Chelonia mydas*).

Green sea turtles (*Chelonia mydas*) and Hawaiian monk seals (*Neomonachus schauinslandi*) are known to visit nearby beaches in Waikīkī and nearshore waters in Mamala Bay. Construction of the proposed project will be conducted entirely on the WAq parcel and there will not be any in water work. Construction best management practices (BMPs) plan should be enforced to avoid impacts to marine species.

Impacts from project operations on terrestrial flora and fauna will be minimal, as the entire parcel is heavily landscaped and all vegetation on site is cultivated. There will be excavation work needed to install the underground utilities and pipes and the sump, but disturbance of large mature trees will be minimized as much as possible. In particular, the milo trees with active *Gygis alba* nests should be properly flagged and not be disturbed until the chicks have fledged and the nesting season has passed. To avoid and minimize impacts to the Hawaiian hoary bat, woody plants greater than 15 feet tall shall not be disturbed, removed, or trimmed during bat birthing and pupping season (June 1 through September 15). Construction of the sump and appurtenances will avoid disturbing as many mature trees as possible, and no night work or artificial lighting should be done to avoid confusing sea birds and turtles.

1. INTRODUCTION

The Waikīkī Aquarium (the Aquarium) is located at the southern end of the world-famous Waikīkī Beach and welcomes more than 250,000 visitors annually. The Aquarium was established in 1904 and has been a part of University of Hawaiʻi (UH) since 1919. The Aquarium moved to its present location in 1955, making it the second oldest aquarium in the United States (U.S.). Much of the Aquarium's aging water system infrastructure was designed prior to modern Federal Clean Water Act regulations and does not meet current regulatory requirements, which has resulted in State, Federal and City regulatory citations.

Much of WAq's aging infrastructure is original since 1955, well beyond its engineering life and outdated, resulting in effluent which fails to meet current regulatory requirements. In August 2019, the Aquarium was notified by the City and County of Honolulu (CCH) Department of Health (DOH) Clean Water Branch (CWB) that it was violating applicable laws by discharging saltwater that did not meet environmental quality thresholds directly into the ocean. The DOH issued an Administrative Order on Consent (AOC) pursuant to its authority to regulate water pollution under Hawaiʻi Revised Statutes (HRS) Chapter 342D and Federal Environmental Protection Agency authorization to issue National Pollutant Discharge Elimination System (NPDES) permits in Hawaiʻi under Section 402 of the Clean Water Act. The University of Hawaiʻi (UH) contracted Oceanit to develop an improved Water System Infrastructure Design for exhibit operations at the Aquarium and to provide an optimized effluent discharge process that will comply with Federal, State, and CCH regulatory requirements.

This Draft Environmental Assessment (EA) is being prepared for WAq's Water System Upgrade in accordance with Hawai'i Revised Statutes (HRS) Chapter 343. According to Hawai ʻi Revised Statutes (HRS) Chapter 343-5, an environmental assessment is required as the proposed action (1) Propose[s] the use of state or county land or the use of state or county funds.

To evaluate environmental impacts that may arise from the proposed action, the intent of this survey report is to identify terrestrial biological resources present within the WAq property. Data collected from this survey will identify and mitigate potential impacts to these resources from short-term construction activities or long-term impacts related to the proposed action.

1.1 Site Description

The Waikīkī Aquarium is located in Honolulu on the south shore of the island of Oʻahu next to the Waikīkī Natatorium War Memorial and Kapiʻolani Park (Figure 1-1). The Aquarium abuts the shoreline seawall on its south edge and extends north up to Kalākaua Avenue. The majority of the major infrastructure from 1955 remains in use today, including the salt water well which was constructed to supply the display tanks. A Marine Life Conservation District (MLCD) lies just offshore of Waikīkī Aquarium. Renown Waikīkī beaches and recreational areas surround the facility. Figure 1-1 presents the Project Location Map.

The Aquarium houses both native and nonnative saltwater animals and some freshwater species in approximately 60 public exhibits and behind the scenes holding tanks that are in operation at any given time. The largest display is a 70,000-gallon seawater pool, which houses an endangered Hawaiian Monk Seal. "Native Tanks" include tanks that house Native Hawaiian saltwater species and solitary non-breeding, non-native animals. Tanks that house native animals may also include one or two nonnative animals that are unable to reproduce and therefore would not cause invasive species introduction when discharged to the ocean.

Figure 1-1: Project Location Map

"Non-Native Tanks" include those that house non-native animals or native animals which require any live non-native feed. Hawaiian freshwater animals are housed separately. Effluent water from native exhibits is discharged through a nearshore outfall under a NPDES permit issued by the DOH. Effluent from non-native exhibits is discharged into the CCH sanitary sewer system.

The Aquarium parcel extends from Kalākaua Avenue to the fence line along the pedestrian promenade above the seawall on the makai side. The Aquarium and associated buildings occupy the about half the parcel on the northern end, while an outdoor grassed courtyard area occupies the south side of the property. This area is a manicured lawn area lined by coconut trees used for events and for visitor gatherings. Landscaped ornamental plants also are present on the east side of the property, along the façade of the Aquarium entrance. Figure 1-2 depicts existing conditions.

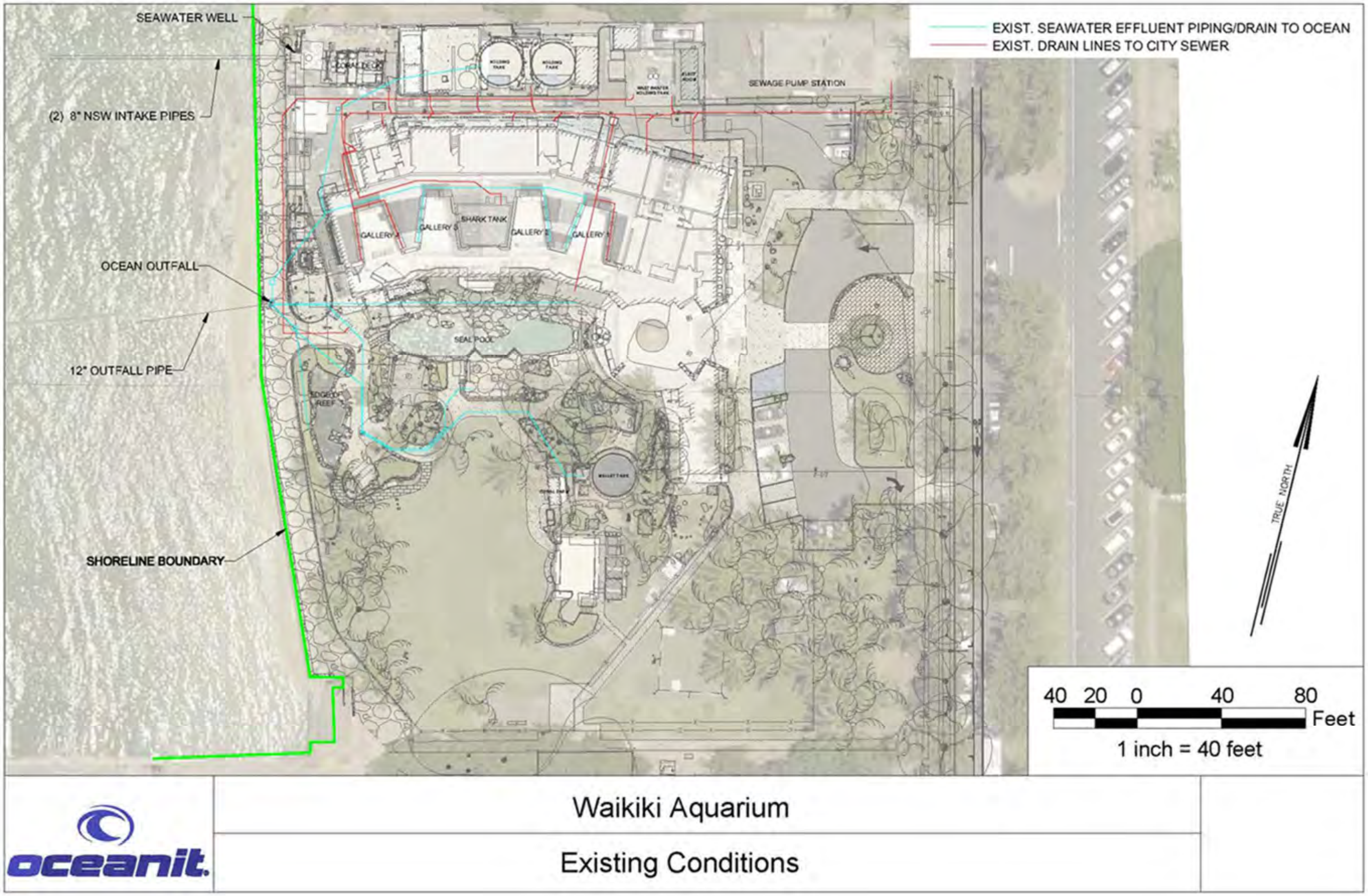

Figure 1-2: WAq Existing Conditions

1.1.1 Aquarium Plant Guide

The Aquarium has various native plants that serve as landscape plants on their property and are used , which they use for educational purposes. These landscaped plants are identified on their *Hawaiian Plant Guide* Brochure (Aquarium, 2022) (Figures 1-3 and 1-4). All native plants specified in the plant guide below were verified at their locations during the May 18, 2022 site visit.

Source: Waikīkī Aquarium (https://www.waikikiaquarium.org/experience/plants-seaweeds/hawaiian-plant-guide/)

Figure 1-3: Aquarium Native Plant Location Guide Map

Source: Waikīkī Aquarium (https://www.waikikiaquarium.org/experience/plants-seaweeds/hawaiian-plant-guide/)

Figure 1-4: Aquarium Native Plant Guide

1.2 Proposed Action

The Proposed Action is to dispose of all effluent into two on-site injection wells, eliminating direct effluent discharge into ocean and into the city sewer system. Effluent from native and non-native tanks will flow by gravity to an underground discharge/transfer sump, where it will be pumped by three sump pumps through two drum screen filters housed in a built above ground structure. The drum screen filters will filter the effluent down to 20 microns prior to being discharged into the injection wells. A conceptual schematic is shown in Figure 1-5 and the Water System Upgrade Plan is presented in Figure 1-6. The construction Scope of Work for the Proposed Action will include:

- Construct and test two injection wells;
- Install drum screen filters and backwash station at the injection well head;
- Construct a drum screen filter house;
- Install a discharge sump, pumps, and feedback controls;
- Install new wastewater plumbing to reconfigure exhibit & filter backwash discharges to the discharge sump, drum screen filter backwash to sewer;
- Install freshwater plumbing to supply drum screen filter backwash station; and

- Complete electrical work to connect new pumps and drum screen filters.

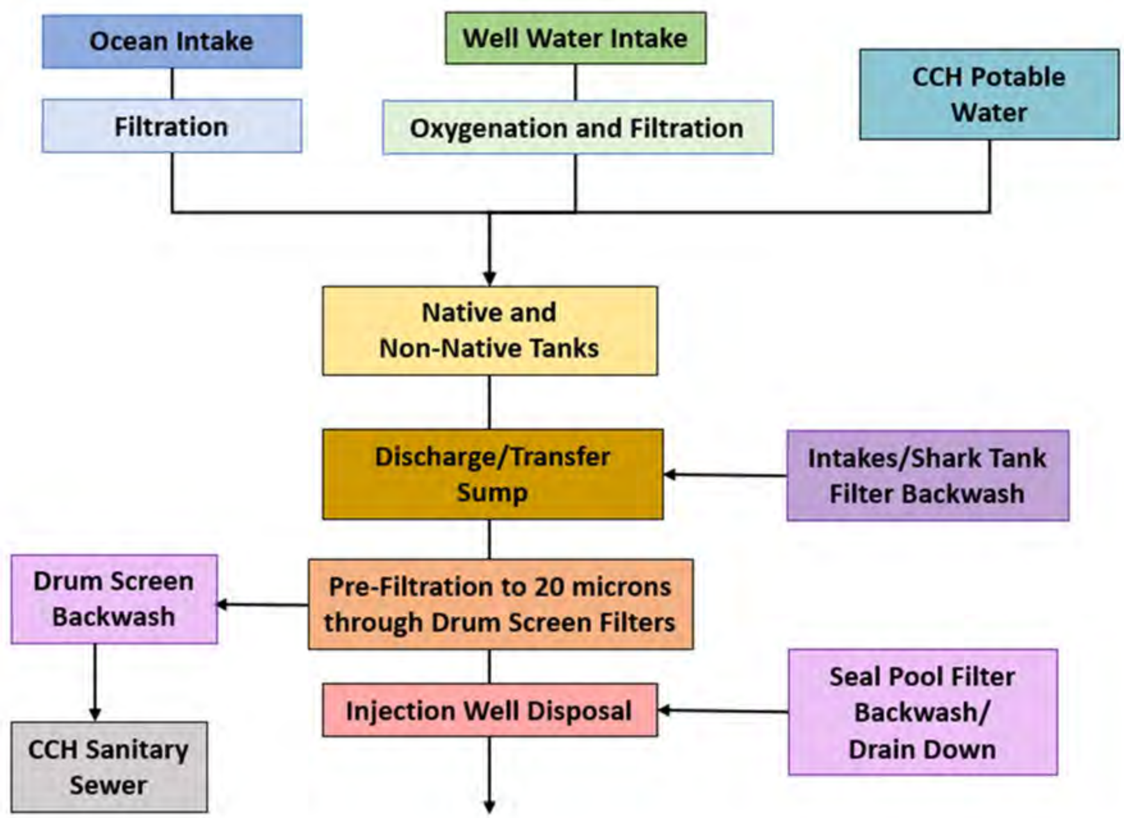

Figure 1-5: Conceptual Schematic of the Proposed Action

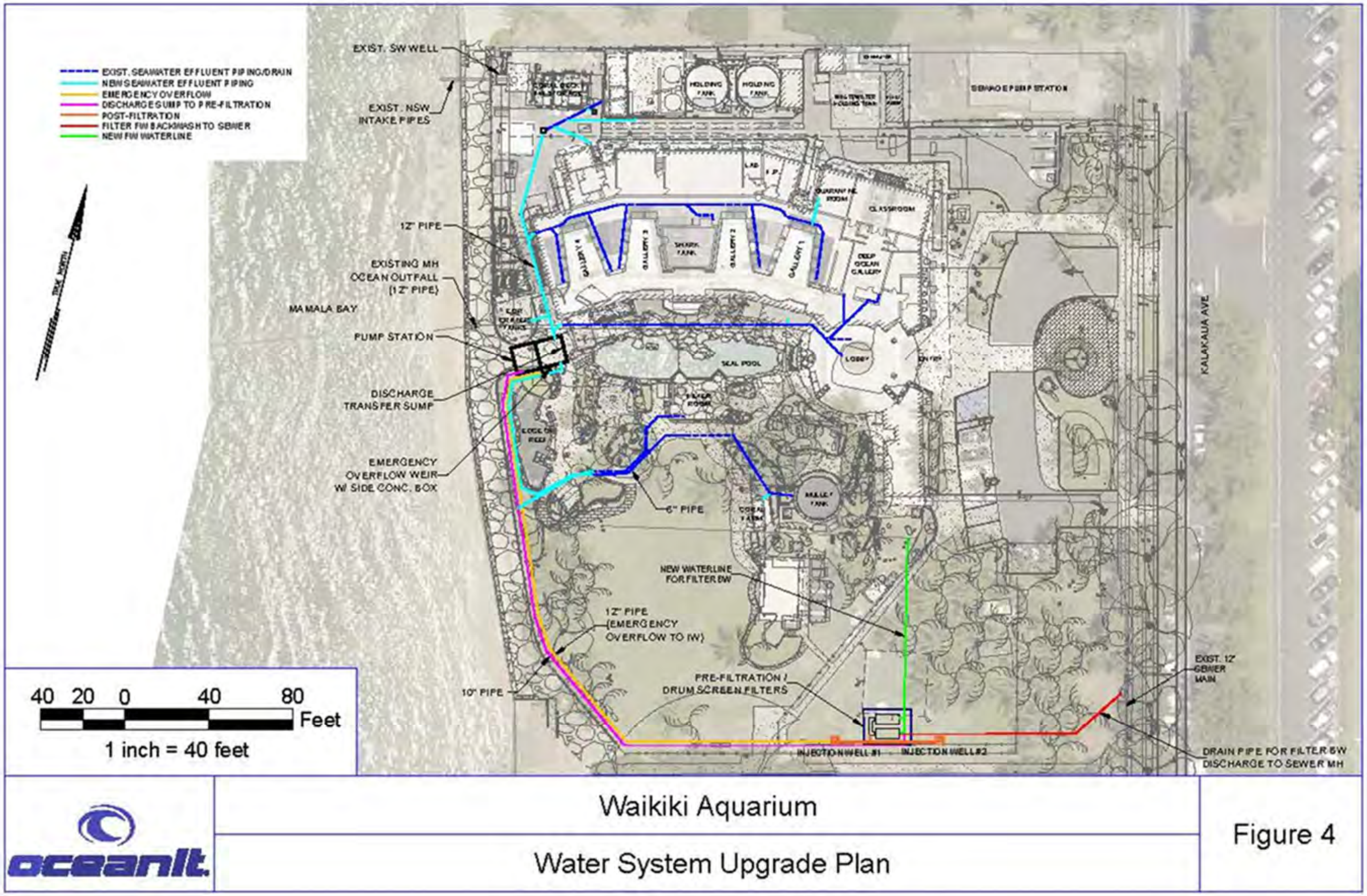

Figure 1-6: Proposed Layout for the Proposed Action - All Effluent Discharge Through Two Injection Wells

2. SURVEY METHODS

A biologist conducted a walking survey for terrestrial flora (i.e., vegetation) and fauna in the outdoor area at the Aquarium on May 18, 2022. The survey area included the lawn gathering area, landscaped native plant live displays, and the front of the WAq to Kalākaua Avenue. All observed plant, invertebrate, and bird species encountered were recorded.

The bird survey was conducted in the morning on May 18, 2022 and included a stationary point count on the south end/fenceline of the property. The survey included a 10-minute viewing period where all birds observed during were recorded within a visible radius of the observer and by listening for vocalizations (Figure 1-2; Attachment A; Photo 1). Other incidental observations of birds during the walking survey were also recorded.

3. SURVEY RESULTS

3.1 Terrestrial Flora

The WAq site is heavily developed and there are WAq staff, volunteers, and visitors in and around the area. The outdoor area of WAq including the grassed courtyard area, is heavily manicured with ornamental plants and native plantings used for educational purposes (see Section 1.1.1).

A total of 25 plant species were identified during the survey on May 18, 2022. Terrestrial plants were all ornamental, landscaped introduced plants or native plants. The vegetation line along the coastline is either not existent due to the presence of seawalls and sand bag erosion control structures, landscaped by the condominiums, or highly disturbed by wave erosion events and anthropogenic use. The soil inland of the seawall and sandbags is mainly fill material vegetated with landscaped grass. There were no plants of concern that were identified as protected, threatened, or endangered (USFWS, 2015; DLNR, 2019).

The most abundant plant species along the shoreline are *naupaka kahakai* (*Scaevola taccada)*, portia tree (or milo, *Thespesia populnea),* and false Kamani (*Terminalia catappa*). A few native plants were observed, including *naupaka kahakai, milo, Pritchardia spp.* palm, *akiʻaki (Sporobolus virginicus),* and the seaside morning glory (pohuehue, *Ipomoea pes-caprae subp. brasilensis*). However, the *naupaka, Pritchardia spp.* palm, and *milo* appeared to be landscaped. A detailed plant list is included in shown in Table 3-1.

Figure 3-1: Flora observed in the project area

Family	*Genus species*	Common Name	Status*	Abundance**
Aizoceae	*Sesuvium portulacastrum*	Sea Purslane / ʻĀkulikuli	N	U
Araceae	*Colocasia esculenta*	Taro / Kalo	P	R
Arecaceae	*Cocos nucifera*	Coconut Tree	P	A
Arecaceae	*Pritchardia spp.*	Fan Palm / Loulu	N	R
Asparagaceae	*Cordyline fruticosa*	Ti Leaf / Kī	N	A
Boraginaceae	*Heliotropium arboreum*	Tree heliotrope	I	A
Boranginaceae	*Cordia subcordata*	Hawaiian Kou	N	R
Casuarinaceae	*Casuarina equisetifolia*	Ironwood	I	C
Convulvulaceae	*Ipomoea pes-caprae*	Beach Morning Glory / Pohuehue	N	O
Euphobiaceae	*Aleurites moluccana*	Candle nut tree / Kukui	P	C
Fabaceae	*Vigna mariana*	Beach Pea / Nanea	N	U
Goodeniaceae	*Scaevola taccada*	Beach Naupaka / Naupaka Kahakai	N	A
Lamiaceae	*Vitex rotundifolia*	Beach Vitex / Pōhinahina	N	O
Malvaceae	*Hibiscus arnottianus*	White Hibiscus	N	U
Malvaceae	*Thespesia populnea*	Portia Tree / Pacific Rosewood / Milo	N	C
Myrtaceae	*Metrosideros polymorpha*	Red and Yellow Ohia / ʻŌhia Lehua	N	O
Pandanaceae	*Pandanus tectorius*	Screw Pine / Hala	N	O
Poaceae	*Sporobolus virginicus*	Aki'aki / Seashore Rushgrass	N	U
Poaceae	*Cynodon dactylon*	Manicured Grass / Bermuda grass	I	A
Polypodiaceae	*Phymatosorus scolopendria*	Maile-scented fern / Lauaʻe	I	C
Rosaceae	*Osteomeles anthylliifolia*	Hawaiian Rose / Ūlei	N	O
Rubiaceae	*Gardenia taitensis*	Tahitian gardenia	I	C
Scrophulariaceae	*Myoporum sandwicense*	False Sandalwoond / Naio	N	R
Thymelaeaceae	*Wikstroemia oahuensis*	Oʻahu false ohelo / ʻĀkia	N	U
Xanthorrhoeaceae	*Dianella sandwicensis*	Hawaiian lily / ʻUki ʻuki	N	C

** Abundance R - Rare (1-2 observations)
U - Uncommon (3-5 observations)
O - Occasional (5-10 observations)
C- Common (11-20 observations)
A - Abundant (>20 observations)

* Status: N - Native to Hawaii, indigenous
I - Introduced, exotic
P - Polynesian introduction before 1778

3.2 Terrestrial Fauna

All bird species observed during the bird survey and the walking survey were introduced species commonly seen in populated areas across the Hawaiian Islands. Only one native bird species was observed, the white fairy tern (*Gygis alba)*. Two (2) fairy tern (*Gygis alba*) nests were observed in separate milo trees (*Thesesia populnea*) near to the public restrooms and mullet tank. The milo trees that contained the nests were marked with blue tape on their trunk to designate them as fairy tern nesting trees and warn tree maintenance crews of their presence. According to WAq staff, at the time of the site visit on May 18, 2022, one nest had a recently fledged offspring (only one adult was observed), and the other nest had a 2-day old chick and an adult. The parent fairy tern was observed feeding the chick fish during the site survey. The white fairy tern is protected under the Migratory Bird Treaty Act (MBTA). A total of 10 species of birds were recorded (Table 3-2).

Table 3-1: Birds Observed in and Near the Survey Area

Common Name	Scientific Name	Status
Common Myna	*Acridotheres tristis*	Non-native
House Finch	*Passer domesticus*	Non-native
House Sparrow	*Haemorhous mexicanus*	Non-native
Red-crested Cardinal	*Paroaria coronata*	Non-native
Red-vented Bulbul	*Pycnonotus cafer*	Non-native
Rock Pigeon	*Columba livia*	Non-native
Rose-Ringed Parakeet	*Psittacula krameria*	Non-native
Spotted Dove	*Streptopelia chinensis*	Non-native
White Fairy Tern	*Gygis alba*	Native
Zebra Dove	*Geopelia striata*	Non-native

Two large banyan trees reside on Kaimana Beach Park / Natatorium parcel just south of the WAq property. Many of the rose-winged parakeets (*Psittacula krameria*) and rock pigeons (*Columba livia*) that passed through the project area were enroute to the two banyan trees.

One Giant African Snail (*Achatina fulica*) was observed in the lawn area. No large mammals were observed. There were no protected species of mammals, birds, reptiles, or insects observed. Although not observed during the time of the survey, rats (*Rattus spp.*), house mice (*Mus musculus*), feral cats (*Felis catus*), and the small Indian mongoose (*Herpestes javanicus*) are likely to occur in the survey area.

Pre-consultation with the PIFWO identified the following federally listed species that may occur or transit through the proposed project area:

- The endangered Hawaiian hoary bat (*Lasiurus cinereus semotus)*
- The endangered Hawaiian petrel (*Pteerodroma sanwichensis)*
- The threatened Newell's shearwater (*Puffinus auricularis newelli)*
- The endangered Hawaii distinct population segment (DPS) of band-rumped storm-petrel (*Oceanodroma castro)*
- The threatened Central North Pacific DPS of green sea turtle (*Chelonia mydas*).

Hawaiian hoary bats roost in exotic and native woody vegetation over 15 feet in height. Several trees within the project area that are greater than 15 feet in height.

Hawaiian seabirds may pass through the project area at night during the breeding, nesting, and fledging seasons (March 1 to December 15). Outdoor and artificial lighting attracts seabirds and can result in seabird disorientation, fallout, and injury or mortality. Fledging birds are particularly vulnerable and would most likely pass through the site between September 15 through December 15.

Green sea turtles may next on any sandy beach in the Pacific Islands and may become disoriented by artificial lighting. Although there is no sandy beach at the project site, there are many sandy beaches adjacent to the project site. Due to the sheer amount of people and tourists that occupy Waikīkī beaches, sea turtle nesting is not common in the area.

4. CONCLUSIONS

Impacts from project operations on terrestrial flora and fauna will be minimal, as the entire parcel is heavily landscaped and all vegetation on site is cultivated. There will be excavation work needed to install the underground utilities and pipes and the sump, but disturbance of large mature trees will be minimized as much as possible. In particular, the milo trees with active *Gygis alba* nests should are properly flagged and should not be disturbed until the chicks have fledged and the nesting season has passed.

No sensitive, protected, rare, threatened, or endangered species were observed within the project area. A wide variety of native plants are cultivated and planted on display for public educational purposes. Any impacts to extant terrestrial species will be localized and temporary, especially if proper BMPs and control plans are implemented. Construction routes and equipment areas should be staged along existing roads, walkways, and open lawn areas to minimize impacts to planted vegetation.

During the pre-consultation process, the Pacific Islands Fish and Wildlife Office (PIFWO) was contacted for their input on the proposed project. Mitigation measures for the Hawaiian hoary bat, seabirds, and green sea turtle suggested by the PIFWO are summarized below.

- To avoid and minimize impacts to the Hawaiian hoary bat, woody plants greater than 15 feet tall shall not be disturbed, removed, or trimmed during bat birthing and pupping season (June 1 through September 15), and barbed wire should not be used for fencing. Construction of the sump and appurtenances will avoid disturbing as many mature trees as possible.
- To minimize impacts to seabirds and sea turtles, the project should avoid outdoor lighting and only limit work during daylight hours, so that it does not attract shearwaters to the construction site. Should nighttime work need to be conducted, nighttime construction should be avoided during the seabird fledging period (September 15 through December 15) and during sea turtle nesting and hatching season (May through December). Additionally, design measures that can be incorporated into the construction or operation of buildings adjacent to the beach include tinting or using automatic window shades for exterior windows that face the beach, reducing the height of the exterior lighting to below three feet and pointed downward or away from the beach, and minimize light intensity to the lowest level feasible. If these mitigation measures are followed, impacts to terrestrial resources and federally protected species will be minimal (PIFWO, 2022).

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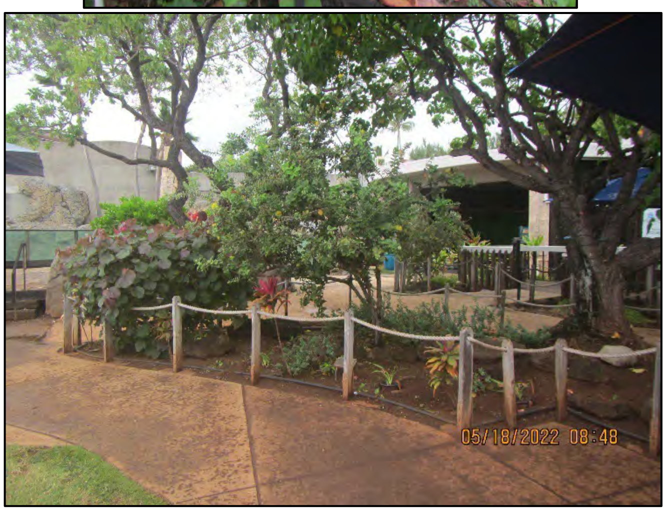
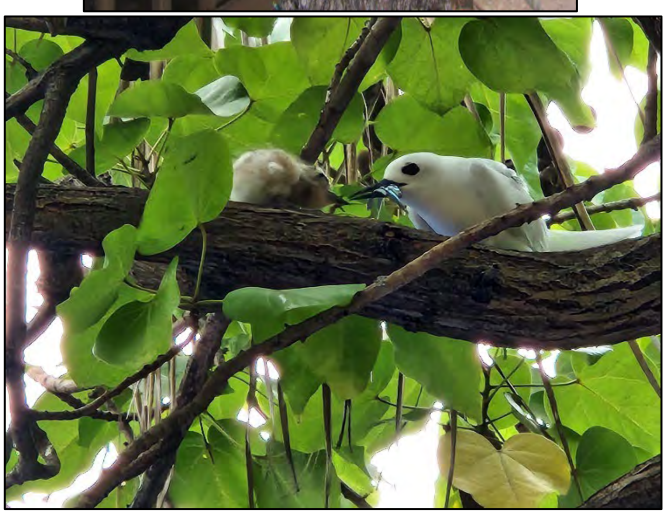
USFWS, 2015. List of species believed to or known to occur in Hawaii. Environmental Conservation Online System. Accessed June 2019. Available at < https://ecos.fws.gov/ecp0/reports/species-listed-by-state-report?state=HI&status=listed>

Attachment A:

Photograph Log

No.	Photograph	Description
1		Photograph open lawn area with mix of grass and turf, taken from bird survey post on the south end of the property line facing north. The Pacific Ocean is to the left, Kalākaua Avenue to the right.
2		Photograph of the northeast corner of the property, facing east toward Kalākaua Avenue. The proposed injection wells will be located in this area.
3		Stage area with potted palms and ornamental plants decorating the stage. The entire area is heavily landscaped.

No.	Photograph	Description
4		Cultivated native white hibiscus plant (*Hibiscus arnottianus*) is an educational live display.
5		Landscaped areas contain native plants that are for public viewing and education.
6		Yellow ʻōhia lehua (*Metrosideros polymorpha*) and red ʻōhia lehua are planted on the WAq site but are not naturally occurring.

No.	Photograph	Description
7		Several planted Hawaiian lily (*Dianella sandwicensis)* plants are on educational display.
8		Two milo (*Thespesia populnea*) trees have active white fairy tern (*Gygis alba)* nests during the May 18, 2022 site visit and are labeled with blue tape.
9		During the site visit on May 18, 2022, a parent white fairy tern (*Gygis alba)* was observed feeding live fish to its offspring.

No.	Photograph	Description
10		Landscaped plants are cultivated in the groundskeeper's area and then planted in the publicly viewed areas of the Aquarium.
11		Beach vitex/ Pōhinahina (*Vitex rotundifolia*) is planted in several locations for public education viewing.

No.	Photograph	Description
12		Several decorative fan palm (*Pritchardia spp.*) trees are present in landscaped areas.
13		Beach naupaka (*Scaevola taccada*) is commonly present, here shown lining the Edge of Reef exhibit.
14		Tahitian gardenia (*Gardenia taitensis*) line the front of the Aquarium.

No.	Photograph	Description
15		Coconut trees (*Cocos nucifera*) trees along are present along the perimeter of the open lawn area.
16		Ironwood *(Casuarina equisetifolia*) trees line Kalākaua Avenue and the sidewalk.

No.	Photograph	Description
17		A large single Hawaiian Kou Tree (*Cordia subcordata*) greets visitors at the front of the Aquarium.

Appendix E:

Tree Protection/Preservation Plan

Tree Solutions & Environmental Consulting Services, Inc.
P.O. Box 10026
Honolulu, Hawaii 96816
808-734-5963

Tree Protection/Preservation Plan (TPPP) for Oceanit- Waikiki Aquarium

1. The General Contractor shall retain the services of a qualified Certified Arborist who has been certified for at least 5 years, with experience in tree protection and preservation planning during construction, tree and root pruning, and transplanting of trees. The Contracting Office shall approve the selection of the Certified Arborist (henceforth, ‘Arborist’). The Arborist shall provide consulting services and perform quality assurance duties during the pre-contract and contract period of work. The Arborist shall also ensure that branch and/or root pruning is performed in accordance with ANSI A-300 Part 1 (current) standards as approved by the International Society of Arboriculture (ISA) and the Tree Care Industry Association (TCIA). He or she will further ensure that proper measures are taken to protect the crown and root systems of the trees from unnecessary damage from construction activity. When potentially damaging construction activities arise, i.e. major support root removal, excessive root removal on one or more sides of the tree, major crown branch removal, or tree transplanting, the Arborist will ensure that all such activity is performed in a manner that will minimize damage to the tree. He or she will ensure that the trees are provided proper care and retain good health during the demolition and construction period as he or she may determine. Alternative procedures may be required on a tree-by-tree basis and field decisions by the Arborist, Contractor, and Contracting Officer may be required to ensure the safety and health of the trees, for example, relocating of driveways, utilities, curbs or trees. The Arborist shall direct, assist and monitor the contractors Qualified Tree Care and/or Landscape (Sub)Contractor’s Certified Arborist or Certified Tree Worker during implementation of the TPPP.

2. The Contractor shall arrange a pre-construction meeting which shall be attended by the Contractor, Sub-Contractors, the Contracting Officer, selected Consultants, and the Arborist to review procedures for performing tree-related work, work in the areas around the trees, access routes and storage areas, and what measures may need to be taken to protect trees during the construction period.

3. **The “Tree Protection Zone” (TPZ) and/or Barrier:** The Arborist shall determine the appropriate TPZ after consulting with the Contractor and Contracting Officer. No grading, compacting, or construction activity shall occur in the zones immediately surrounding the tree and inside the barricaded area. Without approval from the Arborist, all underground utilities, storm drains, and irrigation lines shall be routed outside the tree protection zone. If utilities must traverse the tree protection zone, they shall be tunneled, bored at a depth of 3 feet, or greater within the zone. Where feasible, a temporary barrier shall enclose the TPZ entirely prior to any demolition work and shall remain in place until all site work is completed. The protection barriers shall not be relocated or removed without the permission of the Arborist.

4. **Limitation of Construction Activities under the Tree Crown:** The Contractor shall limit activities under the crown of trees to only those activities explicitly required to complete the construction under and/or adjacent to the tree’s crown as specified. All excavation work required under the crown of the trees shall be performed under the direction of the Arborist. Material and topsoil stockpiling, vehicle parking, temporary roadways, construction material mixing, portable latrines and field offices will not be

located either temporarily or permanently under the tree crowns unless areas have pre-existed paving and/or have been specifically approved by the Arborist.

5. **Tree Crown and Root Pruning:** The Arborist, or a Certified Arborist or Certified Tree Worker under the general supervision of the Arborist, shall perform the tree pruning and root pruning work based on ANSI A300 Pruning Part 1 (current).

6. **Root Pruning:** Before grading, preparation of roadbed, curbing and sidewalk, excavation for foundations, footings, walls or trenching, surface, roots that are greater than 2 inches in diameter must be pruned by manually digging a trench and cutting exposed surface roots with a power or hand saw, rock saw, or narrow trencher with a sharp blade, or approved root pruning equipment. Root pruning of roots below the surface will be done by carefully exposing them by hand or power equipment under the supervision of the Arborist. Any roots damaged during grading or construction shall be exposed to the nearest sound tissue and cut cleanly with a sharp saw under the Arborist's approval. Arborist shall determine whether crown pruning is required after assessing tree structure, quality, and size of roots pruned.

7. **Tree Crown Pruning:** The Arborist shall direct the Landscape (Sub)Contractor's Certified Arborist and/or Certified Tree Worker with the recommended pruning procedures (i.e. crown clean, crown raise, crown reduction, crown thinning, using ANSI A300 Pruning Guidelines Part 1 (current).

8. **Mulch:** The Arborist shall determine when mulch is required inside the TPZ. If required, mulch shall be installed inside the TPZ four inches thick. There shall be a gap of two inches between the trunk and mulch layer.

9. **Tree Maintenance:** In consultation with the Arborist, the (Sub)Contractor's Certified Arborist shall irrigate the trees as necessary to maintain their health during the course of the demolition and construction period. Groundcover is to be maintained. No herbicides are permitted under the tree crowns without prior approval.

10. **If Tree or Root Injury should occur:** If damage should occur during demolition or construction, the Contractor shall immediately report any such injury to the Arborist. The Arborist and the (Sub)Contractor's Certified Arborist shall evaluate the injury and apply the appropriate treatment. The Arborist shall submit a written report of the tree injury and treatment to the Contracting Officer.

11. **Penalties, Compensation and Mitigation:**
    Partial injury or total tree loss: The Contractor and Arborist are responsible for tree health during the construction period and within the Contractor's maintenance period. A sub-contractor shall pay to the tree owner the value of any existing trees to remain on site, provided that such tree died, sustained damage, and/or required care or removal due to failure of the sub-contractor to provide adequate protection, maintenance or full compliance with the Tree Protection and Protection Plan specifications. The Replacement will be with a comparable tree acceptable to the Arborist and the Landscape Architect. Replacement containerized shrubs will be guaranteed for 90 days post-construction. Field stock trees will be guaranteed for 1 year post-construction.

If appropriate measures have been taken to minimize the damage, and no significant tree decline, loss of function, or death occurs, penalties and/or compensation may be waived per approval of the Arborist and Contracting Officer.

The value of the tree shall be determined by the Arborist based on the methods of tree appraisal set forth in *Guide for Plant Appraisal* (10th edition). Any wound or infliction to trees remaining on site constitutes a partial injury violation.

Partial injury includes but is not limited to:

a) Mechanical injuries as breaks, rips, punctures, holes, splits, cracks, tears and other wound to tree trunk, branches or roots caused by persons, tools, vehicles, equipment or other large objects associated with construction activity.

b) Crushed roots caused by persons or equipment

c) Compacted soil caused by vehicles or heavy equipment

d) Chemical contamination by persons or equipment on construction site

e) Unapproved grade level changes

f) Improper pruning procedures

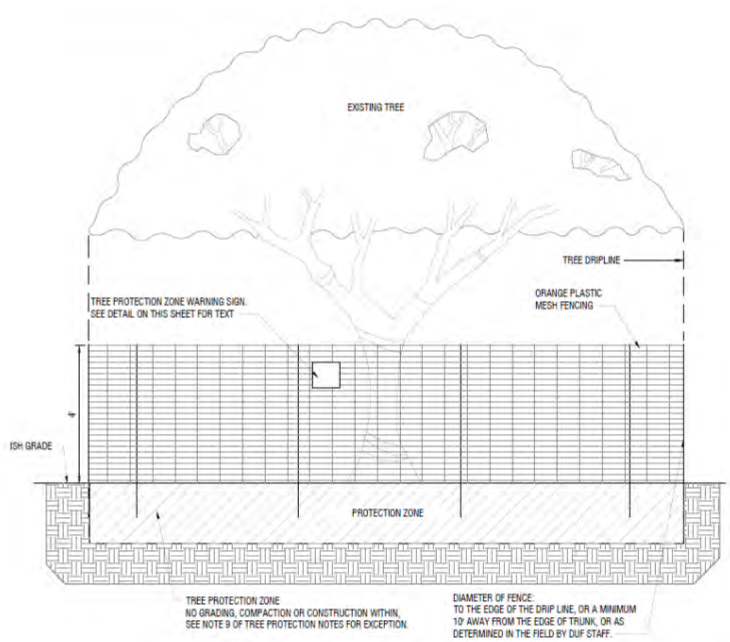
12. Special Provisions
Store fill and trenching materials away from trees (at least 15 ft.) and create ingress and egress pathway to fill site to avoid compacting areas around the tree roots

WARNING

TREE PROTECTION ZONE

THIS FENCE AND SIGN SHALL NOT BE REMOVED WITHOUT APPROVAL FROM PROJECT ARBORIST
PHONE:(808)330-1878

TREE SOLUTIONS & ENVIRONMENTAL CONSULTING SERVICES INC.



TREE PROTECTION ZONE DETAIL | SCALE: AS NOTED | 1

Appendix F:

Archeological Literature Review and Field Inspection Report in Support of Wastewater Discharge System Upgrades at Waikīkī Aquarium

REVISED DRAFT REPORT

Archaeological Literature Review and Field Inspection Report in Support of Wastewater Discharge System Upgrades at Waikīkī Aquarium in Waikīkī Ahupuaʻa, Honolulu (Kona) District, Island of Oʻahu, Hawaii

TMK: (1) 3-1-031:006 (por.)

Prepared for:
Oceanit Laboratories, Inc.
828 Fort Street, Suite 600
Honolulu, Hawaii
96813

On behalf of:
University of Hawaiʻi
Spalding Hall, 2540 Maile Way
Honolulu, Hawaii 96822

October 2022

PACIFIC CONSULTING SERVICES, INCORPORATED
720 IWILEI ROAD, HONOLULU HAWAIʻI 96817

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REVISED DRAFT REPORT

Archaeological Literature Review and Field Inspection Report in Support of Wastewater Discharge System Upgrades at Waikīkī Aquarium in Waikīkī Ahupuaʻa, Honolulu (Kona) District, Island of Oʻahu, Hawaii

TMK: (1) 3-1-031:006 (por.)

By
Nicole I. Vernon, M.A.

Dennis Gosser, M.A.
Principal Investigator

Prepared For:
Oceanit Laboratories, Inc.
828 Fort Street, Suite 600
Honolulu, Hawaii 96813

On Behalf of:
University of Hawaiʻi
Spalding Hall, 2540 Maile Way
Honolulu, Hawaii 96822

Prepared By:
Pacific Consulting Services, Inc.
720 Iwilei Road, Suite 424
Honolulu, Hawaii 96817

October 2022

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MANAGEMENT SUMMARY

Document Title:	Archaeological Literature Review and Field Inspection Report in Support of Wastewater Discharge System Upgrades at Waikīkī Aquarium in Waikīkī Ahupuaʻa, Honolulu (Kona) District, Island of Oʻahu, Hawaii
Date/Revised Date:	Preliminary Draft: July 2022; Draft Aug 2022; Revised Draft Oct 2022
SHPD HICRIS Project No.:	2022PR01098
SHPD Reference Document:	-
Archaeological Permit #:	SHPD Permit No. 22-09
Project Location:	2777 Kalākaua Ave, Honolulu, HI 96815
Project TMK:	(1) 3-1-031:006 (por.)
Land Owner:	State of Hawaii
Project Proponents:	University of Hawaiʻi
Project Tasks:	Archaeological Literature Review and Field Inspection
Parcel Acreage:	2.35 acres (.95 hectares)
Project Area	Approx. 0.16 acres
Principal Investigator:	Dennis Gosser, M.A.
Regulatory Oversight:	Chapter 6E-7 and 6E-8, Hawaii Revised Statutes (HRS) and Hawaii Administrative Rules (HAR) Chapter 275
Project Background:	The University of Hawaiʻi is proposing Wastewater Discharge System Upgrades at Waikīkī Aquarium. Ground disturbing work will involve trenching for installation of waterlines and excavations for new associated structures, which include two wells, a housing structure for a new pump station, emergency overflow box, discharge, and transfer sump, and a filter housing structure.
SIHP #:	Waikīkī Aquarium is over 50 years old (no SIHP site number designated); See Human Skeletal Remains below
Findings:	Background research and previous archaeological findings in the vicinity indicate there is potential for traditional Hawaiian historic properties and human burials in the project area. Waikīkī was intensively used during the pre-Contact and early historic period for habitation, agriculture, and aquaculture, and several *heiau* were once present. In the late 1900s, Waikīkī's landscape was radically modified and became the home of many wealthy businessmen, such as William G. Irwin from England, whose estate included the current project area.
Human Skeletal Remains:	50-80-14-04729, secondarily deposited human skeletal remains
Recommended Effect Determination:	Based on the results of this ALR and on previous archaeological projects near the project area that have recorded subsurface historic properties including cultural deposits and human burials, there is insufficient information to make a Chapter 6E historic preservation determination of effect of the project's impact on potential subsurface historic properties within the 0.16-acre project area. Therefore, archaeological monitoring for identification purposes, guided by a SHPD-approved archaeological monitoring plan (HAR 13-13-279), is recommended. A list of SHPD-permitted consultants to conduct the archaeological monitoring can be found at: https://dlnr.hawaii.gov/shpd/about/branches/archaeology/

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INTRODUCTION

Under contract to Oceanit Laboratories, Inc., Pacific Consulting Services, Inc. (PCSI) has prepared this Archaeological Literature Review and Field Inspection (ALRFI) report in support of the Wastewater Discharge System Upgrades at Waikīkī Aquarium in Waikīkī Ahupuaʻa, Honolulu (Kona) District, Island of Oʻahu, Hawaii. The project proponent is the University of Hawaiʻi, and the landowner is the State of Hawaii. The location of the proposed project is shown in Figure 1. The project scope of work includes upgrades to the aquarium's saltwater treatment and discharge system to protect nearshore waters. A historical, cultural, and archaeological background study was conducted in order to evaluate any potential effect on historic properties and to recommend appropriate historic preservation actions, if warranted. This work was carried out in accordance with Hawaii Revised Statutes (HRS) Chapter 6E, and Title 13 of the Hawaii Administrative Rules (HAR), Subtitle 13 (State Historic Preservation Division Rules), Chapter 275 (*Rules Governing Procedures for Historic Preservation Review for Governmental Projects Covered Under Sections 6E-7 and 6E-8, HRS*).

Project Area Location and Description

The proposed project is located at the Waikīkī Aquarium at 2777 Kalākaua Avenue. The entire project parcel measures 2.35 acres (.95 hectares) and the proposed 0.16-acre (approximate) affected project area (APA) excavations will be conducted primarily in the western and southern portions of the parcel. The Tax Map Key (TMK) parcel for the project area is (1) 3-1-031:006, as shown in Figure 2. Table 1 summarizes the proposed ground disturbing activities, which are described in detail in this section. The project site plan is shown in Figure 3.

Proposed work involves upgrades to the wastewater discharge system. New water, sewer, drain, and discharge lines are to be installed (approximately 150-m long). A housing structure for a new pump station, emergency overflow box, discharge, and transfer sump will be constructed on the west-central portion of the property. A new filter housing structure will be constructed on the south-central portion of the property. Two new injection wells will be excavated on the east and west sides of the housing structure. The purpose of the project is to bring the facility into compliance with the National Pollutant Discharge Elimination System Permit, which is issued and monitored by the Hawaii Department of Health (DOH). The upgraded system will eliminate all direct effluent discharge into the ocean and into the City and County of Honolulu wastewater system.

Table 1. Anticipated Construction Activities.

Task	Work Description	Anticipated Size in m (Length x Width x Depth)
Trenching	Water, sewer, drain, and discharge lines	122 x 0.61 x 1.5 107 x 1.5 x 1.5 24.3 x 2.1 x 1.5
Excavation	Pump station	5.5 x 7.9 x 2.7 m 0.14 dia x 15.2 deep micropiles (n=9)
Excavation	Filter housing structure	9.1 x 6.7 x 0.9 0.14 dia x 15.2 deep micropiles (n=14)
Excavation	Two wells	0.46 dia x 76.2 deep wells (n=2) 1.5 dia x 2.1 deep well vaults (n=2)

ENVIRONMENTAL SETTING

Waikīkī Ahupuaʻa is located on the leeward side of Oʻahu and extends from the Koʻolau mountain range through the coastal plain to the shoreline. The project area is situated within the beach portion of Kapiʻolani Park, between the shoreline and Kalākaua Avenue.

Figure 1. Parcel and Project Area Location on 7.5-Minute Series USGS Honolulu Topographical Quadrangle (2017).

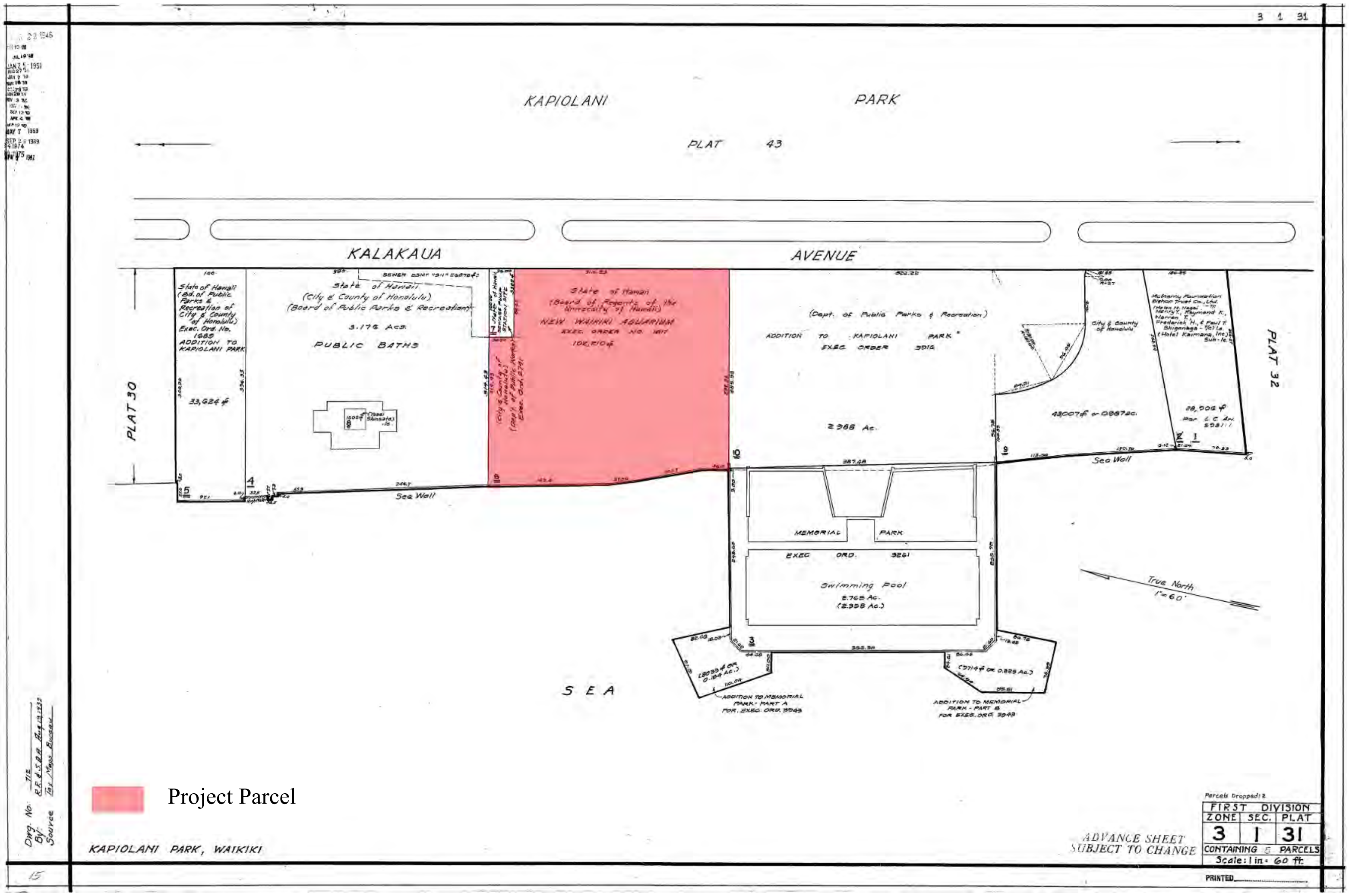


Figure 2. Project Parcel Shown in Tax Map Key (TMK) Plat Map (1) 3-1-031:006 (Tax Maps Bureau 1932)

Figure 3. Conceptual Design Plan for the Waikīkī Aquarium Wastewater Discharge System Upgrade

TOPOGRAPHY AND SOILS

The project area is in a low-lying coastal zone, approximately 3.0 m (9.8 feet [ft]) above mean sea level (amsl). Two major soil series are present, as shown in Figure 4. Most of the project area contains beaches (BS), while the remainder is classified as Jaucas sands (JaC). Areas classified as beaches consist of either sand derived from coral and seashell, or in some cases basalt and andesite (Foote et al 1972:28).

The Jaucas sands series are found on vegetated beach and sand dune areas along the shore. These soils formed in calcareous sand deposits. They are very deep, excessively drained, and have very rapidly permeability (Foot et al. 1972:48). Areas containing these soils are typically used for recreation and as marine wildlife refuges. Vegetation consists of sea grape (*Coccoloba uvifera*), coconut (*Cocos nucifera*), and other xerophytic and salt-tolerant plants. From a historic preservation perspective, deposits of Jaucas Sands are often associated with the presence of traditional Hawaiian burials and subsurface cultural deposits.

Prior to the 1900s, Waikīkī had a long history of productive wetland agriculture and aquaculture (Nakamura 1979). These activities came to a halt in the first part of the twentieth century with the dredging of the Ala Wai Canal and the filling of land. Consequently, it is typical to find substantial historic fill deposits, which consist of either calcareous marine sediments originating from the dredging of the Ala Wai Canal, imported terrigenous fill, or a combination of both, overlying in situ soils in the lowlands of Waikīkī.

RAINFALL, HYDROLOGY, AND VEGETATION

Annual rainfall in the project area averages 596.3 millimeters (mm) (23.48 in) per year with a majority of the rain falling between October and March (Giambelluca et al. 2013). The vegetation in the project area consists of modern landscaping associated with the aquarium grounds and includes both indigenous and introduced species.

HISTORICAL BACKGROUND

Archival background research and literature review examined maps, historical and archival documents, and previous archaeological studies in the vicinity of the project area. Relevant historical maps were georeferenced to determine where traditional Hawaiian or historic features may fall within the project area. The information obtained from these sources was synthesized to present data findings and to evaluate the potential for archaeological and cultural resources in the project area.

The Hawaiian cultural landscape can be described through *mo'ōlelo* and *wahi pana* (significant Hawaiian place names). *Mo'ōlelo* may be myths, legends, proverbs, and events surrounding well-known individuals in Hawaiian history (Pukui and Elbert 1986:254). The project area is situated in the *'ili* (land division of an *ahupua'a*) of Kāneloa in Waikīkī Ahupua'a. Kāneloa can be translated as "tall Kāne" (Pukui et al. 1974:84). Waikīkī, which can be translated as "spouting water" (Pukui et al. 1974:223), is named for its former wetlands fed by numerous streams from the valleys of Makiki, Mānoa, and Pālolo.

Several *heiau* (traditional Hawaiian temple) were once located in Waikīkī Ahupua'a, which were described in Thrum's Hawaiian Annual for 1907. These included Papa'ena'ena Heiau, Kapua Heiau, Kūpalaha Heiau, Helumoa or Āpuakēhau Heiau, Makahuna Heiau, Kamauakapu Heiau, Kulanihakoi Heiau, and Pahu-a-Maui Heiau (Thrum 1906a:44–45; Thrum 1906b: 49–69). Also mentioned in the Annual are four large *pohaku* —also of religious significance—commonly called the Wizard Stones of Kapeimāhū, which are extant to today at Waīkikī Beach (Boyd 1906:139–141). Not noted by Thrum are two other *heiau* formerly present in Waikīkī: Hale Kumuka'aha Heiau, which was mentioned by Hawaiian historian Samuel Kamakau in the Hawaiian newspaper *Kuakoa* (McAllister 1933:78), and "Altar Opunaha," which appears

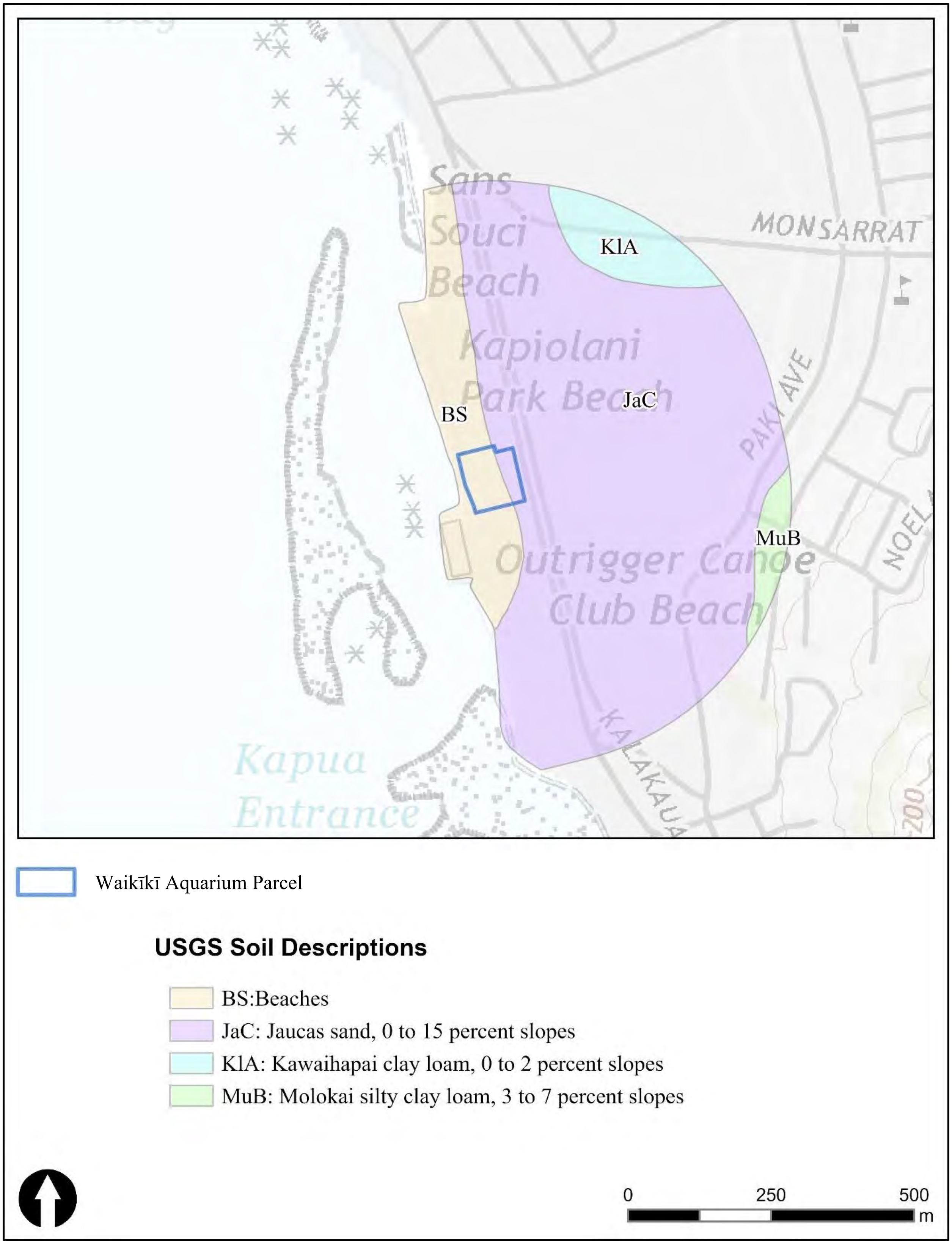


Figure 4. Soil Units in the Vicinity of the Waikīkī Aquarium Parcel (Soil Survey Staff, NRCS, USDA 2022).

on a ca 1876 historic map by C.J. Lyons of the south coast of Oʻahu (Register Map [RM] RM 727). It is unclear if latter site was something other than a *heiau.* Another undated but contemporaneous map by Lyons of Kāneloa does not label the site as an altar. These two maps are shown in Figures 5 and 6. During background research, the only historical sources identified mentioning Opunaha[1] are death notices dating to the 1860s in *Kuakoa* that cite Opunaha, Waikīkī or Waikīkī Kai as the place of death.

The most well-known *heiau* of those listed above is Papaʻenaʻena Heiau. Numerous accounts of this *heiau* from early voyagers were compiled by McAllister (1933:71–74). This *heiau* was located on the west side of Diamond Head and visible from Waikīkī, as shown in Figures 5 and 6 (McAllister 1933:71). Thrum further offers that it was "at the foot of Diamond Head slope, rear of Douglas' premises" (Thrum 1906a:44). It was a *heiau poʻokanaka* (*heiau* where human sacrifices were made) and known for the number of sacrifices carried out by Kamehameha I. A description of Papaʻenaʻena Heiau during this early period is from the journal of Tyerman and Bennet (1832:48–49).

> In the year 1804, when the late king, Tamehameha, was on his way from Hawaii, to invade Tauai, he halted with an army of eight thousand men at Oahu. The yellow fever broke out among the troops, and in the course of a few days swept away more than two-thirds of them. During the plague, the king repaired to the great marae at Wytiti, to conciliate the god, whom he supposed to be angry. The priests recommended a ten days' tabu, the sacrifice of three human victims, four hundred hogs, as many cocoanuts, and an equal number of branches of plantains. Three men, who had been guilty of the enormous turpitude of eating cocoa-nuts with the old queen (the present king's mother), were accordingly seized and led to the marae. But there being yet three days before the offerings could be duly presented, the eyes of the victims were scooped out, the bones of their arms and legs were broken, and they were then deposited in a house, to await the coup de grace on the day of sacrifice. While these maimed and miserable creatures were in the height of their suffering, some persons, moved by curiosity, visited' them in prison, and found them neither raving nor desponding. But sullenly singing the national *huru*---dull as the drone of a bagpipe, and hardly more variable-as though they were insensible of the past, and indifferent to the future. When the slaughtering time arrived, one of them was placed under the legs of the idol, and the other two were laid, with the hogs and fruit, upon the altar-frame. They were then beaten with clubs upon the shoulders till they died of the blows.-This was told us by an eye-witness of the murderous spectacle [Tyerman and Bennet 1832:48–49].

A chief named Kaolohaka is also said to have been sacrificed at this *heiau*: "Fragments of its walls, torn down in 1860, show it to have been about 240 feet square; said to be the place of sacrifice of Kaolohaka, a chief of Hawaii, on suspicion of being a spy" (Thrum 1906a:44).

Based on various accounts, McAllister determined that the *heiau* was "a quadrangular paved terrace, with walls on three sides, but open on the west side, which faced the village of Waikīkī and the sea" (McAllister 1933:74). Multiple step-like terraces led to the open side of the *heiau*. Averaging measurements, given by first-hand accounts, McAllister estimated that the *heiau* was approximately 128 feet by 68 feet with walls 6.2 feet high and 3 feet wide. According to Thrum (1906a:44) the *heiau* was destroyed by Kanaina in 1856 and the stones were used to enclose Queen Emma's premises and for road work.

Kapua Heiau was located somewhere in or near Kapiʻolani Park and is mentioned in the *Legend of Pumaia* (Fornander 1918-1919). Pumaia was a pig farmer who lived in Pukaola in the Kona District of Oʻahu. The king of Oʻahu, Kūaliʻi, was building Kapua Heiau, "east of Leahi Hill overlooking Māmala Bay" (Fornander 1918-1919: 470). When the *heiau* was complete, Kūaliʻi repeatedly ordered pigs from

[1] Kumu Hula Samuel M. ʻOhukaniʻōhiʻa Gon III, a scientist, Hawaiian cultural practitioner, paleobiologist, and teacher has held a changing of the seasons event on the north side of the aquarium: "We gathered at the water's edge at the site of the heiau Kūpalaha, the sibling heiau of Papaʻenaʻena (that still graces the base of Leahi) where, from its kuahu (altar), named Opunaha, the setting sun would be observed by the kahuna kilolani, and on a certain day, the sun would set into the bowl of Puʻu o Kapolei, when seen from Opunaha, marking the end of the Hoʻoilo [Hawaiian Cool Wet Season] and the start of the Kauwela [Hawaiian Hot Dry Season], and the reactivation of the luakini heiau of Kū." (https://www.facebook.com/events/175138762181977l/?acontext=%7B%22ref%22%3A%223%22%2C%22ref_newsfeed_story_type%22%3A%22regular%22%2C%22action_history%22%3A%22null%22%7D).

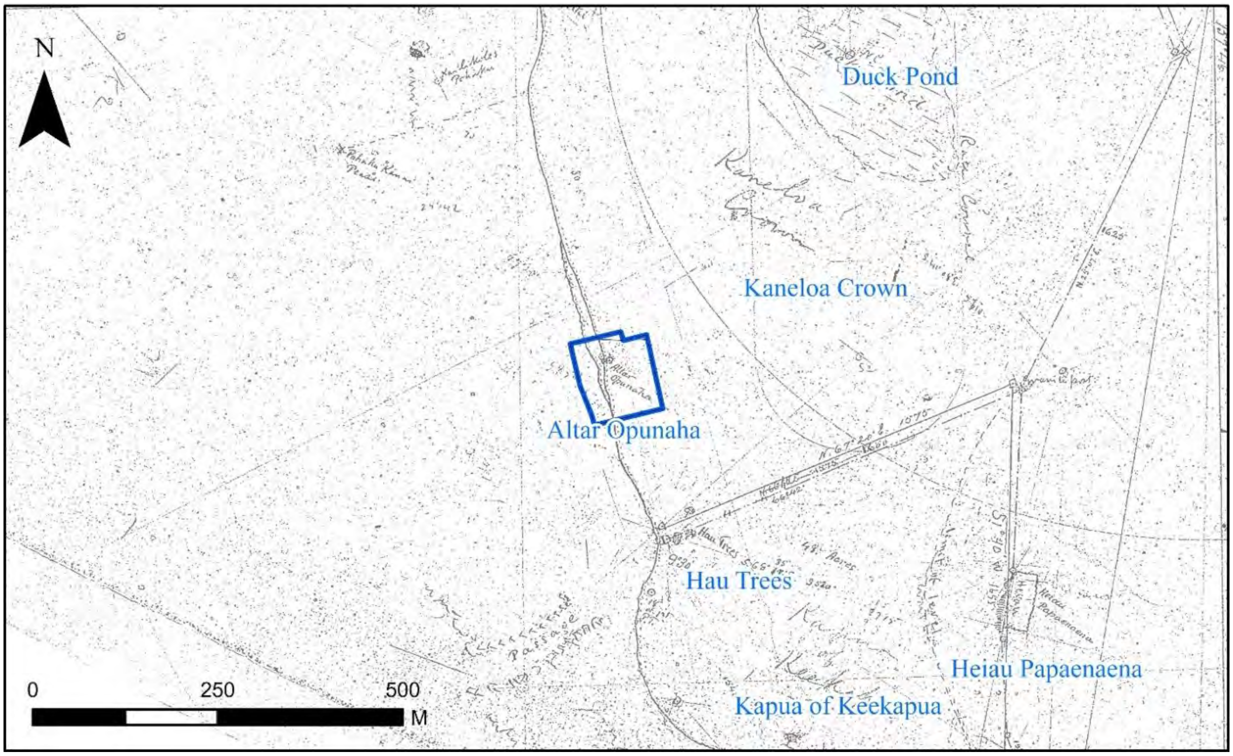


Figure 5. Portion of ca 1876 Map of the South Coast of Oʻahu by C.J. Lyons Showing “Altar Opunaha” and “Heiau Papaenaena” in Relation to the Project Parcel (Reg. 727). Blue Text Added for Clarity.

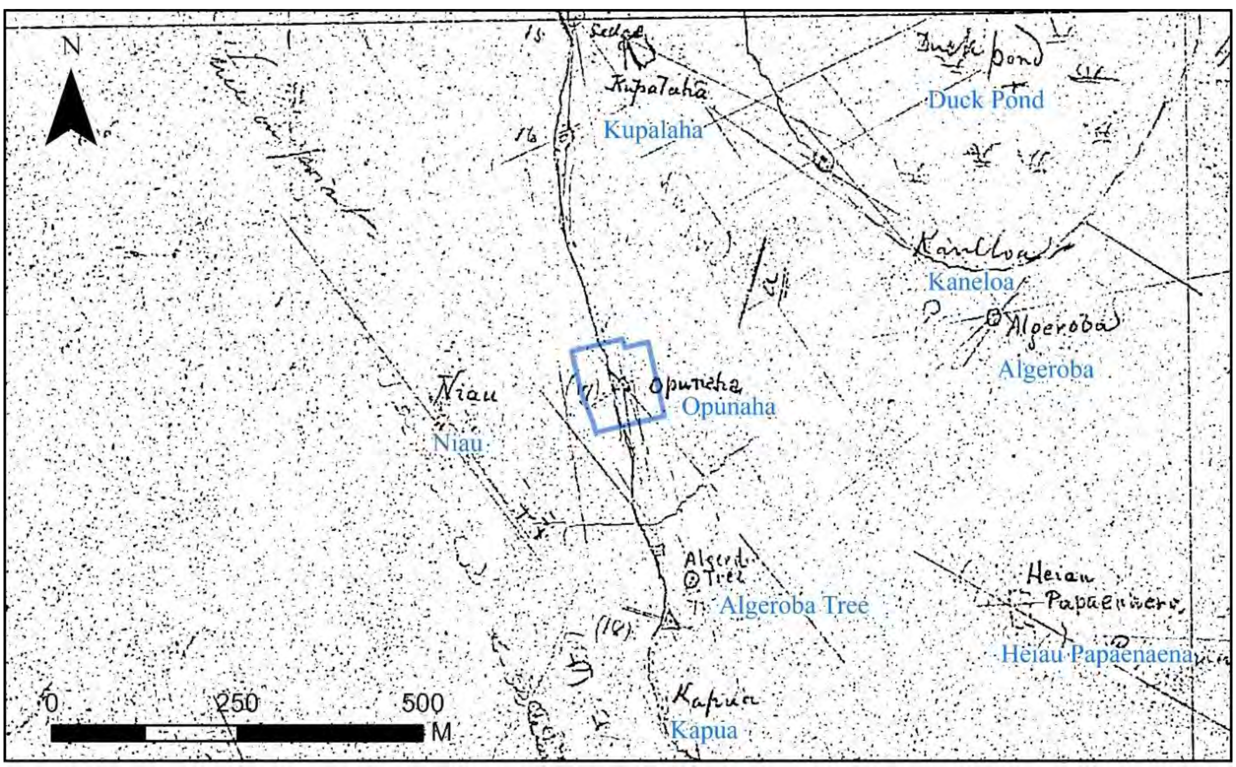


Figure 6. Portion of ca 1876 Map of Kāneloa by C.J. Lyons Showing “Opunaha,” Kupulaha,” and “Heiau Papaenaena” in Relation to the Project Parcel. Blue Text Added for Clarity.

Pumaia until one day Pumaia refused to oblige him. The king's men fought Pumaia over one of the pigs and all the men were killed by Pumaia but one. Kūali‘i then declared war on Pumaia. Pumaia won multiple battles against the king's soldiers until finally Kūali‘i prayed to his god to capture Pumaia. Only then was he caught and bound: "Kualii was so incensed at Pumaia that he was immediately killed and was dragged to Kapua where his dead body was thrown into the pit with the men he had killed. During the ill treatment given his body, the jaws were crushed and cut up into fragments" (Fornander 1918-1919:474).

Makahuna Heiau was once located on the south side of Diamond Head, overlooking "Aqua Marine" and near the former residence of Honorable Sanford B. Dole (McAllister 1933:196). According to a historic map by Wall (1893), this places the *heiau* west of Diamond Head Lighthouse. McAllister offers the following accounts:

> Thrum writes: "A large heiau enclosure dedicated to Kane and Kanaloa, of Kuula character, so said." Tucker reports: "Opposite the residence of the Honorable Sanford B. Dole. The ruins of a heiau of the Pookanaka class. Was located at this place in order to propitiate, by human sacrifice, the departure of the Aliis to foreign shores, and Black Point, between that and Kahala, was called Keala o Kahiki. These ruins are mostly all overgrown and have been used probably to make fences or for road purposes. A dense growth of lantana and kiawe, scrub kiawe, covers the ruins" [McAllister 1933:196].

According to Thrum (1906a), Kūpalaha Heiau was located at Kapi‘olani Park near Cunha's, which is a surfing area named for the Emmanuel S. Cunha estate near Kapahulu and Kalākaua Avenues (Pukui et al. 1974). The location of this estate in shown in Figure 7. In his description Thrum wrote: "Entirely obliterated. Class unknown, but said to have had connection in its workings with Papaenaena" (Thrum 1906a:44). Hammatt and Chiogioji (2002:9) locate Kūpalaha Heiau "on or adjacent to Kalākakua Ave., just southeast of the intersection with Monsarrat Ave." This *heiau* was associated with a legend involving Kākuhihewa, *mō‘i* (king) of O‘ahu circa 1540–1634, and Pueo Ali‘i (king of the owls). In the legend, a man named Kapoi went to gather pili grass at a marsh near the beach. He found seven owl eggs that he collected with the intention of later eating (Thrum 1907:200–202; Westervelt 1915:133–136). After returning home, an owl arrived at his fence and cried out "O Kapoi, give me my eggs!" Hearing the repeated pleas, Kapoi returned the eggs. The owl became his *‘aumakua* (family god) and instructed him to build Manua Heiau (situated on the southwest side of Pūowaina [Punchbowl Crater]). After building the *heiau* he made an offering of bananas and set the *kapu* (taboo) days for its dedication. At the same time, Kākuhihewa was building a *heiau* in Waikīkī and he made a law that if any person built a *heiau* and set the *kapu* before him, that person would be put to death. Kapoi was arrested and taken to the Kūpalaha Heiau in Waikīkī. Kapoi's *‘aumakua* owl tried to help him by calling on all of the owls in the islands to gather and fly to Kūpalaha Heiau to battle the king's men. The king's men surrendered, and the owls won the battle. Since that day, the owl was considered a powerful *akua* (god) and the location of the battle was known as Kukaeunahio-ka-pueo, which means "the confused noise of owls rising in masses" (Thrum 1907:200–202; Westervelt 1915:133–136).

TRADITIONAL HISTORY AND LAND USE

Waikīkī became the seat of royal power in the 1400s when Mā‘ilikūkahi moved his court to the south side of the island. According to Hawaiian Historian Samuel Kamakau, "Upon Mailikukahi becoming king, he was taken early by the chiefs to reside at Waikiki, and that perhaps was the origin of the residence of chiefs at Waikiki, because Waialua was the place formerly of the residence of chiefs, as was also Ewa" (Kamakau n.d. in McAllister 1933:74).

Kamakau notes that the chief Kalamakua, who reigned around the sixteenth century (based on Stoke's 20 year-count; Kelly 1989), was the first to build an extensive irrigation system of *loko i‘a* (fishpond) and *lo‘i* (irrigated taro field) in Waikīkī: "a good chief. He was noted for cultivating, and it was he who constructed the large pond fields Ke‘okea, Kūalulua, Kalāmanamana, and other *lo‘i* in Waikiki. He

Figure 7. Portion of 1912 Map of Honolulu Old Aquarium Location and Estates of Prominent Individuals Along the Coast (Dove 1912).

traveled about his chiefdom with his chiefs and household companions to cultivate the land and gave the produce to the commoners, the "*maka'āinana*" (Kamakau 1991:45).

In 1780, the army of Maui chief Kahekili landed at Waikīkī "carpeting the beaches from Ka'alawai (near Diamond Head) to Kawehewehe (next to the Halekulani Hotel)" (Kanahele 1995:79). According to Thrum (1925:109), he dedicated Papa'ena'ena Heiau, formerly located in the vicinity of Diamond Head, following his victory. In 1794, Kahekili died and was succeeded by Kalanikupule. The next year, Kamehameha invaded O'ahu at Waikīkī, possibly with 10,000 warriors. The army made their base on the sandy beaches from Wai'alae to Diamond Head to Kālia (Kanahele 1995:87). The final battle ended at Nu'uanu when O'ahu warriors became trapped between Kamehameha's warriors and the *pali* (cliff) and chose to leap to their deaths (Tomonari-Tuggle and Blankfein 1998:13).

Kamehameha made his capital at Waikīkī and the area became the chiefly center of the south coast where the ruling chief and subordinate *ali'i* (chiefly class) resided (Cordy 1996; Nāpōkā 1986; Tomonari-Tuggle 1994). Hawaiian historian John Papa 'Ī'ī (1959) describes Kamehameha's residence in Waikīkī:

> Kamehameha's houses were at Puaaliilii, makai of the old road, and extended as far as the west side of the sands of Apuakehau [vicinity of Moana Surfrider Hotel]. Within it was Helumoa [vicinity of Royal Hawaiian Hotel], where Kaahumanu ma went to while away the time. The king built a stone house there, enclosed by a fence; and Kamalo, Wawae, and their relatives were in charge of the royal residence. Kamalo and Wawae were the children of Luluka and Keaka, the childhood guardians of Kamehameha.
>
> This place has long been a residence of chiefs. It is said that it had been Kekuapoi's home, through her husband Kahahana, since the time of Kahekili. Haalou, a makuahine of Kamehameha, lived there with her younger daughter Kekuapoi while en route from Hawaii to Kauai to consult Kapoukahi, a seer of Kauai, for means whereby Kamehameha would gain victory over Keoua Kuahuula ['Ī'ī 1959:17].

Kamakau also wrote of Waikīkī as a home to chiefs:

> Waikīkī sits proudly in the calm of the Ka'ao breeze… Waikīkī was a land beloved of the chiefs and there many of them lived from remote times to the time of board surfing could be indulged in there, and for this reason the chiefs liked the place very much. At Waikīkī are the surfs of Ka-lehua-wehe, 'Aiwohi, Maihiwa, and Kapuna [Kamakau 1991:44].

EARLY HISTORIC LAND USE

Waikīkī is described as a richly productive area in accounts by early European explorers. An early map by Lieutenant C. R. Malden of the Royal Navy, shown in Figure 8, shows cultivated land, freshwater ponds, "Ruins of a Morai", "Fresh Water Ponds", and a coconut grove in the vicinity of the project area. In 1792, Captain George Vancouver of the H.M.S. Discovery arrived at "Whyteete" and noted the field systems:

> On the shores, the villages appeared numerous, large, and in good repair; and the surrounding country pleasingly interspersed with deep, though not extensive valleys; which, with the plains near the sea-side, presented a high degree of cultivation and fertility
>
> This opened to our view a spacious plain, which, in the immediate vicinity of the village, had the appearance of the open common fields in England; but, on advancing, the major part appeared divided into fields of irregular shape and figure, which were separated from each other by low stone walls, and were in a very high state of cultivation. These several portions of land were planted with the eddo or taro root, in different stages of inundation; none being perfectly dry, and some from three to six or seven inches under water. The causeway led us near a mile from the beach, at the end of which was the water we were in quest of. It was a rivulet five or six feet wide, and about two or three feet deep, well banked up, and nearly motionless; some small rills only, finding a passage through the dams that checked the sluggish stream, by which a constant supply was afforded to the taro plantations.

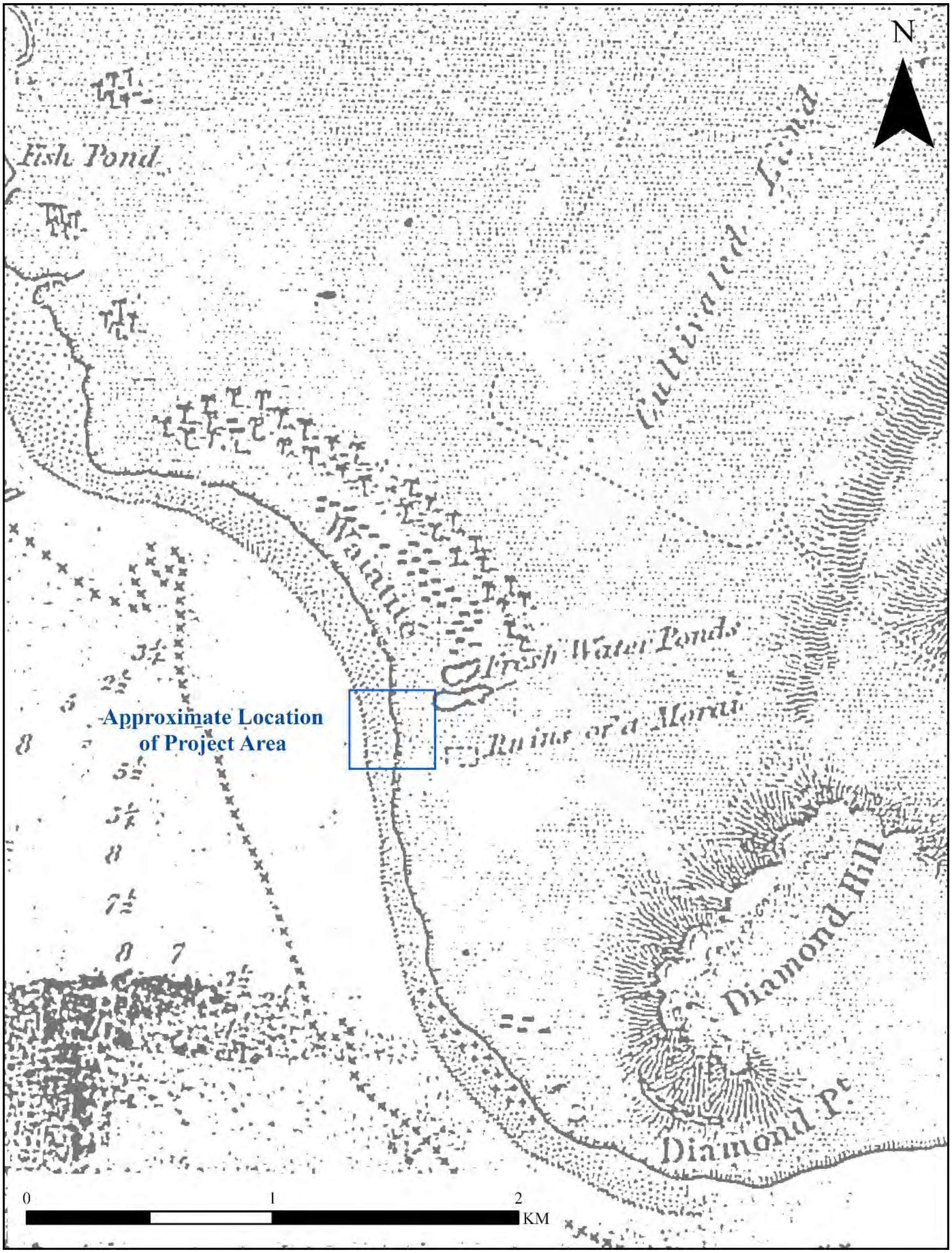


Figure 8. Portion of Historical Map by Malden (1825) Showing the Approximate Location of the Project Area.

> In this excursion we found the land in a high state of cultivation, mostly under immediate crops of taro; and abounding with a variety of wild fowl, chiefly of the duck kind, some of which our sportsmen shot, and they were very fine eating. The sides of the hills, which were at some distance, seemed rocky and barren; the intermediate vallies, which were all inhabited, produced some large trees, and made a pleasing appearance. The plains, however, if we may judge from the labour bestowed on their cultivation, seem to afford the principal proportion of the different vegetable productions on which the inhabitants depend for the subsistence [Vancouver 1798:161–164].

Also aboard the H.M.S. Discovery was surgeon and naturalist Archibald Menzies. He echoed Vancouver's description of a bountiful land:

> The verge of the shore was planted with a large grove of coconut palms, affording a delightful shade to the scattered habitations of the natives. Some of those near the beach were raised a few feet from the ground upon a kind of stage, so as to admit the surf to wash underneath them. We pursued a pleasing path back into the plantation, which was nearly level and very extensive, and laid out with great neatness into little fields planted with taro, yams, sweet potatoes and the cloth plant. These, in many cases, were divided by little banks on which grew the sugar cane and a species of Draecena without the aid of much cultivation, and the whole was watered in a most ingenious manner by dividing the general stream into little aqueducts leading in various directions so as to be able to supply the most distant fields at pleasure, and the soil seemed to repay the labor and industry of these people by the luxuriancy of its productions. Here and there we met with ponds of considerable size, and besides being well stocked with fish, they swarmed with water fowl of various kinds such as ducks, coots, water hens, bitterns, plovers, and curlews [Menzies 1920:23–24].

Several others followed Vancouver and Menzies in describing Waikīkī over the next few decades. Peter Corney wrote of Waikīkī between 1813 and 1818:

> On rounding Diamond hill the village of Wyteetee (Waikiki) appears through large groves of cocoanut and bread-fruit trees; it has a most beautiful appearance, the land all round in the highest state of cultivation, and the hills covered with wood; a beautiful plain extending as far as the eye can reach. A reef of coral runs along the whole course of this shore, within a quarter of a mile of the beach, on which the sea breaks high; inside this reef there is a passage for canoes [Corney 1965:193].

Otto von Kotzebue commander of the Russian ship Rurick viewed Waikīkī from the sea in 1816. His description of the land follows:

> but you have scarcely sailed round the Yellow Diamond Hill, when you are surprised by the most beautiful landscape. Close to the shore you see verdant valleys adorned with palm and banana-trees, under which the habitations of the savages lie scattered; behind this, the land gradually rises, all the hills are covered with a smiling verdure, and bear the stamp of industry [von Kotzebue 1821:320].

Finally, the naturalist Andrew Bloxam was ashore from the H.M.S. Blonde in 1824–1825 when he noted the abundance of Waikīkī:

> I walked along shore towards the bay of Whyteete to see if I could procure any shells, but I found none worth picking up. The whole distance to the village of Whyteete is taken up with innumerable artificial fishponds extending a mile inland from the shore, in these the fish taken by nets in the sea are put, and though most of the ponds are fresh water, yet the fish seem to thrive and fatten. Most of these fish belong to the chiefs, and are caught as wanted. The ponds are several hundred in number and are the resort of wild ducks and other water fowl. I found it very difficult to get out of the labyrinth of paths which lead among them. Whyteete is about four miles east of Honoruru [Honolulu]. It is pleasantly situated and built along the shore among numerous groves of coconut and other trees, and in this respect far better than Honoruru, as scarcely any trees are to be found there [Bloxam 1925:35–36].

This period of political importance ended for Waikīkī in 1809, when Kamehameha moved his capital to Honolulu, which was more accessible to Western visitors (Tomonari-Tuggle and Blankfein 1998:13). Following this move, traditional agriculture in Waikīkī waned. Population in the area had drastically decreased due to economic changes and the devastation caused by Western diseases. The missionary Levi Chamberlain noted these changes when writing in 1828:

> Our path led us along the borders of extensive plats of marshy ground, having raised banks on one or more sides, and which were once filled with water, and replenished abundantly with esculent fish; but now overgrown with tall rushes waving in the wind. The land all around for several miles has the appearance of having once been under cultivation. I entered into conversation with the natives respecting this present neglected state. They ascribed it to the decrease of population [Chamberlain 1957:26].

THE MĀHELE

Traditional land divisions of the fifteenth and sixteenth centuries persisted until the 1848 Māhele, which introduced private property into Hawaiian society (Kamakau 1991:54). During the Māhele, the Land Commission required the Hawaiian chiefs and *konohiki* (land agent for the *ali'i*) to present their claims to the Land Commission. In return they were granted awards for the land quit-claimed to them by Kamehameha III. The remaining unclaimed land was then sold publicly, "subject to the rights of the native tenants" (Chinen 1958:29). The new western system of ownership resulted in many losing their land.

Following the Māhele of 1848, two acts were passed in 1850 that changed land ownership in Hawai'i. On 10 July 1850, the Alien Land Ownership Act was adopted, which allowed foreigners to own land. On 6 August 1850, the Kuleana Act of 1850 was adopted, which allowed *hoa'āina* (common people of the land, native tenants) to make claims to the Land Commission. The new western system of ownership resulted in many losing their land. Often *kuleana* (commoner) claims would be made for discontiguous cultivated plots with varying crops, but only one parcel would be awarded.

Later, parcels were distributed under Land Patent Grants (Gr.) and Land Court Applications (LCAp). When the monarchy was overthrown in 1893, the Crown Lands became Government Lands, public domain for sale by fee simple (Hammatt 2013:A-5). Patents were the certificates issued for the sale of such lands. Beginning in 1900, when Hawai'i became a U.S. territory, the certificates were called Land Patents, or Land Patent Grants (Hammatt 2013:A-5).

Records indicate that the *'ili of* Kāneloa was returned by Aaron Keali'iahonui at the Māhele and retained by Crown. LCAs in the '*ili* were limited to a 20.85-acre square lot northwest of the project area (today's southwest corner of Paki and Kapahulu avenues). Within the lot, 4.35 acres were *kuleana* parcels and 15.0 acres were Crown *lo'i*. Other land within the lot included a pond and grassland. The remainder of the '*ili* (171.0 acres) consisted of level open plain—referred to on historic maps Kāneloa Plain—and a seasonal pond.

LATE HISTORIC LAND USE

In 1876 a group of prominent businessmen, which included Archibald Cleghorn, John O. Dominis, and James Makee, formed the Kapi'olani Park Association. King David Kalākaua offered a 30-year lease of Kāneloa and Kapua (neighboring *'ili* to the east) for the endeavor on the east side of Waikīkī, which was at the time crown land. According to the association's charter, the park would serve the purpose "of adorning and putting in order, a tract of land in the vicinity of Honolulu as a place of public resort, and of promoting Agricultural and Stock Exhibitions, and healthful exercise, recreation and Amusements" (Abel 1992:3–4). Kalakaua dedicated the park in June of 1877 in honor to Queen Kapi'olani. At this time, the east portion of the park was sparsely vegetated and sandy, while the western portion contained wetlands and streams. Consequently, the parks development entailed road building, drainage, and extensive plantings of ironwood, banyan, date palm, and other trees (Abel 1992:4).

Up until 1913, the park was managed by the Honolulu Park Commission whose mission was to operate the park as a public space (Abel 1992:5). During this nascent period, the oceanfront parcels were lost to private individuals in an effort to raise money for the Association through subleasing beachfront lots for residences (see Figure 7). Some of these lots were reacquired in 1905, though others became private property with the overthrow of the monarchy in 1893 (Hibbard and Franzen 1986:43). In 1898, the year Hawai‘i was annexed to the United States, a temporary U.S. military camp was established at the park, which cause damage to the roads and a horse racing track at the park's center. In 1900, horse racing was banned and subsequently the track was used as an auto raceway and a polo field. Elements of the park that date to the early period (1896 to 1913), include the original aquarium, athletic fields, the bandstand, food concessions, and the beach park and bathhouse.

The aquarium parcel is a portion of property formerly owned by William G. Irwin, a very wealthy businessman in the sugar industry. He formed William G. Irwin and Company, which lasted from the mid-1870s to 1880 (Adler 1958:9). In 1881 he partnered with Claus Spreckels in sugar, banking, and ship building (Nellist 1925:123). In 1896 he became the Chair of the Honolulu Park Commission which over saw Kapi‘olani Park, as was mentioned above. The Irwin residence was designed by architect Charles Dickey in 1899. It is cited as "[t]he most expensive and impressive of Dickey's early use of the Mission style" (Neil 1975:102). Dickey also designed the Irwin Stable (Neil 1975:105). Photographs of the Irwin home are shown in Figures 9–11. The historical map in Figure 12 shows the project area parcel in relation to the home and stable. In the 1920s, well after Irwin moved to San Francisco, the house was torn down. The Beach Park Memorial Committee had negotiated the purchase of the Irwin Estate in 1919 (Ireland 2005:58) for the construction of the Waikīkī War Memorial and Natatorium (a saltwater pool). In 1913, management of the park was transferred to the Territory of Hawaii (Abel 1992:5). It was at this time the first public zoo appeared in the park:

> During 1915 and 1916, acquisition of animals and the construction of cages and bird houses established a "zoological garden." So delighted were officials that they filled the park report for 1916 with photographs of animals and added a detailed list of new park acquisitions that included two lions, twelve monkeys, two bears, one tortoise, four elk, four deer, twelve horses, seven donkeys, forty-six ducks, ten geese, four swans, two cranes two emus, assorted Australian doves, and an African elephant [Weyeneth 1991:28].

In 1919, additional coastal parcels were acquired by the Territory of Hawaii and the Waikīkī War Memorial and Natatorium were built, which opened in 1927. The memorial commemorates World War I servicemen. The competitions at the Natatorium included participation by Duke Kahanamoku, Buster Crabbe, and Johnny Weissmuller in the 1920s. The Waikīkī War Memorial and Natatorium are listed on the Hawai‘i Register of Historic Places (HRHP) as SIHP Site 50-80-14-09758. Other notable features of Kapi‘olani Park include the Waikīkī Shell (an outdoor amphitheater built in 1953) and the Waikīkī Aquarium. The Waikīkī Aquarium was formerly located roughly 100 yards north of its current location[2]. Constructed in 1904, it was known as the Honolulu Aquarium and was privately financed by Charles M. Cooke and James B. Castle and operated as part of the Honolulu Rapid Transit and Land Company. In 1919 the land lease expired and the Cooke Estate ceded the lease to the Territory of Hawaii. The present day Waikīkī Aquarium was funded by the Territorial Legislature in 1949 and opened in 1955.

During World War II (WWII), the park again housed the U.S. military. By the end of the war the park was deteriorated, and it entered a period of redevelopment. In 1948, the Honolulu Zoo was established at its current 42.0-acre parcel, the site of a former waterscape. The entrance to the Zoo is listed on the HRHP as SIHP Site 50-80-14-08023.

Kapi‘olani Park is listed on the HRHP as SIHP Site 50-80-14-09758, and is eligible for placement on the National Register of Historic Places (NRHP). However, to date this property has not been added to the NRHP. The significance statement for Kapi‘olani Park as summarized in the NRHP nomination form is listed below:

[2] Waikīkī Aquarium history is summarized from https://www.waikikiaquarium.org/about/history/.

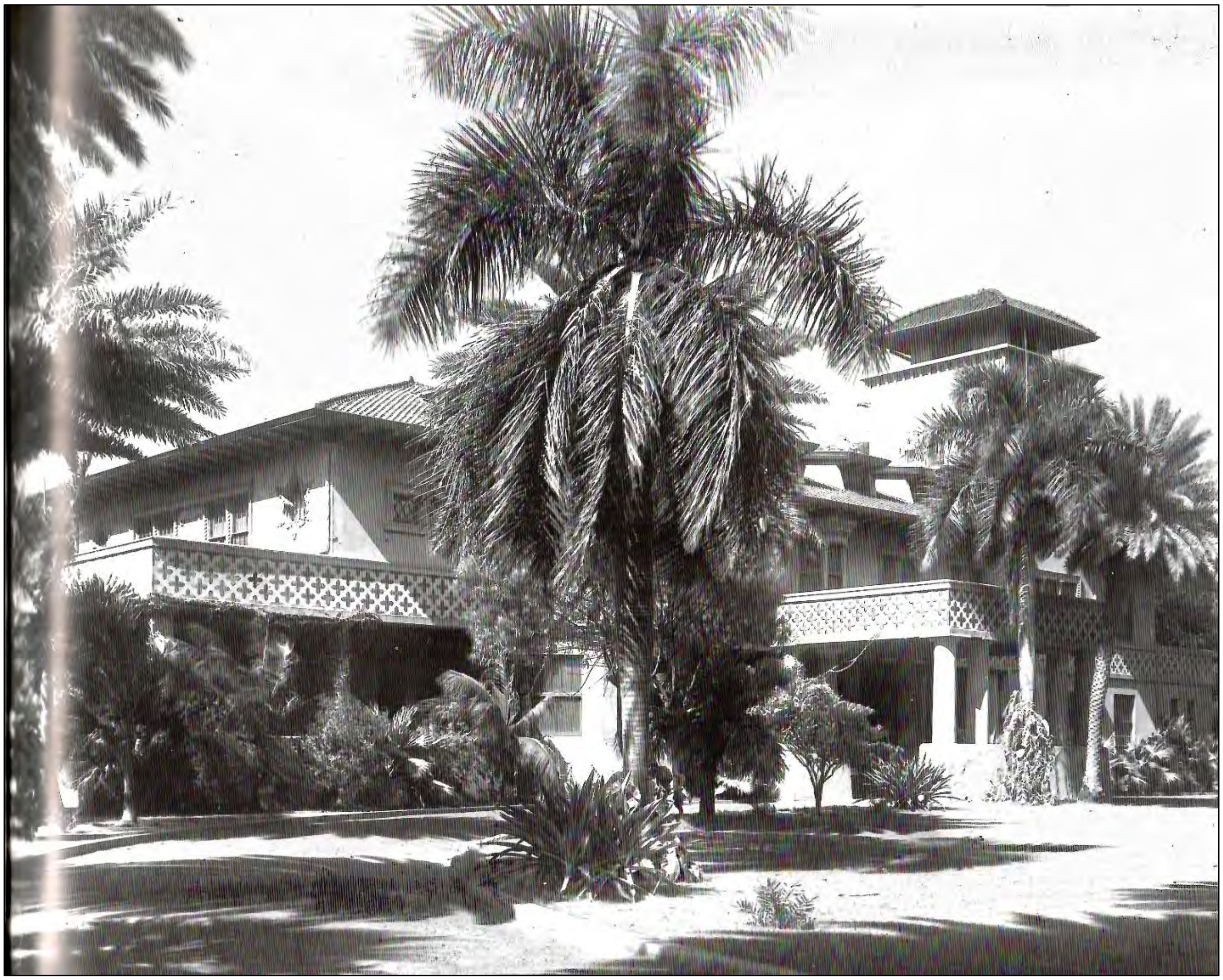


Figure 9. Photograph of the William G. Irwin Residence (Bishop Museum in Hibbard and Franzen (1986:29).

Figure 10. William G. Irwin (Right) at His Waikīkī Property (Hawaii State Archives 2021).

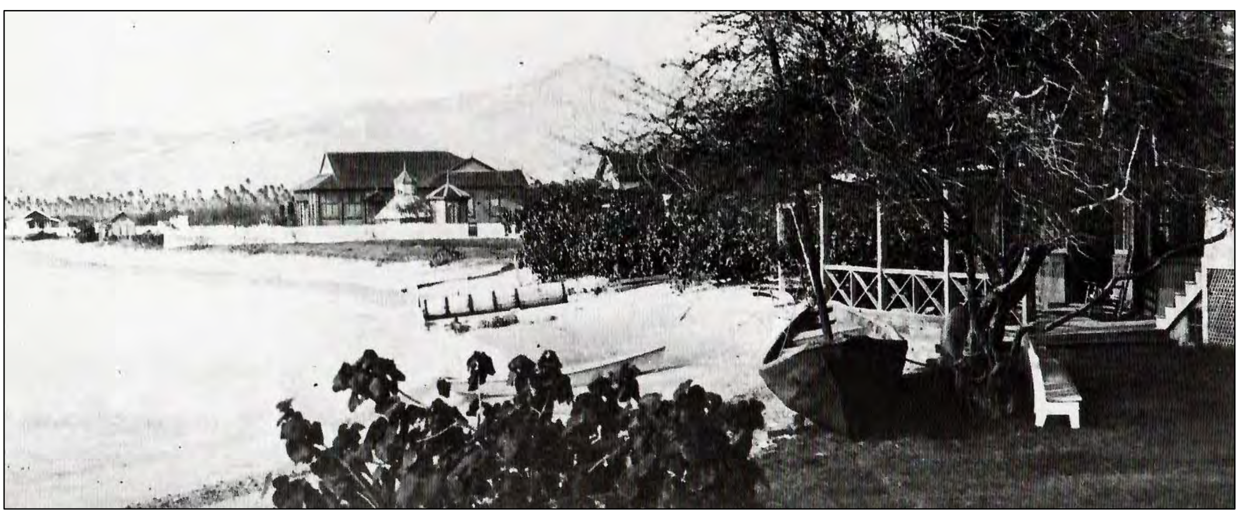


Figure 11. View of Irwin Residence From the Alfred Mitchell House (Bishop Museum in Hibbard and Franzen (1986:22)[3].

[3] This photograph is erroneously dated 1886 in Hibbard and Franzen (1986).

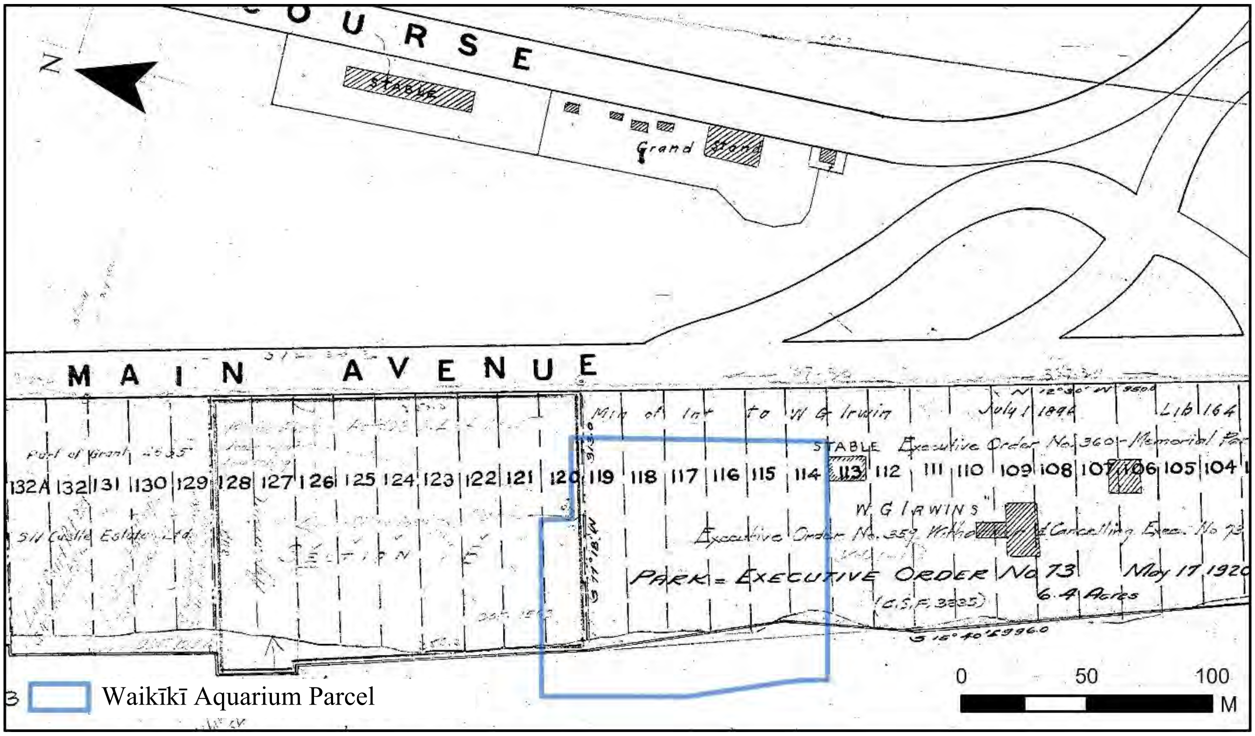


Figure 12. Portion of 1883 Map by Monserrat With Twentieth Century Mark-Ups. Note the Loction of the Irwin House and Stable East of the Project Parcel.

> Kapiolani Park is historically significant for its past association with indigenous Hawaiian culture and royalty. Hawaiian King Kalakaua envisioned the park as a place of recreation for all and namedit after his famous Queen, Kapiolani. Since its dedication in 1877 it has been in continuous use as a location for recreational activities valued by local residents and visitors alike. It provides a sense of place to a special part of Honolulu and is identified with the world famous image of Hawaii as a recreational resort. Over the years it has been the scene of a variety of sports and leisure time activities that reflects the recreational development of Honolulu and Hawaii into the modern world [Abel 1992:3].

PREVIOUS ARCHAEOLOGY

Many archaeological investigations have been conducted in Waikīkī and there have been numerous instances of the inadvertent discovery of human remains, despite the filling of land. Pockets of undisturbed beach sands (i.e., Jaucas Sands) have been observed below the historic fill layers (Bush et al. 2004:37–38), making the possibility of discovering human burials and other cultural materials in this area relatively high. The following section focuses on human burials finds within 500 meters of the project area and previous archaeological investigations in and near the Waikīkī Aquarium. Table 2 summarizes all previous work and the locations of previous projects and previously identified historic properties and human burials are presented in Figure 13. All site numbers follow State Inventory of Historic Places (SIHP) Site 50-80-14-.

Previous Archaeological Investigations Near the Waikīkī Aquarium

Since the early 1900s, human skeletal remains have been encountered inadvertently during construction projects throughout Waikīkī. In 1901, human skeletal remains of four individuals were encountered during trenching for sewer pipes on the James B. Castle property (see Figure 7), which is location of today's Elk's Club. Associated artifacts included whale bone and glass beads, indicating the burials dated to the late pre-Contact to early post-Contact periods (Emerson 1902).

The site of human skeletal remains designated "OA0633" attributed to "Hartwell 1927" is placed south of the Natatorium in an archaeological monitoring report by Bush et al. (2002b:Figure 7). According to a notice in the Federal Register: "In 1927, human remains representing one individual from Waikiki, Oahu were collected by C.C. Hartwell and acquired by the Bishop Museum. No known individual was identified. No associated funerary objects are present."[4]

Near the current project area are several instances of inadvertently discovered human burials reported on by staff of the Bernice Pauahi Bishop Museum (BPBM). Human burials recorded at the Outrigger Canoe Beach Club were designated BPBM Sites 50-Oa-A5-64 and 50-Oa-A6-25 to 55. The sites are not known to have a SIHP designation. A total of 27 burials were encountered (Yost 1971); no formal archaeological report was prepared (Moser et al. 2012). The following is an excerpt from a newspaper article:

> Robert Bowen of the Bishop Museum has been working closely with Ernest Souza, Hawaiian Dredging superintendent, on the removal of skeletons unearthed on the site, between the Colony Surf and the Elks Club...
>
> Most of the bodies were buried in the traditional hoolewa position, with the legs bound tightly against the chest.
>
> One of the skeletons, Bowen said, shows evidence of a successful amputation of the lower forearm, indicating that the Hawaiians knew this kind of operation before the arrival of Europeans.
>
> The ages of the skeletons ranged from children to 40-year-old men and women.
>
> The average life span of the Hawaiians at the time was about 32 years [Honolulu Star-Bulletin; Jan. 24, 1963:1A in Yost 1971:28].

[4] Federal Register Volume 63, Number 18 (Wednesday, January 28, 1998). Notices. Pages 4277–4284. From the Federal Register Online via the Government Publishing Office (www.gpo.gov). FR Doc No: 98-1993.

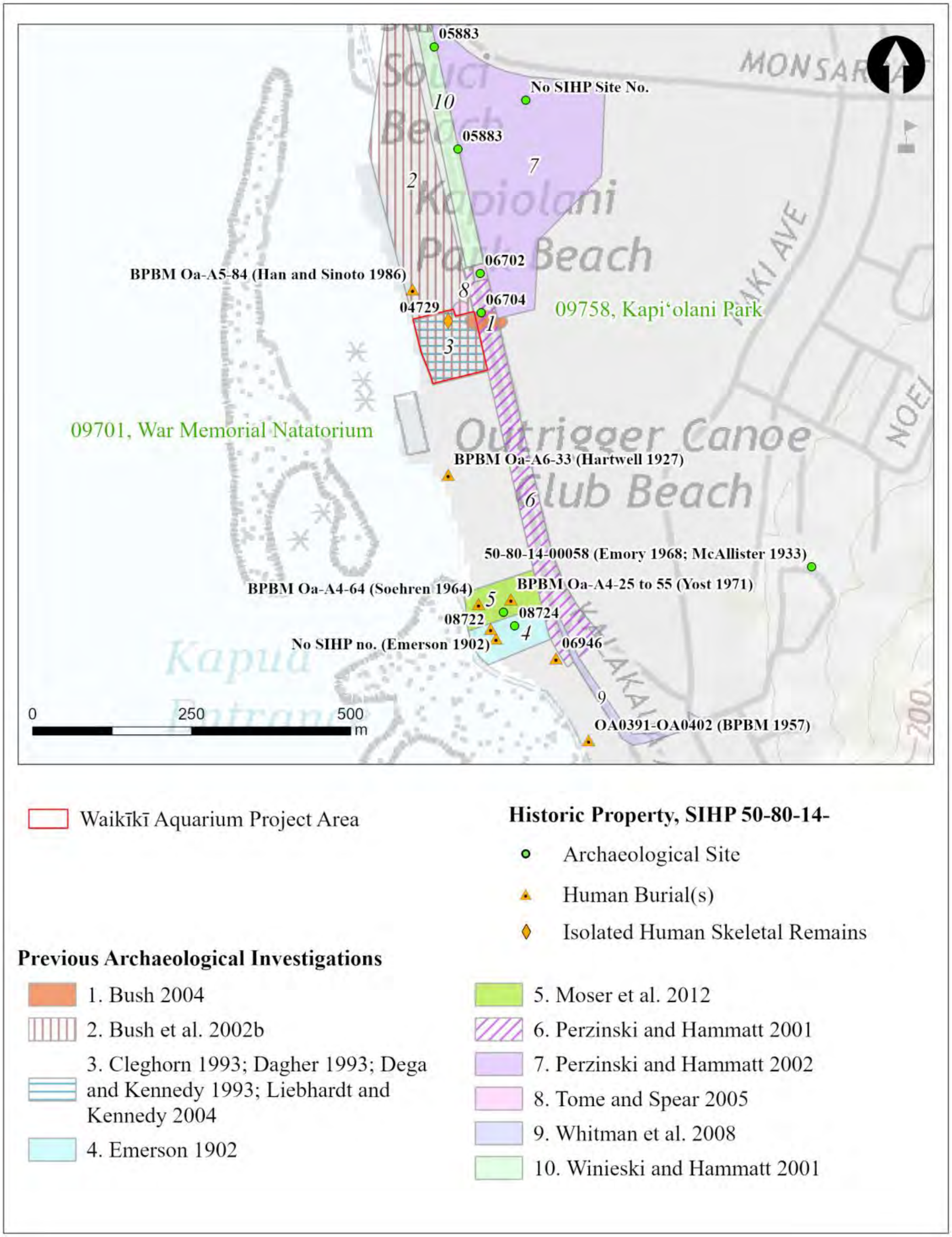


Figure 13. Previous Archaeological Investigations and Historic Properties, Including Human Burials, within 500 Meters of the Project Parcel

Table 2. List of Previous Archaeological Studies and Burial Finds within 500 Meters of the Project Parcel.

Author Year	TMK(s) (1) or Location	Nature of Study	SIHP[1] Site 50-80-14-	Description
Emerson 1902	3-1-032:006/ Today's Elks Club	Inadvertent discovery	No site number	Human skeletal remains of at least four individuals
Hartwell 1927[3]	3-1-031:009/San Souci Beach	Inadvertent discovery	[50-OA-006-33][2]	Human burial
McAllister 1933	Waikīkī (general)	Archaeological Survey	[Site #60]	Waikīkī
BPBM 1957[3]	3-1-032:004(?)/ Diamond Head Apartments (?)	Inadvertent discovery	[50-OA-0391–402][2]	Human burial
Soehren and Sinoto 1964[3] in BPBM 2018	3-1-032:031/ Outrigger Canoe Club	Inadvertent discovery	03705	One humerus (50-Oa-A04-024)
BPBM 1963[3] (Yost 1971)	3-1-032:031/ Outrigger Canoe Club	Inadvertent discovery	[50-OA-A4-25–55]	27 traditional Hawaiian burials
Han and Sinoto 1986[3] in Tulchin and Hammatt 2007:Figure 19	3-1-031:004/ Kapiʻolani Beach Park	Inadvertent discovery?	[Bishop Museum 50-Oa-A5-84]	Human burial
Cleghorn 1993; Dagher 1993; Dega and Kennedy 1993	3-1-031:006/ Waikīkī Aquarium	Inadvertent discovery	04729	Human remains (scattered)
Perzinski and Hammatt 2001	3-1-043:999/ Kalākaua Ave	Archaeological Monitoring	-	No historic properties identified
Winieski and Hammatt 2001	2-6-025–027, 3-1-031 and 043:999/ Kalākaua Ave	Archaeological Monitoring	05883	Discontinuous A horizon
Perzinski and Hammatt 2002	3-1-043:001/ Kapiʻolani Park (bandstand)	Archaeological Monitoring	-	Basalt lamp fragment; charcoal concentration
Bush 2004	3-1-031:999/ Kalākaua Ave	Archaeological Monitoring	06704	Historic trash deposit

Table 2. List of Previous Archaeological Studies and Burial Finds within 500 Meters of the Project Parcel.

Author Year	TMK(s) (1) or Location	Nature of Study	SIHP[1] Site 50-80-14-	Description
Tome and Spear 2005	3-1-031:007/ Kapiʻolani Beach Park	Archaeological Monitoring	06702	Historic debris/trash deposit
Liebhardt and Kennedy 2008	3-1-031:006/ Waikīkī Aquarium	Archaeological Monitoring	-	No historic properties identified
Whitman et al. 2008	3-1-032:999 and 042:999/ Kalākaua Avenue and Poni Mōʻī Road	Archaeological Monitoring	06946	Human burial
Moser et al. 2012	3-1-032:031/ Outrigger Canoe Club	Archaeological Monitoring	-	No historic properties identified
Bush et al. 2002b	3-1-030 and 031/ Queen's Surf Promenade	Archaeological Monitoring	-	No significant historic properties identified

[1] SIHP (State Inventory of Historic Places)

[2]Bernice Pauahi Bishop Museum Hawaiian Archaeological Database

[3]No report citation available; see Bush et al. (2002:Figure 7).

In 1986, human skeletal remains, designated BPBM Site 50-Oa-A5-84, were documented just north of the Waikīkī Aquarium at Kapiʻolani Beach Park (Han and Sinoto 1986[5] in Bush et al. 2002b:Figure 7). Additional burials were recorded south of the aquarium and designated BPBM Site 50-Oa-A5-64. The sites are not known to have a SIHP designation.

In the late 1990s and early 2000s, numerous human burials were found along Kalākaua Avenue in Waikīkī (Bush et al. 2002a; Perzinski et al. 2001; Winieski and Hammatt 2001; Winieski et al. 2001; Winieski et al. 2002); however, all of these burial finds were over 500 meters north of the Waikīkī Aquarium. Relevant results of soil stratigraphy encountered during archaeological monitoring near the current project area are discussed in this section.

In 2000, archaeological monitoring was conducted for the Kapiʻolani Park Bandstand Redevelopment Project (Perzinski and Hammatt 2002). In situ beach sand deposits (20.0+ cm in thickness) were recorded on the northeast side of the bandstand at roughly 30 cmbs, along with a traditional Hawaiian basalt lamp at approximately 40 to 75 cm below the surface. No significant cultural deposits were found west of the bandstand area.

Along Kalākaua Avenue from Poni Mōʻi Road to the Natatorium, archaeological monitoring was conduct for street lighting improvements (Perzinski and Hammatt 2001). Two traditional Hawaiian artifacts were recovered from a backdirt pile, which included a modified Hump-back cowrie and a dense basalt, chisel-shaped adze preform (Perzinski and Hammatt 2001:14). Diagnostic historic period artifacts recovered included ten glass bottles and two ceramic vessels dating from the mid-nineteenth to the early twentieth century. Jaucas sand deposits were encountered at 45 to 50 cmbs below a discontinuous and thin (less than 5 cm thick) A horizon, which was overlain by fill.

During monitoring for the Waikīkī Force Main Replacement project (Winieski and Hammatt 2001). a pit feature and a discontinuous buried “A” horizon, which were designated SIHP Site 05883, were recorded on Kalākaua Avenue, roughly 300 to 400 meters north of the aquarium. To the south of the aquarium, archaeological monitoring was conducted for 12-inch water main installation along Kalākaua Avenue and Poni Mōʻī Road (Whitman et al. 2008). A single in situ pre-Contact traditional Hawaiian burial was inadvertently discovered during excavations, which was designated SIHP Site 06946. Other finds included a pit feature in Jaucas sand. The feature contained burnt layers of charcoal and a burnt basalt cobble.

In 2009 and 2010, archaeological monitoring was conducted during the Outrigger Canoe Club Sewer and Storm Drain Repair and Women’s and Girl’s Locker Room Renovation Projects (Moser et al. 2012). Soil stratigraphy recorded consisted of multiple layers of fill over disturbed Jaucas sand. No historic properties or human burials were encountered. Finds were limited to a small stone awl or cutting tool, a cut pig bone, and charcoal flecking, all in a disturbed context.

The SHPD HICRIS notes three locations of disturbed human burials at the Elk’s Club are designated SIHP Site 08722[6]. The file reads: “Three areas of disarticulated skeletal finds, consisting of three skeletal elements each. Presumably of Hawaiian descent. Found within a highly disturbed deposit located immediately beneath the interior ground surface of the Elks Lodge, Honolulu.” A cultural deposit designated SIHP 08723 is also present based on HICRIS data: “Partially intact, subsurface A horizon ranging from 50–82 cmbs. Deposit is lacking material debris but is rich in charcoal and includes two indeterminate pit features and one combustion feature.” Finally, “Kainalu”, the former Castle family home, was located on the Elk’s Club property, which is designated SIHP Site 08724.

[5] A full reference was not provided in Bush et al. 2002b:Figure 7 and could not be located.

[6] It is possible these burials correlated to the BPBM Sites 50-Oa-A5-64 and 50-Oa-A6-25 to 55.

Previous Archaeological Investigations at the Honolulu Zoo

Over the last 25 years, several archaeological investigations have been conducted within the Honolulu Zoo parcel, which are summarized in Table 3 and located in Figure 14 (Bush et al. 2004; Clark et al. 2014; Farley et al. 2018; Hammatt et al. 2000; McDermott and Chiogioji 2001; Mintmier et al. 2013; Walden et al. 2012). To date, no pre-Contact historic properties have been encountered. McDermott and Chiogioji (2001) noted the following on soil stratigraphy in the Zoo parcel:

> Documented stratigraphy consisted predominantly of various types of fill layers, including terrigenous landscaping fill, dredge sediments from the Ala Wai Canal, construction fill layers, and calcareous "beach sand" layers. These results were not altogether surprising based on the background research, which indicated that prior to development in the 1870s, the area that would become the Zoo was a low-land area of "swamps", ponds, and sand dunes. Background research indicated that substantial fill layers were brought in to elevate the formerly low-lying Zoo area for development [McDermott and Chiogioji 2001:94].

Between 2009 and 2011, archaeological monitoring was conducted during improvements to the zoo entrance area (Walden et al. 2012), which resulted in the recording of Site 07208. This site consists of 12 subsurface features that may be associated with historical activities on Makee Island. Makee Island was an early waterscape feature in Kapiʻolani Park and pre-dated the Ala Wai Canal and Waikīkī Land Reclamation Project.

Between 2010 and 2011, archaeological monitoring was carried out during construction of a new elephant habitat (Mintmier et al. 2013). Recent and possibly historic concrete foundations and infrastructure were encountered, which may be associated with development of Kapiʻolani Park and the zoo. A total of 45 historic artifacts were recovered, including hand-made, mold-blown, bottles, bottles and jars manufactured by automatic bottle machine, English porcelaneous-stoneware, fragmentary examples of English earthenware plates and platters, a fragment of an earthenware jar, and a fragment of a porcelaneous stoneware bowl of Asian, possibly Chinese origin. No pre-Contact or traditional Hawaiian artifacts were encountered. A majority of the assemblage dates from the 1900s to the 1920s (Mintmier et al. 2013).

In 2013, archaeological monitoring was conducted in the northern half of the Honolulu Zoo parking lot (Clark et al. 2014). A single post-Contact subsurface pit feature associated the former Makee Island was recorded. The feature was assigned to the previously designated SIHP Site 07208.

In 2015 and 2016, archaeological monitoring was conducted in the reptile house area of Honolulu Zoo (Farley et al. 2018). Two archaeological features were identified as components of existing SIHP Site 09758, Kapiʻolani Park. Feature 1 is a manhole containing a U.S. military communication line, which is likely associated with military activity during WWII. Construction plans were altered to preserve the manhole during the project. Feature 2 is a historic period concrete box culvert.

Table 3. List of Previous Archaeological Studies and Finds at Honolulu Zoo.

Author Year	TMK(s) (1)/ Location	Nature of Study	SIHP Site 50-80-14-	Description
Hammatt et al. 2000	3-1-043/ Honolulu Zoo	Archaeological Assessment	-	No significant historic properties identified
McDermott and Chiogioji 2001	3-1-043/ Honolulu Zoo	Archaeological Inventory Survey with Subsurface Testing	-	No significant historic properties identified

Table 3. List of Previous Archaeological Studies and Finds at Honolulu Zoo.

Author Year	TMK(s) (1)/ Location	Nature of Study	SIHP Site 50-80-14-	Description
Bush et al. 2004	3-1-043:001/ Honolulu Zoo	Archaeological Monitoring	-	No significant historic properties identified
Mintmier et al. 2013	3-1-043:001 por./ Elephant Enclosure	Archaeological Monitoring	-	Recent and historic features associated with Zoo and Kapiʻolani Regional Park
Walden et al. 2013	3-1-043:001 por./ Front Entrance Area	Archaeological Monitoring	07208	Subsurface features in dune sand layer; possibly on Makee Island
Clark et al. 2014	3-1-043:001 por./ Parking Lot	Archaeological Monitoring	07208	Subsurface pit feature
Farley and Hammatt 2018	3-1-043:001 por./ Reptile House	Archaeological Monitoring	09758	Kapiʻolani Park; identified two additional contributing components

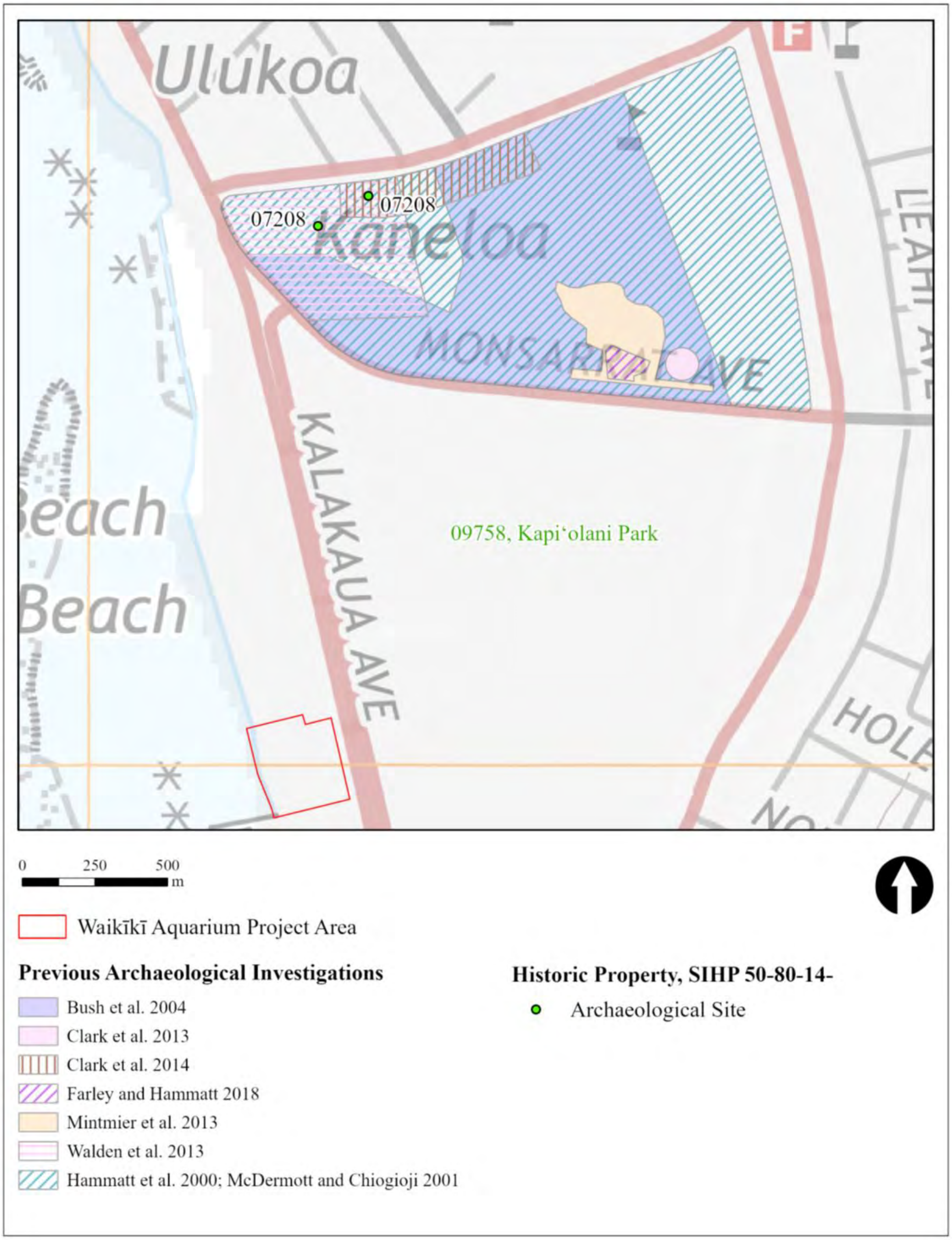
Previous Archaeological Investigations at Waikīkī Aquarium

In the mid-1990s, several human skeletal remains were inadvertently discovered at the Waikīkī Aquarium during rebuilding and modification of a shark tank (Cleghorn 1993; Dagher 1993; Dega and Kennedy 1993). The human skeletal remains were found during backhoe excavation of six inches of sand from the tank area and in backfill brought into the project area for ground support. The fragmented human skeletal remains were scattered, and no formal burial site was identified. It was speculated that the skeletal fragments were brought in with sand from Maui for construction work during the project. The find was designated SIHP Site 04729.

Excavations were monitored for subsurface electrical infrastructure for a new sewer pumping station (Bush 2004), which documented a layer of natural beach sand between 15.0 to 100.0 cmbs (5.9 to 40.0 in). No cultural layer was encountered; however, a trash pit, designated SIHP Site 06704, was recorded within Kalākaua Avenue, adjacent to the aquarium. The site consisted of bottles dating between the 1880s to 1920s, broken ceramic pieces, and butchered animal bone.

Archaeological monitoring was conducted for the Public Baths Pump Station Modification Improvements Project (Tome and Spear 2005). A single archaeological site was identified which consisted of a subsurface feature containing glass bottles manufactured from the 1870s to the 1920s. The site was designated SIHP Site 06702. It was situated in a layer of undisturbed of beach sand at 100 to 170 cmbs, which was overlain by multiple layers of fill. No further archaeological work was recommended in the project area footprint due to extensive previous disturbance.

Archaeological monitoring was conducted in 2008 for electrical system upgrades in the northeast corner of the Waikīkī Aquarium (Liebhardt and Kennedy 2008). The soil stratigraphy primarily consisted of two layers of fill over a transitional layer, followed by Jaucus sand (Liebhardt and Kennedy 2008:12).



1 Figure 14. Previous Archaeological Investigations and Historic Properties at the Honolulu Zoo

Anticipated Finds

Based on archival research and the results of previous archaeological studies in and near the Aquarium, there is potential for encountering subsurface historic properties, including human burials. Dune sands, which may contain human burials, are known to underlie historic fill deposits at approximately 15.0 to 100.0 cm (5.9 to 40.0 in) below ground surface in the northeast corner of the aquarium (Bush 2004; Liebhardt and Kennedy 2008). Evidence of early twentieth century habitation may be encountered on the south side of the aquarium, which is near the former location of the Irwin family's stable. In addition to human burials, anticipated archaeological finds include traditional Hawaiian subsurface cultural deposits or artifacts, and historic features or artifacts associated with the Irwin residence. Finally, the Waikīkī Aquarium is over 50 years old and is a historic property; no SIHP site number has been assigned.

FIELD INSPECTION

An archaeological field inspection was conducted by a PCSI archaeologist, Kylen Chang, B.A., on 17 June 2022. Dennis Gosser, M.A., served as Principal Investigator for the project. Field inspection consisted of walking the property where the ground disturbance is proposed and photographing existing conditions in the project footprint.

Field Inspection Results

As previously noted, the Waikīkī Aquarium is over 50 years old and is a historic property; no SIHP site number has been assigned. No newly identified historic properties were identified in the project area during the field inspection. Photograph locations indicating direction are displayed in Figure 15, which correspond to photographs in Figures 16 through 23.

Figure 15. Proposed Excavations and Field Inspection Photograph Locations Corresponding to Figures 16–23.

Figure 16. Photographs of Proposed Location for Two Wells and a Filter Housing Structure; Photograph 1 Facing Southeast (Left) and Photograph 2 Facing Northeast (Right).

Figure 17. Photographs of Proposed Location for Two Wells and a Filter Housing Structure; Photograph 3 Facing Southwest (Left) and Photograph 4 Facing West (Right).

Well Sites and Filter Housing Structure

The location of the proposed two wells and filter housing structure is currently covered in landscaped grass. Photographs 1–4 of the area are show in Figures 16 and 17 above.

Trenching for Piping

Apart from the new waterline, trenching for new piping (drain, sewer, and post-filter) will occur on the south and west perimeter of the project area. This area contains landscaped grass and pavement. Photographs 13–16 of the trenching areas are show in Figures 18 and 19.

Pump Station, Emergency Overflow Box, and Discharge and Transfer Sump

The location of the proposed pump station, emergency overflow box, and discharge and transfer sump structure is currently paved. Photographs 11 and 12 of the area are show in Figure 20.

General Project Area Photographs.

Additional areas in the vicinity of the proposed ground disturbance were also photographed. Photographs 5–10 in Figures 21–23 show the built environment and landscaping.

SUMMARY AND ASSESSMENT

The proposed project is at the Waikīkī Aquarium at 2777 Kalākaua Avenue. The project proponent is the University of Hawai‘i, and the landowner is the State of Hawaii. The parcel, TMK (1) 3-1-031:006, measures 2.35 acres (.95 hectares). Excavations in the approximately 0.16-acre project area (TMK (1) 3-1-031:006 (por.) will be conducted primarily in the western and southern portion of the parcel for piping, two wells, pump station, emergency overflow box, and discharge and transfer sump structure, and a filter housing structure. The purpose of the project is to bring the facility into compliance with the National Pollutant Discharge Elimination System Permit, which is issued and monitored by the Hawaii Department of Health (DOH). This ALR was carried out in accordance with Hawaii Revised Statutes (HRS) Chapter 6E, and Title 13 of the Hawaii Administrative Rules (HAR), Subtitle 13 (State Historic Preservation Division Rules), Chapter 275 (*Rules Governing Procedures for Historic Preservation Review for Governmental Projects Covered Under Sections 6E-7 and 6E-8, HRS*).

The Waikīkī Aquarium property falls within the traditional land division of Kāneloa ‘Ili. The area was intensively used for habitation, aquaculture, and agriculture from the pre–Contact period into the mid- to late 1800s, when the landscape was transformed by wealthy businessmen. One such businessman was William G. Irwin, whose large home, designed by Charles Dickey, was immediately south of today’s aquarium.

Based on background research and previous archaeological findings in the vicinity, there is potential for traditional Hawaiian historic properties and human burials in the project area. It is also possible that historic period artifacts of cultural deposits may present based on the proximity of the Irwin home site.

RECOMMENDATIONS

As a result of this ALR, it was found that no historic properties are within the proposed project area, although two historic properties are within the larger TMK parcel: the Waikīkī Aquarium building (no SIHP site number designated) and SIHP Site 04729, which was speculated to be skeletal fragments brought onto the aquarium parcel with sand from Maui for construction. Along the beach to the north and south of the aquarium, numerous traditional Hawaiian human burials have been identified. Previous archaeological investigations in the vicinity have recorded in situ soils under fill layers.

Based on the ALR and on previous archaeological projects near the project area that have recorded subsurface historic properties including cultural deposits and human burials, there is insufficient information to make a Chapter 6E historic preservation determination of effect of the project’s impact on potential subsurface historic properties within the 0.16-acre project area. Therefore, archaeological monitoring for identification purposes, guided by a SHPD-approved archaeological monitoring plan (HAR 13-13-279), is recommended. A list of SHPD-permitted consultants to conduct the archaeological monitoring can be found at: https://dlnr.hawaii.gov/shpd/about/branches/archaeology/

Figure 18. Photographs of Proposed Piping Location Along West Perimeter of the Project Area; Photograph 13 Facing North (Left) and Photograph 14 Facing South (Right).

Figure 19. Photographs of Proposed Piping Location Along Southwest and South Perimeter of the Project Area; Photograph 15 Facing Southeast (Left) and Photograph 16 Facing East (Right).

Figure 20. Photographs of Proposed Location for Pump Station/Emergency Overflow Box/Discharge/Transfer Sump; Photograph 11 Facing West (Left) and Photograph 12 Facing South (Right).

Figure 21. Photograph 9 of the Central Portion of the Project Area, Facing North (Left); Photograph 10 of the East-Central portion of the Project Area, Facing Northeast (Right).

Figure 22. Photographs of southeast side of the Project Area; Photograph 5 Facing East (Left) and Photograph 6 Facing Northeast (Right).

Figure 23. Photograph 7 of the South-Central Portion of the Project Area, Facing North (Left); Photograph 8 of the East-Central portion of the Project Area, Facing Northeast (Right).

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GLOSSARY OF HAWAIIAN TERMS

ahupuaʻa—land division and community

> Land division usually extending from the uplands to the sea, so called because the boundary was marked by a heap (*ahu*) of stones surmounted by an image of pig (*puaʻa*) or because a pig or other tribute was laid on the altar as tax to the chief. The landlord or owner of an *ahupuaʻa* might be a *konohiki* (Pukui and Elbert 1986:9)

aliʻi—chief or chiefess

> Chief, chiefess, officer, ruler, monarch, peer, headman, noble, aristocrat, king, queen, commander (Pukui and Elbert 1986:20); implies hereditary rank

akua—a god or goddess

> God, goddess, spirit, ghost, devil, image, idol, corpse; divine, supernatural; godly (Pukui and Elbert 1986:15)

ʻaumakua—family god

> Family or personal gods, deified ancestors who might assume the shape of sharks (all islands except Kauaʻi), owls (as at Mānoa, Oʻahu and Kaʻu and Puna, Hawaiʻi) hawks (Hawai'i), *ʻelepaio*, *ʻiwi*, mudhens, octopuses, eels, mice, rats, dogs, caterpillars, rocks, cowries, clouds, or plants. A symbiotic relationship existed; mortals did not harm or eat *ʻaumakua* (they fed sharks), and *'aumakua* warned and reprimanded mortals in dreams, visions, and calls (Pukui and Elbert 1986:32)

heiau—ceremonial structure or place

> Pre-Christian place of worship, shrine (Pukui and Elbert 1986:64)

heiau poʻokanaka— a class of *heiau* where human sacrifices were made

> A heiau where human sacrifices were offered (Pukui and Elbert 1986:64)

ʻili—division of land smaller than an ahupuaʻa

> Land section, next in importance to *ahupuaʻa* an usually a subdivision of an *ahupuaʻa* (Pukui and Elbert 1986:97)

kapu—taboo

> Taboo, prohibition; special privilege or exemption from ordinary taboo; sacredness; prohibited, forbidden; sacred, holy, consecrated; no trespassing, keep out. (Pukui and Elbert 1986:132)

konohiki—land managers

> Headman of an ahupuaʻa land division undert the chief; land or fishing rights under the control of the konohiki (Pukui and Elbert 1986:166)

kula—dryland field

> Plain, field, open country, pasture. An act of 1884 distinguished dry or *kula* land from wet or taro land (Pukui and Elbert 1986:179)

kuleana—small piece of land under the responsibility of a tenant

> Right, privilege, concern, responsibility, title, business, property, estate, portion, jurisdiction, authority, liability, interest, claim, ownership, tenure, affair, province (Pukui and Elbert 1986:179)

loʻi—wetland taro field

> Irrigated terrace, especially for taro, but also for rice (Pukui and Elbert 1986:209)

loko iʻa—fishpond

makaʻāinana—commoner

> Commoner, populace, people in general (Pukui and Elbert 1986:224)

moʻōlelo–legend

> Story, tale, myth, history tradition, legend, journal, log, yarn, fable, essay, chronicle, record, article (Pukui and Elbert 1986:254)

pali —cliff

Cliff, precipice, steep hill or slope suitable for *olonā* and *wauke*; full of cliffs; to be a cliff (Pukui and Elbert 1986:321)

pōhaku—stone

Rock, stone, mineral, tablet (Pukui and Elbert 1986:334)

wahi pana—legendary place

Legendary place (Pukui and Elbert 1986:377)

Appendix G:

Cultural Impact Assessment in Support of Wastewater Discharge System Upgrades at Waikīkī Aquarium

REPORT

Cultural Impact Assessment in Support of Wastewater Discharge System Upgrades at Waikīkī Aquarium in Waikīkī Ahupua‘a, Honolulu (Kona) District, Island of O‘ahu, Hawaii

TMK: (1) 3-1-031:006 (por)

Prepared for:
Oceanit Laboratories, Inc.
828 Fort Street, Suite 600
Honolulu, Hawaii 96813

On behalf of:
University of Hawai‘í
Spalding Hall, 2540 Maile Way
Honolulu, Hawaii 96822

October 2022

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Cultural Impact Assessment in Support of Wastewater Discharge System Upgrades at Waikīkī Aquarium in Waikīkī Ahupua‘a, Honolulu (Kona) District, Island of O‘ahu, Hawaii
TMK: (1) 3-1-031:006 (por.)

By
Nicole I. Vernon, M.A.

Dennis Gosser, M.A.
Principal Investigator

Prepared For:
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MANAGEMENT SUMMARY

Document Title:	Cultural Impact Assessment in Support of Wastewater Discharge System Upgrades at Waikīkī Aquarium in Waikīkī Ahupuaʻa, Honolulu (Kona) District, Island of Oʻahu, Hawaii
Date/Revised Date:	Draft: July 2022; revised drafts: September 2022, October 2022
SHPD HICRIS Project No.:	2022PR01098
Archaeological Permit #:	SHPD Permit No. 22-09
Project Location:	2777 Kalākaua Ave, Honolulu, HI 96815
Project TMK:	(1) 3-1-031:006 (por.)
Parcel Acreage:	2.35 acres (0.95 hectares)
Project Area:	Approx. 016 acres
Land Owner:	State of Hawaii
Project Proponents:	University of Hawaiʻi
Project Tasks:	Cultural Impact Assessment
Principal Investigator:	Dennis Gosser, M.A.
Regulatory Oversight:	HRS Chapter 343
Project Background:	The University of Hawaiʻi is proposing Wastewater Discharge System Upgrades at Waikīkī Aquarium. Ground disturbing work will involve trenching for installation of waterlines and excavations for new associated structures, which include two wells, a housing structure for a new pump station, emergency overflow box, discharge, and transfer sump, and a filter housing structure.
SIHP #:	Waikīkī Aquarium is over 50 years old (no SIHP site number designated); See Human Skeletal Remains below
General Findings:	Background research and previous archaeological findings in the vicinity indicate there is potential for traditional Hawaiian historic properties and human burials in the project area. Waikīkī was intensively used during the pre-Contact and early historic period for habitation, agriculture, and aquaculture, and several *heiau* were once present. In the late 1900s, Waikīkī's landscape was radically modified and became the home of many wealthy businessmen, such as William G. Irwin from England, whose estate included the current project area. Kumu Hula Samuel M. ʻOhukaniʻōhiʻa Gon III (cultural practitioner) has held a changing of the seasons event to the north of the aquarium at the site of the heiau Kūpalaha
Ka Paʻakai O Kaʻaina Analysis	1. *The identity and scope of valued cultural or historical resources, including the extent to which traditional and customary native Hawaiian rights are exercised:* no valued cultural or historical resources, and no traditional and customary native Hawaiian rights are exercised within the proposed project area. 2. *The extent to which those resources—including traditional and customary native Hawaiian rights—will be affected or impaired by the proposed action:* no traditional and customary native Hawaiian rights—will be affected or impaired by the proposed action. 3. *The feasible action, if any, to be taken by the agency to reasonably protect native Hawaiian rights if they are found to exist:* no native Hawaiian rights related to cultural or historical resources have been found to exist within the proposed project area.
Human Skeletal Remains:	50-80-14-04729, secondarily deposited human skeletal remains (outside project area)
SHPD HRS Chapter 6E Recommendations:	Based on the results of this document and on previous archaeological projects near the project area that have recorded subsurface historic properties including cultural deposits and human burials, there is insufficient information to make a Chapter 6E historic preservation determination of effect of the project's impact on potential subsurface historic properties within the 0.16-acre project area. Therefore, archaeological monitoring for identification purposes, guided by a SHPD-approved archaeological monitoring plan (HAR 13-13-279), is recommended. A list of SHPD-permitted consultants to conduct the archaeological monitoring can be found at: https://dlnr.hawaii.gov/shpd/about/branches/archaeology/

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INTRODUCTION

Under contract to Oceanit Laboratories, Inc., Pacific Consulting Services, Inc. (PCSI) has prepared this Cultural Impact Assessment (CIA) in support of the Wastewater Discharge System Upgrades project at Waikīkī Aquarium in Waikīkī Ahupuaʻa, Honolulu (Kona) District, Island of Oʻahu, Hawaii. The project proponent is the University of Hawaiʻi, and the landowner is the State of Hawaii. The location of the proposed project is shown in Figure 1.

PROJECT LOCATION, PROJECT PURPOSE, AND REGULATORY GUIDANCE,

The proposed project is located at the Waikīkī Aquarium at 2777 Kalākaua Avenue. The entire parcel measures 2.35 acres (.95 hectares) and the proposed 0.16-acre (approximate) project area excavations will be conducted primarily in the western and southern portions of the parcel. The Tax Map Key (TMK) parcel for the parcel is (1) 3-1-031:006, as shown in Figure 2. Table 1 summarizes the proposed ground disturbing activities, which are described in detail in this section. The project site plan is shown in Figure 3.

Proposed work involves upgrades to the wastewater discharge system. New water, sewer, drain, and discharge lines are to be installed. A housing structure for a new pump station, emergency overflow box, discharge, and transfer sump will be constructed on the west-central portion of the property. A new filter housing structure will be constructed on the south-central portion of the property. Two new injection wells will be excavated on the east and west sides of the housing structure. The purpose of the project is to bring the facility into compliance with the National Pollutant Discharge Elimination System Permit, which is issued and monitored by the Hawaii Department of Health (DOH). The upgraded system will eliminate all direct effluent discharge into the ocean and into the City and County of Honolulu wastewater system.

Table 1. Anticipated Construction Activities.

Task	Work Description	Anticipated Size in m (Length x Width x Depth)
Trenching	Water, sewer, drain, and discharge lines	122 x 0.61 x 1.5 107 x 1.5 x 1.5 24.3 x 2.1 x 1.5
Excavation	Pump station	5.5 x 7.9 x 2.7 m 0.14 dia x 15.2 deep micropiles (n=9)
Excavation	Filter housing structure	9.1 x 6.7 x 0.9 0.14 dia x 15.2 deep micropiles (n=14)
Excavation	Two wells	0.46 dia x 76.2 deep wells (n=2) 1.5 dia x 2.1 deep well vaults (n=2)

The purpose of developing this CIA was to gather together information concerning historic properties, cultural resources, and traditional practices that may be impacted by the proposed project. The CIA was prepared pursuant to Act 50[1] (House Bill No. 2895, signed into law on 26 April 2000), and in accordance with the Office of Environmental Quality Control (OEQC) "*Guidelines for Assessing Cultural Impact,*" (adopted by the State of Hawaii Environmental Council on 19 November 1997). The CIA was also prepared in accordance with Hawaii Revised Statute (HRS) Chapter 343 (Environmental Impact Statements), which serves to "…ensure that environmental concerns are given appropriate consideration in decision making…" (HRS Chapter 343-1).

In addition to the regulatory statutes noted above, the current study draws guidance from HRS Chapter 6E-8 as well as Title 13 of the Hawaii Administrative Rules (HAR), Subtitle 13 (State Historic

[1] Section 1 of Act 50 states that the preparation of environmental assessments…should identify and address effects on Hawaii's culture, and traditional customary rights and notes that native Hawaiian culture plays a vital role in preserving and advancing the unique quality of life and the 'aloha spirit' in Hawaiʻi. Articles IX and XII of the state constitution, other state laws, and the courts of the State impose on governmental agencies a duty to promote and protect cultural beliefs, practices, and resources of native Hawaiians as well as other ethnic groups."

Figure 1. Parcel and Project Area Location on 7.5-Minute Series USGS Honolulu Topographical Quadrangle (2017).

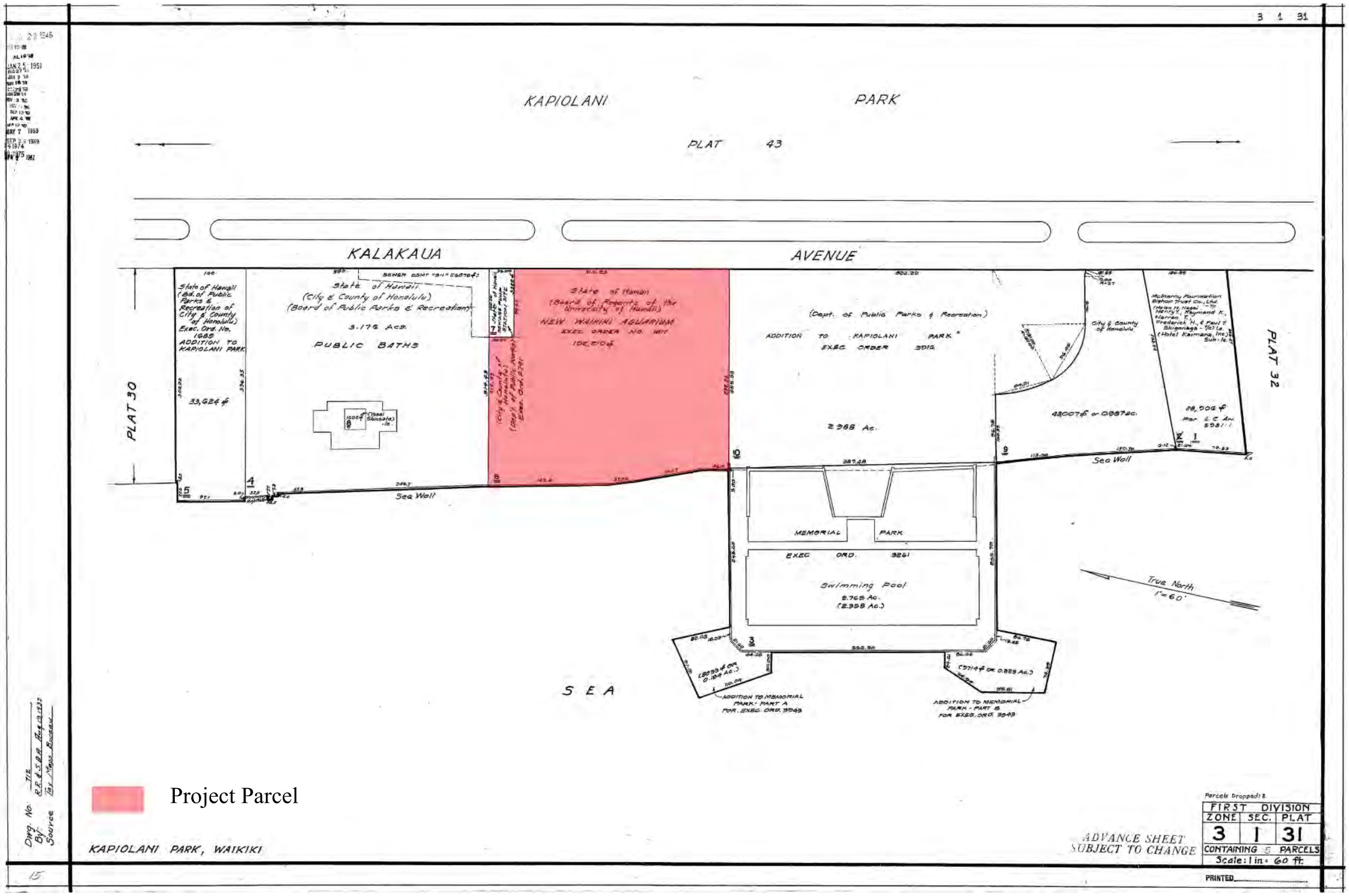

Figure 2. Project Parcel Shown in Tax Map Key (TMK) Plat Map (1) 3-1-031:006 (Tax Maps Bureau 1932)

Figure 3. Conceptual Design Plan for the Waikīkī Aquarium Wastewater Discharge System Upgrade Project

Preservation Division Rules), Chapter 275: (*Rules Governing Procedures for Historic Preservation Review for Governmental Projects*) for pertinent definitions and methodologies concerning historic properties and cultural resources.

ENVIRONMENTAL SETTING

Waikīkī Ahupuaʻa is located on the leeward side of Oʻahu and extends from the Koʻolau mountain range through the coastal plain to the shoreline. The approximately 0.16-acre Affected Project Area (APA) is situated within the beach portion of Kapiʻolani Park, between the shoreline and Kalākaua Avenue.

TOPOGRAPHY AND SOILS

The project area is in a low-lying coastal zone, approximately 3.0 m (9.8 feet [ft]) above mean sea level (amsl). Two major soil series are present, as shown in Figure 4. Most of the project area contains beaches (BS), while the remainder is classified as Jaucas sands (JaC). Areas classified as beaches consist of either sand derived from coral and seashell, or in some cases basalt and andesite (Foote et al 1972:28).

The Jaucas sands series are found on vegetated beach and sand dune areas along the shore. These soils formed in calcareous sand deposits. They are very deep, excessively drained, and have very rapidly permeability (Foot et al. 1972:48). Areas containing these soils are typically used for recreation and as marine wildlife refuges. Vegetation consists of sea grape (*Coccoloba uvifera*), coconut (*Cocos nucifera*), and other xerophytic and salt-tolerant plants. From a historic preservation perspective, deposits of Jaucas Sands are often associated with the presence of traditional Hawaiian burials and subsurface cultural deposits.

Prior to the 1900s, Waikīkī had a long history of productive wetland agriculture and aquaculture (Nakamura 1979). These activities came to a halt in the first part of the 20th century with the dredging of the Ala Wai Canal and the filling of land. Consequently, it is typical to find substantial historic fill deposits, which consist of either calcareous marine sediments originating from the dredging of the Ala Wai Canal, imported terrigenous fill, or a combination of both, overlying in situ soils in the lowlands of Waikīkī.

RAINFALL, HYDROLOGY, AND VEGETATION

Annual rainfall in the project area averages 596.3 millimeters (mm) (23.48 in) per year with a majority of the rain falling between October and March (Giambelluca et al. 2013). The vegetation in the project area consists of modern landscaping associated with the aquarium grounds and includes both indigenous and introduced species.

HISTORICAL BACKGROUND

Archival background research and literature review examined maps, historical and archival documents, and previous archaeological studies in the vicinity of the project area. Relevant historical maps were georeferenced to determine where traditional Hawaiian or historic features may fall within the project area. The information obtained from these sources was synthesized to present data findings and to evaluate the potential for archaeological and cultural resources in the project area.

The Hawaiian cultural landscape can be described through *moʻōlelo* and *wahi pana* (significant Hawaiian place names). *Moʻōlelo* may be myths, legends, proverbs, and events surrounding well-known individuals in Hawaiian history (Pukui and Elbert 1986:254). The project area is situated in the *ʻili* (land division of an *ahupuaʻa*) of Kāneloa in Waikīkī Ahupuaʻa. Kāneloa can be translated as "tall Kāne" (Pukui et al. 1974:84). Waikīkī, which can be translated as "spouting water" (Pukui et al. 1974:223), is named for its former wetlands fed by numerous streams from the valleys of Makiki, Mānoa, and Pālolo.

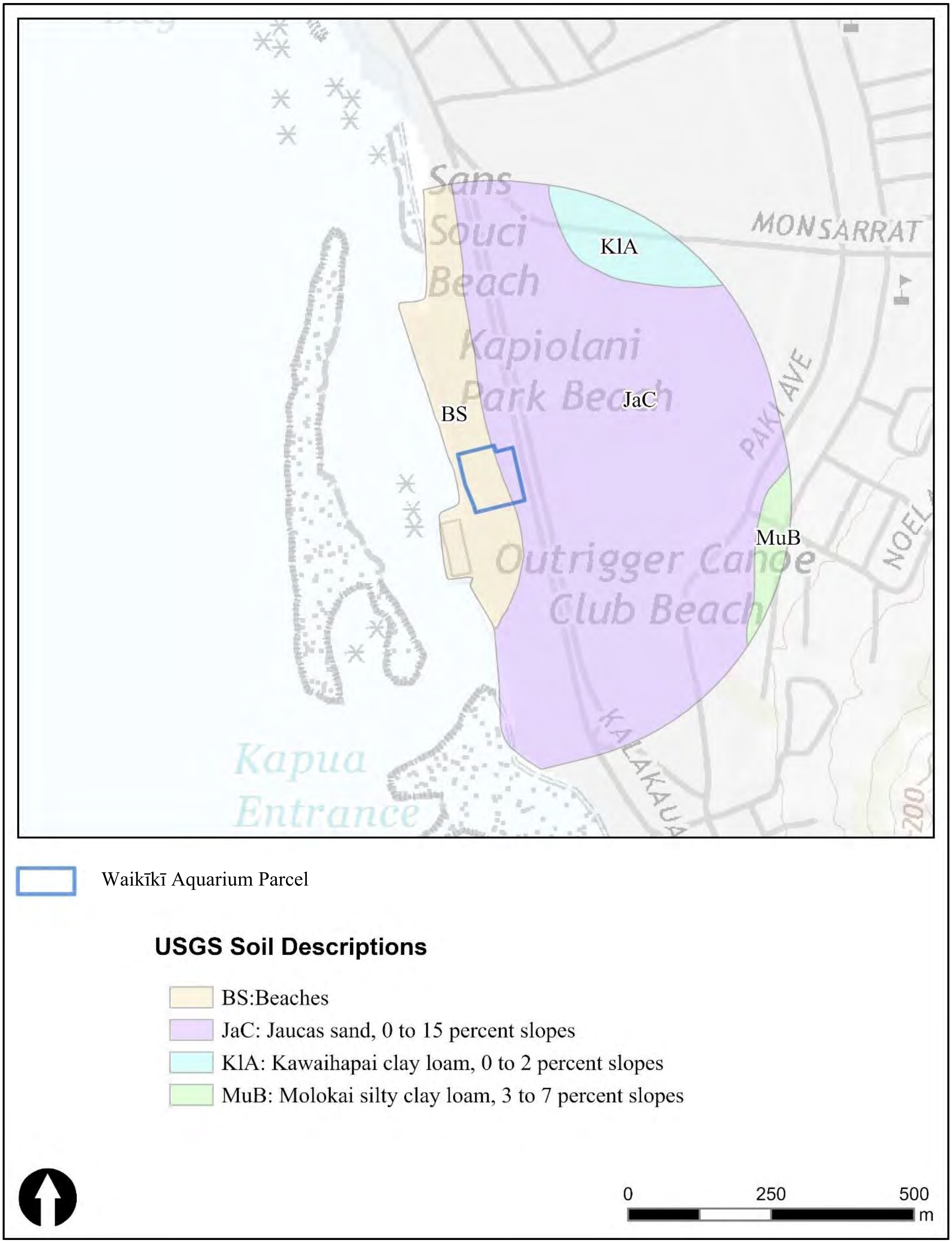

Figure 4. Soil Units in the Vicinity of the Project Area (Soil Survey Staff, NRCS, USDA 2022).

Several *heiau* (traditional Hawaiian temple) were once located in Waikīkī Ahupuaʻa, which were described in Thrum's Hawaiian Annual for 1907. These included Papaʻenaʻena Heiau, Kapua Heiau, Kūpalaha Heiau, Helumoa or Āpuakēhau Heiau, Makahuna Heiau, Kamauakapu Heiau, Kulanihakoi Heiau, and Pahu-a-Maui Heiau (Thrum 1906a:44–45; Thrum 1906b: 49–69). Also mentioned in the Annual are four large *pohaku* —also of religious significance—commonly called the Wizard Stones of Kapeimāhū, which are extant to today at Waīkikī Beach (Boyd 1906:139–141). Not noted by Thrum are two other *heiau* formerly present in Waikīkī: Hale Kumukaʻaha Heiau, which was mentioned by Hawaiian historian Samuel Kamakau in the Hawaiian newspaper *Kuakoa* (McAllister 1933:78), and "Altar Opunaha," which appears on a ca 1876 historic map by C.J. Lyons of the south coast of Oʻahu (Register Map [RM] RM 727). It is unclear if latter site was something other than a *heiau.* Another undated but contemporaneous map by Lyons of Kāneloa does not label the site as an altar. These two maps are shown in Figures 5 and 6. During background research, the only historical sources identified mentioning Opunaha[2] are death notices dating to the 1860s in *Kuakoa* that cite Opunaha, Waikīkī or Waikīkī Kai as the place of death.

The most well-known *heiau* of those listed above is Papaʻenaʻena Heiau. Numerous accounts of this *heiau* from early voyagers were compiled by McAllister (1933:71–74). This *heiau* was located on the west side of Diamond Head and visible from Waikīkī, as shown above in Figures 5 and 6 (McAllister 1933:71). Thrum further offers that it was "at the foot of Diamond Head slope, rear of Douglas' premises" (Thrum 1906a:44). It was a *heiau poʻokanaka* (*heiau* where human sacrifices were made) and known for the number of sacrifices carried out by Kamehameha I. A description of Papaʻenaʻena Heiau during this early period is from the journal of Tyerman and Bennet (1832:48–49).

> In the year 1804, when the late king, Tamehameha, was on his way from Hawaii, to invade Tauai, he halted with an army of eight thousand men at Oahu. The yellow fever broke out among the troops, and in the course of a few days swept away more than two-thirds of them. During the plague, the king repaired to the great marae at Wytiti, to conciliate the god, whom he supposed to be angry. The priests recommended a ten days' tabu, the sacrifice of three human victims, four hundred hogs, as many cocoanuts, and an equal number of branches of plantains. Three men, who had been guilty of the enormous turpitude of eating cocoa-nuts with the old queen (the present king's mother), were accordingly seized and led to the marae. But there being yet three days before the offerings could be duly presented, the eyes of the victims were scooped out, the bones of their arms and legs were broken, and they were then deposited in a house, to await the coup de grace on the day of sacrifice. While these maimed and miserable creatures were in the height of their suffering, some persons, moved by curiosity, visited' them in prison, and found them neither raving nor desponding. But sullenly singing the national *huru*---dull as the drone of a bagpipe, and hardly more variable-as though they were insensible of the past, and indifferent to the future. When the slaughtering time arrived, one of them was placed under the legs of the idol, and the other two were laid, with the hogs and fruit, upon the altar-frame. They were then beaten with clubs upon the shoulders till they died of the blows.-This was told us by an eye-witness of the murderous spectacle [Tyerman and Bennet 1832:48–49].

A chief named Kaolohaka is also said to have been sacrificed at this *heiau*: "Fragments of its walls, torn down in 1860, show it to have been about 240 feet square; said to be the place of sacrifice of Kaolohaka, a chief of Hawaii, on suspicion of being a spy" (Thrum 1906a:44).

[2] Kumu Hula Samuel M. ʻOhukaniʻōhiʻa Gon III, a scientist, Hawaiian cultural practitioner, paleobiologist, and teacher has held a changing of the seasons event on the north side of the aquarium: "We gathered at the water's edge at the site of the heiau Kūpalaha, the sibling heiau of Papaʻenaʻena (that still graces the base of Leahi) where, from its kuahu (altar), named Opunaha, the setting sun would be observed by the kahuna kilolani, and on a certain day, the sun would set into the bowl of Puʻu o Kapolei, when seen from Opunaha, marking the end of the Hoʻoilo [Hawaiian Cool Wet Season] and the start of the Kauwela [Hawaiian Hot Dry Season], and the reactivation of the luakini heiau of Kū." (https://www.facebook.com/events/1751387621819771/?acontext=%7B%22ref%22%3A%223%22%2C%22ref_newsfeed_story_type%22%3A%22regular%22%2C%22action_history%22%3A%22null%22%7D).

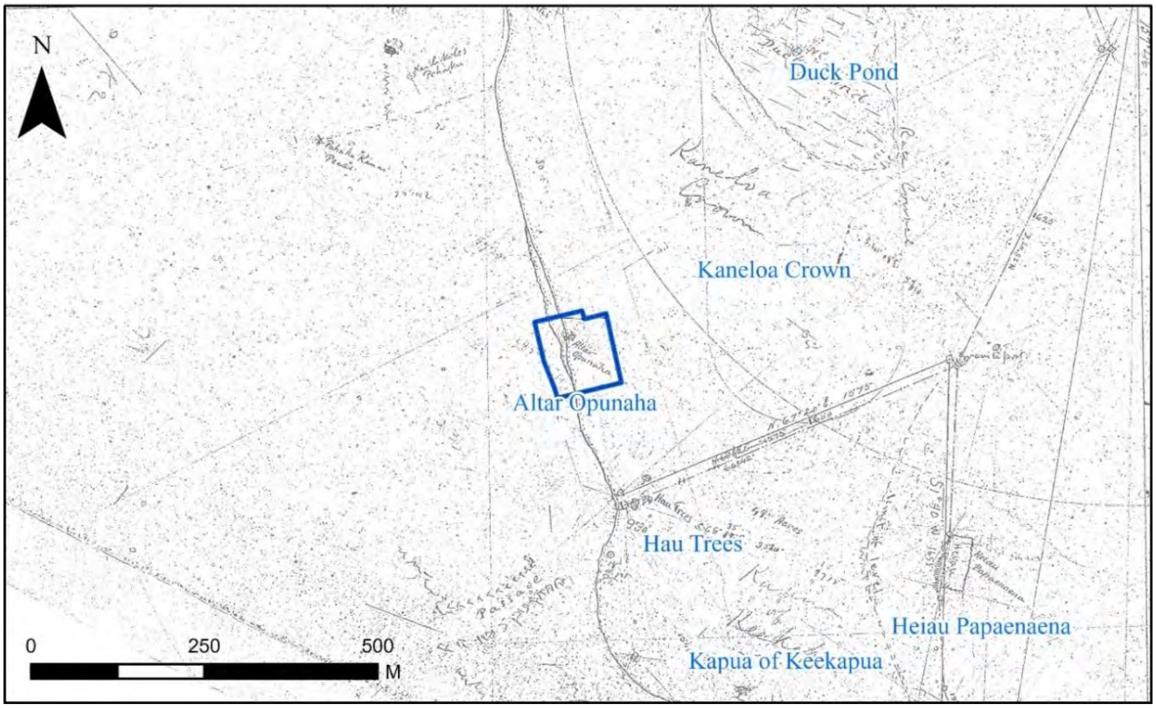

Figure 5. Portion of ca 1876 Map of the South Coast of Oʻahu by C.J. Lyons Showing "Altar Opunaha" and "Heiau Papaenaena" in Relation to the Project Parcel (Reg. 727). Blue Text Added for Clarity.

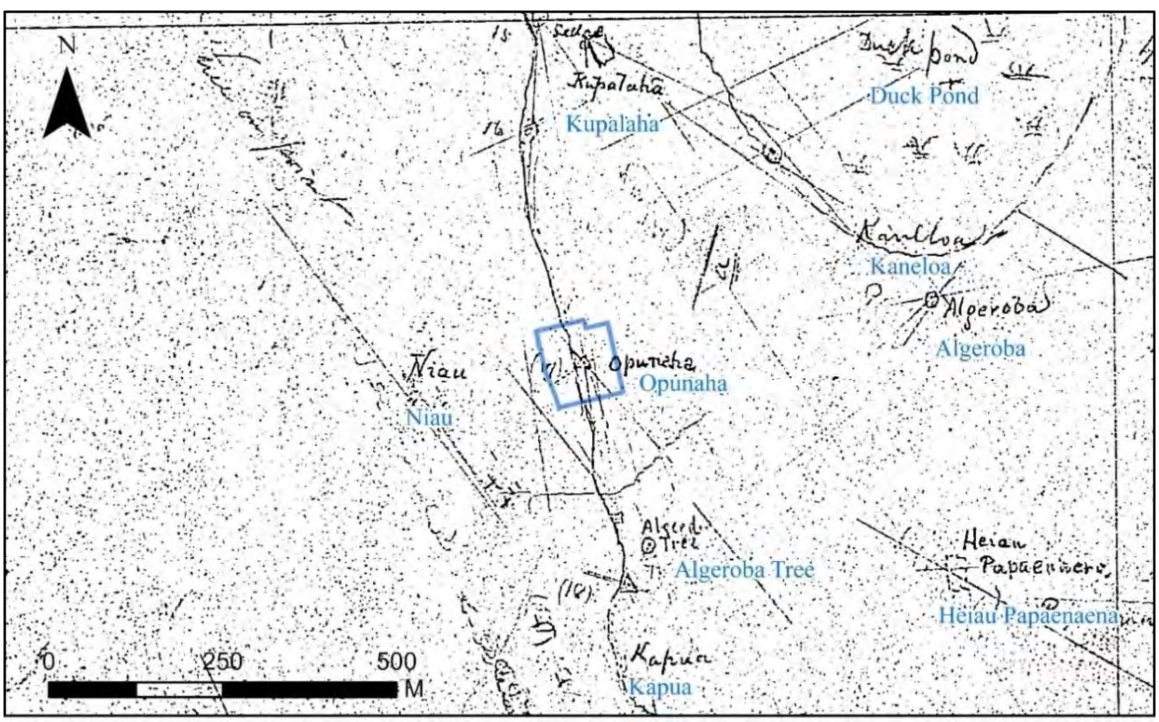

Figure 6. Portion of ca 1876 Map of Kāneloa by C.J. Lyons Showing "Opunaha," Kupulaha," and "Heiau Papaenaena" in Relation to the Project Parcel. Blue Text Added for Clarity.

Based on various accounts, McAllister determined that the *heiau* was "a quadrangular paved terrace, with walls on three sides, but open on the west side, which faced the village of Waikiki and the sea" (McAllister 1933:74). Multiple step-like terraces led to the open side of the *heiau*. Averaging measurements, given by first-hand accounts, McAllister estimated that the *heiau* was approximately 128 feet by 68 feet with walls 6.2 feet high and 3 feet wide. According to Thrum (1906a:44) the *heiau* was destroyed by Kanaina in 1856 and the stones were used to enclose Queen Emma's premises and for road work.

Kapua Heiau was located somewhere in or near Kapiʻolani Park and is mentioned in the *Legend of Pumaia* (Fornander 1918-1919). Pumaia was a pig farmer who lived in Pukaola in the Kona District of Oʻahu. The king of Oʻahu, Kūaliʻi, was building Kapua Heiau, "east of Leahi Hill overlooking Māmala Bay" (Fornander 1918-1919: 470). When the *heiau* was complete, Kūaliʻi repeatedly ordered pigs from Pumaia until one day Pumaia refused to oblige him. The king's men fought Pumaia over one of the pigs and all the men were killed by Pumaia but one. Kūaliʻi then declared war on Pumaia. Pumaia won multiple battles against the king's soldiers until finally Kūaliʻi prayed to his god to capture Pumaia. Only then was he caught and bound: "Kualii was so incensed at Pumaia that he was immediately killed and was dragged to Kapua where his dead body was thrown into the pit with the men he had killed. During the ill treatment given his body, the jaws were crushed and cut up into fragments" (Fornander 1918-1919:474).

Makahuna Heiau was once located on the south side of Diamond Head, overlooking "Aqua Marine" and near the former residence of Honorable Sanford B. Dole (McAllister 1933:196). According to a historic map by Wall (1893), this places the *heiau* west of Diamond Head Lighthouse. McAllister offers the following accounts:

> Thrum writes: "A large heiau enclosure dedicated to Kane and Kanaloa, of Kuula character, so said." Tucker reports: "Opposite the residence of the Honorable Sanford B. Dole. The ruins of a heiau of the Pookanaka class. Was located at this place in order to propitiate, by human sacrifice, the departure of the Aliis to foreign shores, and Black Point, between that and Kahala, was called Keala o Kahiki. These ruins are mostly all overgrown and have been used probably to make fences or for road purposes. A dense growth of lantana and kiawe, scrub kiawe, covers the ruins" [McAllister 1933:196].

According to Thrum (1906a), Kūpalaha Heiau was located at Kapiʻolani Park near Cunha's, which is a surfing area named for the Emmanuel S. Cunha estate near Kapahulu and Kalākaua Avenues (Pukui et al. 1974). The location of this estate in shown in Figure 7. In his description Thrum wrote: "Entirely obliterated. Class unknown, but said to have had connection in its workings with Papaenaena" (Thrum 1906a:44). Hammatt and Chiogioji (2002:9) locate Kūpalaha Heiau "on or adjacent to Kalākakua Ave., just southeast of the intersection with Monsarrat Ave." This *heiau* was associated with a legend involving Kākuhihewa, *mōʻi* (king) of Oʻahu circa 1540–1634, and Pueo Aliʻi (king of the owls). In the legend, a man named Kapoi went to gather pili grass at a marsh near the beach. He found seven owl eggs that he collected with the intention of later eating (Thrum 1907:200–202; Westervelt 1915:133–136). After returning home, an owl arrived at his fence and cried out "O Kapoi, give me my eggs!" Hearing the repeated pleas, Kapoi returned the eggs. The owl became his *ʻaumakua* (family god) and instructed him to build Manua Heiau (situated on the southwest side of Pūowaina [Punchbowl Crater]). After building the *heiau* he made an offering of bananas and set the *kapu* (taboo) days for its dedication. At the same time, Kākuhihewa was building a *heiau* in Waikīkī and he made a law that if any person built a *heiau* and set the *kapu* before him, that person would be put to death. Kapoi was arrested and taken to the Kūpalaha Heiau in Waikīkī. Kapoi's *ʻaumakua* owl tried to help him by calling on all of the owls in the islands to gather and fly to Kūpalaha Heiau to battle the king's men. The king's men surrendered, and the owls won the battle. Since that day, the owl was considered a powerful *akua* (god) and the location of the battle was known as Kukaeunahio-ka-pueo, which means "the confused noise of owls rising in masses" (Thrum 1907:200–202; Westervelt 1915:133–136).

Figure 7. Portion of 1912 Map of Honolulu Old Aquarium Location and Estates of Prominent Individuals Along the Coast (Dove 1912).

TRADITIONAL HISTORY AND LAND USE

Waikīkī became the seat of royal power in the 1400s when Māʻilikūkahi moved his court to the south side of the island. According to Hawaiian Historian Samuel Kamakau, "Upon Mailikukahi becoming king, he was taken early by the chiefs to reside at Waikiki, and that perhaps was the origin of the residence of chiefs at Waikiki, because Waialua was the place formerly of the residence of chiefs, as was also Ewa" (Kamakau n.d. in McAllister 1933:74).

Kamakau notes that the chief Kalamakua, who reigned around the sixteenth century (based on Stoke's 20 year-count; Kelly 1989), was the first to build an extensive irrigation system of *loko iʻa* (fishpond) and *loʻi* (irrigated taro field) in Waikīkī: "a good chief. He was noted for cultivating, and it was he who constructed the large pond fields Keʻokea, Kūalulua, Kalāmanamana, and other *loʻi* in Waikiki. He traveled about his chiefdom with his chiefs and household companions to cultivate the land and gave the produce to the commoners, the "*makaʻāinana*" (Kamakau 1991:45).

In 1780, the army of Maui chief Kahekili landed at Waikīkī "carpeting the beaches from Kaʻalawai (near Diamond Head) to Kawehewehe (next to the Halekulani Hotel)" (Kanahele 1995:79). According to Thrum (1925:109), he dedicated Papaʻenaʻena Heiau, formerly located in the vicinity of Diamond Head, following his victory. In 1794, Kahekili died and was succeeded by Kalanikupule. The next year, Kamehameha invaded Oʻahu at Waikīkī, possibly with 10,000 warriors. The army made their base on the sandy beaches from Waiʻalae to Diamond Head to Kālia (Kanahele 1995:87). The final battle ended at Nuʻuanu when Oʻahu warriors became trapped between Kamehameha's warriors and the *pali* (cliff) and chose to leap to their deaths (Tomonari-Tuggle and Blankfein 1998:13).

Kamehameha made his capital at Waikīkī and the area became the chiefly center of the south coast where the ruling chief and subordinate *aliʻi* (chiefly class) resided (Cordy 1996; Nāpōkā 1986; Tomonari-Tuggle 1994). Hawaiian historian John Papa ʻĪʻī (1959) describes Kamehameha's residence in Waikīkī:

> Kamehameha's houses were at Puaaliilii, makai of the old road, and extended as far as the west side of the sands of Apuakehau [vicinity of Moana Surfrider Hotel]. Within it was Helumoa [vicinity of Royal Hawaiian Hotel], where Kaahumanu ma went to while away the time. The king built a stone house there, enclosed by a fence; and Kamalo, Wawae, and their relatives were in charge of the royal residence. Kamalo and Wawae were the children of Luluka and Keaka, the childhood guardians of Kamehameha.
>
> This place has long been a residence of chiefs. It is said that it had been Kekuapoi's home, through her husband Kahahana, since the time of Kahekili. Haalou, a makuahine of Kamehameha, lived there with her younger daughter Kekuapoi while en route from Hawaii to Kauai to consult Kapoukahi, a seer of Kauai, for means whereby Kamehameha would gain victory over Keoua Kuahuula [ʻĪ'ī 1959:17].

Kamakau also wrote of Waikīkī as a home to chiefs:

> Waikīkī sits proudly in the calm of the Kaʻao breeze… Waikīkī was a land beloved of the chiefs and there many of them lived from remote times to the time of board surfing could be indulged in there, and for this reason the chiefs liked the place very much. At Waikīkī are the surfs of Ka-lehua-wehe, ʻAiwohi, Maihiwa, and Kapuna [Kamakau 1991:44].

EARLY HISTORIC LAND USE

Waikīkī is described as a richly productive area in accounts by early European explorers. An early map by Lieutenant C. R. Malden of the Royal Navy, shown in Figure 8, shows cultivated land, freshwater ponds, "Ruins of a Morai", "Fresh Water Ponds", and a coconut grove in the vicinity of the project area.

In 1792, Captain George Vancouver of the H.M.S. Discovery arrived at "Whyteete" and noted the field systems:

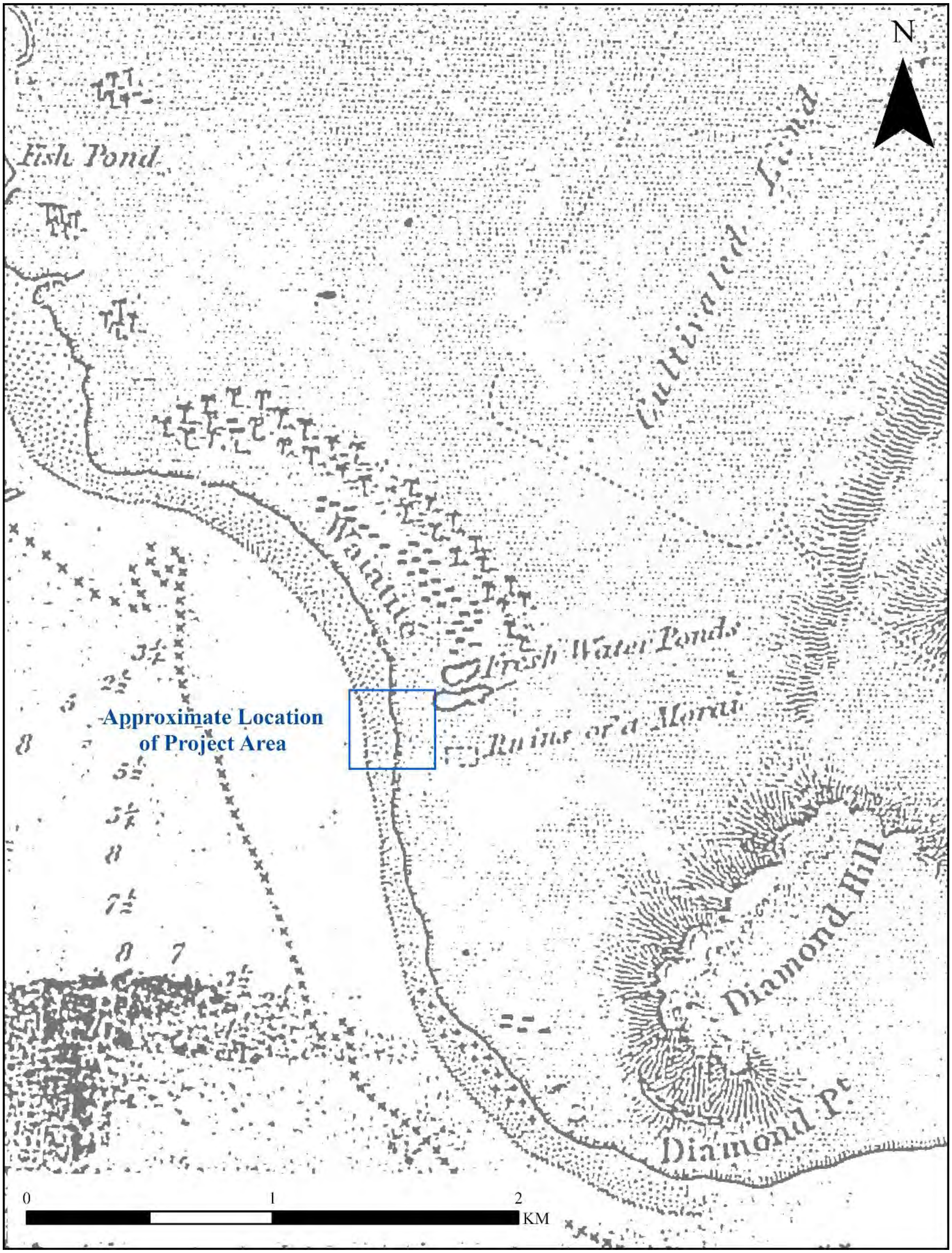

Figure 8. Portion of Historical Map by Malden (1825) Showing the Approximate Location of the Project Area.

> On the shores, the villages appeared numerous, large, and in good repair; and the surrounding country pleasingly interspersed with deep, though not extensive valleys; which, with the plains near the sea-side, presented a high degree of cultivation and fertility
>
> This opened to our view a spacious plain, which, in the immediate vicinity of the village, had the appearance of the open common fields in England; but, on advancing, the major part appeared divided into fields of irregular shape and figure, which were separated from each other by low stone walls, and were in a very high state of cultivation. These several portions of land were planted with the eddo or taro root, in different stages of inundation; none being perfectly dry, and some from three to six or seven inches under water. The causeway led us near a mile from the beach, at the end of which was the water we were in quest of. It was a rivulet five or six feet wide, and about two or three feet deep, well banked up, and nearly motionless; some small rills only, finding a passage through the dams that checked the sluggish stream, by which a constant supply was afforded to the taro plantations.
>
> In this excursion we found the land in a high state of cultivation, mostly under immediate crops of taro; and abounding with a variety of wild fowl, chiefly of the duck kind, some of which our sportsmen shot, and they were very fine eating. The sides of the hills, which were at some distance, seemed rocky and barren; the intermediate vallies, which were all inhabited, produced some large trees, and made a pleasing appearance. The plains, however, if we may judge from the labour bestowed on their cultivation, seem to afford the principal proportion of the different vegetable productions on which the inhabitants depend for the subsistence [Vancouver 1798:161–164].

Also aboard the H.M.S. Discovery was surgeon and naturalist Archibald Menzies. He echoed Vancouver’s description of a bountiful land:

> The verge of the shore was planted with a large grove of coconut palms, affording a delightful shade to the scattered habitations of the natives. Some of those near the beach were raised a few feet from the ground upon a kind of stage, so as to admit the surf to wash underneath them. We pursued a pleasing path back into the plantation, which was nearly level and very extensive, and laid out with great neatness into little fields planted with taro, yams, sweet potatoes and the cloth plant. These, in many cases, were divided by little banks on which grew the sugar cane and a species of Draecena without the aid of much cultivation, and the whole was watered in a most ingenious manner by dividing the general stream into little aqueducts leading in various directions so as to be able to supply the most distant fields at pleasure, and the soil seemed to repay the labor and industry of these people by the luxuriancy of its productions. Here and there we met with ponds of considerable size, and besides being well stocked with fish, they swarmed with water fowl of various kinds such as ducks, coots, water hens, bitterns, plovers, and curlews [Menzies 1920:23–24].

Several others followed Vancouver and Menzies in describing Waikīkī over the next few decades. Peter Corney wrote of Waikīkī between 1813 and 1818:

> On rounding Diamond hill the village of Wyteetee (Waikiki) appears through large groves of cocoanut and bread-fruit trees; it has a most beautiful appearance, the land all round in the highest state of cultivation, and the hills covered with wood; a beautiful plain extending as far as the eye can reach. A reef of coral runs along the whole course of this shore, within a quarter of a mile of the beach, on which the sea breaks high; inside this reef there is a passage for canoes [Corney 1965:193].

Otto von Kotzebue commander of the Russian ship Rurick viewed Waikīkī from the sea in 1816. His description of the land follows:

> but you have scarcely sailed round the Yellow Diamond Hill, when you are surprised by the most beautiful landscape. Close to the shore you see verdant valleys adorned with palm and banana-trees, under which the habitations of the savages lie scattered; behind this, the land gradually rises, all the hills are covered with a smiling verdure, and bear the stamp of industry [von Kotzebue 1821:320].

Finally, the naturalist Andrew Bloxam was ashore from the H.M.S. Blonde in 1824–1825 when he noted the abundance of Waikīkī:

> I walked along shore towards the bay of Whyteete to see if I could procure any shells, but I found none worth picking up. The whole distance to the village of Whyteete is taken up with innumerable artificial fishponds extending a mile inland from the shore, in these the fish taken by nets in the sea are put, and though most of the ponds are fresh water, yet the fish seem to thrive and fatten. Most of these fish belong to the chiefs, and are caught as wanted. The ponds are several hundred in number and are the resort of wild ducks and other water fowl. I found it very difficult to get out of the labyrinth of paths which lead among them. Whyteete is about four miles east of Honoruru [Honolulu]. It is pleasantly situated and built along the shore among numerous groves of coconut and other trees, and in this respect far better than Honoruru, as scarcely any trees are to be found there [Bloxam 1925:35–36].

This period of political importance ended for Waikīkī in 1809, when Kamehameha moved his capital to Honolulu, which was more accessible to Western visitors (Tomonari-Tuggle and Blankfein 1998:13). Following this move, traditional agriculture in Waikīkī waned. Population in the area had drastically decreased due to economic changes and the devastation caused by Western diseases. The missionary Levi Chamberlain noted these changes when writing in 1828:

> Our path led us along the borders of extensive plats of marshy ground, having raised banks on one or more sides, and which were once filled with water, and replenished abundantly with esculent fish; but now overgrown with tall rushes waving in the wind. The land all around for several miles has the appearance of having once been under cultivation. I entered into conversation with the natives respecting this present neglected state. They ascribed it to the decrease of population [Chamberlain 1957:26].

THE MĀHELE

Traditional land divisions of the fifteenth and sixteenth centuries persisted until the 1848 Māhele, which introduced private property into Hawaiian society (Kamakau 1991:54). During the Māhele, the Land Commission required the Hawaiian chiefs and *konohiki* (land agent for the *ali'i*) to present their claims to the Land Commission. In return they were granted awards for the land quit-claimed to them by Kamehameha III. The remaining unclaimed land was then sold publicly, "subject to the rights of the native tenants" (Chinen 1958:29). The new western system of ownership resulted in many losing their land. Often claims would be made for discontiguous cultivated plots with varying crops, but only one parcel would be awarded.

Following the Māhele of 1848, two acts were passed in 1850 that changed land ownership in Hawai'i. On 10 July 1850, the Alien Land Ownership Act was adopted, which allowed foreigners to own land. On 6 August 1850, the Kuleana Act of 1850 was adopted, which allowed *hoa'āina* (common people of the land, native tenants) to make claims to the Land Commission. The new western system of ownership resulted in many losing their land. Often *kuleana* (commoner) claims would be made for discontiguous cultivated plots with varying crops, but only one parcel would be awarded.

Following the Kuleana Act of 1850 individual *kuleana* (commoner) lots we granted. Later, parcels were distributed under Land Patent Grants (Gr.) and Land Court Applications (LCAp). When the monarchy was overthrown in 1893, the Crown Lands became Government Lands, public domain for sale by fee simple (Hammatt 2013:A-5). Patents were the certificates issued for the sale of such lands. Beginning in 1900, when Hawai'i became a U.S. territory, the certificates were called Land Patents, or Land Patent Grants (Hammatt 2013:A-5).

Records indicate that the *'ili of* Kāneloa was returned by Aaron Keali'iahonui at the Māhele and retained by Crown. LCAs in the '*ili* were limited to a 20.85-acre square lot northwest of the project area (today's southwest corner of Paki and Kapahulu avenues). Within the lot, 4.35 acres were *kuleana* parcels and 15.0 acres were Crown *lo'i*. Other land within the lot included a pond and grassland. The remainder of the '*ili* (171.0 acres) consisted of level open plain—referred to on historic maps Kāneloa Plain—and a seasonal pond.

LATE HISTORIC LAND USE

In 1876 a group of prominent businessmen, which included Archibald Cleghorn, John O. Dominis, and James Makee, formed the Kapiʻolani Park Association. King David Kalākaua offered a 30-year lease of Kāneloa and Kapua (neighboring *ʻili* to the east) for the endeavor on the east side of Waikīkī, which was at the time crown land. According to the association's charter, the park would serve the purpose "of adorning and putting in order, a tract of land in the vicinity of Honolulu as a place of public resort, and of promoting Agricultural and Stock Exhibitions, and healthful exercise, recreation and Amusements" (Abel 1992:3–4). Kalakaua dedicated the park in June of 1877 in honor to Queen Kapiʻolani. At this time, the east portion of the park was sparsely vegetated and sandy, while the western portion contained wetlands and streams. Consequently, the parks development entailed road building, drainage, and extensive plantings of ironwood, banyan, date palm, and other trees (Abel 1992:4).

Up until 1913, the park was managed by the Honolulu Park Commission whose mission was to operate the park as a public space (Abel 1992:5). During this nascent period, the oceanfront parcels were lost to private individuals in an effort to raise money for the Association through subleasing beachfront lots for residences (see Figure 7). Some of these lots were reacquired in 1905, though others became private property with the overthrow of the monarchy in 1893 (Hibbard and Franzen 1986:43). In 1898, the year Hawaiʻi was annexed to the United States, a temporary U.S. military camp was established at the park, which cause damage to the roads and a horse racing track at the park's center. In 1900, horse racing was banned and subsequently the track was used as an auto raceway and a polo field. Elements of the park that date to the early period (1896 to 1913), though not the original structures, include the aquarium, athletic fields, the bandstand, food concessions, and the beach park and bathhouse.

The aquarium parcel is a portion of property formerly owned by William G. Irwin. Mr. Irwin was a very wealthy businessman in the sugar industry. He formed William G. Irwin and Company, which lasted from the mid-1870s to 1880 (Adler 1958:9). In 1881 he partnered with Claus Spreckels in sugar, banking, and ship building (Nellist 1925:123). In 1896 he became the Chair of the Honolulu Park Commission which over saw Kapiʻolani Park, as was mentioned above. The Irwin residence was designed by architect Charles Dickey in 1899. It is cited as "[t]he most expensive and impressive of Dickey's early use of the Mission style" (Neil 1975:102). Dickey also designed the Irwin Stable (Neil 1975:105). Photographs of the Irwin home are shown in Figures 9–11. The historical map in Figure 12 shows the project area parcel in relation to the home and stable. In the 1920s, well after Irwin moved to San Francisco, the house was torn down. The Beach Park Memorial Committee had negotiated the purchase of the Irwin Estate in 1919 (Ireland 2005:58) for the construction of the Waikīkī War Memorial and Natatorium (a saltwater pool).

In 1913, management of the park was transferred to the Territory of Hawaii (Abel 1992:5). It was at this time the first public zoo appeared in the park:

> During 1915 and 1916, acquisition of animals and the construction of cages and bird houses established a "zoological garden." So delighted were officials that they filled the park report for 1916 with photographs of animals and added a detailed list of new park acquisitions that included two lions, twelve monkeys, two bears, one tortoise, four elk, four deer, twelve horses, seven donkeys, forty-six ducks, ten geese, four swans, two cranes two emus, assorted Australian doves, and an African elephant [Weyeneth 1991:28].

In 1919, additional coastal parcels were acquired by the Territory of Hawaii and the Waikīkī War Memorial and Natatorium were built, which opened in 1927. The memorial commemorates World War I servicemen. The competitions at the Natatorium included participation by Duke Kahanamoku, Buster Crabbe, and Johnny Weissmuller in the 1920s. The Waikīkī War Memorial and Natatorium are listed on the Hawaiʻi Register of Historic Places (HRHP) as SIHP Site 50-80-14-09758. Other notable features of Kapiʻolani Park include the Waikīkī Shell (an outdoor amphitheater built in 1953) and the Waikīkī

.

Figure 9.Photogrpah of the William G. Irwin Residence (Bishop Museum in Hibbard and Franzen (1986:29).

Figure 10. William G. Irwin (Right) at His Waikīkī Property (Hawai‘i State Archives 2021).

Figure 11. View of Irwin Residence From the Alfred Mitchell House (Bishop Museum in Hibbard and Franzen (1986:22)[1]

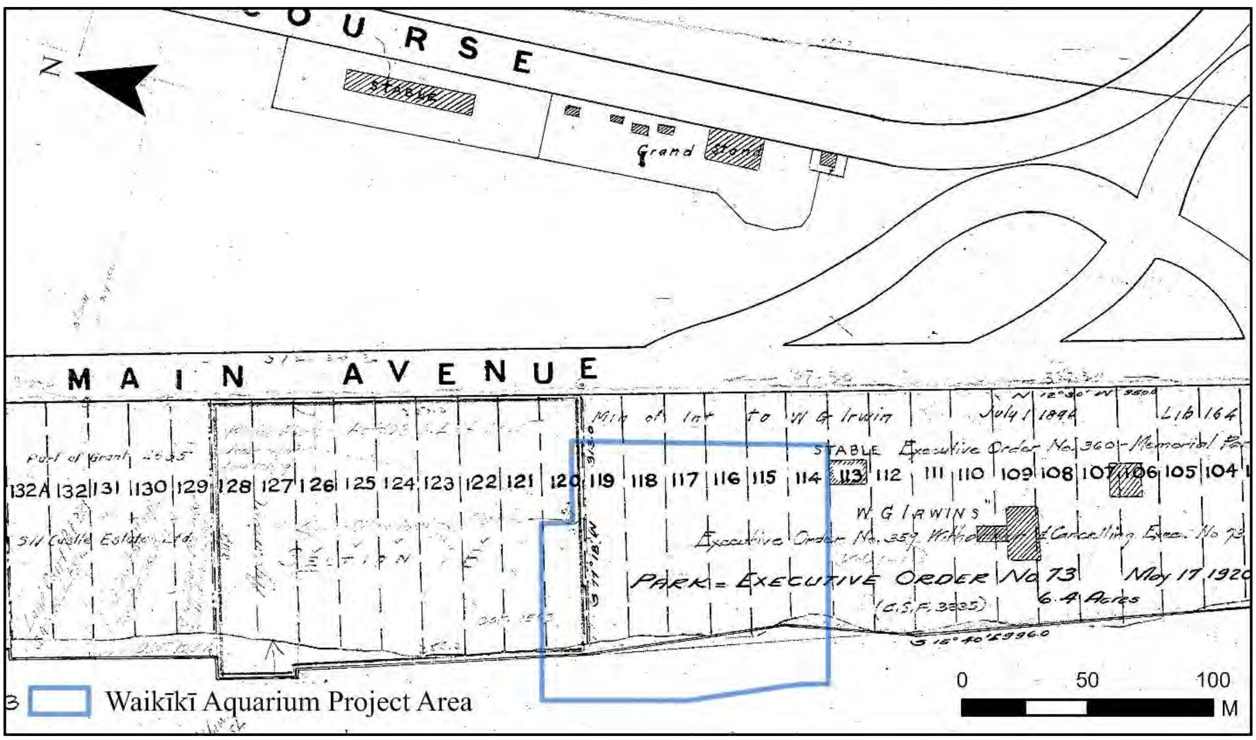

Figure 12. Portion of 1883 Map by Monserrat With Twentieth Century Mark-Ups. Note the Loction of the Irwin House and Stable East of the Project Area.

Aquarium. The Waikīkī Aquarium was formerly located roughly 100 yards north of its current location[3]. Constructed in 1904, it was known as the Honolulu Aquarium and was privately financed by Charles M. Cooke and James B. Castle and operated as part of the Honolulu Rapid Transit and Land Company. In 1919 the land lease expired and the Cooke Estate ceded the lease to the Territory of Hawaii. The present day Waikīkī Aquarium was funded by the Territorial Legislature in 1949 and opened in 1955.

During World War II (WWII), the park again housed the U.S. military. By the end of the war the park was deteriorated, and it entered a period of redevelopment. In 1948, the Honolulu Zoo was established at its current 42.0-acre parcel, the site of a former waterscape. The entrance to the Zoo is listed on the HRHP as SIHP Site 50-80-14-08023.

Kapiʻolani Park is listed on the HRHP as SIHP Site 50-80-14-09758, and is eligible for placement on the National Register of Historic Places (NRHP). However, to date this property has not been added to the NRHP. The significance statement for Kapiʻolani Park as summarized in the NRHP nomination form is listed below:

> Kapiolani Park is historically significant for its past association with indigenous Hawaiian culture and royalty. Hawaiian King Kalakaua envisioned the park as a place of recreation for all and named it after his famous Queen, Kapiolani. Since its dedication in 1877 it has been in continuous use as a location for recreational activities valued by local residents and visitors alike. It provides a sense of place to a special part of Honolulu and is identified with the world famous image of Hawaii as a recreational resort. Over the years it has been the scene of a variety of sports and leisure time activities that reflects the recreational development of Honolulu and Hawaii into the modern world [Abel 1992:3].

PREVIOUS ARCHAEOLOGY

Many archaeological investigations have been conducted in Waikīkī and there have been numerous instances of the inadvertent discovery of human remains, despite the filling of land. Pockets of undisturbed beach sands (i.e., Jaucas Sands) have been observed below the historic fill layers (Bush et al. 2004:37–38), making the possibility of discovering human burials and other cultural materials in this area relatively high. The following section focuses on human burials finds within 500 meters of the project area and previous archaeological investigations in and near the Waikīkī Aquarium. Table 2 summarizes all previous work and the locations of previous projects and previously identified historic properties and human burials are presented in Figure 13. All site numbers follow State Inventory of Historic Places (SIHP) Site 50-80-14-.

Previous Archaeological Investigations Near the Waikīkī Aquarium

Since the early 1900s, human skeletal remains have been encountered inadvertently during construction projects throughout Waikīkī. In 1901, human skeletal remains of four individuals were encountered during trenching for sewer pipes on the James B. Castle property (see Figure 7), which is location of today's Elk's Club. Associated artifacts included whale bone and glass beads, indicating the burials dated to the late pre-Contact to early post-Contact periods (Emerson 1902).

The site of human skeletal remains designated "OA0633" attributed to "Hartwell 1927" is placed south of the Natatorium in an archaeological monitoring report by Bush et al. (2002b:Figure 7). According to a notice in the Federal Register: "In 1927, human remains representing one individual from Waikiki, Oahu were collected by C.C. Hartwell and acquired by the Bishop Museum. No known individual was identified. No associated funerary objects are present."[4]

[3] Waikīkī Aquarium history is summarized from https://www.waikikiaquarium.org/about/history/.
[4] Federal Register Volume 63, Number 18 (Wednesday, January 28, 1998). Notices. Pages 4277–4284. From the Federal Register Online via the Government Publishing Office (www.gpo.gov). FR Doc No: 98-1993.

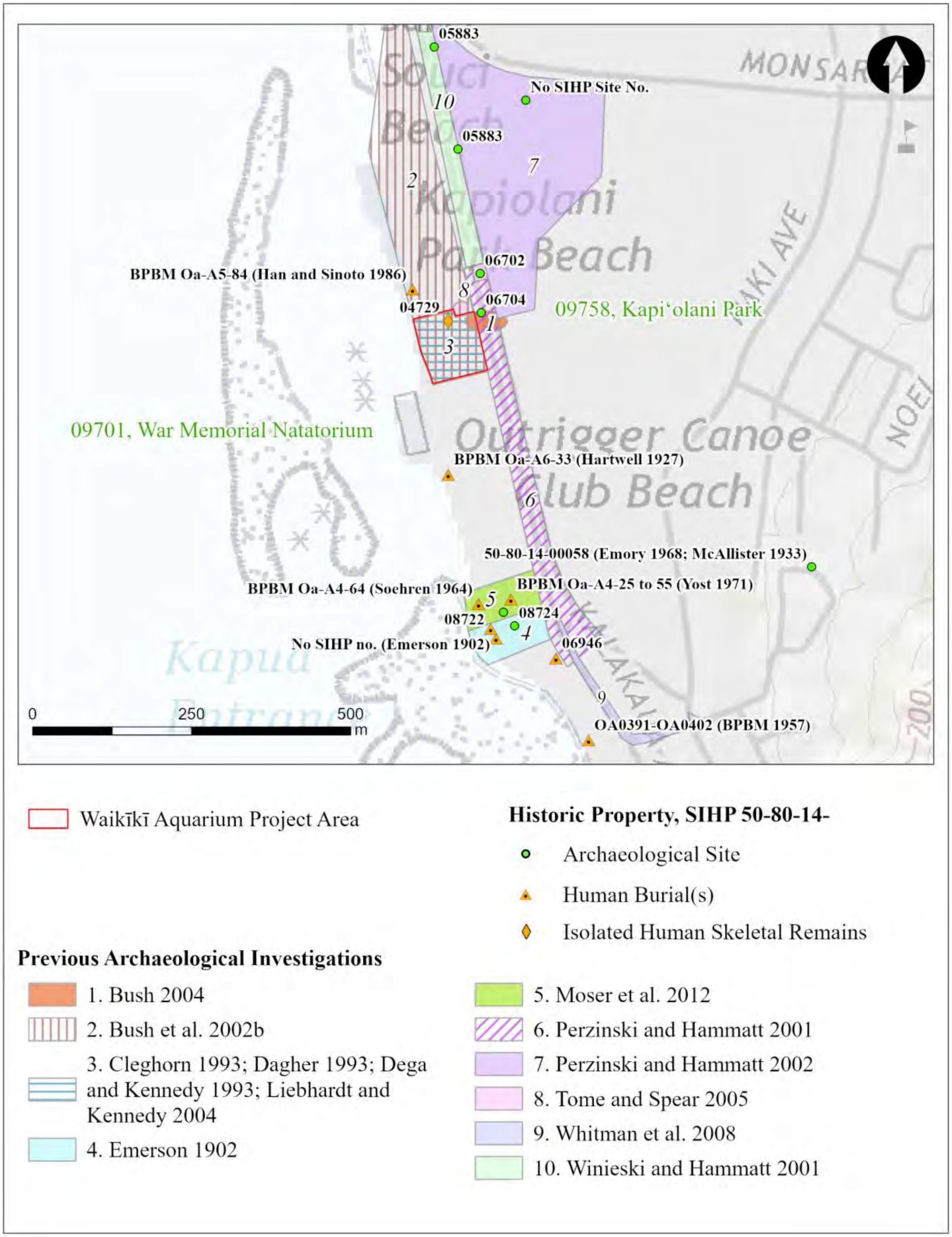

Figure 13. Previous Archaeological Investigations and Historic Properties, Including Human Burials, within 500 Meters of the Project Area.

Table 2. List of Previous Archaeological Studies and Burial Finds within 500 Meters of the Project Area.

Author Year	TMK(s) (1) or Location	Nature of Study	SIHP[1] Site 50-80-14-	Description
Emerson 1902	3-1-032:006/ Today's Elks Club	Inadvertent discovery	No site number	Human skeletal remains of at least four individuals
Hartwell 1927[3]	3-1-031:009/San Souci Beach	Inadvertent discovery	[OA006-33][2]	Human burial
McAllister 1933	Waikīkī (general)	Archaeological Survey	[Site #60]	Waikīkī
BPBM 1957[3]	3-1-032:004(?)/ Diamond Head Apartments (?)	Inadvertent discovery	[OA0391–402][2]	Human burial
Soehren and Sinoto 1964[3] in BPBM 2018	3-1-032:031/ Outrigger Canoe Club	Inadvertent discovery	03705	One humerus (50-Oa-A04-024)
BPBM 1963[3] (Yost 1971)	3-1-032:031/ Outrigger Canoe Club	Inadvertent discovery	[50-OA-A4-25–55]	27 traditional Hawaiian burials
Han and Sinoto 1986[3] in Tulchin and Hammatt 2007:Figure 19	3-1-031:004/ Kapiʻolani Beach Park	Inadvertent discovery?	[Bishop Museum 50-Oa-A5-84]	Human burial
Cleghorn 1993; Dagher 1993; Dega and Kennedy 1993	3-1-031:006/ Waikīkī Aquarium	Inadvertent discovery	04729	Human remains (scattered)
Perzinski and Hammatt 2001	3-1-043:999/ Kalākaua Ave	Archaeological Monitoring	-	No historic properties identified
Winieski and Hammatt 2001	2-6-025–027, 3-1-031 and 043:999/ Kalākaua Ave	Archaeological Monitoring	05883	Discontinuous A horizon
Perzinski and Hammatt 2002	3-1-043:001/ Kapiʻolani Park (bandstand)	Archaeological Monitoring	-	Basalt lamp fragment; charcoal concentration
Bush 2004	3-1-031:999/ Kalākaua Ave	Archaeological Monitoring	06704	Historic trash deposit

Table 2. List of Previous Archaeological Studies and Burial Finds within 500 Meters of the Project Area.

Author Year	TMK(s) (1) or Location	Nature of Study	SIHP[1] Site 50-80-14-	Description
Tome and Spear 2005	3-1-031:007/ Kapiʻolani Beach Park	Archaeological Monitoring	06702	Historic debris/trash deposit
Liebhardt and Kennedy 2008	3-1-031:006/ Waikīkī Aquarium	Archaeological Monitoring	-	No historic properties identified
Whitman et al. 2008	3-1-032:999 and 042:999/ Kalākaua Avenue and Poni Mōʻī Road	Archaeological Monitoring	06946	Human burial
Moser et al. 2012	3-1-032:031/ Outrigger Canoe Club	Archaeological Monitoring	-	No historic properties identified
Bush et al. 2002b	3-1-030 and 031/ Queen's Surf Promenade	Archaeological Monitoring	-	No significant historic properties identified

[1] SIHP (State Inventory of Historic Places)

[2]Bernice Pauahi Bishop Museum Hawaiian Archaeological Database

[3]No report citation available; see Bush et al. (2002:Figure 7).

1

Near the current project area are several instances of inadvertently discovered human burials reported on by staff of the Bernice Pauahi Bishop Museum (BPBM). Human burials recorded at the Outrigger Canoe Beach Club were designated BPBM Sites 50-Oa-A5-64 and 50-Oa-A6-25 to 55. The sites are not known to have a SIHP designation. A total of 27 burials were encountered (Yost 1971); no formal archaeological report was prepared (Moser et al. 2012). The following is an excerpt from a newspaper article:

> Robert Bowen of the Bishop Museum has been working closely with Ernest Souza, Hawaiian Dredging superintendent, on the removal of skeletons unearthed on the site, between the Colony Surf and the Elks Club...
>
> Most of the bodies were buried in the traditional hoolewa position, with the legs bound tightly against the chest.
>
> One of the skeletons, Bowen said, shows evidence of a successful amputation of the lower forearm, indicating that the Hawaiians knew this kind of operation before the arrival of Europeans.
>
> The ages of the skeletons ranged from children to 40-year-old men and women.
>
> The average life span of the Hawaiians at the time was about 32 years [Honolulu Star-Bulletin; Jan. 24, 1963:1A in Yost 1971:28].

In 1986, human skeletal remains, designated BPBM Site 50-Oa-A5-84, were documented just north of the Waikīkī Aquarium at Kapiʻolani Beach Park (Han and Sinoto 1986[5] in Bush et al. 2002b:Figure 7). Additional burials were recorded south of the aquarium and designated BPBM Site 50-Oa-A5-64. The sites are not known to have a SIHP designation.

In the late 1990s and early 2000s, numerous human burials were found along Kalākaua Avenue in Waikīkī (Bush et al. 2002a; Perzinski et al. 2001; Winieski and Hammatt 2001; Winieski et al. 2001; Winieski et al. 2002); however, all of these burial finds were over 500 meters north of the Waikīkī Aquarium. Relevant results of soil stratigraphy encountered during archaeological monitoring near the current project area are discussed in this section.

In 2000, archaeological monitoring was conducted for the Kapiʻolani Park Bandstand Redevelopment Project (Perzinski and Hammatt 2002). In situ beach sand deposits (20.0+ cm in thickness) were recorded on the northeast side of the bandstand at roughly 30 cmbs, along with a traditional Hawaiian basalt lamp at approximately 40 to 75 cm below the surface. No significant cultural deposits were found west of the bandstand area.

Along Kalākaua Avenue from Poni Mōʻi Road to the Natatorium, archaeological monitoring was conduct for street lighting improvements (Perzinski and Hammatt 2001). Two traditional Hawaiian artifacts were recovered from a backdirt pile, which included a modified Hump-back cowrie and a dense basalt, chisel-shaped adze preform (Perzinski and Hammatt 2001:14). Diagnostic historic period artifacts recovered included ten glass bottles and two ceramic vessels dating from the mid-nineteenth to the early twentieth century. Jaucas sand deposits were encountered at 45 to 50 cmbs below a discontinuous and thin (less than 5 cm thick) A horizon, which was overlain by fill.

During monitoring for the Waikīkī Force Main Replacement project (Winieski and Hammatt 2001). a pit feature and a discontinuous buried "A" horizon, which were designated SIHP Site 05883, were recorded on Kalākaua Avenue, roughly 300 to 400 meters north of the aquarium. To the south of the aquarium, archaeological monitoring was conducted for 12-inch water main installation along Kalākaua Avenue and Poni Mōʻī Road (Whitman et al. 2008). A single in situ pre-Contact traditional Hawaiian burial was inadvertently discovered during excavations, which was designated SIHP Site 06946. Other finds

[5] A full reference was not provided in Bush et al. 2002b:Figure 7 and could not be located.

included a pit feature in Jaucas sand. The feature contained burnt layers of charcoal and a burnt basalt cobble.

In 2009 and 2010, archaeological monitoring was conducted during the Outrigger Canoe Club Sewer and Storm Drain Repair and Women's and Girl's Locker Room Renovation Projects (Moser et al. 2012). Soil stratigraphy recorded consisted of multiple layers of fill over disturbed Jaucas sand. No historic properties or human burials were encountered. Finds were limited to a small stone awl or cutting tool, a cut pig bone, and charcoal flecking, all in a disturbed context.

The SHPD HICRIS notes three locations of disturbed human burials at the Elk's Club are designated SIHP Site 08722[6]. The file reads: "Three areas of disarticulated skeletal finds, consisting of three skeletal elements each. Presumably of Hawaiian descent. Found within a highly disturbed deposit located immediately beneath the interior ground surface of the Elks Lodge, Honolulu." A cultural deposit designated SIHP Site 08723 is also present based on HICRIS data: "Partially intact, subsurface A horizon ranging from 50–82 cmbs. Deposit is lacking material debris but is rich in charcoal and includes two indeterminate pit features and one combustion feature." Finally, "Kainalu", the former Castle family home, was located on the Elk's Club property, which is designated SIHP Site 08724.

Previous Archaeological Investigations at the Honolulu Zoo

Over the last 25 years, several archaeological investigations have been conducted within the Honolulu Zoo parcel, which are summarized in Table 3 and located in Figure 14 (Bush et al. 2004; Clark et al. 2014; Farley et al. 2018; Hammatt et al. 2000; McDermott and Chiogioji 2001; Mintmier et al. 2013; Walden et al. 2012). To date, no pre-Contact historic properties have been encountered. McDermott and Chiogioji (2001) noted the following on soil stratigraphy in the Zoo parcel:

> Documented stratigraphy consisted predominantly of various types of fill layers, including terrigenous landscaping fill, dredge sediments from the Ala Wai Canal, construction fill layers, and calcareous "beach sand" layers. These results were not altogether surprising based on the background research, which indicated that prior to development in the 1870s, the area that would become the Zoo was a low-land area of "swamps", ponds, and sand dunes. Background research indicated that substantial fill layers were brought in to elevate the formerly low-lying Zoo area for development [McDermott and Chiogioji 2001:94].

Between 2009 and 2011, archaeological monitoring was conducted during improvements to the zoo entrance area (Walden et al. 2012), which resulted in the recording of SIHP Site 07208. This site consists of 12 subsurface features that may be associated with historical activities on Makee Island. Makee Island was an early waterscape feature in Kapi'olani Park and pre-dated the Ala Wai Canal and Waikīkī Land Reclamation Project.

Between 2010 and 2011, archaeological monitoring was carried out during construction of a new elephant habitat (Mintmier et al. 2013). Recent and possibly historic concrete foundations and infrastructure were encountered, which may be associated with development of Kapi'olani Park and the zoo. A total of 45 historic artifacts were recovered, including hand-made, mold-blown, bottles, bottles and jars manufactured by automatic bottle machine, English porcelaneous-stoneware, fragmentary examples of English earthenware plates and platters, a fragment of an earthenware jar, and a fragment of a porcelaneous stoneware bowl of Asian, possibly Chinese origin. No pre-Contact or traditional Hawaiian artifacts were encountered. A majority of the assemblage dates from the 1900s to the 1920s (Mintmier et al. 2013).

In 2013, archaeological monitoring was conducted in the northern half of the Honolulu Zoo parking lot (Clark et al. 2014). A single post-Contact subsurface pit feature associated the former Makee Island was recorded. The feature was assigned to the previously designated SIHP Site 07208.

[6] It is possible these burials correlated to the BPBM Sites 50-Oa-A5-64 and 50-Oa-A6-25 to 55.

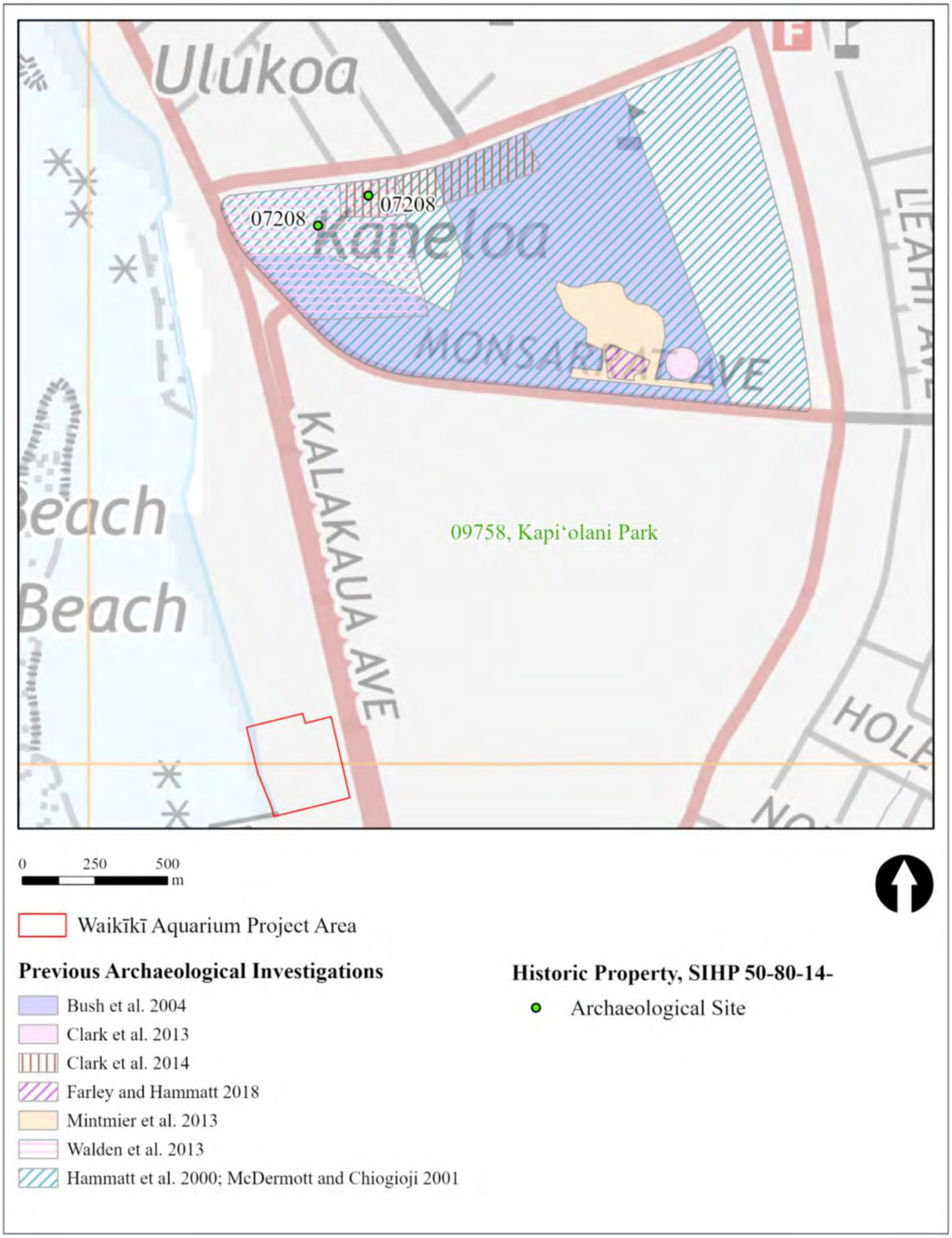

Figure 14. Previous Archaeological Investigations and Historic Properties at the Honolulu Zoo.

Table 3. List of Previous Archaeological Studies and Finds at Honolulu Zoo.

Author Year	TMK(s) (1)/ Location	Nature of Study	SIHP Site 50-80-14-	Description
Hammatt et al. 2000	3-1-043/ Honolulu Zoo	Archaeological Assessment	-	No significant historic properties identified
McDermott and Chiogioji 2001	3-1-043/ Honolulu Zoo	Archaeological Inventory Survey with Subsurface Testing	-	No significant historic properties identified
Bush et al. 2004	3-1-043:001/ Honolulu Zoo	Archaeological Monitoring	-	No significant historic properties identified
Mintmier et al. 2013	3-1-043:001 por./ Elephant Enclosure	Archaeological Monitoring	-	Recent and historic features associated with Zoo and Kapiʻolani Regional Park
Walden et al. 2013	3-1-043:001 por./ Front Entrance Area	Archaeological Monitoring	07208	Subsurface features in dune sand layer; possibly on Makee Island
Clark et al. 2014	3-1-043:001 por./ Parking Lot	Archaeological Monitoring	07208	Subsurface pit feature
Farley and Hammatt 2018	3-1-043:001 por./ Reptile House	Archaeological Monitoring	09758	Kapiʻolani Park; identified two additional contributing components

In 2015 and 2016, archaeological monitoring was conducted in the reptile house area of Honolulu Zoo (Farley et al. 2018). Two archaeological features were identified as components of existing SIHP Site 09758, Kapiʻolani Park. Feature 1 is a manhole containing a U.S. military communication line, which is likely associated with military activity during WWII. Construction plans were altered to preserve the manhole during the project. Feature 2 is a historic period concrete box culvert.

Previous Archaeological Investigations at Waikīkī Aquarium

In the mid-1990s, several human skeletal remains were inadvertently discovered at the Waikīkī Aquarium during rebuilding and modification of a shark tank (Cleghorn 1993; Dagher 1993; Dega and Kennedy 1993). The human skeletal remains were found during backhoe excavation of six inches of sand from the tank area and in backfill brought into the project area for ground support. The fragmented human skeletal remains were scattered, and no formal burial site was identified. It was speculated that the skeletal fragments were brought in with sand from Maui for construction work during the project. The find was designated SIHP Site 04729.

Excavations were monitored for subsurface electrical infrastructure for a new sewer pumping station (Bush 2004), which documented a layer of natural beach sand 15 to 100 cmbs (5.9 to 40.0 in). No cultural layer was encountered; however, a trash pit, designated SIHP Site 06704, was recorded within Kalākaua Avenue, adjacent to the aquarium. The site consisted of bottles dating between the 1880s to 1920s, broken ceramic pieces, and butchered animal bone.

Archaeological monitoring was conducted for the Public Baths Pump Station Modification Improvements Project (Tome and Spear 2005). A single archaeological site was identified which consisted of a subsurface feature containing glass bottles manufactured from the 1870s to the 1920s. The site was designated SIHP Site 06702. It was situated in a layer of undisturbed of beach sand at 100 to 170 cmbs, which was overlain by multiple layers of fill. No further archaeological work was recommended in the project area footprint due to extensive previous disturbance.

Archaeological monitoring was conducted in 2008 for electrical system upgrades in the northeast corner of the Waikīkī Aquarium (Liebhardt and Kennedy 2008). The soil stratigraphy primarily consisted of two layers of fill over a transitional layer, followed by Jaucus sand (Liebhardt and Kennedy 2008:12).

ANTICIPATED FINDS

Based on archival research and the results of previous archaeological studies in and near the Aquarium, there is potential for encountering subsurface historic properties, including human burials. Dune sands, which may contain human burials, are known to underlie historic fill deposits at approximately 15 to 100 cm (5.9 to 40.0 in) below ground surface in the northeast corner of the aquarium (Bush 2004; Liebhardt and Kennedy 2008). Evidence of early twentieth century habitation may be encountered on the south side of the aquarium, which is near the former location of the Irwin family's stable. In addition to human burials, anticipated archaeological finds include traditional Hawaiian subsurface cultural deposits or artifacts, and historic features or artifacts associated with the Irwin residence. Finally, the Waikīkī Aquarium is over 50 years old and is a historic property; no SIHP site number has been assigned.

FIELD INSPECTION

An archaeological field inspection was conducted by a PCSI archaeologist, Kylen Chang, B.A., on 17 June 2022. Dennis Gosser, M.A., served as Principal Investigator for the project. Field inspection consisted of walking the property where the ground disturbance is proposed and photographing existing conditions in the project footprint.

FIELD INSPECTION RESULTS

As previously noted, the Waikīkī Aquarium is over 50 years old and is a historic property; no SIHP site number has been assigned. No new historic properties were identified in the project area during the field inspection. Photograph locations indicating direction are displayed in Figure 15, which correspond to photographs in Figures 16 through 23.

Well Sites and Filter Housing Structure

The location of the proposed two wells and filter housing structure is currently covered in landscaped grass. Photographs 1–4 of the area are show in Figures 16 and 17.

Trenching for Piping

Apart from the new waterline, trenching for new piping (drain, sewer, and post-filter) will occur on the south and west perimeter of the project area. This area contains landscaped grass and pavement. Photographs 13–16 of the trenching areas are show in Figures 18 and 19.

Pump Station, Emergency Overflow Box, and Discharge and Transfer Sump

The location of the proposed pump station, emergency overflow box, and discharge and transfer sump structure is currently paved. Photographs 11 and 12 of the area are show in Figure 20.

General Project Area Photographs.

Additional areas in the vicinity of the proposed ground disturbance were also photographed. Photographs 5–10 in Figures 21–23 show the built environment and landscaping.

CULTURAL CONSULTATION

As part of the CIA, PCSI contacted the SHPD requesting contact information for individuals who might be interested in participating in the consultation process to determine if traditional cultural practices were being undertaken within the project area. In addition. a public notice was placed in the Office of Hawaiian Affairs Ka Wai Ola Newsletter (Appendix A). Furthermore, recent CIAs undertaken immediately adjacent to the Aquarium (Walden et al. 2013; Walden and Collins 2017) were reviewed to determine if traditional or customary cultural practices had been identified in the immediate vicinity of the project area.

To date, PCSI has not received a response from SHPD or been contacted as a result of the Ka Wai Ola Newsletter Public Notice. With regards to recent CIAs conducted adjacent to the current project area (one in association with a project to repair the Queen's Seawall [Walden and Collins 2017], the other in association with a project to construct a new Ocean Safety Substation [Walden et al. 2013]), all responses indicated that there was no knowledge of traditional or cultural practices for the area. One respondent did question the ownership legality of the project proponent; however, that response has no bearing on traditional or customary cultural practices within the current project.

As noted above, Kumu Hula Samuel M. ʻOhukaniʻōhiʻa Gon III, a scientist, Hawaiian cultural practitioner, paleobiologist, and teacher has held a changing of the seasons event to the north of the aquarium at the site of the heiau Kūpalaha. According to a Facebook page for the event (see above for the URL):

> We gathered at the water's edge at the site of the heiau Kūpalaha, the sibling heiau of Papaʻenaʻena (that still graces the base of Leahi) where, from its kuahu (altar), named Opunaha, the setting sun would be observed by the kahuna kilolani, and on a certain day, the sun would set into the bowl of Puʻu o Kapolei, when seen from Opunaha, marking the end of the Hoʻoilo [Hawaiian Cool Wet Season] and the start of the Kauwela [Hawaiian Hot Dry Season] , and the reactivation of the luakini heiau of Kū

It appears that the event last occurred in 2017 and it is unclear if future events are planned.

KA PAʻAKAI O KAʻAINA ANALYSIS

A further analytical framework for addressing the preservation and protection of cultural practices specific to Native Hawaiian communities resulted from a 2000 Hawaii Supreme Court ruling (in Ka Paʻakai O KaʻAina vs Land Use Com'n. 94 Hawaii 31 (2001). In its decision, the court established a three-part analytical approach to identify, assess impacts, and mitigate impacts to traditional and customary native Hawaiian rights associated with a proposed action. The three-part analysis, based on current consultation, past consultations, and archival research is summarized below:

1. *The identity and scope of valued cultural, historical, or natural resources, including the extent to which traditional and customary native Hawaiian rights are exercised*: no valued cultural or historical resources, and no traditional and customary native Hawaiian rights are exercised within the proposed project area.
2. *The extent to which those resources—including traditional and customary native Hawaiian rights—will be affected or impaired by the proposed action:* no traditional and customary native Hawaiian rights—will be affected or impaired by the proposed action.
3. *The feasible action, if any, to be taken by the agency to reasonably protect native Hawaiian rights if they are found to exist:* no native Hawaiian rights related to cultural or historical resources have been found to exist within the proposed project area.

SUMMARY AND ASSESSMENT

The proposed Wastewater Discharge System Upgrades Project is at the Waikīkī Aquarium at 2777 Kalākaua Avenue (see Figure 1). The project proponent is the University of Hawaiʻi, and the landowner is the State of Hawaii. The project parcel, TMK (1) 3-1-031:006, measures 2.35 acres (.95 hectares). Excavations will be conducted throughout the parcel for piping, two wells, pump station, emergency overflow box, and discharge and transfer sump structure, and a filter housing structure. The purpose of the project is to bring the facility into compliance with the National Pollutant Discharge Elimination System Permit, which is issued and monitored by the Hawaii Department of Health (DOH). An archaeological literature review that addresses historical, cultural, and archaeological background was conducted in order to evaluate any potential effect on historic properties in the project area, and to recommend appropriate historic preservation actions, if warranted. This work was carried out in accordance with Hawaii Revised Statutes (HRS) Chapter 6E, and Title 13 of the Hawaii Administrative Rules (HAR), Subtitle 13 (State Historic Preservation Division Rules), Chapter 275 (*Rules Governing Procedures for Historic Preservation Review for Governmental Projects Covered Under Sections 6E-7 and 6E-8, HRS*).

The Waikīkī Aquarium property falls within the traditional land division of Kāneloa ʻIli. The area was intensively used for habitation, aquaculture, and agriculture from the pre–Contact period into the mid- to late 1800s, when the landscape was transformed by wealthy businessmen. One such businessman was William G. Irwin, whose large home, designed by Charles Dickey, was immediately south of today's aquarium.

Based on background research and previous archaeological findings in the vicinity, there is potential for traditional Hawaiian historic properties and human burials in the project area. It is also possible that historic period artifacts of cultural deposits may present based on the proximity of the Irwin home site.

Based on cultural consultation, there appears to be a cultural practice that may occur (yearly) to the north of the aquarium, but not within the project area. Likewise, previous archaeological research indicates that human burials have been discovered within the aquarium boundaries as well as nearby the project area.

RECOMMENDATIONS

As a result of this CIA, it was found that no historic properties are within the proposed project area, although two historic properties are within the larger TMK parcel: the Waikīkī Aquarium building (no SIHP site number designated) and SIHP Site 04729, which was speculated to be skeletal fragments brought onto the aquarium parcel with sand from Maui for construction. Along the beach to the north and south of the aquarium, numerous traditional Hawaiian human burials have been identified. Previous archaeological investigations in the vicinity have recorded in situ soils under fill layers. Consequently, there is potential for encountering traditional Hawaiian cultural deposits or human burials in the project area. Pursuant to HRS, Chapter 6E-8 and its implementing regulations at HAR §13-275, there is insufficient information to make a Chapter 6E historic preservation determination of effect of the project's impact on potential subsurface historic properties within the 0.16-acre project area. Therefore, archaeological monitoring for identification purposes, guided by a SHPD-approved archaeological monitoring plan (HAR §13-279), is recommended. A list of SHPD-permitted consultants to conduct the archaeological monitoring can be found at: https://dlnr.hawaii.gov/shpd/about/branches/archaeology/

With regards to cultural practices, it is recommended that, should the project move forward, the organizers of the changing seasons event be consulted to ensure that scheduling and construction logistics do not interrupt or interfere with the event.

Figure 15. Proposed Excavations and Field Inspection Photograph Locations Corresponding to Figures 16–23.

Figure 16. Photographs of Proposed Location for Two Wells and a Filter Housing Structure; Photograph 1 Facing Southeast (Left) and Photograph 2 Facing Northeast (Right).

Figure 17. Photographs of Proposed Location for Two Wells and a Filter Housing Structure; Photograph 3 Facing Southwest (Left) and Photograph 4 Facing West (Right).

Figure 18. Photographs of Proposed Piping Location Along West Perimeter of the Project Area; Photograph 13 Facing North (Left) and Photograph 14 Facing South (Right).

Figure 19. Photographs of Proposed Piping Location Along Southwest and South Perimeter of the Project Area; Photograph 15 Facing Southeast (Left) and Photograph 16 Facing East (Right).

Figure 20. Photographs of Proposed Location for Pump Station/Emergency Overflow Box/Discharge/Transfer Sump; Photograph 11 Facing West (Left) and Photograph 12 Facing South (Right).

Figure 21. Photograph 9 of the Central Portion of the Project Area, Facing North (Left); Photograph 10 of the East-Central portion of the Project Area, Facing Northeast (Right).

Figure 22. Photographs of southeast side of the Project Area; Photograph 5 Facing East (Left) and Photograph 6 Facing Northeast (Right).

Figure 23. Photograph 7 of the South-Central Portion of the Project Area, Facing North (Left); Photograph 8 of the East-Central portion of the Project Area, Facing Northeast (Right).

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GLOSSARY OF HAWAIIAN TERMS

ahupuaʻa—land division and community

Land division usually extending from the uplands to the sea, so called because the boundary was marked by a heap (*ahu*) of stones surmounted by an image of pig (*puaʻa*) or because a pig or other tribute was laid on the altar as tax to the chief. The landlord or owner of an *ahupuaʻa* might be a *konohiki* (Pukui and Elbert 1986:9)

aliʻi—chief or chiefess

Chief, chiefess, officer, ruler, monarch, peer, headman, noble, aristocrat, king, queen, commander (Pukui and Elbert 1986:20); implies hereditary rank

akua—a god or goddess

God, goddess, spirit, ghost, devil, image, idol, corpse; divine, supernatural; godly (Pukui and Elbert 1986:15)

ʻaumakua—family god

Family or personal gods, deified ancestors who might assume the shape of sharks (all islands except Kauaʻi), owls (as at Mānoa, Oʻahu and Kaʻu and Puna, Hawaiʻi) hawks (Hawai'i), *ʻelepaio*, *ʻiwi*, mudhens, octopuses, eels, mice, rats, dogs, caterpillars, rocks, cowries, clouds, or plants. A symbiotic relationship existed; mortals did not harm or eat *ʻaumakua* (they fed sharks), and *'aumakua* warned and reprimanded mortals in dreams, visions, and calls (Pukui and Elbert 1986:32)

heiau—ceremonial structure or place

Pre-Christian place of worship, shrine (Pukui and Elbert 1986:64)

heiau poʻokanaka— a class of *heiau* where human sacrifices were made

A heiau where human sacrifices were offered (Pukui and Elbert 1986:64)

ʻili—division of land smaller than an ahupuaʻa

Land section, next in importance to *ahupuaʻa* an usually a subdivision of an *ahupuaʻa* (Pukui and Elbert 1986:97)

kapu—taboo

Taboo, prohibition; special privilege or exemption from ordinary taboo; sacredness; prohibited, forbidden; sacred, holy, consecrated; no trespassing, keep out. (Pukui and Elbert 1986:132)

konohiki—land managers

Headman of an ahupuaʻa land division undert the chief; land or fishing rights under the control of the konohiki (Pukui and Elbert 1986:166)

kula—dryland field

Plain, field, open country, pasture. An act of 1884 distinguished dry or *kula* land from wet or taro land (Pukui and Elbert 1986:179)

kuleana—small piece of land under the responsibility of a tenant

Right, privilege, concern, responsibility, title, business, property, estate, portion, jurisdiction, authority, liability, interest, claim, ownership, tenure, affair, province (Pukui and Elbert 1986:179)

loʻi—wetland taro field

Irrigated terrace, especially for taro, but also for rice (Pukui and Elbert 1986:209)

loko iʻa—fishpond

makaʻāinana—commoner

Commoner, populace, people in general (Pukui and Elbert 1986:224)

moʻōlelo–legend

Story, tale, myth, history tradition, legend, journal, log, yarn, fable, essay, chronicle, record, article (Pukui and Elbert 1986:254) *pali*—cliff

Cliff, precipice, steep hill or slope suitable for *olonā* and *wauke*; full of cliffs; to be a cliff (Pukui and Elbert 1986:321)

pōhaku—stone

Rock, stone, mineral, tablet (Pukui and Elbert 1986:334)

wahi pana—legendary place

Legendary place (Pukui and Elbert 1986:377)

Appendix H:

Draft EA Pre-Consultation Comments and Responses

From:	Haruno, Shawn H.
To:	WAq
Subject:	[External] State Department of Health Noise
Date:	Thursday, May 12, 2022 3:08:09 PM
Attachments:	HAR 11-46 - Current.pdf

Aloha Om, commenting on the WAq water system upgrade project. Please comply with Chapter 11-46 Community Noise Control. All construction activities and mechanical equipment needs to be under the allowable limit at or beyond the property line, if not, a community noise permit should be submitted.

Mahalo,

Shawn Haruno
State of Hawaii – Department of Health
Indoor and Radiological Health Branch
Noise Section Supervisor
99-945 Halawa Valley Street
Aiea, HI 96701
Office: 808-586-5800
Cell: 808-294-9695

TITLE 11

HAWAII ADMINISTRATIVE RULES

DEPARTMENT OF HEALTH

CHAPTER 46

COMMUNITY NOISE CONTROL

HAWAII ADMINISTRATIVE RULES

TITLE 11

DEPARTMENT OF HEALTH

CHAPTER 46

COMMUNITY NOISE CONTROL

Historical Note: Chapter 46 is based substantially on Chapter 43 of Title 11, Hawaii Administrative Rules, Community Noise Control for Oahu, Department of Health, State of Hawaii. [Eff 11/6/81; R SEP 2 3 1996]

§11-46-1 Purpose. It is the purpose of this chapter to define the maximum permissible sound levels, and to provide for the prevention, control, and abatement of noise pollution in the State from the following excessive noise sources: stationary noise sources; and equipment related to agricultural, construction, and industrial activities. It is also the purpose of this chapter to establish noise quality standards to protect public health and welfare, and to prevent the significant degradation of the environment and quality of life. [Eff SEP 23 1996] (Auth: HRS §§342F-3, 342F-31) (Imp: HRS §§342F-3, 342F-31)

§11-46-2 Definitions. As used in this chapter, unless the context otherwise requires:

"Activity" means an act or combination of acts which create noise, and which is associated with any excessive noise source.

"Agricultural activities" means any or all activities necessary or incidental for the purpose of agricultural functions, such as land cultivation, crop production, and harvesting.

"Ambient or background noise" means the totality of sounds in a given place and time, independent of the sound contribution of the specific source being measured.

"Applicant" means a person or persons responsible for the excessive noise source.

"Authorized emergency vehicles" means police and fire vehicles; private and public ambulances; and state and county vehicles used for emergencies.

"Best available control technology" means any limitation based on the maximum degree of noise reduction which would be emitted from any excessive noise source which the director, on a case-by-case basis, considering environmental and economical impacts and other costs, determines is achievable for that source through application of production processes or available methods, systems, and techniques. If the director determines that technological or economic limitations would make the imposition of the provisions of this chapter infeasible, a design, equipment, work practice, or operational standard, or a combination thereof, may be prescribed instead to satisfy the requirement for the application of the best available control technology.

"Complaint" means any written charge filed with the department that a person is violating any provision of this chapter or order adopted pursuant to this chapter.

"Construction activities" means any or all activities, including but not limited to those activities necessary or incidental to the erection, demolition, assembling, renovating, installing, or equipping of buildings, public or private highways, roadways, premises, and parks.

"Construction equipment" means any device designed and intended for use in construction, including but not limited to any air compressor, pile driver, bulldozer, pneumatic hammer, steam shovel, derrick, crane, tractor, grader, loader, power saw, pump, pneumatic drill, compactor, on-site vehicle, and power hand tool.

"Construction site" means any or all areas, necessary or incidental for the purpose of conducting construction activities.

"Council" means the legislative body of a county.

"County" means the city and county of Honolulu, county of Hawaii, county of Kauai, or county of Maui, State of Hawaii.

"dBA" means the A-weighted sound level or unit of measurement describing the total sound level of all noises as measured with a sound level meter using the "A" weighting network.

"Decibel" means the unit for measuring the volume of sound, equal to twenty times the logarithm to the base ten of the ratio of the pressure of the sound measured to the reference pressure, which is twenty micropascals (0.0002 dynes per square centimeter).

"Department" means the department of health, State of Hawaii.

"Device" means any mechanism or instrument which is designed to or which actually produces sound when operated or handled.

"Director" means the director of the department of health, State of Hawaii, or the director's duly authorized agent.

"Dwelling" means a room or rooms connected together constituting an independent housekeeping unit for an individual or a family, containing facilities for bathing or cooking, or both.

"Emergency" means any condition which would require immediate attention or corrective action to avoid probable danger to property, or to the health and safety of people.

"Equipment" means any or all devices used in an operation or activity.

"Excessive noise" means the presence of sound as measured by standard testing devices, and of a volume, or in quantities, and for durations, as established by this chapter.

"Excessive noise source" means any stationary noise source; and any equipment related to agricultural, construction, and industrial activity which emits sound in excess of the maximum permissible sound levels specified in section 11-46-4, as measured at any point at or beyond the property line.

"HRS" means Hawaii Revised Statutes.

"Holiday" means a day observed by federal or by state law for suspension of operations in whole or part.

"Impulsive noise" or "impact noise" means any sound with a rapid rise and decay of sound pressure level, lasting less than one second, caused by sudden contact between two or more surfaces, or caused by a sudden release of pressure, including but not limited to any hammering, pile driving, and explosion.

"Industrial activities" means any or all activities necessary or incidental to manufacturing, refining, or processing of materials and products.

"Maximum permissible sound levels" means the sound levels assigned to zoning districts, as established by the director. The maximum permissible sound levels are specified in section 11-46-4(a).

"Muffler" means a mechanical apparatus designed to allow the flow of gas, air, and steam, and to reduce the noise created by intake from or exhaust to the atmosphere by such flow.

"Noise" means any sound that may produce adverse physiological or psychological effects or interfere with individual or group activities, including but not limited to communication, work, rest, recreation, or sleep.

"Noise pollution" means noise emitted from any excessive noise source in excess of the maximum permissible sound levels.

"Off-hour roadwork" means any roadway construction between the hours of 6:00 p.m. and 7:00 a.m., which would require a variance from the director. For the purpose of this definition, roadway construction shall be limited to any activity, necessary or incidental to reconstruction or resurfacing of public or private highways or roads.

"On-site vehicles" means fuel-, electric-, and air-powered vehicles, stationary and mobile, which are operated within the boundaries of a construction site or agricultural or industrial premises.

"Open space" means any zoning district or parcel essentially free of structures that serves the purpose of visual relief and buffering from building or structural mass.

"Operate" means perform or conduct any activity associated with an excessive noise source.

"Owner" means the owner of the freehold of the premises or lesser estate therein, or mortgagees thereof, a lessee or agent of any of the aforementioned persons, a lessee of a device or the lessee's agent, a tenant, operator, or any other person who has regular control of the premises, or of an equipment, or of a device.

"Party" means each person or agency named as party or properly entitled to be a party in any court or agency proceeding.

"Permit" means written authorization from the director to operate any excessive noise source.

"Person" means any individual, partnership, firm, association, public or private corporation, trust estate or any other legal entity, or the State or any of its political subdivisions.

"Premises" means any property, including its structure and other surrounding property, which is used as a dwelling, or as a place of business, or as a place to construct, manufacture, or conduct any activity.

"Property line boundary" means a line drawn through the points of contact of adjoining lands, apartments, condominiums, townhouses or duplexes, owned, rented, or leased by different persons; a demarcation or a line of separation of properties; and also, for any two or more buildings sharing common grounds, the line drawn midway between any two said buildings. For the purpose of this chapter, the property line includes all points on a plane formed by projecting the property line in a manner deemed appropriate by the director.

"Public space" means any zoning district or parcel used, owned, or managed by the federal government, the State of Hawaii, or the counties to fulfill a governmental function, activity, or service for public benefit, including but not limited to libraries, satellite city halls, public schools, and post offices.

"School activity" means a public or private school function for students up through the twelfth grade which is approved by the school principal or an authorized representative.

"Sound" means an oscillation in pressure, particle displacement, particle velocity, or other physical parameter, in a medium with internal forces that causes compression and rarefaction of that medium. The description of sound may include any characteristic of such sound, including duration, intensity, and frequency.

"Sound level" means the sound pressure level obtained by the use of a sound level meter and frequency weighting network, such as A, B, or C, as specified in American National Standards Institute specifications for sound level meters.

"Sound level meter" means an instrument or combination of instruments, which meets or exceeds the requirement for a type I or type II sound level meter as specified in the American National Standard Institute, ANSI S1.4-1983, specifications for sound level meters.

"Sound pressure level" means twenty times the logarithm to the base ten of the ratio of the measured sound pressure to the reference sound pressure of 0.0002 dynes per square centimeter or twenty micropascals.

"Stationary noise source" means any mechanical source of noise fixed in or on a station, course, or mode within any premises, including but not limited to mechanical air conditioning units, exhaust systems, generators, compressors, pumps, or other similar equipment.

"Variance" means a special written authorization from the director to cause or emit excessive noise in a manner or amount in excess of applicable standards, or to do an act that deviates from the requirements of this chapter or any rules adopted under chapter 342F, HRS.

"Zoning districts" means the land use districts established by rules or ordinances adopted by council, legislature, county, or state government agencies. [Eff SEP 23 1996] (Auth: HRS §§342F-3, 342F-31) (Imp: HRS §§342F-1, 342F-3, 342F-31)

§11-46-3 Classification of zoning districts. This section shall describe the zoning districts as specified in Table 1, maximum permissible sound levels in dBA, found in section 11-46-4, and as provided in section 11-46-4:

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

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

(3) Class C zoning districts include all areas equivalent to lands zoned agriculture, country, industrial, or similar type. [Eff SEP 23 1996] (Auth: HRS §§342F-3, 342F-31) (Imp: HRS §§342F-3, 342F-31)

§11-46-4 Maximum permissible sound levels in dBA. (a) The maximum permissible sound levels specified in Table 1, as provided in this subsection and in section 11-46-3, shall apply to the following excessive noise sources: stationary noise sources; and equipment related to agricultural, construction, and industrial activities.

Table 1. Maximum permissible sounds levels in dBA.

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

(b) The maximum permissible sound levels in Table 1, as provided in subsection (a), shall apply to any excessive noise source emanating within the specified zoning district, and at any point at or beyond (past) the property line of the premises in a manner deemed appropriate by the director.

(c) Noise levels shall not exceed the maximum permissible sound levels for more than ten per cent of the time within any twenty minute period, except by permit or variance issued under sections 11-46-7 and 11-46-8.

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

(e) The maximum permissible sound level for impulsive noise shall be ten dBA above the maximum permissible sound levels specified in Table 1 of subsection (a). "Fast" meter response shall be used to measure these types of noise. [Eff SEP 23 1996] (Auth: HRS §§342F-3, 342F-31) (Imp: HRS §§342F-3, 342F-31)

§11-46-5 <u>Exemptions.</u> This chapter shall not apply to the following:

(1) Any authorized emergency vehicle or vehicles responding to an emergency call or acting in an emergency;
(2) The sounding of any emergency signaling device, including but not limited to civil defense warning systems, burglar and fire alarms, sirens, whistles, or similar signaling devices;
(3) Activities related to the emergency maintenance and repair of state and county highways, parks, and public utilities including but not limited to water, sewer, electric, gas, and telephone systems, provided the noise is confined to only the equipment in use;
(4) Operation of emergency generators, when installed and used as required and necessary for the protection of public health and safety, provided the best available control technology is implemented;
(5) Backup alarm devices on any vehicle, where such device is required by federal or state occupational safety and health regulations;
(6) Construction and remedial activities related to the emergency repair of damages caused by

natural disasters, including but not limited to tsunamis and hurricanes; and

(7) Any school activity which is approved by school authorities; provided that this exemption shall limit these activities to the hours of 7:00 a.m. to 10:00 p.m. [Eff SEP 2 3 1996] (Auth: HRS §§342F-3, 342F-31) (Imp: HRS §§342F-3, 342F-30, 342F-31)

§11-46-6 Noise prohibited. (a) General prohibition. Without a permit or variance issued pursuant to section 11-46-7 or 11-46-8, no person within the State shall operate, from any premises or land owned, rented, leased, occupied, or controlled by that person, any excessive noise source.

(b) Specific prohibitions.

(1) Mufflers.

(A) No person shall operate nor shall its owner permit the operation of an on-site vehicle, construction equipment, or device, with a motor or exhaust system or both, without a muffler. This subparagraph shall not apply to pile hammers and pneumatic hand tools weighing less than fifteen pounds; and

(B) No person shall operate nor shall its owner permit the operation of an on-site vehicle, construction equipment, tool, or device, on any premises or a construction site, with a motor or exhaust system or both, which has been altered, modified, or repaired; provided this subparagraph shall not apply if the operator or owner can show that the altered, modified, or repaired component is equally or more effective than the original component in reducing noise. [Eff SEP 2 3 1996] (Auth: HRS §§342F-3, 342F-30, 342F-31) (Imp: HRS §§342F-3, 342F-30, 342F-31)

§11-46-7 Permits. (a) Applicability. In accordance with section 342F-4, HRS, the director may grant, renew, modify, suspend, revoke, or deny permits to operate any excessive noise source which emits or may emit noise levels in excess of the maximum permissible sound levels specified in Table 1, Maximum permissible sound levels in dBA, of section 11-46-4(a), which is in the public interest, and which may be subject to such reasonable conditions as the director may prescribe.

(b) The following factors in granting an application for permit or an application by a permit holder for the modification or renewal of a permit, may be considered by the director:

(1) The best available control technology is provided to control noise levels from the excessive noise source;
(2) The proposed noise emitting activity is in the public interest, as defined by subsection (c);
(3) The services or activities for which the permit is sought are temporary and cannot be delayed, postponed, or rescheduled to a time period in which such services are permitted;
(4) The applicant requires additional time to alter or modify the applicant's activity or operation to comply with this chapter;
(5) The applicant has disclosed any possible impact from noises created by any proposed nighttime activity which may affect the immediate surrounding; and
(6) The applicant plans to notify the people in the surrounding area of planned nighttime activity.

(c) In determining public interest, the director shall consider the environmental impact of the proposed action, any adverse environmental effects which cannot be avoided should the action be implemented, the alternatives to the proposed action, the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity, any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented, and any other factors which the director may by rule prescribe.

(1) Any determination of public interest shall promote the optimum balance between economic development and environmental quality.

(d) Application for permit or renewal.

(1) Every application for permit or renewal

shall be submitted on forms furnished by the director.

(2) The applicant shall submit sufficient information to enable the director to make a decision on all applications. Subject to the request of the director, every application for permit or renewal may include the following information:

(A) Applicant identification;
(B) Type and purpose of activity;
(C) Location and time of activity;
(D) A list of vehicles, construction or agricultural equipment, tools, and any devices;
(E) A description of the stationary noise source, including information pertaining to the purpose of the noise producing source including supporting facts which demonstrate that termination of the noise source operation would constitute an unreasonable hardship on the applicant, on the community, or on other persons;
(F) Information pertaining to other available alternatives to replace the operation of the noise source;
(G) Estimated duration and schedule of activity;
(H) A detailed schedule of plans, procedures, and specifications for the attenuation of noise level emissions from the excessive noise source;
(I) Description of the immediate impact area; and
(J) Such other information as the director may request.

(3) The director shall not act upon or consider any incomplete application for permit or renewal. An application shall be deemed complete only when all required and requested information, including the application form, plans, schedules, specifications, and other information have been timely submitted.

(4) Every application shall be signed by the applicant and shall constitute an acknowledgment and agreement that the

applicant will comply with all the terms and conditions of the permit, this chapter, and chapter 342F, HRS.

(5) The failure of the director to act on a completed application within one hundred eighty days of the receipt of such application, shall be deemed a grant of such application; provided that the applicant acts consistently with the application process.

(6) The director may require the submission of additional information after the application has been submitted, and may ensure that, if an application is incomplete or otherwise deficient, processing of the application shall not be completed until such time as the applicant has supplied all required information or otherwise corrected the deficiency.

(e) Period of permit.

(1) The director shall determine the effective period of the permit, which shall be for any term not exceeding five years.

(2) On written request, the director may extend the period of the permit upon showing that an extension is justified; provided in no case shall an extension be granted if the combined term of the originally issued permit and any extension or extensions exceed five years. Any extension or extensions shall be subject to annual fees as provided in subsection (i).

(3) The director, on application, may renew a permit from time to time, for any term not exceeding five years.

(f) Application for modification of permit.

(1) Every application for the modification of a permit shall be submitted in writing to the director; and

(2) The director shall not act upon or consider any incomplete request for a modification of a permit. A request for modification of a permit shall be deemed complete only when all required and requested information, including plans, schedules, specifications, and other information have been timely submitted.

(g) No applicant for renewal of a permit shall be held in violation of this chapter during the pendency of the applicant's application provided that the applicant acts consistently with the permit previously granted, the application of all plans, specifications, and other information submitted as a part thereof.

(h) Fees.

(1) The director may establish reasonable fees for the issuance of permits and renewals to cover the cost of granting thereof and for the implementation and enforcement of the terms and conditions of permits;

(2) Every applicant for permit or renewal shall pay the applicable annual fees as provided in subsection (i);

(3) Fees shall not be refunded or applied to any subsequent application; and

(4) Fees shall be made payable to the State of Hawaii.

(i) Fee schedule. The annual fee schedule for a permit or a renewal to a permit shall be as follows:

(1) Permit fees for construction activities.

(A) $25 per year for activities involving demolition, construction, extension, additions, or renovation of a single family dwelling.

(B) $50 per year for all other activities, including but not limited to demolition of building structures, construction of buildings, residential subdivisions, shopping centers, bridges, reservoirs, utilities, roadway (including improvements), and site work for subdivisions and golf courses.

(2) Permit fees for operation of stationary noise sources or equipment related to agricultural and industrial activities shall be $50 per year.

(j) Specific permit restrictions for construction activities.

(1) No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels for the hours before 7:00 a.m. and after 6:00 p.m. of the same day, Monday through Friday;

(2) No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels for the

hours before 9:00 a.m. and after 6:00 p.m. on Saturday; and

(3) No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels on Sundays and on holidays.

(k) Transfer of permit.

(1) Each permit is nontransferable either from one location to another, from one activity to another, or from one person to another without the written approval of the director.

(l) Suspension, revocation, or denial. The director may suspend, revoke, or deny any permit if, after affording an opportunity for a hearing in accordance with chapter 91, HRS, it is determined that:

(1) There is a violation of any condition of the permit;
(2) There is a violation of this chapter;
(3) There are deviations from, or there is a failure to comply with, all information or facts contained within the permit;
(4) The permit was obtained by misrepresentation or failure to disclose fully all relevant facts;
(5) There is a change in any condition that requires either a temporary or permanent reduction or elimination of the excessive noise emission; or
(6) Such action is in the public interest.

(m) Termination of permits. The director shall be notified, in writing, of the permanent termination of the activity for which the permit has been granted. If such notice is not received by the expiration date specified in the permit, the permit shall automatically terminate and the permittee shall be divested of all rights therein.

(n) Records. The director shall keep records of all permits and their disposition. [Eff SEP 23 1996] (Auth: HRS §§342F-3, 342F-4, 342F-14, 342F-31) (Imp: HRS §§342F-3, 342F-4, 342F-14, 342F-31)

§11-46-8 <u>Variances.</u> (a) Applicability. In accordance with section 342F-5, HRS, the director may grant, renew, modify, suspend, revoke, or deny variances to operate any excessive noise source which emits or may emit noise levels in excess of the maximum permissible sound levels specified in Table 1, Maximum permissible sound levels in dBA, of section 11-46-4(a), and which use or operation does not conform to the requirements of section 11-46-7, or other applicable provisions of this chapter.

(b) No variance, modification, or renewal shall be granted by the director unless the application and the supporting information clearly show that:

(1) The continuation of the function or operation involved in the emission occurring or proposed to occur by the granting of the variance is in the public interest, as defined in section 11-46-7(c);

(2) The emission occurring or proposed to occur does not substantially endanger human health or safety; and

(3) Compliance with the provisions of this chapter from which the variance is sought would produce serious hardship without equal or greater benefits to the public.

(c) Application for variance, modification, or renewal.

(1) Every application shall be submitted on forms furnished by the director.

(2) Every application shall be accompanied by a complete and detailed description of present conditions, how present conditions do not conform to standards, and such other information as the director may by rule prescribe.

(3) Every application shall be reviewed in light of the descriptions, statements, plans, histories, and other supporting information submitted with the application; any additional information as may be submitted upon the request of the director; and the effect or probable effect upon the maximum permissible sound levels established pursuant to this chapter.

(4) The applicant shall submit sufficient information to enable the director to make a decision on the application. Subject to the request of the director, every application for variance may include the following information:

(A) Applicant identification;
(B) Type and purpose of activity, including a brief description of the applicant's activity which results in the proposed emission;
(C) Location and time of activity;
(D) A list of vehicles, construction or agricultural equipment, tools, and any devices;
(E) Estimated duration and schedule of activity;
(F) Plans and procedures for the attenuation of noise emission from noise sources to minimize excessive noise levels;
(G) Description of the immediate impact area;
(H) Any adverse environmental effects which cannot be avoided;
(I) Description of alternatives to the proposed activity;
(J) Discussion of the relationship between short-term use of the environment and the maintenance and enhancement of long-term productivity;
(K) Discussion of any irreversible and irretrievable commitments of resources which would be involved in the proposed activity;
(L) Disclosure of any possible impact from noise created by any proposed nighttime activity which may affect the immediate surrounding;
(M) Plans for notification of the people in the surrounding area of planned nighttime activities; and
(N) Such other information as the director may request.

(5) The director shall not act upon or consider any incomplete application for variance, modification or renewal. An application shall be deemed complete only when all required and requested information, including the application form, plans, schedules, specifications, and other information have been timely submitted.

(6) Every application shall be signed by the

applicant and shall constitute an acknowledgment and agreement that the applicant will comply with all of the terms and conditions of the variance, this chapter, and chapter 342F, HRS.

(7) The director may require the submission of additional information after the application has been submitted, and may ensure that, if an application is incomplete or otherwise deficient, processing of the application shall not be completed until such time as the applicant has supplied all required information or otherwise corrected the deficiency.

(8) Every application for renewal shall be made at least one hundred eighty days prior to the expiration of the variance. The director shall act on a completed application for renewal within one hundred eighty days of the receipt of such application.

(9) Every application for renewal shall meet all conditions specified in the immediately preceding variance; and shall provide for emission not greater than that attained pursuant to the terms of the immediately preceding variance at its expiration.

(d) Public participation requirements.

(1) Any application for a variance, submitted pursuant to this chapter, shall be subject to the public participation requirements.

(2) Public notices of every completed application for a variance, except an application for off-hour road work, shall be circulated in a manner designed to inform interested and potentially interested persons of the proposed emission.

(3) Procedures for the circulation of public notices shall include at least the following:
   (A) Notices shall be circulated within the geographical areas of the proposed emission; such circulation shall include publishing in local newspapers and periodicals, or, if appropriate, in a daily newspaper of general circulation;
   (B) Notice shall be mailed to any person upon request; and

(C) The director shall add the name of any person, upon request, to a mailing list to receive copies of notices for all variance applications within the State or within a certain geographical area.

(4) The director shall provide a period of not less than thirty days following the date of the public notice during which time interested persons may submit their written review with respect to the variance application and the tentative determinations of the department, if any. The period for comment may be extended at the discretion of the director.

(5) The contents of the public notice of applications for variances shall include at least the following:

(A) Name, address, and phone number of agency issuing the public notice;

(B) Name and address of each applicant;

(C) Brief description of each applicant's activities or operations which result in the emission described in the variance application;

(D) A short description of the location of each emission indicating whether such emission is new or existing;

(E) A brief description of the procedures for the formulation of final determinations, including the thirty-day comment period required by paragraph (4), and any other means by which interested persons may influence or comment upon those determinations; and

(F) Address and phone number of state agency premises at which interested persons may obtain further information and inspect a copy of the variance applications and supporting and related documents.

(6) The director may hold a public hearing, if, after reviewing the comments submitted under paragraph (4), the director determines that a public hearing is warranted. Any hearing brought pursuant to this subsection shall be held in the geographical area of the proposed emission or other appropriate area, at the

discretion of the director.

(e) Fees.

(1) The director may establish reasonable fees for the issuance of variance and renewals to cover the cost of issuance thereof and for the implementation and enforcement of the terms and conditions of variances.

(2) Every applicant for variance or renewal shall pay the applicable fee as set forth in subsection (f);

(3) Fees shall not be refunded nor applied to any subsequent application; and

(4) Fees shall be made payable to the State of Hawaii.

(f) Fee schedule. The fee for a variance or renewal of a variance shall be $100 per year and all costs associated with the public participation requirements as provided in subsection (d), including but not limited to costs for publication of public notices, circulation of public notices, and public hearing. Public notices shall be prepared by the department.

(g) Granting of variances, modifications, or renewals.

(1) If a variance, modification, or renewal is granted on the grounds that there is no practicable means known or available for the adequate prevention, control, or abatement of the excessive noise involved, it shall be only until the necessary means for prevention, control, or abatement become practicable, and subject to the taking of any substitute or alternate measures that the director may prescribe.

(2) Every variance, modification, or renewal granted under this section shall include conditions requiring the grantee to perform noise sampling and report the results of such sampling to the director.

(h) Period of variance, modification, or renewal.

(1) The director may issue a variance or renewal for a period not exceeding five years.

(2) The period of modification shall be the period of the variance originally issued, for the term not exceeding five years.

(3) On written request, the director may extend the period of the variance upon showing that an extension is justified; provided in no case shall an extension be granted if the combined term of the originally issued variance and any extension or extensions exceeds five years. Any extension or extensions shall be subject to annual fees as provided in subsection (f).

(i) Variance conditions. Each variance may be subject to such reasonable conditions as the director may prescribe.

(j) Suspension, revocation, or denial. The director may suspend, revoke, or deny any variance if, after affording an opportunity for a hearing in accordance with chapter 91, HRS, it is determined that:

(1) There is a violation of any condition of the variance;
(2) There are deviations from, or failure to comply with, all information or facts contained within the variance;
(3) The variance was obtained by misrepresentation or failure to disclose fully all relevant facts;
(4) There is a change in any condition that requires either a temporary or permanent reduction or elimination of the excessive noise emission; or
(5) Such action is in the public interest.

(k) Termination of variances. The director shall be notified, in writing, of the permanent termination of the activity for which the variance has been granted. If such notice is not received by the expiration date specified in the variance, the variance shall automatically terminate and the applicant shall be divested of all rights therein.

(l) Records. The director shall keep records of all requests for variance and their disposition. [Eff SEP 23 1996] (Auth: HRS §§342F-3, 342F-5, 342F-14-, 342F-31) (Imp: HRS §§342F-3, 342F-5, 342F-14, 342F-31)

§11-46-9 <u>Measurement of sound levels.</u> (a) The director may adopt procedures which set forth criteria for the measurement of sound. Such procedures may be in substantial conformity with standards and recommended practices established by the American National Standards Institute or the Society of Automotive Engineers, and the latest revisions thereof.

(b) The director may revise such measurement procedures from time to time to reflect current engineering judgment and advances in noise measurement techniques.

(c) For the purpose of this chapter, sound level measurements shall be conducted using standard procedures, with sound level meters, using the "A" weighting network and "slow" meter response unless otherwise stated.

(d) Sound level meters and calibrators shall conform to specifications provided in the American National Standard, ANSI S1.4-1983, specification for sound level meters.

(e) Windscreens shall be used whenever appropriate.

(f) The various factors affecting the accuracy of a measurement shall be evaluated to the extent necessary for the implementation of this chapter. For example, if the accuracy with which a measurement can be made with specific instruments at a specific location is plus or minus two dBA, then any measured level greater than the specified maximum permissible sound level, plus two dBA, will indicate that excessive noise has been emitted.

(g) Measurements shall normally not be used for enforcement unless the noise level at a point of measurement is more than three decibels greater than the ambient or background noise level.

(h) The ambient noise level may be estimated from sound levels measured during nonoperation of the noise source or by sound levels measured at one or more points near the point of measurement where the noise source is inaudible. [Eff SEP 23 1996] (Auth: HRS §§342F-3, 342F-31) (Imp: HRS §§342F-3, 342F-31)

§11-46-10 Certification. Persons conducting noise measurements for the enforcement of this chapter shall have been trained in the techniques of sound measurement and the operation of sound level meters and other sound measuring instruments and shall have been certified by the director. [Eff SEP 23 1996] (Auth: HRS §§342F-3, 342F-31) (Imp: HRS §§342F-3, 342F-31)

§11-46-11 Powers and duties. In order to implement and enforce this chapter and for the general purpose of prevention, control, and abatement of noise pollution in the State, the director shall have, in addition to any other vested authority, the power to:

(1) Conduct research programs for the purpose of determining the causes, effects, and hazards of excessive noise and the means whereby noise may be monitored, controlled, or abated;

(2) Conduct programs of public education regarding the causes, effects, and general methods of abatement and control of noise; the actions prohibited by this chapter and the procedures for reporting violations;

(3) Cooperate, to the extent practicable, with all appropriate state, federal, and county agencies;

(4) Coordinate noise programs with appropriate county agencies in providing technical assistance in areas such as development of regulatory control of activities creating noise disturbances, and in sound measurement;

(5) Conduct state educational and training programs on noise prevention, control, and abatement, including the preparation and distribution of information relating to excessive noise and its effect on people;

(6) Request any other department or agency responsible for any proposed or final standard, regulation, or similar action to consult on the advisability of revising the action, if there is reason to believe that the action is not consistent with any provision of this chapter;

(7) Develop and recommend for promulgation, provisions regulating the use and operation of any product; and

(8) Develop and promulgate standards, testing methods, and procedures. [Eff SEP 23 1996] (Auth: HRS §§342F-3, 342F-31, 342F-33) (Imp: HRS §§342F-3, 342F-31, 342F-33)

§11-46-12 Inspection of premises. (a) The director upon receiving reports of, or identifying any actual or suspected excessive noise source, is authorized, upon presenting appropriate credentials to the owner, operator, or agent in charge:

(1) To enter at all reasonable hours, any premises, to conduct an investigation, to ascertain compliance or noncompliance with this chapter, or any permit, variance or modification issued pursuant to this chapter, to make reasonable tests in connection therewith, and to recommend requirements for any noise attenuation measures;

(2) To inspect at reasonable times and within reasonable limits and in a reasonable manner, any premises and all pertinent equipment or devices; and

(3) To require that the owner, operator, or agent of any premises cease operation of all pertinent equipment, or devices for the purpose of conducting an investigation and inspection thereof.

(b) No confidential information secured pursuant to this section by any official or employee of the department, within the scope and course of the official's or employee's employment, in the prevention, control, or abatement of excessive noise, shall be disclosed by the official or employee, except as it relates directly to the excessive noise, and only in connection with the official's or employee's official duties and within the scope and course of the official's or employee's employment. [Eff SEP 2 3 1996] (Auth: HRS §§342F-3, 342F-6, 342F-31) (Imp: HRS §§342F-3, 342F-6, 342F-31)

§11-46-13 <u>Other ordinances and rules.</u> The council of any county may adopt and provide for the enforcement of ordinances regulating any matter relating to excessive noise. No such ordinance shall be held invalid on the ground that it covers any subject or matter embraced within any statute or rule of the State; provided that in any case of conflict between the statute or rule and ordinance, the law which affords the most protection to the public shall apply. [Eff SEP 2 3 1996] (Auth: HRS §§342F-3, 342F-20, 342F-31, 46-17) (Imp: §§342F-3, 342F-20, 342F-31)

§11-46-14 Enforcement. (a) Initial violation. If the director determines that any person has violated or is violating this chapter, or any condition of a permit, variance, or modification issued pursuant to this chapter, the director:

(1) Shall cause written notice to be served upon the alleged violator or violators. This notice shall specify the alleged violation and may contain an order specifying a reasonable time during which that person shall be required to take any measures that may be necessary to correct the violation and give periodic progress reports;

(2) May require that the alleged violator or violators appear before the director for a hearing at a time and place specified in the notice and answer the charges complained of; and

(3) May impose penalties as provided in section 342F-11, HRS, and section 11-46-18 by sending a notice, in writing, either by certified mail or by personal services, to the alleged violator or violators describing the violation.

(b) Continuing violation. If the director determines that any person is continuing to violate this chapter, or any condition of a permit, variance, or modification issued pursuant to this chapter after having been served a notice of violation, the director:

(1) Shall cause written notice to be served upon the alleged violator or violators. The notice shall specify the alleged violation and shall contain an order requiring that person to submit a written schedule within thirty days specifying the measures to be taken and the time within which the measures shall be taken to bring that person in compliance with this chapter, or the conditions of a permit, variance, or modification issued pursuant to this chapter;

(2) Shall accept or modify the submitted schedule within thirty days of receipt of the schedule. Any schedule not acted upon after thirty days of receipt by the director shall be deemed accepted by the director;

(3) Shall issue to the alleged violator or

violators a cease order against the activities that violate this chapter, or any condition of a permit or variance issued pursuant to this chapter if that person does not submit a written schedule to the director within thirty days. This order shall remain in effect until the director accepts the written schedule; and

(4) May impose penalties as provided in section 342F-11, HRS, or section 11-46-18 by sending a notice, in writing, either by certified mail or by personal service, to the alleged violator or violators describing the violation.

(c) Violation of abatement schedule or order. If the director determines that any person has violated the provisions of an accepted schedule or has violated an order issued under this section, the director shall impose penalties by sending a notice in writing, either by certified mail or by personal service, to that person, describing such nonadherence or violation.

(d) Violation order.

(1) Any order issued under this chapter shall become final, unless no later than twenty days after the notice of order is served, the person or persons named therein request, in writing, a hearing before the director.

(2) Any penalty imposed under this chapter shall become due and payable twenty days after the notice of penalty is served, unless the person or persons named therein request, in writing, a hearing before the director.

(3) Whenever a hearing is requested on any penalty imposed under this chapter, the penalty shall become due and payable only upon completion of all review proceedings and the issuance of a final order confirming the penalty in whole or in part.

(e) Contested hearing.

(1) Upon request for a hearing, the director shall require that the alleged violator or violators appear before the director for a hearing at a time and place specified in the notice and answer the charges complained of.

(2) Any hearing conducted under this section shall be conducted as a contested case under

chapter 91, HRS.

(3) If, after a hearing held pursuant to this section, the director finds that a violation or violations have occurred, the director shall affirm or modify any penalties imposed, or shall modify or affirm the order previously issued, or issue an appropriate order or orders for the prevention, abatement, or control of the violation involved, or for the taking of such other corrective action as may be appropriate.

(4) If, after a hearing on an order or penalty contained in a notice, the director finds that no violation has occurred or is occurring, the director shall rescind the order or penalty.

(5) An order issued after hearing may prescribe the date or dates by which the violation or violations shall cease and may prescribe timetables for necessary action in preventing, abating, or controlling the violation.

(f) Civil action.

(1) If the amount of any penalty is not paid to the department within thirty days after it becomes due and payable, the director may institute a civil action in the name of the State to collect the administrative penalty which shall be a government realization.

(2) In any proceeding to collect the administrative penalty imposed, the director need only show that notice was given, a hearing was held or the time granted for requesting a hearing expired without a request for a hearing, the administrative penalty was imposed, and the penalty remains unpaid.

(g) Subpoena.

(1) In connection with any hearing held pursuant to this section, the director shall have the power to subpoena the attendance of witnesses and the production of evidence on behalf of all parties.

(h) The director shall enforce the provisions of this chapter. [Eff SEP 2 3 1996] (Auth: HRS §§342F-3, 342F-9, 342F-31) (Imp: HRS §§342F-3, 342F-9, 342F-31)

§11-46-15 Records.
(1) The director may require that the owner, operator, or agent of any premises establish and maintain all pertinent records.
(2) The director shall have access to all pertinent records.
(3) The director may require that the owner, operator, or agent of any premises develop and submit reports of all pertinent records;.
(4) The director may require that the owner, operator, or agent of any premises produce copies of all pertinent records upon request by the director.
(5) The director may require that the owner, operator, or agent of any premises conduct measurements of sound levels of any source in accordance with established methods and procedures, at such locations and times as the director may reasonably prescribe, and to furnish reports of the results of such measurements. [Eff SEP 23 1996] (Auth: HRS §§342F-3, 342F-7, 342F-31) (Imp: HRS §§342F-3, 342F-7, 342F-31)

§11-46-16 Penalties. (a) Any person who violates any provision of this chapter, or any permit, variance, or modification issued pursuant to this chapter, shall be subject to fines of not more than $10,000 for each separate offense. Each day of violation shall constitute a separate offense. Any action taken to impose or collect the penalty provided for in this subsection shall be considered a civil or administrative action, as the case may be.

(b) Any person who denies, obstructs, or hampers the entrance or inspection by any duly authorized employee of the department of any premises, or vehicle that the employee is authorized to enter and inspect, shall be fined not more than $500. Any action taken to impose or collect the penalty provided for in this section shall be considered a civil action. [Eff SEP 23 1996] (Auth: HRS §§342F-3, 342F-9, 342F-31) (Imp: HRS §§342F-3, 342F-9, 342F-31)

§11-46-17 Citation. (a) Any person who commits a violation of this chapter may be issued a summons or citation for such violation by any person authorized to enforce this chapter, hereinafter referred to as enforcement officer.

(b) The summons or citation shall warn the person to appear and answer to the charge against the person at a certain place and at a time within seven days after the issuance of the summons or citation.

(c) The summons or citation shall be printed on a form adopted or prescribed by the state district courts.

(d) Summons and citations shall be consecutively numbered and the carbon copy or copies of each shall bear the same number.

(e) The summons or citation shall be designed to provide for all necessary information.

(f) The original of a summons or citation shall be given to the purported violator and the other copy or copies distributed in the manner prescribed by the district courts; provided that the district courts may prescribe alternative methods of distribution of the original and any other copies.

(g) In the event any person fails to comply with a summons or citation issued to such person, the enforcement officer shall cause a complaint to be entered against the person and shall secure the issuance of a warrant for the person's arrest. Failure to comply with a summons or citation is a misdemeanor. [Eff SEP 23 1996] (Auth: HRS §§342F-3, 342F-10, 342F-31) (Imp: HRS §§342F-3, 342F-10, 342F-31)

§11-46-18 Administrative penalties. (a) In addition to any other administrative or judicial remedy provided by this chapter, the director is authorized to impose by order the penalties specified in section 342F-9(b) and (c), HRS, and section 11-46-16.

(b) Factors to be considered in imposing an administrative penalty include:

(1) The nature and history of the violation and of any prior violations;
(2) The economic benefit, if any, resulting from the violation;
(3) The opportunity, difficulty, and history of corrective action;
(4) Good faith efforts to comply; and

(5) Any other matters that justice may require.

(c) It is presumed that the violator's economic and financial conditions allow payment of the penalty, and the burden of proof to the contrary shall be on the violator. [Eff SEP 23 1996] (Auth: HRS §§342F-3, 342F-11, 342F-31) (Imp: HRS §§342F-3, 342F-11, 342F-31)

§11-46-19 Injunctive and other relief. The director may institute a civil action in any court of competent jurisdiction for injunctive and other relief to prevent any violation of this chapter, any rule adopted pursuant to this chapter, or any condition of a permit or variance issued pursuant to this chapter, without the necessity of a prior revocation of the permit or variance, to impose and collect civil penalties, to collect administrative penalties, or obtain other relief. The court shall have the power to grant relief in accordance with the Hawaii rules of civil procedure. [Eff SEP 23 1996] (Auth: HRS §§342F-3, 342F-12, 342F-31) (Imp: HRS §§342F-3, 342F-12, 342F-31)

§11-46-20 Public records. Reports submitted to the department on the emission of excessive noise shall be made available for inspection by the public during established office hours unless such reports contain information of a confidential nature concerning secret processes or methods of manufacture. [Eff SEP 23 1996] (Auth: HRS §§342F-3, 342F-15, 342F-31) (Imp: HRS §§342F-3, 342F-15, 342F-31)

§11-46-21 Litigation. No part of this chapter shall be allowed as a defense against suit brought by any person for damage alleged to occur as a result of noise. [Eff SEP 23 1996] (Auth: HRS §§342F-3, 342F-31) (Imp: §§342F-3, 342F-31)

§11-46-22 Severability. If any provision of this chapter, or the application thereof to any person or circumstance is held invalid, the remainder of this chapter, and the application of the chapter to other persons or circumstances, shall not be affected thereby. [Eff SEP 23 1996] (Auth: HRS §§342F-3, 342F-31) (Imp: HRS §§342F-3, 342F-31)

DEPARTMENT OF HEALTH

The repeal of Chapter 11-43 and the adoption Chapter 11-46, Hawaii Administrative Rules, on the Summary Page dated SEP 23 1996 were adopted on SEP 23 1996, following public hearings held on June 24, 1996 on the island of Kauai; June 25, 1996 on the island of Maui; June 26, 1996 in Hilo, Hawaii; June 27, 1996 in Kona, Hawaii; and July 1, 1996 on the island of Oahu, after public notices were given in the Honolulu Advertiser, Honolulu Star-Bulletin, Garden Isle, Maui News, Hawaii Tribune Herald, and West Hawaii Today on May 24, 1996.

The repeal of Chapter 11-43, and the adoption of Chapter 11-46, Hawaii Administrative Rules, shall take effect ten days after filing with the Office of the Lieutenant Governor.

Lawrence Miike

LAWRENCE MIIKE
Director
Department of Health

'96 SEP 12 P1:59

APPROVED:

Benjamin J. Cayetano

BENJAMIN J. CAYETANO
GOVERNOR
STATE OF HAWAII

Date: 9/11/96

APPROVED AS TO FORM:

Elizabeth E. Ralles

Deputy Attorney General

Filed: SEP 1 2 1996

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innovation through engineering & scientific excellence

July 29, 2022

Shawn Haruno
State of Hawaii – Department of Health
Indoor and Radiological Health Branch
Noise Section Supervisor
99-945 Halawa Valley Street
Aiea, HI 96701

Dear Mr. Haruno

SUBJECT: Environmental Assessment (EA) for the Waikīkī Aquarium Water System Upgrade
Response to Pre-Consultation Comments

Thank you for your pre-consultation comment dated May 12, 2022, regarding the Waikīkī Aquarium Water System Upgrade.

We note your comment regarding compliance with Chapter 11- 46 Community Noise Control and will include an analysis of construction-related noise impacts and mitigation in the Draft EA.

We will include copies of your comments and our response in the Draft EA. Further, we will notify you of its publication in *The Environmental Notice* published by the State of Hawaii, Office of Planning and Sustainable Development.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to
Brandon Shima, Project Manager, Office of Project Delivery, University of Hawaiʻi
Tavia Oshiro, Environmental Compliance Program Manager, University Hawaiʻi

Water Resources Research Center

UNIVERSITY of HAWAIʻI® MĀNOA

May 13, 2022

To Whom It May Concern,

This is to acknowledge receipt of your letter requesting a review of an environmental assessment (EA) or environmental impact statement (EIS), see attached. The Environmental Center at the University of Hawaiʻi at Mānoa, which for a time was linked to the Water Resources Research Center (WRRC), has been discontinued. As a result of the closure of the Environmental Center, we regret that WRRC no longer has the capacity to review environmental documents.

Sincerely,

Thomas Giambelluca
Director

2540 Dole Street, Holmes Hall 283
Honolulu, Hawaiʻi 96822
Telephone: (808) 956-7847
Fax: (808) 956-5044

From: Sachs, Elyse M
To: WAq
Subject: [External] 2022-0043962-S7-001 Species List for the Waikiki Aquarium Water System Upgrade, O'ahu
Date: Thursday, May 19, 2022 11:22:20 AM
Attachments: 2022-0043962-S7-001 Waikiki Aquarium Water System Upgrade Oahu.pdf
IPaC Info Letter_Species List Instructions_PIFWO_19May2022_Final.pdf

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Dear Mr. Das,

Attached you will find the FWS Pacific Islands Fish and Wildlife Office's response to your species list request for the above-named project.

We thank you for your efforts to conserve listed species and native habitats. Please contact me should you have any questions pertaining to this response or require further guidance. When referring to this project, please include this reference number: 2022-0043962-S7-001.

The Pacific Island Fish and Wildlife Office (PIFWO) is transitioning to the use of the Information for Planning and Consultation (IPaC) online portal, https://ipac.ecosphere.fws.gov/, for federal action agencies and non-federal agencies or individuals to obtain official species lists, including threatened and endangered species and designated critical habitat in your project area. Using IPaC expedites the process for species list distribution and takes minimal time. Please find step by step instructions attached, and feel free to share with additional project partners.

Thanks,
Elyse

Elyse Sachs
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawai'i 96850
Office: 808-792-9420
Email: elyse_sachs@fws.gov

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaiʻi 96850

May 19, 2022

In Reply Refer To:
2022-0043962-S7-001

Mr. Om Das
Oceanit Laboratories, Inc.
828 Fort Street Mall, Suite 600
Honolulu, Hawaiʻi 96813

Subject: 2022-0043962-S7-001 Species List for the Waikīkī Aquarium Water System Upgrade, Oʻahu

Dear Mr. Das:

Thank you for your letter of May 9, 2022 requesting guidance for the proposed Waikīkī Aquarium Water System Upgrade, located at 2777 Kalākaua Avenue, TMK (1) 3-1-031:006 on the island of Oʻahu. The purpose of this upgrade is to ensure that the water system infrastructure complies with regulatory requirements. The Proposed Action is intended dispose of all Waikīkī Aquarium effluent into two on-site injection wells, thereby eliminating direct discharge into the ocean and the City and County of Honolulu (CCH) wastewater system. The aquarium is located on the south shore of the island of O'ahu near the Waikīkī Natatorium War Memorial and adjacent to Kapi'olani Park.

This letter has been prepared under the authority of and in accordance with provisions of the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq*.), as amended (ESA). We have reviewed the information you provided and pertinent information in our files, as it pertains to federally listed species in accordance with section 7 of the ESA. Our data indicate the following federally listed species may occur or transit through the vicinity of the proposed project area: the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus);* endangered Hawaiian petrel (*Pterodroma sandwichensis*), threatened Newell's shearwater (*Puffinus auricularis newelli*), and endangered Hawaii distinct population segment (DPS) of band-rumped storm-petrel (*Oceanodroma castro*) (hereafter collectively referred to as Hawaiian seabirds); and threatened Central North Pacific DPS of green sea turtle (*Chelonia mydas*).

Hawaiian hoary bat

The Hawaiian hoary bat roosts in both exotic and native woody vegetation across all islands and will leave young unattended in trees and shrubs when they forage. If trees or shrubs 15 feet or

taller are cleared during the pupping season, there is a risk that young bats could inadvertently be harmed or killed since they are too young to fly or may not move away.
To avoid and minimize impacts to the endangered Hawaiian hoary bat we recommend you consider incorporating the following applicable measure into your project description:

- Do not disturb, remove, or trim woody plants greater than 15 feet tall during the bat birthing and pup rearing season (June 1 through September 15).
- Do not use barbed wire for fencing.

Hawaiian seabirds
Hawaiian seabirds may traverse the project area at night during the breeding, nesting and fledging seasons (March 1 to December 15). Outdoor lighting could result in seabird disorientation, fallout, and injury or mortality. Seabirds are attracted to lights and after circling the lights they may become exhausted and collide with nearby wires, buildings, or other structures or they may land on the ground. Downed seabirds are subject to increased mortality due to collision with automobiles, starvation, and predation by dogs, cats, and other predators. Young birds (fledglings) traversing the project area between September 15 and December 15, in their first flights from their mountain nests to the sea, are particularly vulnerable.

To avoid and minimize potential project impacts to seabirds we recommend you incorporate the following applicable measures into your project description:

- Fully shield all outdoor lights so the bulb can only be seen from below bulb height and only use when necessary.
- Install automatic motion sensor switches and controls on all outdoor lights or turn off lights when human activity is not occurring in the lighted area.
- Avoid nighttime construction during the seabird fledging period, September 15 through December 15.

Green sea turtle
The Service consults on sea turtles and their use of terrestrial habitats (beaches where nesting and/or basking is known to occur), whereas the National Oceanic and Atmospheric Administration (NOAA) Fisheries consults on sea turtles in aquatic habitats. We recommend that you consult with NOAA Fisheries regarding the potential impacts from the proposed project if it may affect offshore or open ocean habitats.

Green sea turtles may nest on any sandy beach area in the Pacific Islands. Hawksbill sea turtles exhibit a wide tolerance for nesting substrate (ranging from sandy beach to crushed coral) with nests typically placed under vegetation. Both species exhibit strong nesting site fidelity. Nesting occurs on beaches from May through September, peaking in June and July, with hatchlings emerging through November and December.

Optimal sea turtle nesting habitat is a dark beach free of barriers that restrict sea turtle movement. Nesting turtles may be deterred from approaching or laying successful nests on lighted or disturbed beaches. They may become disoriented by artificial lighting, leading to exhaustion and placement of a nest in an inappropriate location (such as at or below the high tide line). Hatchlings that emerge from nests may also be disoriented by artificial lighting. Inland areas visible from the beach should be sufficiently dark to allow for successful navigation by hatchlings to the ocean.

To avoid and minimize project impacts to sea turtles from lighting we recommend incorporating the following applicable measures into your project description:

- Avoid nighttime work during the nesting and hatching season (May to December).
- Minimize the use of lighting on or near beaches and shield all project-related lights so the light is not visible from any beach.
    - If lights can't be fully shielded or if headlights must be used, fully enclose the light source with light filtering tape or filters.
- Incorporate design measures into the construction or operation of buildings adjacent to the beach to reduce ambient outdoor lighting such as:
    - tinting or using automatic window shades for exterior windows that face the beach;
    - reducing the height of exterior lighting to below 3 feet and pointed downward or away from the beach; and
    - minimize light intensity to the lowest level feasible and, when possible, include timers and motion sensors.

We appreciate your efforts to conserve protected species. If you have questions regarding this response, please contact Elyse Sachs, Fish and Wildlife Biologist (phone: 808-792-9400, email: Elyse_Sachs@fws.gov). When referring to this project, please include this reference number: 2022-0043962-S7-001.

Sincerely,

Island Team Manager
O'ahu, Kaua'i, Northwestern Hawaiian Islands, and American Samoa

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawai'i 96850

Subject: IPaC generated official species list for the Pacific Islands Fish and Wildlife Office

Dear Action Agency or Applicant:

Beginning March 21, 2022, the Pacific Island Fish and Wildlife Office (PIFWO) will be transitioning to the use of the Information for Planning and Consultation (IPaC) online portal, https://ipac.ecosphere.fws.gov/, for federal action agencies and non-federal agencies or individuals to obtain official species lists, including threatened and endangered species and designated critical habitat in your project area. IPaC has been used by continental USFWS offices to provide official species lists since 2017. Using IPaC expedites the process for species list distribution. Obtaining a species list in IPaC is relatively straightforward and takes minimal time to complete. Step by step instructions are included below.

Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of your species list should be verified after 90 days. New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change the species list. Verification can be completed by visiting the IPaC website at regular intervals during project planning and implementation. An updated list may be requested through the IPaC system by completing the same process used to obtain the initial species list.

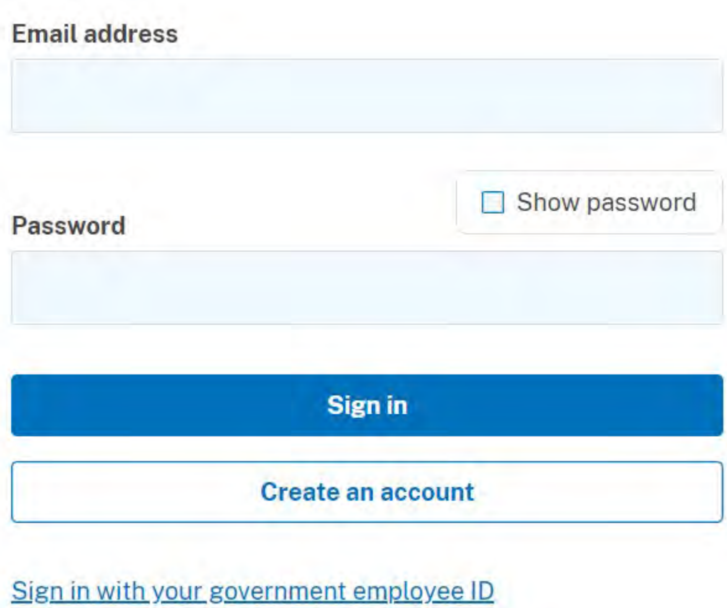
We hope this process provides efficiencies to our partners in obtaining a species list. For federal action agencies, it also opens additional IPaC functionality that the PIFWO office is still working on, such as the use of Determination Keys for informal section 7 programmatic consultations. We will let our agency partners know when that functionality becomes available.

If you have questions about a species list obtained through the IPaC system or need assistance in completing an IPaC species list request, please contact the Service at 808-792-9400 or via email at pifwo_admin@fws.gov. We appreciate your efforts to conserve listed species across the Pacific Islands.

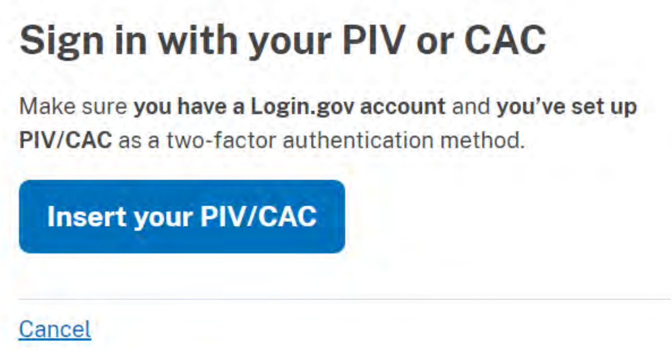
Instructions for Action Agencies and partners to obtain an official species list in IPaC

- Navigate to https://ipac.ecosphere.fws.gov/
- You can get an unofficial species list without logging in. However, if you want an official species list you will need to log in first using your Login.gov account. If you don't have an IPaC account, they are easy to create.

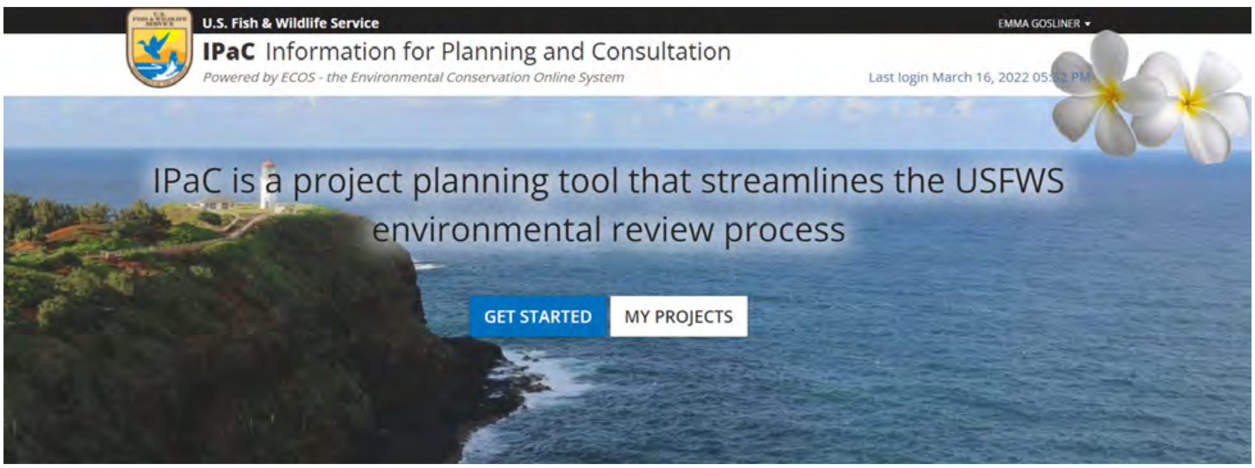
Select Log in with Login.gov and sign in using your email and password.



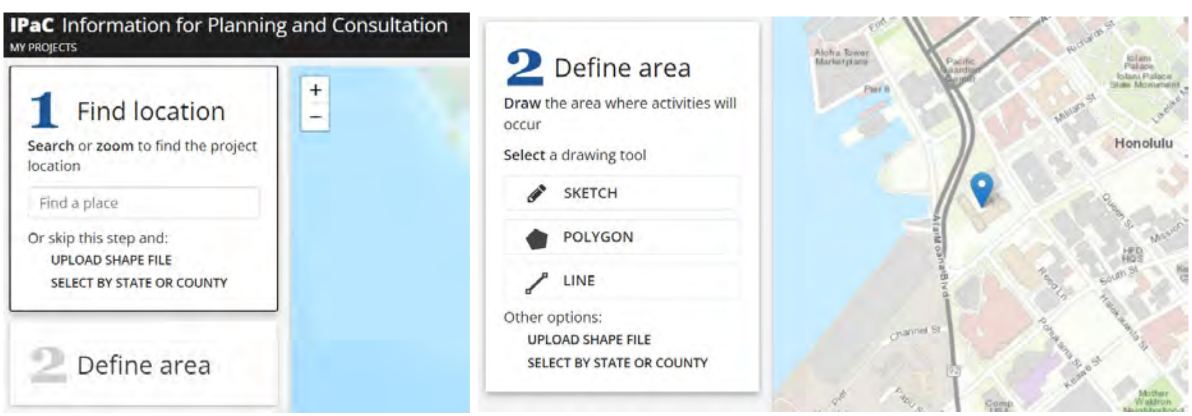
If you have a PIV or CAC card, you can sign in using that method as well.

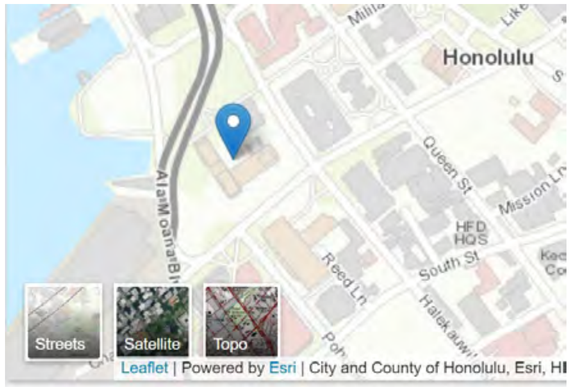


- Once you log in, select "Get Started".

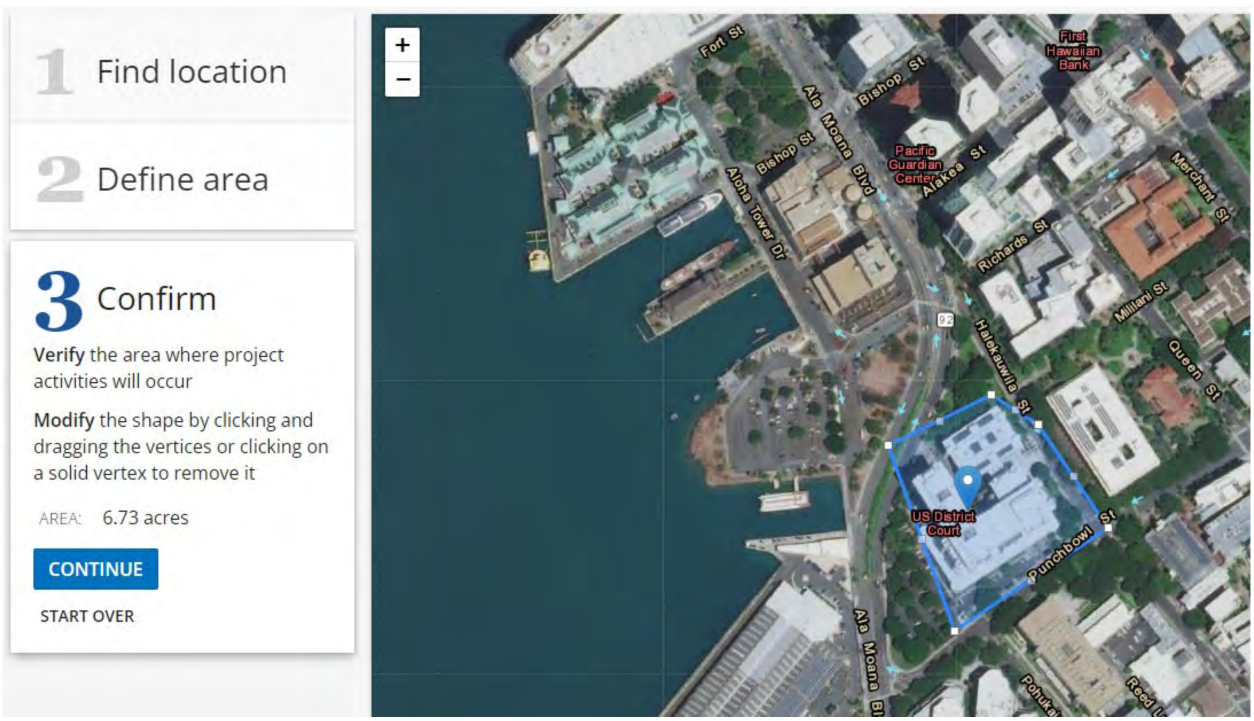


- Define the action area: Identify the location of the proposed action by uploading an existing shapefile or by entering an address or coordinates of the action area. Once identified on the map, you can manually draw the action area using the drawing tools.



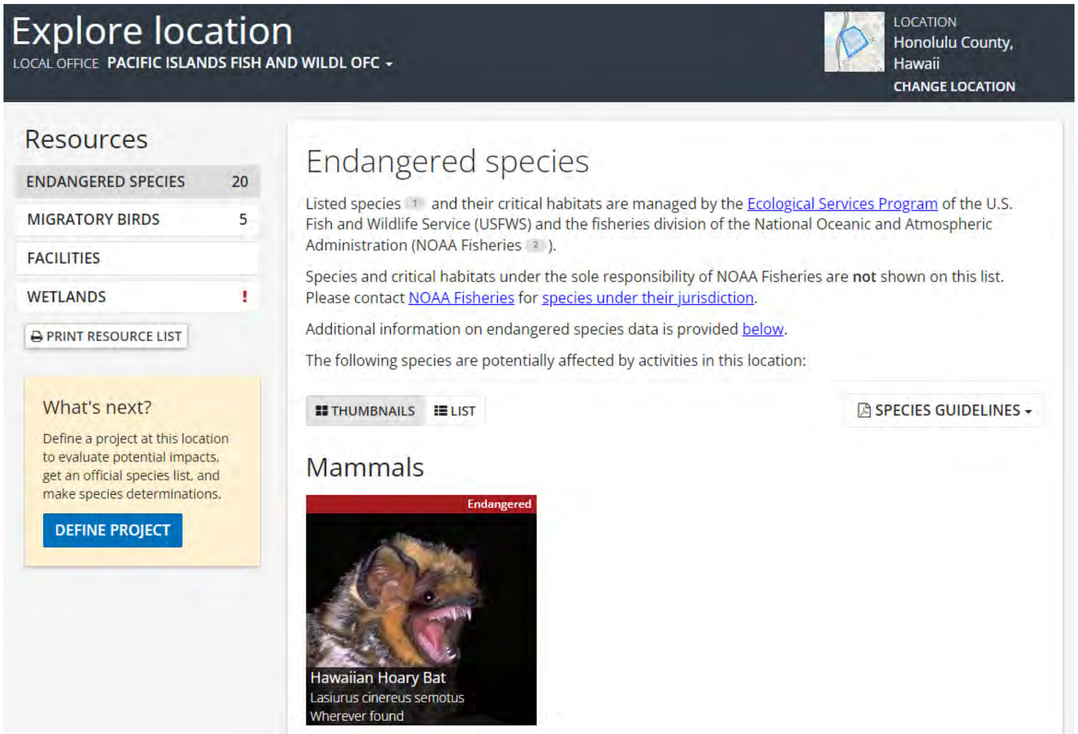


To help identify your action area you can choose between multiple base maps available.

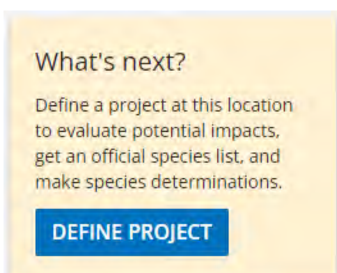


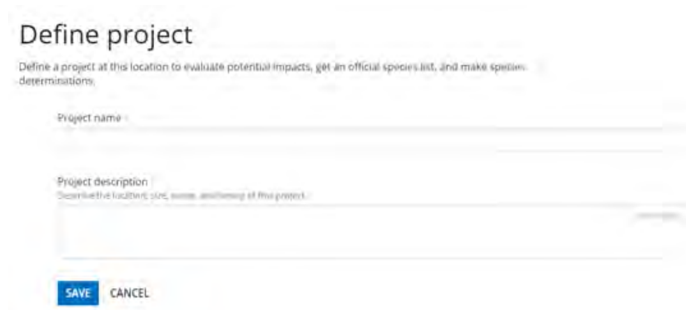
Press continue when you have finished drawing or uploading the action area location.

- The species information on the page that follows is not official. However, it identifies the project County, local Fish and Wildlife Field Office, species covered under NOAA Fisheries as well as Migratory Bird Treaty Act species. The list can be viewed in Thumbnail or List format.
- Once the species list populates you will see images of the species that may occur on, near, or transgress across your project. Click on SPECIES GUIDELINES on your top right to see Avoidance and Minimization measures to incorporate into your General Project Design Guidelines.



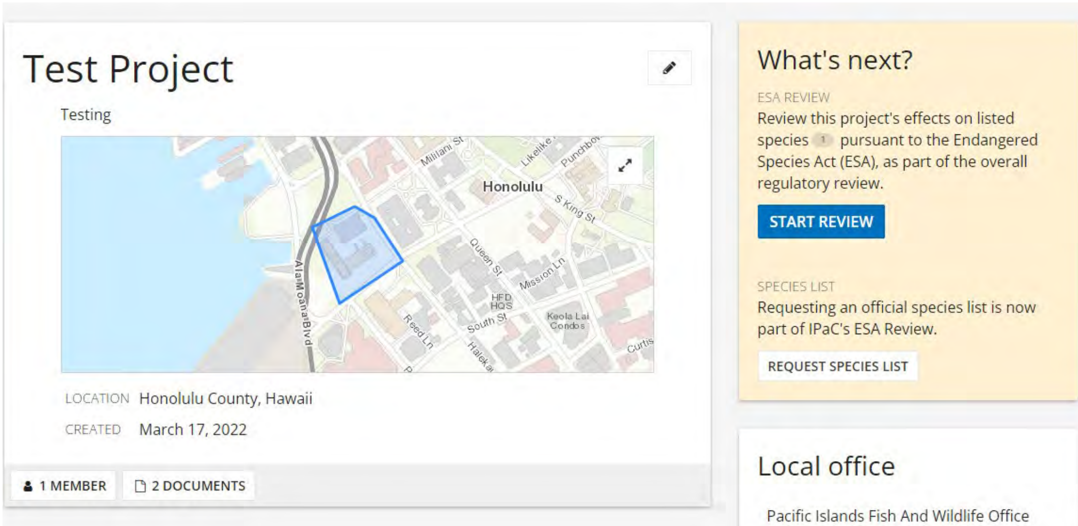
- Continue with the following steps to comply with the requirements of ESA section 7 to obtain an **official species list**.
- Select Define Project



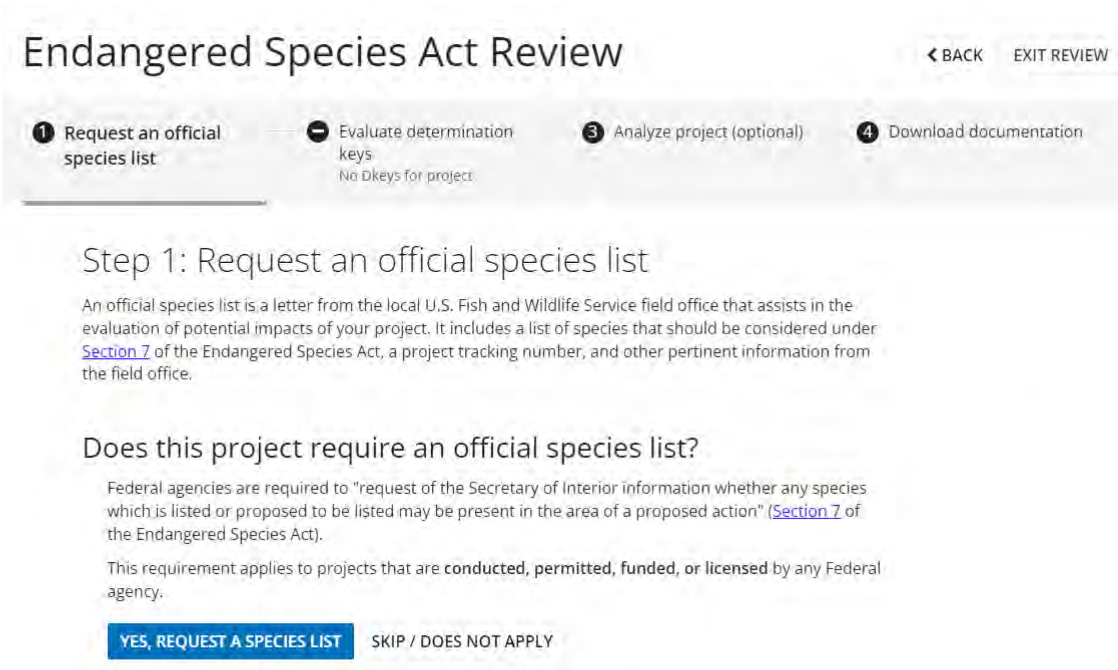


Enter the Project Name and a brief description of the project (a description is not mandatory, but recommended for future coordination with the Service). Click SAVE at bottom of page.

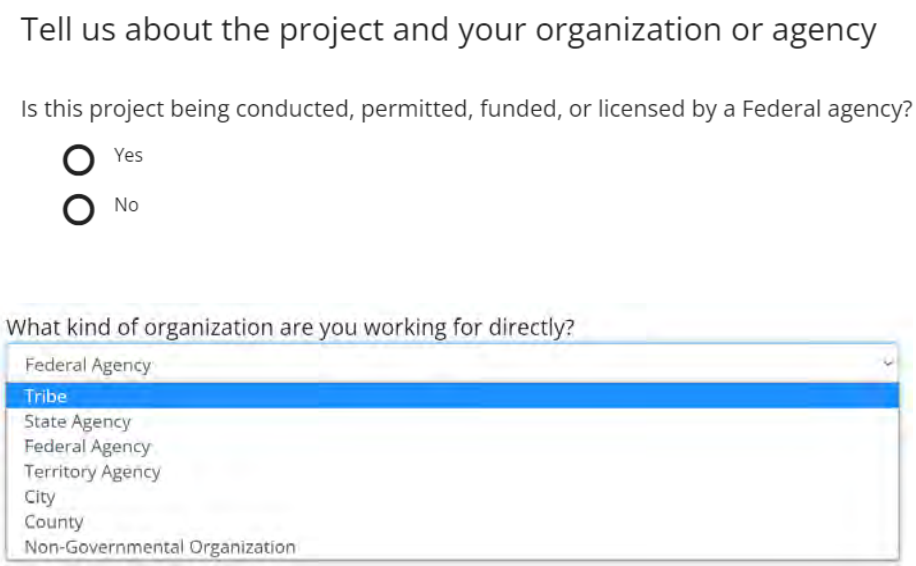
- At the bottom of the What's next box on the right, click Request Species List



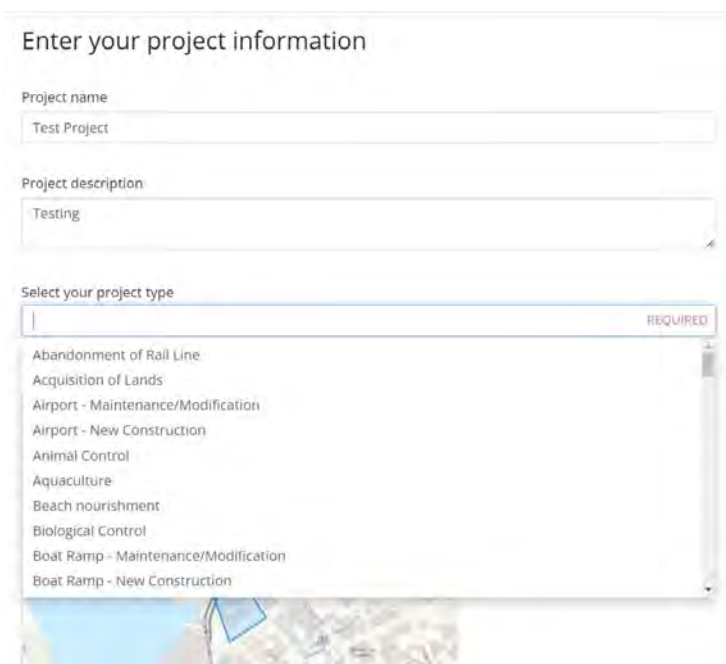
- on the following screen, click Yes, Request Species List



- Fill out the contact information for yourself or your agency. Contractors, state partners, and any other project proponents may request a species list and should be covered using the dropdown menus.



- From the pull-down menu for Classify Type of Project, select the project type that best fits the proposed action.



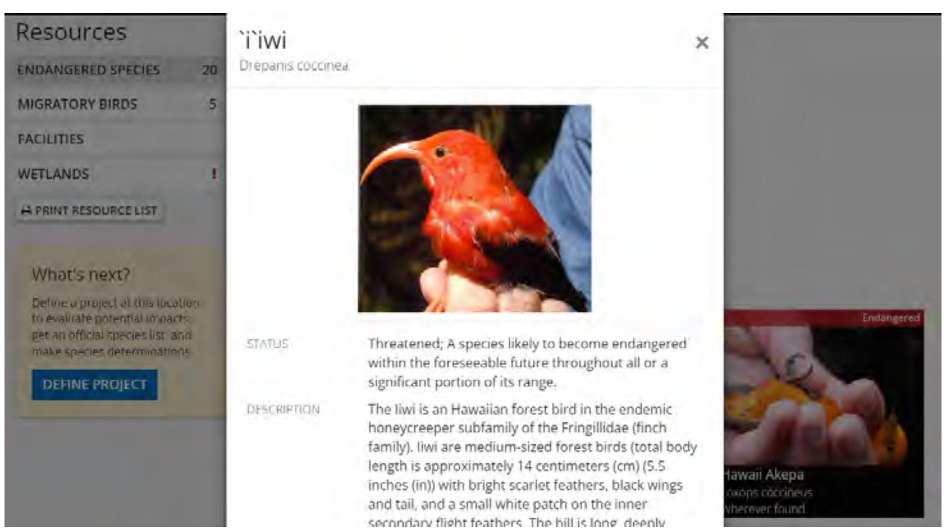
- Once all required sections are filled out, press SUBMIT OFFICIAL SPECIES LIST REQUEST

Location

SUBMIT OFFICIAL SPECIES LIST REQUEST

- An Official Species List should be generated and available for download in a couple of seconds.

- If you need additional information on a species, click on their name that is hot-linked to their species information page. A brief overview of the species' status, description and critical habitat will appear as well as a link to their ECOS species profile.



oceanit
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July 29, 2022

Elyse Sachs
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaiʻi 96850

Dear Ms. Sachs:

SUBJECT: Environmental Assessment (EA) for the Waikīkī Aquarium Water System Upgrade
Response to Pre-Consultation Comments

Thank you for your pre-consultation comment dated May 19, 2022, regarding the Waikīkī Aquarium Water System Upgrade.

We note your comment regarding avoiding harm to Hawaiian hoary bats, Hawaiian seabirds, and green sea turtles and will incorporate these comments in our Draft EA analysis of project impacts and mitigation regarding these species and their native habitats.

We will include copies of your comments and our response in the Draft EA. Further, we will notify you of its publication in *The Environmental Notice* published by the State of Hawaii, Office of Planning and Sustainable Development.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to
Brandon Shima, Project Manager, Office of Project Delivery, University of Hawaiʻi
Tavia Oshiro, Environmental Compliance Program Manager, University Hawaiʻi

DAVIDY.IGE
GOVERNOR

CURT T, OTAGURO
COMPTROLLER

AUDAEVHIDANO
DEPUTY COMPTROLLER

{P)22.081

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O, BOX119, HONOLULU. HAWAII 86810-0119

MAY 17 2022

Mr.Om Das
Oceanit Laboratories, Inc.
828 Fort Street Mall, Suite 600
Honolul Hawaii 96813

Dear Mr. Das:

Subject: Request for Pre-Consultation for an Environmental Assessment
The Waikiki Aquarium WaterSystem Upgrade
2777 Kalakaua Avenue
Honolulu, Oahu, Hawaii
TMK: (1)3-1-031: 006

Thank you for the opportunity to comment on the subject project. We have no comments to offer at this time as the proposed project does not impact any of the Department of Accounting and General Services• projects or existing facilities.

If you have any questions,your staff may call Ms. Gayle Takasaki of the Planning Branch At (808) 586-0584.

Sincerely,

CHRISTINE L.K.INIMAKA
Public Works Administrator

GT:mo

innovation through engineering & scientific excellence

August 1, 2022

Christine L. Kinimaka, Public Works Administrator
State of Hawaii Department of Accounting and General Services
P.O. Box 119
Honolulu, HI 96810-0119

Dear Ms. Kinimaka:

SUBJECT: Environmental Assessment (EA) for the Waikīkī Aquarium Water System Upgrade
Response to Pre-Consultation Comments

Thank you for your pre-consultation comment dated May 17, 2022 regarding the Waikīkī Aquarium Water System Upgrade.

We note that your department has no comments on this project, as it does not impact your projects or existing facilities.

We will include copies of your comments and our response in the Draft EA. Further, we will notify you of its publication in *The Environmental Notice* published by the State of Hawaii, Office of Planning and Sustainable Development

Sincerely,

Berna Senelly
Regulatory Lead

Copies to
Brandon Shima, Project Manager, Office of Project Delivery, University of Hawaiʻi
Tavia Oshiro, Environmental Compliance Program Manager, University Hawaiʻi

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

RICK BLANGIARDI
MAYOR

SHELDON K. HAO
FIRE CHIEF

JASON SAMALA
DEPUTY FIRE CHIEF

May 20, 2022

Mr. Om Das P.E., PMP
Oceanit Laboratories, Inc.
828 Fort Street Mall, Suite 600
Honolulu, Hawaii 96813

Dear Mr. Das:

Subject: Pre-Consultation for an Environmental Assessment for the Waikiki Aquarium
2777 Kalakaua Avenue
Honolulu, Hawaii 96815
Tax Map Key: 3-1-031: 006

In response to your letter received on May 12, 2022, regarding the abovementioned subject, the Honolulu Fire Department (HFD) reviewed the submitted information and requires that the following be complied with:

1. Fire department access roads shall be provided such that any portion of the facility or any portion of an exterior wall of the first story of the building is located not more than 150 feet (46 meters) from fire department access roads as measured by an approved route around the exterior of the building or facility. (National Fire Protection Association [NFPA] 1; 2018 Edition, Sections 18.2.3.2.2 and 18.2.3.2.2.1, as amended.)

   A fire department access road shall extend to within 50 feet (15 meters) of at least one exterior door that can be opened from the outside and that provides access to the interior of the building. (NFPA 1; 2018 Edition, Section 18.2.3.2.1.)

2. An approved water supply capable of supplying the required fire flow for fire protection shall be provided to all premises upon which facilities, buildings, or portions of buildings are hereafter constructed or moved into the jurisdiction. The approved water supply shall be in accordance with NFPA 1; 2018 Edition, Section 18.3 and 18.4.

3. The fire department access roads shall be in accordance with NFPA 1; 2018 Edition, Section 18.2.3.

4. Submit civil drawings to the HFD for review and approval.

Should you have questions, please contact Acting Battalion Chief Kendall Ching of our Fire Prevention Bureau at 808-723-7154 or kching3@honolulu.gov.

Sincerely,

CRAIG UCHIMURA
Acting Assistant Chief

CU/EO:ns

oceanit
innovation through engineering & scientific excellence

July 29, 2022

Craig Uchimura, Acting Assistant Chief
c/o Kendall Ching, Acting Battalion Chief
636 South Street
Honolulu, Hawaiʻi 96813-5007

Dear Acting Battalion Chief Ching:

SUBJECT: Environmental Assessment (EA) for the Waikīkī Aquarium Water System Upgrade Response to Pre-Consultation Comments

Thank you for your pre-consultation comment dated May 20, 2022 regarding the Waikīkī Aquarium Water System Upgrade.

We note your comment regarding providing Fire Department access to the property in accordance with NFPA 1, 2018 Edition, Section 18.2.3, and an approved water supply. Further, we understand that civil drawings need to be submitted to your department for review and approval. We will incorporate your comments in the Draft EA in our discussion on project impacts and mititgation on fire protection services.

We will include copies of your comments and our response in the Draft EA. Further, we will notify you of its publication in *The Environmental Notice* published by the State of Hawaii, Office of Planning and Sustainable Development

Sincerely,

Berna Senelly
Regulatory Lead

Copies to
Brandon Shima, Project Manager, Office of Project Delivery, University of Hawaiʻi
Tavia Oshiro, Environmental Compliance Program Manager, University Hawaiʻi

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

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

R K BLANGIARD
MAYOR

RADE K AN
INTER M HIEF

OUR REFERENCE EO-DK

May 20, 2022

<u>SENT VIA EMAIL</u>

Mr. Om Das, P.E., PMP
WAq@oceanit.com

Dear Mr. Das:

This is in response to your letter of May 9, 2022, requesting input on the Pre-Consultation, Draft Environmental Assessment, for the Waikiki Aquarium Water System Upgrade project.

The Honolulu Police Department recommends that adequate notification be made to the public and businesses in the area in the event of road closures. Any impacts to vehicular and pedestrian traffic, particularly along Kalakaua Avenue fronting the aquarium, may lead to complaints.

If there are any questions, please call Major Randall Platt of District 6 (Waikiki) at (808) 723-3339.

Thank you for the opportunity to review this project.

Sincerely,

DARREN CHUN
Assistant Chief of Police
Support Services Bureau

innovation through engineering & scientific excellence

July 29, 2022

Darren Chun, Assistant Chief of Police, Support Services Bureau
c/o Major Randall Platt of District 6 (Waikiki)
801 South Beretania Street
Honolulu, Hawaiʻi 96813

Dear Major Platt

SUBJECT: Environmental Assessment (EA) for the Waikīkī Aquarium Water System Upgrade
Response to Pre-Consultation Comments

Thank you for your pre-consultation comment dated May 20, 2022, regarding the Waikīkī Aquarium Water System Upgrade.

We note your comment that adequate notification is made to the public and businesses in the event of road closures We will incorporate your comments in the Draft EA in our discussion on project impacts and mititgation on police protection services.

We will include copies of your comments and our response in the Draft EA. Further, we will notify you of its publication in *The Environmental Notice* published by the State of Hawaii, Office of Planning and Sustainable Development

Sincerely,

Berna Senelly
Regulatory Lead

Copies to
Brandon Shima, Project Manager, Office of Project Delivery, University of Hawaiʻi
Tavia Oshiro, Environmental Compliance Program Manager, University Hawaiʻi

Dale Uno

From: Kaneshiro, Michael <michael.kaneshiro@doh.hawaii.gov>
Sent: Wednesday, June 8, 2022 1:16 PM
To: WAq
Subject: [External] Request for Pre-Consultation for an Environmental Assessment for the Waikiki Aquarium Water System Upgrade

Dear Berna (spelling?),

Thank you for your phone message to the Department of Health (DOH), Environmental Management Division (EMD)'s Clean Water Branch (CWB) requesting pre-consultation comments on an Environmental Assessment for the Waikiki Aquarium Water System Upgrade. Your phone message to my supervisor, Mr. Darryl Lum, references an Oceanit letter with the subject, "Request for Pre-Consultation for an Environmental Assessment for the Waikiki Aquarium Water System Upgrade", dated May 9, 2022.

CWB offers standard comments on Environmental Assessments, Environmental Impact Statements, and other documents on our website at: https://health.hawaii.gov/cwb/clean-water-branch-home-page/cwb-standard-comments/. Please click on the link https://health.hawaii.gov/cwb/files/2018/05/Memo-CWB-Standard-Comments.pdf for CWB's standard project comments.

Please let us know if you have any further questions.

Thank you,
Mike Kaneshiro
Clean Water Branch
State of Hawaii Department of Health
Phone: (808) 586-4309

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

05023PDCL.18

May 10, 2018

MEMORANDUM

SUBJECT: Clean Water Branch Standard Project Comments

TO: Agencies and Project Owners

FROM: ALEC WONG, P.E., CHIEF Alec Wong
Clean Water Branch

This memo is provided for your information and sharing. You are encouraged to share this memo with your project partners, team members, and appropriate personnel.

The Department of Health (DOH), Clean Water Branch (CWB) will no longer be responding directly to requests for comments on the following documents (Pre-consultation, Early Consultation, Preparation Notice, Draft, Final, Addendums, and/or Supplements):

- Environmental Impact Statements (EIS)
- Environmental Assessments (EA)
- Stream Channel Alteration Permits (SCAP)
- Stream Diversion Works Permits (SDWP)
- Well Construction/Pump Installation Permits
- Conservation District Use Applications (CDUA)
- Special Management Area Permits (SMAP)
- Shoreline Setback Areas (SSA)

For agencies or project owners requiring DOH-CWB comments for one or more of these documents, please utilize the DOH-CWB Standard Comments below regarding your project's responsibilities to maintain water quality and any necessary permitting. DOH-CWB Standard Comments are also available on the DOH-CWB website located at: http://health.hawaii.gov/cwb/.

DOH-CWB Standard Comments

The following information is for agencies and/or project owners who are seeking comments regarding environmental compliance for their projects with the Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. You may be responsible for fulfilling additional requirements related to our program.

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 point source water pollutant discharges into State surface waters (HAR, Chapter 11-55). Point source means any discernible, confined, and discrete conveyance from which pollutants are or may be discharged.

    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.

Some of the activities requiring NPDES permit coverage include, but, are not limited to:

a. Discharges of Storm Water

   i. For Construction Activities Disturbing One (1) or More Acres of Total Land Area.

      By HAR Chapter 11-55, an NPDES permit is required before the start of the construction activities that result in the disturbance of one (1) or more acres of total land area, including clearing, grading, and excavation. The total land area includes a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under a larger common plan of development or sale.

   ii. For Industrial Activities for facilities with primary Standard Industrial Classification (SIC) Codes regulated in the Code of Federal Regulations (CFR) at 40 CFR 122.26(b)(14)(i) through (ix) and (xi). If a facility has more than one SIC code, the activity that generates the greatest revenue is the primary SIC code. If revenue information is unavailable, use the SIC code for the activity with the most employees. If employee information is also unavailable, use the SIC code for the activity with the greatest production.

   iii. From a small Municipal Separate Storm Sewer System (along with certain non-storm water discharges).

b. Discharges to State surface waters from construction activity hydrotesting or dewatering

c. Discharges to State surface waters from cooling water applications

d. Discharges to State surface waters from the application of pesticides (including insecticides, herbicides, fungicides, rodenticides, and various other substances to control pest) to State waters

e. Well-Drilling Activities

   Any discharge to State surface waters of treated process wastewater effluent associated with well drilling activities is regulated by HAR Chapter 11-55. Discharges of treated process wastewater effluent (including well drilling slurries, lubricating fluids wastewater, and well purge wastewater) to State surface waters requires NPDES permit coverage.

NPDES permit coverage is not required for well pump testing. For well pump testing, the discharger shall take all measures necessary to prevent the discharge of pollutants from entering State waters. Such measures shall include, if necessary, containment of initial discharge until the discharge is essentially free of pollutants. If the discharge is entering a stream or river bed, best management practices (BMPs) shall be implemented to prevent the discharge from disturbing the clarity of the receiving water. If the discharge is entering a storm drain, the discharger must obtain written permission from the owner of the storm drain prior to discharge. Furthermore, BMPs shall be implemented to prevent the discharge from collecting sediments and other pollutants prior to entering the storm drain.

3. A Section 401 Water Quality Certification (WQC) is required if your project/activity:

   a. Requires a federal permit, license, certificate, approval, registration, or statutory exemption; and

   b. May result in a discharge into State waters. The term "discharge" is defined in Clean Water Act, Subsections 502(16), 502(12), and 502(6).

   Examples of "discharge" include, but are not limited to, allowing the following pollutants to enter State waters from the surface or in-water: solid waste, rock/sand/dirt, heat, sewage, construction debris, any underwater work, chemicals, fugitive dust/spray paint, agricultural wastes, biological materials, industrial wastes, concrete/sealant/epoxy, and washing/cleaning effluent.

   Determine if your project/activity requires a federal permit, license, certificate, approval, registration, or statutory exemption by contacting the appropriate federal agencies (e.g. Department of the Army (DA), U.S. Army Corps of Engineers (COE), Pacific Ocean Division Honolulu District Office (POH) Tel: (808) 835-4303; U.S. Environmental Protection Agency, Region 9 Tel: (415) 947-8021; Federal Energy Regulatory Commission Tel: (866) 208-3372; U.S. Coast Guard Office of Bridge Programs Tel: (202) 372-1511). 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 regarding their permitting requirements.

   To request a Section 401 WQC, you must complete and submit the Section 401 WQC application. This application is available on the e-Permitting Portal website located at: https://eha-cloud.doh.hawaii.gov/epermit/.

Please see HAR, Chapter 11-54 for the State's Water Quality Standards and for more information on the Section 401 WQC. HAR, Chapter 11-54 is available on the CWB website at: http://health.hawaii.gov/cwb/.

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 and up to two (2) years in jail.

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. Consideration should be given to areas prone to flooding, or where the infrastructure is aged and will need to be rehabilitated.

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July 29, 2022

Michael Kaneshiro
Clean Water Branch
State of Hawaii Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801-3378

Dear Mr. Kaneshiro:

SUBJECT: Environmental Assessment (EA) for the Waikīkī Aquarium Water System Upgrade
Response to Pre-Consultation Comments

Thank you for your pre-consultation comment dated June 8, 2022, regarding the Waikīkī Aquarium Water System Upgrade.

Per your comment, we will incorporate information contained in https://health.hawaii.gov/cwb/files/2018/05/Memo-CWB-Standard-Comments.pdf in our analysis of potential impacts on State waters, if any, and related mitigation measures.

We will include copies of your comments and our response in the Draft EA. Further, we will notify you of its publication in *The Environmental Notice* published by the State of Hawaii, Office of Planning and Sustainable Development.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to
Brandon Shima, Project Manager, Office of Project Delivery, University of Hawaiʻi
Tavia Oshiro, Environmental Compliance Program Manager, University Hawaiʻi

BOARD OF WATER SUPPLY

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

June 3, 2022

Mr. Om Das
Oceanit Laboratories, Inc.
828 Fort Street Mall, Suite 600
Honolulu, Hawaii 96813

Dear Mr. Das:

Subject: Your Letter Dated May 9, 2022 Requesting Comments on the Environmental Assessment Pre-Consultation for the Waikiki Aquarium Water System Upgrade at 2777 Kalakaua Avenue, Tax Map Key: 3-1-031: 006

Thank you for your letter regarding the proposed improvements to the on-site wastewater disposal system.

The existing water system is currently adequate to accommodate the proposed development. However, please be advised that the existing Honolulu water system capacity has been reduced due to the shut-down of the Halawa Shaft pumping station as a proactive measure to prevent fuel contamination from the Navy's Red Hill Bulk Storage Tank fuel releases. The final decision on the availability of water will be confirmed when the building permit application is submitted for approval, pending evaluation of the water system conditions at that time on a first-come, first-served basis. The Board of Water Supply (BWS) reserves the right to change any position or information stated herein up until the final approval of the building permit application.

We continue to request 10% voluntary water conservation of all customers until new sources are completed, and require water conservation measures in all new developments. If water consumption significantly increases, progressively restrictive conservation measures may be required to avoid low water pressures and disruptions of water service.

Presently, there is no moratorium on the issuance of new and additional water services. Water distributed via the BWS water systems remain safe for consumption. The BWS is closely monitoring water usage and will keep the public informed with the latest findings. Please visit our website at www.boardofwatersupply.com and www.protectoahuwater.org for the latest updates and water conservation tips.

When water is made available, the applicant will be required to pay our Water System Facilities Charges for resource development, transmission, and daily storage.

Water conservation measures are required for all proposed developments. These measures include utilization of nonpotable water for irrigation using rain catchment, drought tolerant plants, xeriscape landscaping, efficient irrigation systems, such as a drip system and moisture sensors, and the use of Water Sense labeled ultra-low flow water fixtures and toilets.

The proposed project is subject to BWS Cross-Connection Control and Backflow Prevention requirements prior to the issuance of the Building Permit Applications.

The developer should coordinate with the State Department of Health in regards to wastewater disposal system and injection well requirements.

The on-site fire protection requirements should be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.

If you have any questions, please contact Ernest Lau, Manager and Chief Engineer at (808) 748-5061.

Very truly yours,

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

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August 1, 2022

Ernest Y. Lau, Manager and Chief Engineer
City and County of Honolulu Board of Water Supply
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Lau:

SUBJECT: Environmental Assessment (EA) for the Waikīkī Aquarium Water System Upgrade
Response to Pre-Consultation Comments

Thank you for your pre-consultation comment dated June 3, 2022, regarding the Waikīkī Aquarium Water System Upgrade.

Your comments will be included in the analysis of potential impacts on the municipal water system and identificaiton of recommended mitigation. We note your comment that the current water system is adequate and that a final decision on availability of water will be determined upon submission of a building permit application. Your request that 10% voluntary water conservation until new sources completed is also noted.

We understand that the proposed action is subject to BWS Cross-Connection Control and Backflow Prevention requirements; and that we should coordinate with State Department of Health in regards to wastewater disposal system and injection well requirements. Additionally, on-site fire protection requirements should be coordinated with FHB's Fire Prevention Bureau.

We will include copies of your comments and our response in the Draft EA. Further, we will notify you of its publication in *The Environmental Notice* published by the State of Hawaii, Office of Planning and Sustainable Development.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to
Brandon Shima, Project Manager, Office of Project Delivery, University of Hawaiʻi
Tavia Oshiro, Environmental Compliance Program Manager, University Hawaiʻi

STATE OF HAWAII
OFFICE OF PLANNING
& SUSTAINABLE DEVELOPMENT

DAVID Y. IGE
GOVERNOR

MARY ALICE EVANS
DIRECTOR

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

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

DTS 202205161051NA

Coastal Zone Management Program

Environmental Review Program

Land Use Commission

Land Use Division

Special Plans Branch

State Transit-Oriented Development

Statewide Geographic Information System

Statewide Sustainability Branch

June 9, 2022

Mr. Om Das P.E., PMP
Project Manager
Oceanit Laboratories, Inc.
828 Fort Street Mall, Suite 600
Honolulu, Hawaiʻi 96813

Subject: Request for Pre-Consultation for an Environmental Assessment, Proposed Waikīkī Aquarium Water System Upgrades; 2777 Kalākaua Avenue, Honolulu, Oʻahu
TMK: (1) 3-1-031:006

Thank you for the opportunity to provide comments on your Pre-consultation request for the proposed Waikīkī, Aquarium Water System Upgrades. The notification request was received by our office via memo dated May 16, 2022.

It is our understanding the purpose of this proposed action is to ensure that the Waikīkī Aquarium's water system infrastructure complies with all regulatory requirements, and ensure all effluent is pumped into two on-site injection wells. This would eliminate any direct discharge of wastewater into the Pacific Ocean or into the City and County of Honolulu (CCH) wastewater system.

The water system upgrade will also meet the Administrative Order on Consent Notice of Violation from the State of Hawaiʻi Department of Health (DOH), CCH Department of Environmental Services Industrial Wastewater Discharge Permit effluent discharge requirements, and National Pollutant Discharge Elimination System (NPDES) requirements.

The Office of Planning and Sustainable Development (OPSD) has reviewed the transmitted material, and have the following comments to offer:

1. <u>Hawaiʻi Coastal Zone Management (CZM) Program</u>
   The CZM area is defined as "all lands of the State and the area extending seaward from the shoreline to the limit of the State's police power and management authority, including the U.S. territorial sea" (Hawaiʻi Revised Statutes (HRS) § 205A-1).

   Pursuant to HRS § 205A-4, in implementing the objectives of the CZM program, agencies shall consider ecological, cultural, historic, esthetic, recreational, scenic, open space values, coastal hazards, and economic development. As this project is being proposed by the University of Hawai'i and will need State and CCH agency permits and approvals, the Draft Environmental Assessment (Draft EA) would be an appropriate opportunity to demonstrate agency alignment with HRS § 205A-2, as amended. Furthermore, compliance with HRS § 205A-2 is an important component for meeting the requirements of HRS Chapter 343.

2. Special Management Area (SMA)
Given that the subject Environmental Assessment (EA) may serve as a supporting document for a SMA Use Permit application, we recommend that the EA specifically discuss the compliance with the requirements of SMA use and any applicable shoreline setbacks requirements by consulting with the CCH Department of Planning and Permitting. Furthermore, the Draft EA should provide a regional location map and include the project site's proximity and relation to the designated SMA boundary and the shoreline.

3. Climate Change Adaptation / Sea Level Rise (SLR)
The Waikīkī Aquarium and its support facilities are within close proximity to the Pacific Ocean and Waikīkī Bay. Thus, this site is vulnerable to the natural threats associated with coastal areas such as shoreline flooding, storm surges, shoreline erosion, saltwater intrusion, and related natural disasters associated with climate change. To assess potential impacts of SLR and assess the viability of the Waikīkī Aquarium's proposed water system upgrades, we suggest the Draft EA refer to the findings of the Hawai'i Sea Level Rise Vulnerability and Adaptation Report 2017, accepted by the Hawai'i Climate Change Mitigation and Adaptation Commission.

   The Report, and Hawaii Sea Level Rise Viewer at https://www.pacioos.hawaii.edu/shoreline/slr-hawaii/ particularly identifies a 3.2-foot sea level rise exposure area across the main Hawaiian Islands, which may occur in the mid to latter half of the 21st century. The Draft EA should provide a map of 3.2-foot sea level rise exposure area in relation to the project area, and consider site-specific mitigation measures, including setbacks from the shoreline erosion during the life of the proposed structure, to respond to the potential impacts of 3.2-foot SLR.

4. Stormwater Runoff, Erosion, and Water Resources
Pursuant to Hawaii Administrative Rules (HAR) § 11-200.1-18(d)(7) – identification and analysis of impacts and alternatives considered; to ensure that nearshore marine resources along the coastal regions along Waikīkī Bay remain protected, the negative effects of stormwater inundation and sediment loading surrounding the proposed project site, ensuing from roadway improvements during the construction and operational phase should be evaluated.

> Issues that may be examined include, but are not limited to, project site characteristics in relation to flood and erosion prone areas, vulnerability of the nearshore environment, and any increase of permeable surfaces that may lead to an increased volume or rate of stormwater runoff. Developing mitigation measures for the protection for surface water resources and the coastal ecosystem should take this into account, pursuant to HAR § 11-200.1-18(d)(8).

If you have any questions, please contact Joshua Hekekia at (808) 587-2845 or via email at Joshua.k.hekekia@hawaii.gov.

Sincerely,

Mary Alice Evans

Mary Alice Evans,
Director

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July 29, 2022

Mary Alice Evans, Director
State of Hawaiʻi Office of Planning and Sustainable Development
235 South Beretania Street, 6th Floor
Honolulu, Hawaii 96813

Dear Ms. Evans:

SUBJECT: Environmental Assessment (EA) for the Waikīkī Aquarium Water System Upgrade Response to Pre-Consultation Comments

Thank you for your pre-consultation comment dated June 9, 2022, regarding the Waikīkī Aquarium Water System Upgrade.

We will incorporate your comments in the Draft EA regarding an analysis of the project's relationship to plans and policies regarding the following:

- Coastal Zone Management Act, as addressed in HRS 205A-4 and HRS 205A-2 and compliance with HRS Chapter 343.
- Special Management Area use requirements and applicable shoreline setback requirements.
- Climate Change Adaptation and Sea Level Rise as related to findings of the Hawaii Sea Level Rise Vulnerability and Adaptation Report 2017.
- Stormwater Runoff, Erosion, Water Resources - Pursuant to HAR 11-200.1-18(d)(7), evaluate negative effects of stormwater inundation and sediment loading surrounding project site during construction and operational phases; consider project site characteristics in relation to flood and erosion prone areas, vulnerability of nearshore environment, increase of permeable surfaces that may lead to increased volume/rate of stormwater runoff.

We will include copies of your comments and our response in the Draft EA. Further, we will notify you of its publication in *The Environmental Notice* published by the State of Hawaii, Office of Planning and Sustainable Development.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to
Brandon Shima, Project Manager, Office of Project Delivery, University of Hawaiʻi
Tavia Oshiro, Environmental Compliance Program Manager, University Hawaiʻi

DAVID Y. IGE
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M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

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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: 6/8/2022
DAR # AR6278

MEMORANDUM

TO: Brian J. Neilson
DAR Administrator

FROM: Kimberly Fuller, Aquatic Biologist

SUBJECT: Request for Pre-Consultation for an Environmental Assessment for the Waikiki
Aquarium Water System Upgrade

Request Submitted by: Oceanit on behalf of the University of Hawaii
2777 Kalakaua Avenue, Honolulu, HI 96815. TMK: (1) 3-1-031 :006

Location of Project:

Brief Description of Project:

Oceanit is preparing the Draft Environmental Assessment (DEA) for the upgrade of the water system at the Waikiki Aquarium. The proposed action is to dispose of all effluent into two on-site injection wells, eliminating direct discharge into the ocean and the City and County of Honolulu (CCH)wastewater system. The water system upgrade will fulfill the State of Hawai'i Department of Health (DOH) Administrative Order on Consent (AOC) regarding the CCH Department of Environmental Services (ENV) Notice of Violation (NOV), CCH ENV Industrial Wastewater Discharge Permit (IWDP) effluent discharge requirements, and DOH National Pollutant Discharge Elimination System (NPDES) requirements.

Comments:

☐ No Comments ☒ Comments Attached

Thank you for providing DAR the opportunity to review and comment on the proposed project. Should there be any changes to the project plan, DAR requests the opportunity to review and comment on those changes.

Comments Approved: Date: Jun 9, 2022

Brian J. Neilson
DAR Administrator

DAR# AR6278

Brief Description of Project

The current water supply for the Waikiki Aquarium is around 470,000 gallons per day (GPD),
the upgrades will be designed for a water use target of 800,000 GPD. Currently the discharge from the seal pool and and native saltwater exhibits are discharged through Outfall Serial No. 001 into Mamala Bay. Water from the non-native tanks and freshwater exhibits is discharged to the CCH wastewater system. The filter backwash water from the shark tank, seal pool, and a 20-ft holding tank is also discharged to the CCH wastewater system.

The project upgrades will dispose of all effluent from both native and non-native exhibits via two on-site injection wells. The piping inside the existing building and outside will route wastewater to a discharge sump located at the southwest side of the property. Two pumps will pump the water from the sump to a structure on the south side of the property for filtration and treatment prior to discharge into the injection wells. The water will be filtered by 20 micron drum screens and the drum screen backwash will be disposed into CCH sewer systems.

DAR# AR6278

Comments

Erosion and Land Based Source of Pollution (LBSP) Mitigation:

DAR recommends that best management practices for mitigation of erosion and LBSP be followed. The close proximity to aquatic resources should be considered during design and construction. Landscape design and leveling should be such that long term erosion and LBSP are minimized.

During construction these measures would include any type of barrier (e.g. sediment barriers/bags, petroleum absorption diapers, etc.) that limits the amount of sediment or LBSP (e.g. petroleum products, chemicals, debris, etc.) to the maximum extent practicable. DAR recommends that all construction materials be composed of environmentally inert materials to the extent practicable. The Contractor shall consider the weather while performing construction. Some work may be performed during low rain conditions, but all construction would be halted during storm conditions or when storm conditions threaten the watershed.

DAR should be notified to assess impact should any event occur during construction that could negatively impact marine resources. Examples of this type of event include but are not limited to excess turbidity from construction, release of liquids such as oil or gas into the water, and live rock or coral damage.

Protected Marine Species:

In the event that protected species such as the Hawaiian monk seal, other marine mammal or sea-turtle is observed in close proximity to the construction/repair site, and the activities being conducted may be considered as a "negligent or intentional act which results in disturbing or molesting a marine mammal". Contractors should take appropriate action to modify activities in order to avoid disturbance to the regular behavior and activities of the animal. Appropriate action would include but is not limited to ceasing construction activity until the animal leaves the area.

Any interaction between a protected species and the construction and repair activity proposed should be reported to the NOAA Protected Species Division and State of Hawaii DOCARE:

NOAA Marine Mammal Response Coordinators (Oahu): 808-220-7802

DAR# AR6278

Comments

NOAA Sea Turtles (Oahu): Monday-Friday, 7:30am-4pm NOAA National Marine Fisheries Service - PIFSC Marine Turtle Biology and Assessment Program: (808) 725-5730

State of Hawaii Department of Land and Natural Resources (DLNR) Division of Conservation and Resources Enforcement (DOCARE): 808-643-3567

Entanglement Prevention:

DAR recommends that applicant utilize best management practices to eliminate any potential for incidental entanglement of any marine organism. Entanglement prevention practices will include but are not limited to: minimizing the amount of in-water structures or components that may potentially cause entanglement during research operations (loops, holes, slack lines). If incidental entanglement of protected species occurs DAR and the appropriate federal agency should be notified immediately.

Aquatic Invasive Species Concerns:

This new plan proposes to dispose of water via injection wells from the non-native species exhibits. There is filtration planned before discharge, but DAR would like more details of how this new setup will pose little to no risk of non-native species being introduced into the adjacent marine resource. It seems that the sump will be on the ocean-side of the property with unfiltered water- more detail on measures of how to ensure none of the unfiltered water would overflow onto the property and into the ocean is desired. Viruses, bacteria, and gametes of certain taxa can pass through a 20 micron filter, but it appears the injection well additionally will filter the water after the drum filtration.

According to §187A-6.5 HRS "No person shall release any live non-native fish or other live non-native aquatic life being held in an aquarium or other confinement for scientific study, exhibition, display, sale, or for any other purpose, into any waters of the State"

Injection Well Concerns:

Information ensuring that additional disposal via injection wells will not cause an increase in nutrients or contaminants that could be detrimental to the already invasive algae dominated reef could be helpful.

DAR# AR6278

Comments

If there are chemical treatments done in the tanks to manage parasites or diseases- where will the wastewater for those circumstances be disposed? DAR acknowledges in the initial letter the applicant addressed that they will be following compliance with the Clean Water Act, currently under the jurisdiction of the Department of Health.

Thank you for the opportunity to comment.

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July 29, 2022

Brian J. Neilson, Administrator
Division of Aquatic Resources
Department of Land and Natural Resources
1151 Punchbowl Street, Room 330
Honolulu, Hawaii 96813

Dear Mr. Neilson:

SUBJECT: Environmental Assessment (EA) for the Waikīkī Aquarium Water System Upgrade Response to Pre-Consultation Comments

Thank you for your pre-consultation comment dated June 8 2022, regarding the Waikīkī Aquarium Water System Upgrade.

We note your recommendations for Best Management Practices (BMP) during construction and operation to minimize and mitigate Land Based Source of Pollution (LBSP). The measures you identify, including erosion mitigation and construction materials, will be incorporation in the EA analysis of potential impacts and mitgation.

Regarding the protected marine species, construction and operation of the proposed action will occur within the Waikīkī Aquarium property, and are not in close proximity to protected species mentioned in your comments. Regarding the impacts of injection wells on adjacent marine resources, the proposed action is intended to significantly reduce impacts on adjacent marine habitat. We will present supporting information in the EA and incorporate and address your comment in the analysis of such impacts and any recommended mitigation.

We will include copies of your comments and our response in the Draft EA. Further, we will notify you of its publication in *The Environmental Notice* published by the State of Hawaii, Office of Planning and Sustainable Development.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to
Brandon Shima, Project Manager, Office of Project Delivery, University of Hawai‘i
Tavia Oshiro, Environmental Compliance Program Manager, University Hawai‘i

Dale Uno

From: DOH.SDWB <DOH.sdwb@doh.hawaii.gov>
Sent: Monday, June 13, 2022 10:12 AM
To: WAq
Subject: [External] RE: Pre-Consultation on the Waikiki Aquarium Proposed Water System Upgrade)

Mahalo for your message.
The Department of Health (DOH), Safe Drinking Water Branch (SDWB) will no longer be responding directly to requests for comments on the following documents (Pre-consultation, Early Consultation, Preparation Notice, Draft, Final, Addendums, and/or Supplements):

- Environmental Impact Statements (EIS)
- Environmental Assessments (EA)
- Conservation District Use Applications (CDUA)
- Drinking Water Operator Certification
- Source Water Assessment and Protection
- Underground Injection Control (UIC) Wells

Please utilize the DOH-SDWB Standard Comments on the DOH-SDWB website at https://health.hawaii.gov/sdwb/ (direct link at https://health.hawaii.gov/sdwb/files/2020/11/SDWBStdCmts2020.docx-signed.pdf) regarding your project's responsibilities to maintain drinking water quality and any necessary permitting.

Mahalo,
Safe Drinking Water Branch

From: WAq <WAq@oceanit.com>
Sent: Wednesday, June 8, 2022 3:08 PM
To: DOH.SDWB <DOH.sdwb@doh.hawaii.gov>
Subject: [EXTERNAL] Pre-Consultation on the Waikiki Aquarium Proposed Water System Upgrade)

Aloha,

Oceanit is preparing an Environmental Assessment (EA) for the Waikīkī Aquarium Water System Upgrade, the location of which is 2777 Kalākaua Avenue. On May 9, we sent you a request for pre-consultation on the EA to the State of Hawaiʻi Department of Health Safe Drinking Water Branch Environmental Management Division (2385 Waimano Home Rd., Ste. 110, Uluakupu Bldg. 4, Pearl City, HI 96782-1400), attention Joanna Seto, Program Administrator. Pre-consultation comments are due on June 10.

I spoke to Geda today to see if the Safe Drinking Water Branch wanted to submit pre-consultation comments. She asked that I email what we had earlier to track the routing and status of your response.

I look forward to hearing from you.

All the best,

Berna Senelly

Berna Cabacungan Senelly | **Senior Regulatory and Community Lead**
828 Fort Street Mall Suite 600 | Honolulu, HI 96813
Email: bsenelly@oceanit.com
Office: 808.531.3017 ext. 221
Direct: 808.954.4221
Mobile: 817.422.1372
Fax: 808.531.3177

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Please consider the environment before printing this message.

DAVID Y. IGE
GOVERNOR OF HAWAII

ELIZABETH A. CHAR, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
SAFE DRINKING WATER BRANCH
ULUAKUPU BLDG. 4
2385 WAIMANO HOME ROAD, SUITE 110
PEARL CITY, HI 96782

In reply, please refer to:
File: SDWB
SDWBStdCmts2020.docx

November 27, 2020

MEMORANDUM

TO: AGENCIES AND PROJECT OWNERS

FROM: JOANNA L. SETO, P.E., CHIEF
Safe Drinking Water Branch

Joanna L. Seto

SUBJECT: SAFE DRINKING WATER BRANCH STANDARD PROJECT COMMENTS

This memo is provided for your information and sharing. You are encouraged to share this memo with your project partners, team members, and appropriate personnel.

The Department of Health (DOH), Safe Drinking Water Branch (SDWB) will no longer be responding directly to requests for comments on the following documents (Pre-consultation, Early Consultation, Preparation Notice, Draft, Final, Addendums, and/or Supplements):

- Environmental Impact Statements (EIS)
- Environmental Assessments (EA)
- Conservation District Use Applications (CDUA)
- Drinking Water Operator Certification
- Source Water Assessment and Protection
- Underground Injection Control (UIC) Wells

For agencies or project owners requiring DOH-SDWB comments for one or more of these documents, please utilize the DOH-SDWB Standard Comments below regarding your project's responsibilities to maintain drinking water quality and any necessary permitting. DOH-SDWB Standard Comments are also available on the DOH-SDWB website located at: https://health.hawaii.gov/sdwb/.

DOH-SDWB Standard Comments

The following information is for agencies and/or project owners who are seeking comments regarding environmental compliance for their projects in the areas of: 1) Public Water Systems; 2) Underground Injection Control; 3) Groundwater Protection, and 4) Drinking Water State Revolving Fund with the Hawaii Administrative Rules (HAR), Chapters 11-19, 11-20, 11-21, 11-23, 11-23A, 11-25, and 11-65. You may be responsible for fulfilling additional requirements related to our program.

1. Public Water System Supervision

   a. Federal and state regulations define a public water system as a system that regularly serves an average of 25 or more individuals at least 60 days per year or has at least 15 service connections providing water for human consumption. All public water system owners and operators are required to comply with Hawaii Administrative Rules (HAR), Title 11, Chapter 20, "Rules Relating to Public Water Systems."

   b. All new public water systems are required to demonstrate and meet minimum capacity requirements prior to their establishment. This requirement involves demonstration that the system will have satisfactory technical, managerial, and financial capacity to enable the system to comply with safe drinking water standards and requirements.

   c. Projects that propose development of new sources of drinking water serving or proposed to serve a public water system must comply with the terms of HAR 11-20-29, entitled "Use of new sources of raw water for public water systems." This section requires that all new public water system sources be approved by the Director of Health (Director) prior to its use. Such approval is based primarily upon the submission of a satisfactory engineering report, which addresses the requirements set in HAR Section 11-20-29.

   d. The engineering report must identify all potential sources of contamination and evaluate alternative control measures, which could be implemented to reduce or eliminate the potential for contamination, including treatment of the water source. In addition, water quality analyses for all regulated contaminants, performed by a laboratory certified by the DOH State Laboratories Division (https://health.hawaii.gov/sdwb/approvedlablist/), must be submitted as part of the report to demonstrate compliance with all drinking water standards. Additional parameters may be required by the Director for this submittal or additional tests required upon his or her review of the information submitted.

   e. All sources of public water systems must undergo a source water assessment, which will delineate a source water protection area. This process is preliminary to the creation of a source water protection plan for that source and activities which will take place to protect the drinking water source.

   f. Projects proposing to develop new public water systems or proposing substantial modifications to existing public water systems must receive approval by the Director prior to construction of the proposed system or modification. These projects include treatment, storage, and distribution systems of public water systems. The approval authority for projects owned and operated by a County Board or Department of Water or Water Supply has been delegated to them.

g. All public water systems must be operated by certified distribution system and water treatment plant operators as defined by HAR Chapter 11-25, entitled "Rules Relating to Certification of Public Water System Operators."

h. All projects which propose the use of dual water systems or the use of a non- potable water system in proximity to an existing drinking water system to meet irrigation or other needs must be carefully designed and operated these systems to prevent the cross-connection of these systems and prevent the possibility of backflow of water from the non-potable system to the drinking water system. The two (2) systems must be clearly labeled and physically separated by air gaps or reduced pressure principle backflow prevention devices to avoid contaminating the drinking water supply. In addition, backflow devices must be tested annually to assure their proper operation. Further, all non-potable spigots and irrigated areas should be clearly labeled with warning signs to prevent the inadvertent consumption on non-potable water. Compliance with HAR Chapter 11-21, entitled "Cross-Connection and Backflow Control" is also required.

i. All projects which propose the establishment of a potentially contaminating activity (as identified in the Hawai`i Source Water Assessment Plan) within the source water protection area of an existing source of water for a public water supply should address this potential and activities that will be implemented to prevent or reduce the potential for contamination of the drinking water source.

For further information concerning the application of capacity, new source approval, operator certification, source water assessment, backflow/cross-connection prevention or other regulated public water system programs, please contact the Safe Drinking Water Branch Engineering Section at (808) 586-4258 or email sdwb@doh.hawaii.gov.

2. Underground Injection Control (UIC) Program

a. Injection wells used for the subsurface disposal of wastewater, sewage effluent, or surface runoff are subject to environmental regulation and permitting under HAR Chapter 11-23 entitled "Underground Injection Control." The DOH's approval must be first obtained before any injection well construction commences. A UIC permit must be issued before any injection well operation occurs.

b. Authorization to use an injection well is granted when a UIC permit is issued to the injection well facility. The UIC permit contains discharge and operation limitations, monitoring and reporting requirements, and other facility management and operational conditions. A complete UIC permit application form found at https://eha-cloud.doh.hawaii.gov/epermit/Home/9034789e-2918-4f30-82a2-9a5940e467f2 is needed to apply for a UIC permit.

c. A UIC permit can have a valid duration of up to five (5) years. Permit renewal is needed to keep an expiring permit valid for another term.

d. The UIC line delineates the extent of our underground sources of drinking water and is used to define areas where certain types of injection wells are prohibited. The UIC line is plotted on official UIC maps available for review at SDWB or by contacting the UIC program. Online interpretations of the UIC line maps exists and should be used with caution as they are not the official maps. One website hosting an interpretation of the UIC line map is at the following: https://geoportal.hawaii.gov/datasets/4597dde2703a4e539f51588531e48101_20

e. If your project involves the construction of an injection well, you must first obtain the DOH's written approval to construct the injection well before any construction commences. The primary purpose of HAR, Chapter 11-23 is to protect underground sources of drinking water from injection well contamination. Written approval is obtained by filing an application for a UIC permit. You may submit your permit application via electronic filing (preferred method) through the DOH website at http://eha cloud.hawaii.gov/epermit or submit a hard copy permit application to:

   Safe Drinking Water Branch
   Uluakupu Bldg. 4
   2385 Waimano Home Road, Suite 110
   Pearl City, Hawaii 96782-1400

f. Areas mauka of the UIC line are considered to overlie underground sources of drinking water. Therefore, no new subclass A injection wells, such as sewage injection wells that receive greater than 1,000 gallons per day, will be allowed to be constructed.

g. New sewage injection wells have been further prohibited effective July 5, 2018. Hawaii Revised Statutes 340E-2(e) states *"The director shall promulgate regulations establishing an underground injection control program. Such program shall prohibit any underground injection which is not authorized by a permit issued by the director; provided that the director shall not issue permits for the construction of sewage wastewater injection wells unless alternative wastewater disposal options are not available, feasible, or practical;"*

h. New storm water drainage injection well construction must be sited beyond one-quarter mile of a drinking water well. If you intend to construct a drinking water well, be careful to site all drainage injection wells at least one-quarter mile away from the drinking water source well.

For further information about the UIC permit and the UIC Program, please contact UIC staff at (808) 586-4258 or email at sdwb@doh.hawaii.gov.

3. Drinking Water State Revolving Fund Program

The Drinking Water State Revolving Fund (DWSRF) is a federally-capitalized loan program that provides low interest loans to regulated community water systems in the State of Hawaii for their drinking water infrastructure projects. If you would like more information regarding DWSRF eligibility, financing options, etc., you may visit the DWSRF website at https://health.hawaii.gov/sdwb/drinking-water-state-revolving-fund/ or contact Ms. Joan Corrigan at joan.corrigan@doh.hawaii.gov.

4. Private Water Wells

   a. **WARNING!** As the owner of a privately-owned well, you should **NOT** assume that water from your well is safe for consumption. It is your responsibility to make sure that your well water is safe to drink. The only way to do this is to have your well regularly tested for bacteriological and chemical contaminants.

   b. There are no regulations controlling water quality in private wells serving individual residences as there are for public water systems (public or privately-owned utilities supplying water to 25 or more people or 15 service connections). In other words, there are no enforceable limits for contaminants and no requirements for regular testing. Private wells are often found in rural areas, where many activities such as onsite wastewater disposal can contaminate the ground water.

   c. U.S. Environmental Protection Agency (EPA) Recommendations: The EPA recommends that private well owners test their well water each year for such contaminants as Total Coliform bacteria, Nitrates, as well as any other contaminants that may be of concern in your area. More frequent testing may be appropriate if you suspect a problem. EPA also suggests that you consider testing for pesticides, organic chemicals, and heavy metals before using it for the first time. Please refer to the EPA website on Private Drinking Water Wells at http://www.epa.gov/privatewells.

   d. Other Contaminants: Water testing can be very expensive. It is important that you spend time to identify what other potential contaminants may be of concern. Please refer to the EPA website on Private Drinking Water Wells for more information. Be aware of what and how you use and dispose of household and garden chemicals. Also determine the location of nearby septic tanks or cesspools, and agricultural or industrial activities in the area. General information on known chemical contamination of ground water in Hawaii can be found at the DOH website http://health.hawaii.gov/sdwb/groundwater-contamination-viewer.

   e. Laboratories: Whenever possible, utilize a laboratory that is certified or approved for the specific drinking water tests and carefully follow their instructions for collecting, storing, and transporting the samples. Be sure to ask the lab to use EPA approved methods for drinking water analysis. A list of Drinking Water Laboratories Certified or Approved by the Hawaii Department of Health, State Laboratories Division can be found at https://health.hawaii.gov/sdwb/approvedlablist/. As lab certification status changes constantly, confirm their status when you contact the lab. Please note that the list is limited to currently regulated contaminants in public water systems.

   f. Results: Once the lab provides you with the test results, you will be in a better position to determine if your well water is safe to drink or what contaminant you need to treat for. Generally, you should compare the results with Federal (https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations) and State (http://health.hawaii.gov/sdwb/files/2014/07/MCL-Fct-2014-07-10.pdf) Maximum Contaminant Level (MCL) drinking water standards. Where your test results are greater than the Federal or State maximum contaminant levels, your well water should be considered as unsafe for consumption.

oceanit
innovation through engineering & scientific excellence

July 29, 2022

Joanna Seto, Chief
Safe Drinking Water Branch
State of Hawaii Department of Health
Uluakupu Bldg. 4
2385 Waimano Home Road, Suite 110
Pearl City, Hawaii 96782

Dear Ms. Seto:

SUBJECT: Environmental Assessment (EA) for the Waikīkī Aquarium Water System Upgrade
Response to Pre-Consultation Comments

Thank you for your pre-consultation comment dated June 13, 2022 regarding the Waikīkī Aquarium Water System Upgrade.

We understand that the Department of Health Safe Drinking Water Branch is no longer responding directly to comments to pre-consultation related to EAs. We apprreciate your reference to Standard Comments at https://health.hawaii.gov/sdwb/ and will utilize this resource in the EA analysis of potential impacts and recommended mitigation measures.

We will include copies of your comments and our response in the Draft EA. Further, we will notify you of its publication in *The Environmental Notice* published by the State of Hawaii, Office of Planning and Sustainable Development.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to
Brandon Shima, Project Manager, Office of Project Delivery, University of Hawaiʻi
Tavia Oshiro, Environmental Compliance Program Manager, University Hawaiʻi

DAVID Y. IGE
GOVERNOR OF
HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

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

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

REF: OCCL: TF

COR: OA 22-179

Jun 9, 2022

Om Das
Oceanit Laboratories, Inc.
828 Fort Street Mall, Suite 600
Honolulu, HI 96813

SUBJECT: Pre-Consultation for an Environmental Assessment Waikiki Aquarium Water System Upgrade.
Located at 2777 Kalakaua Avenue
Kapiolani Park, Waikiki, Oahu
Tax Map Key (TMK): (1) 3-1-031:006

Dear Om Das:

The Office of Conservation and Coastal Lands (OCCL) has reviewed your letter and attachments regarding the subject matter. According to your letter, the Waikiki Aquarium is proposing to upgrade its water system infrastructure to ensure that the system complies with regulatory requirements. Upgrading the water system infrastructure is intended to dispose of all Waikiki Aquarium effluent into two (2) on-site injections wells eliminating the need to direct discharge into the ocean and the City and County of Honolulu wastewater system. The upgraded working system will be designed for a water use target of 800,000 gallons per day (GPD) to accommodate future improvements and master plan. A Draft Environmental Assessment (DEA) is being prepared for the proposed project.

The OCCL regulates land uses in the State Land Use Conservation District through the issuance of Conservation District Use Permits (CDUPs) and Site Plan Approvals (SPAs) to help conserve, protect, and preserve important natural and cultural resources. Based on the information you have provided; it appears that TMK: (1) 3-1-031:006 lies in the State Land Use Urban District. In this context, the OCCL offers the following comments on the proposed project and the preparation of its DEA.

It is unclear if land uses are being proposed makai of the shoreline or in the Conservation District. Proposed land uses in the Conservation District need to conform to Hawaii Administrative Rules (HAR) Chapter 13-5. A copy of HAR Chapter 13-5 can be obtained at https://dlnr.hawaii.gov/occl/rules/ .

Reference to and discussion regarding state sea level rise exposure area (SLR-XA) maps and the proposed action is required content in a DEA pursuant to HAR §11-200.1-18. This appears to be furthered by the recent amendments to HRS Chapter 205A under Act 16 (2020) which reiterates the need to evaluate potential impacts related to coastal hazards and sea level rise. As such, coastal hazards and sea level rise must be evaluated at a site-specific and cumulative level in the DEA.

A cursory review of the Hawaii State Sea Level Rise Viewer (https://www.pacioos.hawaii.edu/shoreline/slr-hawaii/) indicates that the subject parcel lies within the sea level rise exposure area (SLR-XA) (see attachment). We suggest that you include a thorough discussion of coastal hazards, climate change, sea level rise, and associated impacts in the development of the DEA. You and your clients may want to consider reviewing the Hawaii Sea Level Rise Vulnerability and Adaptation Report (2017) in preparing the DEA. A copy of the report can be obtained at https://climateadaptation.hawaii.gov/wp-content/uploads/2017/12/SLR-Report_Dec2017.pdf . Guidance for making planning decisions utilizing the SLR-XA can be found at https://climate.hawaii.gov/wp-content/uploads/2020/12/Guidance-for-Using-the-Sea-Level-Rise-Exposure-Area.pdf . The DEA must contain a summary description of the affected environment including, but not limited to, the project's exposure to coastal hazards as well as sea level rise.

It appears that the subject property is protected by a seawall. The OCCL requests that the DEA disclose the legal status of the seawall as well as its condition.

Should you have any questions, contact Trevor Fitzpatrick of the Office of Conservation and Coastal Lands at (808) 798-6660 or trevor.j.fitzpatrick@hawaii.gov .

Sincerely,

S Michael Cain

Michael Cain, Acting Administrator
Office of Conservation and Coastal Lands

CC: *Oahu District Land Division Office*
City and County of Honolulu, Department of Planning and Permitting

Sea Level Rise Projections For Modeling

Sea level rise exposure mapping in the 2017 Hawaii Sea Level Rise Report is based on an upper-end projection of 3.2 feet of sea level rise by 2100 in the 5th Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), the United Nations body of leading climate scientists and governmental representatives. The IPCC AR5 identified four sea level rise scenarios based on Representative Concentration Pathways (RCPs) for Greenhouse Gas (GHG) emissions (IPCC 2014). The IPCC AR5 "business-as-usual" GHG emissions scenario, RCP8.5, was used to model exposure to sea level rise. This scenario assumes GHG emissions continue to increase at their current rate and predicts as much as 3.2 feet of Global Mean Sea Level (GMSL) rise by the year 2100 (Figure 1).

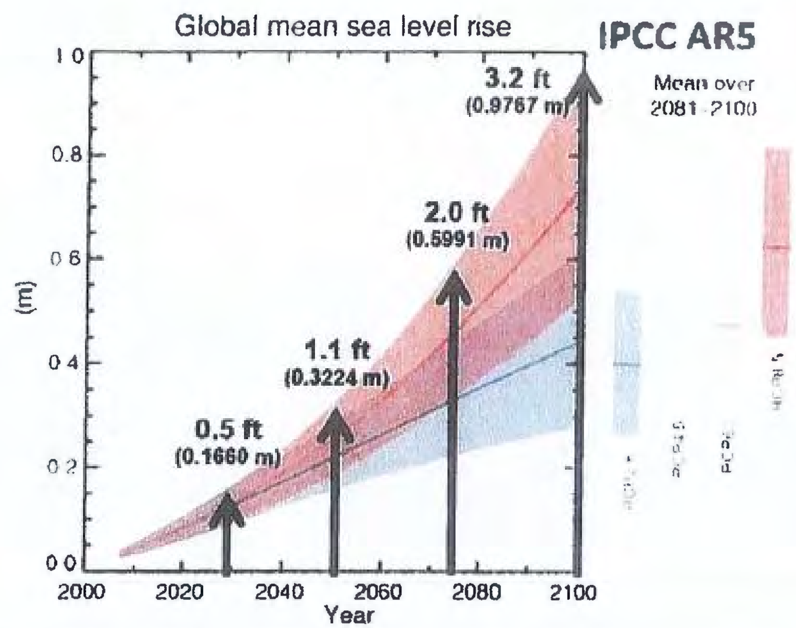


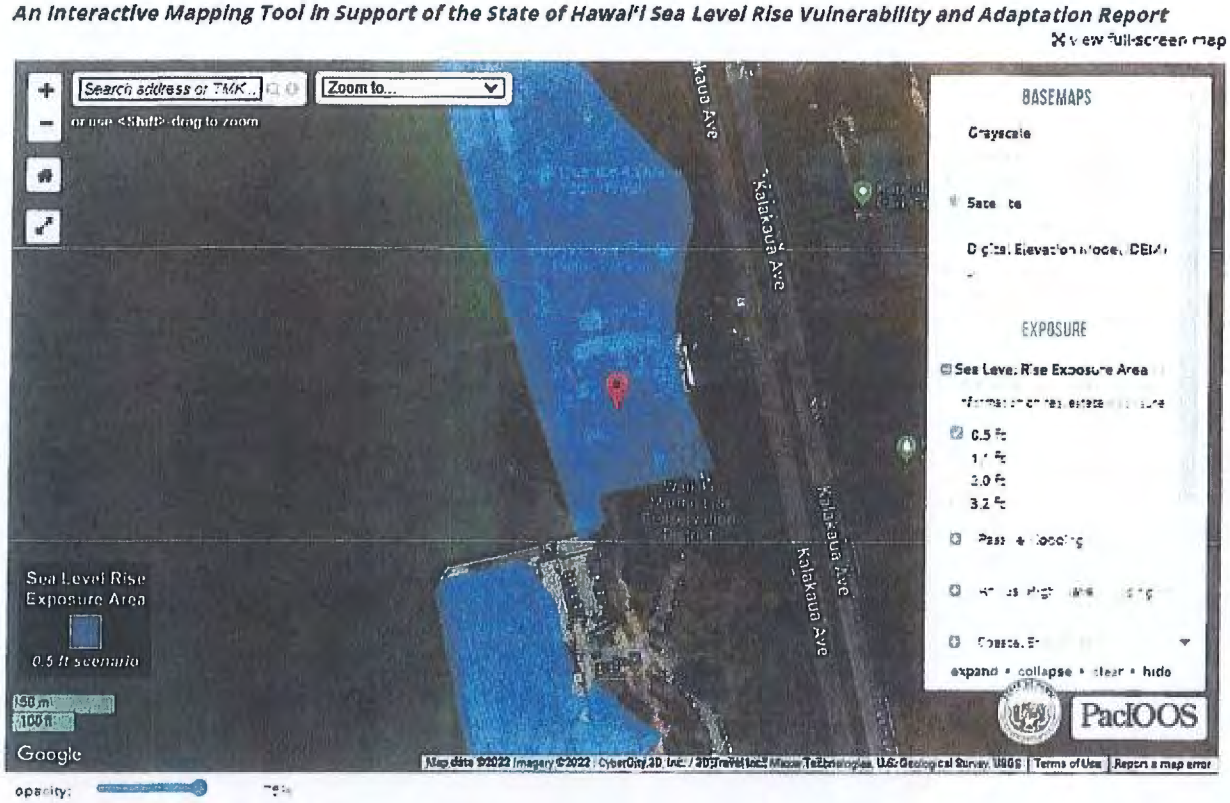
Figure 1. Projected GMSL rise under different greenhouse gas emissions scenarios from the IPCC AR5 Report

As expected, the science on sea level rise observations and forecasts have continued to advance. Since completion of the 2017 Report, peer-reviewed scientific literature as well as government and multinational reports increasingly point to about 3 feet of sea level rise by 2100 as a mid-range, rather than high-end, scenario and show that sea level rise greater than 3 feet in this century is physically possible (Figure 2, Sweet et al. 2017). These increasing projections of sea level rise are based on greenhouse gas emissions, which continue to increase, and observations of accelerating ice mass loss to the oceans, particularly from Greenland and West Antarctica. The projections are often provided to 2100, though sea level rise will not stop at that time but will likely continue for centuries.

Attachment

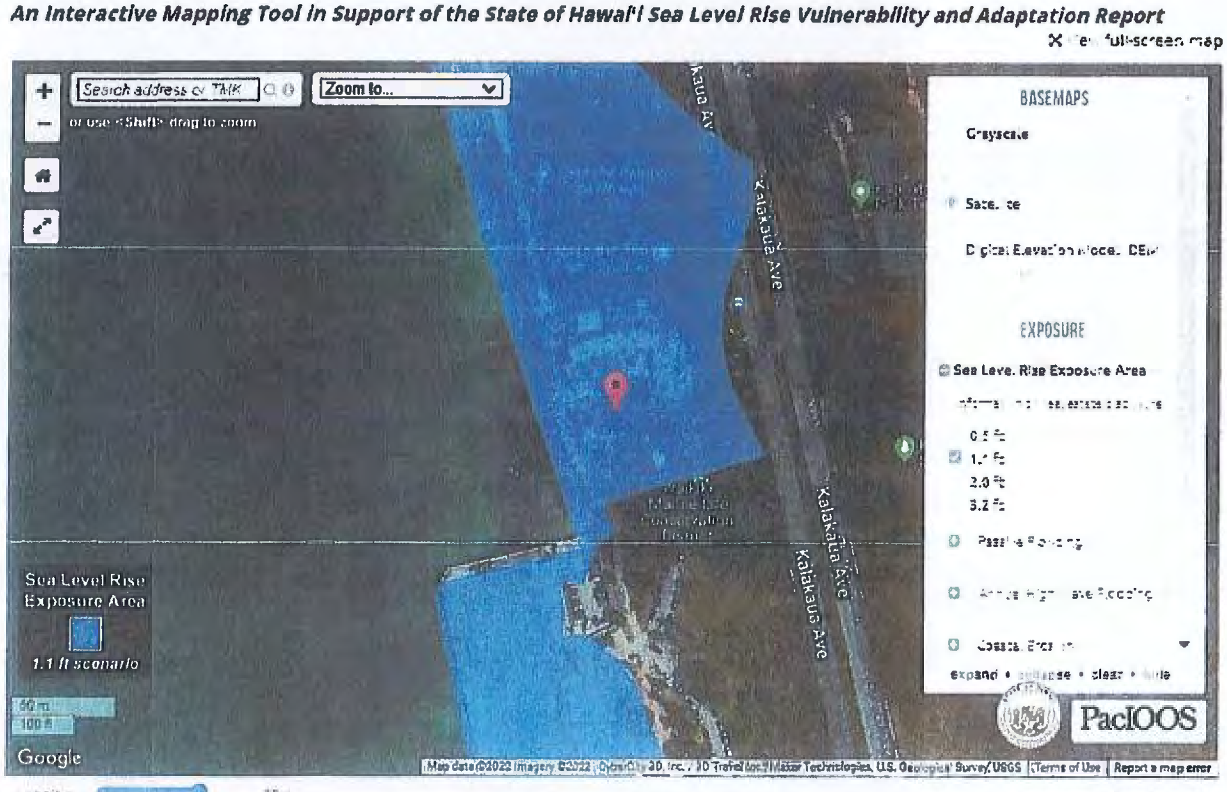
Sea Level Rise : State of Hawaiʻi Sea Level Rise Viewer

An Interactive Mapping Tool In Support of the State of Hawaiʻi Sea Level Rise Vulnerability and Adaptation Report



Sea Level Rise : State of Hawaiʻi Sea Level Rise Viewer

An Interactive Mapping Tool In Support of the State of Hawaiʻi Sea Level Rise Vulnerability and Adaptation Report



Attachment

Sea Level Rise : State of Hawai'i Sea Level Rise Viewer

An Interactive Mapping Tool in Support of the State of Hawai'i Sea Level Rise Vulnerability and Adaptation Report

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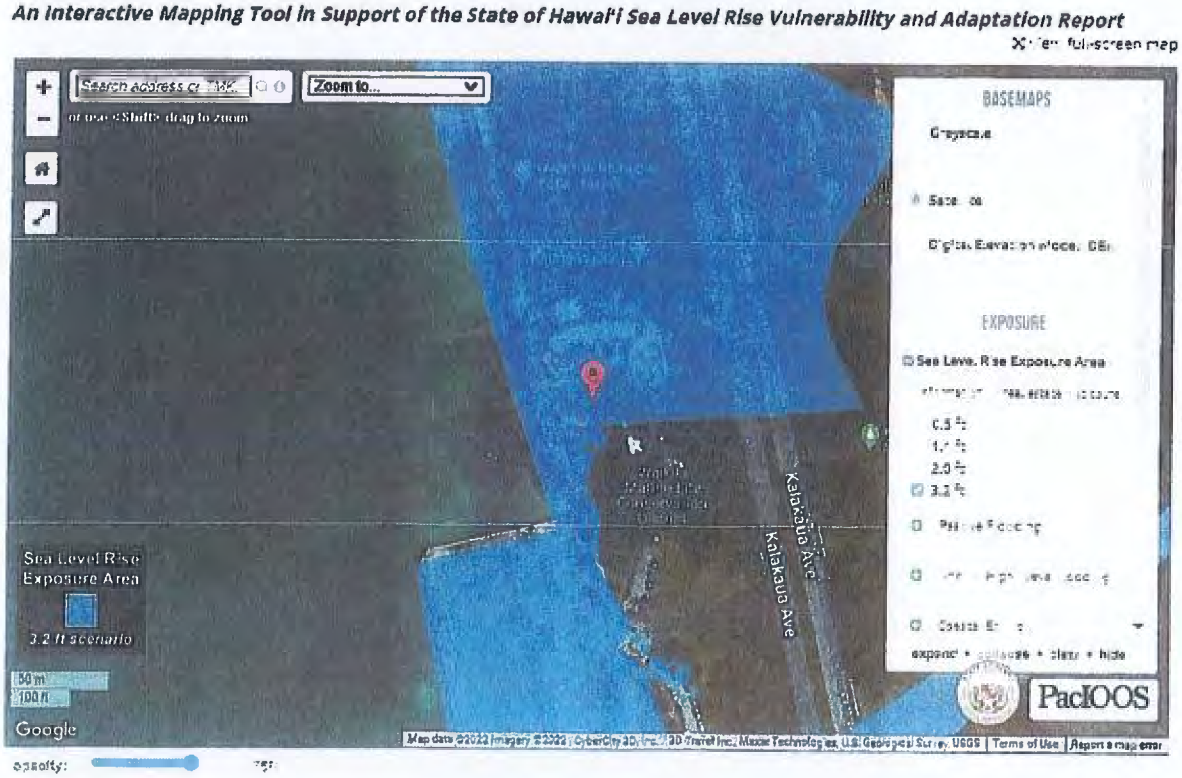
An Interactive Mapping Tool in Support of the State of Hawai'i Sea Level Rise Vulnerability and Adaptation Report



Attachment

innovation through engineering & scientific excellence

July 29, 2022

Michael Cain, Administrator
Office of Conservation and Coastal Lands
P. O. Box 621
Honolulu, Hawaiʻi 96809

Dear Mr. Cain:

SUBJECT: Environmental Assessment (EA) for the Waikīkī Aquarium Water System Upgrade Response to Pre-Consultation Comments

Thank you for your pre-consultation comment dated June 9, 2022, regarding the Waikīkī Aquarium Water System Upgrade.

We note your comment regarding the project site's State Land Use District and affirm that the project site lies within the State Land Use Urban District. Further, the project site is mauka of the shoreline and does not require permits related to the Conservation District. The EA will include a throrough discussion of the project's relationship to land use plans, policies, and regulations.

Per your comment, the EA will include SLR-XA maps, evaluate coastal hazards and SLR at site-specific and cumulative levels. Further, the impact analysis will include discussions of coastal hazards, climate change, SLR and associated impacts, and a summary description of the affected environment including, but not limited to, project's exposure to coastal hazards and SLR, as well as disclose the legal status of the seawall and its condition.

We will include copies of your comments and our response in the Draft EA. Further, we will notify you of its publication in *The Environmental Notice* published by the State of Hawaii, Office of Planning and Sustainable Development.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to
Brandon Shima, Project Manager, Office of Project Delivery, University of Hawaiʻi
Tavia Oshiro, Environmental Compliance Program Manager, University Hawaiʻi

Dale Uno

From: Pobuk, Jack <jpobuk@honolulu.gov>
Sent: Tuesday, June 14, 2022 10:03 AM
To: WAq
Subject: [External] Waikiki Aquarium Wtr Sys Upgr; comments on EA Pre-conslt
Attachments: PRO 22-057.ltr to Oceanit.2022 06 10. rspns to EA Pre-Conslt, Waikiki Aquarium Wtr Sys Upgr .pdf

Please see attached comment letter from ENV Dept., and let us know that you got this.
Thanks,
Jack

Jack R. Pobuk, P.E.
Branch Chief, CIP Program & Planning
Dept of Environmental Services
City and County of Honolulu
1000 Uluohia Street, Suite 308
Kapolei, Hawaii 96707
desk: (808) 768-3464

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 ● FAX: (808) 768-3487 ● WEBSITE: http://envhonolulu.org

RICK BLANGIARDI
MAYOR

ROGER BABCOCK, JR., Ph.D., P.E.
DIRECTOR

MICHAEL O'KEEFE
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO:
PRO 22-057

June 10, 2022

VIA ELECTRONIC SUBMITTAL

Oceanit Laboratories, Inc.
Attention: Om Das
828 Fort Street Mall, Suite 600
Honolulu, Hawaii 96813

Dear Mr. Das:

SUBJECT: Pre-Consultation for an Environmental Assessment for the
Waikiki Aquarium Water System Upgrade
2777 Kalakaua Avenue, Honolulu, Hawaii
TMK: 1-3-1-031:006

We have reviewed the subject documents transmitted to us by your letter dated May 9, 2022. We have the following comments:

1. The Environmental Assessment should provide clarification of the proposed discharges to the City and County of Honolulu's (CCHs) wastewater system. In the text of your letter, it says the plan is to eliminate the need to directly discharge water into the CCH wastewater system, but this seems to conflict with Figures 3 and 4, which show a discharge of filter backwash water going to the CCH sewer main.

2. Provide information on the quantity, including peak, average, and time of day, and quality of the water proposed to be sent to the CCH sewer. For the required permits from our department, and from the Department of Planning and Permitting, detailed information will be needed in order to make the appropriate decisions on what is allowable.

3. Identify the proposed means of measuring the volume of flow, including possible alternatives if there are alternatives, to be used for billing of sewer service fees. Our usual means of determining volume of flow, based on Board of Water Supply water meter readings, would not provide sufficient information

to determine all of the volumes of water that may be discharged to the CCH sewer.

Should you have any questions, please call Jack Pobuk, Branch Chief, at (808) 768-3464 or via email at jpobuk@honolulu.gov.

Sincerely,

Roger Babcock Jr.

Roger Babcock, Jr., Ph.D., P.E.
Director

July 29, 2022

Dr. Roger Babcock, Director
Director of Environmental
Services City and County of
Honolulu 1000 Uluohia Street,
Suite 308 Kapolei, Hawai'i 96707

Dear Dr. Babcock:

SUBJECT: Environmental Assessment (EA) for the Waikīkī Aquarium Water System Upgrade
Response to Pre-Consultation Comments

Thank you for your pre-consultation comment dated June 10, 2022, regarding the Waikīkī Aquarium Water System Upgrade.

We note your comment regarding clarification of proposed discharges into the City and County wastewater system. There will be some discharge from the drum filter backwash into the wastewater system, and it will be limited to the freshwater filter backwash water from the drum screen filters plus minimal seawater. We will incorporate your comments in the EA and clarify that the current plan is to use freshwater for filter backwash.

We will further describe the estimated quantity and quality of water proposed to be disposed in the City's wastewater system and identify proposed means of measuring flow volume to be used in determining sewer service fees.

We will include copies of your pre-consultation comments and our response in the Draft EA. Further, we will notify you of its publication in *The Environmental Notice* published by the State of Hawaii, Office of Planning and Sustainable Development.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to
Brandon Shima, Project Manager, Office of Project Delivery, University of Hawai'i
Tavia Oshiro, Environmental Compliance Program Manager, University Hawai'i

Oceanit Center 828 Fort Street Mall, Suite 600 Honolulu, Hawaii 96813 Phone: 808.531.3017 Fax: 808.531.3177
www.oceanit.com

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

June 14, 2022

LD 0485

Oceanit Laboratories, Inc.
Attention: Om Das
828 Fort Street Mall, Suite 600
Honolulu, HI 96813

Via email: WAq@oceanit.com

Dear Sirs:

SUBJECT: **Pre-Consultation for an Environmental Assessment**
Waikiki Aquarium Water System Upgrade
2777 Kalakaua Avenue, Honolulu, Island of Oahu
TMK: (1) 3-1-031:006

Thank you for the opportunity to review and comment on the subject project. The Land Division of the Department of Land and Natural Resources (DLNR) distributed copies of your request to DLNR's various divisions for their review and comment.

Enclosed are comments received from our (a) Engineering Division, (b) Division of Forestry and Wildlife, and (c) Office of Conservation and Coastal Lands. Should you have any questions, please feel free to contact Barbara Lee via email at *barbara.j.lee@hawaii.gov*. Thank you.

Sincerely,

Russell Tsuji

Russell Y. Tsuji
Land Administrator

Attachments
cc: Central Files

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

May 27, 2022

LD 0485

MEMORANDUM

FROM: ~~TO:~~ **DLNR Agencies:**

X Div. of Aquatic Resources *(via email: kendall.l.tucker@hawaii.gov)*
__ Div. of Boating & Ocean Recreation
X Engineering Division *(via email: DLNR.engr@hawaii.gov)*
X Div. of Forestry & Wildlife *(via email: rubyrosa.t.terrago@hawaii.gov)*
__ Div. of State Parks
X Commission on Water Resource Management *(via email: DLNR.CWRM@hawaii.gov)*
X Office of Conservation & Coastal Lands *(via email: sharleen.k.kuba@hawaii.gov)*
X Land Division – Oahu District *(via email: barry.w.cheung@hawaii.gov)*

TO: ~~FROM:~~ Russell Tsuji
Russell Y. Tsuji, Land Administrator

SUBJECT: **Pre-Consultation for an Environmental Assessment Waikiki Aquarium Water System Upgrade**

LOCATION: 2777 Kalakaua Avenue, Honolulu, Island of Oahu, Hawaii
TMK: (1) 3-1-031:006

APPLICANT: **OCEANIT on behalf of the Waikiki Aquarium**

Transmitted for your review and comment is information on the above-referenced project. Please review the attached information and submit any comments by the internal deadline of **June 09, 2022** to *barbara.j.lee@hawaii.gov* at the Land Division.

If no response is received by the above due date, we will assume your agency has no comments at this time. Should you have any questions about this request, please contact Barbara Lee at the above email address. Thank you.

BRIEF COMMENTS:

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(✓) Comments are included/attached.

Signed: [signature]
Print Name: Carty S. Chang, Chief Engineer
Division: Engineering Division
Date: Jun 6, 2022

Attachments
Cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji

Ref: Pre-Consultation for an Environmental Assessment Waikiki Aquarium Water System Upgrade
Location: 2777 Kalakaua Avenue, Honolulu, Island of Oahu, Hawaii
TMK: (1) 3-1-031:006
Applicant: OCEANIT on behalf of the Waikiki Aquarium

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 Special Flood Hazard Area (high-risk areas). State projects are required to comply with 44CFR regulations as stipulated in Section 60.12. Be advised that 44CFR, Chapter 1, Subchapter B, part 60 reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood Hazard Zones are designated on FEMA's Flood Insurance Rate Maps (FIRM). The official FIRMs can be accessed through FEMA's Map Service Center (msc.fema.gov). Our Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT) could also be used to research flood hazard information.

If there are questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency 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) 270-7139.
- Kauai: County of Kauai, Department of Public Works (808) 241-4896.

The applicant should include water demands and infrastructure required to meet project needs. Please note that all State projects requiring water service from their local Department/Board of Water Supply system will be required to pay a resource development charge, in addition to Water Facilities Charges for transmission and daily storage.

The applicant is required to provide water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update projections.

Signed: ____________________
CARTY S. CHANG, CHIEF ENGINEER

Date: Jun 6, 2022

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

May 27, 2022

LD 0485

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources *(via email: kendall.l.tucker@hawaii.gov)*
__Div. of Boating & Ocean Recreation
X Engineering Division *(via email: DLNR.engr@hawaii.gov)*
X Div. of Forestry & Wildlife *(via email: rubyrosa.t.terrago@hawaii.gov)*
__Div. of State Parks
X Commission on Water Resource Management *(via email: DLNR.CWRM@hawaii.gov)*
X Office of Conservation & Coastal Lands *(via email: sharleen.k.kuba@hawaii.gov)*
X Land Division – Oahu District *(via email: barry.w.cheung@hawaii.gov)*

Russell Tsuji

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: **Pre-Consultation for an Environmental Assessment**
Waikiki Aquarium Water System Upgrade
LOCATION: 2777 Kalakaua Avenue, Honolulu, Island of Oahu, Hawaii
TMK: (1) 3-1-031:006
APPLICANT: **OCEANIT on behalf of the Waikiki Aquarium**

Transmitted for your review and comment is information on the above-referenced project. Please review the attached information and submit any comments by the internal deadline of **June 09, 2022** to *barbara.j.lee@hawaii.gov* at the Land Division.

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BRIEF COMMENTS:

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(☑) Comments are included/attached.

Signed: [signature]
Print Name: DAVID G.SMITH, Administrator
Division: Division of Forestry and Wildlife
Date: Jun 6, 2022

Attachments
Cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

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

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

June 3, 2022

MEMORANDUM

Log no. 3685

TO: RUSSELL Y. TSUJI, Land Administrator
Land Division

FROM: DAVID G. SMITH, Administrator
Division of Forestry and Wildlife

SUBJECT: Division of Forestry and Wildlife Comments for the Pre-Consultation for an Environmental Assessment (EA) for the Waikīkī Aquarium Water System Update on O'ahu

The Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) has received your pre-consultation request for an EA regarding the proposed Waikīkī Aquarium water system update project located at 2777 Kalakaua Avenue, Honolulu, on the island of O'ahu, TMK: (1) 3-1-031:006. The proposed project consists of updating the discharge system by installing piping inside the existing building and outside to route exhibit wastewater to a discharge sump located on the southwest side of the property.

The State listed Hawaiian Hoary Bat or 'Ōpe'ape'a (*Lasiurus cinereus semotus*) could potentially occur in the vicinity of the project area and may roost in nearby trees. Any required site clearing should be timed to avoid disturbance to bats during their birthing and pup rearing season (June 1 through September 15). During this period woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed. Barbed wire should be avoided for any construction because bat mortalities have been documented as a result of becoming ensnared by this type of fencing during flight.

Artificial lighting can adversely impact seabirds that may pass through the area at night by causing them to become disoriented. This disorientation can result in collision with manmade structures or grounding of birds. For nighttime work that might be required, DOFAW recommends that all lights used be fully shielded to minimize impacts. Nighttime work that requires outdoor lighting should be avoided during the seabird fledging season from September 15 through December 15. This is the period when young seabirds take their maiden voyage to the open sea. For illustrations and guidance related to seabird-friendly light styles that also protect the dark, starry skies of Hawai'i please visit: https://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf

The State threatened White Tern (*Gygis alba*) or Manu o Kū is known to nest in the proposed project vicinity. If tree trimming or removal is planned, DOFAW strongly recommends a qualified biologist survey for the presence of White Terns prior to any action that could disturb the trees. White Tern pairs lay their single egg in a branch fork with no nest. The eggs and chicks can be easily dislodged by construction equipment that nudges the trees. If a nest is discovered, please notify DOFAW staff for assistance.

The State endangered Hawaiian Monk Seal (*Monachus schauinslandi*) and threatened Green Sea Turtle (*Chelonia mydas*) could potentially occur or haul out on shore within the vicinity of the proposed project site. If either species is detected within 100 meters of the project area all nearby construction operations should cease and not continue until the focal animal has departed the area on its own accord.

DOFAW recommends minimizing the movement of plant or soil material between worksites, such as in fill. Soil and plant material may contain invasive fungal pathogens (e.g., Rapid ʻŌhiʻa Death), vertebrate and invertebrate pests (e.g., Little Fire Ants, Coconut Rhinoceros Beetle), or invasive plant parts that could harm our native species and ecosystems. We recommend consulting the Oʻahu Invasive Species Committee (OISC) at (808) 266-7994 in planning, design, and construction of the project to learn of any high-risk invasive species in the area and ways to mitigate spread. All equipment, materials, and personnel should be cleaned of excess soil and debris to minimize the risk of spreading invasive species. Gear that may contain soil, such as work boots and vehicles, should be thoroughly cleaned with water and sprayed with 70% alcohol solution to prevent the spread of Rapid ʻŌhiʻa Death and other harmful fungal pathogens.

DOFAW recommends using native plant species for landscaping that are appropriate for the area (i.e. climate conditions are suitable for the plants to thrive, historically occurred there, etc.). Please do not plant invasive species. DOFAW recommends consulting the Hawaiʻi-Pacific Weed Risk Assessment website to determine the potential invasiveness of plants proposed for use in the project (https://sites.google.com/site/weedriskassessment/home). We recommend that you refer to www.plantpono.org for guidance on selection and evaluation for landscaping plants.

We appreciate your efforts to work with our office for the conservation of our native species. Should the scope of the project change significantly, or should it become apparent that threatened or endangered species may be impacted, please contact our staff as soon as possible. If you have any questions, please contact Paul Radley, Protected Species Habitat Conservation Planning Coordinator at (808) 295-1123 or paul.m.radley@hawaii.gov.

Sincerely,

DAVID G. SMITH
Administrator

OA-22-179

LD 0485

TF

DAVID Y. IGE
GOVERNOR OF HAWAII

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

2022 MAY 27 P 3:11

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 27, 2022

RECEIVED
LAND DIVISION
2022 JUN 9 PM 1:54

LD 0485

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources *(via email: kendall.l.tucker@hawaii.gov)*
__Div. of Boating & Ocean Recreation
X Engineering Division *(via email: DLNR.engr@hawaii.gov)*
X Div. of Forestry & Wildlife *(via email: rubyrosa.t.terrago@hawaii.gov)*
__Div. of State Parks
X Commission on Water Resource Management *(via email: DLNR.CWRM@hawaii.gov)*
X Office of Conservation & Coastal Lands *(via email: sharleen.k.kuba@hawaii.gov)*
X Land Division – Oahu District *(via email: barry.w.cheung@hawaii.gov)*

Russell Tsuji

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: **Pre-Consultation for an Environmental Assessment**
Waikiki Aquarium Water System Upgrade
LOCATION: 2777 Kalakaua Avenue, Honolulu, Island of Oahu, Hawaii
TMK: (1) 3-1-031:006
APPLICANT: **OCEANIT on behalf of the Waikiki Aquarium**

Transmitted for your review and comment is information on the above-referenced project. Please review the attached information and submit any comments by the internal deadline of **June 09, 2022** to *barbara.j.lee@hawaii.gov* at the Land Division.

If no response is received by the above due date, we will assume your agency has no comments at this time. Should you have any questions about this request, please contact Barbara Lee at the above email address. Thank you.

BRIEF COMMENTS:

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(✓) Comments are included/attached.

Signed: [signature]
Print Name: Trevor Fitzpatrick
Division: OCCL
Date: 6/9/2022

Attachments
Cc: Central Files

DAVID Y. IGE
GOVERNOR OF
HAWAII

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

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
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BUREAU OF CONVEYANCES
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CONSERVATION AND RESOURCES ENFORCEMENT
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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

REF: OCCL: TF

COR: OA 22-179

Jun 9, 2022

Om Das
Oceanit Laboratories, Inc.
828 Fort Street Mall, Suite 600
Honolulu, HI 96813

SUBJECT: Pre-Consultation for an Environmental Assessment Waikiki Aquarium Water System Upgrade.
Located at 2777 Kalakaua Avenue
Kapiolani Park, Waikiki, Oahu
Tax Map Key (TMK): (1) 3-1-031:006

Dear Om Das:

The Office of Conservation and Coastal Lands (OCCL) has reviewed your letter and attachments regarding the subject matter. According to your letter, the Waikiki Aquarium is proposing to upgrade its water system infrastructure to ensure that the system complies with regulatory requirements. Upgrading the water system infrastructure is intended to dispose of all Waikiki Aquarium effluent into two (2) on-site injections wells eliminating the need to direct discharge into the ocean and the City and County of Honolulu wastewater system. The upgraded working system will be designed for a water use target of 800,000 gallons per day (GPD) to accommodate future improvements and master plan. A Draft Environmental Assessment (DEA) is being prepared for the proposed project.

The OCCL regulates land uses in the State Land Use Conservation District through the issuance of Conservation District Use Permits (CDUPs) and Site Plan Approvals (SPAs) to help conserve, protect, and preserve important natural and cultural resources. Based on the information you have provided; it appears that TMK: (1) 3-1-031:006 lies in the State Land Use Urban District. In this context, the OCCL offers the following comments on the proposed project and the preparation of its DEA.

It is unclear if land uses are being proposed makai of the shoreline or in the Conservation District. Proposed land uses in the Conservation District need to conform to Hawaii Administrative Rules (HAR) Chapter 13-5. A copy of HAR Chapter 13-5 can be obtained at https://dlnr.hawaii.gov/occl/rules/ .

Reference to and discussion regarding state sea level rise exposure area (SLR-XA) maps and the proposed action is required content in a DEA pursuant to HAR §11-200.1-18. This appears to be furthered by the recent amendments to HRS Chapter 205A under Act 16 (2020) which reiterates the need to evaluate potential impacts related to coastal hazards and sea level rise. As such, coastal hazards and sea level rise must be evaluated at a site-specific and cumulative level in the DEA.

A cursory review of the Hawaii State Sea Level Rise Viewer (https://www.pacioos.hawaii.edu/shoreline/slr-hawaii/) indicates that the subject parcel lies within the sea level rise exposure area (SLR-XA) (see attachment). We suggest that you include a thorough discussion of coastal hazards, climate change, sea level rise, and associated impacts in the development of the DEA. You and your clients may want to consider reviewing the Hawaii Sea Level Rise Vulnerability and Adaptation Report (2017) in preparing the DEA. A copy of the report can be obtained at https://climateadaptation.hawaii.gov/wp-content/uploads/2017/12/SLR-Report_Dec2017.pdf. Guidance for making planning decisions utilizing the SLR-XA can be found at https://climate.hawaii.gov/wp-content/uploads/2020/12/Guidance-for-Using-the-Sea-Level-Rise-Exposure-Area.pdf. The DEA must contain a summary description of the affected environment including, but not limited to, the project's exposure to coastal hazards as well as sea level rise.

It appears that the subject property is protected by a seawall. The OCCL requests that the DEA disclose the legal status of the seawall as well as its condition.

Should you have any questions, contact Trevor Fitzpatrick of the Office of Conservation and Coastal Lands at (808) 798-6660 or trevor.j.fitzpatrick@hawaii.gov .

Sincerely,

S Michael Cain

Michael Cain, Acting Administrator
Office of Conservation and Coastal Lands

CC: *Oahu District Land Division Office*
City and County of Honolulu, Department of Planning and Permitting

Sea Level Rise Projections For Modeling

Sea level rise exposure mapping in the 2017 Hawaii Sea Level Rise Report is based on an upper-end projection of 3.2 feet of sea level rise by 2100 in the 5th Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), the United Nations body of leading climate scientists and governmental representatives. The IPCC AR5 identified four sea level rise scenarios based on Representative Concentration Pathways (RCPs) for Greenhouse Gas (GHG) emissions (IPCC 2014). The IPCC AR5 "business-as-usual" GHG emissions scenario, RCP8.5, was used to model exposure to sea level rise. This scenario assumes GHG emissions continue to increase at their current rate and predicts as much as 3.2 feet of Global Mean Sea Level (GMSL) rise by the year 2100 (Figure 1).

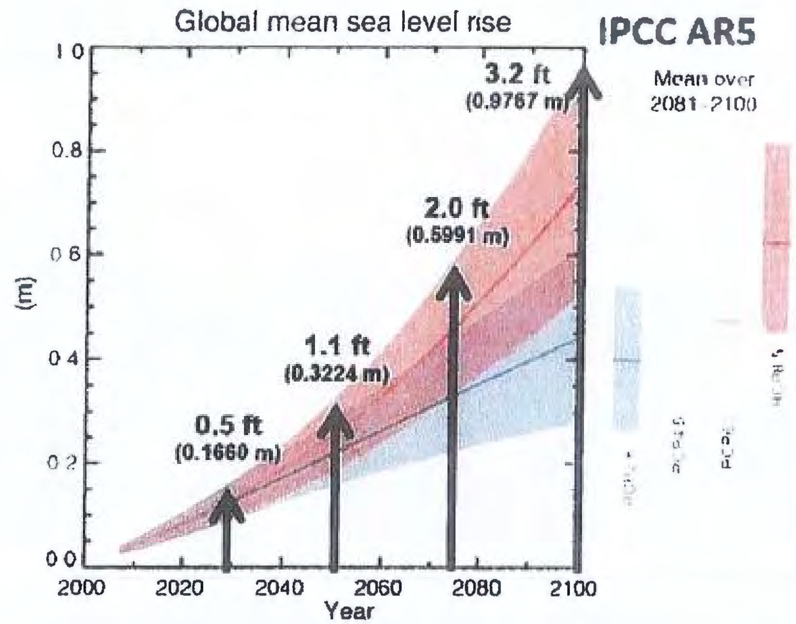


Figure 1. Projected GMSL rise under different greenhouse gas emissions scenarios from the IPCC AR5 Report.

As expected, the science on sea level rise observations and forecasts have continued to advance. Since completion of the 2017 Report, peer-reviewed scientific literature as well as government and multinational reports increasingly point to about 3 feet of sea level rise by 2100 as a mid-range, rather than high-end, scenario and show that sea level rise greater than 3 feet in this century is physically possible (Figure 2, Sweet et al. 2017). These increasing projections of sea level rise are based on greenhouse gas emissions, which continue to increase, and observations of accelerating ice mass loss to the oceans, particularly from Greenland and West Antarctica. The projections are often provided to 2100, though sea level rise will not stop at that time but will likely continue for centuries.

Attachment

Sea Level Rise : State of Hawaiʻi Sea Level Rise Viewer

An Interactive Mapping Tool in Support of the State of Hawaiʻi Sea Level Rise Vulnerability and Adaptation Report

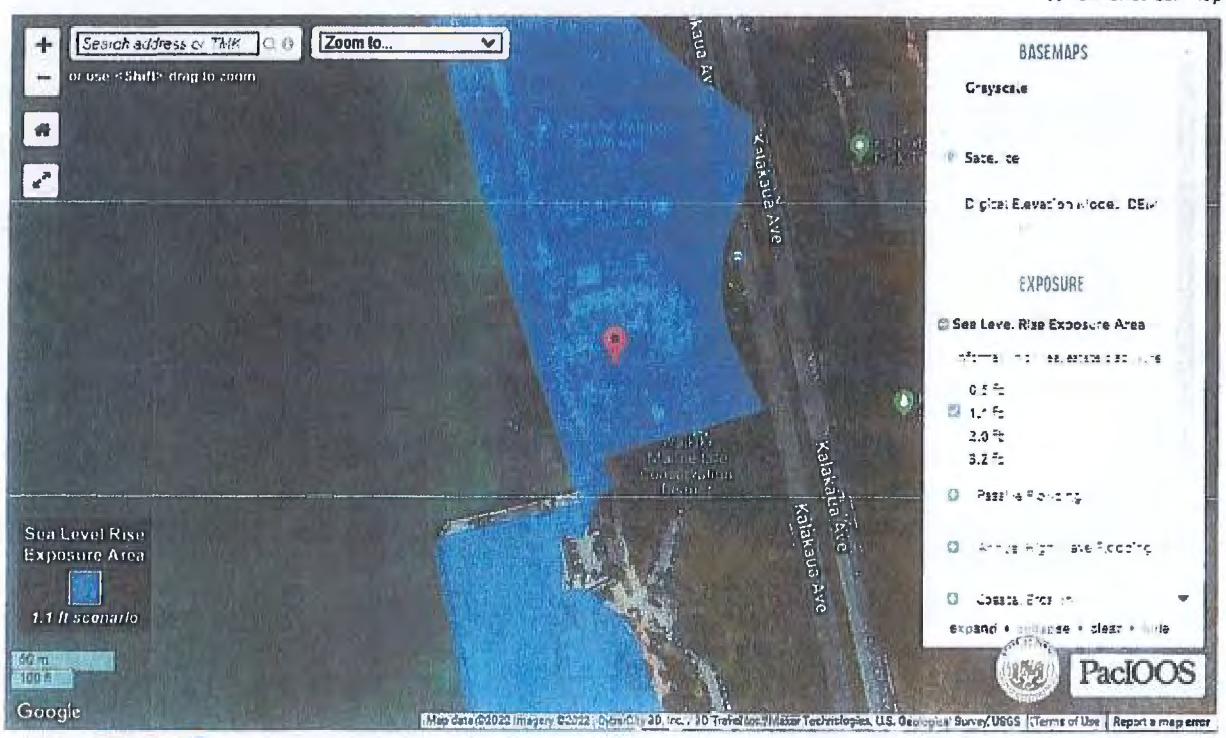
View full-screen map

opacity:

Sea Level Rise : State of Hawaiʻi Sea Level Rise Viewer

An Interactive Mapping Tool in Support of the State of Hawaiʻi Sea Level Rise Vulnerability and Adaptation Report

View full-screen map



Attachment

Sea Level Rise : State of Hawai'i Sea Level Rise Viewer

An Interactive Mapping Tool in Support of the State of Hawai'i Sea Level Rise Vulnerability and Adaptation Report

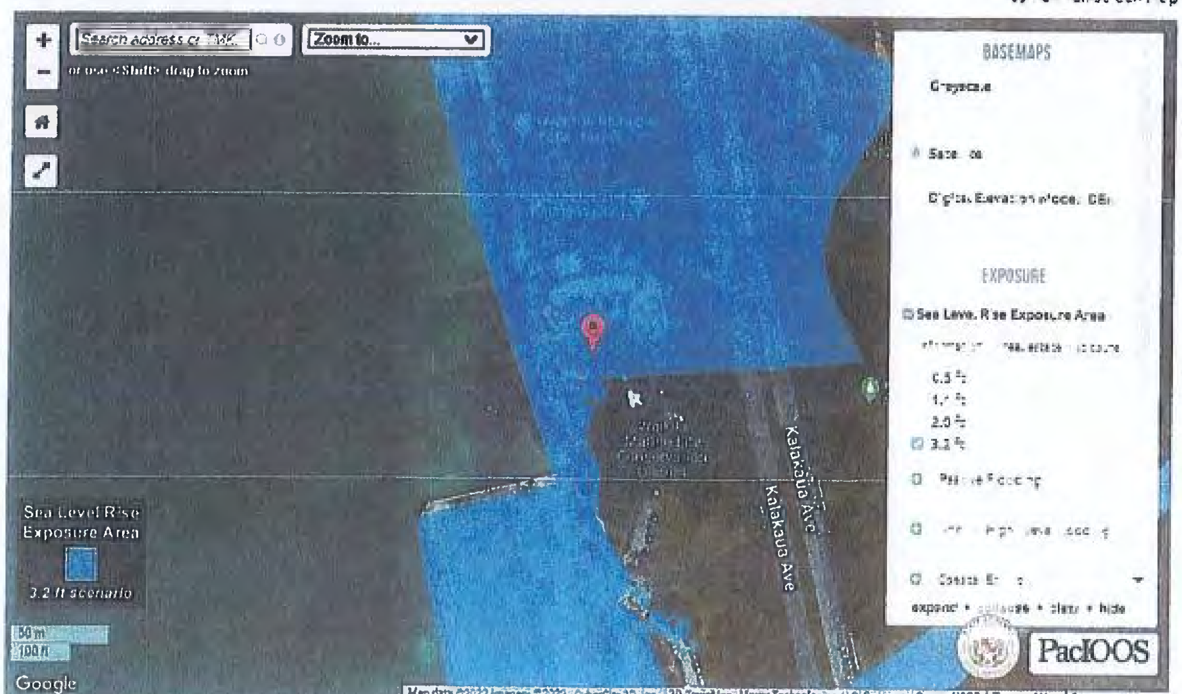
View full-screen map

opacity: 75%

Sea Level Rise : State of Hawai'i Sea Level Rise Viewer

An Interactive Mapping Tool in Support of the State of Hawai'i Sea Level Rise Vulnerability and Adaptation Report

View full-screen map



opacity:

Attachment

oceanit
innovation through engineering & scientific excellence

July 22, 2022

Russell Tsuji, Land Administrator
State of Hawai‘i
Department of Land and Natural Resources, Land Division
P. O Box 621
Honolulu, Hawaii 96809

Dear Mr. Tsuji:

SUBJECT: Environmental Assessment (EA) for the Waikīkī Aquarium Water System Upgrade Response to Pre-Consultation Comments

Thank you for your pre-consultation comment dated June 14, 2022, regarding the Waikīkī Aquarium Water System Upgrade. This letter responds to comments from the Engineering Division and the Division of Forestry and Wildlife. The Office of Conservation and Coastal Lands sent comments in a separate email, and we are responding to their comment directly.

We note comments from the Engineering Division to research the Flood Hazard Zone designation for the project. Further, the Engineering Division requested that the EA include water demands and infrastructure required to meet project needs and provide these calculations to this division. The EA will include that information and we will provide these calculations to the division.

The Division of Forestry and Wildlife commented that the endangerment of the Hawaiian Hoary Bat, seabirds, and the White Tern be considered in development of the plan, especially as related to the disturbance or removal of vegetation that may disturb roosting and nesting of these species. Further, it was noted that potential construction impacts on either the Hawaiian Monk Seal or Green Sea Turtle need to be addressed.

Other comments from the Division of Forestry and Wildlife were related to the adverse impacts of artificial lighting on seabirds and a recommendation to use native plant species appropriate for the area. It was also recommended that consultation with the O‘ahu Invasive Species Committee be conducted to learn of any high-risk invasive species that are in the area and ways to mitigate spread. All comments from the Division of Forestry and Wildlife will be incorporated in the analysis of potential impacts and recommended mitigation related to flora and fauna.

We will include copies of your comments and our response in the Draft EA. Further, we will notify you of its publication in *The Environmental Notice* published by the State of Hawaii, Office of Planning and Sustainable Development.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to
Brandon Shima, Project Manager, Office of Project Delivery, University of Hawai‘i
Tavia Oshiro, Environmental Compliance Program Manager, University Hawai‘i

Dale Uno

From: David Delaney - NOAA Federal <david.delaney@noaa.gov>
Sent: Wednesday, June 15, 2022 5:19 PM
To: Berna Senelly; WAq
Cc: Stuart Goldberg - NOAA Federal; Malia Chow - NOAA Federal; Gerry Davis - NOAA Federal
Subject: Re: [External] Waikiki Aquarium Injection Wells Request for Comments

Aloha Berna,

The National Marine Fisheries Service, Pacific Islands Regional Office (PIRO) received a request from Oceanit, on the behalf University of Hawaiʻi, for comments on potential adverse effects to the marine environment from proposed activities to upgrade the water circulation system at the Waikīkī Aquarium. Our technical assistance is provided below and is intended to help you avoid and minimize potential adverse effects to NOAA trust resources, including essential fish habitat (EFH). This technical assistance does not fulfill any federal responsibilities and does not constitute an EFH consultation, which requires a federal nexus. In addition to being the federal regulatory agency responsible for implementing the Magnuson-Stevens Fishery Conservation and Management Act (MSA; Section 305(b)(2) as described by 50 CFR 600.920), PIRO oversees consultations for compliance with the Endangered Species Act (ESA) and other statutory mandates. For all questions related to consultations with us in the future, please contact us through the email address EFHESAconsult@noaa.gov.

Given the information that you have provided, there currently is no federal nexus for consultation on EFH. If a permit is required by the U.S. Environmental Protection Agency, however, that permit would require the lead Federal agency to consult with NMFS on EFH if the activities may adversely affect EFH. Therefore, we recommend that you confirm whether such a permit(s) may be required and refer that agency to NMFS via the email address provided above. Irrespective, and because there could be potential impacts to NOAA trust resources, including EFH, below is our technical assistance intended to help you avoid and minimize potential adverse effects to the marine environment.

In the main Hawaiian Islands, EFH has been designated in the marine water column from the surface to a depth of 1,000 meters (m), from the shoreline to the outer boundary of the Exclusive Economic Zone (200 nautical miles), and the seafloor from the shoreline out to a depth of 700 m. These waters and submerged lands are designated as EFH because they support various life stages for the management unit species (MUS) identified under the Western Pacific Fishery Management Council's Pelagic and Hawaiʻi Archipelago Fishery Ecosystem Plan (Hawaiʻi FEP). The MUS and life stages found in these waters include: eggs, larvae, juveniles, and adults of Bottomfish MUS; eggs, larvae, juveniles, and adults of Crustacean MUS; and eggs, larvae, juveniles, and adults of Pelagic MUS. Specific types of habitat considered as EFH include coral reefs, patch reefs, hard substrate, seagrass beds, soft substrate, artificial or man-made structures, lagoon, estuarine, surge zone, deep-slope terraces and pelagic/open ocean.

NMFS is concerned that certain aspects of the proposed project may adversely affect EFH through the proposed activities due to increased intake and the release of seawater. Specifically, NMFS is concerned that: 1) increased seawater intake volumes will result in mortality to eggs, larvae, and juvenile life stages of federally managed fish species (e.g., Bottomfish, Pelagic, and Crustacean management unit species (MUS)), and 2) possible adverse effects to water quality from releasing water through the two injection wells.

Entrainment of Life History Stages of MUS:
The increase in water uptake from the current water supply for WA is approximately 470,000 gallons per day (GPD) and the upgraded working system will be designed for a water use target of 800,000 GPD to accommodate future improvements and the master plan. NMFS is concerned that there may be elevated mortality of eggs, larvae, and juveniles from various federally managed fish stocks. Therefore, to determine if this additional uptake entrains lifestages of MUS, it would be useful to complete an analysis of the water to see if it contains any MUS lifestages, as this is an increase of 70% of water intake and possible intake of MUS. Quantifying unavoidable loss of these life stages would be useful to develop potential avoidance and minimization measures, if practicable.

Adverse Effects of Releasing Processed Seawater Through the Injection Well
The release of seawater from the injection well may adversely affect the nearshore marine environment and NOAA trust resources via sedimentation and turbidity; and the potential delivery of elevated nutrients, pathogens, and chemical contaminants. We describe these topics below.

i. Sedimentation and Turbidity: Sedimentation may smother corals and seagrass. Elevated turbidity levels reduce light penetration and photosynthesis in corals and seagrass. These adverse effects may cause short-term, long-term to permanent, and cumulative adverse effects to habitat forming EFH such as corals and seagrass. Consider developing measures to avoid and minimize these adverse effects.

ii. Nutrient, Disease, and Chemical Contamination: Elevated macronutrient concentrations may cause algal overgrowth in coral reef ecosystems. Introduction of pathogens, including bacteria and viruses, can cause various types of coral disease resulting in degradation of coral condition. Chemical contaminants, including petroleum products and metal (e.g., copper in anti-fouling paints) can cause mortality and reduced reproductive success, respectively. In all, discharge of high concentrations of nutrients, pathogens, and chemical contaminants could reduce water quality and negatively affect marine life in the marine environment. We recommend that you consider these concerns and develop any potential avoidance and minimization measures.

We greatly appreciate the opportunity to provide comments. For all additional questions related to this, please contact us through the email address: EFHESAconsult@noaa.gov.

Best,
David

On Fri, Jun 10, 2022 at 6:18 AM Berna Senelly <bsenelly@oceanit.com> wrote:

> Aloha e Stu
>
> Thank you for your question. The project will not involve navigable waters; hence, no Army Corps permit. No federal funding is involved. Please contact me if you have other questions.
>
> Berna Senelly

From: Stuart Goldberg - NOAA Federal <stuart.goldberg@noaa.gov>
Sent: Friday, June 10, 2022 1:23 AM
To: WAq <WAq@oceanit.com>
Cc: David Delaney - NOAA Federal <david.delaney@noaa.gov>
Subject: Re: [External] Waikiki Aquarium Injection Wells Request for Comments

Aloha Berna,

Thanks much. Can you clarify what the potential Federal nexus is for this project? Is UH/Waikiki Aquarium getting an Army Corps permit or is there some Federal funding for this work?

Thanks. The nexus matters because it will dictate who NMFS will potentially consult with on this activity.

Stu

On Thu, Jun 9, 2022 at 6:31 PM WAq <WAq@oceanit.com> wrote:

> Aloha Mr. Goldberg:
>
> The attached Technical Memorandum from the hydrogeologist (Intera) provides background information on the proposed injection wells at the Waikiki Aquarium. There's no proposed in-water work for this project. This information will be included in the Draft Environmental Assessment.
>
> Please let me know if you have questions.
>
> Berna Senelly

From: Stuart Goldberg - NOAA Federal <stuart.goldberg@noaa.gov>
Sent: Thursday, June 9, 2022 1:11 AM
To: WAq <WAq@oceanit.com>
Cc: David Delaney - NOAA Federal <david.delaney@noaa.gov>
Subject: [External] Waikiki Aquarium Injection Wells Request for Comments

Aloha,

In drafting potential comments for the proposed injection well upgrade at the Waikiki Aquarium, I was wondering if you had any corresponding background material on the injection well so that we can better understand how it works and determine any concerns for leaching into the marine environment. Also, can you clarify if there is any proposed in-water work potentially decommissioning and/or removing any existing pipe?

Thanks,

Stu

--

Stuart Goldberg, Ph.D.
Acting EFH Coordinator, Pacific Islands Regional Office
NOAA Fisheries | U.S. Department of Commerce
Office: (858) 334-2818
www.fisheries.noaa.gov

July 29, 2022

David Delaney
Pacific Islands Regional Office (PIRO)
National Marine Fisheries Service
1845 Wasp Blvd., Bldg. 176
Honolulu, Hawaii 96818

Dear Mr. Delaney:

SUBJECT: Environmental Assessment (EA) for the Waikīkī Aquarium Water System Upgrade Response to Pre-Consultation Comments

Thank you for your pre-consultation comment dated June 15, 2022, regarding the Waikīkī Aquarium Water System Upgrade.

As you indicated in your comment, there is no federal nexus for consultation for essential fish habitat (EFH) and we confirm that no federal permits are required for this project.

We appreciate your technical assistance to help us avoid and minimize potential adverse effects on the marine environment. We note your concern regarding possible adverse effects due to increased intake and release of water, specifically as related to the mortality of eggs, larvae, and juveniles from various federally managed fish species. You also commented on the possible adverse effects to water quality from releasing water through the two injection wells.

The proposed project deals with the construction of a new effluent disposal system for the aquarium and does not include the intake system. The primary purpose of the project is to effectively eliminate any adverse impacts to the ocean environment from its current level. The EA will clarify the primary purpose of the proposed action and will incorporate your comments in the analysis of potential impacts and recommended mitigation, if appropriate, on marine habitat.

We will include copies of your comments and our response in the Draft EA. Further, we will notify you of its publication in *The Environmental Notice* published by the State of Hawaii, Office of Planning and Sustainable Development.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to
Brandon Shima, Project Manager, Office of Project Delivery, University of Hawaiʻi
Tavia Oshiro, Environmental Compliance Program Manager, University Hawaiʻi

Dale Uno

From: Berna Senelly
Sent: Tuesday, June 21, 2022 12:59 PM
To: Joshua Rudolph - NOAA Federal; WAq
Cc: Ron Dean - NOAA Federal
Subject: RE: [External] Re: Waikiki Aquarium

Mahalo, Joshua. We will include your comment in the Draft EA. Please let me know if you have any questions or further comments

Berna Senelly

oceanit

From: Joshua Rudolph - NOAA Federal <joshua.rudolph@noaa.gov>
Sent: Tuesday, June 21, 2022 4:58 PM
To: WAq <WAq@oceanit.com>
Cc: Berna Senelly <bsenelly@oceanit.com>; Ron Dean - NOAA Federal <ron.dean@noaa.gov>
Subject: [External] Re: Waikiki Aquarium

Aloha Berna,

As Stuart Goldberg (NMFS HCD) and you may have discussed, we've not been able to identify a federal nexus for your proposed project. We expect that we will likely see this through the EPA's Notice of Intent process, if you're required to permit it through them for water quality concerns. However, at this time we do not have any comments for your proposed project related to ESA-listed species.

Thanks,

Josh

On Wed, Jun 8, 2022 at 3:28 PM Ron Dean - NOAA Federal <ron.dean@noaa.gov> wrote:

> ---------- Forwarded message ---------
> From: **WAq** <WAq@oceanit.com>
> Date: Wed, Jun 8, 2022 at 3:26 PM
> Subject: Waikiki Aquarium
> To: ron.dean@noaa.gov <ron.dean@noaa.gov>, malia.chow@noaa.gov <malia.chow@noaa.gov>

Aloha Ron and Malia

As I mentioned, Oceanit is preparing the Environmental Assessment for the Waikiki Aquarium Water System Upgrade. We sent a letter requesting pre-consultation comments on May 9, 2022, and comments are due on June 10. 2022. I called Mr Tosatti to see if National Marine Fisheries Services was intending to submit comments and you both responded. Thank you.

I am attaching what we had sent on May 9. I understand that this is the first you are seeing this and appreciate it if you can send your pre-consultation comments by June 17. Please let me know if you have questions. I look forward to hearing from you.

All the best,

Berna

Berna Cabacungan Senelly | **Senior Regulatory and Community Lead**

828 Fort Street Mall Suite 600 | Honolulu, HI 96813

Email: bsenelly@oceanit.com

Office: 808.531.3017 ext. 221

Direct: 808.954.4221

Mobile: 817.422.1372

Fax: 808.531.3177
▸ **Website** | **Facebook** | **Twitter** | **LinkedIn**

--
Ron Dean
Intergovernmental Coordination and Conservation Branch Chief
Protected Resources Division
NOAA Fisheries | U.S. Department of Commerce
1845 Wasp Blvd., Bldg 176, Room 2884
Honolulu, HI 96818
Office: (808) 725-5140
www.fisheries.noaa.gov

--

Joshua Rudolph, M.Sc.
Endangered Species Biologist
Protected Resources
Pacific Island Regional Office
NOAA Fisheries | U.S. Department of Commerce
Office: (808) 725-5147
www.fisheries.noaa.gov

innovation through engineering & scientific excellence

July 29, 2022

Joshua Rudolph
National Oceanic and Atmospheric Agency Fisheries Service

Dear Mr. Rudolph:

SUBJECT: Environmental Assessment (EA) for the Waikīkī Aquarium Water System Upgrade
Response to Pre-Consultation Comments

Thank you for your pre-consultation comment dated June 21, 2022, regarding the Waikīkī Aquarium Water System Upgrade.

We note your comment that there is no federal nexus for the proposed action. You also commented that you have no comments related to ESA-listed species.

We will include copies of your comments and our response in the Draft EA. Further, we will notify you of its publication in *The Environmental Notice* published by the State of Hawaii, Office of Planning and Sustainable Development.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to
Brandon Shima, Project Manager, Office of Project Delivery, University of Hawai‘i
Tavia Oshiro, Environmental Compliance Program Manager, University Hawai‘i

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
230 OTAKE STREET
FORT SHAFTER, HAWAII 96858-5440

June 22, 2022

SUBJECT: Determination of No Permit Required for University of Hawaii, Waikiki Aquarium Water System Upgrade, Honolulu, Island of Oahu, Hawaii; Department of the Army File No. POH-2022-00081

University of Hawaii
c/o Mr. Om Das
Oceanit Laboratories, Inc
828 Fort Street Mall, Suite 600
Honolulu, Hawaii 96813

Dear Mr. Das:

The Honolulu District, U.S. Army Corps of Engineers (Corps), Regulatory Office has received your request for pre-consultation for an Environmental Assessment for the Waikiki Aquarium Water System Upgrade, located at 2777 Kalakaua Avenue, TMK (1) 3-1-031:006, in Honolulu, Island of Oahu, Hawaii. You submitted a description of the preliminary project design and requested comments regarding permitting requirements. Please reference the Corps project number POH-2022-00081 in any future correspondence related to this project.

We have reviewed your submittal pursuant to our authorities under Section 404 of the Clean Water Act (33 U.S.C. 1344; “Section 404”) and Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403; “Section 10”). Section 404 requires Department of Army (DA) authorization for the discharge (Placement) of dredged and/or fill material into waters of the U.S., including marine waters, streams, drainages, and wetlands. Under Section 404, the geographic limits of the Corps jurisdiction in marine waters is the high tide line. Section 10 requires DA authorization for the placement of structures in, under, or over navigable waters of the U.S. and/or other work affecting the course, location, condition or capacity of such waters. Under Section 10, the geographic limits of the Corps jurisdiction is the mean high water mark.

Based on the preliminary project description, associated figures, and desktop references, it appears that the proposed water system upgrade project on the Waikiki Aquarium property would occur in uplands, landward of the geographic limits of the Corps jurisdiction; therefore, the proposed project would not require a DA permit. This information is based on documentation that you have provided and does not constitute an approved jurisdictional determination on the project area.

Be advised that a DA permit may be required if you alter the method, scope, or location of your proposed work. In particular, if the proposed water system upgrade project extends into the Pacific Ocean beyond the seawall along the Waikiki Aquarium property then a DA permit may be required. You should contact our office if you are considering modifying your project.

Thank you for your cooperation with the Honolulu District Regulatory Program. Should you have any questions regarding the permitting process or our regulatory program, please contact me at Vera.B.Koskelo@usace.army.mil or via telephone at (808) 835-4310. You are encouraged to provide comments on your experience with the Honolulu District Regulatory Office by accessing our web-based customer survey form at https://regulatory.ops.usace.army.mil/customer-service-survey/.

Sincerely,

Vera Koskelo
Regulatory Project Manager
Regulatory Office

oceanit
innovation through engineering & scientific excellence

July 29, 2022

Vera Koskelo, Regulatory Project Manager
Regulatory Office U.S Army Corps of Engineers, Honolulu District
Department of the Army
230 Otake Street
Fort Shafter, Hawaii 96858-5440

Dear Ms. Koskelo:

SUBJECT: Environmental Assessment (EA) for the Waikīkī Aquarium Water System Upgrade Response to Pre-Consultation Comments

Thank you for your pre-consultation comment dated June 22, 2022, regarding the Waikīkī Aquarium Water System Upgrade.

We note your comment that the proposed action would not require a Section 404 Department of Army (DA) permit. We understand that a DA permit may be required if the method, scope, or location of the proposed work is altered or extends into the Pacific Ocean beyond the existing seawall.

We will include copies of your comments and our response in the Draft EA. Further, we will notify you of its publication in *The Environmental Notice* published by the State of Hawaii, Office of Planning and Sustainable Development.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to
Brandon Shima, Project Manager, Office of Project Delivery, University of Hawaiʻi
Tavia Oshiro, Environmental Compliance Program Manager, University Hawaiʻi

DEPARTMENT OF PARKS & RECREATION

CITY AND COUNTY OF HONOLULU

1000 Uluohia Street, Suite 309, Kapolei, Hawaii 96707
Phone: (808) 768-3003 • Fax: (808) 768-3053
Website: www.honolulu.gov

RICK BLANGIARDI
MAYOR

LAURA H. THIELEN
DIRECTOR

KEHAULANI PU'U
DEPUTY DIRECTOR

June 13, 2022

SEND VIA EMAIL

Mr. Om Das
WAq@oceanit.com

Dear Mr. Das:

SUBJECT: Environmental Assessment for the Waikiki Aquarium
Water System Upgrade
2777 Kalakaua Avenue
Honolulu, Hawaii 96815
TMK: (1) 3-1-031:006

The Department of Parks and Recreation (DPR) received the Pre-Consultation request for an Environmental Assessment for the Waikiki Aquarium Water System Upgrade dated on May 9, 2022.

After reviewing Oceanit Water System Upgrade project within the Waikiki Aquarium boundaries, future work does not appear to affect any DPR's neighboring properties. The proposed 18 inches wide 245 foot long PVC drain pipes for injection wells, should not impact Kapiolani Regional Park. Plans show all upgrades will be within Waikiki Aquarium, however contractor can apply for a DPR Right-of-Entry permit if needed.

Should you have any questions, please contact Ms. Jennifer Barra, Planner V, at jennifer.barra@honolulu.gov.

Sincerely,

Laura H. Thielen
Director

LHT:cw
(880779)

July 29, 2022

Laura Thielen, Director
City and County of Honolulu
Department of Parks and Recreation
1000 Uluohia Street, Suite 309
Kapolei, Hawaii 96707

Dear Ms. Thielen:

SUBJECT: Environmental Assessment (EA) for the Waikīkī Aquarium Water System Upgrade
Response to Pre-Consultation Comments

Thank you for your pre-consultation comment dated June 13, 2022, regarding the Waikīkī Aquarium Water System Upgrade.

We note your comment that the proposed action does not appear to affect any of the Department of Parks and Recreation's neighboring properties. An application for a Right-of-Entry permit will be submitted if deemed applicable. Your comments will be incorporated in our EA analysis of potential impacts and recommended mitigation measures, if any, on parks and recreation.

We will include copies of your pre-consultation comments and our response in the Draft EA. Further, we will notify you of its publication in *The Environmental Notice* published by the State of Hawaii, Office of Planning and Sustainable Development.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to
Brandon Shima, Project Manager, Office of Project Delivery, University of Hawai‘i
Tavia Oshiro, Environmental Compliance Program Manager, University Hawai‘i

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

RICK BLANGIARDI
MAYOR

DEAN UCHIDA
DIRECTOR

DAWN TAKEUCHI APUNA
DEPUTY DIRECTOR

June 22, 2022

2022/ELOG-1012(LM)

Mr. Om Das
Oceanit Laboratories, Inc.
828 Fort Street Mall, Suite 600
Honolulu, Hawaii 96813

Dear Mr. Das:

SUBJECT: Request for Pre-Consultation Comments
Environmental Assessment (EA) for the Waikiki Aquarium (WAq) Water System Upgrade
2777 Kalakaua Avenue – Waikiki
Tax Map Key 3-1-031: 006

This is in response to your letter, received May 13, 2022, requesting comments on the scope and content to be addressed in a Draft EA, as required under Chapter 343, Hawaii Revised Statutes (HRS), for the upgrade of the WAq water system. The WAq is a shoreline lot within the Special Management Area (SMA). The following items should be addressed in the Draft EA:

1. Long-term Planning Policies and Objectives: The Draft EA should address the proposed Project's consistency with the relevant policies of the General Plan and the Primary Urban Center Development Plan.

2. Land Use Ordinance (LUO) Chapter 21, Revised Ordinances of Honolulu (ROH): Based on a review of our records, the Project site is located on a 102,210-square-foot (2.346 acres) shoreline lot within the P-2 General Preservation District and Diamond Head Special Design District, Core Area. Therefore, proposed development activities must comply with the development standards applicable to the P-2 General Preservation District and the Diamond Head Special Design District, Core Area. Depending on the details of the Project, a Special District Permit may be required pursuant to LUO Section 21-9.40-6. Project compliance with these standards should be presented and evaluated in the Draft EA. The LUO is available on our website at: www.honoluludpp.org/ApplicationsForms/ZoningandLandUsePermits

3. Onsite Structures: The Draft EA should describe all existing and proposed structures and improvements on the site, including pools, garages, pavement, fences, walls, stairways, shoreline hardening structures, irrigation, individual wastewater systems, etc. If any existing structures or improvements are proposed to remain in place, the Draft EA should describe what and where they are located, whether they were lawfully established (permitted), and whether they are located within any required setback areas. Such structures and improvements should be included in the Draft EA's analysis of compliance with the applicable development standards in the LUO.

4. SMA: On September 15, 2020, Governor Ige signed Act 16 (2020) into law. The stated purpose of Act 16 (2020) is to strengthen the State's coastal zone management policy by amending Chapter 205A, HRS, to protect state beaches and dunes, and to reduce residential exposure to coastal hazards.

   The Draft EA should include in its analysis all of the required components for an SMA Use Permit under both Chapter 205A, HRS, as revised, and Chapter 25, ROH. The revised text of Chapter 205A, HRS, as amended by Act 16 (2020) is available online at:
   https://www.capitol.hawaii.gov/session2020/bills/SB2060_HD2_.htm

   Chapter 25, ROH, is available online at:
   www.honolulu.gov/rep/site/ocs/roh/ROH_Chapter_25_article_1_12.pdf

5. Shoreline Setback: The site is subject to a 40-foot shoreline setback and all development must be located outside of the setback area. The location of the regulatory shoreline setback must be confirmed on a shoreline survey certified by the State of Hawaii, and must also be reflected in the plans submitted for the SMA Use Permit to confirm compliance with the Shoreline Setback Ordinance (Chapter 23, ROH). A draft shoreline survey should be included and evaluated in the Draft EA. A *certified* shoreline survey should be included in the Final EA.

   Alternatively, if the Applicant seeks to waive the requirement for a certified shoreline survey and locate all development more than 55 feet from an uncertified (presumed) shoreline, the Draft EA should include a shoreline survey and plans that identify and label the proposed distance from the presumed shoreline. Under this approach, the Applicant must provide evidence documenting the location of the presumed shoreline. Such information may include, but is not limited to, a previously certified shoreline survey, erosion and/or accretion information, historic versus current photographs, and physical or geographic markers such as survey pins or trees that document the level of change in the shoreline since the most recent certified shoreline survey.

Please note that a waiver of the requirement for a certified shoreline survey is subject to the discretion of the Director of the Department of Planning and Permitting (DPP).

Chapter 23, ROH, is available online at:
www.honolulu.gov/rep/site/ocs/roh/ROH_Chapter_23__.pdf.pdf

The DPP Rules Relating to Shoreline Setbacks and the SMA are available online at:
www.honoluludpp.org/Portals/0/AboutDPP/administrativerules/DppRules03Shoreline.pdf

6. Flood Zone: The Draft EA should identify the subject property's Flood Zone, as mapped by the Federal Emergency Management Agency, and evaluate the proposed Project's compliance with the City's Flood Hazard Areas Ordinance (Chapter 21A, ROH), which is available online at:
https://www.honolulu.gov/rep/site/ocs/roh/ROH_Chapter_21A_.pdf

   Any new equipment, such as the pump station, shall be elevated or designed to withstand flooding.

7. Coastal Hazards: The Project site is susceptible to Sea Level Rise (SLR), tsunamis, and storm surge. Mayor's Directive 18-2, issued on July 16, 2018, requires all City departments and agencies to use the Hawaii *SLR Vulnerability and Adaptation Report*, the *SLR Guidance* and the *Climate Change Brief* in planning decisions. As a result, proposed development activities within the SMA must be evaluated not only for potential impacts to sensitive SMA resources, but also for current and future susceptibility to coastal hazards such as flooding, SLR, wave action, tsunami, and storm surge.

   The recent amendments to Chapter 205A, HRS, under Act 16 (2020), further reiterate the need to evaluate potential impacts related to coastal hazards and SLR. As such, the following items need to be evaluated in a site-specific coastal hazards analysis and evaluated in both the Draft EA and SMA Use Permit application prepared for the Project. This analysis should evaluate the site's existing topographic, geologic, and shoreline environment, and show whether and how a proposed development can safely be located outside of the 3.2-foot SLR Exposure Area and avoid impacts associated with other coastal hazards. This study should include analysis of potential impacts and mitigation measures associated with implementation of the Project related but not limited to the following:

- SLR - Potential impacts relating to SLR at the subject property, based on review of the State's SLR Exposure Area Mapping Tool, of 3.2 feet of SLR.

- Storm Surge - Potential impacts and hurricane storm surge inundation levels at the subject property during Category 1 through 4 hurricane events, based on review of the National Oceanic and Atmospheric Administration's (NOAA) National Hurricane Storm Surge Hazard Maps.

- Potential cumulative impacts of coastal hazards and property inundation should SLR exacerbate flooding, coastal erosion, wave-action, or other coastal hazards that may occur at the subject property.

The Draft EA should also explore Project alternatives, site design (siting and configuring the proposed dwelling as far from the shoreline as possible), Project design features (elevated structures, alternative foundations, etc.), Best Management Practices, and appropriate mitigation measures to reduce potential impacts related to coastal hazards to the extent possible. Relevant sources of information are available online at the following links:

- Mayor's Directive No. 18-2 (2018) regarding climate change and SLR: www.honolulu.gov/rep/site/dpptod/climate_docs/MAYORS_DIRECTIVE_18-2.pdf

- SLR Vulnerability and Adaptation Report: http://climate.hawaii.gov/wp-content/uploads/2019/02/SLR-Report_Dec2017-with-updated-disclaimer.pdf

- State SLR Exposure Area Mapping Tool: www.pacioos.hawaii.edu/shoreline/slr-hawaii/

- Guidance for Using the SLR Exposure Map : https://climate.hawaii.gov/wp-content/uploads/2020/12/Guidance-for-Using-the-Sea-Level-Rise-Exposure-Area.pdf

- Honolulu Office of Climate Change, Sustainability and Resiliency Climate Ready Oahu Web Explorer: www.resilientoahu.org/water

- NOAA Storm Surge Mapping tool: https://www.nhc.noaa.gov/nationalsurge/

8. <u>Wetlands and Sensitive Species</u>: The Draft EA should identify the presence or potential presence of any protected wetlands, sensitive habitat, flora species, and fauna species. The DPP recommends reaching out to the U.S. Fish and Wildlife Service (USFWS) to obtain a list of species that are known to occur, or may potentially occur, in the Project vicinity. Known, mapped wetlands can be viewed on the USFWS National Wetlands Inventory *Wetlands Mapper*. The Draft EA must evaluate potential impacts to each identified sensitive species, and provide standard agency-required mitigation measures as well as any applicable site-specific mitigation measures to avoid or minimize potential impacts to each identified species, critical habitat and habitat applicable to the site. The Wetlands Mapper is available online at: https://www.fws.gov/wetlands/data/mapper.html.

10. Please be advised that in December 2020, the State Historic Preservation Division (SHPD) began using a new online system to better track consultation requests: https://shpd.hawaii.gov/hicris/landing.

    Because the new tracking system requires agency-to-agency requests, the DPP has created a generic request letter that consultant's/property owners may use for projects that will eventually require DPP approval. This letter may be completed by a consultant or property owner and submitted to SHPD directly via their online system to initiate requests before permit applications are submitted to the DPP. The letter includes a general DPP contact number and email, as well as blank fields where the property owner or their consultant can enter their contact information. The generic request letter is available online at: https://tinyurl.com/h7yvc7vp.

Finally, please contact the appropriate Neighborhood Board (NB) and any relevant neighborhood associations or commissions to request an opportunity to present the Project proposal at the next available NB meeting and/or association meeting(s).

Thank you for the opportunity to comment on this proposal. Should you have any questions, please contact Laura Mo, of our staff, at (808) 768-8025 or via email at laura.mo@honolulu.gov.

Very truly yours,

Alex R. Beatty

for Dean Uchida
Director

oceanit

innovation through engineering & scientific excellence

July 29, 2022

Dean Uchida, Director
City and County of Honolulu
Department of Planning and Permitting
650 South King Street, 7th Floor
Honolulu, Hawaiʻi 96813

Dear Mr. Uchida:

SUBJECT: Environmental Assessment (EA) for the Waikīkī Aquarium Water System Upgrade Response to Pre-Consultation Comments

Thank you for your pre-consultation comment dated June 22, 2022, regarding the Waikīkī Aquarium Water System Upgrade.

We note your comments to address the project's consistency with several plans, policies and regulations, in the Honolulu General Plan, the Primary Urban Center Development Plan, zoning, the Diamond Head Special Design District, Special Management Area (SMA), and Shoreline Setback. The DEA will include a separate section discussing consistency with Federal, State and County plans, policies and regulations.

Regarding the SMA, we received a determination from DPP (dated April 18, 2022) that the project requires a Major SMA and are proceeding accordingly. In addition, we will be applying for a Shoreline Setback and will include a draft shoreline survey in the Draft EA and a certified shoreline survey in the Final EA.

In addition to addressing the aforementioned comments, the EA will also include a description of onsite structures and how they may be affected by the proposed actions.

We will include copies of your pre-consultation comments and our response in the Draft EA. Further, we will notify you of its publication in *The Environmental Notice* published by the State of Hawaii, Office of Planning and Sustainable Development.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to
Brandon Shima, Project Manager, Office of Project Delivery, University of Hawaiʻi
Tavia Oshiro, Environmental Compliance Program Manager, University Hawaiʻi

Appendix I:

Draft EA Comment Letters and Responses

DAVID Y. IGE
GOVERNOR
KE KIA'ĀINA

AUDREY HIDANO
COMPTROLLER
KA LUNA HO'OMALU HANA LAULĀ

MEOH-LENG SILLIMAN
DEPUTY COMPTROLLER
KA HOPE LUNA HO'OMALU HANA LAULĀ

STATE OF HAWAIʻI | KA MOKUʻĀINA O HAWAIʻI
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES | KA ʻOIHANA LOIHELU A LAWELAWE LAULĀ
P.O. BOX 119, HONOLULU, HAWAII 96810-0119

(P)22.198

NOV 14 2022

Berna Senelly
Oceanit Laboratories, Inc.
828 Fort Street Mall, Suite 600
Honolulu, Hawaii 96813

Dear Ms. Senelly:

Subject: Draft Environmental Assessment
The Waikiki Aquarium Water System Upgrade
2777 Kalakaua Avenue
Honolulu, Oahu, Hawaii
TMK: (1) 3-1-031: 006

Thank you for the opportunity to comment on the subject project. We have no comments to offer at this time as the proposed project does not impact any of the Department of Accounting and General Services' projects or existing facilities.

If you have any questions, your staff may call Dora Choy of the Planning Branch at (808) 586-0488.

Sincerely,

CHRISTINE L. KINIMAKA
Public Works Administrator

DC:mo

February 23, 2023

Christine Kinimaka, Public Works Administrator
Hawai‘i Department of Accounting and General Services
P. O. Box 119
Honolulu, Hawaii 96810-0119

Dear Ms. Kinimaka:

SUBJECT: Draft Environmental Assessment
Waikīkī Aquarium Water System Upgrade
2777 Kalākaua Avenue
Honolulu, HI 96815
TMK (1) 3-1-031:006

Thank you for your comment letter dated November 14, 2022 on the Draft Environmental Assessment regarding the Waikīkī Aquarium Water System Upgrade. We note that you have no comments to offer at this time. We will append your comment and our response in the Final Environmental Assessment.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to

Brandon Shima, Project Manager, Office of Project Delivery, University of Hawai‘i
Lise Ditzel-Ma, Project Manager, Office of Project Delivery, University of Hawai‘i
Tavia Oshiro, Environmental Compliance Program Manager, University Hawai‘i

DAVID Y. IGE
GOVERNOR

JADE T. BUTAY
DIRECTOR

Deputy Directors
ROSS M. HIGASHI
EDUARDO P. MANGLALLAN
DAVID J. RODRIGUEZ
EDWIN H. SNIFFEN

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

IN REPLY REFER TO:

DIR 0499
HWY-OM 2.22-0930

November 29, 2022

VIA EMAIL: WAq@oceanit.com

Mr. Om Das
Oceanit Laboratories, Inc.
828 Fort Street Mall, Suite 600
Honolulu, Hawaii 96813

Dear Mr. Das:

Subject: Request for Pre-Consultation for an Environmental Assessment for the Waikiki Aquarium Water System Upgrade

Thank you for your letter dated May 9, 2022, regarding the subject above. We have no comments to offer and have no requirements as your project does not impact Hawaii Department of Transportation facilities or properties. We apologize for the late response.

Should you have further questions, please contact Ryan Nakata, Maintenance Engineer, of our Highways Division, Oahu District at (808) 831-6700 ext. 134 or via email at ryan.a.nakata@hawaii.gov.

Sincerely,

JADE T. BUTAY
Director of Transportation

oceanit
innovation through engineering & scientific excellence

February 23, 2023

Mr. Ed Sniffen, Director
Hawaiʻi State Department of Transportation
869 Punchbowl Street
Honolulu, Hawaiʻi 96813-5097

Dear Director Sniffen:

SUBJECT: Draft Environmental Assessment
Waikīkī Aquarium Water System Upgrade
2777 Kalākaua Avenue
Honolulu, HI 96815
TMK (1) 3-1-031:006

Thank you for your comment letter dated November 29, 2022, on the Draft Environmental Assessment regarding the Waikīkī Aquarium Water System Upgrade. We note that you have no comments to offer and no project requirements that would impact your facilities or properties. We will include your comment and our response in the Final Environmental Assessment.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to

Brandon Shima, Project Manager, Office of Project Delivery, University of Hawaiʻi
Lise Ditzel-Ma, Project Manager, Office of Project Delivery, University of Hawaiʻi
Tavia Oshiro, Environmental Compliance Program Manager, University Hawaiʻi

Oceanit Center 828 Fort Street Mall, Suite 600 Honolulu, Hawaii 96813 Phone: 808.531.3017 Fax: 808.531.3177
www.oceanit.com

DAVID Y. IGE
GOVERNOR OF HAWAII

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

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

December 6, 2022

MEMORANDUM *Log no. 3897*

TO: RUSSELL Y. TSUJI, Land Administrator
Land Division

FROM: LAINIE BERRY, Wildlife Program Manager
Division of Forestry and Wildlife

SUBJECT: **Division of Forestry and Wildlife Comments for a Draft Environmental Assessment (DEA) for the Waikiki Aquarium (Waq) Water System Upgrade Project on Oʻahu**

The Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) has received your request for comments for a DEA regarding the proposed Waq water system upgrade project located at 2777 Kalākaua Avenue in Waikīkī, Honolulu, on the island of Oʻahu; TMK: (1) 3-1-031:006. The proposed project consists of installing a wastewater discharge/transfer sump and pumps, two (2) onsite injection wells and associated appurtenances and equipment for the disposal of aquarium exhibit wastewater and upgrading the piping inside the existing building and the property.

DOFAW concurs with the mitigation measures included in the DEA intended to avoid construction and operational impacts to State-listed species including the Hawaiian Hoary bat (*Lasiurus cinereus semotus*), White Fairy Tern (*Gygis alba*), Hawaiian Monk Seal *(Neomonachus schauinslandi*), Green Sea Turtle(*Chelonia mydas*), Hawaiian petrel (*Pterodroma sanwichensis*), Newell's shearwater (*Puffinus auricularis newelli*), and Band-rumped storm-petrel (*Oceanodroma castro*). For illustrations and guidance related to seabird-friendly light styles that also protect the dark, starry skies of Hawaiʻi, please visit https://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf. We also appreciate the measures outlined to prevent the spread of invasive species and for the use of native plant species for landscaping. DOFAW has no additional comments regarding the potential for the proposed work to affect listed species in the vicinity of the project area.

We appreciate your efforts to work with our office for the conservation of our native species. These comments are general guidelines and should not be considered comprehensive for this site or project. It is the responsibility of the applicant to do their own due diligence to avoid any negative environmental impacts. Should the scope of the project change significantly, or should it become apparent that threatened or endangered species may be impacted, please contact our staff as soon as possible. If you have any questions, please contact Paul Radley, Protected Species Habitat Conservation Planning Coordinator at (808) 295-1123 or paul.m.radley@hawaii.gov.

Sincerely,

Lainie Berry

LAINIE BERRY
Wildlife Program Manager

February 23, 2023

Ms. Lanie Berry, Wildlife Program Manager
Divison of Forestry and Wildlife
Hawai‘i Department of Land and Natural Resources
1151 Punchbowl Street, Room 325
Honolulu, Hawai‘i 96813

Dear Ms. Berry:

SUBJECT: Draft Environmental Assessment
Waikīkī Aquarium Water System Upgrade
2777 Kalākaua Avenue
Honolulu, HI 96815
TMK (1) 3-1-031:006

Thank you for your comment letter dated December 6, 2022, on the Draft Environmental Assessment (DEA) regarding the Waikīkī Aquarium Water System Upgrade. We note your concurrence with mitigation measures included in the DEA intended to avoid construction and operational impacts to State-listed species including the Hawaiian Hoary bat (*Lasiurus cinereus semotus*), White Fairy Tern (*Gygis alba*), (*Neomonachus schauinslandi*), Green Sea Turtle(*Chelonia mydas*), Hawaiian petrel (*Pterodroma sanwichensis*), Newell’s shearwater (*Puffinus auricularis newelli*), and Band-rumped storm-petrel (*Oceanodroma castro*). Further we will consult with

We understand that it is the applicant‘s responsibility to do due diligence to avoid any negative environmental impacts. Should the scope of the project change significantly, or should it become apparent that threatened or endangered species may be impacted, we will contact your staff as soon as possible. Your comments and our responses will be appended to the Final Environmental Assessment.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to

Brandon Shima, Project Manager, Office of Project Delivery, University of Hawai‘i
Lise Ditzel-Ma, Project Manager, Office of Project Delivery, University of Hawai‘i
Tavia Oshiro, Environmental Compliance Program Manager, University Hawai‘i

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

November 10, 2022

LD 0478e

MEMORANDUM

FROM: ~~TO:~~ **DLNR Agencies:**
X Div. of Aquatic Resources *(via email: kendall.l.tucker@hawaii.gov)*
__Div. of Boating & Ocean Recreation *(via email: richard.t.howard@hawaii.gov)*
X Engineering Division *(via email: DLNR.Engr@hawaii.gov)*
X Div. of Forestry & Wildlife *(via email: rubyrosa.t.terrago@hawaii.gov)*
__Div. of State Parks
X Commission on Water Resource Management *(via email: DLNR.CWRM@hawaii.gov)*
X Office of Conservation & Coastal Lands *(via email: sharleen.k.kuba@hawaii.gov)*
X Land Division – Oahu District *(via email: barry.w.cheung@hawaii.gov)*

Russell Tsuji

TO: ~~FROM:~~ Russell Y. Tsuji, Land Administrator
SUBJECT: **Draft Environmental Assessment (DEA)**
Waikiki Aquarium Water System Upgrade
LOCATION: 2777 Kalakaua Avenue, Honolulu, Island of Oahu, Hawaii
TMK: (1) 3-2-031:006
APPLICANT: **Oceanit on behalf of the University of Hawaii at Manoa for the Waikiki Aquarium**

Transmitted for your review and comment is information on the above-referenced subject. The DEA was published on November 08, 2022 by the State Environmental Review Program (formerly the Office of Environmental Quality Control) at the Office of Planning and Sustainable Development in the periodic bulletin, The Environmental Notice, available at the following link:

https://files.hawaii.gov/dbedt/erp/The_Environmental_Notice/2022-11-08-TEN.pdf

Please submit any comments by **December 06, 2022,** to *barbara.j.lee@hawaii.gov* at Land Division. If no response is received by this date, we will assume your agency has no comments. If you have any questions, please contact Barbara Lee directly at the above email address. Thank you.

BRIEF COMMENTS:

( ) We have no objections.
( ) We have no comments.
(✓) We have no additional comments.
( ) Comments are included/attached.

Signed:
Print Name: Carty S. Chang, Chief Engineer
Division: Engineering Division
Date: Nov 17, 2022

Attachments
Cc: Central Files

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February 23, 2023

Mr. Carty Chang, Chief Engineer
Engineering Division
Hawai‘i State Department Land and Natural Resources
P.O Box 621
Honolulu, Hawai‘i 96809

Dear Mr. Chang:

SUBJECT: Draft Environmental Assessment
Waikīkī Aquarium Water System Upgrade
2777 Kalākaua Avenue
Honolulu, HI 96815
TMK (1) 3-1-031:006

Thank you for your comment form dated November 17, 2022, on the Draft Environmental Assessment regarding the Waikīkī Aquarium Water System Upgrade. We note that you have no additional comments. We will append your comment and our response in the Final Environmental Assessment.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to
Brandon Shima, Project Manager, Office of Project Delivery, University of Hawai‘i
Lise Ditzel-Ma, Project Manager, Office of Project Delivery, University of Hawai‘i
Tavia Oshiro, Environmental Compliance Program Manager, University Hawai‘i

DAVID Y. IGE
GOVERNOR OF HAWAII

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

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AND COASTAL LANDS

2022 NOV 10 P 3:01

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

DEPT. OF LAND &
NATURAL RESOURCES
STATE OF HAWAII

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 10, 2022

LD 0478e

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources *(via email: kendall.l.tucker@hawaii.gov)*
__Div. of Boating & Ocean Recreation *(via email: richard.t.howard@hawaii.gov)*
X Engineering Division *(via email: DLNR.Engr@hawaii.gov)*
X Div. of Forestry & Wildlife *(via email: rubyrosa.t.terrago@hawaii.gov)*
__Div. of State Parks
X Commission on Water Resource Management *(via email: DLNR.CWRM@hawaii.gov)*
X Office of Conservation & Coastal Lands *(via email: sharleen.k.kuba@hawaii.gov)*
X Land Division – Oahu District *(via email: barry.w.cheung@hawaii.gov)*

FROM: Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: **Draft Environmental Assessment (DEA)**
Waikiki Aquarium Water System Upgrade
LOCATION: 2777 Kalakaua Avenue, Honolulu, Island of Oahu, Hawaii
TMK: (1) 3-2-031:006
APPLICANT: **Oceanit on behalf of the University of Hawaii at Manoa for the Waikiki Aquarium**

Transmitted for your review and comment is information on the above-referenced subject. The DEA was published on November 08, 2022 by the State Environmental Review Program (formerly the Office of Environmental Quality Control) at the Office of Planning and Sustainable Development in the periodic bulletin, The Environmental Notice, available at the following link:

https://files.hawaii.gov/dbedt/erp/The_Environmental_Notice/2022-11-08-TEN.pdf

Please submit any comments by **December 06, 2022,** to *barbara.j.lee@hawaii.gov* at Land Division. If no response is received by this date, we will assume your agency has no comments. If you have any questions, please contact Barbara Lee directly at the above email address. Thank you.

BRIEF COMMENTS:

( ) We have no objections.
(✓) We have no comments.
( ) We have no additional comments.
( ) Comments are included/attached.

Signed: [signature]
Print Name: K. Tiger Mills
Division: DLNR - DCCL
Date: 11/27/2022

No need maintained in DCCL

Attachments
Cc: Central Files

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February 23, 2023

Ms. K Tiger Mills
Office of Conservation and Coastal Lands
Hawai‘i State Department Land and Natural Resources
P. O. Box 621
Honolulu, Hawai‘i 96809

Dear Ms. Mills:

SUBJECT: Draft Environmental Assessment
Waikīkī Aquarium Water System Upgrade
2777 Kalākaua Avenue
Honolulu, HI 96815
TMK (1) 3-1-031:006

Thank you for your comment form dated November 27, 2022 on the Draft Environmental Assessment regarding the Waikīkī Aquarium Water System Upgrade. We note that you have no comments. We will include your comment and our response in the Final Environmental Assessment.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to

Brandon Shima, Project Manager, Office of Project Delivery, University of Hawai‘i
Lise Ditzel-Ma, Project Manager, Office of Project Delivery, University of Hawai‘i
Tavia Oshiro, Environmental Compliance Program Manager, University Hawai‘i

STATE OF HAWAIʻI
OFFICE OF PLANNING
& SUSTAINABLE DEVELOPMENT

JOSH GREEN, M.D.
GOVERNOR

SCOTT J. GLENN
DIRECTOR

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

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

Coastal Zone Management Program

Environmental Review Program

Land Use Commission

Land Use Division

Special Plans Branch

State Transit-Oriented Development

Statewide Geographic Information System

Statewide Sustainability Branch

DTS202211090905NA

December 12, 2022

Ms. Berna Cabacungan Senelly
Oceanit
Senior Regulatory and Community Lead
828 Fort Street Mall, Suite 600
Honolulu, HI 96813

Dear Ms. Cabacungan Senelly:

Subject: Draft Environmental Assessment Waikīkī Aquarium Water System Update Plan, Honolulu, Oʻahu, Hawaiʻi
TMK: (1) 3-1-031: 006

Thank you for the opportunity to provide comments for the Draft Environmental Assessment (Draft EA) for the proposed Waikīkī Aquarium Water System Update Plan. The Draft EA consultation review material was received by our office via memo on November 8, 2022.

It is our understanding that the proposed action includes installation of a wastewater discharge/transfer sump and pumps, two onsite injection wells and associated appurtenances and equipment for disposal of aquarium exhibit wastewater, and upgrading the piping inside the existing building and the property. Three pumps connected to the discharge/transfer sump will pump the wastewater from the sump to a filter house structure on the south side of the property for filtration prior to discharge into the two injection wells.

The Office of Planning and Sustainable Development (OPSD) has reviewed the transmitted material, and has the following comments to offer:

1. <u>Executive Summary</u>
The Executive Summary lists an Alternative A - filter and treat wastewater prior to being discharge into the existing ocean outfall, and Alternative B – native exhibit waster filtered and treated prior to being discharged through ocean outfall; non-native exhibit wastewater filtered prior to being discharged into injection well. On page 1, the Draft EA states that Option 1 - Disposal of all effluent into on-site injection wells is referred to as the Proposed Action. OPSD suggests that the Final Environmental Assessment (Final EA) list all alternatives, include the preferred alternative, keep the term "Alternative" instead of "Option", and make it clear in Executive Summary which alternative is the Proposed Action.

2. Increase in Saltwater Supply
   Section 3, pages 11-12 of the Draft EA discuss design option developments. On page 11, the Draft EA states that one of the key goals for the effluent discharge would accommodate an increase in Waikīkī Aquarium saltwater supply to 800,000 gallon per day (GPD) from its present 470,000 GPD in anticipation of future exhibits. The Final EA should provide an assessment and justification on the increase in saltwater supply, which nearly doubles the present level. Such amount increase in saltwater supply will affect the depth, capacity, lifespan and even the number of the proposed injection wells for the disposal of saltwater.

3. Sea Level Rise (SLR)/Climate Change Adaptation
   In our pre-consultation response letter, DTS 202205161051NA, dated June 9, 2022, we noted that the aquarium's location is highly vulnerable to future coastal hazards related impacts related to rising sea levels such as seasonal coastal inundation, storm surges, and beach erosion. We acknowledge that Section 3.2.1, pages 36-38 of the Draft EA evaluate Climate Change and Sea Level Rise and includes the findings of the Hawai'i Sea Level Rise Vulnerability and Adaptation Report. However, the Draft EA concedes that the Waikīkī Aquarium complex is entirely within the 3.2 SLR-exposure area, a long-term plan for adaptation or relocation may need to be developed. Furthermore, under this scenario a Category 4 hurricane could bring storm surge flooding which will inundate the entire parcel with water levels less than 3 feet above ground.

4. Hawai'i Coastal Zone Management (CZM) Program
   Section 4.3, Page 53, states "Hawaii's CZM program was enacted in 1977 and amended in 2019 (HRS Chapter 205A)." This should be changed to "The Hawai'i CZM Program was approved by the federal government in 1978 and the state in 1977 and is codified under HRS Chapter 205A."

5. Special Management Area (SMA)
   Section 4.6, Page 55 of the Draft EA states, "HRS §205A-21 defines SMA as lands extending inland from the shoreline as delineated in maps filed with the Authority as of June 8, 1977, or as amended pursuant to HRS §205A-23 and amended in Act 116 on September 9, 2020."

   For accuracy, please correct the above statement(s). The SMA extends inland from and along the shoreline. SMA in each county shall be as shown on such maps filed with the authority as of June 8, 1977, pursuant to HRS § 205A-23. Act 16, Session Laws of Hawaii 2020, which amended HRS Chapter 205A, was enacted on September 15, 2020.

6. Shoreline Setbacks
   Section 4.8, page 63 discusses shoreline setback variances. Please note that a variance is not a permit **but is an exception** to the prohibition of structures or activities that are located within the shoreline area. Please correct references to "shoreline setback **permit**" accordingly.

   OPSD suggests that the Final EA provide a map layout of the shoreline area with a certified shoreline and the shoreline setback line decided by the City and County of Honolulu, Department of Planning Permitting, and discuss all proposed structures and activities that will occur within the shoreline area.

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

Sincerely,

Scott J. Glenn

Scott J. Glenn,
Director

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February 23, 2023

Mr. Scott Glenn, Director
Hawai'i Office of Planning and Sustainable Development
235 South Beretania Street, 6th Floor
Honolulu, Hawai'i 96813

Dear Mr. Glenn:

SUBJECT: Draft Environmental Assessment
Waikīkī Aquarium Water System Upgrade
2777 Kalākaua Avenue
Honolulu, HI 96815
TMK (1) 3-1-031:006

Thank you for the Office of Planning and Sustainable Development's comment letter dated December 12, 2022 on the Draft Environmental Assessment (DEA) regarding the Waikīkī Aquarium Water System Upgrade. Our responses are as follows:

1. Executive Summary – We appreciate your clarification on how we identify the alternatives, and will use "Alternative" rather than "Option" as appropriate.

2. Increase in Saltwater Supply – We agree that the increased saltwater supply will necessitate increased injection well capacity. Each well is designed to accommodate the design maximum discharge of 594 gallons per minute. This equates to 855,000 gallons per day. There will be two injection wells with one serving as standby. We will expand the Final EA discussion to explain that two injection wells are recommended to achieve disposal of the target 800,000 GPD. Even though the current estimated daily flow rate at the aquarium is 470,000 GPD, the current NDPES Permit (HI 0020630) is based on average flow of 640,000 GPD. The design flow rate of 800,000 GPD is a 25% increase of the NDPES Permit allowance. Based on the hydrogeological study and the capacity of the existing saltwater supply well (exceeding 800,000 GPD), it's anticipated that each of the two proposed injection wells will have the capacity to handle the future flow of 800,000 GPD. At any given time only one injection well will need to be operational whereas the other can be on standby. Periodic maintenance/cleaning of the injection wells should be performed to maintain their capacity.

3. Sea Level Rise (SLR)/Climate Change Adaptation - As you acknowledged, Section 3.2.1 evaluated climate change and sea level rise and we include findings of the Hawai'i Sea Level Rise Vulnerability and Adaptation Report. We further state, in Section 3.2.1.2, that WAq building complex is entirely in the 3.2 SLR-XA, and a long-term plan for adaptation or relocation may need to be developed for WAq. Regarding Category 4 hurricanes, in Section 3.2.3, Tsunami and Hurricane Hazards, we state that given Category 4 hurricanes, storm surge flooding will inundate the entire WAq parcel with water levels less than 3 ft above ground and

depict that information in Figure 3-10, Storm Surge Risk Map, Category 4 Hurricane. We appreciate and concur with your comments.

4. Hawai‘i Coastal Zone Management (CZM) Program – Thank you for the clarification of CZM adoption dates and codification. We will incorporate this information in the Final EA.

5. Special Management Area (SMA) – We will incorporate the language you provided to accurately portray the role of the counties in developing, updating and maintaining SMA maps of their respective counties.

6. Shoreline Setbacks – The references to "shoreline setback permit" on page 63 have been changed to "shoreline setback variance." Regarding your suggestion for a shoreline a map layout of the shoreline area with a certified shoreline and the shoreline setback line decided by the CCH DPP, please note that Section 4.6.3 includes Figure 4-1 which shows a certified shoreline survey for the property.

Again, thank you for your comments and guidance on the Draft Environmental Assessment. We will append your comments and our response in the Final EA.

Sincerely,

Berna Senelly
Regulatory Lead

Copies to
Brandon Shima, Project Manager, Office of Project Delivery, University of Hawai‘i
Lise Ditzel-Ma, Project Manager, Office of Project Delivery, University of Hawai‘i
Tavia Oshiro, Environmental Compliance Program Manager, University Hawai‘i